HOW MANY?

A DICTIONARY OF UNITS OF MEASUREMENT

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A

a

an international symbol for year, taken from the Latin word *annus*. Although English-speaking countries continue to use the traditional symbol *yr* for most purposes, scientists use the *a* symbol in papers and textbooks. The symbol is often seen in combinations such as Ma (million years) or Ga (billion years).

a or A

shortened version of am or AM in a statement of time (see below).

A

a symbol for international standard paper sizes, followed by the size number, as in A4 for a standard business-letter sheet. A table of sizes is provided. A sheet of size A*n* has a width of $100 \cdot 2^{-1/4-n/2}$ centimeters and a length of $100 \cdot 2^{1/4-n/2}$ centimeters (rounded to the nearest millimeter). Note: "A" is also the SI symbol for the ampere (see below).

A*

see "angstrom star" below.

aas

see "as" below.

ab-

a prefix indicating that an electrical unit is part of the CGS absolute electromagnetic system. These units are also indicated by the notation **emu** (as in "volt emu"). Although these units are defined naturally as part of the CGS system, all of them except the abampere and abcoulomb are either much too large or much too small for most applications. They have been replaced almost completely by the corresponding SI units. Following are the SI equivalents for each of the "ab" units:

Electric current: 1 **abampere** = 10 amperes
Electric charge: 1 **abcoulomb** = 10 coulombs
Capacitance: 1 **abfarad** = 10^9 farads = 1 gigafarad
Inductance: 1 **abhenry** = 10^{-9} henry = 1 nanohenry
Resistance: 1 **abohm** = 10^{-9} ohm = 1 nanoohm
Conductance: 1 **abmho** = 10^9 siemens
Magnetic flux density: 1 **abtesla** = 10^{-4} tesla = 1 gauss
Potential: 1 **abvolt** = 10^{-8} volt = 10 nanovolts
Power: 1 **abwatt** = 10^{-7} watt = 0.1 microwatt
Magnetic flux: 1 **abweber** = 10^{-8} weber = 1 maxwell.

absorbance unit (AU)

a logarithmic unit used to measure optical density, the absorbance of light transmitted through a partially absorbing substance. If T is the percentage of light transmitted, then the absorbance is defined to be $-\log_{10} T$ absorbance units. An increase in absorbance of 1.0 AU corresponds to a reduction in transmittance by a factor of 10. If the absorbance is 1.0 AU then 10% of the light is transmitted; at 2.0 AU only 1% of the light is transmitted, and so on. Note that AU is also used in astronomy as a symbol for the astonomical unit (see below).

abv, abw

symbols for alcohol by volume and alcohol by weight. 1% abv = 1% v/v and 1% abw = 1% w/v.

academic year

a unit of time in U.S. schools, generally equal to 9 months beginning in August or September.

accm, acfm, acfh, acfd, acim (etc.)

symbols for "actual cubic centimeters per minute", "actual cubic feet per minute", "actual cubic feet per hour", "actual cubic feet per day", and "actual cubic inches per minute." Many similar abbreviations are in use. These are units of flow rate for gases. See sccm.

ACI

a symbol for the "anatomical Chinese inch" or t'sun [2].

acoustic ohm

any one of several units measuring sound resistance. These units got their name by analogy with electric resistance, which is measured in ohms. The sound resistance across a surface in a given medium is defined to be the pressure of the sound wave at the surface divided by the volume velocity. Unfortunately, the result is often stated in "acoustic ohms" no matter what units are used to measure pressure and

time. In the CGS system, the acoustic ohm equals 1 microbar second per cubic centimeter (μbar·s/cm^3), which is the same as 1 dyn·s/cm^5. In the MKS system, the acoustic ohm is equal to the SI unit, 1 pascal second per cubic meter (Pa·s/m^3), or 1 N·s/m^5. The CGS acoustic ohm equals 10^5 MKS acoustic ohms. See also rayl.

acre (ac or A)

a unit of area used for measuring real estate in English-speaking countries. "Acre," an Old English word meaning a field, is derived from the Latin *ager* and Greek *agros*, also meaning a field. The acre was originally defined as the area that could be plowed in a day by a yoke of oxen. It was in use in England at least as early as the eighth century, and by the end of the ninth century it was generally understood to be the area of a field one furlong (40 rods or 10 chains) long by 4 rods [1] (or 1 chain) wide. Thus an acre is 10 square chains, 160 square rods, 43 560 square feet or 4840 square yards. There are exactly 640 acres in a square mile. In metric countries the unit corresponding to the acre is the hectare, which is 10,000 square meters (the area of a square 100 meters on each side). One acre is equal to 0.404 687 3 hectare. Among traditional European land area units, the acre is typical in being defined as a day's work but unusual in not being visualized as the area of a square. Similar units include the French journal, north German and Dutch morgen, south German and Swiss juchart, Austrian joch, and Czech jitro.

acre (used as a unit of length)

various historical references mention "acre" as a unit of length, but there has never been any official definition of such a unit. In older works, especially in Britain, an**acre of length** is a furlong and an **acre of breadth** is 4 rods, since those were the historic dimensions of an acre. The acre is also the area of a square about 208.710 feet (roughly 208 feet 8.5 inches or 63.615 meters) on a side, and sometimes, mostly in the U.S. and Canada, this length was called an acre or the **side of an acre**. In contrast, the original area unit was sometimes called the **square acre**. All these usages are obsolete.

acre foot (ac ft or af)

a unit of volume used to measure the capacity of reservoirs. One acre foot is a volume one foot deep covering an area of one acre. Thus an acre foot contains exactly 43 560 cubic feet, about 325 851.4 U.S. gallons, or about 1233.482 cubic meters (0.123 348 hectare meter). The symbol **af** is widely used in reservoir management in the U.S., often in combinations such as **kaf** (1000 acre feet) or **maf** (million acre feet; this symbol should be **Maf**).

acre inch (ac in)

a unit of volume equal (of course) to 1/12 acre foot. An acre inch contains exactly 3630 cubic feet, about 27 154.29 U.S. gallons, or about 102.7902 cubic meters.

AD

abbreviation for the Latin *anno domini*, "year of the Lord," the traditional designation for years of the common or Christian era. This abbreviation is often replaced by CE (common era), especially in countries where Christianity is not a dominant religion. See CE for additional information.

-ad

a suffix added to a number to create a unit of quantity equal to that number: for example, a 24ad is a unit of quantity equal to 24. Units of quantity equal to 1 through 8 are known, respectively, as the monad, dyad, triad, tetrad, pentad, hexad, heptad, and octad, terms coined by adding -ad to the Greek numbers 1-8.

Admiralty mile

see nautical mile.

aeon

a unit of time equal to one billion years (1 Ga). Proposed in 1957 for use in geology, the aeon is not approved by the SI and hasn't found much favor.

AFUE

an abbreviation for **annual fuel utilization efficiency**, a measure of the efficiency of a gas furnace. The rating is designed to represent the percentage of the fuel energy actually delivered as heat energy, averaged over the course of a typical heating season. The actual calculation is

quite complex, taking many properties of the furnace into account. Older furnaces have ratings of 60% AFUE or even lower; the newest high-efficiency furnaces are rated in the 90%-95% AFUE range. The U.S. Department of Energy requires new furnaces to operate at 78% AFUE or better.

agate, agate line

a traditional unit of area used in printing and advertising. The agate line is equal to 1/14 inch (1.814 millimeters) multiplied by the width of the printed line. Its name comes from the traditional type size called agate, which sets approximately 14 lines to the inch (very small print!).

AH

abbreviation for the Latin *anno hegirae*, traditionally used in the West to designate years of the Islamic calendar. The Islamic calendar is lunar, counting twelve lunar months to the year (see month [2]). Thus its years are shorter than ordinary solar years. Years are counted from the day of the Hijra (Hegira in Latin), the flight of Mohammed from Mecca to Medina, which is fixed at 16 July 622 AD in the Julian calendar. The Islamic year AH 1431 begins at sunset of 13 December 2009 in the current (Gregorian) calendar. **Link:** Islamic calendar information from IslamicFinder.org.

air mass

a unit used in astronomy in measuring the absorption of light from the stars by the atmosphere. One air mass is the amount of absorption of light from a star directly overhead (at the *zenith*). The absorption of light from other stars is greater, because their light must pass obliquely through the atmosphere. If Z is the *zenithal angle*, the angle between the star and the zenith, then the absorption of its light is estimated to be sec Z air masses, "sec" being the secant trigonometric function.

air watt

an engineering unit used to express the effective cleaning power of a vacuum cleaner or central vacuum system. The air watt is practically the same as the ordinarywatt. Measurements of vacuum power, however, are computed from English units using the following formula established by the American Society for Testing and Materials (ASTM): power in air watts equals 0.117354·F·S, or very nearly F·S/8.5, where F is the air flow in the system in cubic feet per minute (CFM) and S is the suction pressure in inches of water column (in WC). This definition makes the air watt equal to 0.9983 watt.

ale gallon

a traditional unit of liquid volume in Britain and the U.S., the ale gallon was equal to 282 cubic inches (4.6212 liters) or about 1.2208 U.S.liquid gallon (1.0165 British Imperial gallon). Standardized in the sixteenth century under Queen Elizabeth I, the ale gallon remained in use well into the nineteenth century but is obsolete today. It is also called the **beer and ale gallon**.

allergy unit (AU)

a measure of the potency of the compounds used by physicians in skin testing for allergies. The units are calibrated for each compound and the strength of the solutions is stated in allergy units per millimeter (AU/ml).

almude

a traditional unit of volume in Spain and Portugal. The two countries used the name for units of quite different sizes. The Spanish almude is comparable to the Britishgallon; it holds about 4.625 liters, equivalent to 1.017 Imperial gallon or 1.222 U.S. liquid gallon. The Portuguese almude is much larger; it holds about 16.7 liters, which is 3.67 Imperial gallons or 4.41 U.S. liquid gallons.

aln or alen

a traditional Scandinavian unit of distance very similar to the north German elle: roughly 2 feet or 60 centimeters. The Danish alen, also used in Norway, was equal to 62.77 centimeters (24.71 inches). The Swedish aln was 2 fot or 59.38 centimeters (23.38 inches).

alpha TE

an abbreviation for "alpha tocopherol equivalent," a measure of vitamin E used in nutrition. Vitamin E is actually a group of related chemical compounds called tocopherols. The activity, or potency, of vitamin E in a food or food supplement is measured by the quantity (in milligrams) of alpha tocopherol (the most active of the forms of the vitamin)

which would be equivalent to the compounds present in the food or supplement. One milligram alpha TE is equal to 1.5 international units (IU).

alqueire [1]

a traditional unit of volume for dry goods in Portugal and Brazil, equal to 1/4 fanga (the Portuguese equivalent of the Spanish fanega). This is about 13.8 liters or 12.5 U.S. dry quarts.

alqueire [2]

a traditional unit of land area in Portugal and Brazil. Still used commonly to measure farmland in Brazil, the unit varies considerably from region to region. One alqueire equals 2.42 hectares (5.980 acres) in São Paulo; 4.84 hectares (11.960 acres) in Río de Janeiro, Minas Gerais, and Goiás; 9.68 hectares (23.920 acres) in Bahía, and 2.7225 hectares (6.728 acres) in the northern part of the country. In Portugal, where the unit is obsolete, it was much smaller, about 0.14 hectare (0.35 acre).

alt h

traditional abbreviation in pharmacy for *alternis horis*, every other hour, a unit of frequency sometimes used in medical prescriptions.

am or AM [1]

abbreviation for the Latin *ante meridiem*, "before noon," used after a time to indicate that the time is before 12:00 (noon). The notations "am" and "pm" are used extensively in the United States, Canada, and other countries where time is usually not stated on a 24-hour basis. By convention, midnight is represented as 12:00 am and noon as 12:00 pm. In text, however, it is best to avoid the use of 12:00 am or 12:00 pm since the reader may not be aware of these conventions.

AM [2]

abbreviation for the Latin *anno mundi*, "year of the world." This abbreviation is traditionally used to designate years in the Jewish calendar, which counts years from the creation of the world as described in the Hebrew scriptures. The Jewish calendar is lunisolar; its years correspond to ordinary solar years (see month [2]). The first day of AM 1 is equivalent to 6 October 3761 BCE in the Julian calendar, and AM 5769 began at sunset of 29 September 2008 in the current (Gregorian) calendar. **Link:** Wikipedia has a good description of the Jewish calendar and its history; Remy Landau has an extensive web site on the subject; and a date converter is available.

amagat

units used by physicists to express the relative volume and density of gases. The **amagat volume unit** is about 22.414 liters per mole (L/mol) or 0.022 414 m^3/mol, the volume occupied by a gas at standard temperature (0.01°C) and standard pressure (1 atmosphere).

The **amagat density unit** represents the corresponding relative density, which is equal to one kilomole per standard volume, or 44.615 moles per cubic meter (mol/m^3), or 0.044 615 mole per liter (mol/L), again provided the measurement is made at standard temperature and pressure. In general, the ideal gas law shows that the relative density is equal to P/RT, where P is the pressure on the gas, T is the absolute temperature (in kelvins) and R is the universal gas constant, R = 8.314 joules per mole per kelvin. The unit honors the Dutch physicist E. H. Amagat (1841-1915), whose work included the study of gases under pressure.

amber

an old English unit of volume, used for both liquids and dry goods. The amber was equal to about 4 bushels or roughly 140 liters.

American run

see run.

ampere (A or amp)

the SI base unit of electric current, named for the French physicist André-Marie Ampère (1775-1836), one of the pioneers in studying electricity. The current official definition of the ampere goes like this: suppose we have two parallel conductors, infinitely long and having negligible cross section. Place these conductors one meter apart in a perfect vacuum. One ampere is the current which, if it's flowing in these conductors, creates between them a force of 0.2 micronewtons per meter of length. (You're welcome to object that no one can make an infinitely long conductor, nor a perfect vacuum. But scientists can use the idealized definition to construct appropriate real-world equipment

in their laboratories.) It is likely that new definitions will be adopted at the CGPM meeting in 2011; the proposed definition is that the ampere represents a flow of exactly 6 241 509 479 607 717 888 elementary charge units (such as electrons) per second. The other electrical units are all defined in terms of the ampere. For example, one ampere represents a current flow of one coulomb of charge per second. One ampere of current results from a potential distribution of one volt per ohm of resistance, or from a power production rate of one watt per volt of potential. The unit is known informally as the **amp**, but **A** is its official symbol.

ampere hour (A·h or amp hr)

a commercial unit of electric charge often used to state the capacity of a battery. One ampere hour is the charge accumulated by a steady flow of one ampere for one hour. This is equivalent to exactly 3600 coulombs.

ampere per meter (A/m) or ampere-turn per meter

the SI unit of magnetic field strength. One ampere per meter is equal to pi/250 oersteds (12.566 371 millioersteds) in CGS units. The ampere per meter is also the SI unit of "magnetization" in the sense of magnetic dipole moment per unit volume; in this context 1 A/m = 0.001 emu per cubic centimeter.

ampere turn (At)

the MKS unit of "magnetomotive force." Electric current passing through a coil of wire generates a magnetic field. This field-generating ability is called magnetomotive force; it is equal to the product of the current, in amperes, and the number of turns of wire in the coil. One ampere turn equals 4pi/10 = 1.256 637 gilberts (Gb).

amphora

a historic unit of volume. An amphora is the volume of an urn or jar of the same name. These urns were tall, with handles near the top on both sides (the word amphora comes from two Greek words meaning "on both sides" and "carry"). Amphoras were the containers of choice for shipping wine and many other commodities in the ancient world. Archaeologists report that the Greek amphora held about 38.8 liters (10.25 U.S. liquid gallons, or 8.54 British Imperial gallons). The Roman amphora was smaller, about 25.5 liters (6.74 U.S. gallons or 5.61 British Imperial gallons).

anatomical Chinese inch (ACI)

a name in English for the t'sun [2], a unit of relative distance used in acupuncture.

anchor

another name for the anker (see below).

angstrom (Å or A)

a metric unit of length, equal to 0.1 nanometer or 10^{-10} meter. Angstroms are used most often to measure the wave length of light waves. There is a technique called spectroscopy for identifying chemical substances by the wave lengths of light which they absorb (or emit, depending on the circumstances). Light shining through or from the substance is passed through a prism, which separates the various wave lengths to form a colorful spectrum. The spectrum often includes bright bands corresponding to wave lengths at which the substance emits light, or dark bands if the substance is absorbing light. The pattern of bands identifies the substance in somewhat the same way a fingerprint identifies a person. One of the pioneers of spectroscopy was the Swedish physicist Anders Jon Ångström (1814-1874), and in his honor the wave lengths of light waves are customarily stated in angstroms. Although English speakers usually pronounce the word as if it were English, the Swedish pronunciation is closer to "ong-strerm."

angstrom star (Å* or A*)

a unit used to measure the wavelength of X-rays. Because it's easier to measure the ratio between two X-ray wavelengths than it is to measure the wavelengths themselves, the wavelengths are usually stated as multiples of a standard wavelength. The X unit and the angstrom star are the units used for this purpose. Å* was defined by J.A. Bearden in 1965 to provide a unit approximately equal to the angstrom (10^{-10} meter or 0.1 nanometer). Later measurements have shown that in fact A* is equal to approximately 1.000 0015 x 10^{-10} meter or 100.000 15 picometers.

angular mil

see mil [2].

animal unit (AU)
a unit of feed consumption used in U.S. dairying and ranching. One animal unit is the feed or grazing requirement of a mature cow weighing 1000 pounds (about 454 kilograms). This is approximately 26 pounds (11.8 kg) of dry forage. Total feed requirements are often figured by the **animal unit month (AUM)**, the feed required to sustain one animal unit of livestock for one month (780 pounds or 354 kg).

anker or anchor
a small wine barrel used in Britain and elsewhere in northern Europe. In England an anker usually held 10 wine (U.S. liquid) gallons (37.85 liters); the Scottish anker held 20 Scots pints (about 34 liters). The word anker is of Dutch origin.

anna
a unit of land area in South Asia. In Pakistan, the anna equals 20.17 square yards or 16.86 square meters. In Nepal, the anna is nearly twice that size: 31.8 square meters, 342 square feet, or 38 square yards.

annual percentage rate (% APR)
a unit used in the U.S. for stating interest rates and rates of return on investment. By federal regulation, these rates can be stated however a financial institution wishes, but they must be stated also in % APR so that consumers can compare rates of different loans and investment opportunities. Mathematically, the natural rate *r* of return on money is the "instantaneous" rate, the rate that allows for compounding of interest continuously. The APR is the percentage growth rate *a* of the money over a period of one year, as if interest were compounded annually. The two rates are related by the formulas $a = e^r - 1$ and $r = \ln(1 + a)$, where e^r is the natural exponential function and ln is the natural logarithmic function.

ap
an abbreviation for "apothecary," used with certain units to indicate that the measurement is in the traditional apothecary system (see below). For units existing in both the apothecary and troy systems, the apothecaries' units are the same as the troy units, for example, 1 oz ap = 1 troy ounce.

Apgar score
a numerical measure of the health of a newborn baby. One minute after birth (and at regular intervals thereafter through the first moments of life) newborns are rated 0, 1, or 2 on five indicators of health (respiratory effort, heart rate, skin color, muscle tone, and reflexive response to smell). Possible scores therefore range from 0 to 10. The unit is named for its inventor, the American anesthetist Virginia Apgar (1909-1974).

API degree, API gravity
see degree API.

apostilb (asb)
an MKS unit of luminance, equal to the brightness produced by 1/pi candela per square meter or 10^{-4} lambert. The name of the unit is pseudo-Greek for luminance; it combines the ancient Greek *stilbein*, to "glitter" or "shine," with the prefix *apo-*, "away from."

apothecary weights
a version of the troy weight system formerly used by apothecaries (pharmacists). The troy pound, equal to 373.242 grams or 13.165 72 avoirdupois ounces, is always divided into 12 ounces, each ounce being equal to 480 grains. In the apothecary system, the ounce is divided into 8 drams (60 grains) each containing 3 scruples (20 grains). There is a parallel system of liquid volume measure in which the fluid ounce is divided into 8 fluid drams (or fluidrams) each containing 3 fluid scruples. The apothecary system continued in use into the early twentieth century, but it has been replaced everywhere in pharmacy by the use of metric units. The abbreviation "ap." indicates apothecaries' units, as in "oz. ap." or "dr. ap."

arcminute (′ or min)
a unit of angular measure, also called the **minute of arc**, equal to 60 arcseconds and to 1/60 degree. There are 21 600 arcminutes in a circle.

arcsecond (″ or as or sec or s)
a unit of angular measure, also called the **second of arc**, equal to 1/60 arcminute. One arcsecond is a very small angle indeed: there are 1 296 000 seconds in a circle. The SI defines s as the symbol for the time unit and recommends ″ as the symbol for the arcsecond. The symbol **as** has

become common in astronomy, where very small angles are stated in milliarcseconds (mas).

are (a)

a unit of area equal to 100 square meters. The word is pronounced the same as "air." Being the area of a square 10 meters on each side, the are is a little large for measuring areas indoors and a little small for measuring areas outdoors. As a result, the are is not used as often as its multiple, the hectare (ha). One are is approximately 1076.3910 square feet, 119.5990 square yards, or 0.02471 acre.

arm's-length

in English the term "arm's-length" is used figuratively to mean "a distance discouraging familiarity or conflict." In many cultures, however, the length of a human arm is standardized as a unit of distance equal to about 70 centimeters or 28 inches. Examples include the Italian braccio, the Russian sadzhen, and the Turkish pik.

arpent [1]

a traditional unit of distance in French-speaking countries. The arpent equals 30 toises or 10 perches; this is about 191.8 feet or 58.47 meters. The unit was used to measure land; in fact, *arpentage* is the French word for surveying. In Canada the arpent has an official definition of 191.835 English feet (58.471 308 meters).

arpent [2]

a traditional unit of area in French North America (Québec and Louisiana), equal to one square arpent [1]. The arpent of area equals 900 square toises, 100 (square)perches, approximately 0.8445 acre or 0.3419 hectare. By the official Canadian definition, the arpent of area contains 36 800.667 23 English square feet or about 0.844 827 acre (0.341 889 hectare).

arratel or artel

versions of a traditional Arab unit of weight; see rotl. The spelling "arratel" is used in Portugal as an alternate name for the libra.

arroba (@)

a traditional unit of weight in Spain and Portugal, equal to 1/4 quintal. However, the Spanish and Portuguese quintals are of different sizes. In Spain, the arroba equals 25.36 pounds (11.50 kilograms); arrobas of very similar sizes were established in the Spanish speaking countries of Latin America. In Portugal and Brazil, the arroba traditionally equals 32.38 pounds (14.69 kilograms, but in recent years this has been "metrized" to be exactly 15 kilograms). The arroba has also been used as a metric unit equal to exactly 15 kilograms. The name of the unit comes from *ar rub'*, Arabic for "the quarter." The @ sign has been used in Spanish as a symbol for the arroba since the sixteenth century at least.

arshin

a traditional Russian unit of distance. Peter the Great standardized the arshin at exactly 28 English inches, or 71.12 centimeters, early in the 1700s. The arshin was also used in several other countries adjacent to Russia. The arshin is also used as a unit of area equal to one square arshin; this would be equal to 5.4445 square feet or 0.5058 square meter.

artaba

a historic unit of volume, used for both liquid and dry measurement throughout the Middle East. In ancient times the artaba varied in size between about 35 and 55 liters. In recent centuries the Arab artaba, equal to about 66 liters, was a common unit in both Arab and non-Arab parts of the area.

as

a symbol used in astronomy for the arcsecond (see above).

as, ass, or aas

a traditional unit of mass for gold and silver, used in most of northern Europe but not in England. The unit varied in size from about 48 to 58 milligrams (0.75 to 0.90 English grain).

ASA number

for many years, the initials of the American Standards Association appeared on film packages in the United States as a measure of the speed of the photographic emulsion (the stuff on the film that "develops" to form the picture). The scale is arbitrary, but the important thing to know is that the speed at which the image registers on the film is proportional to the ASA number. Thus ASA 400 film registers an image twice as fast as ASA 200 film and four times as fast as ASA 100 film. The ASA number

is now combined with the European DIN rating as a composite ISO rating. For example, ASA 400 film is now marked ISO 400/27°, because 27 is the DIN rating corresponding to ASA 400.

assay ton (AT)

a specialized unit of mass used by minerologists in assaying (testing) ores for the presence of gold, silver, platinum, uranium, or other valuable metals. One assay ton equals 29.1667 grams: just a little over an an ounce! The assay ton is actually a sample size. Since there are 87500/3 = 29166.7 troy ounces in a short ton (2000 lb), the number of *milligrams* of a precious metal in a sample of one assay ton is numerically equal to the number of *troy ounces* of that metal in one ton of raw ore. In Britain, the assay ton is based on the long ton and thus equals 98/3 = 32.6667 grams.

astronomical unit (ua or au or AU)

a unit of distance used by astronomers to measure distances in the Solar System. One astronomical unit equals the "average" distance from the center of the Earth to the center of the Sun (mathematically, it is the length of the semimajor axis of the Earth's elliptical orbit, which is the ordinary average of the Earth's minimum and maximum distances from the Sun). The currently accepted value, adopted in 1996, is 149 597 870 691 meters ($1.495\ 978\ 706\ 91 \times 10^8$ kilometers or about 92 955 807 miles), with an uncertainty of about 30 meters. The astronomical unit is a convenient yardstick for measuring the distances between objects in the Solar System. Astronomers find it particularly convenient to use astronomical units in solving the equations of planetary motion. Because these equations are the same regardless of the unit used for distance, the predictions they generate will remain correct even if future astronomers determine a slightly different length for the distance between the Earth and Sun. This unit is accepted for use with SI units. The official symbol for the unit is **ua**, but the symbol **au** is common in English-speaking countries. Note that AU is also used as the symbol for the absorbance unit (see above).

atmo-meter (atmo-m)

a unit used in atmospheric physics to compare the "depth" or total volume of atmospheres, or components of atmospheres. The depth (in atmo-meters) is equal to the depth (in meters) the atmosphere, or one gas component of the atmosphere, would have if it formed a uniform layer at standard temperature (0 °C) and pressure (1 atmosphere). One atmo-meter represents $2.686\ 99 \times 10^{25}$ molecules of gas per square meter of planetary surface.

at

symbol for the technical atmosphere.

atmosphere (atm or atmos)

a unit of pressure designed to equal the average pressure of the Earth's atmosphere at sea level. In other pressure units, one atmosphere equals exactly 1013.25millibars (mb), 101.325 kilopascals (kPa), approximately 29.92 inches of mercury (in Hg), 760.0 millimeters of mercury (mm Hg), or 14.6959 pounds of force per square inch (lbf/in^2). This is the **standard atmosphere**; it equals 1.03323 technical atmosphere (that is, 1.03323 kilograms of force per square centimeter).

atom

a medieval unit of time. The Greek word *atomos* means something "uncuttable," thus indivisible. In medieval times the Latin form *atomus* was also used to mean "a twinkling of the eye," the smallest amount of time imaginable. This was sometimes defined in a precise way equivalent to exactly 1/376 minute or about 160 milliseconds.

atomic mass unit (u or amu)

the unit of mass used by chemists and physicists for measuring the masses of atoms and molecules. Early in the nineteenth century, scientists discovered that each chemical element is composed of atoms, and that each chemical compound is composed of molecules in which atoms are combined in a fixed way. No one knew then just how small atoms and molecules really are, but as long as the relative weights of the different atoms were known, the outcome of chemical reactions could be predicted. These relative masses were determined by careful study of various reactions. The general idea was that atoms of hydrogen, known to be the lightest element, should have a mass of 1 amu, and all the other atoms should have masses which are multiples of this (then

unknown) mass of the hydrogen atom. For a long time, physicists and chemists disagreed on the details of this definition. In 1960 they agreed on the definition of the **unified atomic mass unit** as 1/12 the mass of the most common atoms of carbon, known as carbon-12 atoms. (Most elements are mixtures of atoms which have different masses because they contain different numbers of neutrons; these varieties are called isotopes.) Careful experiments have measured the size of this unit; the currently accepted value (1998) is 1.660 538 782 x 10^{-27} kilograms. (This number equals 1 divided by Avogadro's number; see mole.) In addition, 1 amu equals approximately 931.494 028 MeV (see electron volt). In biochemistry, the atomic mass unit is called the dalton (Da).

atomic number

The atomic number was originally defined (about 1865) simply as an index describing the position of an element in the periodic table. Not until 1913 was it known that the atomic number is actually a unit of measurement, equal to the number of electrons surrounding a neutral (uncharged) atom, and also to the number of protons in the nucleus.

atto- (a-)

a metric prefix denoting 10^{-18} (one quintillionth). For example, one electron volt equals 0.1602 attojoule. The root of the prefix is *atten*, the word for 18 in Danish and Norwegian.

AU or au

in astronomy, the synbol for the astronomical unit; in medicine, a symbol for allergy units.

AUC

abbreviation for the Latin phrase *ab urbe condita*, "from the founding of the city." The Romans counted years from the legendary founding of Rome by Romulus and Remus, an event placed in 753 BC (or BCE) in our present calendar. The Christian Church continued to count years AUC for centuries after the fall of Rome. Our year 2002 is 2755 AUC.

aught (/0)

a unit used by jewelers and craftspeople to measure the size of small beads (often called seed beads). The measurement scale is inverted: larger numbers of aughts correspond to smaller beads. Beads of size 11/0, a common size, average a little less than 2 millimeters in diameter, and other sizes are more-or-less inversely proportional. The measure may have originated as the number of beads that could comfortably be strung on one inch of cord; with present sizes a string of *n* beads of size *n*/0 occupies about 0.8 inch (20 mm). The word *aught*, meaning zero, is a fairly recent corruption of the old English word *naught*, meaning nothing; apparently the phrase *a naught*, meaning a zero, came to be misspelled as *an aught*.

aume

an old English wine measure equal to about 40 gallons (roughly 150 liters). The aume is the English version of a German unit, the ohm [2].

aune

a traditional French unit of distance, varying from region to region but similar in length to the English ell.

av or avdp

abbreviations for avoirdupois (see below).

Avogadro's number, Avogadro constant (N_A)

a unit of relative quantity equal to the number of atoms or molecules per mole of a substance. The currently accepted value is 6.022 141 79 x 10^{23} per mole with an uncertainty of 0.000 000 47 x 10^{23} per mole (about 80 parts per billion). The atomic mass unit (see above), in grams, is equal to one divided by this number. The unit is named for the Italian chemist and physicist Amadeo Avogadro (1776-1856). Avogadro was the first to conclude from Dalton's atomic theory that equal volumes of gases (at the same temperature and pressure) must contain equal number of molecules.

avoirdupois weights

the common traditional system of weights in all the English-speaking countries. Until the introduction of the metric system, almost all weights were stated in avoirdupois units, with only precious metals being measured by troy weights and pharmaceuticals by apothecary weights (see above). The name of the system comes from the Old French phrase *avoir du pois* or *aveir de pois*, "goods of weight," indicating simply that the goods were being sold by weight rather than by volume

or by the piece. The system is based on the avoirdupois pound [1] of 7000 grains. The pound is divided into 16 ounces [1], each divided further into 16 drams [1]. The avoirdupois system was introduced in England around 1300, replacing an older commercial system based on a "mercantile pound" (*libra mercatoria*) of 7200 grains divided into exactly 15 troy ounces [2]. Scholars believe the avoirdupois pound was invented by wool merchants and modeled on a pound of 16 ounces used in Florence, Italy, which was an important buyer of English wool at the time. The avoirdupois weights quickly became the standard weights of trade and commerce. They continue to be used for most items of retail trade in the United States, and they remain in some use in Britain, Canada, and other areas of British heritage despite the introduction of metric units there.

AWG
abbreviation for American Wire Gauge. See gauge [3] and the table of wire gauge equivalents.

B

B [1]
informal abbreviation for "billion," generally meaning the American billion 10^9. This abbreviation is non-metric: the metric abbreviation for 10^9 is G, standing for the prefix giga-. The B form has been used in such units as **Bcf** (billion cubic feet) and **BeV** (billion electron volts).

B [2]
a symbol for international standard paper sizes, followed by the size number, as in B4. A table of sizes is provided. A sheet of size B *n* has a width of $100 \cdot 2^{-n/2}$centimeters and a length of $100 \cdot 2^{1/2-n/2}$ centimeters (rounded to the nearest millimeter).

bag [1]
another name for a sack (3 bushels) used as unit of measure in Britain.

bag [2]
an old English unit of weight, varying with the contents of the bag but generally in the range of 2-4 hundredweight (100-200 kilograms).

bag [3]
a unit of weight for cement. Traditionally a bag of portland cement weighs 94 pounds (42.6 kilograms) in the US. and 87.5 pounds (39.7 kilograms) in Canada. However, cement is now being sold also in metric-sized bags of 50 kilograms (110.2 pounds) by many suppliers.

baht
a traditional weight unit in Thailand, now equal to exactly 15 grams or 1/40 catty (0.5291 ounce). The baht, originally the weight of a silver coin of the same name, is used to measure the weight of precious metals. The unit is pronounced *bot*.

baker's dozen
an informal unit of quantity, equal to 13. Bakers sometimes toss in an extra item for each dozen bought, making a total of 13. This custom is very old, dating at least from the thirteenth century, when the weights and prices of loaves of bread were strictly regulated by royal proclamations called *assizes*, and bakers could be jailed if they failed to provide fair weight at the listed prices.

bale (bl) [1]
a bundle of merchandise, usually pressed and bound in some way. The word "bale" has been used in many ways to describe standard packages of various commodities. For example, a bale of paper is traditionally equal to 10 reams. In agriculture, a bale of hay is generally a huge round bundle left in the field until needed; these bales can weigh up to 1500 pounds (700 kilograms). In U.S. garden shops, a bale of straw is typically 3 cubic feet (0.085 cubic meter).

bale (bl) [2]
a commercial unit of weight for shipments of cotton. In the United States, one bale of cotton, formerly equal to 500 pounds (226.80 kg), is now equal to 480 pounds (217.72 kg). The British used the Egyptian bale, formerly equal to 750 pounds (340.19 kg) but now equal to 720 pounds (326.59 kg). Other countries use a variety ofcotton bale weights.

ball
a unit measuring the degree of ice coverage of polar seas. One ball equals 10% coverage. The unit was invented by the Russian naval officer N. N.

Zhubov (1895-1960).

Balling

a unit of density; see degree Plato.

balthazar

a large wine bottle holding about 12 liters, 16 times the volume of a regular bottle.

bank cubic meter (BCM)

a traditional unit of volume in coal mining. A bank cubic meter represents the contents of a cubic meter of rock in place, before it is drilled and blasted.

bar [1] (b)

a metric unit of atmospheric pressure, equal to one million dynes per square centimeter, 100 kilopascals, 750.062 torr, 1.019 72 kilograms of force per square centimeter (kgf/cm^2), or about 14.503 78 pounds per square inch (lbf/in^2). The word comes from the Greek *baros*, "weighty." We see the same root in our word,*barometer*, for an instrument measuring atmospheric pressure. One bar is just a bit less than the average pressure of the Earth's atmosphere, which is 1.013 25 bar. In practice, meteorologists generally record atmospheric pressure in millibars (mb). In English-speaking countries, barometric pressure is also expressed as the height, in inches, of a column of mercury supported by the pressure of the atmosphere. In this unit, one bar equals 29.53 inches of mercury (in Hg).

bar [2]

another name for the measure, a musical unit.

bar abs, bar dif

symbols indicating pressures measured in bars. **bar abs** indicates bars *absolute*, measuring the total pressure including the pressure of the atmosphere. **bar dif**indicates bars *differential*, measuring a difference between two pressures, neither of which is atmospheric pressure.

Barcol hardness (BH)

a measure of hardness, primarily for plastics and soft metals, made with a Barcol Impressor. Measurements on the Barcol scale are typically between 30 and 90. There is no precise conversion between these readings and other hardness scales, but the manufacturer provides a data bulletin with tables for approximate conversion toRockwell, Brinell, and Vickers hardness numbers.

barg

symbol for **bar gauge**, a common unit of pressure in engineering. The term "gauge" means that the pressure has been read from a gauge that actually measures the difference between the pressure of the fluid or gas and the pressure of the atmosphere.

barge

an informal unit of volume used in the U.S. energy industry. The barges used on American rivers customarily carry about 25 000 barrels of oil (see barrel [2] below). This is equivalent to 1.05 million gallons, roughly 1400 register tons, or about 3975 cubic meters.

barleycorn

an old English unit of length equal to 1/3 inch or about 8.5 millimeters. The custom of using seeds as units of length or weight is very common in farming societies. In Anglo-Saxon England, where barley was a basic crop, barleycorns played this traditional role. The weight of a barleycorn, later renamed the grain, is the original basis of all English weight systems including the older troy system and the later avoirdupois system. As a length unit, 3 barleycorns were equal to the Saxon *ynce*(inch). The English foot was actually defined as 12 of these *ynces*, that is, as 36 barleycorns.

bar liter

a metric unit of energy used to measure the potential energy of gases under pressure. The energy is computed by multiplying the volume of gas in liters by the pressure in bars. One bar liter equals exactly 100 joules or about 73.7562 foot pounds. This unit is not acceptable in the SI.

barn (b)

a slightly humorous unit of area used in nuclear physics. When atoms are bombarded with smaller particles such as electrons, the electrons are scattered as if the nucleus of the atom was a tiny solid object. The barn is used to express the apparent cross-sectional area of this scattering object.

One barn is equal to 10^{-28} square meters. Using this unit, physicists can say that such and such a nucleus is "as big as a barn," or 10 barns, or whatever. The proper SI unit to use for these measurements is the square femtometer (fm^2); one barn equals 100 fm^2.

barrel (bbl or brl or bl) [1]

a commercial unit of volume used to measure liquids such as beer and wine. The official U. S. definition of the barrel is 31.5 gallons, which is about 4.211 cubic feet or 119.24 liters. This unit is the same as the traditional British wine barrel. In Britain the barrel is now defined to be 36 Imperial gallons, which is substantially larger: about 5.780 cubic feet or 163.66 liters. This unit is slightly smaller than the traditional British beer and ale barrel, which held 5.875 cubic feet or 166.36 liters. There are other official barrels, defined in certain U.S. states; most of them fall in the general range of 30-40 gallons. A barrel of beer in the U.S., for example, is usually 31 U.S. gallons (117.35 liters). The origin of the standard symbol **bbl** is not clear. The "b" may have been doubled originally to indicate the plural (1 bl, 2 bbl), or possibly it was doubled to eliminate any confusion with **bl** as a symbol for the bale (see above). Note: Some web sites are claiming that "bbl" originated as a symbol for "blue barrels" delivered by Standard Oil in its early days; this is incorrect because there are citations for the symbol at least as early as the late 1700s, long before Standard Oil was founded.

barrel (bbl or bo) [2]

a commercial unit of volume used to measure petroleum. By international agreement a barrel of petroleum equals 42 U. S. gallons, which is about 158.987 liters. The symbol **bo** (barrel of oil) is used for this unit in the petroleum industry. The petroleum barrel originated in the Pennsylvania oilfields (the first commercial oilfields) in the late nineteenth century. Apparently, 40-gallon barrels were increased to 42 gallons to provide insurance agansť any spillage or underfilling. By coincidence (it seems), this unit is the same size as the traditional tierce, a wine barrel.

barrel (bbl or brl or bl) [3]

a commercial unit of volume used to measure dry commodities such as apples. The U. S. dry barrel, established by Congress in 1912, is 105 dry quarts, which is about 4.083 cubic feet or 115.63 liters. (This is the only case in the United States customary system where a dry volume is less than the corresponding fluid volume.) For certain commodities, other sizes are traditional in the U.S.; for example, a barrel of sugar was traditionally 5 cubic feet (about 141.58 liters). In Newfoundland, a barrel of herring held 32 Imperial gallons (145.47 liters) but a barrel of sand was only 18 Imperial gallons (81.83 liters).

barrel (bbl) [4]

a commercial unit of weight, varying with the commodity being measured. In the U.S., for example, a barrel of flour traditionally holds 196 pounds (88.90 kg) and a barrel of beef, fish, or pork 200 pounds (90.72 kg). A barrel of cement is traditionally equal to 4 bags, which is 376 pounds (170.55 kg) in the U.S. and 350 pounds (158.76 kg) in Canada. In old England, a barrel of herrings was 32 pounds (14.51 kg) and a barrel of soap was 256 pounds (116.12 kg).

barrel bulk

a commercial unit of volume equal to exactly 5 cubic feet or 0.141 584 cubic meters. There are exactly 8 barrels bulk in a freight ton and 20 in a register ton.

barrer or Barrer

a CGS unit of gas permeability for membranes, contact lenses, and similar thin materials. Permeability is defined to be the gas flow rate multiplied by the thickness of the material, divided by the area and by the pressure difference across the material. To measure this quantity, the barrer is the permeability represented by a flow rate of 10^{-10} cubic centimeters per second (volume at standard temperature and pressure, 0 °C and 1 atmosphere), times 1 centimeter of thickness, per square centimeter of area and centimeter of mercury difference in pressure. That is, 1 barrer = 10^{-10} $cm^2 \cdot s^{-1} \cdot cmHg^{-1}$, or, in SI units, 7.5005 x 10^{-18} $m^2 \cdot s^{-1} \cdot Pa^{-1}$. The unit, often capitalized, honors the New Zealand chemist Richard M. Barrer (1910-1996), who was a leader in research on the diffusion of gases.

barrique

a large French wine barrel holding 225 liters (about 59.44 U.S. gallons).

barye (ba)

the CGS unit of pressure, equal to 1 dyne per square centimeter. Pronounced "bar-ee," the barye derives from the Greek word for weight, *barys*. It's a very small unit; 1 barye is equal to 0.1 pascal (Pa), 1 microbar (μb), or about 14.5 x 10^{-6} pound per square inch.

basis point (bp)

a unit of proportion equal to 0.01% or 10^{-4}. The basis point is used in finance to measure small fluctuations in interest rates and the rates of return on investments. Prior to the introduction of the basis point, these fluctuations were measured clumsily in 64ths of a percent.

basis weight

a unit used in the paper industry to express the weight (really, the thickness) of paper. The basis weight is the weight in pounds of one ream (500 sheets) of a basic size sheet. For details, see pound weight.

BAU

abbreviation for bioequivalent allergy unit, a measure of the potency of the compounds used by doctors in allergy skin tests. See PNU.

baud (Bd)

a unit used in engineering for measuring the rate of data transmission over telegraph or telephone lines. The baud rate is the number of distinct symbols transmitted per second, that is, the number of times per second the signal carrying the communication varies in strength or frequency. In the days of the telegraph, the signal increased at the start of a pulse and decreased at the end, so the baud rate was 2 times the number of dots that could be transmitted per second. In recent years, when the baud has been used to represent digital data transmission, the definition has varied according to the technique used. If the symbols transmitted have only two states (on or off) then the baud rate is the same as the transmission rate in bits per second. This was the case in early modems, but in modern data transmission equipment symbols have a much larger number of possible states. For example, if the signal has $2^8 = 256$ possible states, then a single symbol can carry 8 bits of information and the bit rate will be 8 times the baud rate. Consequently, any use of "baud" as a synonym for "bits per second" is incorrect. The baud is named for the French telegraph engineer J. M. E. Baudot (1845-1903), the inventor of the first teleprinter.

Baumé

a measure of relative density; see degree Baumé.

BB

a common shot pellet size in the U.S.; the diameter of BB shot is used informally sometimes as a distance unit. BB shot has a diameter of 0.180 inch (4.572 mm). See the table of shot pellet sizes.

BC, BCE

abbreviations for "before Christ" and "before common era," respectively. These are standard designations for years before the beginning of the common or Christian era (see CE). Oddly, there is no year designated 0 in the common system for numbering years; the year 1 CE (or 1 AD) was preceded by 1 BCE (or 1 BC). The lack of a year 0 means that the number of years elapsing between the year *n* BCE and the year *m* CE (or *n* BC and *m* AD) is $n + m - 1$.

Bcfe

a symbol used in the natural gas industry for 1 billion cubic feet of gas equivalent (cfe). This is really an energy unit equal to about 1.091 petajoules (PJ).

bcm [1]

a symbol for "billion cubic microns per square inch," a unit used in flexographic printing. In this process, a roller engraved with a large number of tiny cells is used to transfer ink to the printing plate. The unit measures the total volume of these cells per unit area of the roller. One billion (10^9) cubic microns per square inch is the same as one cubic millimeter per square inch (mm^3/in^2) or one microliter per square inch ($\mu L/in^2$). The appropriate SI unit for this volume per area measure is the micrometer or micron (μm); 1 bcm is equal to 1.5500 μm.

bcm [2]

abbreviation for "bank cubic meter" (see above).

B/D

symbol for barrels of oil per day (see barrel [2] above), a unit used in the energy industry to measure the rate at which oil is pumped from a well.

bead sizes

see aught.

beat [1]

a unit of time equal to 0.001 day or 86.4 seconds. "Metric time," meaning decimalized time, is an idea dating back at least to the French Revolution of the 1790's. In most metric time proposals, the day is divided into 10 **metric hours**, each metric hour into 100 **metric minutes** (or beats), and each metric minute into 100 **metric seconds** (sometimes called **blinks**). In 1998 the Swatch Corporation repackaged metric time in a very attractive way as **Internet time**. In their proposal, time is counted in beats from midnight Central European Standard (winter) time (2300 Universal Time of the previous day, or 6:00 pm U.S. Eastern Standard Time of the previous day). The time at *n* beats is recorded as @*n*.beat; thus midnight U.S. Eastern Standard Time is @250.beat.

beat [2]

a musical unit representing a single rhythmic stress. In most musical compositions, beats are organized into measures, with each measure containing a set number of beats, one of which carries a primary or accented stress. At the same time, the tempo of the music is expressed by setting a number of beats equal to a whole note. If there are *m* beats in a measure and *n* beats in a whole note, then the fraction m/n is called the time signature of the composition. For example, a waltz has a time signature of 3/4 (3 beats per measure and 4 beats per whole note), while a march has a time signature of 4/4.

beat [3]

a unit of relative time in acting, representing a short, silent pause for dramatic effect. In the script, playwrights may specify a pause of one, two, or more beats. The unit does not have a definite length, but the director and the actors usually have an intuitive sense of how long a beat should be at a specific point in the action.

Beaufort scale

an empirical scale, first devised by the British admiral Sir Francis Beaufort (1774-1857), for estimating wind speed by observing the effects of the wind. Using the scale, sailors can judge the wind velocity by observing the wind's effects on the waves. There is a corresponding scale for observers on land. For example, a moderate gale (32-38 miles per hour) is described as "force 7" on the Beaufort scale. The Beaufort scale numbers come rather close to being a unit of measurement, because they are equal to the whole number closest to 0.66 times the wind velocity in miles per hour raised to the exponent 2/3 (Beaufort force = 0.66 x (velocity$^{2/3}$)).

becquerel (Bq)

the SI derived unit of activity, usually meaning radioactivity. "Radioactivity" is caused when atoms disintegrate, ejecting energetic particles. One becquerel is the radiation caused by one disintegration per second; this is equivalent to about 27.0270 picocuries (pCi). The unit is named for a French physicist, Antoine-Henri Becquerel (1852-1908), the discoverer of radioactivity. See also curie. Note: both the becquerel and the hertz are basically defined as one event per second, yet they measure different things. The hertz is used to measure the rates of events that happen periodically in a fixed and definite cycle. The becquerel is used to measure the rates of events that happen sporadically and unpredictably, not in a definite cycle.

beer gallon, beer and ale gallon

see ale gallon.

bee space

an informal unit of distance used in beekeeping. In a hive, bees seal up an opening smaller than a bee space, and they fill a larger opening with new honeycomb. If an opening is equal to a bee space, the bees leave it open as a passageway. A hive can be disassembled to remove the honey if the individual comb frames are carefully spaced one bee space apart. This discovery, made by the British beekeeper Lorenzo Longstroth in 1852, is crucial to modern beekeeping. The exact size of the bee space varies somewhat with the strain of bees being raised, but it is generally very close to 1/4 inch or 6.5 millimeters.

bel (B)

a logarithmic measure of sound intensity, invented by engineers of the Bell telephone network in 1923 and named in honor of the inventor of the telephone, Alexander Graham Bell (1847-1922). If one sound is 1 bel louder than another, this means the louder sound is 10 times more intense than the fainter one. A difference of 2 bels corresponds to an increase of 10 x 10 or 100 times in intensity. The beginning of the scale, 0 bels, can be defined in various ways (see decibel) originally intended to represent the faintest sound that can be detected by a person who has good hearing. In practice, sound intensity is almost always stated in decibels. One bel is equal to approximately 1.151 293 nepers.

bell

a traditional unit of time. On ships at sea, a practical measure of time is the watch, a period of 4 hours. The watch is divided into 8 bells, so one bell equals 1/2 hour or 30 minutes. Every 30 minutes the ship's bell sounds the number of bells elapsed since the start of the watch.

benz (Bz)

a proposed metric unit of speed, equal to 1 meter per second or about 2.237 miles per hour. The unit would honor Karl F. Benz (1844-1929), the German engineer generally regarded as the inventor of the automobile.

BeV

a symbol sometimes used in the U.S. for one billion (10^9) electronvolts. The correct symbol is GeV.

bhp

abbreviation for **brake horsepower**. The brake horsepower of an engine is the effective power output, sometimes measured as the resistance a brake attached to the output shaft provides to an engine. See horsepower.

bi-

a common English prefix meaning 2. In statements of frequency, *bi-* and *semi-* have become confused and it isn't always clear what a word like "bimonthly" means. This is how it's supposed to work: in adverbs of frequency, bi- means "every two." Thus a **biweekly** payroll is paid once every two weeks, a **bimonthly** magazine is published once every two months, and the U.S. House of Representatives is elected **biennially** (every two years). For something that happens twice per time unit, usesemi-.

biannually

a confusing expression of frequency. The word is used both for twice a year and for once every two years, so it should be avoided. Twice a year is *semiannually* and once every two years is *biennially*.

bicron (μμ)

an obsolete metric unit of distance, defined as 10^{-12} meter or 10^{-6} micron. This distance is now called a picometer (pm). The name is a reference to the double prefix in "micromicron."

BID or b.i.d.

abbreviation for the Latin phrase *bis in die*, twice a day, a unit of frequency traditionally used by doctors in writing medical prescriptions.

biennium

a unit of time equal to two years. Many U.S. states, including North Carolina, elect legislators every two years and adopt budgets for this two-year period, called a biennium.

bigha

a traditional unit of land area in South Asia. The bigha varies in size from region to another; in India it is generally less than an acre (0.4 hectare). In Bengal (both in Bangladesh and in West Bengal, India) the bigha was standardized under British colonial rule at 1600 square yards (0.1338 hectare or 0.3306 acre); this is often interpreted as being 1/3 acre. In central India bighas were standardized at 3025 square yards or 5/8 acre (0.2529 hectare). In Nepal the bigha equals about 0.677 hectare (1.67 acres). The bigha was divided into 20 katthas, and each kattha contained 20 dhurs.

billennium

a new word meaning one billion (10^9) years. The plural billennia is appearing informally in science writing in phrases such as "countless billennia" or "the billennia of evolutionary time."

billet

a single stick of firewood. Traditional English billets had a length of 40

inches (1.016 meters).

billiard

a unit of quantity equal to 10^{15}, which is one quadrillion in American terminology or 1000 billion in traditional British terminology. The name is coined to parallel milliard, which has long been a name for 1000 million.

billion (bn or B)

a number equal to 1000 million in the U.S. but one million million in traditional British usage. See Names for Large Numbers for a discussion of the billion problem. The symbol **bn** is often used for billion, especially in Britain; Americans also use **B**.

bimester

a rarely-seen unit of time equal to 2 months.

bimillennium

a unit of time equal to 2000 years.

bind

an old English unit of quantity for eels, equal to 250.

biot (Bi)

another name for the abampere, a unit of electric current equal to 10 amperes. This unit honors the French mathematician and physicist Jean-Baptiste Biot (1774-1862), one of the founders of the theory of electromagnetism.

bips

informal name for the bit per second (see below).

bissextile year

an old name for a leap year. In the Roman calendar as proclaimed by Julius Caesar in 45 BC, the leap ("intercalary") day in a leap year was inserted not at the end of February but after the day known as *ante diem sextum Kalendas Martii* (February 24). The leap day was known as *ante diem bis sextum Kalendas Martii*, hence the bissextile day, and the year was the bissextile year.

bit (b) [1]

the basic unit of the amount of data. Each bit records one of the two possible answers to a single question: "0" or "1," "yes" or "no," "on" or "off." When data is represented as binary (base-2) numbers, each binary digit is a single bit. In fact, the word "bit" was coined by the American statistician and computer scientist John Tukey (b. 1915) in 1946 as an acronym for **b**inary dig**it**. Somewhat more generally, the bit is used as a logarithmic unit of data storage capacity, equal to the base-2 logarithm of the number of possible states of the storage device or location. For example, if a storage location stores one letter, then it has 26 possible states, and its storage capacity is $\log_2 26 = 4.7004$ bits.

bit (b) [2]

a unit of information content, now known also as the shannon. In information and communications theory, if a message has probability p of being received, then its information content is $-\log_2 p$ shannons. This unit is often called the bit, because if the message is a bit string and all strings are equally likely to be received, then the information content is equal the number of bits.

bit per second (b/s or bps)

a common unit of data transmission rate in computer science. The symbol bps is often pronounced "bips." Modem transmission rates are often stated in kilobits per second (Kbps or kb/s) or megabits per second (Mbps of Mb/s). See also baud (above).

blink

a unit of time equal to 10^{-5} day or exactly 0.864 second. This unit is also called the **metric second**; in most metric time proposals, the day is divided into 10 hours, each hour into 100 minutes (called **beats** in "Internet time": see "beat" above), and each minute into 100 seconds or blinks. An actual eye blink takes less than half as much time as this unit.

block [1]

an informal unit of distance popular in the U.S. A block is the distance between street intersections in the rectangular street grids common in many American cities. The length of a block varies from about 1/20 mile (80 meters) to about to about 1/10 mile (160 meters).

block [2]

a "unit" used in describing the distance between two locations in a city by the number of intersections encountered between those locations;

in this usage "12 blocks" means the traveler will cross 12 street intersections before reaching the destination.

block [3]

an informal unit of area equal to one square block [1]. A typical block has an area of roughly 2-5 acres or 1-2 hectares.

blondel

another name for an apostilb. Proposed in 1942, this unit honors the French physicist André Blondel (1863-1938) for his pioneering work in photometry.

blood alcohol level (BAL)

a legal measurement of alcohol concentration in the bloodstream, determining whether a person is considered legally impaired or intoxicated. The blood alcohol level is usually stated as a percentage, such as 0.10%. In most U.S. states, this is a measurement of "weight by volume" (w/v). 0.10% w/v is equivalent to 100 milligrams of alcohol per deciliter (100 milliliters) of blood, which is the same as 1 gram per liter (g/L). In a few states, the measurement is the percentage mass concentration (w/w, or milligrams of alcohol per milligram of blood). 0.10% w/w is the same alcohol concentration as 0.1055% w/v or 1.055 g/L, a slightly higher concentration than 0.10% w/v. Internationally, blood alcohol levels are often stated in millimoles per liter (mmol/L). 1 millimole per liter is equal to 4.61 mg/dL or 0.00461% w/v. In the other direction, each 0.01% w/v is equal to about 2.169 mmol/L.

bn

a common symbol for billion, generally the U.S. billion (10^9).

board foot (bd ft, fbm, or BF)

a unit of volume used for measuring lumber. One board foot is the volume of a one-foot length of a "standard board" twelve inches wide by one inch thick. Thus a board foot equals 144 cubic inches, or 1/12 of a cubic foot, or approximately 2.360 liters. The number of board feet is easily computed from the dimensions of the stack, no matter how wide or thick the boards are. For example, a stack of two-by-fours 4 ft high, 4 ft wide, and 8 ft long contains 4 x 4 x 8 = 128 cubic feet, equivalent to 128 x 12 = 1536 board feet. The symbol fbm is an abbreviation for "foot, board measure."

Board of Trade unit (BOTU)

a British name for the kilowatt hour, a unit of electrical energy.

body inch

an English name for the t'sun [2], the basic distance measurement used in acupuncture.

body mass index (BMI)

a measure of "fatness" used in medicine and health. The BMI is equal to a person's mass ("weight") M (in kilograms) divided by the square of his or her height H (in meters): BMI = M/H^2. If measurements are made in traditional English units, the equivalent formula is BMI = $703.07 \cdot M/H^2$, where M is measured in pounds and H ininches. In the U.S., a person with a BMI less than 20 is considered underweight, a person with a BMI of 25 or more is considered overweight, and a person with a BMI of 30 or more is considered obese. (These figures are for adults. Doctors also keep in mind that women's BMI measures are normally lower than those of men.)

boe

abbreviation for "barrel of oil equivalent," a commercial unit of energy. One boe is equal to about 6.119 gigajoules (GJ) or 5.800 million Btu.

bohr or bohr radius (a_0)

a unit of distance used in particle physics. The bohr radius represents the mean distance between the proton and the electron in an unexcited hydrogen atom. It equals about 52.918 picometers (pm), or 52.918×10^{-12} meter. The unit is named for the Danish physicist Niels Bohr (1885-1962), who explained the structure of atoms in a famous paper in 1913.

boiler horsepower

a traditional unit measuring the power delivered by a boiler. The boiler horsepower is defined to be the power required to convert 30 pounds (13.61 kilograms) per hour of water at 100 °F (37.78 °C) to saturated steam at a pressure of 70 pounds per square inch gauge (482.6 kilopascals gauge). This power, about 33 471 Btu per hour or 9.8095 kilowatts, is more than 13 times the usual mechanical definition of the horsepower, but it is judged sufficient to run an engine producing

one horsepower of mechanical power.

bole

a rarely-used (and probably obsolete) cgs unit of momentum. The bole is equal to 1 gram-centimeter per second (g·cm/s), or 10^{-5} kilogram-meter per second (kg·m/s) in SI units.

boll

a traditional unit of volume in Scotland equal to 16 Scots pecks or 4 firlots. This is about 145 liters for wheat, peas, or beans, or about 194 liters for oats or barley.

bolt

a commercial unit of length or area used to measure finished cloth. Generally speaking, one bolt represents a strip of cloth 100 yards (91.44 meters) long, but the width varies according to the fabric. Cotton bolts are traditionally 42 inches (1.067 meters) wide and wool bolts are usually 60 inches (1.524 meters) wide. Thus a bolt of cotton is 116.667 square yards (97.566 m^2) and a bolt of wool is 166.667 square yards (139.355 m^2).

bone-dry unit (bdu)

a unit used in the forest products industry to measure bulk products such as wood chips. One bone-dry unit is a volume of wood chips (or whatever) that would weigh 2400 pounds (1.0886 metric ton) if all the moisture content were removed. The **bone-dry ton (bdt)** is similar but based on a weight of 2000 pounds (0.9072 metric ton). The **bone-dry metric ton (bdmt)** is based on a weight of one tonne (2204.623 pounds).

book sizes

see -mo; also see the much more complete information posted by Stanford University.

bore

the bore of a gun is the inside diameter of its barrel. As a result, "bore" is sometimes used as a unit, meaning the same as gauge [1] for shotguns and the same ascaliber [1] for other guns.

bottle (btl)

a unit of volume. Like actual bottles, this unit varies according to the nature of the contents. For a long time in the U.S., a bottle of milk was 1 quart (1/4 gallon or 946.36 milliliters), a bottle of whiskey was 1 fifth (1/5 gallon or 757.1 milliliters), and a bottle of champagne was 2/3 quart (1/6 gallon or 630.91 milliliters). In the British Empire, a common bottle size was 2/3 Imperial quart (1/6 gallon or 757.68 milliliters), a unit known as the **reputed quart**. Today wine is customarily sold in bottles containing 750 milliliters (about 25.3605 U.S. fluid ounces or 26.3963 British Imperial fluid ounces). See also quart [2]. Other countries have traditional units of about this size. For example, the Russian **boutylka** contains 768.95 milliliters.

bougie (bg or cd)

French word for "candle," also used historically for the candlepower and currently for the candela. French authors should use the SI symbol **cd** and not "bg" when they use this term to mean the candela.

bovate

an old English unit of land area equal to 1/8 hide. This was roughly 15 acres or 6 hectares. The word comes from the Latin *bovis*, an ox, indicating that the bovate was an area that could be farmed with the help of one ox.

box

a unit of volume, usually informal but standardized in certain industries. In the U.S., a box of citrus fruit contains 1.6 bushels (56.383 liters).

BP

abbreviation for "years before present," a unit of time used in anthropology, geology, and paleontology. By international convention, the year 1950 CE (or AD) represents the present, so years "BP" are really years before 1950.

BP unit

a unit used in Britain to measure the potency of a vitamin or drug, that is, its expected biological effects. For each substance to which this unit applies, the British Pharmacopoeia Commission has determined the biological effect associated with a dose of 1 BP unit. Other quantities of the substance can then be expressed in terms of this standard unit.

In many cases, the BP unit is equal to the international unit (IU). Since the British Pharmacopoeia includes the standards of the European Pharmacopoeia, BP units are equivalent to "Ph Eur" units for those substances covered by both sets of standards.

bpd

abbreviation for barrels per day, a unit of production used in the petroleum industry.

bpm

abbreviation for beats per minute, the common unit of tempo in music. The same symbol is used in medicine for heart rates and also for respiration rates (breaths per minute). Technically, 1 bpm is equal to 1/60 hertz.

braça

see braza, below.

braccio

a traditional Italian unit of distance. The word means "arm", and a braccio is the length of a man's arm, about 27 or 28 inches (68-71 centimeters). In modern times, the braccio has become an informal metric unit of exactly 70 centimeters (about 27.56 inches).

brace

another name for a pair. The word is used mostly by hunters, who may speak of a brace of partridges or a brace of shotguns. Derived from the Latin word *bracchia* for both arms, it literally means "one for each arm."

brake horsepower (bhp)

the effective power output of an engine, sometimes measured as the resistance a brake attached to the output shaft provides to an engine. See horsepower.

brasse

a traditional unit of distance in France, comparable to the English fathom. The brasse is equal to 5 pieds (French feet); using the *pied de roi* as the standard for the pied this is about 1.624 meters or 5.328 English feet, slightly shorter than the Spanish braza (next entry). Note that the French have another fathom-size unit, the toise, equal to 6 pieds (about 1.949 meters or 6.395 English feet). The brasse was commonly used at sea and the toise on land. The name of the unit is related to *bras* (arm) and *brassée* (armful), recalling the traditional definition of the fathom as a man's armspan.

braza

a traditional unit of distance in Spain and Latin America. Like the brasse, the braza is comparable to the English fathom. In Spain it equals 2 varas, 8 palmos, or about 1.67 meters (5.48 feet or 65.75 inches). In Latin America the braza tends to be larger. The Argentine braza is 1.73 meters (5.68 feet or 68.16 inches), and under the Texas definition of the vara the braza would be 1.693 meters (5.556 feet or 66.67 inches). The Portuguese **braça** is similar, but it equals 10 palmos or about 2.20 meters (7.22 feet or 86.6 inches).

breadth

another name for a span (9 inches or 22.86 centimeters). This unit is traditionally used to measure the dimensions of flags.

breakfast cup

a unit of liquid volume, used in food recipes in Britain. The breakfast cup is similar to the cup used by American cooks, except that it is based on British Imperial units. Thus it equals 1/2 Imperial pint. This is equivalent to 10 Imperial fluid ounces, 17.339 cubic inches, 1.20 U.S. cup, or about 284 milliliters. This unit is also called a**tumblerful**.

breve

the standard unit of relative time in music, equal to the time length of 2 whole notes. Although this is the longest interval in musical notation, the word comes from the Latin *brevis*, brief. The breve is equal to 2 semibreves, 4 minims, 8 crotchets, or 16 quavers.

brewster (B)

a unit used in optics to measure stress-induced birefringence. A material exhibits birefringence if it has different indices of refraction along different axes. Many crystals exhibit birefringence. In addition, certain substances, including many plastics, exhibit birefringence if they are subjected to compression or stress in one direction. The brewster, which measures this effect, has dimensions reciprocal to those of stress. One brewster is defined to equal 10^{-12} square meters per newton (m^2/N) or

10^{-13} square centimeters per dyne (cm^2/dyn). The unit is named for the British physicist David Brewster (1781-1868), who discovered stress-induced birefringence in 1816.

bright, brightness

a unit describing surface brightness, or reflectivity, especially of paper. The fraction of light reflected by a surface is called its *albedo*, and its brightness is the albedo expressed as a percentage. Thus "88 bright" paper reflects 0.88, or 88%, of the light falling on the paper.

bril

a unit used to express the "brilliance" or subjective brightness of a source of light. The scale used is logarithmic: an increase of 1 bril means doubling the luminance (and thus the actual amount of light energy) emitted by the source. A luminance of 1 lambert is defined to have a brilliance of 100 brils. Mathematically, the brilliance in brils equals (log L)/log 2 + 100, where L is the luminance in lamberts.

Brinell hardness (HB or BHN)

a measure of the hardness of a metal introduced by J. A. Brinell in 1900. In the Brinell test (generally used for metals of uniform hardness), a hard object such as a steel ball is pressed into the material being tested. The ball is of a specified diameter, usually 1 centimeter. The Brinell hardness is the amount of force applied to the ball divided by the area of the indentation the ball makes in the material. The result is measured in kilograms of force per square millimeter but should be stated as an empirical reading, without units. For readings up to about HB 500, Brinell hardness is about 0.96 times the Vickers hardness.

British horsepower (Bhp)

the traditional horsepower, equal to about 745.7 watts, as opposed to the metric horsepower, which is equal to about 735.5 watts. Note that the symbol bhp, with the lower case "b," is used for brake horsepower.

British shipping ton

see shipping ton.

British thermal unit (Btu or BTU or BThU)

a unit of heat energy defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. In America the British thermal unit is sometimes called the **heat unit**. In defining the Btu, it is necessary to specify the temperature of the water; thus there have been several definitions over the years. However, one Btu is equal to about 251.996 (small) calories, or 0.251 996 of the (kilo-) calories counted by dieters. Using the current definition of the calorie (the IT calorie), one Btu equals approximately 778.169 foot pounds, 1.055 056 kilojoules or 0.293 071 watt hour. The symbol **BThU** has also been used, especially in Britain.

brix

a unit of proportion, equal to percent, used in measuring the concentration of sugar and other soluble solids in unfermented grape juice, fruit syrups, maple syrup, and similar solutions. Thus one brix equals 1%. The unit is named for the Austrian scientist Adolf Brix (d. 1870), who invented a hydrometer that reads directly the percentage of sugar in the juice, provided the reading is taken at a specified temperature. Also called **degree Brix (°Bx)**. In winemaking, the alcohol concentration in the finished wine is estimated to be 0.55 times the sugar concentration in brix of the unfermented juice. In the U.S. citrus fruit industry, juice concentrate is generally required to contain at least 42 brix of soluble solids (sugars and acids).

Btuh

a non-standard symbol used in the U.S. heating and airconditioning industry for British thermal units per hour, a unit of power. 1 Btuh equals 0.293 071 watt. The proper symbol is Btu/h.

Bubnoff unit (B)

a unit used in geology to measure erosion rates. One Bubnoff unit is equal to the removal of one micrometer per year (μm/a), or one millimeter per thousand years, or one meter per million years (m/Ma). First proposed in 1968, the unit is named for Serge von Bubnoff (1888-1957), a Russian-born geologist who taught in Germany.

bucket

a unit of volume, generally informal. In the U.S., many commodities (both wet and dry) are sold in plastic buckets holding 5 U.S. liquid gallons (about 18.927 liters). In Britain, a bucket is often

understood to be 4 gallons, or 18.182 liters based on the British Imperial gallon.

bunder

a traditional Dutch unit of land area. Since the adoption of the metric system in the Netherlands in 1809 the bunder has been considered equal to the hectare (2.471acres). Historically, the unit varied with locality, generally in the range 0.85-1.3 hectare. The unit was also used in Belgium, being called the **bonnier** in French-speaking provinces.

bundle (bdl) [1]

a unit of quantity for paper, equal to 2 reams or 40 quires. This would be 960 sheets using the old definition of 24 sheets per quire, or 1000 sheets using the newer quire of 25 sheets.

bundle (bdl) [2]

a traditional unit of length for yarn, equal to 20 hanks. For cotton yarn, a bundle contains 16 800 yards (about 15.362 kilometers). For wool, a bundle contains 11 200 yards (10.241 kilometers).

bundle (bdl) [3]

in the construction trades, a bundle is a package of shingles. Shingles are usually packed so that exactly 3, 4, or 5 bundles are needed to cover a square (100 square feet or 9.29 square meters). Asphalt shingles are often sold in bundles of 27, with 3 bundles per square, but the heavier cedar shingles generally require 5 bundles per square.

bushel (bu) [1]

a traditional unit of volume used for measuring dry commodities such as grains and fruits. In the United States, the customary bushel is based on an old British unit known as the **Winchester bushel**. This unit dates to the early fourteenth century, at least: King Edward I defined the bushel to be 8 gallons in 1303. The form used in the U.S. was legalized by Parliament in 1696. One U.S. or Winchester bushel equals 4 pecks or 32 (dry) quarts; this is a volume of 2150.42 cubic inches or about 1.2445 cubic feet, and represents the volume of a cylindrical container 18.5 inches (47.0 cm) in diameter and 8 inches (20.3 cm) deep. The U.S. bushel holds about 35.239 07 liters. Traditionally, there is also a **heaped bushel**, which is 27.8% (sometimes 25%) larger than a regular bushel.

The regular bushel is also called **struck measure** to indicate that the bushels have been struck, or leveled, rather then heaped. The origin of the word "bushel" is unclear; some scholars believe it derives from an ancient Celtic unit, but most believe it is of medieval French origin, probably a slang name for a wooden crate (the French word for wood is *bois*).

bushel (bu) [2]

a unit of volume in the British Imperial system (see gallon [3]) equal to 8 Imperial gallons, or 2219.36 cubic inches (1.2844 cubic feet). The Imperial bushel holds about 36.369 liters.

bushel (bu) [3]

a commercial unit of weight for grains and other bulk commodities. Agricultural commodities such as wheat are traditionally sold by the bushel, but because commodities tend to settle and compact in shipping, disputes over the volume delivered arise easily. To avoid these disputes, traders in a market or a country generally agree on a standard weight for one bushel of the commodity. Often this standard weight is set by law. Although the bill of lading still shows "bushels," it is really the weight rather than the volume that is sold and guaranteed. For example, in the United States a bushel of wheat equals 60 pounds (27.216 kg), a bushel of barley 48 pounds (21.772 kg), a bushel of oats 32 pounds (14.515 kg), and a bushel of rye 56 pounds (25.401 kg). A more complete table is included.

business day

a unit of time equal to one day [3] during which a business is open. Phrases such as "8-10 business days" are common; they refer to a period of time containing that number of business days plus however many days the business is not open during the period; thus "8 business days" may mean 10-12 actual days, or even longer if holidays intervene.

butcher

a unit of volume for beer in South Australia. A butcher of beer is a glass holding 200 milliliters (about 7 Imperial fluid ounces). This is called a glass [3] or a seven in other parts of Australia.

butt

a traditional unit of volume used for wines and other alcoholic beverages. A butt is generally defined to be two hogsheads, but the size of hogsheads varies according to the contents. In the United States a hogshead is typically 63 gallons and a butt is 126 gallons: about 16.844 cubic feet or 476.96 liters. In Britain, a butt of beer is 108 Imperial gallons: about 17.339 cubic feet or 490.98 liters. The word comes from the Roman *buttis*, a large cask for wine.

button measure

a unit of distance equal to 1/40 inch (0.635 millimeter), used, as you might guess, for measuring the thickness of buttons. This unit is also called the line, a bad idea since the line is generally equal to 1/12 inch.

Bya or bya

a common abbreviation (in English speaking countries) for "billion years ago."

byte (B)

a unit of information used in computer engineering. Technically the byte is a unit of addressable memory, and its size can vary depending on the machine or the computing language. However, in most contexts the byte is equal to 8 bits (or 1 **octet**). This means that a byte has $2^8 = 256$ possible states. The unit was named by IBM engineer Werner Buchholz in 1956, and the 8-bit size was popularized starting in 1964 by IBM's System 360, a top-selling mainframe computer. The spelling "byte" is used instead of "bite" in order to avoid confusion with the bit.

C

c

a symbol for the speed of light. One of the fundamental principles of physics is that light always travels at the same speed in a vacuum, exactly 299 792 458 meters per second or about 670 617 300 miles per hour. Another fundamental principle is that no object can travel faster than light. At speeds that are large fractions of the speed of light, the theory of relativity predicts a variety of strange physical effects. In calculations involving relativity, speeds are customarily expressed as fractions of the speed of light, such as 0.95 *c*.

C [1]

the Roman numeral 100, sometimes used as a unit of quantity or as a prefix meaning 100, as in Cwt (hundredweight) or CCF (100 cubic feet).

C [2]

a symbol for international standard paper sizes, followed by the size number, as in C4. The C series of sizes is used primarily for envelopes. A table of sizes is provided.

C [3]

a unit of relative current for batteries. For a particular battery, a current of 1C is a current in amperes numerically equal to the rated capacity of the battery in ampere hours. In other words, a 1C current will completely charge or discharge the battery in one hour.

CA, CCA

abbreviations for "cranking amps" and "cold cranking amps," respectively. These units are often seen on motor vehicle batteries in the U.S. The amps involved are ordinary amperes of electric current. "Cranking amps" measure the current supplied by the battery when starting the vehicle at a temperature of 32 °F (0 °C), while "cold cranking amps" measure the current supplied at 0 °F (-17.8 °C).

caballeria

a traditional unit of land area in Spanish speaking countries. In Spain and Peru the caballeria is equal to 60 fanegas, which is roughly 40 hectares (100 acres). In Central America it equals 60 manzanas, which is roughly 45 hectares (110 acres). In Cuba, the caballeria is a smaller unit equal to 33.162 acres or 13.420 hectares, but in the Dominican Republic it is a larger unit equal to 1200 tareas or about 75.4 hectares (186.5 acres). In Puerto Rico, the caballeria was equal to 200 cuerdas (see below) which is about 78.6 hectares (194.0 acres).

caballo de vapor (cv)

Spanish name for the metric horsepower.

cable

a unit of distance formerly used at sea. The traditional U.S. mariner's

cable was 120 fathoms long. This is equal to 720 feet, or 0.1185 nautical mile, or about 219.4 meters. The British Admiralty, in 1830, defined the cable to equal exactly 0.1 nautical (Admiralty) mile, which is 608 feet or about 185.3 meters. Some navies are now using a metric cable equal to exactly 200 meters (about 656.17 ft).

cabot

a traditional unit of volume in Jersey (Channel Islands), used for both liquid and dry commodities in trade. The cabot equals 10 pots [3], which is 17.375 Imperial quartsor about 19.747 liters. For dry commodities, the cabot is roughly comparable to 1/2 bushel.

cade

an old name for a cask, sometimes used as a unit of measure for fish. A cade of herring, for example, was 720 fish.

calendar year (cal yr)

a civil unit of time, equal to 365 days or (in leap years) 366 days. See year [2]. In archaeology, climatology, and other sciences studying the earth over the last 40 000 years or so, a careful distinction must be made between calendar years (cal yr) and radiocarbon years (^{14}C yr).

caliber (cal) [1]

a unit used to express the bore of a gun. (The bore is the inside diameter of the gun barrel.) Traditionally, the diameter was stated in inches, so that ".22 caliber" referred to a pistol having a bore of 0.22 inches (5.588 mm). This usage is declining, because bore diameters of many guns are now stated directly in millimeters. "Caliber" is the American spelling; elsewhere the unit is often spelled "calibre." The decimal point is usually omitted when caliber measurements are spoken (as in "38-caliber"). Sometimes it is omitted when the measurement is written, but this is not a good practice.

caliber (cal) [2]

a measure of the relative length of a gun barrel, defined as the length divided by the diameter of the bore. Thus a 50-caliber gun on a warship has a barrel 50 times longer than its bore. Confining the shell within the barrel for a longer time increases the velocity, so guns with a higher caliber usually have a longer range.

caliper

the thickness of a sheet of paper or card stock. Traditionally measured in points [7] (thousandths of an inch), caliper is now measured in microns (micrometers). The word "caliper" is sometimes used in place of the proper unit, as in ".004 caliper" (.004 inch or 4 points) or "120 caliper" (120 microns).

call second (Cs)

a unit of telecommunications traffic equal to one or more calls or other communications having an aggregate duration of one second. The **call minute (Cmin)** and **call hour (Ch)** are defined similarly.

Callipic cycle

a unit of time equal to 76 years or 4 Metonic cycles, formerly used in astronomy in predicting the phases of the Moon. After the passage of one Callipic cycle, the phases of the Moon repeat essentially on the same calendar dates as in the preceding cycle. The cycle is named for the Greek astronomer Callipus, who discovered it in 330 BCE.

calorie (cal)

the CGS unit of heat energy. This calorie (also called a **gram calorie** or **small calorie**) is the amount of heat required at a pressure of one atmosphere to raise the temperature of one gram of water by one degree Celsius. Unfortunately, this varies with the temperature of the water, so it is necessary to specify which degree Celsius is meant. A traditional choice was the degree from 14.5°C to 15.5°C; raising the temperature of water through this range requires 4.1858 joules, a quantity called the **15° calorie**. Another choice produces the **thermochemical calorie**, equal to exactly 4.184 joules. More common today is the **international steam table calorie**, or **IT calorie** for short, defined by an international conference in 1956 to equal exactly 4.1868 joules, exactly 1.163 milliwatt hours, or about 0.003 968 32British thermal units (Btu). The name of the unit comes from the Latin *calor*, heat.

Calorie (kcal or Cal)

a common name for the MKS unit of heat energy. This unit is properly called the **kilocalorie**; it is also called the **kilogram calorie** or **large**

calorie. It is often (but certainly not always!) distinguished from the small calorie by capitalizing its name and symbol. The large calorie, or rather kilocalorie, is the amount of heat required at a pressure of one atmosphere to raise the temperature of one kilogram of water by one degree Celsius. Since this is 1000 times as much water as mentioned in the definition of the small calorie, the kilocalorie equals 1000 small calories, 4.1868 kilojoules, 3.9683 Btu, or 1.163 watt hours. (These conversions assume the IT calorie is in use; see previous entry.) These are the "calories" that joggers are trying to get rid of, the ones we gain by eating. The use of the same term "calorie" for two different-size units is endlessly confusing, but we seem to be stuck with it.

caña, canna, canne

traditional units of distance in Spain, Italy, and southern France, respectively. The caña varied in size, but it was most often defined as 8 palmos, which makes it the Mediterranean version of the fathom, equal to roughly 2 meters (6.5 feet). In Italy a measuring stick is still called a *canna metrica*. The unit is sometimes translated "rod" in English, but "fathom" is the proper choice.

candela (cd)

the SI base unit for measuring the intensity of light. *Candela* is the Latin word for "candle." The unit has a long and complicated history. Originally, it represented the intensity of an actual candle, assumed to be burning whale tallow at a specified rate in grains per hour. Later this definition was replaced with a definition in terms of the light produced by the filament of an incandescent light bulb. Still later a standard was adopted that defined the candela as the intensity of 1/600 000 square meter of a "black body" (a perfect radiator of energy) at the temperature of freezing platinum (2042 K) and a pressure of 1 atmosphere. This definition has also been discarded, and the candela is now defined to be the luminous intensity of a light source producing single-frequency light at a frequency of 540 terahertz (THz) with a power of 1/683 watt per steradian, or 18.3988 milliwatts over a complete sphere centered at the light source. The frequency of 540 THz corresponds to a wave length of approximately 555.17 nanometers (nm); normal human eyes are more sensitive to the green light of this wavelength than to any other. In order to produce 1 candela of single-frequency light of wavelength l, a lamp would have to radiate $1/(683V(l))$ watts per steradian, where $V(l)$ is the relative sensitivity of the eye at wavelength l. Values of $V(l)$, defined by the International Commission on Illumination (CIE), are available online from the Color and Vision Research Laboratories of the University of California at San Diego and the University of Tübingen, Germany.

candle (cd)

an older name of the candela (see above), or of the candlepower (see below).

candlepower (cp)

a unit formerly used for measuring the light-radiating capacity of a lamp or other light source. One candlepower represents the radiating capacity of a light with the intensity of one "international candle," or about 0.981 candela as now defined. Since 1948 the candela has been the official SI unit of light intensity, and the term "candlepower" now means a measurement of light intensity in candelas, just as "voltage" means a measurement of electric potential in volts.

candy

a traditional weight unit of South Asia. The candy was quite variable, generally within the range 500 to 800 pounds (225 to 365 kilograms). In the international cotton trade, the candy was generally equal to exactly 7 (British) hundredweight, which is 784 pounds or 355.62 kilograms.

can sizes

Food cans are identified by their nominal dimensions, diameter × height. (The "nominal" dimensions are somewhat larger than the actual dimensions, as is the case for lumber and some other products.) In the metric world the dimensions are 2- or 3-digit numbers representing dimensions in millimeters. In traditional U.S. nomenclature, the dimensions are stated as 3-digit numbers, with the first digit representing inches and the remaining two digits representing 16ths of an inch. A common can for fruits and vegetables, for example, is designated 83 × 116 in metric terminology, or 307 × 409 (3-7/16 × 4-9/16) in

traditional terminology. If only one number is mentioned it is the diameter; thus a "404" can has a nominal diameter of 4-4/16 = 4.25 inches and a "65" can has a nominal diameter of 65 millimeters.
Link: chart of standard can sizes with metric and traditional designations, from Dantraco Associates.

cantar
an English spelling for the Arab form of the quintal. In recent years, the cantar has been interpreted as a metric unit equal to 50 kilograms (110.23 pounds); traditional cantars tended to be a few percent larger than this.

canvas
in rowing, a "canvas" is the distance between the bowman and the bow, or between the coxswain and the stern. These areas were once covered by canvas. Winning by a canvas in rowing is analogous to winning by a head in a horse race.

Cape foot (cf)
a traditional unit of distance in South Africa. The Cape foot equals 12.396 English inches, 1.0330 English foot, or 31.4858 centimeters. This unit is not the traditional Dutch foot, but it is similar in length to the "Rhine foot" of northern Germany. The Cape foot was widely used for land measurement and appears on many deeds in South Africa. Europeans often referred to South Africa as "The Cape," meaning the Cape of Good Hope.

Cape rood
a traditional unit of distance in South Africa, equal to 12 Cape feet or 12.396 English feet (3.7783 meters). See also rood.

carat (ct or c) [1]
a unit of mass used for diamonds and other precious stones. Originally spelled **karat**, the word comes from the Greek *keration*, a carob bean; carob beans were used as standards of weight and length in ancient Greece in much the same way barleycorns were used in old England. Traditionally the carat was equal to 4 grains. The definition of the grain differed from one country to another, but typically it was about 50 milligrams and thus the carat was about 200 milligrams. In the U. S. and Britian, the diamond carat was formerly defined by law to be 3.2 troy grains, which is about 207 milligrams. Jewelers everywhere now use a **metric carat** defined in 1907 to be exactly 200 milligrams.

carat (ct or c) [2]
in Britain, the spelling "carat" is also used for the unit of gold purity known in America as the karat.

carb [1]
an informal unit used in the treatment of diabetes, equal to 15 grams of carbohydrates. This unit is known under various names, including **carbo**, **carb unit**, **choice**, or **exchange**. The significance of 15 grams is that in a very rough way that quantity of carbohydrate requires about 1 unit of injected insulin for patients with Type I diabetes (the actual ratio between carbohydrate and insulin varies considerably from patient to patient and is usually much lower for patients with Type II diabetes).

carb [2]
an informal unit equal to 1 gram of carbohydrate, commonly used in describing low-carbohydrate diets such as the Atkins diet. This newer usage of the term "carb" conflicts with the traditional use by diabetics (previous entry).

carcel
a former French unit for measuring the intensity of light. The unit was defined as the intensity of a standard Carcel lamp, which burnt colza oil in a precisely defined way. One carcel equals about 9.74 candelas (see above).

carga
a traditional unit in Spanish and Portuguese speaking countries. The word means "load". It was often used as a unit of mass or weight equal to 3 quintals or as a unit of volume equal to the volume holding 3 quintals of the commodity being shipped.

Carnegie unit
a unit of academic credit used in college admissions decisions in the U.S. The unit was introduced by the Carnegie Foundation for the Advancement of Teaching in 1914 to provide colleges with a standard

measure of students' course work in high schools. A Carnegie unit represents the equivalent of one academic year of study in a subject in a class meeting 4 or 5 times a week for 40 to 60 minutes per meeting, a minimum of 120 hours of total class time.

carreau

a traditional unit of land area in Haiti equal to approximately 1.29 hectares (3.18 acres). The unit originated as the area of a square 100 pas (Haitian paces) on a side, with the pas being equal to 3.5 pieds (French feet). Foreigners are not allowed to own more than 1 carreau of urban land or 5 carreaux of rural land in Haiti.

cart

a unit of volume, generally informal, equal to the capacity of a small cart. In Newfoundland, a cart of salt traditionally equalled 6 tubs or 108 Imperial gallons (490.98 liters).

carton

a small container. The size of a carton is usually not standardized, but certain sizes are customary. In the U.S. citrus fruit industry, a standard carton is equal to 1/2box or 0.8 bushel (28.191 liters).

carucate

another name for the hide, an old English unit of land area. The name comes from a Latin word meaning "plowland."

case

a conventional unit of sales for many items, varying with the item and over time. A case of wine, for example, is traditionally twelve 750-milliliter bottles. The word comes from the Latin *capsa*, a chest.

castellation

a unit of angle measure equal to 1/6 turn or 60°, used in mechanical engineering. A castellated nut is a locknut having a raised rim with a number of equally spaced slots, usually 6. A cotter pin fits into one of the slots and into a hole bored in the bolt, holding the nut in place with a precise degree of torque, or "tightness". To turn the nut one castellation is to turn it from one slot to the next, that is, by 1/6 turn.

category (cat)

the ranking of a hurricane on the Saffir-Simpson scale, used by the U.S. National Weather Service. A somewhat different scale of categories is used for tropical cyclones by the Australian Bureau of Meterology.

catty

a weight unit of the colonial period in East and Southeast Asia, originating as the *kati* in Malaya. The catty varied a little from market to market. Typically it was equal to about 4/3 pound avoirdupois (604.79 grams), and it is still equal to that weight in Malaysia. In Thailand, the catty is used now as a metric unit equal to exactly 600 grams (1.3228 pounds). In China, the catty was identified with the jin, a traditional Chinese unit.

cawny or cawney

a traditional unit of land area in southern India, equal to about 4/3 acre (0.54 hectare). The name is an English tranliteration of a Tamil word for the unit.

cb-

abbreviation for "cubic," seen in combinations such as **cbm** (cubic meter) or **cbft** (cubic foot). The proper symbol for cubic meters is m^3, not cbm.

cc [1]

an alternate symbol for the cubic centimeter (cm^3). This symbol is obsolete and should not be used; cm^3 should be used in its place. The cubic centimeter is the same volume as the milliliter (mL or ml).

cc or ^{cc} [2]

a symbol for the centesimal second (see below).

CCF

an abbreviation for 100 cubic feet. Local water and sewer utilities often sell water in CCF units; for this purpose one CCF equals about 748.05 gallons (U.S.) or about 2831.7 liters. Utilities sometimes sell natural gas in CCF units; for this purpose the CCF is really a unit of energy roughly equivalent to the therm (1 CCF of natural gas provides about 1.034 therm).

ccm

an incorrect symbol for the cubic centimeter (cm^3).

CCs

a unit of telecommunications traffic equal to 100 call-seconds. One CCs could represent a single call 100 seconds long, or 10 calls each 10 seconds long, etc. The symbol stands for "centum call second."

CE [**1**]

abbreviation for "common era." This abbreviation is a non-religious designation used in place of the traditional AD for years of the common or Christian era. Years of the common era are supposed to be counted from the birth of Jesus of Nazareth, founder of the Christian religion. However, the year-numbering system was not established until more than 500 years later. It is based on calculations of the priest and scholar Dionysius Exiguus placing Jesus's birth in the Roman year 753 AUC. Dionysius knew he had incomplete information, and there is evidence that he picked this particular date to simplify the calculation of the date of Easter. According to the Biblical account, Jesus was born several years before the death of Herod the Great, who died, we now know, in 750 AUC (4 BC). Thus the calculation of the common era is off by 6 or 7 years at least. In the conventional use of the common era system, there is no year 0 and the year prior to 1 CE is designated 1 BCE (or 1 BC). In astronomy, however, it simplifies calculations to define the year 0 CE = 1 BC and to apply negative numbers to earlier years. Thus Herod died in -3 CE, and, in general, *-n* CE is the year more commonly called *n* + 1 BC.

CE [**2**]

French abbreviation for *colonne d'eau*, water column, seen in pressure measurements. See centimeter of water (below) or millimeter of water.

Celsius

see degree Celsius. The word "degree" is often omitted in informal statements of temperature, as in "we expect a high of about 23 Celsius today."

Celsius heat unit (Chu)

a unit of heat energy equal to the energy required to raise the temperature of one pound of water by 1°C at standard atmospheric pressure. 1 Chu is equal to exactly 1.8 Btu, approximately 453.59 IT calories (see above), or 1.8991 kilojoules. The unit is also called the **centigrade heat unit**.

cent [**1**]

an old English unit of quantity, usually equal to 100 but sometimes 120 (the **great** or **long hundred**) or some other figure of similar size. The Latin number 100,**centum**, is also used in English works for this quantity.

cent [**2**]

an informal name for 1/100 of almost any unit, for example, a centiliter (0.01 liter). Phrases such as "15 cents of an inch" were formerly common in English.

cent [**3**]

a unit used in music when it is necessary to specify the ratio in frequency between two tones with great precision. There are 100 cents in a semitone, or 1200 in an octave. If two notes differ by 1 cent, the ratio between their frequencies is $2^{1/1200}$ or approximately 1.000 5778. One cent equals 1/1.2 = 0.83333 millioctave or about 0.2509 savart.

cent [**4**]

a unit used in nuclear engineering to describe the "reactivity" of a nuclear reactor, equal to 0.01 dollar. For a discussion of reactivity, see inhour.

cent [**5**]

a common unit of land area in southern India, equal to 0.01 acre, exactly 435.6 square feet, or about 40.47 square meters.

cental (cH or ctl)

an alternate name in Britain for the U.S. hundredweight, which is equal to exactly 100 pounds (the British hundredweight is 112 pounds). Introduced by British merchants around 1850, the name was apparently coined after the model of the quintal. The cental has sometimes been confused with the centner (see below).

centesimal minute (**ᶜ**), **centesimal second** (**ᶜᶜ**)

units of angle measure sometimes used in surveying. In the centesimal system, the right angle is divided into 100 grads or gons. Each gon is divided into 100 centesimal minutes (or centigons) and each centesimal minute into 100 centesimal seconds. Thus the centesimal minute equals 0.009° or 0.54 arcminute, and the centesimal second equals 0.324

arcseconds.

centi- (c-)

a metric prefix meaning one hundredth, or 0.01. The prefix comes from the Latin word *centum* for one hundred.

centiare (ca)

a metric unit of area. The centiare equals 0.01 are, which is exactly 1 square meter (about 10.7639 square feet).

centibar (cbar or cb)

a metric unit of pressure identical with the kilopascal (kPa). One centibar equals 0.01 bar, 7.5006 torr, or 0.1450 pounds per square inch (lbf/in^2 or psi). The centibar is traditionally used in agriculture as a unit of soil water tension (the water pressure on the roots of plants) as measured by devices called tensiometers.

centigon (cgon)

a unit of angle measure equal to 0.01 gon, 0.01 grad, or 0.0001 right angle; this is equivalent to 0.009°, 0.54 arcminute, or exactly 32.4 arcseconds. The centigon is useful in navigation (potentially, at least) because 1 centigon of latitude represents approximately 1 kilometer on the earth's surface, in the same way that 1 nautical mile represents approximately 1 minute of latitude in traditional navigation.

centigrade [1]

a temperature scale; see degree centigrade.

centigrade [2]

a French unit of angle measurement equal to 0.01 grad, 0.009°, 0.54', or 32.4".

centigram (cg)

a metric unit of mass equal to 10 milligrams or about 0.154 grain.

centigray (cGy)

a unit of radiation dose equal to 0.01 gray or 1 rad. Dose of radiation used in cancer treatments, formerly stated in rads, are generally stated now in centigrays.

centihg

an informal unit of pressure equal to 1 centimeter of mercury. This is equivalent to 10 millimeters of mercury, approximately 0.3937 inHg, 0.1933 lb/in^2, 13.33millibars, or 1333 pascals. The word is pronounced "sentig".

centiliter (cl or cL)

a common metric unit of volume. One centiliter equals 10 cubic centimeters; this is about 0.610 24 cubic inch, 0.3318 U.S.fluid ounce or 0.3519 British fluid ounce. In the kitchen, a centiliter is roughly equal to 2 U.S. teaspoons (or 0.704 British tablespoonful).

centimeter (cm) [1]

the basic unit of distance in the CGS version of the metric system, equal to 0.01 meter. One centimeter is about 0.393 700 787 inch.

centimeter (cm) [2]

an obsolete name for the statfarad (approximately 1.11 picofarad), the CGS electrostatic unit of capacitance.

centimeter (cm) [3]

an obsolete name for the abhenry, the CGS electromagnetic unit of inductance. The abhenry is the same as the nanohenry.

centimeter (cm) [4]

one of several traditional units of pressure, including the centimeter of mercury and the centimeter of water (next two entries).

centimeter of mercury (cmHg, cm Hg)

a traditional unit of pressure equal to 10 mmHg, 1.333 22 kilopascal, or about 0.193 pounds per square inch.

centimeter of water (cmH_2O, cm WC, cm CE, cm WS)

a unit of pressure equal to the pressure exerted at the Earth's surface by a water column (WC) 1 centimeter high. This is about 98.067 pascals, 0.980 67 millibars, 0.3937 inch of water, or 2.04 pounds per square foot. The unit is used in respiratory medicine and elsewhere to measure air pressures. The French symbol is cm CE (*colonne d'eau*), and the German symbol is cm WS (*Wassersäule*).

centimillion

a word sometimes used to mean 100 million (10^8). This usage applies the traditional Latin prefix cent-, meaning 100, but it conflicts with the metric prefix centi-, which means 1/100. In metric language, the number 100 million could be called a hectomillion or (at least in the U.S.) a

decibillion.

centimorgan (cM)

a unit of genetic separation used in genetics and biotechnology. If two locations on a chromosome have a 1% probability of being separated during recombination in a single generation, then the distance between those locations is one centimorgan. In humans, the centimorgan is approximately equal to one million base pairs. The unit honors the pioneering American geneticist Thomas Hunt Morgan (1866-1945), who received the 1933 Nobel Prize in Medicine for his discoveries concerning the role played by the chromosome in heredity.

centinewton (cN)

a metric unit of force equal to 0.01 newton. This unit has some popularity in engineering as a substitute for the gram of force (gf), since it equals about 1.019 72 gf (about 0.0360 ounces of force in the English system). In the textile industry, the breaking strength of fibers is commonly expressed in centinewtons per tex.

centipoise (cP, cPs, or cPo)

a common metric unit of dynamic viscosity equal to 0.01 poise or 1 millipascal second (mPa·s). The dynamic viscosity of water at 20 °C (68 °F) is about 1 centipoise. The correct symbol for the unit is cP, but cPs, cPo, and even cps are sometimes used.

centiradian

a unit of angle measure equal to 0.01 radian or about 0.572958° (34' 22.65").

centisecond (cs or csec)

a unit of time equal to 0.01 second or 10 milliseconds. Centiseconds are frequently used in the study of human speech to measure precisely the length of sounds.

centistokes (cSt)

a common metric unit of kinematic viscosity equal to 0.01 stokes or 1 mm^2/s. The viscosity of lubricating oils and many other liquids is frequently stated in centistokes. Although the centistokes is not an SI unit it is likely to remain in use, since it provides a convenient and traditional name for an SI-appropriate quantity (1 mm^2/s). The older symbol **cS** should not be used for this unit, since S is now the symbol for the siemens.

centner [1]

the English name for a German weight or mass unit, the zentner, equal to 50 kilograms or about 110.231 pounds. The name centner should not be used for the cental (see above).

centner [2]

a Russian weight or mass unit equal to 100 kilograms (approximately 220.4623 pounds). This centner, also used in Ukraine and the other former Soviet republics, is equal to the decitonne and to the metric quintal; it is twice the size of the centner [1] used in western Europe.

centrad

an informal name for the centiradian (see above).

centum

the Latin number 100, sometimes used in works in English.

century [1]

a unit of quantity equal to 100. In ancient Rome, a "century" was originally a company of about 100 soldiers led by an officer called a centurion.

century [2]

a traditional unit of time equal to 100 years. In naming centuries, historians recall that there was no year 0 in the conventional year numbering system. Thus the First Century included the years 1-100 and the Twentieth Century included the years 1901-2000. (As an example in the other direction, the Fifth Century BC included the years 500-401 BC.) With this convention, 2001 is the first year of the Twenty-first Century.

cetane number

a measure of the ability of diesel fuel to reduce engine knocking. The cetane number plays the same role in diesel engine technology that the octane number plays in conventional automobile engine technology. It is the percentage by volume of cetane which must be added to methylnaphthalene to give the mixture the same resistance to

knocking as the diesel fuel sample being tested. Cetane is the name of a hydrocarbon compound whose molecules contain 16 carbon atoms and 34 hydrogen atoms, the 16 carbons being arranged in a long chain. Adding one oxygen atom to cetane produces cetyl alcohol, a waxy compound found in whale oil. The words "cetyl" and "cetane" are both derived from the Latin word *cetus* for a whale.

cf

a common symbol for the cubic foot.

cfe

a symbol for cubic foot of gas equivalent, used in the natural gas industry. This is really an energy unit; 1 cfe is equal to about 1034 British thermal units (Btu), 0.01034 therm, or 1.091 megajoule (MJ). Multiples of this unit are formed using non-metric prefixes: **Mcfe** for 1000 (not 1 million) cfe, **MMcfe** for 1 million cfe, and**Bcfe** for 1 billion cfe.

cfh, cfm, cfs

traditional abbreviations for cubic feet per hour, cubic feet per minute, and cubic feet per second, respectively. 1 cfm = 28.3169 liters per minute (L/min) and 1 cfs = 28.3169 liters per second (L/s). Symbols with a slash, such as **Cf/h**, are also seen.

CFU

abbreviation for "colony forming units," a count of the number of active bacterial cells in preparations of *Lactobacillus acidophilus* and other "friendly" organisms of the digestive system. Counts as high as one billion CFU per gram are not uncommon.

chain (ch)

a unit of distance used or formerly used by surveyors. Although the unit is not often used today, measured distance along a road or railroad is commonly called**chainage** regardless of the units used. The traditional British surveyor's chain, also called **Gunter's chain** because it was introduced by the English mathematician Edmund Gunter (1581-1626) in 1620, is 4 rods [1] long: that's equal to exactly 1/80 mile, 1/10 furlong, 22 yards, or 66 feet (20.1168 meters). The traditional length of a cricket pitch is 1 chain. Gunter's chain has the useful property that an acre is exactly 10 square chains. The chain was divided into

100 links. American surveyors sometimes used a longer chain of 100 feet, known as the **engineer's chain** or **Ramsden's chain**. (However, Gunter's chain is also used in the U.S.; in fact, it is an important unit in the Public Lands Survey System.) In Texas, the **vara chain** of 2 varas (55.556 ft) was used in surveying Spanish land grants. In the metric world, surveyors often use a chain of 20 meters (65.617 ft). See also shackle and shot [2] for anchor chain lengths.

chain number

a size designation for roller chains, such as the drive chains of bicycles or motorcycles. These chains are traditionally designated by a three-digit number. The first digit specifies the pitch, the distance between pins, in eighths of an inch; the second and third digits specify the width of the rollers in 80ths of an inch. Thus a 425 chain has a pitch of 4/8 (= 0.5) inch and a roller width of 25/80 (= 0.3125) inch.

chalder or chaldron (chd)

a traditional British unit of volume or weight used for dry commodities such as coal or lime. As a volume measure, the chaldron is equal to 36 bushels, or 288 British Imperial gallons; this is equivalent to 46.237 cubic feet or 1.3091 cubic meters. As a measure for coal, the chalder equals 1/8 keel or 53 hundredweight (5936 pounds or 2692.52 kilograms). The words "chalder," "chaldron," and "cauldron" are English spellings of the same old French word, which originally meant a large kettle.

champagne quart

see quart [2].

character (char)

a unit of information used in computer science and telecommunications. The number of bits required to specify a character has varied as more robust coding systems have been developed. By the 1970s, one character was typically equal to 8 bits or one byte. Current coding systems such as UTF-8 use up to 4 bytes to designate all the characters used in all the world's languages and other symbolic systems.

charka

a traditional Russian unit of volume containing about 123.0 milliliters,

4.159 U.S. fluid ounces or 4.329 Imperial fluid ounces. There are 6.25 charki in a boutylka(bottle) and 10 in a schtoff. The word charka means a cup or glass.

Charrière, Charrière gauge (Ch)
a unit of distance used for measuring the diameters of small tubes such as catheters, fiber optic bundles, etc. The gauge number is the diameter of the tube in units of 1/3 millimeter. In English-speaking countries, the scale is usually called the **French gauge** and the unit is simply called "French." Charrière was a nineteenth century French instrument manufacturer.

cheval vapeur (cv or ch)
French name for the metric horsepower. In Canadian French, however, the term is used to mean the English horsepower.

ch'ih
a unit of distance used in China during the colonial period. The ch'ih equals 10 t'sun, 35.814 centimeters, or 14.1 inches. There are 1800 ch'ih in a li.

chiliad [1]
a unit of quantity equal to 1000. The word comes from the Greek numeral 1000, *chilioi*, which is also the origin of the metric prefix kilo-. Pronounced "killiad," the chiliad was once fairly common in learned writing, but it has nearly disppeared from use today.

chiliad [2]
another name for a millennium (1000 years).

chilo
an informal Italian name for a kilogram.

chilo-
Italian spelling of the metric prefix kilo- (1000).

chin
one of several spellings in English for the jin, a traditional Chinese weight unit.

chip
in New Zealand, another name for a punnet.

choi
a name used in Thailand and Laos for the viss. The word is sometimes spelled **joi** in English.

chopine
a traditional French unit of volume. The unit varied regionally, but by the 18th century it was more or less standardized as 23.475 cubic pouces (465.7 milliliters). The chopine is obsolete in France today, but the word survives (especially in Canada) as a French name for the English pint units.

choppin
a traditional Scottish unit of volume equal to 2 mutchkins or 1/2 Scots pint. The choppin is equivalent to about 52.1 cubic inches, 1.80 U.S. liquid pints, 1.50 British Imperial pints, or 854 milliliters.

CI or ci
a traditional symbol for the cubic inch.

cicero (cc)
a unit of distance used by typesetters and printers in continental Europe, equal to 12 Didot points. This is approximately 0.1780 inch or 4.52 millimeters. The cicero corresponds to the British and American pica. Presumably, this unit got its name because type of this size was used in printing the works of classical authors such as the Roman statesman and orator Marcus Tullius Cicero (106-43 BCE).

CID
a symbol for cubic inch of displacement, formerly used in the U.S. in stating the engine displacements of motor vehicles; these measurements are now made in liters.

cinque
an old English word for the number 5, pronounced "sink" and derived from the French number 5, *cinq*. In English history, the original Cinque Ports were Sandwich, Dover, Hythe, Romney and Hastings. The word survives today as the name for a 5-spot showing in dice, or for a 5-card in card games.

circle (cir)
the traditional unit of angle measure, divided into 2 pi radians or 360 degrees.

circular inch, circular mil (cmil)
informal units of area. A circular inch is the area of a circle one inch [1] in diameter, and a circular mil is the area of a circle one mil [1] in diameter. A circle of diameter *d* has an area of pi·d^2/4, so the circular inch is equal to approximately 0.785 398 square inches or 5.067 07 square centimeters, and the circular mil is equal to approximately 0.785 398 square mils or 506.707 square micrometers.

city block
see block.

civil year
a year as measured by the conventional (Gregorian) calendar, equal to 365 days in most years but 366 days in a leap year. See year [2]. This is the same unit as the calendar year (see above). Both names are often used to specify years beginning with January 1, as opposed to a fiscal year beginning on some other date.

Clark degree
see degree [4].

clausius
a unit of entropy. Entropy is a measure of the extent to which heat or energy in a physical system is not available for performing work. It is computed in units of energy per kelvin. One clausius is equal to 1 kilocalorie per kelvin (kcal/K) or 4.1868 kilojoules per kelvin (kJ/K). The unit honors the German physicist Rudolf Clausius (1822-1888), who introduced and named the concept of entropy in 1850.

click
U.S. military slang for the kilometer (about 0.621 mile). Also spelled **klick** or **klik**. This unit became popular during the Vietnam War, but it was invented by U.S. troops in Germany during the 1950s. Occasionally it was used as a non-metric unit equal to 1000 yards (0.9144 kilometer).

city block
see block.

clo
a unit of thermal insulation used for clothing. One clo is intended to represent the insulation required to keep a resting person warm in an indoor room at 70 °F (21.1°C). The rate of a person's heat loss is measured in watts per square meter of skin area per kelvin of temperature difference across the clothing; the value of insulation is measured by the reciprocal of this rate, in square meter kelvins per watt (m^2K/W). One clo is equal to 0.155 m^2K/W or 1.550 togs.

clothyard, clothier's yard
an alternate name for the ell. The English ell is 45 inches (1.143 meters), but the "clothyard arrows" used with longbows in late medieval times were closer in length to the 37-inch Scottish ell.

clove
an old English unit of weight. A clove is usually considered equal to 1/2 stone or 1/16 hundredweight; that's 7 pounds (3.175 kilograms) by the modern definition of the stone, but in the past the clove varied from 6.25 to 8 pounds.

clusec
a unit of power used to express the performance or leakage of vacuum pumps. One clusec represents a flow of 10 milliliters per second at a pressure of one micrometer (or micron) of mercury. This is equivalent to 0.01 lusec or 1.333 microwatts. The name of the unit is an acronym for "centi-lusec."

CmA
a unit of relative electric current used especially in connection with nickel metal hydride (NiMH) storage batteries. The symbol designates the current flow per hour, into or out of the battery, as a fraction of the battery's rated capacity. In other words, a current of 0.1 CmA would completely charge or discharge the battery in 10 hours. Put another way, if the rated capacity of the battery is 2 ampere hours or 2000 milliampere hours, then 0.1 CmA is a current flow of 200 milliamperes.

cmil
symbol for the circular mil (see above). Note that this is *not* a centimil.

coffee measure
a flat-bottomed scoop or spoon used to measure coffee in U.S. homes. The coffee measure holds 2 U.S. tablespoons (about 29.57 milliliters).

coffeespoon
a unit of volume formerly used in U.S. food recipes. A coffeespoon is 1/2 teaspoon, 1/12 fluid ounce, or about 2.5 milliliters.

collothun
an ancient Persian unit of liquid volume, equal to 1/8 artaba or (in recent centuries) about 8.25 liters.

color rendering index (CRI)
a scale used in engineering to measure the ability of an artificial lighting system to show the "true" colors of objects, that is, the colors those object display in natural daylight out of doors. The scale is from 0 to 100, with higher numbers representing a higher degree of fidelity of color. The test procedure, developed by the Illuminating Engineering Society of North America (IESNA), involves comparison of eight test colors under both natural lighting and the artificial source being tested.

color temperature (CCT)
a measure of the overall "color" of a light source. The measurement is obtained by comparing the spectrum, or mix of colors (wavelengths of light), produced by the light source to the spectrum of a "black body," a theoretical object that absorbs all radiation falling on it. (A black body is also a perfectly efficient radiator of energy, its spectrum depending only on its temperature.). The measurement is expressed in kelvins (K). Lower temperatures indicate more red and yellow light, higher temperatures more blue. Incandescent light bulbs are "cool" with a color temperature of about 2800 K, while daylight at noon is much "hotter" (bluer) at about 6000 K. Fluorescent lighting can be produced with a broad range of color temperatures including everything between these two values. "CCT" stands for "correlated color temperature."

color units
several systems have been devised to measure colors. For most of us not directly concerned with dyes, paints, or inks, the subject was academic until recently, but now computers require precise methods for describing the colors to be displayed or printed. These methods typically use three variables, reflecting the fact that the human eye has three types of color sensor. Computer monitors use the RGB system, which specifies colors with three variables measuring the intensity of the three primary colors red, blue, and green in the color. Frequently each variable is specified by one byte and therefore takes values in the range 0 to 255. If all three are 0, the resulting color is black; if all three are 255 the resulting color is white. The RGB settings for the Carolina blue background of this page are R=153, G=204, and B=255. Since it is difficult to estimate the relative amounts of red, green, and blue needed to create a particular color, many graphics design programs use the HSV color system, which describes colors using three variables called **hue**, **saturation**, and **value**. Once again, all three variables are assigned values from 0 to 255. Hue, which is what we call "color" in ordinary language, is described on a circular scale. Hue values begin with red at 0 and run through yellow, green, blue, and purple before returning to red at 255. Saturation is the purity of the color, the extent to which it is not watered down with gray. The pure color has saturation 255. As saturation is reduced, the color becomes grayer, until at saturation 0 the color is replaced by a neutral gray of the same intensity as the original color. The value (or intensity) of the color is its brightness. The pure or most natural form of the color has value in the middle of the scale, at 127. As value is increased the color becomes brighter. In the opposite direction, the color becomes less bright, becoming black at value 0. This page's background has hue 140, saturation 240, and value 192 in the HSV system. See also: Lovibond color units (used for beer and honey).

colpa, colp, or collop
a traditional Irish unit. The colpa was originally a unit of livestock equal to one cow or horse or to 6 sheep. Later it was used as a unit of pastureland equal to the pasturage supporting one colpa of livestock. This varied according to the quality of the land, but it was roughly equal to the Irish acre (0.6555 hectare). "Collop" is an English version of the Irish word "colpa."

column inch (col in)
a unit of relative area used in journalism. A column inch is an area one column wide and one inch deep. The width of a column varies; a standard size in the U.S. is 2-1/16 inch. At this width a column inch is

2.0625 square inches or about 13.31 square centimeters.

commercial acre

a unit of area used in U.S. real estate, equal to exactly 36 000 square feet or about 0.826 45 ordinary acre (0.334 45 hectare). The unit was invented by commercial realtors to express the approximate portion of an acre of subdivided land that remains to be sold in the retail market after portions are set aside (dedicated) for necessary streets and other utilities. Buyer beware! It is legal to sell land by the commercial acre in many U.S. states, although most consumers are not aware of the smaller size of the unit.

common year

a year of 365 days, as opposed to a leap year of 366 days.

cooling degree day (CDD)

see degree day.

cone, cone number

a measure of temperature used by potters. Pyrometric cones are cone-shaped objects designed to soften and bend after absorbing a specific amount of heat. Potters place these cones in the kiln and observe them through peepholes; when the cone bends all the way over the proper amount of heat has been delivered to the pottery being fired. Although cones bend within narrow temperature ranges there is not a simple relationship between cone number and temperature. Technical tables areposted on the Internet by the Orton Ceramic Foundation.

cong

a metric unit of area used in Vietnam. One cong equals 1000 square meters, which is 0.1 hectare, 0.24177 acres, or 1196.00 square yards.

congius

a historic unit of liquid volume. The Roman congius was equal to about 3.2 liters (3.4 U.S. quarts or 2.8 British Imperial quarts); it was divided into 6 sextarii (sixths) which corresponded closely to modern pints. In the nineteenth century, the congius was used in British medicine and pharmacology as a name for the British Imperialgallon (4.546 09 liters).

coomb or coom

a traditional British unit of volume used mostly for dry commodities. A coomb is 4 Imperial bushels; this is equivalent to 5.1374 cubic feet or about 145.48 liters.

COP

an abbreviation for **coefficient of performance**, a measure of the efficiency of heat pumps, air conditioners, refrigerators, and freezers. The COP is the ratio of the useful energy output of the system (the amount of heat energy added to or removed from the building) divided by the electric energy input when the unit is operating in a steady-state test condition. Typical values are in the range 2-4. (The energy "output" exceeds the input, because the system only uses the input energy to move heat energy, not to create it.) Heat pumps have a higher COP for heating than for cooling, because the compressor's input energy produces heat energy that can be used in heating but must be dissipated outdoors for cooling. For air conditioners, the COP equals the energy efficiency ratio (EER) divided by 3.412.

cord (cd) [1]

a traditional unit of volume used to measure stacked firewood. Like most traditional units of trade, the cord has varied somewhat according to local custom. In the United States, the cord is defined legally as the volume of a stack of firewood 4 feet wide, 8 feet long, and 4 feet high. (In Maryland, the law specifies that the wood be stacked "tight enough that a chipmunk cannot run through it." Presumably it is up to the buyer to provide the chipmunk.) One cord is a volume of 128 cubic feet, about 3.6246 cubic meters, or 3.6246 steres. The name apparently comes from an old method of measuring a stack of firewood using a cord or string.

cord (cd) [2]

in the U.S. timber industry, the cord is also used as a unit of weight for pulpwood. The weight varies with tree species, ranging from about 5200 pounds (2.36 metric tons) for pine to about 5800 pounds (2.63 metric tons) for hardwood.

cord foot (cd ft)

a traditional unit of volume used to measure stacked firewood. A cord foot is the volume of a stack of firewood 4 feet wide, 1 foot long, and 4 feet high. Thus the cord foot is 1/8 cord, or 16 cubic feet, or about

0.4531 cubic meter.

cordel [1]

a traditional unit of distance in Spain and Latin America. More specifically, the cordel is a rope used in land measurement. In Mexico and the southwestern U.S., the cordel measured 50 varas or about 42.33 meters (138.9 feet), using the Texas standard of 33 1/3 inches for the vara. In Cuba, however, the cordel was only 24 varas or about 20.35 meters (66.8 feet). Longer cordels were used in some parts of South America.

cordel [2]

a unit of area equal to one square cordel: about 1792 square meters (2143 square yards or 0.433 acre) in Mexico and the southwestern U.S. or about 414.2 square meters (495.4 square yards).

coulomb (C)

the SI unit of electric charge. One coulomb is the amount of charge accumulated in one second by a current of one ampere. Electricity is actually a flow of charged particles, such as electrons, protons, or ions. The charge on one of these particles is a whole-number multiple of the charge *e* on a single electron, and one coulomb represents a charge of approximately $6.241\ 506 \times 10^{18}$ *e*. The coulomb is named for a French physicist, Charles-Augustin de Coulomb (1736-1806), who was the first to measure accurately the forces exerted between electric charges.

count (ct) [1]

a unit of quantity equal to 1. This unit is used in commerce to specify that the quantity stated represents a reliable count. For example, a carton marked "oranges 24 ct" contains exactly 24 oranges.

count (ct) [2]

a traditional unit measuring the texture of a fabric, equal to the number of threads per inch. A 100 count fabric has 39.37 threads per centimeter.

count (ct) [3]

an informal unit of volume in bartending, equal to 0.5 fluid ounce (14.8 milliliters). Bartenders usually fit bottles with pourers designed to restrict the flow to 0.5 fluid ounce per second. They can then measure a quantity of liquid by counting, "one thousand one, one thousand two, ..." while pouring. This is much faster than using a measuring glass, and just about as accurate.

count (ct) [4]

a measure of size used in the U.S. for shrimp and similar items described by the number of items per pound. Thus "50 count" shrimp weigh an average of 1/50 pound each.

cousins

English, like most languages, has a procedure for stating the precise relationship between persons of common descent; a typical designation is "second cousins, once removed." First cousins are persons sharing a common grandparent; second cousins are persons sharing a common great-grandparent, and, generally, for $n > 1$, n-th cousins are persons sharing a common $(n - 1)$-times-great-grandparent. This means n-th cousins have $n + 1$ generations in each of their descents from the common ancestor. The "removed" phrase is used when the number of generations in the descent from the common ancestor is not the same for both cousins: "r times removed" means the difference in the number of generations is r. Thus, for n-th cousins r times removed, the common ancestor is an $(n - 1)$-times-great-grandparent of one cousin and an $(n + r - 1)$-times-great-grandparent of the other cousin. (In the case of first cousins r times removed, the grandparent of one cousin is also an r-times-great-grandparent of the other cousin.) For n-th cousins r times removed, there are $n + 1$ generations in the descent from a common ancestor for one cousin, and $n + r + 1$ generations for the other. The number of degrees of consanguinity between n-th cousins r times removed is $2n + r + 2$.

covado, covido

Portuguese and Arabic names, respectively, for the cubit (see below). The Portuguese covado is equal to 3 palmos (66 centimeters, or 20.12 inches), while the Arabic covido is about 48 centimeters or 19 inches.

cover

a traditional Welsh unit of area, standardized in the British system to be exactly 2/3 acre (about 0.2698 hectare). The word is an Anglicized version of the Welsh name *cyfair* for the unit.

cpi
a common abbreviation for characters per inch, used in printing. The unit is also called **pitch**.

cps
a traditional abbreviation for cycles per second; also an incorrect symbol for the centipoise (see above).

cran
a traditional unit of volume formerly used by fishermen. The cran, originally intended to represent the volume of fish held by a barrel, was standardized at 37.5 Imperialgallons, or about 170.46 liters. This is somewhat larger than the usual Imperial barrel. In modern times, the cran is also used somewhat informally to mean a volume of fish weighing about a hundredweight (112 pounds or 50.8 kilograms). The name of the unit is an old Gaelic word meaning a quantity or measure of something.

crannock
an old English unit of volume for grains. Never standardized, the crannock was roughly 10 bushels (350 liters).

crith
a unit of mass sometimes used in the physics and chemistry of gases. The crith is equal to the mass of a liter of hydrogen at standard temperature (0.01°C) and pressure (1 atmosphere); this is about 89.885 milligrams. The name comes from an ancient Greek word for a barleycorn.

crore
a traditional unit of quantity in India, equal to 10^7 or 10 million. Large numbers are usually described in India using the crore and the lakh (10^5); for example, the number 25 600 000 is called 2 crore 56 lakh and written "2,56,00,000".

crotchet
a unit of relative time in music equal to 1/4 whole note or 1/8 breve. The word, pronounced *crotch-it*, comes from the old Norse word *krok* for a hook; in this context it refers to the traditional hooked symbol for a quarter note.

crumb
a unit of information in computer science, equal to 2 bits. The unit is thought to have originated at IBM in the early 1980s. There are 2 crumbs in a nibble.

cu
abbreviation for "cubic," as in cubic feet or cubic meters. This symbol is forbidden by the SI, but it remains in common use in ordinary English text. The proper symbol for cubic feet is ft^3, not cu. ft.

cuadra [1]
a traditional Latin American unit of distance. The cuadra is generally equal to 100 varas (about 84 meters or 275 feet) in Central America and northern South America. In Argentina and Chile, the cuadra is equal to 150 varas (roughly 130 meters or 410 feet).

cuadra [2]
a traditional Latin American unit of area equal to one square cuadra [1]. Except in Argentina and Chile, this is 10 000 square varas, generally in the range 1.75-1.85 acres (0.71-0.75 hectare). In Argentina and Chile, the cuadra was 22 500 square varas (4.18 acres or 1.69 hectare).

cuartillo
a traditional Spanish unit of volume comparable to the liter or the English quart. The cuartillo equals 4 octavillos or 1/4 almude and contains 1.156 25 liters, which is about 1.222 U.S. liquid quart or 1.017 British Imperial quart.

cubic centimeter (cm^3 or cc)
the CGS unit of volume, equal to 10^{-6} cubic meter, 1 milliliter, or about 0.061 023 7 cubic inch.

cubic foot (ft^3, cu ft, or cf)
a traditional unit of volume in English speaking countries. One cubic foot equals 1728 in^3, 1/27 yd^3, 0.028 316 85 m^3, or 28.316 85 liters. The cubic foot also holds about 7.4805 U.S. liquid gallons or about 6.2288 British Imperial gallons.

cubic inch (in^3, cu in, or CI)
a traditional unit of volume in English speaking countries. One cubic inch equals 1/1728 = 5.787 037 x 10^{-4} ft^3, 16.3871 cm^3, 16.3871 milliliters, 0.5541 U.S. fluid ounce, or 0.5767 British Imperial fluid

ounce.

cubic meter (m^3)

the SI unit of volume, equal to 10^6 cm^3, 1000 liters, 35.3147 ft^3, or 1.307 95 yd^3. A cubic meter holds about 264.17 U.S. liquid gallons or 219.99 British Imperial gallons.

cubic yard (yd^3)

a traditional unit of volume in English speaking countries. One cubic yard equals 27 ft^3, 46 656 in^3, 0.764 555 m^3, or 764.555 liters. A cubic yard holds about 201.97 U.S. liquid gallons or about 168.20 British Imperial gallons.

cubit

a historic unit of distance frequently mentioned in the Bible. The word comes from the Latin *cubitum*, "elbow," because the unit represents the length of a man's forearm from his elbow to the tip of his outstretched middle finger. This distance tends to be about 18 inches or roughly 45 centimeters. In ancient times, the cubit was usually defined to equal 24 digits or 6 palms. The Egyptian royal or "long" cubit, however, was equal to 28 digits or 7 palms. In the English system, the digit is conventionally identified as 3/4 inch; this makes the ordinary cubit exactly 18 inches (45.72 centimeters). The Roman cubit was shorter, about 44.4 centimeters (17.5 inches). The ordinary Egyptian cubit was just under 45 centimeters, and most authorities estimate the royal cubit at about 52.35 centimeters (20.61 inches).

cuerda (cda) [1]

a traditional unit of land area in Puerto Rico. The cuerda is equal to about 3930 square meters, 4700 square yards, 0.393 hectare, or 0.971 acre. Because the cuerda and the acre are so close to being equal, they are often treated informally as being equal. Mainlanders sometimes call the unit the "Spanish acre."

cuerda (cda) [2]

a traditional unit of distance in Guatemala, equal to 25 varas or about 21 meters (roughly 69 feet). Since *cuerda* means a cord or rope in Spanish, this unit probably arose as the length of a measuring rope. The cuerda is also used as an area measure equal to 1 square cuerda or 625 square varas; this is about 440 square meters or 527 square yards.

cuerda (cda) [3]

a traditional unit of volume for firewood in Cuba, analogous to the U.S. cord (see above). A cuerda of firewood is equal to 128 cubic pies, 2.87 cubic meters, or 0.79 cord.

cumec

an informal unit of flow equal to 1 cubic meter per second or about 35.3147 cubic feet per second. The name was coined after the model of the cusec (see below).

cun

see t'sun [2].

cunit

a measure of wood volume used in forestry. One cunit (pronounced *cue-nit*) is a volume of timber containing 100 cubic feet (2.8317 cubic meters) of actual wood (excluding bark and air between the logs). The unit is used mostly for wood intended as pulpwood or firewood.

cup (c) [1]

a traditional unit of volume used in recipes in the United States. One cup equals 1/2 (liquid) pint, or 8 fluid ounces. Technically, one cup equals exactly 14.4375 cubic inches or approximately 236.6 milliliters, not that anyone measures quite so precisely in the kitchen. American cooks use the same size cup for measuring both liquid and dry substances. In Canada, a cup is equal to 8 Imperial fluid ounces (13.8710 cubic inches or 227.3 milliliters). In Britain, cooks sometimes used a similar but larger unit called the breakfast cup, equal to 10 Imperial fluid ounces. The British cup equals 1/2 Imperial pint, but the Canadian cup is only 0.4 Imperial pint.

cup (c) [2]

an informal metric unit of volume equal to 250 milliliters, commonly used in recipes in Australia.

cup (c) [3]

an informal unit of volume for coffee. The size of a cup of coffee varies according to local custom, but a typical size is about 5 fluid ounces or 150 milliliters.

curie (Ci)
a unit of radioactivity. One curie was originally defined as the radioactivity of one gram of pure radium. In 1953 scientists agreed that the curie would represent exactly 3.7 x 10^{10} atomic disintegrations per second, or 37 gigabecquerels (GBq), this being the best estimate of the activity of a gram of radium. See also becquerel. The unit is named for Pierre and Marie Curie, the discoverers of radium.

cusec
a traditional unit of flow equal to 1 cubic foot per second or about 28.317 liters per second.

cut [1]
a traditional unit of length for yarn in Scotland and northern England. One cut equals 1/12 hank, a unit varying with the material. A cut of cotton yarn is 70 yards; a cut of wool is 46 2/3 yards.

cut [2]
a unit of concentration for shellac; see pound cut.

CV or cv
a common symbol for the metric horsepower, standing for the French name *cheval vapeur* or the Spanish name *caballo de vapor*.

Cwt or cwt
traditional symbol for the hundredweight.

cy
a traditional symbol for the cubic yard.

cycle (c)
an informal name for "cycle per second." The frequencies of radio signals and of alternating electric current were previously stated in cycles; thus the alternating current in American homes is often described as "60-cycle" and a radio station might describe its signal frequency as "1040 kilocycles", really meaning 1040 kilocycles per second.

cycles per second (cps)
a traditional unit of frequency equal to one per second, or one hertz. Almost all measurements of frequency are now stated in hertz, the SI unit.

D

D
the Roman numeral 500.

D-
an obsolete symbol for the metric prefix deka- or deca-, seen in combinations such as DL (dekaliter) or DTH (dekatherm). The correct prefix is **da-**.

dag
symbol for the dekagram (10 grams; see entry below), an uncommon metric unit of mass.

daily value (DV)
a unit of nutrition used in the United States. The U.S. Food and Drug Administration establishes recommended daily amounts of various nutrients, both "good" ones like vitamins and "bad" ones like fat and sodium. These so-called daily values are based on a hypothetical person, male or female, who requires a diet of 2000 Calories per day. The results are approximate at best, since nutritional needs vary with age, sex, and other factors. Food packages generally carry nutritional lables specifying the amount of each nutrient contained in a standard serving, expressed as a percentage of the daily value (%DV). A table of the official daily values for each nutrient is provided.

daktylos
an ancient Greek unit of distance equal to a finger width, about 19 millimeters or 0.75 inch. There were 16 daktylos in the pous, the Greek foot, and 24 in a pechys (cubit). This unit was the Greek predecessor of the Roman digit (see below).

dal or daL
symbol for the dekaliter (10 liters; see entry below), an uncommon metric unit of volume.

dalton (Da or D)
an alternate name for the unified atomic mass unit (u or amu). The dalton is often used in microbiology and biochemistry to state the masses of large organic molecules; these measurements are typically in

kilodaltons (kDa). It seems necessary to have such a unit, since "kilo-amu" would be such a clumsy name. The SIaccepts the dalton as an alternate name for the unified atomic mass unit and specifies Da as its proper symbol. The unit honors the English chemist John Dalton (1766-1844), who proposed the atomic theory of matter in 1803.

dam

symbol for the dekameter (10 meters; see entry below), a metric unit of distance.

dan

a traditional Chinese weight unit, previously spelled **tan** in many English works. During the European colonial era the unit was equal to 100 catties or 133.333 pounds. In modern China the dan is equal to 100 jin, which is exactly 50 kilograms (110.231 pounds). The dan is the Chinese equivalent of the European quintal orhundredweight.

daN

symbol for the decanewton or dekanewton (see below under dekanewton), a common metric unit of force.

Danjon scale

a scale measuring the brightness (or rather, the darkness) of lunar eclipses, devised by the French astronomer André Louis Danjon (1890-1967). A table is provided.

daraf

a unit of electrical elastance, which is the ability of an electric potential to charge a capacitor. The daraf is equal to one volt of potential per coulomb of charge (V/C). The name of the unit is "farad" spelled backwards, because the elastance, in darafs, is 1 divided by the capacitance in farads. This unit is not recognized as part of theSI.

darcy

a CGS unit of permeability. Permeability is the extent to which a solid allows the flow of a fluid. This flow depends on the properties of the solid and also on the dynamic viscosity of the fluid and the difference in pressure driving the flow. One darcy is the permeability of a solid through which one cubic centimeter of fluid, having a viscosity of one centipoise, will flow in one second through a section one centimeter thick and one square centimeter in cross section, if the pressure difference between the two sides of the solid is one atmosphere. It turns out that permeability has the same units as area; since there is no SI unit of permeability, square meters are used. One darcy is equal to about 0.98692×10^{-12} square meter. The unit is named for a French scientist, H. Darcy (1803-1858), who did pioneering work in the study of permeability.

darwin

a logarithmic unit measuring the rate of evolution in characteristics of organisms. If the measurement of a characteristic (such as length, for example) changes from *a*to *b* in *y* million years, then the rate of evolution is $(\ln b - \ln a)/y$ darwins. (Technically, since the difference in natural logarithms is dimensionless, the darwin is a specialized name for the inverse megayear Ma^{-1}). The unit is named for Charles Darwin (1809-1882), the English biologist who founded the theory of evolution.

dash (ds)

an informal unit of volume used in food and drink recipes. Originally the dash was usually a liquid measure, small but indefinite in amount, roughly 1/8 teaspoon or a little less. More recently it has been used as both a liquid and dry measure. Kitchen supply stores in the U.S. and other countries have begun selling sets of "minispoons" in which the dash spoon is designed to hold exactly 1/8 teaspoon, which is roughly 0.02 fluid ounce or 0.6 milliliter.

data mile

a unit of distance used in radar technology. The data mile equals exactly 6000 ft or 1828.8 meters; this is equivalent to about 1.137 statute (ordinary) miles or 0.9875nautical miles. U.S. military radar equipment is often calibrated in data miles.

date

dates of the year are described in many ways in different languages. To avoid confusion in international communications, the International Organization for Standardization (ISO) adopted in 1986 an international standard (ISO 8601) for representation of dates and times. The ISO 8601 format for dates is YYYY-MM-DD, where YYYY

is the year number, MM is the month (01 through 12) and DD the day number. Hyphens, not slashes, must be used as the separators in the representation (if separators are used at all; YYYYMMDD is also acceptable). Thus 2001-04-05 is the representation for the date called April 5, 2001, in traditional U.S. notation. The international standard covers numeric representations only; it doesn't prohibit traditional statements of the date, using words, in whatever the local style is. Thus "April 5, 2009" remains perfectly acceptable in U.S. usage. However, non-standard numeric representations, such as 04/05/09, should not be used, because these representations are interpreted differently in different countries. For additional information, see ISO's Date and Time Format FAQ.

day [**1**]

a traditional unit of time marked by one rotation of the Earth on its axis. Different cultures have had different ideas about when to mark the start of the day, whether it should be from one sunset to the next, one sunrise to the next, etc. (Astronomers sometimes consider the day to run from one noon to the next, and today we usually mark the day from one midnight to the next.) This unit is called the **solar day**, since it is defined by observations of the sun. However, the solar day varies in length, because the speed of the Earth in its orbit varies, with the Earth moving faster when it is closer to the Sun. The result is that solar days are longer during the Northern Hemisphere winter and shorter during the Northern Hemisphere summer, because, despite what Northern Hemisphere residents might think, the Earth is actually closer to the Sun during the Northern Hemisphere winter. Because of this irregularity in the length of actual days, what our clocks attempt to measure is the average period of time between two successive noons, that is, between two successive appearances of the Sun on the meridian (the imaginary line joining due north to due south across the sky). Astronomers call this period of time the **mean solar day**. By long tradition, solar and mean solar days were divided into 24 hours, or 1440 minutes, or 86 400 seconds.

day [**2**]

a unit of time generally equal to exactly 24 hours, or 1440 minutes, or 86 400 seconds. This unit is meant to be equivalent (for all practical purposes) with the mean solar day. But there is a small problem with making this equivalence. The second has its own scientific definition based on the frequency of a certain radiation from cesium atoms and having nothing to do with the Earth's rotation. The reason for making this scientific definition of the second is that the length of the mean solar day is not constant from one year to the next. The gravitational attraction of the Moon is very gradually slowing the Earth's rotation, so that each day is a tiny bit longer, about 40 nanoseconds on the average, than the previous day. This lengthening adds one second to the length of the day about every 60 000 years. During the first decades of the 21st century the actual length of the mean solar day will be about 86 400.002 seconds. For this reason, time as kept by our best clocks runs a bit faster than time as kept by the Earth. To keep clock time and sun time in step (within 0.9 seconds), every so often a **leap second** must be added at the end of a day. This is done at midnight Universal Time either on June 30 or on December 31. Because the rate of slowing is erratic, the need for these leap seconds cannot be predicted more than a few months in advance. (**Link**: **explanation of leap seconds** from the U.S. Naval Observatory.)

day [**3**]

a civil unit of time, the period during which all times have officially the same date (see above). Like day [2], this unit is generally equal to exactly 24 hours, or 1440 minutes, or 86 400 seconds, with a rare extension by addition of a leap second. However, changes in time reckoning also affect the length of the civil day. A day on which "summer" or "daylight" time is adopted has only 23 hours, and a day on which the reckoning reverts to "winter" or "standard" time has 25 hours. Similar adjustments may occur if a locality switches from one time zone to a different zone.

dB -

a symbol indicating that a measurement is made using a logarithmic scale similar to that of the decibel (see below) in that a difference of 10 dB- corresponds to a factor of 10. In each case, the actual

measurement a is compared to a fixed reference level r and the "decibel" value is defined to be $10 \log_{10}(a/r)$. Many units of this kind have been used and only a few of the more common ones are mentioned in the next entries. In each case the dB symbol is followed by a second symbol identifying the specific measurement. Often the two symbols are not separated (as in "dBA"), but the Audio Engineering Society recommends that a space be used (as in "dB A").

dB A, dB C

units of sound intensity, exactly like the decibel except that before the measurement is made sounds of high and low frequencies, heard poorly or not at all by the human ear, have been filtered out. The letters A and C refer to two filtering methods.

dB c

a unit of signal strength used in electronics, especially in measuring noise levels. The signals are measured relative to the strength of the carrier signal, which is the desired signal. A typical statement might be that a certain noise level is -50 dB c, meaning that the noise is 50 "decibels below carrier" or 10^{-5} times the carrier signal strength.

dB FS

abbreviation for "decibels full scale," a unit of power as measured by a digital device. A digital measurement has a maximum value M depending on the number of bits used. If the actual power measurement is p, the dB FS value displayed is $20 \cdot \log_{10}(p/M)$ dB FS. Since p cannot exceed M, this reading is always negative.

dB i

a unit measuring the gain of an antenna. The reference level is the strength of the signal that would be transmitted by an isotropic antenna: one radiating equally in all directions. For example, an antenna rated 20 dB i transmits a signal in the desired direction $10^2 = 100$ times stronger than an isotropic antenna.

dB m, dB W

logarithmic units of power used in electronics. These units measure power in decibels above the reference level of 1 milliwatt in the case of dB m and 1 watt in the case of dB W. A power of n watts equals 10 $\log n$ dB W; conversely, a power of p dB W equals $10^{(p/10)}$ watts. The same formulas link dB m to milliwatts. An increase of 10 dB m or 10 dB W represents a 10-fold increase in power. Since 1 watt = 1000 milliwatts, 0 dB W = 30 dB m.

dB rn

a symbol for "decibels above reference noise," a unit measuring noise levels in telecommunications. The usual reference level is -90 dB m, which is equivalent to a power of 1 picowatt (1 pW). For example, 50 dB rn equals -40 dB m.

dB spl

a logarithmic unit of sound intensity as computed from the sound pressure level. The reference level is a pressure of 20 micropascals. If sound waves exert a pressure of P pascals, the sound intensity is $100 + 20 \cdot \log_{10}(P/2)$ dB spl.

dB u

a logarithmic unit of power, similar to dB m but computed from voltage measurements. The reference level is 0.775 volts, the voltage which generates a power of 1 milliwatt across a circuit having an impedance of 600 ohms. A voltage of V volts corresponds to a power of $20 \cdot \log_{10}(V/0.775)$ dB u.

dB V

a logarithmic unit of power, similar to dB m but computed from voltage measurements. The reference level is 1 volt. A voltage of V volts corresponds to a power of $20 \cdot \log_{10}(V)$ dB V.

dB W

see dB m above.

dB Z

a unit of radar reflectivity used in meteorology. The unit measures the amount of energy returned to a weather radar site as a function of the amount transmitted. The scale is logarithmic, a difference of 10 dB Z indicating a 10-fold increase in energy returned. For display purposes, dB Z values are grouped as follows:

(Level 1, 18-30 dBZ) - Light precipitation

(Level 2, 30-38 dBZ) - Light to moderate rain

(Level 3, 38-44 dBZ) - Moderate to heavy rain
(Level 4, 44-50 dBZ) - Heavy rain
(Level 5, 50-57 dBZ) - Very heavy rain; hail possible
(Level 6, >57 dBZ) - Very heavy rain and hail; large hail possible
The colorful "radar images" shown on television are actually plots of these levels.

deadweight ton (dwt)
a traditional unit of weight or mass used in the shipping industry. The deadweight tonnage of a ship is the difference between its weight when completely empty and its weight when fully loaded. This includes the weight of everything portable carried by the ship: the cargo, fuel, supplies, crew, and passengers. The deadweight ton is traditionally equal to the British ("long") ton of 2240 pounds (1016.047 kilograms). However, more and more often it is being taken to equal the metric ton (exactly 1000 kilograms, or 2204.623 pounds).

debye (D)
a CGS unit of electric dipole moment used in chemistry and physics. A charged molecule can be regarded as a tiny bar with opposite charges at the ends. Such a bar is called a dipole, and its dipole moment is the amount of the charge multiplied by half the length of the bar. Thus the appropriate unit of dipole moment in the SI would be the coulomb meter (C·m). Since this is much too large for molecules, the debye is defined as an electric dipole moment of 10^{-18} statcoulomb centimeter or 3.33564×10^{-30} coulomb meter. The unit honors the Dutch physicist P.J.W. Debye (1884-1966), who was famous for his research on polar molecules.

deca- (da-)
a metric prefix meaning 10, derived from the Latin word for ten, *decem*. The Greek form **deka-** is also used, and it has the advantage of avoiding confusion with deci-, one tenth. The International Bureau of Weights and Measures (BIPM) specifies deca- for the prefix and da- for the symbol. In its interpretation of the International System (SI) for U.S. use, the U.S. National Institute of Standards and Technology (NIST) recommends deka- for the spelling of the prefix. Following NIST, this dictionary uses the spelling deka-.

decade [1]
a traditional unit of quantity equal to 10. Also called the **decad**. In medieval English this unit was anglicized as the dicker (see below).

decade [2]
a traditional unit of time equal to 10 years.

decade [3]
a unit of time equal to 10 days or 1/3 month. The revolutionary governments in France (1790s) and the Soviet Union (1920s) tried to decimalize and secularize the calendar by eliminating the week (with its traditional day of religious observance) and substituting the decade. Both efforts failed. However, the decade survived as a unit of civil time in Russia and as a 10-day unit in some scientific contexts (for example, a 10-day cycle in meteorology is called a decade). Where the decade equals 1/3 month, the three decades of a month are the 1st-10th, 11th-20th, and 21st through the last day of the month.

decade [4]
another name for the bel or the order of magnitude: a logarithmic unit used to compare the sizes of quantities. Two quantities differ by one decade if one is 10 times the other, by two decades if one is 10·10 = 100 times the other, and so on.

decamillion
the number 10 million (10^7).

decatherm
see dekatherm, below.

decay time [1]
a unit of relative time used in physics. Decay time is similar to half life, but shorter and less familiar. It is the time required for an exponentially decaying process (such as radioactivity) to decrease to 1/e = 36.7879% of its original value. The fraction of activity remaining at time T, if T is measured in decay time units, is simply e^{-T}. The decay time equals 0.693 147 half life.

decay time [2]
a unit of relative time used in various engineering applications. In many

cases, it is the time required for a decaying process to decrease to 10% of its original value. However, a variety of definitions are used in different fields.

decennium

a unit of time equal to 10 years; another name for a decade [2]. The census in the U.S. is called decennial because it is taken every ten years.

deci- (d-)

a metric prefix meaning one tenth, or 0.1. The prefix is derived from the Latin word *decimus* for a tenth.

decibar (dbar)

a metric unit of pressure equal to 0.1 bar or 10 kilopascals. One decibar equals 75.006 torr, or 1.450 pounds per square inch (lbf/in^2 or psi). The decibar is often used to measure the pressure of seawater, because an increase of 1 decibar in pressure corresponds closely to an increase of 1 meter in depth.

decibel (dB)

a customary logarithmic measure most commonly used (in various ways) for measuring sound. The human ear is capable of detecting an enormous range of sound intensities. Because of this great range, and because our perception of sound is not linear, it makes sense to measure sound on logarithmic scales. Informally, if one sound is 1 bel (10 decibels) "louder" than another, this means the louder sound is 10 times louder than the fainter one. A difference of 20 decibels corresponds to an increase of 10 x 10 or 100 times in intensity. The beginning of the scale, 0 decibels, can be set in different ways, depending on exactly which aspect of sound is being measured. For sound intensity (the power of the sound waves per unit of area) 0 decibels is equal 1 picowatt per square meter; this corresponds approximately to the faintest sound that can be detected by a person who has good hearing. A quiet room has a normal sound intensity of around 40 decibels, ten thousand times louder than the faintest perceptible sound, and a thunderclap may have an intensity of 120 decibels, a trillion times louder than the faintest sound. For sound pressure (the pressure exerted by the sound waves) 0 decibels equals 20 micropascals (μPa) RMS, and for sound power 0 decibels sometimes equals 1 picowatt. In all cases, one decibel equals about 0.115 129 neper and d decibels equal $d(\ln 10)/20$ nepers. See also dB- (above).

decigram (dg)

a metric unit of mass equal to 100 milligrams or about 1.5432 grains.

decile

a statistical unit equal to 10 percentiles, or 1/10 of a ranked sample. See percentile. The word is pronounced with a soft "c": *des-ile*.

deciliter (dl or dL)

a fairly common metric unit of volume equal to 0.1 liter or 100 cubic centimeters. A deciliter contains 6.10237 cubic inches, 3.38140 U.S. fluid ounces, or 3.519 British fluid ounces. The deciliter is similar in size to the gill, an old English unit of volume. The deciliter is commonly used in medicine to express blood volume in units of concentration, such as micrograms per deciliter (μg/dL).

decimeter (dm)

a fairly common metric unit of distance equal to 10 centimeters or 3.9370 inches. The decimeter is very close to the hand, a traditional English unit.

decimillimeter (dmm)

a metric unit of distance equal to 0.1 millimeter (10^{-4} meter) or about 3.937 mils. The unit is used in civil engineering for stating the results of penetration tests of asphalt concrete, in which a needle is pushed into the concrete under specified conditions. Although this unit is allowed by some standards agencies, the use of compound prefixes such as decimilli- is not permitted in the SI.

decipascal second (dPa·s)

a unit of dynamic viscosity equal to 0.1 pascal second (Pa·s) or 1 poise. This rather clumsy SI unit is occasionally used because of its equivalence with the poise, an older unit not allowed in the SI.

decipol

an empirical unit of indoor odor intensity introduced by the Danish environmental scientist P.O. Fanger in 1988. One olf is defined as the indoor odor intensity produced by one "standard person", and one

decipol is the perceived odor intensity level in a space having an odor source of strength one olf and ventilation at the rate of 10 liters/second with unpolluted air. Measurements are recorded by human observers using protocols laid out by Fanger and his colleagues.

decitex (dtex)

a common metric unit of yarn density equal to 0.1 tex, 0.9 denier (see below), or 0.1 milligram per meter. This unit was previously called the **drex**.

decitonne (dt or dtn)

a metric unit of mass or weight equal to 100 kilograms (approximately 220.4623 pounds). This unit is becoming common in international trade; it is the same as the Russian centner, the German doppelzentner (see below), and the French metric quintal.

degree (° or deg) [**1**]

the standard unit of angle measure, equal to 1/360 circle, 60 minutes, 3600 seconds, or about 0.017 453 293 radian. So far as we know, this unit was introduced by the Greek geometer Hipparchus of Nicaea (ca. 180-ca. 125 BC), who developed the first trigonometric tables.

degree (° or deg) [**2**]

a unit of distance sometimes used at sea, equal to 60 nautical miles, approximately 69.05 statute miles, or 111.12 kilometers. This distance is the average length of one degree of latitude (that is, the average distance between two lines of latitude 1° degree apart). Because the Earth is not exactly spherical, a degree of latitude actually varies from about 68.7 miles at the Equator to 69.4 miles at the poles. One degree of longitude is about 69.17 miles at the Equator (shrinking to nothing at the poles!).

degree (° or deg) [**3**]

any of the various units of temperature (see below). In the U.S., the unmodified unit "degree" generally means the degree Fahrenheit; in other countries, it generally means the degree Celsius.

degree (° or deg) [**4**]

a unit measuring the hardness of water. Water is called "hard" if it contains a high concentration of mineral salts, especially calcium carbonate. This concentration can be expressed clearly in parts per million (ppm) or in milligrams per liter (mg/L). But starting in the mid-19th century, several uses of "degree" for water hardness became well established. In the U.S. and Britain, hardness is measured in **Clark degrees**, named for the scientist who devised the first reliable test for water hardness. The Clark degree is defined as 1 part of calcium carbonate per 70 000 parts of water; this is about 14.3 parts per million (ppm), 17.1 mg/L, or 1 grain per gallon (gpg, another popular measure of hardness). The French, properly decimal as always, used a degree equal to exactly 10 ppm, while the German degree was equivalent to 17.8 ppm.

degree (° or deg) [**5**]

various scientific quantities, especially specific gravity and viscosity, have been measured in "degrees" based on the readings of particular instruments. The degree scales of Baumé (see below) and Beck, and many others, have been used in measuring specific gravity, and the scales of Engler and MacMichael are common in the measurement of viscosity. Often these degree scales can't be converted in a simple way to the quantities being measured; one needs the conversion formula or table for the particular instrument. Some of this data can be found in scientific and engineering handbooks, especially older ones.

degree (° or deg) [**6**]

the percentage of alcohol, by volume, present in a mixture. In winemaking, for example, a 13° wine is 13% alcohol by volume (13% v/v). This unit is also called the**degree Gay-Lussac** (° GL) after the French chemist Joseph-Louis Gay-Lussac (1778-1850).

degree (deg) [**7**]

a unit used in mathematics to describe algebraic expressions. The degree of an expression having a single variable is the highest exponent (or power) to which that variable appears. If the expression has more than one variable, then the degree is the highest total exponent of the individual terms, where in each term the exponents of the different variables are added. Thus $x^2y^4z^3$ is a term of degree 9.

degree (°) [**8**]

the DIN speed rating for film; see DIN below.

degree (deg) [9]
a unit measuring consanguinity: the extent to which two persons are related to one another by common descent ("by blood," as the usual saying is). Essentially all cultures, societies, and nations have prohibited marriage between closely related individuals, and the determining factor is often the number of degrees of consanguinity between the two persons. If X is an ancestor of Y, the number of degrees of consanguinity between X and Y is the number of descents; thus parent and child are separated by 1 degree, grandparent and grandchild by 2 degrees, and so on. If persons X and Y are not linked by direct descent but do share a common ancestor A, the usual definition is that the number of degrees of consanguinity between X and Y is the total number of descents, counting up from X to A and then back down from A to Y. For example, siblings (brother and sister) are separated by 2 degrees, aunt and nephew by 3 degrees, and first cousins by 4 degrees. This calculation is backed by modern science, because we have learned that persons separated by *n* degrees of consanguinity share about $1/2^{n-1}$ of their genes if they have two common ancestors or $1/2^{n}$ if they have only one common ancestor. See also cousins.

degree (°) [10]
a measure of curvature of railroad tracks or highways, used primarily in the U.S. When railroad tracks follow an arc of a circle, the angle of curvature is the angle (measured at the center of the circle) spanned by a chord of a standard length. In the U.S., the chord used is the U.S. chain of 100 feet (30.48 meters). In the metric world, a chord of 20 meters is sometimes used. On most U.S. rail lines curvatures are less than 6° (making the radius greater than 955 feet or 291 meters); on high speed lines they are less than 2° (making the radius greater than 2865 feet or 873 meters). For highways in the U.S., the angle of curvature is the angle (measured at the center of the circle) spanned by an arc 100 ft long.

degree API (°API)
a unit invented by the American Petroleum Institute (API) to measure the specific gravity, or one might say the "lightness," of petroleum. Lighter oils are more valuable, so the API scale gives them higher readings than heavier oils. If S is the specific gravity of the petroleum at temperature 60 °F (15.56 °C), the API degree rating is equal to (141.5/S) - 131.5 degrees.

degree Balling
see degree Plato, below.

degree Baumé (°B or °Bé)
a unit of relative density, as read on a type of hydrometer invented by the French chemist Antoine Baumé (1728-1804). Two scales are used, depending on whether the liquid is lighter than water or heavier than water. For lighter liquids, the relative density d in degrees Baumé is related to specific gravity S by the formula d = (144.3 / S) - 144.3; for heavier liquids the formula is d = 144.3 - (144.3 / S).

degree Brix (°Bx)
see brix.

degree Celsius (°C)
a metric unit of temperature. The Celsius temperature scale is named for the Swedish astronomer and physicist Anders Celsius (1701-1744), who used a similar scale. The freezing point of water (at one atmosphere of pressure) was originally defined to be 0 °C, while the boiling point is 100 °C. Thus the Celsius degree is 1/100 of the difference between these two temperatures. (The scale actually used by Celsius was inverted, so that 0 °C was the boiling point of water and 100 °C the freezing point.) In the SI system, the Celsius scale is defined so that the temperature of the triple point of water (the temperature at which water can exist simultaneously in the gaseous, liquid, and solid states) is exactly 0.01 °C, and the size of the degree is 1/273.16 of the difference between this temperature and absolute zero (the temperature at which all molecular motion ceases). For practical purposes this is equivalent to the original definition. See also degree Fahrenheit, kelvin.

degree centigrade (°C)
an older name for the degree Celsius. The Celsius scale is called "centigrade" because it has 100 (centi-) gradations between the freezing point and boiling point of water. About 1850 scientists began calling the unit "degree Celsius" in honor of its (presumed) inventor.

degree day (deg da)
a unit used in meteorology and engineering to measure the demand for heating or cooling. In the United States, it's agreed that 65 °F (18.3 °C) is the critical outside temperature; below this tempeature heating is needed and above it cooling is needed. The number of degree days recorded on a given date is equal to the difference between 65 and the mean temperature for that date (figured as the average of the highest and lowest temperatures). If the mean temperature is above 65, **cooling degree days (CDD)** are recorded; if it is below 65, **heating degree days (HDD)** are recorded. The total number of heating or cooling degree days recorded in any period of time measures rather accurately the demand during that time for fuel used in heating and cooling buildings.
degree Dornic (°D)
a measure of the acidity of milk. Each degree Dornic is equivalent to 0.01% lactic acid in the milk. Normal values are around 15.
degree EBC (°EBC)
a unit used in Europe to measure the color of beer. EBC is an abbreviation for European Brewing Convention. EBC degrees are related to the Lovibond degrees used in the U.S. (see below) by the approximate formula °EBC = (°L * 2.65) - 1.2.
degree Fahrenheit (°F)
a traditional unit of temperature still used customarily in the United States. The unit was defined by the German physicist Daniel G. Fahrenheit (1686-1736), who also invented the mercury thermometer. Fahrenheit set 0° at the coldest temperature he could conveniently achieve using an ice and salt mixture, and it is said he intended to set 96° as the temperature of the human body. (If so, he was off a little there; normal oral temperature for humans is between 98 °F and 99 °F.) On this scale, the freezing point of water (at normal sea level atmospheric pressure) turned out to be about 32 °F and the boiling point about 212 °F. Eventually the scale was precisely defined by these two temperatures. 1°F equals 5/9 °C, but in converting between scales we have to be careful to adjust the zero points as well. To convert a temperature in °F to the Celsius scale, we must first subtract 32° and then multiply by 5/9.

In the other direction, to convert a temperature in °C to the Fahrenheit scale, we must first multiply by 9/5 and then add 32°.
degree Gay-Lussac (°GL)
see degree [6] above.
degree Kelvin (°K)
an obsolete name for the kelvin. In the International System, temperatures on the absolute temperature scale are stated in kelvins, not in degrees Kelvin.
degree KMW (°KMW)
a unit used in Austria to measure the sugar content of must, the unfermented liquor from which wine is made. One degree KMW is roughly equivalent to 1% sugar by weight or 5° Oe; for the exact conversion see below under degree Oeschle. KMW is an abbreviation for Klosterneuburger Mostwaage (Klosterneuburg Must Scale).
degree Lovibond (°L)
a unit used in the U.S. to measure the color (really the darkness) of beer and honey. The scale is open-ended, but most readings fall between 1 (a very light gold, or yellow) and 25 (a very dark brown). A good description of the scale, with comments on other units in use, has been posted by pdlab.com.
degree MacMichael (°McM)
a unit used to measure the viscosity, or thickness, of chocolate. Typical values range from around 60 °McM (very thin chocolates suitable for pouring into molds) to around 190 °McM (very thick chocolates suitable for hand dipping or forming around a center). A MacMichael viscometer is used to make the measurement.
degree Oechsle (°Oe)
a unit used in Germany and Switzerland to measure the sugar content of must, the unfermented liquour from which wine is made. One degree Oechsle (or Öchsle) is roughly equivalent to 0.2% sugar by weight. This unit is related legally to °KMW by the formula °Oe = °KMW * ([.022 * °KMW] + 4.54).
degree Plato (°P)
a unit measuring sugar content, especially of the wort, the unfermented

liquour from which beer is made. Named for a German chemist, one degree Plato represents a sugar content equivalent to 1% sucrose by weight. Not all the sugar in a wort is sucrose; the unit standardizes the measurement to the sucrose equivalent. The reading is made with a device called a saccharometer. The **degree Balling** is a somewhat older unit equivalent (approximately) to the degree Plato. In Europe, beer is often taxed either by the degree Plato or by the actual alcohol content. There is no precise conversion between these quantities, but for tax purposes it is often assumed that 1% alcohol (1 degree [6], see above) is equivalent to 2.5 degrees Plato; that is, 1 degree Plato is legally equivalent to 0.4% alcohol.

degree Quevenne (°Q)

a unit measuring the density of milk. 1 degree Quevenne represents a difference in specific gravity of 0.001, so, for example, 20 °Q milk has specific density 1.020.

degree Rankine (°R)

a traditional unit of absolute temperature. 1 degree Rankine represents the same temperature difference as 1 degree Fahrenheit, but the zero point of the scale is set at absolute zero. This means the Rankine temperature is 459.67° plus the Fahrenheit temperature. 1 degree Rankine is equal to exactly 5/9 kelvin. The unit is named for the British physicist and engineer William Rankine (1820-1872).

degree Réaumur (°r or °R)

a unit of temperature formerly used in continental Europe. The Réaumur temperature scale is named for the French scientist René-Antoine Ferchault de Réaumur (1683-1757). It is similar to the Celsius scale in having its zero point at the freezing temperature of water, but the interval between the freezing and boiling temperatures of water equals 80 °r instead of 100 °C. Therefore, 1 °r equals 1.25 °C or 2.25 °F.

degree Soxhlet-Henkel (°SH)

a measure of the acidity of milk. Each degree Soxhlet-Henkel is equivalent to 0.0225% lactic acid in the milk. Normal values are around 7.

degree Therner (°Th)

a measure of the acidity of milk. Each degree Therner is equivalent to 0.009% lactic acid in the milk. Normal values are around 17.

degree Twaddle (°Tw)

a unit measuring the specific gravity of liquids denser than water. 1 degree Twaddle represents a difference in specific gravity of 0.005 or 1/200, so a liquid of specific gravity S is measured at 200(S - 1) °Tw. For milk, 1 degree Twaddle equals 5 degrees Quevenne (see above).

deka- (da-)

a metric prefix meaning 10, taken directly from the Greek word for ten, *deka*. The Latin spelling deca- is also used (see deca-, above). Although the U.S. National Institute for Standards and Technology recommends deka-, deca- is seen frequently in American publications. The spelling deca- is also used in French and in other languages where "k" rarely occurs in the middle of a word. Regardless of spelling, da- is the official symbol. (The symbol dk- for deka- is incorrect, but it is seen fairly often.)

dekagram or decagram (dag)

a common metric unit of mass, the dekagram is frequently used in European food recipes. One dekagram is equal to 10 grams, 0.01 kilogram, or 0.352 739 66 ounce. The symbol **dkg** sometimes used for this unit is incorrect.

dekaliter or decaliter (daL or dal)

a metric unit of volume equal to 10 liters and comparable to the English peck. The dekaliter is equal to about 2.641 72 U.S. liquid gallons, 1.135 10 U.S. pecks, or 2.199 69 British Imperial gallons (1.099 85 British pecks). The symbol **dkL** sometimes used for this unit is incorrect.

dekameter or decameter (dam)

a common metric unit of distance equal to 10 meters (about 32.8084 feet). The symbol **dkm** sometimes used for this unit is incorrect.

dekanewton or decanewton (daN)

a fairly common metric unit of force equal to 10 newtons. The dekanewton is equal to 1 megadyne, to 1.019 716 kilograms of force

(kgf) or kiloponds (kp), to 2.248 09 pounds of force (lbf), and to 72.3301 poundals. In engineering, the dekanewton is a convenient substitute for the kilogram of force or kilopond, since it is nearly equal to those units.

dekan

a unit of angle measure equal to 10° or 1/36 circle. The ancient Egyptians divided the circle of the Zodiac into 36 divisions, which the Greeks called dekans. The unit is still used occasionally in astrology, where one dekan equals 1/3 sign.

dekare, dekar, or decare

a metric unit of area equal to 10 ares, that is, 1000 square meters or 0.1 hectare. In English units, the dekare equals approximately 10 763.91 square feet, 1195.99 square yards, or 0.247 105 acres. Various traditional units of land area have been identified with the dekare, including the Middle Eastern dunum (see below), the Norwegian mål, the Greek stremma, and the Vietnamese cong.

dekatherm or decatherm (DTH)

a unit of energy equal to 10 therms, 1 million Btu, or about 1.055 057 gigajoules (GJ). This unit is used in the energy industry as a synonym for the million-Btu (MM Btu).

demal (D)

an obsolete unit of concentration in chemistry. From 1901 to 1964, the liter was officially defined to be exactly 1.000 028 cubic decimeter. During this period, there was a small difference between measuring concentration in moles per liter and in moles per cubic decimeter. Concentration in moles per liter is called molar, while concentration in moles per cubic decimeter was called demal. This distinction has now disappeared along with the awkward definition of the liter. The former conversion was 1 demal = 1.000 028 molar.

demi-

a traditional prefix meaning 1/2. The prefix is derived from the Latin *dimedius*, meaning a cut in the middle of something.

demi [1]

a half bottle of wine (375 milliliters).

demi [2]

an informal French unit of volume for beer, generally equal to 250 milliliters (1/4 liter). The unit was originally a half pint (*demipinte*).

demisemiquaver

a unit of relative time in music equal to 1/32 whole note or 1/64 breve.

denaro

a traditional Italian weight unit equal to 24 grani; its size varied from about 1.1 grams to 1.25 grams.

denier [1]

a traditional unit of yarn density. One denier is the density of a thread having a mass of 1 gram per 9 kilometers of length. The metric unit of yarn density is the tex; 1 denier equals 1/9 tex or 10/9 decitex.

denier [2]

a traditional French weight unit, comparable to the English pennyweight. Like the pennyweight, the denier is equal to 24 grains (1.275 grams). This unit was also called the **scrupule**.

desiccant unit (DU)

a unit measuring the amount of a drying agent. One desiccant unit is the amount of the drying agent that can absorb 3 grams of water at a relative humidity of 20% and 6 grams at a relative humidity of 40%, when the temperature is between 21 °C (69.8 °F) and 25 °C (77 °F). (Different industrial standards differ slightly in the temperature specification.)

dessertspoon or dessertspoonful (dsp or dssp)

a unit of volume sometimes used in food recipes. The dessertspoon is equal to 2 teaspoons; this is roughly equivalent to 10 milliliters in the U.S. In the metric world, a measuring spoon holding exactly 10 milliliters is often called a dessertspoon.

dessiatina

a traditional unit of land area in Russia equal to 2400 square sadzhens. By coincidence, this makes the dessiatina very nearly the same as a hectare: it equals about 1.0925 hectare or 2.6996 acres.

deuce

an old English word for two, derived from the old French *deus* (now spelled *deux*). The word survives as the name for a two-spot showing

in dice or a two card in card games. In tennis, "deuce" describes a tie situation in which a player must win the next two points in order to win the game.

devil's dozen

an alternate name for the baker's dozen, a traditional unit of quantity equal to 13. This name reflects the long-standing association of the number 13 with bad luck or evil.

dex

a logarithmic unit being used in astronomy. Originally, dex was a convenient function defined by dex $(x) = 10^x$. But the notation is now being used after the exponent in expressions such as -.043 dex, meaning $10^{-.043}$. Thus 1 dex equals a factor of 10, making the dex identical to the bel. The name "dex" is a contraction of "decimal exponent."

dhur

a traditional unit of land area in South Asia, equal to 1/20 kattha or 1/400 bigha. Like the bigha, the dhur varied in size from region to another. In Nepal, where the unit is still in use, the dhur equals about 16.9 square meters or 20.2 square yards.

dialog unit (dlu)

a unit of relative distance used in computer graphics. Actually there are two units: the horizontal dialog unit equals 1/4 the average width of the font being used, and the vertical dialog unit equals 1/8 the average height of the font. If the font's aspect ratio (the ratio of height to width) is 2:1, these two units will be the same. This is often the case. The unit is used particularly in the design of dialog boxes.

diameter (dia, X, or ×)

a unit of magnification equivalent to power. "Power" tends to be used in adjective phrases, such as "120-power eyepiece" or "7-power binoculars." "Diameters" often appear in declarative statements of magnification, such as, "the eyepiece lens magnifies 120 diameters."

diamond

a mysterious marking on many tape measures in the U.S. The diamonds mark a distance unit equal to exactly 8/5 feet (19.2 inches or 48.768 centimeters). This is potentially useful to carpenters if they wish to place 5 studs, floor joists, etc., in a distance of 8 feet.

dicker

a traditional unit of quantity equal to 10. The word is an English version of the Latin word for ten, *decem*. After centuries of use, especially by traders in furs and skins, the dicker has nearly disappeared from the English language.

Didot point

a unit of distance used in typography; see point [2].

dieb. alt., dieb. tert.

abbreviations for the Latin *diebus alternis*, every other day, and *diebus tertius*, every third day, units of frequency sometimes used in medical prescriptions.

digit

a historic unit of distance equal to the width of a person's finger. Used in all the ancient civilizations of the Middle East and Mediterranean, the digit was equal to 0.75 inch or 19 millimeters with only the smallest variations. Typically, there were 4 digits in a palm, 16 in a foot, and 24 (sometimes 28) in a cubit. The word digit is from the Latin word for a finger or toe, *digitus*.

dimension (dim)

a mathematical unit measuring the number of independent directions in a set or space. Traditionally, a space has as many dimensions as there are mutually perpendicular directions at each point in the space: thus a line has 1 dimensions, a plane has 2 dimensions, and the ordinary space we live in has 3 dimensions. The theory of relativity is set in a "space-time" having 4 dimensions, and higher dimensional spaces are frequently used in science and economics. In addition, mathematicians have developed several methods for assigning fractional dimensions to certain complex sets.

DIN

the initials of Deutsches Institut für Normung, the German standards agency. Outside the U.S., film was generally marked with a DIN speed rating such as DIN 24 (corresponding to ASA 200). A difference of 3 in the DIN rating corresponds to a doubling of the film speed; that is,

DIN 27 film (ASA 400) is twice as fast as DIN 24. The ASA and DIN ratings are now combined, with a degree symbol on the DIN number, and marked with ISO (the initials of the International Organization for Standardization). Thus DIN 27 film is now marked ISO 400/27°.

diopter (dpt or D)

a metric unit used in optics to measure the refractive power of a lens. Each converging lens has a focal length, defined to be the distance from the center of the lens to the point at which the lens focuses light. (Diverging lenses, which can be used to convert focused light to parallel rays, have a negative focal length.) The shorter the focal length, the greater the refractive power of the lens. The refractive power of the lens, in diopters, equals 1 divided by the focal length of the lens, in meters, so 1 diopter = 1 m^{-1}. The unit is often spelled *dioptre* outside the United States. The lower case Greek letter delta is also used as a symbol for the diopter. See alsoprism diopter.

diraa

a traditional Egyptian unit of distance equal to about 58 centimeters (22.8 inches).

djerib

see jerib.

dk-

an incorrect symbol for the metric prefix deka- (10), sometimes seen in combinations such as **dkg** for the dekagram or **dkm** for the dekameter. The correct symbol is**da-**.

DN

a symbol for "nominal diameter," a size measure for piping, valves, fittings, etc. Nominal diameter is essentially the inside diameter of the piping in millimeters. Industrial standards organizations, such as the American National Standards Institute (ANSI), set standards for pipes and fittings based on DN ratings; these standards specify in detail the size, composition, and strength of each component.

Dobson unit (DU)

a unit used in geophysics to measure the ozone in the atmosphere. One Dobson unit represents the amount of atmospheric ozone that would form a uniform layer 0.01 millimeter (10 micrometers) thick at standard temperature (0 °C) and pressure (1 atmosphere or 1013.25 millibars). The Dobson unit equals 10^{-5} atmo-meter. Under normal conditions, the atmosphere contains about 300 Dobson units of ozone, but this falls to 100 Dobson units or less in the "ozone holes" over the Earth's poles. The unit is named for the British physicist G.M.B. Dobson; in 1920 he invented a spectrometer to measure ozone concentrations from the ground.

dog watch

a unit of time on ships at sea equal to 2 hours, one half the usual length of a watch.

dog year

an informal unit of time equal to 1/7 of a normal, or "human" year. According to folklore, dogs age 7 times faster than humans.

dol

a unit proposed for the measurement of pain. James Hardy, Herbert Wolff, and Helen Goodell, all of Cornell University, proposed the unit based on their studies of pain during the 1940s and 1950s; they defined one dol to equal 2 "just noticeable differences" (jnd's) in pain. However, the unit did not come into widespread use and other methods are now used to assess the level of pain experienced by patients. The name of the unit is from the Latin word for pain, *dolor*.

dollar ($)

a unit used in nuclear engineering to describe the "reactivity" of a nuclear reactor. For a particular reactor, one dollar is the reactivity at which the chain reaction is just self-sustaining. The size of the unit varies with the design of the reactor; a typical size is approximately 10^{-5} = 0.001%. For a discussion of reactivity, see inhour.

donkey power

a somewhat light-hearted metric unit of power equal to 250 watts or about 0.3353 horsepower.

donum, dönüm

see dunum (below).

doppelzentner (Dz)

a name often used in Germany for the decitonne or metric quintal. Since a zentner is 50 kilograms, a doppelzentner or "double" zentner equals 100 kilograms (about 220.462 pounds).

double

a traditional unit of volume for liquor equal to 2 shots. In the U.S., a double equals 2 fluid ounces or about 59.15 milliliters.

double magnum

a large wine bottle holding about 3 liters, 4 times the volume of a regular bottle. A double magnum is also called a **jeroboam**.

doublet

another name for a pair.

double word or doubleword

a unit of information equal to 2 shortwords, 4 bytes or 32 bits. See also word [2].

douzième

a traditional unit of distance used in watchmaking. The word is French for "twelfth," and a douzième is equal to 1/12 Swiss ligne. This is about 188 micrometers (microns) or 7.4 mils.

dozen (doz or dz)

a familiar unit of quantity equal to 12. Division into units of 12 rather than 10 has the advantage that 12 can be evenly divided into halves, thirds, or quarters. For this reason, units of 12 have been common since the earliest civilizations of the Middle East. "Dozen" comes from an old French word *dozaine* related to the Latin word*duodecem*, "twelve." One dozen dozen (that is, 144) is called a gross, and one dozen gross is called a great gross.

dpa

abbreviation for "displacements per atom," a measure of the damage to a crystalline material caused by bombarding the material with energetic particles. Each displacement represents an atom dislodged from its place in the crystal by the radiation.

dpi

a unit used to measure the resolution, or sharpness, of a photograph or video image. The unit, an abbreviation for "dots per inch," remains in use even though individual picture elements are now called pixels rather than dots.

dpm, dps

abbreviations for "decay per minute" and "decay per second," respectively, units used in the measurement of rates of radioactivity. 1 dps is properly called 1 becquerel(Bq). 1 dpm is equal to 1/60 becquerel or 0.45045 picocuries.

drachm

traditional British spelling of dram (see below).

drachma

a traditional unit of weight in Greece and the eastern Mediterranean. The drachma was a Greek coin, and the unit was originally the weight of the coin. In ancient times this was about 4.3 grams, but more recent versions are about 3.2 grams, 49.3 grains, or 0.113 ounce avoirdupois. There is also a traditional Dutch weight unit of the same name, but it is somewhat larger: 3.906 grams, 60.28 grains, or 0.1374 ounce avoirdupois. Compared to a similar English unit, the Greek drachma is about 2.5pennyweight and the Dutch is almost exactly 3 pennyweight.

drachme

a traditional unit of weight in France and Germany, generally between 3.7 and 3.9 grams.

dram (dr) [1]

a unit of weight in the traditional avoirdupois system (see pound [1]), equal to 1/16 ounce or 1/256 pound. One dram equals about 1.7718 gram. The word dram comes from a Latin weight unit, the *dragma*, and derives ultimately from the Greek *drachme*, meaning a handful. The word is usually spelled "drachm" in Britain and "dram" in the United States, but both spellings are pronounced "dram." The avoirdupois dram is sometimes abbreviated **dr. av.** to distinguish it from the apothecaries' dram (next entry).

dram (dr) [2]

a unit of weight in the traditional system of English apothecaries, equal to 60 grains, 3 scruples, 1/8 troy ounce, or approximately 3.8879 gram. See troy weights for additional information. The apothecaries' dram is

sometimes abbreviated **dr. ap.** to distinguish it from the avoirdupois dram. It is equivalent to about 2.1943 avoirdupois drams. There is a similar Italian unit, the **dramma**, equal to 72 grani or roughly 3.5 grams.

dram (dr) [3]

a traditional unit of volume. See fluid dram.

drex

a unit traditionally used in the textile industry to measure the density of a single fiber of yarn. One drex equals a density of one gram per 10 kilometers of length, or 1 microgram per centimeter (μg/cm). Since 1 drex equals 0.1 tex, the unit is now called the **decitex (dtex)** .

drill sizes

traditional drill sizes are numbers 1-80, with larger numbers indicating smaller drills. Number 1 has diameter 0.2280 inch and number 80 has diameter 0.0135 inch. Larger sizes are designated by letters or by specifying the diameter directly in 64ths of an inch. The metric drill size is the diameter in millimeters. EngineersEdge.com has a table showing the traditional sizes and metric equivalents.

drink

a unit measuring the alcohol content of beverages, used in describing the medical effects of alcohol. U.S. physicians generally consider one drink equal to 0.5 U.S. fluid ounces of alcohol; the appropriate metric equivalent would be 15 milliliters. In U.S. fluid units, one drink corresponds to about 4 ounces of wine, 10-12 ounces of beer, or 1.25 ounces of whiskey.

drap

a traditional unit of weight in Scotland, equal to 1/16 Scots ounce or about 1.9 grams. Sometimes spelled **drop**, this unit was the Scottish counterpart of the English dram [1].

drop (gtt) [1]

a unit of volume used in pharmacy. Traditionally the drop was another name for a minim, a unit of volume equal to 1/60 fluid dram or 1/480 fluid ounce (about 0.0616 milliliter in the U.S., 0.0592 milliliter in Britain). Now that prescriptions are written in metric units, the pharmacist's drop is equal to exactly 0.05 milliliter (20 drops/ml). In hospitals, intravenous tubing is used to deliver medication in drops of various sizes ranging from 10 drops/ml to 60 drops/ml. The traditional abbreviation is from the Latin *gutta*, drop. Originally, **gt** was the symbol for a single drop, with **gtt** being the plural.

drop [2]

a informal unit of volume used in recipes. According to some older kitchen references, 24 drops = 1/4 teaspoon; with U.S. definitions this makes the drop equal to 1/576 fluid ounce or about 0.051 milliliter, comparable to the pharmacist's drop (previous entry).

drought severity category (D)

a measure of drought severity developed by the U.S. National Drought Mitigation Center and used widely by other agencies in the U.S. Categories are denoted D0-D5, with higher numbers indicating more severe drought. A table is provided.

drum

a unit of volume sometimes used in the oil trade. The traditional standard drum of oil contains 55 U.S. gallons or about 208.198 liters. One 55-gallon drum equals 1.3095 barrels [2]. In the metric world, drums of 200 liters, 205 liters, and 208 liters are in use as substitutes for the traditional size.

dry pint, dry quart

common names for the U.S. pint and quart units used for dry commodities, used to distinguish these units from the pint and quart used for liquids. The dry units are equal to about 1.163 647 times the corresponding liquid units.

dry ton

see wet ton.

dsp, dssp

symbols for the dessertspoon (2 teaspoons). See "dessertspoon" above.

duet or duo

a traditional unit of quantity equal to 2. The word *duet* is a French version of the Italian *duo*, two.

dunum, dönüm, or donum

a traditional unit of land area in the Middle East and the Balkans. The

unit is of Turkish origin, dönüm being the Turkish spelling. As it is commonly used today in Turkey, Israel, Palestine and in Croatia and other areas of the former Yugoslavia, the dunum is a metric unit equal to 1000 square meters or 0.1 hectare (about 0.2471acre). The traditional size seems to have been around 900 square meters. In Mesopotamia and Arabia, the dunum was a larger unit, traditionally in the range of 2500 to 4000 square meters. In modern Iraq, the dunum is now standardized at 2500 square meters (about 0.6179 acre).

duro, durometer

a measure of the hardness of plastic, rubber, or similar material, made by an instrument called a durometer. These instruments test the material with a steel pin, and the depth of the indentation made by the pin is read by a calibrated spring meter. There are various versions of the durometer, designed for materials of different kinds; to be called durometers, all versions must conform to standards set by standards organizations such as the American Society for Testing and Materials (ASTM). Durometer scales run from 0 to 100, with larger numbers indicating harder material. The different scales are identified by letters, including A, B, C, D, O, DO, and OO. However, since only one type is used for a particular material, the scale designation is often omitted. Typical notations used are "50 duro", "65 durometer A", and "D40 duro".

dwt

abbreviation for deadweight ton (see above); also the traditional symbol for pennyweight.

dyad

a unit of quantity equal to 2. This unit is frequently used in cell biology and biotechnology.

dyne (dyn)

the CGS unit of force. One dyne is the force that accelerates a mass of one gram at the rate of one centimeter per second per second. Expressed in SI units, the dyne equals 10^{-5} newton. This is quite a small force: it equals about 2.248×10^{-6} pound of force (lbf) in the traditional English system. The word dyne comes from the Greek *dynamis*, power.

E

***e* [1]**

a symbol for the electric charge on one electron. Since the charges on other particles in atomic physics are whole-number multiples of this charge, the symbol *e* is often used as a unit of measure. 1 *e* is equal to approximately $1.602\ 176\ 487 \times 10^{-19}$ coulomb, or 160.217 648 7 zeptocoulombs (zC).

***e* [2]**

a mathematical unit used as the base of "natural" logarithms and exponentials. The real number *e* is irrational, which means that its decimal expansion is infinite and non-repeating. To 25 significant digits *e* equals 2.718 281 828 459 045 235 360 287. Of the many properties of this number, the most important is that the rate of change in the function e^x is equal to the value of the function itself: an example of the behavior we call "exponential growth." As a result, the larger the value of this function is, the faster the function grows. The Swiss mathematician Leonard Euler (1707-1783) introduced the symbol *e*, probably because it is the first letter of the word "exponential." Other mathematicians continued to use the letter in his honor. It is sometimes called the Euler number.

earth-rate unit (eru)

a unit of angular velocity equal to 15° per hour (one revolution per day), the rate at which the earth rotates on its axis. This unit is used to measure the drift rates of gyroscopes and various pointing devices in aerospace engineering.

EBC

abbreviation for **European Brewing Commission**, frequently used for a unit of turbidity equal to 4.08 NTU or FNU.

EBHC

a unit of telecommunications traffic density equal to 2 call minutes (120 call seconds) per hour, or 1/30 erlang (see below). EBHC stands for "equated busy-hour call."

eclipse year

a unit of time used in astronomy in the prediction of eclipses. The plane of the moon's orbit around the earth and the plane of the earth's orbit around the sun intersect in a line called the line of nodes. Eclipses of the sun or moon can only occur at times when the moon and sun both lie very close to this line. However, the line of nodes rotates slowly, so comparable appearances of the sun on the line do not fall exactly a year apart. The actual interval between these crossings, the eclipse year, has a length of 346.62 days.

ecm

a unit of electric dipole moment used in physics. The moment of an electric dipole is the product of an electric charge and the distance by which the charge is displaced from the center of charge. The ecm is the product of the charge *e* on an electron and a distance of 1 centimeter (cm). In SI units, 1 ecm = 1.602 178 x 10^{-21}coulomb meter (C·m).

EDR (sq ft)

an abbreviation for Equivalent Direct Radiation, a unit used in the design of hot water heating systems. The measurement is traditionally stated in square feet, representing the area of the radiator surface, but it is actually interpreted as a unit of power,with 1 EDR ft^2 equal to 240 Btu per hour.

EER

an abbreviation for **energy efficiency rating**, a U.S. measure of the efficiency of an air conditioner. The EER is computed as the cooling capacity of the unit (in Btu per hour) divided by the electric power consumed (in watts) at a temperature of 95 °F (35 °C) and under specified test conditions. Typical values are in the range 8-12. The EER is equal to 0.293 071 times the COP under the specified conditions. See also SEER, and **energy factor** (EF, below).

EF

a symbol for energy factor (see below) or for the enhanced Fujita scale for tornado intensity.

effective dose (ED)

a measure used in pharmacology to express the percentage of a population that receives the desired benefit from a dose of the substance being studied. The measurement is usually given as a subscript. For example, the ED_{50} dose is the amount of the substance that benefits 50% of the test population.

eighth

means 1/8, of course; in meteorology the eighth is the unit for measuring the proportion of the sky covered by clouds. See okta.

einstein, Einstein unit (E)

a unit of light energy concentration sometimes used in physical chemistry. One einstein (or Einstein unit) is the energy per mole of photons carried by a beam of monochromatic light. Suppose a beam of light (in vacuum) has frequency ν (in hertz) and wavelength l (in meters). Then one einstein is equal to (3.990 313 x 10^{-10})νor (0.119 627)/l joules per mole (J/mol). The unit is named for the physicist Albert Einstein (1879-1955), who explained how light carries energy in a famous 1905 paper.

el

the Dutch ell, a traditional unit of length equal to about 68-70 centimeters (roughly 27 inches). See the discussion of the ell, below.

electric horsepower

a unit of power, equal to exactly 746 watts (550.221 foot pounds per second), used in the electric industry. This is slightly larger than the ordinary or mechanicalhorsepower of exactly 550 foot pounds per second.

electron (m_e)

the mass of the electron, often used as a unit of mass in particle physics. An electron has a mass of about 9.109 382 x 10^{-31} kilogram, 9.109 382 x 10^{-28} gram, or 0.510 9989 million electronvolts (MeV, see next two entries).

electronvolt (eV) [1]

a unit of work or energy used in physics. One electronvolt is the work required to move an electron through a potential difference of one volt. The size of the electronvolt must be determined experimentally; the currently accepted value (1998) is 160.217 646 2 x 10^{-21} joule, or 1.602 176 462 x 10^{-12} erg. This unit is accepted for use with SI units. The official

spelling is electronvolt (one word) rather than electron volt.

electronvolt (eV) [2]

a unit of mass used in particle physics. Mass and energy are related by Einstein's famous equation, $E = mc^2$. The constant c is the speed of light, 299.79×10^6 m/sec. An energy of 1 electronvolt is therefore equivalent to a mass of about $1.782\,662 \times 10^{-33}$ gram, or about $1.073\,544 \times 10^{-9}$ atomic mass unit. This is such a small unit that most particle masses are measured in MeV or GeV.

ell

a traditional unit of length used primarily for measuring cloth. In the English system, one ell equals 20 nails, 45 inches, or 1.25 yards (exactly 1.143 meters). The word comes from the Latin *ulna*, which originally meant the elbow and is now the name of the bone on the outside of the forearm. The history of the unit is not clear. Some authorities believe the ell was originally a double forearm length, that is, 2 cubits or 36 inches, the same length as a yard. The ell and the yard do seem to be identified in some medieval documents, with *ulna* being used for both, and in Scotland the ell was equal to 37 Scots inches or 37.2 English inches (94.5 centimeters), only slightly longer than the yard. (This Scottish length might also reflect an old practice of cloth merchants in giving an extra inch with each yard, to allow for any irregular cutting at the ends of the piece.) However, the English cloth ell is definitely longer than the yard; it seems to be the distance from the shoulder to the fingers of the opposite hand. This reflects a practice of cloth merchants of holding the cloth at the shoulder with one hand and pulling the piece through with the opposite hand. This cloth ell was used with a similar length in France, where it was called the **aune**. The Dutch el and German elle are a little more than half the English ell; they may represent "arm's-length" units like the Italian braccio, the Russian sadzhen, and the Turkish pik.

elle

a traditional unit of distance in German speaking countries. The elle varied considerably, but it was always shorter than the English ell or French aune. A typical value in northern Germany was exactly 2 fuss (German feet), which would be close to 24 inches or 60 centimeters. In the south, the elle was usually longer, about 2.5 fuss. In Vienna, the elle was eventually standardized at 30.68 inches (77.93 centimeters). Although the German word *Elle* is often translated "yard" in English, this is not a very good equivalent.

em

a printer's unit of relative distance. One em is the height of the type size (in points) being used. If 12 point type is being set, then one em is 12 points, and so on. Seepoint [2].

emu [1]

an abbreviation for "electromagnetic unit." See ab-.

emu [2]

a CGS unit of magnetic dipole moment equal to 4pi micro-oersteds ($1.256\,637 \times 10^{-5}$ Oe). In SI units, one emu equals 0.001 $A{\cdot}m^2$.

emu/cm³ or emu/cc

a CGS unit of magnetization. In SI units, one emu/cm³ can be interpreted either as 4pi/10 milliteslas (1.256 637 mT) as a unit of magnetic polarization or excess magnetic induction, or as 1000 amperes per meter as a unit of magnetic dipole moment per unit volume.

en

a printer's unit of relative distance, equal to 1/2 em. If 12 point type is being set, then one en is 6 points, and so on.

encablure

a traditional French unit of distance corresponding to the English cable. The encablure was equal to 120 brasses or 600 pieds; this is about 194.88 meters or 639.37 English feet. Most navies, including the French, now use a metric cable equal to exactly 200 meters; in French this metric unit is sometimes called the *encablure nouvelle* (new cable).

energy factor (EF)

a measure of the energy efficiency of an appliance. In the U.S., the Department of Energy has defined energy factors for a variety of appliances. For dishwashers, the energy factor is the number of cycles per kilowatt hour of power input. For clothes washers, it is the capacity of the washer in cubic feet divided by the number of kilowatt hours of

power input per washing cycle. For clothes dryers, it is the number of pounds of clothes dried per kilowatt hour of power consumed.

engineer's chain

see chain.

Engler degree

a unit of kinematic viscosity given by readings on an Engler viscometer. The reading is the time (in seconds) required for 200 milliliters of the liquid being tested to flow through the device. The conversion of Engler degrees to absolute units requires an appropriate table, but for liquids having a viscosity of 100 centistokes or more the Engler degree is roughly equal to 7.6 centistokes.

enhanced Fujita scale (EF)

the revised Fujita scale for estimating the strength of tornados, implemented by the U.S. National Weather Service in 2007.

ennead

a unit of quantity equal to 9, coined from the Greek word for nine, *ennea*.

enzyme unit (U or EU)

a unit used by biochemists to measure the activity of enzymes, which are proteins produced by living cells to cause or facilitate necessary chemical reactions within the cell. One enzyme unit is the quantity of enzyme needed to cause a reaction to process 1 micromole of substance per minute under specified conditions. Thus, one enzyme unit has a catalytic activity of 1/60 microkatal (μkt) or 16.667 nanokatals (nkt).

eon

alternate spelling for aeon, a unit of time equal to 1 billion years.

Eotvos unit (E)

a unit used in geophysics to measure the change in the acceleration of gravity with horizontal distance. One Eotvos unit equals 10^{-9} Gal per centimeter or 10^{-4} Gal per kilometer. In proper SI terms, the Eotvos unit equals 10^{-9} per second squared (s^{-2}). The unit honors the Hungarian physicist Roland von Eötvös (1848-1919).

ephah

a ancient unit of volume for grains and dry commodities, used in the Bible. The ephah is believed to equal about 40.32 liters or 1.4239 cubic feet. This is equivalent to about 1.144 U.S. bushel.

epoch [1]

a measure of time used in astronomy. In an epoch system, times are specified as years and fractions of years (such as epoch 1998.5). To set a starting point for the system, a specific epoch time must be fixed as a particular clock time of a particular date. In 1984, the International Astronomical Union agreed that epoch times should be fixed by requiring that epoch 2000.0 equals 12 hours Universal Time of the day 2000 January 1. Other epoch conventions were used in the past. See alsoJulian epoch. The name comes from a Greek word *epoche* meaning a stopping point or fixed point.

epoch [2]

a unit of time equal to 19 years, used in predictions of the tides. In this use, an epoch is another name for a Metonic cycle. All possible alignments of the sun and moon occur in this 19-year cycle, so tidal heights and other tidal phenomena are averaged over this period.

equivalent or equivalent weight (Eq)

a unit of relative amount of substance used in chemistry. One equivalent weight of an element, compound, or ion is the weight in grams of that substance which would react with or replace one gram of hydrogen. Since one gram of hydrogen is very nearly equal to one mole and since hydrogen has one electron free to react with other substances, 1 Eq of a substance is effectively equal to one mole divided by the valence of the substance (the number of electrons the substance would engage in participating in the reaction). In practice, this is a large unit and measurements are more likely to be in milliequivalents (mEq or meq).

erg

the unit of work or energy in the CGS system, equal to the work done by a force of one dyne acting through a distance of one centimeter. Equivalently, one erg is the kinetic energy of a mass of 2 grams moving at a velocity of 1 cm/sec. This is equal to 0.1 microjoule, or about 7.375 x 10^{-8} foot-pound. The name of the unit is from the Greek word *ergon*, work. There is no symbol; the word is spelled out in full. Adding prefixes is a problem: 1000 ergs is usually called a kiloerg, but one million ergs is

a megalerg, the "l" being added to ease pronunciation.

erlang (E)

a measure of telecommunications traffic density. The erlang is a dimensionless "unit" representing a traffic density of one call-second per second (or one call-hour per hour, etc.). The erlang is sometimes divided into 36 unit calls or 30 EBHC. Also called the traffic unit (TU), the erlang honors A. K. Erlang (1878-1929), a Danish mathematician who studied the mathematics of telephone networks.

estadio

a traditional unit of distance in Spain and Portugal. The estadio, like the stade and the English furlong, is equal to 1/8 mile. The Spanish estadio is equal to 1/8 milla or 625 pies; this is about 571 feet or 174 meters. The Portuguese unit is 1/8 milha, which is much longer: about 856 feet or 261 meters.

esu

an abbreviation for "electrostatic unit." See stat-.

ett- or etto- (h-)

Italian spelling for the metric prefix hecto- (100). The hectare, for example, is **ettaro** in Italian. The International System allows national variations in spelling of the names of units, but not in the symbols used for them; thus the symbol for etto- is h-.

etto (hg)

an informal Italian name for the hectogram, a unit of mass equal to 100 grams or about 3.5274 ounces.

EU

a symbol sometimes used for the enzyme unit (see above).

exa- (E-)

a metric prefix denoting 10^{18} (one quintillion in U.S. nomenclature). The Latin and Greek prefix ex- means "out of," and is often used to indicate "a long way," as in the words "expanse" or "extreme." In addition, the prefix suggests the Greek *hexa*, meaning 6, this being the prefix for 1000^6.

exajoule (EJ)

a metric unit of energy. One exajoule equals 947.817 (U.S.) trillion Btu, 277.7778 petawatt hours, or about 9480 megatherms. The unit is often used in discussing global energy production, which is measured in hundreds of exajoules per year.

exameter (Em)

a metric unit of distance equal to 10^{15} kilometers. This is equivalent to about 621.371 trillion miles, 105.7 light years, or 32.408 parsecs. One exameter is approximately the distance from the earth to the Hyades star cluster in Taurus.

exbi- (Ei-)

a binary prefix meaning 2^{60} = 1 152 921 504 606 846 976. This prefix, adopted by the International Electrotechnical Commission in 1998, replaces exa- for binary applications in computer science. The prefix is a contraction of "exabinary."

exposure value (EV)

a unit used in photography to describe relative exposure. EV 0 is assigned to a specific combination of exposure time and lens aperture, such as 1 second at f/1. The difference between two exposure values is equal to the number of stops separating the two exposure settings. Different combinations of exposure time and lens aperture can have the same exposure value; the unit was invented to simplify the relationship. Regardless of camera settings, EV 6 is one stop "faster" than EV 5, that is, an EV 6 setting records an image with half as much light as an EV 5 setting.

eyesight

a term often used with a Snellen fraction in phrases such as "20/20 eyesight."

F

f or f/

see f ratio, below.

F

see farad or Fujita-Pearson scale, below.

face cord

a unit of volume for firewood. See rick.

faden
an alternate name for the klafter, a German unit of distance.
faggot
a traditional unit of volume for firewood. A faggot was 3 feet in length and 2 feet in circumference; this is a volume of about 0.955 cubic feet or 27 liters. There are about 134 faggots in a cord.
Fahrenheit
see degree Fahrenheit.
fall [1]
a traditional unit of distance equal to 6 ells. The fall was used in land measurement somewhat like the rod [1]. Measurements in rods were often made with an actual wood pole, while measurements in falls were often made with a rope 6 ells long. The distance falling under the rope was called a fall. The fall was used mostly in Scotland, where its traditional length was 6 Scots ells or about 18.6 English feet (5.67 meters). The **Scots furlong** was equal to 40 falls (226.8 meters) rather than 40 rods, and the **Scots mile** was equal to 320 falls (5952 English feet, 1.127 English mile or 1814.2 meters). After the unification of Scotland and England the fall was reinterpreted to equal 6 English ells (22.5 feet or 6.858 meters).
fall [2]
a traditional unit of area equal to one square fall [1]. In the traditional Scots system of measurement, a fall of land equals about 346 square feet or 32.15 square meters. A traditional **Scots acre** was equal to 160 falls or about 6150 square English yards (1.27 English acres or 0.514 hectare). In the English system a fall of land is 506.25 square feet, 56.25 square yards, or about 47.03 square meters.
fanega [1]
a Spanish unit of volume, mostly for dry goods. The word is derived from an Arabic word *faniqa* for a large sack. The fanega equals 12 almudes or 48 cuartillos; this is about 55.50 liters or 1.960 cubic feet (1.575 U.S. bushels). Very similar units were used in Portugal and in most of the Latin American countries. In Chile and Argentina, however, a much larger fanega, roughly 2.5 U.S. bushels, was customary.

fanega [2] or fanegada
a traditional unit of land area in Spain and in some Latin American countries. The unit originated as the amount of land that could be planted with a fanega [1] of seed. It varied considerably from one area to another. In 1801 it was standardized in Spain as the area of a square 96 varas (80.2 meters) on a side; this comes to 0.643hectare (1.59 acres). After the introduction of the metric system it became customary to refer to an area 80 meters square as a fanega. This unit is not legal but is still used informally in some parts of Spain. The Central American manzana is a counterpart of this traditional Spanish unit.
farad (F)
the SI unit of electric capacitance. Very early in the study of electricity scientists discovered that a pair of conductors separated by an insulator can store a much larger charge than an isolated conductor can store. The better the insulator, the larger the charge that the conductors can hold. This property of a circuit is called capacitance, and it is measured in farads. One farad is defined as the ability to store one coulomb of charge per volt of potential difference between the two conductors. This is a natural definition, but the unit it defines is very large. In practical circuits, capacitance is often measured in microfarads, nanofarads, or sometimes even in picofarads (10^{-12} farad, or trillionths of a farad). The unit is named for the British physicist Michael Faraday (1791-1867), who was known for his work in electricity and electrochemistry.
faraday (Fd)
a unit of electric charge. In a process called electrolysis, chemists separate the components of a dissolved chemical compound by passing an electric current through the compound. The components are deposited at the electrodes, where the current enters or leaves the solution. The British electrochemist and physicist Michael Faraday (1791-1867) determined that the same amount of charge is needed to deposit one mole of any element or ion of valence one (meaning that each molecule of the ion has either one too many or one too few electrons). This amount of charge, equal to about 96.4853 kilocoulombs or

26.8015 ampere hours, became known as Faraday's constant. Later, it was adopted as a convenient unit for measuring the charges used in electrolysis. One faraday is equal to the product of Avogadro's number (see mole) and the charge (1 *e*) on a single electron.

fardel

an old English word meaning a fourth part, used sometimes as a unit of land area equal to 1/4 virgate, 1/2 nook, or about 8-10 acres.

farsakh, farasang

Arabic and Persian names, respectively, for the unit classically known as the parasang.

farthing

an old English word for 1/4, later used as the name of a coin equal in value to 1/4 penny.

farthingdale [1]

an older name for the rood [2], a unit of land area equal to 1/4 acre (0.1012 hectare). "Farthingdale," like "fardel," means a fourth part.

farthingdale [2]

a fardel (see above).

fathom (fth or fath)

a traditional unit of distance equal to 2 yards or 6 feet (approximately 1.829 meters). The word comes from the Old English *fæthm*, meaning "outstretched arms", because a fathom is the distance between a man's outstretched fingertips. This is a generic unit that has been used in many cultures since ancient times. Other versions include the Spanish braza, the French brasse and toise, the German klafter, the Danish **favn** (6.18 feet or 1.88 meters), the Swedish **famn** (5.84 feet or 1.78 meters) and the Japanese ken. In England, the fathom was a common unit during Saxon times, and it continued to be used for many purposes through the medieval era. In fact, the length of the foot may have been defined, early in the twelfth century, specifically to assure that 1 foot = exactly 1/6 fathom. Today the fathom is used almost exclusively at sea, measuring water depth, the length of ships' cables, etc.

fat half, fat quarter

terms used in fabric retailing to indicate that an order is cut only half the width of the bolt. For example, if a bolt is 44 inches wide, a yard of fabric is a piece one yard long and 44 inches wide, that is, 36 inches by 44 inches. An ordinary half yard of the fabric would be 18 inches by 44 inches. To cut a fat half, a full yard (36 x 44) is cut in half parallel to the edges of the bolt, that is, a fat half is 36 inches by 22 inches (1 yard by half the width of the bolt, in general). Similarly, a fat quarter is 1/2 yard by half the width of the bolt (18 inches by 22 inches, in our example).

fatt

a traditional unit of volume for grain, generally equal to 9 bushels or 1/4 chalder. This would be about 317 liters based on the traditional grain bushel now used in the U.S. or about 327 liters based on the British Imperial bushel.

FAU

abbreviation for **formazin attenuation unit**, a unit of water turbidity. This unit is used to express turbidity measured by a nephelometer that measures directly the fraction of light transmitted through a water sample as compared to the fraction transmitted through a standard preparation of formazin. The procedure is specified by standard ISO 7027 of the International Organization for Standardization. See NTU for additional information on turbidity.

fbm

a symbol sometimes used for the board foot. The "bm" stands for "board measure."

FCC unit

a U.S. measure of purity and effectiveness for chemical substances added to foods. FCC stands for Food Chemical Codex, a code of standards prepared by the U.S. Institute of Medicine for the U.S. Food and Drug Administration. Perhaps most familiar to consumers is the FCC unit for the enzyme lactase, taken by those who are lactose intolerant. There is no definite conversion between FCC units and milligrams, because different manufacturers prepare their products in different ways. Instead, FCC units provide a way to judge the relative effectiveness of different preparations, no matter what their weights.

feddan
an Egyptian unit of land area, formerly used throughout the Middle East and North Africa. The feddan equals about 0.42 hectare or 1.038 acre.
femto- (f-)
a metric prefix standing for 10^{-15} (one quadrillionth). The prefix was coined from *femten*, the word for fifteen in Danish and Norwegian. This was an attractive idea because it preserved the established symbol for 10^{-15} meter (see next entry).
fermi (fm or f)
a metric unit of distance formerly used in atomic physics. One fermi equals 10^{-15} meter, or 1 **femtometer**. The unit is named for Enrico Fermi (1901-1954), the Italian-American physicist who built the first nuclear reactor. There was a need for this unit before the metric prefixes for very small quantities were defined; now distances formerly measured in fermis are stated in femtometers instead.
FEU
a unit of cargo capacity, especially for container ships. These ships carry cargo in standard metal boxes, called containers, that can be transferred easily to trains or trucks. FEU is an abbreviation for "forty-foot equivalent unit." One FEU represents the cargo capacity of a standard container 40 feet long, 8 feet wide, and (usually) a little over 8 feet high. One FEU equals roughly 25 register tons (see ton [3]) or 72 cubic meters.
fibrin unit (FU)
a unit of potency for nattokinase, an enzyme that reduces the viscosity of blood and reduces its tendency to clot. The enzyme was discovered in natto, a traditional cheese-like Japanese food made from a fermented soybean mash. The unit is defined in terms of a specific test of a preparation's ability to dissolve fibrin, the protein found in clots; there is no standard equivalence to millograms.
field box
a unit of volume in the U.S. citrus fruit industry, equal to 10 boxes or 16 bushels (0.5638 cubic meter).
fifth [1]

a traditional U.S. unit of liquid volume equal to 4/5 quart, which is the same as 1/5 gallon. The fifth contains exactly 46.2 cubic inches, or about 757.084 milliliters. This unit is an American version of the traditional bottle.
fifth [2]
a unit used in music to describe the ratio in frequency between notes. Two notes differ by a fifth if the higher note has frequency exactly 3/2 times the frequency of the lower one. On the standard 12-tone scale, the perfect fifth is very closely approximated as 7 half steps, corresponding to a frequency ratio of $2^{7/12} = 1.4983$.
fillette
a half bottle of champagne (375 milliliters).
fineness (fine)
a unit of proportion equal to 1/1000. This unit is used to express the purity of alloys of gold or other precious metals. A statement that a gold bar is "999 fine" means that the bar contains at most 0.1% other metals. See also per mill.
finger [1]
a traditional unit of distance equal to 2 nails or 4.5 inches (11.43 centimeters). This unit represents the length of the middle finger, from the tip to the joint where the finger is attached to the hand.
finger [2]
a name for the digit, a unit of distance equal to 3/4 inch (19.05 mm). The finger-width was a common unit of measurement in Anglo-Saxon England. After the 12-inch English foot became established, the finger survived as an informal measure.
Finsen unit (FU)
a unit formerly used in medicine to measure the intensity of the ultraviolet light used in various medical treatments. Ultraviolet radiation of the standard wavelength 296.7 nanometers has intensity 1 Finsen unit if its energy density is 10^5 watts per square meter. The unit honors the Danish physician Niels Finsen (1860-1904), who received the Nobel prize for medicine in 1903 for his research on the use of light in the treatment of various diseases.

firkin (fir) [1]
a traditional unit of volume equal to 1/4 barrel or 1/2 kilderkin. Since barrels are of various sizes, the capacity of a firkin varies. Based on the standard U.S. barrel of 31.5 gallons, a firkin would equal 7.875 gallons, 1.05 cubic feet, or about 29.81 liters. Traditional British barrels and firkins are larger; in the Imperial system a firkin holds 1.445 cubic feet or 40.91 liters. The unit is of Dutch origin, and its name is based on the Dutch word *vier* for four.

firkin (fir) [2]
a traditional unit of weight for butter and soap, equal to 4 stone or 56 pounds (about 25.40 kilograms).

firlot
a traditional Scottish unit of volume equal to 4 Scots pecks. This is about 36.3 liters for wheat, peas, or beans, or about 48.6 liters for oats or barley. The firlot corresponds closely to the U.S. and British bushel.

fiscal year
a unit of one year used for budgeting or accounting. A fiscal year has the same length as an ordinary year, but its starting date may be different. In the U.S., for example, the federal government's fiscal year starts on October 1. Generally, fiscal year *n* ends in ordinary year *n*, so the U.S. federal fiscal year 2005 begins October 1, 2004 and ends September 30, 2005.

fist [1]
an informal unit of distance equal approximately to the hand (10 centimeters or 4 inches). The unit represents the width of a clenched fist.

fist [2]
an informal unit of angle measure equal to 10°, which is the approximate angle subtended by a clenched fist held at arm's length (this works for both adults and children). This unit is used by amateur astronomers to estimate angular distances in the sky.

fistmele
a traditional unit of distance equal to the width of a clenched fist with the thumb extended. This is about 6.5 inches or 16.5 centimeters, making the fistmele the same as the Saxon shaftment. The unit is used in archery, where it measures the brace height of a bow (the distance from the center of the grip to the bowstring) and also in kayaking, where it measures various critical dimensions of the boat. In both cases, the intention is that if the fist of the actual archer or kayaker is used in establishing the unit, then the bow or the boat will fit that person precisely.

FIT
an acronym for "Failure In Time" or "Failure unIT," a unit used to express the expected failure rates of semiconductors or other electronic components. One FIT is equal to a rate of one failure per U.S. billion (10^9) hours, that is, 1 FIT = 10^{-9}/h. Since 10^9 hours equals about 114 thousand years, these failure rates are estimated from accelerated test procedures using various statistical techniques.

flagon
a traditional unit of liquid volume, generally equal to the wine (or U.S. liquid) gallon (about 3.785 liters). A flagon is a large, narrow-necked pitcher or bottle.

flask [1]
an old name for a bottle, now specialized to mean a narrow, flattened container for alcoholic beverages. Such flasks come in various sizes, often holding around 6 U.S. fluid ounces or 180 milliliters. The word is very old, appearing as *flaska* in Old High German and as *flascon* in Latin.

flask [2]
a commercial unit of weight formerly used to measure liquid mercury (or quicksilver, as it was called). The flask was equal to 76.5 pounds avoirdupois, which is equivalent to almost exactly 34.7 kilograms.

flat
an informal unit of angle measure equal to 1/6 turn or 60°. Hex nuts have 6 flat sides; to turn the nut "one flat" is to turn it 1/6 revolution.

flick (f)
a unit of spectral radiance used in optical and communications engineering. Radiance is the power radiated per unit solid angle per unit of emitting surface. Radiance varies with wavelength, and to measure this variation spectral radiance is defined is the radiance per unit of

wavelength span. The flick is a short name for the spectral radiance of 1 watt per steradian per square centimeter of surface per micrometer of span in wavelength. This is mathematically equivalent to 10^{10} watts per steradian per cubic meter. In practice, spectral radiance is typically in microflicks.

flock

an old English unit of quantity equal to 2 score or 40.

floor

another name for a story as a unit of height for buildings. In Britain, the floor above the ground floor is usually called the first floor, so in a building with four stories (or storeys) the top floor is called the third floor. In the U.S., the numbering of floors is most often the same as the numbering of stories.

flops

a unit of computing power equal to one floating point operation per second. In computer science, there is a distinction between fixed point numbers (which have a fixed number of decimal places) and floating point numbers (which are stored with as many digits as the computer's design allows). A floating point operation is an addition or subtraction of two floating point numbers. The power of supercomputers is being measured in teraflops (Tflops): trillions of floating point operations per second.

fluid dram or fluidram (fl dr)

a unit of volume in the traditional apothecary system, equal to 1/8 fluid ounce. This unit is usually called the fluid dram or fluidram to avoid confusion with the weightdram. The U. S. fluid dram contains about 0.225 586 cubic inches or 3.696 691 milliliters. In the British Imperial system, the fluid dram is about 0.216 734 cubic inches or 3.551 633 milliliters.

fluid ounce (fl oz)

a traditional unit of liquid volume, called the fluid ounce to avoid confusion with the weight ounce. In the U. S. customary system there are 16 fluid ounces in a pint, so each fluid ounce represents 1.804 687 cubic inches or 29.573 531 milliliters. In the British Imperial system there are 20 fluid ounces in an Imperial pint, so each fluid ounce represents about 1.733 871 cubic inches or 28.413 063 milliliters. A U.S. fluid ounce of water weighs just a bit more than one ounce avoirdupois; a British fluid ounce weighs exactly one ounce at a specified temperature and pressure.

fluid scruple

a traditional British unit of liquid volume equal to 1/3 fluidram or about 1.1839 milliliters.

flux unit (fu)

a former name for the jansky, a unit used in astronomy to measure the strength of a radio signal received from an object in the sky.

FNU

abbreviation for **formazin nephelometric unit**, a unit of water turbidity equivalent to the NTU (nephelometric turbidity unit) used in the U.S. The symbol FNU, specified by the International Organization for Standardization in its standard ISO 7027, is widely used outside the U.S. See NTU.

f number

see f ratio, below.

fod

the traditional Danish foot, equal to about 12.365 inches or 31.41 centimeters.

foe

an informal unit of energy used by astrophysicists to express the energy released by supernovas. One foe equals 10^{51} ergs or 10^{44} joules. This is comparable to the amount of energy released by a normal star over its entire lifetime, but in a supernova a foe of energy can be released in a matter of seconds. The word "foe" is an acronym for [10 to the] fifty-one ergs.

folio

in traditional legal practice, a unit of quantity for the words in a legal document. In the U.S., a folio is 100 words; in Britain it is 72 or 90 words, depending on the type of document. In the days before mechanical copying, clerks were paid by the folio to copy legal documents. The word is from the Latin *folium*, leaf, and originally

referred to a page; apparently the unit once represented the number of words on a page.

food calorie

the large or kilogram Calorie; see calorie [2].

foot (ft or ‘)

a traditional unit of distance. Almost every culture has used the human foot as a unit of measurement. The **natural foot** (*pes naturalis* in Latin), an ancient unit based on the length of actual feet, is about 25 centimeters (9.8 inches). This unit was replaced in early civilizations of the Middle East by a longer foot, roughly 30 centimeters or the size of the modern unit, because this longer length was conveniently expressed in terms of other natural units:

1 foot = 3 hands = 4 palms = 12 inches (thumb widths) = 16 digits (finger widths)

This unit was used in both Greece and Rome; the Greek foot is estimated at 30.8 centimeters (12.1 inches) and the Roman foot at 29.6 centimeters (11.7 inches). In northern Europe, however, there was a competing unit known in Latin as the *pes manualis* or **manual foot**. This unit was equal to 2 shaftments, and it was measured “by hand,” grasping a rod with both hands, thumbs extended and touching. The manual foot is estimated at 33.3 centimeters (13.1 inches).

In England, the Roman foot was replaced after the fall of Rome by the natural foot and the Saxon shaftment (16.5 centimeters). The modern foot (1/3 yard or about 30.5 centimeters) did not appear until after the Norman conquest of 1066. It may be an innovation of Henry I, who reigned from 1100 to 1135. Later in the 1100s a foot of modern length, the “foot of St. Paul’s,” was inscribed on the base of a column of St. Paul’s Church in London, so that everyone could see the length of this new foot. From 1300, at least, to the present day there appears be little or no change in the length of the foot.

Late in the nineteenth century, after both Britain and the U.S. signed the Treaty of the Meter, the foot was officially defined in terms of the new metric standards. In the U.S., the Metric Act of 1866 defined the foot to equal exactly 1200/3937 meter, or about 30.480 060 96 centimeters.

This unit, still used for geodetic surveying in the United States, is now called the **survey foot**. In 1959, the U.S. National Bureau of Standards redefined the foot to equal exactly 30.48 centimeters (exactly 0.999 998 survey foot). This definition was also adopted in Britain by the Weights and Measures Act of 1963, so the foot of 30.48 centimeters is now called the**international foot**.

Elsewhere on this page are entries for the Danish **fod**, Swedish **fot**, and German **fuß (fuss)**. Other foot units include the French pied, Italian and Spanish pie, and Hungarian láb.

football field [1]

a common informal unit of distance in the United States and Canada. Americans aren’t quite agreed as to whether the unit is exactly 100 yards (91.44 meters), the distance between the goal lines on an American football field, or 120 yards (109.728 meters), the distance including the two end zones. Canadian football fields are 110 yards (100.58 meters) long between the goal lines and 150 yards (137.16 meters) including the end zones. As a distance equal to the length of an athletic field, this unit is analogous to the classical stade or stadium, although the stade is roughly twice as long as a football field.

football field [2]

an informal unit of area in the United States and Canada. Including the end zones, an American football field represents an area of about 1.3223 acres or 0.535 hectarewhile the Canadian football field has an area of 2.0145 acres or 0.815 hectare.

footcandle (fc or ftc)

a traditional unit of illuminance or illumination, defined as the illuminance received by a surface at a distance of one foot from a source of intensity one international candle. The “international candle” was the predecessor of the candela as the standard unit of light intensity. Illuminance is now measured in lux; one footcandle equals 10.764 lux or about 1.0764 milliphot. The unit is also spelled foot-candle or foot candle.

footlambert (fL, fl or ftL)

a unit of luminance, the brightness of a surface. The footlambert

describes the luminance of a surface that emits or reflects one lumen per square foot; it is the luminance of a perfectly reflecting surface under an illumination of one footcandle. One footlambert equals 3.426 259 candelas per square meter or about 1.0764 millilambert (mLb). The unit is also spelled foot-lambert or foot lambert. The one-word spelling and symbol **fL** have been endorsed by the Illuminating Engineering Society of North America (IES) and by the Institute of Electrical and Electronics Engineers (IEEE). (Of course, fL is also the SI symbol for the femtoliter.)

foot of head (ft hd)
a traditional unit of water pressure used in plumbing and hydraulics. "Head" is short for "headwaters"; it refers to the depth of the water upstream from the point at which the pressure is measured. One foot of head is equivalent to a pressure of 0.433 lb/in^2, 2.989 kilopascals (kPa), 29.89 millibars (mb), or 0.882 inches of mercury (in Hg).

foot per minute (ft/min or fpm)
a traditional unit of velocity or flow rate. One foot per minute equals exactly 30.48 cm/min, 5.08 mm/s, or 0.018 288 miles per hour.

foot per second (ft/s or ft/sec or fps)
a traditional unit of velocity. One foot per second equals exactly 15/22 mile per hour or exactly 1.097 28 kilometers per hour.

foot pound (ft·lbf or ft·lb) [**1**]
a traditional unit of work, equal to the work done by a force of one pound acting through a distance of one foot. This is equivalent to approximately 1.355 818 joule, 1.285 07 x 10^{-3} Btu, or 0.323 832 (small) calorie.

foot pound (ft·lbf or ft·lb) [**2**]
another name for the traditional unit of torque also known as the pound foot.

foot poundal
a unit of work, equal to the work done by a force of one poundal acting through a distance of one foot. One foot poundal is equivalent to about 0.031 081 foot pound, or 0.042 140 joule.

foot pound per second (ft·lbf/s or ft·lb/s)
a traditional unit of power equal to about 1.355 818 watt or 0.001 818 horsepower.

foot ton (ft·tn)
a traditional unit of work, equal to the work done by a force of one ton acting through a distance of one foot. In the U.S. system, a foot ton equals 2000 foot pounds (2.7116 kilojoules or 2.570 Btu); in the British Imperial system a foot ton equals 2240 foot pounds (3.0370 kilojoules or 2.8786 Btu).

force
a measurement of wind velocity based on the Beaufort scale.

forpet
Scottish for a 1/4 part, generally meaning 1/4 peck; thus the forpet is another name for a lippie.

fortnight
a traditional English unit of time equal to 2 weeks or 14 days. The word, a contraction of "fourteen nights," has been used since at least the 1100s.

fot
the traditional Swedish foot, also called the **Stockholm foot**, equal to 11.689 inches or 29.69 centimeters. The fot was divided into 2 **kvarter** or into 12 **tum**.

fother
a traditional English unit of weight for lead. The fother, equal to 30 fotmals (next entry), was always a little smaller than a (long) ton. The original version seems to have been equivalent to 2160 avoirdupois pounds, and the version still being used in the nineteenth century was equal to 19.5 hundredweight or 2184 pounds.

fotmal
a traditional English unit of weight for lead. In medieval England the fotmal was equal to 70 "mercantile" pounds, which is equivalent to 72 avoirdupois pounds.

fourth
a unit used in music to describe the ratio in frequency between notes. Two notes differ by a fourth if the higher note has frequency exactly 4/3 times the frequency of the lower one. On the standard 12-tone scale, the

perfect fourth is very closely approximated as 5 half steps, corresponding to a frequency ratio of $2^{5/12} = 1.3348$.

fpm

a common abbreviation for foot per minute (ft/min), a traditional unit of flow (see above).

fps

a common abbreviation for foot per second (ft/s or ft/sec), a traditional unit of speed or flow, or for frames per second, a unit used in video processing.

frail

a kind of basket, sometimes used as a commercial unit of weight for fruit. Depending on the item, a frail could equal anywhere from 32 to 75 pounds (15-34 kilograms). In the nineteenth century a frail of raisins was often taken to equal 50 pounds (22.68 kilograms).

f ratio or f number or f stop (f/ or f)

a measure of the light-gathering power of the lenses in cameras and telescopes. The f ratio, for example "f/4" or "f4," is the aperture of the lens (the effective diameter of the lens, which may be reduced or "stopped down" for the exposure; see also stop) expressed as a fraction of the focal length of the lens (the distance from the lens to the point where light is focused). Thus "f/4" indicates that the aperture is 1/4 the focal length. In cameras the f ratio is proportional to the square root of the exposure time, so an f/8 setting requires a four times ($(8/4)^2$) longer exposure than an f/4 setting. Because of this connection with exposure times, the f ratio is often said to express the "speed" of a lens.

franklin (Fr)

a CGS unit of electric charge equal to 3.3356×10^{-10} coulombs or 1 statcoulomb. An electrostatic charge of one franklin exerts a force of one dyne on an equal charge at a distance of one centimeter. The unit honors Benjamin Franklin (1706-1790), one of the leaders of the American Revolution, who was also an early investigator of electricity.

freight ton

originally a unit of volume equal to 40 cubic feet; see ton [5]. More recently, another name for the revenue ton.

French (Fg or Ch)

a unit of distance used for measuring the diameters of small tubes such as catheters, fiber optic bundles, etc. One French is equal to 1/3 millimeter (about 13.123mils). The name and the symbol Ch refer to the **Charrière gauge** scale, which is often called the French scale.

frigorie

a unit of refrigeration formerly used in Europe, equal to 1 (kilogram) Calorie per hour (4.1868 kilojoules per hour, or 3.9683 Btu per hour). The name was coined from the calorie by replacing the Latin *calor*, for heat, with *frigor*, for cold.

f stop

see f ratio, above.

fsw

symbol for "feet of seawater," a conventional unit of pressure. 1 fsw = 0.3048 meter of seawater (msw).

FTE

abbreviation for "full time equivalent," a unit of the rate of work equivalent to that performed by a employee who holds a regular appointment. In the U.S., the FTE is generally equal to 40 hours per week. The symbol FTE is also used for the amount of work performed at this rate over a set period of time, such as a month (170 hours) or a year (2080 hours).

fuder

a traditional German unit of liquid volume. A "fuder" is a cartload. In most of the German states the traditional fuder held about 9 hectoliters (roughly 238 U.S. gallons), making the fuder about the same size as the British tun or the French wine tonneau. In the Mosel wine region of Germany, a fuder is now a metric unit equal to 10 hectoliters (1 cubic meter, or 264.17 U.S. gallons). In Austria, the traditional fuder was equal to 18.11 hectoliters (478.42 U.S. gallons), twice the size of the German unit. In Belgium today, the fuder (or foudre) is a metric unit equal to 30 hectoliters (792.52 U.S. gallons).

Fujita scale (EF)

an empirical scale for estimating the wind speed of a tornado from

the damage it causes. The scale, as developed by the American meteorologists Theodore Fujita and Allen Pearson, ranged from F0 to F5. In 2007, the U.S. National Weather Service began using a revised version called the EF (Enhanced Fujita) scale; the designations in the new scale are EF0 to EF5.

full step

see step [2].

funt

a traditional Russian unit of weight or mass corresponding the German pfund (which is pronounced "funt"). The funt is equal to about 0.9028 pound avoirdupois or 409.5 grams. The plural is **funte**.

furlong (fur)

a traditional unit of distance. Long before the Norman Conquest in 1066, Saxon farmers in England were measuring distance in rods and furlongs and areas in acres. The word "furlong", from the Old English *fuhrlang*, means "the length of a furrow"; it represents the distance a team of oxen could plow without needing a rest. A furlong equals 40 rods [1], which is exactly 10 chains, 220 yards, 660 feet, or 1/8 mile. One furlong is exactly 201.168 meters, so a 200-meter dash covers a distance very close to a furlong. The length of horse races is often stated in furlongs.

fuß or fuss

the German foot (see foot, above). The length of the fuß varied somewhat; the Viennese version was equal to 12.444 inches or 31.608 centimeters, while the *Rheinfuss* (Rhine foot), used in much of western and northern Germany, was equal to 12.357 inches or 31.387 centimeters. In Bavaria a shorter fuß of about 29 centimeters was used. There's no change in the plural.

G

g

a symbol for the average acceleration produced by gravity at the Earth's surface (sea level). The actual acceleration of gravity varies from place to place, depending on latitude, altitude, and local geology. The symbol *g* is often used informally as a unit of acceleration. By agreement among physicists, the **standard acceleration of gravity** g_n is defined to be exactly 9.806 65 meters per second per second (m/s^2), or about 32.174 05 feet per second per second. At latitude *p*, a conventional value of the acceleration of gravity at sea level is given by the **International Gravity Formula**,

$g(p)=9.7803267714(1+0.00193185138639\sin^2(p))/\sqrt{(1-0.0069437999013\sin^2(p))}$. The variation, caused by the oblateness of the Earth and the accleration we experience due to the rotation of the Earth, is about half a percent, from 9.780 327 m/s^2 at the Equator to 9.833 421 m/s^2 at the poles.

The symbol *g* was used as a unit first in aeronautical and space engineering, where it is important to limit the accelerations experienced by the crew members of aircraft and spaceships: the "*g* forces," as they are called. This use became familiar through the space programs, and now a variety of accelerations are measured ing's. The names **gee** and **grav** is also used for this unit. Note that g is also the symbol for the gram.

G [1]

informal abbreviation in computer science for 2^{30} = 1 073 741 824. See also giga- [2] and gibi-.

G [2]

a symbol for grand, a slang term for 1000.

Ga

symbol for one billion (10^9) years. The *a* stands for the Latin *annus*, year.

gage

alternate spelling for gauge (see below).

galactic year

the unit of time in which the Solar System makes one revolution around the center of the Milky Way galaxy. The galactic year is estimated to be about 225 million ordinary years. The age of the Solar System is about 20 galactic years.

galileo (Gal or gal)

the CGS unit of acceleration. One galileo is an acceleration of 1

centimeter per second per second (cm/s^2). This unit is used by geologists, who make careful measurements of local variations in the acceleration of gravity in order to draw conclusions about the geologic structures underlying an area. These variations are typically measured in milligals (mGal). One Gal is approximately 0.001 019 7 *g*, where *g* is the acceleration of gravity, so a milligal is a very small acceleration, about 10^{-6} *g*. The name of the unit honors the Italian astronomer and natural philosopher Galileo Galilei (1564-1642), who proved that all objects at the Earth's surface experience the same gravitational acceleration. To avoid confusion with the symbol for the gallon, and to conform to the usual metric style, the symbol for this unit should be Gal rather than gal.

gallon (gal) [**1**]
a traditional unit of liquid volume, derived from the Roman *galeta*, which originally meant a pailful. Gallons of various sizes have been used in Europe ever since Roman times. In the United States, the liquid gallon is legally defined as exactly 231 cubic inches; this is equal to the old English **wine gallon**, which originated in medieval times but was not standardized until 1707, during the reign of Queen Anne. Some scholars believe the wine gallon was originally designed to hold 8 troy pounds of wine. The U. S. gallon holds 4 liquid quarts or exactly 3.785 411 784 liters; a U.S. gallon of water weighs about 8.33 pounds. American colonists were also familiar with the Elizabethan **beer and ale gallon**, which held 282 cubic inches (4.621 liters).

gallon (gal) [**2**]
a historic British unit of dry volume still used implicitly in the U.S. In the U.S., the term "gallon" is not used in dry measure, but if it were it would be equal to 1/2 peck, or 4 dry quarts, or 268.8025 cubic inches, or approximately 4.404 884 liters. This unit is the English **corn** or **grain gallon**, standardized during the reign of Elizabeth I in the sixteenth century. The earliest official definition of a dry gallon in Britain is a 1303 proclamation of Edward I, where the gallon is defined as the volume of 8 pounds of wheat; the current U.S. "gallon" contains about 7.5 pounds of wheat. Grain gallons have tended to be larger than liquid gallons throughout the history of British units, apparently because they were based on heaped rather than "struck" (leveled) containers. A container in which grain has been heaped above the top will hold as much as 25% more grain, and the traditional corn gallon is in fact 16.4% larger than the wine gallon.

gallon (gal) [**3**]
a British Imperial unit of volume larger than either of the American gallons. The Imperial Weights and Measures Act of 1824 established a new unit for all volumes, liquid or dry, replacing all the other gallons in previous use in Britain. The **Imperial gallon**, designed to contain exactly 10 pounds of distilled water under precisely defined conditions, holds exactly 4.546 09 liters or approximately 277.4194 cubic inches. The Imperial gallon equals 1.20095 U.S. liquid gallons (British wine gallons) or 1.03206 U.S. dry gallons (British corn gallons).

gallon (gal) [**4**]
a traditional unit of volume in Scotland equal to 4 Scots quarts. This is almost exactly 3 British Imperial gallons, 3.6 U.S. liquid gallons, or 13.63 liters.

galopin
a French name for a small glass of beer, typically 200 milliliters (about 6.76 U.S. fluid ounces).

gamma [**1**]
a unit of magnetic flux density equal to 10^{-9} tesla (1 nanotesla) or 10^{-5} oersted (10 μOe). In geophysics, small changes in the Earth's magnetic field are traditionally stated in gammas. The nanotesla (nT) is now recommended for these measurements.

gamma [**2**]
an informal metric unit of mass equal to 1 microgram (μg).

garnets
a traditional unit of liquid volume in Russia. The garnets is equivalent to approximately 3.28 liters; this is about 3.47 U.S. quarts or 2.89 British Imperial quarts.

gas permeation unit (GPU)
a CGS unit of gas permeance for membranes, contact lenses, and similar thin materials. Permeance is defined to be the gas flow rate through the

material, per unit of area and per unit of pressure difference across the material. The unit is equal to 10^4 barrer per centimeter, or 10^{-6} cm·s^{-1}·cmHg^{-1}, or, in SI units, 7.5005 x 10^{-16}m·s^{-1}·Pa^{-1}.

gauge (ga) [1]

a traditional unit measuring the interior diameter of a shotgun barrel. The gauge of a shotgun was the number of lead balls, each of a size just fitting inside the barrel, that were required to make up a pound. In other words, if a lead ball weighing 1/12 pound just fit in the barrel of a shotgun, then it was a 12-gauge shotgun. Today, the internal diameters for each gauge number are read from a table.

gauge (ga) [2]

a unit expressing the fineness of a knitted fabric, equal to the number of loops per 1.5 inches (38.1 millimeters). The same unit is also used to express the size of the knitting needles used to create a fabric of that fineness.

gauge (ga) [3]

a traditional unit measuring the diameter (or the cross-sectional area) of a wire. Various wire gauge scales have been used in the U.S. and Britain. In traditional scales, larger gauge numbers represent thinner wires. (For very thick wires, repeated zeros are used instead of negative numbers, so gauges 00, 000, and 0000 represent -1, -2, and -3, respectively.) In the **American Wire Gauge** (AWG) scale, 0000 gauge represents a wire having a diameter of 0.46 inch and 36 gauge represents a diameter of 0.005 inch (5 mils). Diameters for the other gauges are obtained by geometric interpolation, meaning that the ratio between successive diameters is a constant, except for necessary roundoff. Thus *n* gauge wire has a diameter of $.005 \cdot 92^{((36-n)/39)}$ inch. The **metric wire gauge** number is equal to 10 times the diameter of the wire, in millimeters; thus a metric 8 gauge wire has diameter 0.8 millimeters. A table of wire gauge equivalents is provided.

gauge (ga) [4]

a traditional unit measuring the thickness of sheet metal. Larger gauge numbers represent thinner metal: 10 gauge represents a thickness of 0.1345 inch (3.416 millimeters) and each increase of 1 in the gauge number corresponds to a reduction of about 10% in the thickness. A table is provided.

gauge (ga) [5]

a traditional unit measuring the thickness of plastic film. For this purpose 1 gauge equals 0.01 mil [1] or 10^{-5} inch (0.254 micrometer).

gauge (ga) [6]

a traditional unit measuring the thickness of tennis racquet strings. There are two systems in use. In the U.S. system larger gauge numbers indicate thinner strings; in the European system larger gauge numbers indicate thicker strings. A table is provided.

gauss (G or Gs) [1]

the CGS unit of magnetic flux density. A field of one gauss exerts, on a current-carrying conductor placed in the field, a force of 0.1 dyne per ampere of current per centimeter of conductor. One gauss represents a magnetic flux of one maxwell per square centimeter of cross-section perpendicular to the field. In SI units, one gauss equals 10^{-4} tesla. The unit is named for the German mathematician and astronomer Karl Friedrich Gauss (1777-1855).

gauss (G or Gs) [2]

a former name for the CGS unit of magnetic field strength, officially renamed the oersted in 1930.

gauss (G or Gs) [3]

the CGS unit of magnetic dipole moment per unit volume, more commonly written emu/cm^3 or emu/cc. In this use the gauss equals 1000 amperes per meter in SIunits.

GDU

a symbol for **gelatin digesting unit**, used for measuring dosage of bromelain, an enzyme used as a digestive aid and for reduction of pain and inflammation. This unit cannot be converted to a weight unit, because different preparations of the enzyme differ in activity. Bromelain is also measured in milk clotting units (MCU); 1 GDU equals approximately 1.5 MCU.

gear inch

a traditional unit for measuring the gears of bicycles. In low gears, the

pedals are easy to turn but have to be turned very fast to achieve any speed; in high gears the pedals are harder to turn but don't have to be turned fast to achieve high speed. The gear value is computed in gear inches as the diameter of the drive wheel times the size of the front sprocket divided by the size of the rear sprocket, all measurements being in inches. (This is the same as the diameter of the drive wheel times the number of gear teeth on the front sprocket divided by the number of teeth on the rear sprocket.) This is the diameter that the drive wheel would need to have to give the same pedal effort as if the pedals were attached directly to the wheel, as on a child's tricycle. Values range from about 25 gear inches for the low gears on mountain bikes to more than 100 gear inches for the highest gears on racing bikes.

gee

an informal name for *g*, the standard acceleration of gravity (see above).

gee pound

another name for a slug.

generation (gen)

an informal unit of time. Roughly speaking, a generation is the average length of time between the birth of a parent and the birth of the child. This leaves a question, however: should just the father, or just the mother, or both parents be included in the calculation? Various answers to this question, plus a lack of consistent data, have led to a range of estimates for the length of a generation, from about 25 to 35 years. Genealogists tend to use the higher figures, anthropologists the lower ones. There is some research suggesting that the approximate length of the generation in the world today is about 28 years.

German legal meter (Glm)

an obsolete unit of distance, longer than a meter by 13.5965 micrometers (less than 1 part in 70 000). This unit was used in surveying in Namibia, a former German colony.

geographical mile

another name for the nautical mile, especially the Admiralty mile (6080 feet or 1853.184 meters). For a (different) German use of the term *geographische meile*, seemeile.

GeV

the symbol for one billion (10^9) electronvolts. Thanks to Einstein's equation $E = mc^2$ equating mass wth energy, the GeV can be regarded either as a unit of energy equal to 160.217 646 2 picojoules, or as a unit of mass equal to 1.782 662 x 10^{-24} gram or 1.073 544 atomic mass unit.

gf

symbol for gram force (see below under gram weight).

g/g

a symbol for "gram per gram", a unit of mass concentration. For example, a concentration of 0.02 g/g, or 2% g/g, means that the substance being measured comprises 2% of the mass of the mixture in which it is found. This symbol is equivalent to the traditional symbol w/w.

gibi- (Gi-)

a binary prefix meaning 2^{30} = 1 073 741 824. This prefix, adopted by the International Electrotechnical Commission in 1998, is supposed to replace giga- for binary applications in computer science. (This innovation does not appear to be sucessful.) The prefix is a contraction of "gigabinary."

gig

an informal contraction of the gigabyte (GB) common in computer science, especially as a unit of storage capacity.

giga- (G-)

a metric prefix denoting 10^9 or one billion (in the American meaning of the word billion). This prefix was coined from the Greek word *gigas*, meaning giant. The Greeks pronounced the word with a two hard g sounds, as in "gig." The prefix is sometimes pronounced with an initial soft g sound, as in "jig." Some dictionaries favor this choice, but the hard g pronunciation seems more common.

gigabecquerel (GBq)

a unit of radioactivity equal to one billion atomic disintegrations per second or 27.027 millicuries.

gigaflops (Gflops)

a unit of computing power equal to one billion (10^9) floating point operations per second. See flops.

gigagram (Gg)
an SI unit of mass equal to 10^9 grams, one million kilograms, or 1 kilotonne (1000 metric tons). This unit is used in scientific contexts, such as the measurement of atmospheric emissions. One gigagram equals about 2.2046 million pounds or 1102.3 U.S. (short) tons.

gigahertz (GHz)
a unit of frequency equal to 10^9 per second, or 1 per nanosecond. Cellular phones and microwave ovens operate with radio waves having frequencies in the gigahertz range.

gigajoule (GJ)
a metric unit of energy commonly used in the energy industry. One gigajoule equals 947 817 Btu, 277.7778 kilowatt hours, or about 9.48 therms.

gigaliter (GL or Gl)
a metric unit of volume equal to 10^9 liters or one million cubic meters. This is equivalent to 810.713 acre feet or 35.315 million cubic feet.

gigameter (Gm)
a metric unit of distance equal to one million kilometers or about 621 371.2 miles. Seldom used, this unit would be a good yardstick for the inner Solar System: the distance from the earth to the sun is about 149.60 gigameters.

gigaparsec (Gpc)
a non-metric unit of distance equal to one billion parsecs, 3.2616 billion light years, or 30.856 78 zettameters (30.856 78 x 10^{21} kilometers). The unit is used in astronomy.

gigapascal (GPa)
a metric unit of pressure. One gigapascal equals 10 kilobars or approximately 145 038 pounds (72.519 short tons) per square inch. Pressures in this range are common inside the earth and can be produced by various high-energy events.

gigatonne (Gt)
a metric unit of mass or weight equal to one billion metric tons (tonnes) or about 2.2046 trillion pounds. This very large unit is used, for example, in discussing the amounts of carbon added to the atmosphere by human activities.

gigawatt (GW)
a metric unit of power equal to one billion (10^9) watts or about 1.341 million horsepower.

gigawatt hour (GW·h)
a metric unit of energy equal to one billion watt hours, 3.6 terajoules, or about 3.412 billion Btu.

gigayear (Gyr)
a unit of time equal to one billion years. The international symbol **Ga** is also used, the "a" being taken from the Latin word *annus* for a year.

gilbert (Gi)
the CGS unit of magnetomotive force, equal to 10/4pi = 0.795 775 ampere-turns. The unit is named for the English physicist and physician William Gilbert (1540-1603), who published his discoveries on magnetism in 1600.

gill (gi)
a traditional unit of volume for liquids, especially wine and other alcoholic beverages. The gill is 1/4 pint. In the U. S. customary system, one gill is equal to 1/2 cup, 4 fluid ounces, 7.21875 cubic inches, or about 118.3 milliliters. In the British Imperial system, the gill equals 5 fluid ounces, 9.023 cubic inches, or about 142.1 milliliters. The unit is pronounced "jill", with a soft "g" sound. Its name comes a Latin word *gillo* for a small wine vessel.

gillion
an informal alternate name for the number 10^9, called "billion" in America but often called "milliard" in France and "thousand million" in Britain. The reasoning here is that if mega- means a million and tera- a trillion, then giga- should mean a gillion!

gin
one of several spellings used in English for the jin, the Chinese weight unit also called the catty.

g/kg
a symbol for "gram per kilogram", a unit of mass concentration equal to 1 per mill (1 part per thousand). 1 g/kg also equals 0.1% g/g or 0.1% w/w.

Glasgow coma scale (GCS)
a scale used in emergency medicine to assess the condition of trauma victims and other partially-conscious patients. The scale range is 3-15; patients with Glasgow scores of 3-8 are usually said to be in a coma. The score is obtained by observing the patient's eye-opening, motor response, and response to commands. A table is provided.

glass [1]
a unit of time measured by an hourglass or sandglass. At sea, time was traditionally measured with half-hourglasses, making the glass a nautical unit of time equal to 1/2 hour. In this use the glass is another name for the bell.

glass [2]
another name for the U.S. cup (236.6 milliliters). Doctors in the U.S. are fond of saying that everyone should drink 8 glasses of water a day, and this is the amount they have in mind for a glass.

glass [3]
an informal unit of volume used in Australian pubs. In several states of Australia a glass of beer is usually 200 milliliters, but it is 235 milliliters in Queensland and 285 milliliters in Western Australia.

glean
an old English unit of quantity for herrings, equal to 25 fish.

gm
an incorrect symbol for the gram (see below). The correct symbol is g. In engineering, "gm" is sometimes used to distinguish "gram mass" from "gram force" (gf). This practice is not recommended.

GMT
abbreviation for Greenwich Mean Time, the standard time of longitude 0°. This meridian of longitude, called the *prime meridian*, was fixed as the longitude of the Royal Greenwich Observatory in London by the International Meridian Conference of 1884. GMT is five hours later than U.S. Eastern Standard Time. The abbreviation UT (Universal Time) has largely replaced GMT.

gnat's eye
an idiomatic "unit" of distance; it's common to hear that something is "as small as a gnat's eye." In fact, the eyes of typical gnats tend to have diameters similar in size to a hair's breadth: roughly 100-150 micrometers (0.10-0.15 millimeters).

go
a traditional Japanese unit of liquid volume. One go is about 180.39 milliliters, 0.3812 U.S. pint, or 0.3174 British Imperial pint.

goad
a traditional unit of distance sometimes used in measuring cloth. One goad is equal to 54 inches or 1.5 yards (1.3716 meters). A goad was originally a spear; later it was a pointed rod used for prodding animals to get a move on. The unit must have originated as the length of such an instrument.

gon (g)
another name for the grad, a unit of angle measurement equal to 1/400 circle, 0.01 right angle, 0.9°, or 54'. This name was formerly used in German, Swedish, and other languages in which the word *grad* means *degree*. The gon is rarely used today. The name is taken from the ancient Greek word *gonia*, angle.

gong-
in the Pinyin system for transliterating Chinese, the word *gong* (preferably with a macron, or long-vowel sign, over the *o*) represents a character whose basic meaning is "public" or "official." This meaning has been extended in recent years to include "metric." Thus a **gongjin** is a metric jin, that is, a kilogram, and a **gongli** is a metricli, or kilometer.

googol
a unit of quantity equal to 10^{100} (1 followed by 100 zeroes). The googol was invented by the American mathematician Edward Kasner (1878-1955) in 1938. According to the story, Kasner asked his nephew Milton Sirotta, who was then 8 years old, what name he would give to a really large number, and "googol" was Milton's response. Kasner also defined the **googolplex**, equal to 10^{googol}, that is, 1 followed by a googol of zeroes. These inventions caught the public's fancy and are often mentioned in discussions of very large numbers. In the traditional American system

for naming large numbers, the googol is equal to 10 duotrigintillion.

gpf

symbol for U.S. gallons per flush, a specification sometimes found on toilets. 1 gpf = 3.785 liters per flush (Lpf). U.S. government regulations now require the use of low-flush toilets of 6.0 Lpf = 1.585 gpf or less.

gpg

a customary symbol for grains per gallon (gr/gal) (see below).

gpm, gps

customary symbols for gallons per minute (gal/min) and gallons per second (gal/s), traditional units for measuring the flow of liquids. 1 gpm equals about 3.785 41 liters per minute (L/min) if U.S. gallons are meant, or exactly 4.546 09 L/min if British Imperial gallons are meant.

GPU

symbol for the gas permeation unit (see above).

gr

an ambiguous symbol, traditionally used in English both for the grain and the gross. It has also been used, very improperly, for the gram (g). In the metric world, gr is often the symbol for the grad or grade (next entry).

grad, grade [1], gradian, or **gon (^{g} or gr or grd)**

a unit of angle measurement equal to 1/400 circle, 0.01 right angle, 0.9°, or 54'. This unit was introduced in France, where it is called the **grade**, in the early years of the metric system. The **grad** is the English version, apparently introduced by engineers around 1900. The name **gon** is used for this unit in German, Swedish, and other northern European languages in which the word *grad* means *degree*. Although many calculators will display angle measurements in grads as well as degrees or radians, it is difficult to find actual applications of the grad today.

grade [2]

a measure of the steepness of a slope, such as the slope of a road or a ramp. Usually stated as a percentage in the U.S, the grade is the same quantity known as the slope in mathematics: the amount of (vertical) change in elevation per unit distance horizontally ("rise over run"). Thus a 5% grade has an elevation gain of 0.05 meter for each meter of horizontal distance, or 0.05 foot for each foot of horizontal distance. Grades are also stated as ratios (1/20 grade or 1 in 20 grade) and in some countries as a permillage (50 °/oo grade). The angle of inclination, in grads or grades [1], is *not* equal to the percentage grade in this sense: for a 5% grade the angle of inclination is about 2.86° or 3.18 grads.

grade [3]

a measure of quality for ball bearings. A bearing of grade *g* is required to be spherical to an accuracy of *g* parts per million ($g\ 10^{-6}$). Thus lower grade numbers represent better bearings; a 25 grade bearing is spherical to within 25 ppm, but a 1000 grade bearing is only spherical to within 1000 ppm, or 0.1%.

grade point (gp or GP)

a unit of academic recognition used in U.S. schools and colleges. To compute the number of grade points awarded to a student for a course, the student's grade (often assigned as a letter or a percentage) is converted to a standard scale (traditionally 0.0-4.0, with 4.0 being the highest score). This scale number is multiplied by the number of semester hours or quarter hours assigned to the course. Thus a student who has a grade of A (4.0) on a course carrying 3 semester hours of credit receives 12 grade points.

grade point average (GPA)

an index of academic achievement used in U.S. schools and colleges, equal to the number of grade points received divided by the number of semester hours or quarter hours of courses taken by the student.

gradian

another name for the grad (see above).

grain (gr) [1]

a traditional unit of weight. The grain, equal to 1/480 troy ounce (see also pound [2]), or exactly 64.798 91 milligrams, was the legal foundation of traditional English weight systems, with various pounds being defined as a specified number of grains: 5760 grains in a troy pound and 7000 grains in an avoirdupois pound, for example. In the version of the troy system used by jewelers, there are 24 grains in a pennyweight and 20 pennyweight in an ounce. In the version used

by apothecaries, there are 20 grains in a scruple, 3 scruples in a dram, and 8 drams in an ounce. Originally the grain was defined in England as the weight of a barleycorn. This made the English grain larger than the corresponding grain units of France and other nations of the Continent, because those units were based on the weight of the smaller wheat grain.

grain (gr) [2]
a unit of weight formerly used by jewelers in measuring diamonds and other precious stones. The jeweler's grain is exactly 1/4 carat. Now that the carat has been standardized at 200 milligrams, the jeweler's grain is exactly 50 milligrams, or approximately 0.7716 troy grain. This unit is widely used for measuring pearls, so it is sometimes called the **pearl grain**.

grain (gr) [3]
a traditional French unit of weight equal to 53.115 milligrams.

grain per gallon (gr/gal or gpg)
a traditional unit measuring the hardness of water. Water is "hard" if it contains dissolved minerals such as calcium or magnesium salts. 1 gpg is equivalent to about 17.118 milligrams per liter (mg/L). This unit is also called the **Clark degree**; see degree [4].

gram (g)
a unit of mass in the metric system. The name comes from the Greek *gramma*, a small weight identified in later Roman and Byzantine times with the Latin *scripulum*or scruple (the English scruple is equal to about 1.3 grams). The gram was originally defined to be the mass of one cubic centimeter of pure water, but to provide precise standards it was necessary to construct physical objects of specified mass. One gram is now defined to be 1/1000 of the mass of the standard kilogram, a platinum-iridium bar carefully guarded by the International Bureau of Weights and Measures in Paris for more than a century. (The kilogram, rather than the gram, is considered the base unit of mass in the SI.) The gram is a small mass, equal to about 15.432 grains or 0.035 273 966 ounce. The original French spelling **gramme** is sometimes used. **Note:** The only correct symbol for the gram is g. The abbreviations "gm" and (worse) "gr" should never be used.

gram atom, gram atomic weight
older names for the atomic mass unit.

gram calorie
the CGS unit of heat energy; see calorie.

gram equivalent (gEq), gram equivalent mass (GEM), gram equivalent weight (GEW)
various names for the mass in grams of a substance that would react with or replace one gram of hydrogen. See equivalent, the shorter name now used in many contexts for this unit.

gram force
see gram weight, below.

gram mole, gram molecule, gram molecular weight (gmol or gmole)
older names for the mole.

gram per square meter (g/m^2 or gsm)
a common metric unit of areal density, used for paper, fabric, and similar materials. One gram per square meter is equal to about 0.029 4935 ounce per square yard. The symbol **gsm** is commonly used for this unit, but **g/m^2** is the proper SI symbol.

gram rad
a name sometimes used for the rad, a unit of radiation dose.

gram weight or gram force (gf)
a unit of weight equal to the force exerted on a mass of one gram by gravity at the Earth's surface: approximately 980.665 dynes, 9.806 65 millinewtons, or about 0.002 2045 pounds of force in the English system. This unit has also been called the **pond**.

gran
a traditional German weight unit, varying in size but typically about 60 milligrams.

grand (G)
slang for 1000, especially the sum of 1000 dollars in the U.S. or 1000 pounds in Britain.

grano
a traditional Italian weight unit, varying in size but typically about 50 milligrams. The plural is **grani**.

grav (*g*)
another name for the unit of acceleration usually called the *g* (see above).
gray (Gy)
the SI unit of radiation dose. Radiation carries energy, and when it is absorbed by matter the matter receives this energy. The dose is the amount of energy deposited per unit of mass. One gray is defined to be the dose of one joule of energy absorbed per kilogram of matter, or 100 rad. The unit is named for the British physician L. Harold Gray (1905-1965), an authority on the use of radiation in the treatment of cancer.
great gross
a traditional unit of quantity equal to a dozen gross, or 1728.
great hundred
a traditional unit of quantity equal to 120 instead of 100. The great hundred equals 6 score or 2 shocks. Merchants in medieval England used both the great hundred and the gross (144) in specifying quantities, but more recently the gross has been much more common.
great year
the Platonic year.
green ton, green tonne (GT)
terms used in the forest products industry for a U.S. ton or metric ton (tonne) of freshly cut timber, bark mulch, etc. Once the material has dried, it will of course weigh less.
Gregorian year
a unit of time equal to exactly 365.2425 days, the average length of a year in the Gregorian calendar currently used throughout the world. See year [2].
grit
a measure of fineness for abrasive materials such as sandpaper, sanding belts, or the finer materials used to polish optical surfaces. Originally the grit number was the number of holes in a standard screen; if the screen had, say, 240 holes, then the particles that would pass through the screen were described as 240 grit. However, very fine abrasive particles (such as 500 to 1000 grit) are too small to be screened in this way, so the measure is defined by tables giving the average particle size in micrometers for each grit size. A table of grit sizes is provided.
gros
a traditional French weight unit equal to 3 deniers (about 3.824 grams).
gross (gro or gr)
a unit of quantity equal to a dozen dozen, or 144. This commercial unit has been in use since at least the 1400's.
gross ton (GT)
the name "gross ton" is used in at least two ways: (1) as another name for the British Imperial or long ton of 2240 pounds (see ton [1]), and (2) as another name for the register ton, a unit of volume equal to 100 cubic feet (see ton [3]), in describing the entire interior volume of a ship as opposed to the cargo-carrying capacity. To avoid confusion, it is better to use "long ton" for use (1) and "gross register ton" for use (2).
ground
an informal unit of land area in India, especially southern India, equal to roughly 200-220 square meters or 2150-2400 square feet.
growler
a container of beer designed for carryout. In the U.S., a growler generally holds 1/2 gallon (about 1.89 liters).
gry
a proposed unit of distance in the English traditional system. The name was first used in June 1679 by the philosopher John Locke (1632-1704) as a unit equal to 0.001 foot, 0.01 inch, or 0.1 line in a decimalized distance system. (Thomas Jefferson, who was very familiar with Locke's writings, later proposed a similar system in the U.S., but he called 0.001 foot a point rather than a gry.) In 1813, the gry was revived in another decimal measurement scheme in Britain. All these ideas failed, but the gry had some limited use in the nineteenth century as a unit equal to 0.1 line or 1/120 inch (0.211 667 millimeter). Long forgotten, the gry recently came back into the limelight in connection with a trick question, circulating on the Internet, which asked for three common English words ending in -gry. The word "gry" is from the ancient Greek,

where it meant "a trifling amount."

gsm

a common but non-standard symbol for grams per square meter (g/m^2), the metric unit of density for paper and for fabric. Paper density measured in this unit is often called **grammage**.

gt, gtt

traditional pharmicist's abbreviations for a drop. Originally, gt was the singular (1 gt) and gtt the plural. The symbol comes from the Latin word *gutta* for a drop.

g/t

symbol for grams per tonne (metric ton), a unit of proportion equal to 0.001 g/kg or 1 part per million by mass. This unit is used, for example, in stating the concentration of gold, silver, or other minerals in ores.

Gunter's chain

the traditional surveyor's chain equal to 4 rods [1]; see chain.

Gurley unit

see porosity.

gutenberg

a unit of distance used in typography, equal to 1/7200 inch or 3.5278 micrometers. The gutenberg is 0.01 point [2], more or less, depending on how the point is defined. The unit is named for Johannes Gutenberg (ca. 1390-1468), the German inventor of printing from movable type.

H

h

Planck's constant, equal to approximately $6.626\,068\,96 \times 10^{-34}$ joule second, a fundamental constant of physics also used as a unit of "action" or of angular momentum in particle physics. The unit was defined by the German physicist Max Planck (1858-1947), who showed in 1900 that at atomic and subatomic scales energy occurs in discrete packets called quanta. Each quantum has energy $h \cdot f$, where f is the frequency of the radiation in hertz (see below).

hacienda

a large traditional unit of land area in Mexico and the southwestern U.S. The word also refers to a large estate, ranch, or plantation. As a unit, it equals 5 square leguasor 125 million square varas. Using the Texas definition of the vara, this would be about 8960 hectares or 22 140 acres (34.59 square miles). Using the shorter Mexican vara, it would be about 8778 hectares or 21 690 acres.

hair's breadth

a common informal unit of distance. Human hairs vary considerably in width, depending on age, color, genetics, and other factors. An average hair is approximately 70 to 100 micrometers (μm) in diameter, so, as a rough standard, a hair's breadth is 100 μm or 0.1 millimeter (mm).

halakim (hl)

plural of **helek** (see below). The word is also transliterated as **chalakim** or **chlakim**.

halbe

a German word for one half; often used as a unit of volume for beer and other liquids equal to 1/2 maß (generally 1/2 liter).

half [1]

a unit of proportion equal to 1/2. The English word "half," like the German prefix "halb-," is often placed before the name of a unit to create a combination which functions as a new unit equal to half the old one. **Half dozen**, **half hour**, and **half gallon** are typical and common examples.

half [2]

an informal name for 1/2 of many units. For example, in Britain a "half" often means a 1/2 pint glass of beer, cider, lemonade, or whatever.

half life

a unit of relative time measuring the rate at which a radioactive substance decays, or (more generally) the rate of decrease for any process that decreases exponentially. In the case of radioactivity, the half life is the time required for the activity to be reduced by half. After a second half life, the activity is again reduced by half, so it is then 1/4 the

original activity. To reduce the activity to 0.1% of the original amount requires about 9.966 half lives.

half step

a unit used in music to describe the ratio in frequency between notes. Equal to 1/12 octave, the half step measures the difference between adjacent notes in the standard 12-tone scale, as on a piano keyboard. Two notes differ in frequency by a half step if the higher one has frequency equal to $2^{1/12} = 1.0595$ times the frequency of the lower one.

hand

a traditional unit of distance, now used mostly to measure the height of horses. One hand equals 4 inches, 1/3 foot, or 10.16 centimeters.

handle

a traditional unit of volume for beer, used in pubs in the Northern Territory of Australia. A handle of beer is 285 milliliters (10 fluid ounces). Glasses of this size are called middies or pots in most Australian states, schooners in South Australia.

hank

a traditional measure of length for yarn. The length of yarn in a hank varies with the market and the material; for example, a hank of cotton yarn traditionally included 840 yards (768 meters) of yarn, while a hank of wool yarn was 560 yards (512 meters). For both cotton and wool, these traditional hanks are equal to 7 leas or to 12cuts. In the U.S., however, a hank of woolen yarn is generally 1600 yards (1463 meters). In retail trade, a hank is often equal to 6 or 7 skeins of varying size.

hardness

a measure of the hardness of a metal or mineral. Hardness is a property easy to appreciate but difficult to quantify and measure. The Mohs hardness scale is used in geology to give a rough estimate of hardness by testing which minerals are able to scratch the sample. In metallurgy, samples are tested for hardness by machines which indent the surface under a controlled pressure; the resulting measurement is often computed as the force applied divided by the surface area of the indentation. The Brinell, Vickers, Rockwell, and Knoop tests are among the techniques used. Plastics, rubber, and similar materials are tested

with instruments called durometers and the resulting readings are often designated duro.

hartley (Hart)

a unit of information content used in information and communications theory. The hartley is similar to the shannon. If the probability of receiving a particular message is p, then the information content of the message is $-\log_{10} p$ hartleys. For example, if a message is a string of 5 letters or numerals, with all combinations being equally likely, then a particular message has probability $1/36^5$ and the information content of a message is $5(\log_{10} 36) = 7.7815$ hartleys. One hartley equals $\log_2 10 = 3.321\,928$ shannons or $\log_e 10 = 2.302\,585$ nats.

hartree (E_h)

a unit of energy used in atomic and moleclar physics, equal to about 4.3598×10^{-18} joule or 27.212 electron volts. The unit is named for the British physicist and mathematician Douglas R. Hartree (1897-1958).

hat size

in the metric world, the size of a hat is simply the circumference C of the head it's meant to cover, in centimeters. The traditional U.S. hat size was defined to equal$C$/pi, in inches; this would be the diameter if the head were circular in cross section. Thus the U.S. hat size equals the metric size divided by 2.54pi, which is almost exactly 8. Traditional British hat sizes are equal to U.S. sizes minus 1/8. Thus metric size 60 is equivalent to U.S. size 60/8 = 7 1/2 and British size 7 3/8. A table is provided.

hat trick or hat-trick

an informal unit of quantity equal to 3. The unit is used in sports to describe three successes by a player either consecutively or in a single contest. It originated in cricket to describe the very rare event of a bowler dismissing three batsmen on consecutive throws. No one seems to know the reason for sure: according to one popular account, cricket clubs in England sometimes awarded a hat to a player who performed the feat, but others suspect this was an effect, rather than a cause, of the expression. Today "hat trick" is more familiar to North Americans in ice hockey, where it refers to the less rare event of a player scoring three goals in a single game.

head (hd) [1]
an informal unit of length, equal to the approximate length of a horse's head, used in expressing the results of a horse race.

head (hd) [2]
a notation seen in measurements of water pressure; see foot of head.

head (hd) [3]
a unit of quantity for livestock, equal to one animal. No -s is added for the plural: one speaks of "35 head" of cattle.

heaped bushel
a traditional unit of volume in the United States, the heaped bushel is just what its name implies: the volume of a bushel container filled to overflowing. Officially, the heaped bushel was supposed to equal 1.278 regular, or "struck" bushels; this is a volume of 2748.237 cubic inches, 1.5904 cubic feet, or 45.036 liters. In practice, the heaped bushel was frequently interpreted as 1.25 bushels, which is equal to exactly 5 pecks, 2688.025 cubic inches, 1.5556 cubic feet, or 44.049 liters.

heat index (HI or HX)
a measure of the combined effect of heat and humidity on the human body. U.S. meteorologists compute the index from the temperature T (in °F) and the relative humidity H (as a fraction; that is, H = 0.65 if the relative humidity is 65%). The formula used is
$HI = -42.379 + 2.04901523\,T + 1014.333127\,H - 22.475541\,TH - .00683783\,T^2 - 548.1717\,H^2 + 0.122874\,T^2H + 8.5282\,TH^2 - 0.0199\,T^2H^2$.

heating degree day (HDD)
see degree day.

heat unit
an alternate name, coined by Americans, for the British thermal unit (Btu). This is not the same as the Celsius heat unit (Chu).

hebdo-
an obsolete metric prefix denoting ten million (10^7). It was coined from the Greek *hebdomos*, seventh. A group of seven is sometimes called a **hebdomad**, a word related to the French *hebdomadaire*, weekly.

hect- or hecto- (h-)
a metric prefix denoting 100, coined from the Greek word *hekaton* for one hundred.

hectare (ha)
the customary metric unit of land area, equal to 100 ares. One hectare is a square hectometer, that is, the area of a square 100 meters on each side: exactly 10 000 square meters or approximately 107 639.1 square feet, 11 959.9 square yards, or 2.471 054 acres.

hectare meter (ha·m)
a unit of volume used to measure the capacity of reservoirs, equal to the volume of water one meter deep covering one hectare. The unit is used mostly in British Commonwealth countries, especially India, where it provides a metric unit comparable to the traditional English acre foot. Reservoir capacities are often stated in millions of hectare meters (Mha·m or MHM). One hectare meter equals exactly 10 000 cubic meters or about 8.1071 acre feet.

hectobar (hbar)
a fairly common metric unit of pressure equal to 100 bars, 10 megapascals (MPa), or 1 dekanewton per square millimeter (daN/mm^2). This is approximately 1450.38 pounds per square inch (lbf/in^2 or psi) or 208 855 pounds (104.43 U.S. tons) per square foot.

hectogram (hg)
a common metric unit of mass, equal to 100 grams or about 3.5274 ounces.

hectoliter (hL or hl)
a common metric unit of volume. The hectoliter equals 100 liters, 0.1 cubic meter, 26.417 U.S. liquid gallons, 21.999 British Imperial gallons, or 3.5315 cubic feet.

hectometer (hm)
a metric unit of distance equal to 100 meters, 328.084 feet, or 109.361 yards. This unit isn't used much in everyday life in metric countries, but it appears in various scientific contexts.

hectopascal (hPa)
a metric unit of pressure equal to 100 pascals or 0.1 kilopascal (kPa). The hectopascal, used almost entirely in measurements of air pressure, is

identical to themillibar (mb). The millibar has been used to measure air pressure for many years, but it is not an SI unit. Although meteorologists in various countries use the hectopascal as a kind of alias for the millibar, the natural SI unit for air pressure is the kilopascal.

heer

a traditional measure of length for linen and woolen yarn, equal to 2 cuts or 1/6 hank (see above). This is equivalent to 80 yards (73.152 meters).

Hefner candle (HC) or Hefnerkerze (HK)

a former unit for measuring the intensity of light. The unit is named for F. von Hefner-Altenack (1845-1904), who invented a laboratory light standard, the Hefner lamp, which burned isopentyl acetate to provide light of intensity 1 HK. One Hefner candle is equivalent to approximately 0.902 candela (cd).

helek (hl)

a traditional Hebrew unit of time equal to 1/1080 hour, 1/18 minute or 10/3 seconds. The plural is **halakim**. Halakim are used in formulas establishing the instant of new moon, which marks the start of the month in the Jewish calendar. In English, the unit is often called a **part** of an hour. The Jews inherited this unit from the Babylonians; it was widely used throughout the ancient Middle East.

hemidemisemiquaver

the shortest named unit of relative time in music, equal to 1/8 quaver, 1/64 whole note or 1/128 breve.

hemina

a Roman unit of liquid volume, equal to 1/2 sextarius or about 265.6 milliliters (0.561 U.S. pint or 0.467 British Imperial pint).

hemisphere

a traditional unit of solid angle equal to 1/2 sphere, 2pi steradians, or about 20 626.48 square degrees.

henry (H)

the SI unit of electric inductance. A changing magnetic field induces an electric current in a loop of wire (or in a coil of many loops) located in the field. Although the induced voltage depends only on the rate at which the magnetic flux changes, measured in webers per second, the amount of the current depends also on the physical properties of the coil. A coil with an inductance of one henry requires a flux of one weber for each ampere of induced current. If, on the other hand, it is the current which changes, then the induced field will generate a potential difference within the coil: if the inductance is one henry a current change of one ampere per second generates a potential difference of one volt. The henry is a large unit; inductances in practical circuits are measured in millihenrys (mH) or microhenrys (μH). The unit is named for the American physicist Joseph Henry (1797-1878), one of several scientists who discovered independently how magnetic fields can be used to generate alternating currents. The plural is sometimes spelled **henrys**, but in English it is correct to spell it **henries**.

heptad

a unit of quantity equal to 7.

hertz (Hz)

the SI unit of frequency, equal to one cycle per second. The hertz is used to measure the rates of events that happen periodically in a fixed and definite cycle; thebecquerel, also equal to one "event" per second, is used to measure the rates of things which happen randomly or unpredictably. Multiples of the hertz are common: the frequencies of radio and television waves are measured in kilohertz (kHz), megahertz (MHz), or even gigahertz (GHz), and the frequencies of light waves in terahertz (THz). The unit is named for the German physicist Heinrich Rudolf Hertz (1857-1894), who proved in 1887 that energy is transmitted through a vacuum by electromagnetic waves.

hexad

a unit of quantity equal to 6.

hexit

a unit of information equal to 4 bits or 1/2 byte. A string of 4 bits has 16 possible states (0-15) and is usually represented as a single base-16, or **hex**adecimal, dig**it**(in the hexadecimal system the letters A through F are used to represent the numbers 10 through 15, respectively). A hexit of data is also known as a **nibble** or a**quadbit**.

hide

a very old English unit of land area, dating from perhaps the seventh century. The hide was the amount of land that could be cultivated by a single plowman and thus the amount of land necessary to support a family. Depending on local conditions, this could be as little as 60 acres or as much as 180 acres (24-72 hectares). The hide was more or less standardized as 120 acres (48.6 hectares) after the Norman conquest of 1066. The hide continued in use throughout medieval times, but it is now obsolete. The unit was also known as the **carucate**.

hin

an ancient Hebrew unit of liquid capacity, mentioned several times in the Bible. The unit varied in size over time, but typically it was around 3.7 liters, a little smaller than the U.S. gallon.

hogshead (hhd)

a traditional unit of volume for liquids. Originally the hogshead varied with the contents, often being equal to 48 gallons of ale; 54 of beer; 60 of cider; 63 of oil, honey, or wine; or 100 of molasses. In the United States, a hogshead is defined to hold 2 barrels, or 63 gallons; this was the traditional British wine hogshead. It is equal to exactly 14 553 cubic inches, or about 8.422 cubic feet (238.48 liters). In the British Imperial system, the hogshead equals 1/2 butt, or 52.5 Imperial gallons (8.429 cubic feet, or 238.67 liters). Thus the British Imperial and American hogsheads are almost exactly the same size. No one seems to know for sure how this unit got its unusual name.

hold

one of two Hungarian units of land area. The traditional **magyar hold** or Hungarian acre is equal to 1200 square öl (fathoms) or about 0.4314 hectare (1.066 acres). The official **kataszteri hold** or cadastral hold, used for land taxation, is 1600 square öl or about 0.5752 hectare (1.421 acres); this unit is equivalent to the Austrianjoch.

homestead

a historic unit of area in the United States, equal to 160 acres (64.75 hectares). Under the Homestead Act passed by Congress in 1862, settlers in the western states were allowed to take title to a homestead of 160 acres of land by registering a claim, settling on the land, and cultivating it. A homestead equals 1/4 square mile, or 1/4 section in U.S. government terminology.

hoppus foot, hoppus board foot

traditional units of volume in British forestry. In a 1736 manual of practical calculation, the English surveyor Edward Hoppus advised foresters to estimate the volume of wood in a log of length L and girth (circumference) G as $L \cdot (G/4)^2$. Since the actual volume of a cylinder is $L \cdot G^2/(4 \cdot pi)$, the resulting figure, called the hoppus volume, is smaller than the actual volume of the log. In fact not all the wood in a log can be used, and the hoppus volume was considered a fairly reasonable estimate of the usable volume of wood in the log. Volume measurements made using the hoppus formula are stated in **hoppus feet**. In effect, this makes the hoppus foot a unit of volume equal to 4/pi = 1.273 cubic feet or 0.036 054 cubic meter. Similarly, the hoppus board foot is equal to 1/12 hoppus foot or 1.273 board feet, which is almost exactly 3 liters (0.00300 cubic meter). The British forestry industry changed its unit of timber measurement from hoppus feet to cubic meters in 1971.

hoppus ton (HT)

a traditional unit of volume in British forestry. One hoppus ton is equal to 50 hoppus feet or 1.8027 cubic meters. Shipments of tropical hardwoods from Southeast Asia, especially shipments of teak from Myanmar (Burma), are still stated in hoppus tons.

horse

slang for the horsepower, as in "200-horse engine."

horsepower (hp)

a unit of power representing the power exerted by a horse in pulling. The horsepower was defined by James Watt (1736-1819), the inventor of the steam engine, who determined after careful measurements that a horse is typically capable of a power rate of 550 foot-pounds per second. This means that a horse, harnessed to an appropriate machine, can lift 550 pounds at the rate of 1 foot per second. Today the SI unit of power is named for Watt, and one horsepower is equal to approximately 745.6999 watts. (Slightly different values have been used in certain industries.) Outside the U.S., the English word "horsepower" is often

used to mean the metric horsepower, a slightly smaller unit.

horsepower hour (hp hr)

a unit of work or energy equal to the work done at the rate of 1 horsepower for 1 hour. The horsepower hour equals 1 980 000 foot pounds or approximately 2.685 megajoules, 2545 Btu, 641.1 (large) Calories, or 745.7 watt hours.

horsepower year (hp yr)

an obsolete unit of work or energy equal to the work done at the rate of 1 horsepower for 1 year. Based on the Julian year of 365.25 days, the horsepower year is approximately 6536.8 kilowatt hours, 23.537 gigajoules, or 22.309 million Btu.

Hounsfield unit (HU)

a unit used in medical imaging (CT or MRI scanning) to describe the amount of x-ray attenuation of each "voxel" (volume element) in the three-dimensional image. The voxels are normally represented as 12-bit binary numbers, and therefore have $2^{12} = 4096$ possible values. These values are arranged on a scale from -1024 HU to +3071 HU, calibrated so that -1024 HU is the attentuation produced by air and 0 HU is the attenuation produced by water. Tissue and bone then produce attenuations in the positive range. The reading in Hounsfield units is also called the **CT number**. The unit is named for the British engineer Godfrey Hounsfield, who demonstrated the first CT scanner in 1972. For this invention he received the Nobel Prize in medicine in 1979.

hour (h or hr) [1]

a traditional unit of time, equal to 60 minutes, or 3600 seconds, or 1/24 day [2]. The custom of dividing the daylight into 12 hours goes back at least as far as the Babylonians, who liked to divide units by 12 because groups of 12 are easily divided into halves, thirds, or fourths. Originally an hour was 1/12 of the time between sunrise and sunset, so summer hours were longer than winter hours. Later, when people wanted to express times at night, it was natural to divide the night into 12 hours as well, making 24 hours in the day. Only after the invention of mechanical clocks, around 1300, did hours became equal intervals marked by clocks. The word comes from an ancient Greek word *hora* which originally meant a season, especially a religious season, and hence a "defined" period of time. In the Christian church*hora* came to mean one of the services held at seven specific times during the day, thus establishing the word as marking subdivisions of the day.

hour (h or hr) [2]

a unit of angular measure used in astronomy, equal to 1/24 circle or 15°. Objects can be located in the sky in a coordinate system in which the equatorial plane is the same as that of the Earth. In this system, the latitude coordinate is called declination and is measured in degrees from the Equator to the poles, just as latitude is measured on the surface of the Earth. The longitude coordinate, called right ascension, is measured in hours from the longitude, traditionally known as the First Point of Aries, at which the Sun appears to cross the Equator on its northward journey in the spring.

hour (h or hr) [3]

a unit of sidereal time in astronomy; see sidereal day.

house

in astrology, each sign of the Zodiac is called a house; thus the house can be considered a unit of angle measure equal to 1/12 circle or 30°.

hu

a traditional Chinese unit of liquid volume. The hu contains about 51.77 liters, 13.676 U.S. gallons, or 11.389 British Imperial gallons.

hubble

a unit of distance sometimes used in astronomy. The hubble is a gigantic unit, equal to 10^9 light years. This is 9.4605×10^{21} kilometers (9.4605 yottameters, if you please), 5.8785 sextillion miles (U.S.), 63.240×10^{12} astronomical units, or 306.595 megaparsecs. In practice, most astronomers use the megaparsec for measuring such stupendous distances. The unit honors the American astronomer Edwin Hubble (1889-1953), who discovered the expansion of the Universe later explained by the Big Bang theory.

hue

a numerical measure of color; see color units.

hun

a unit of length in Thailand, equal to 1/8 inch or 3.175 millimeters. Pronounced "hoon," the unit seems to be used almost entirely for measuring the size of dice.

hundred [1]

a unit of quantity. In commercial use in old England the term "hundred", or **cent (C)**, did not always mean an even 100; sometimes it meant 120 (the "great hundred") or some other number, depending on the item. For fish, the exact number in a hundred varied with the species.

hundred [2]

an old English unit of area equal to 100 hides (see above). This is roughly 12 000 acres, 5000 hectares, or 18.75 square miles. The hundred is approximately the area of a village with its associated fields, so the name "hundred" came to mean a minor division of a shire or county. This use carried over to the American colonies, where, for example, many of the early settlements in Virginia were called hundreds. In colonial South Australia, the hundred was a subdivision of a county with an area of about 100 square miles or 260 square kilometers.

hundredweight (Cwt or cwt)

a traditional unit of weight equal to 1/20 ton. The hundredweight is the English version of a commercial unit used throughout Europe and known in other countries as the quintal or the zentner. In general, this unit is larger than 100 pounds avoirdupois, so to fit the European market the hundredweight was defined in England as 112pounds avoirdupois (about 50.8023 kilograms) rather than 100 pounds. This definition apparently dates from about the middle of the 1300's. The British hundredweight was divided into 4 quarters [1] of 28 pounds, 8 stone of 14 pounds, or 16 cloves of 7 pounds each. In the United States, where the currency was decimalized and there wasn't so much need to align the unit with the quintal and zentner, the hundredweight came to equal exactly 100 pounds (about 45.3592 kilograms). The U.S. hundredweight seems to have been invented by merchants around 1840. To distinguish the two hundredweight units, the British version is often called the **long hundredweight** and the American is called the **short hundredweight** or **cental**. The C in the symbol is of course the Roman numeral 100.

hüvelyk

the Hungarian inch unit, equal to 1/12 láb or about 2.63 centimeters. As is true of the inch unit in many languages, the word also means "thumb."

hyl

an obsolete MKS unit of mass. One hyl is the mass that is accelerated at one meter per second per second by one kilogram of force (kgf). Since 1 kgf = 9.806 65newtons, the hyl is equivalent to 9.806 65 kilograms. The name of the unit comes from an ancient Greek word for matter.

I

i

a mathematical number equal to the square root of -1. Although often called the **imaginary unit**, *i* is quite real in many applications. For example, in vector geometry it is used to represent a counterclockwise rotation by 90°. The Swiss mathematician Leonhard Euler (1707-1783) introduced the symbol *i* for the imaginary unit in 1777.

IACS

an abbreviation for International Annealed Copper Standard, a measure of conductivity used to compare electrical conductors to a traditional copper-wire standard. Conductivity is expressed as a percentage of the standard. 100% IACS represents a conductivity of 58 megasiemens per meter (MS/m); this is equivalent to a resistivity of 1/58 ohm per meter for a wire one square millimeter in cross section.

IBU

an abbreviation for international bitterness (or bittering) unit, a unit used in brewing beer and ale. One IBU is equal to 1 part per million of isohumulone, an acid (derived from hops) that provides the bitterness in the brew. Measurements from 0 to about 70 IBU are possible, but most beers measure between 10 and 30 IBU.

icfm

abbreviation for **inlet cubic feet per minute**, a unit traditionally used to measure the capacity of air compressors.

IE
symbol for *international einheit*, the German name for the international unit (IU).
IGPM
abbreviation for Imperial gallons per minute.
immi
a traditional Swiss unit of liquid volume. The immi has been brought into the metric system and now equals exactly 1.5 liters (about 3.17 U.S. liquid pints).
imperial
a large wine bottle holding about 6 liters, 8 times the volume of a regular bottle. Also called a **methuselah**.
Imperial gallon (gal or IG)
a traditional unit of volume equal to about 1.201 U.S. liquid gallon or 4.546 liters. See gallon [3]. In Canada, the term "Imperial" is used frequently to distinguish the British Imperial units from the corresponding U.S. units.
Imperial units
the units of the British Imperial system, adopted by Parliament in 1824. The basic units of the system are the foot, the avoirdupois pound, and the Imperial pint. The Weights and Measures Acts of 1963 and 1985 have redefined the Imperial units in term of the SI units. The Imperial units remain in varying degrees of use in Britain, Canada, Australia, and other areas of British heritage despite the introduction of metric units there. Americans should note that the Imperial foot and pound are essentially the same as the units used in the U.S., but the Imperial pint is significantly larger than the U.S. liquid and dry pints.
inch (in or ") [1]
a traditional unit of distance equal to 1/12 foot or exactly 2.54 centimeters. The Old English word *ynce* is derived from the Latin *uncia*, meaning a 1/12 part; thus "inch" and "ounce" actually have the same root. The inch was originally defined in England in two ways: as the length of three barleycorns laid end to end, or as the width of a man's thumb at the base of the nail. The barleycorn definition is peculiarly English, but the thumb-width definition is generic. In fact, in many European languages the word for inch also means *thumb*: examples include the Dutch duim, Swedish tum, French pouce, and Spanish pulgada. In the history of English units the inch seems to come before the foot: after the Norman conquest of 1066 the foot was defined to equal 12 inches, rather than the inch being defined as 1/12 foot.
inch (in or ") [2]
one of several traditional units of pressure. Air pressure is measured traditionally in inches of mercury (next entry) and water pressure in inches of water column (following entry).
inch of mercury (in Hg)
a traditional unit of atmospheric pressure. In the United States, atmospheric pressure is customarily expressed as the height of a column of mercury exerting the same pressure as the atmosphere. When a traditional mercury barometer is used, this height is read directly as the height of the mercury column. These readings must be corrected for temperature since mercury, like most liquids, tends to expand as it warms. The conventional equivalent of one inch of mercury is 0.491 153 pounds per square inch or 3.386 38 kilopascals (33.8638 millibars). In the symbol for the unit, Hg is the chemical symbol for mercury; it comes from the Latin word *hydrargyrum*("water-silver") for the liquid metal.
inch of water column (in WC)
a traditional unit of pressure, used in plumbing to describe both water and gas pressures. The conventional equivalent of one inch of water is 249.0889 pascals, which is 2.490 889 millibars, about 0.036 127 pounds per square inch (psi) or about 0.073 556 inches (1.868 32 millimeters) of mercury.
inch of water gauge (in wg or "wg)
another common name for the inch of water column. The word "gauge" (or "gage") after a pressure reading indicates that the pressure stated is actually the difference between the absolute, or total, pressure and the air pressure at the time of the reading.
inch pound (in·lbf or in lb)
a traditional unit of work or energy, equal to 1/12 foot pound, about

0.112 985 joule or 1.0709 x 10^{-4} Btu.

in d.

abbreviation for the Latin *in die*, daily, a unit of frequency used in medical prescriptions.

inhour (ih or inhr)

a unit used in nuclear engineering to describe the "reactivity" of a nuclear reactor. In a reactor, fast-moving neutrons break apart atoms of uranium or plutonium; the fission of these atoms releases additional neutrons which keep the reaction going. The ratio R between the number of neutrons created and the number consumed in each cycle of fission must be very close to 1 in order for the reaction to be controlled. The reactivity is the difference $k = R - 1$ between this ratio and 1. One inhour is the reactivity which will cause the number of neutrons to increase by a factor of $e = 2.71828$ in one hour; a reactivity of t inhours will cause the number of neutrons to increase by a factor of e in $1/t$ hours. The exact size of the unit varies according to the design of the reactor. Enrico Fermi (1901-1954), the Italian-American physicist who built the first nuclear reactor, introduced this unit in 1947; its name is an acronym for "inverse hours." Other reactivity measures include the dollar and the milli-k.

international foot

the current foot unit of the English-speaking countries, equal to exactly 30.48 centimeters. See survey foot for additional information.

international nautical mile

the nautical mile as currently defined by international agreement, equal to exactly 1852 meters or 6076.11549 feet. This long name is sometimes used to distinguish the current nautical mile from older units.

international rubber hardness degree (IRHD)

a unit used to measure the hardness of rubber and similar materials (technically known as elastomers). Measurements are made using an IRHD durometer, and the results are usually similar, but not identical, to readings made with the older Shore "A" durometer. The International Organization for Standardization (ISO) and the American Society for Testing and Materials (ASTM), among other standards agencies, have published IRHD test procedures.

international unit (IU)

a unit used to measure the activity (that is, the effect) of many vitamins and drugs. For each substance to which this unit applies, there is an international agreement specifying the biological effect expected with a dose of 1 IU. Other quantities of the substance are then expressed as multiples of this standard. Examples: 1 IU represents 45.5 micrograms of a standard preparation of insulin or 0.6 microgram of a standard preparation of penicillin. Consumers most often see IU's on the labels of vitamin packages: in standard preparations the equivalent of 1 IU is 0.3 microgram (0.0003 mg) for vitamin A, 50 micrograms (0.05 mg) for vitamin C, 25 nanograms (0.000 025 mg) for vitamin D, and 2/3 milligram for (natural) vitamin E. Please note: for many substances there is no definite conversion between international units and mass units (such as milligrams). This is because preparations of those substances vary in activity, so that the effect per milligram of one preparation is different from that of another.

Internet time

a global decimal time system proposed by the Swatch Corporation. See beat for more information.

ips

an abbreviation for inches per second (in/s), a traditional unit of velocity equal to 2.54 centimeters per second.

ipy

an abbreviation for inches per year (in/yr), a traditional unit for corrosion rates.

Irish acre

a traditional unit of land area in Ireland, equal to 160 square Irish perches (see next entry). This is equivalent in English units to 7840 square yards, 70 560 square feet, or about 1.6198 English acre (0.6555 hectare). The colpa, a traditional Irish unit of pasturage, is approximately equal to the Irish acre.

Irish mile

the traditional mile in Ireland is 6720 feet, which is 1.272 727 English

mile or 2.048 256 kilometers. The discrepancy arose because the Irish perch, or rod, was standardized at 21 feet instead of the English figure of 16.5 feet. Just as in England, the Irish chain was equal to 4 perches (84 feet instead of 66 feet), the Irish furlongwas equal to 10 chains (840 feet instead of 660 feet) and the mile was equal to 8 furlongs.

iron

a traditional unit measuring the thickness of leather used in making shoes, especially the soles of the shoes. One iron is equal to 1/48 inch (0.5292 millimeter), so a sole 1/4 inch thick is described as "12 iron." The origin of this unit is unclear; comments from knowledgeable readers would be welcome!

ISO

the "short name" of the International Organization for Standardization. Based in Switzerland, the ISO sets international industrial standards, including standards for the use of units of measurements. For ISO film ratings, see ASA.

IT calorie

common name for the **international steam table calorie**, a unit of energy equal to exactly 4.1868 joules. See calorie.

J

jag

a traditional British name for a small load, especially a small load of hay. Never standardized, the jag represented roughly 20-25 bushels (0.7-1.0 cubic meters).

jansky (Jy)

a unit used in radio astronomy to measure the strength, or more precisely the flux density, of radio signals from space. In measuring signal strength, it's necessary to take into account both the area of the receiving antenna and the width of the frequency band in which the signal occurs. Accordingly, one jansky equals a flux of 10^{-26} watts per square meter of receiving area per hertz of frequency band (W/m^2Hz). Although it is not an SI unit, the jansky is approved by the International Astronomical Union and is widely used by astronomers. It honors Karl G. Jansky (1905-1950), the American electrical engineer who discovered radio waves from space in 1930. The jansky is sometimes called the **flux unit**.

jar

a traditional unit of electric capacitance, approximately equal to the capacitance of one of the Leiden jars used in electrical experiments as long ago as the eighteenth century. Benjamin Franklin is said to have measured the storage power of his electrical equipment in jars. There are 9×10^8 jars in a farad, so 1 jar is approximately 1.1 nanofarad.

jerib or djerib

a traditional unit of land area in the Middle East and southwestern Asia. The jerib originally varied considerably from one area to another. In modern times it has become identified with the hectare in many countries, including Turkey and Iran. In Afghanistan, however, it is usually equal to 1/5 hectare (2000 square meters or 0.494 acre).

jerk

a name sometimes used by engineers for the rate of change in the acceleration of an object. This is not as silly as it might sound, because when we're in a vehicle and feel a jerk, we are in fact experiencing a change in the acceleration of the vehicle. The term has also been used as a unit of rate of change in acceleration equal to a change in acceleration of one foot per second per second in one second, that is, 1 ft/sec^3. In this usage, one jerk equals 0.3048 m/s^3 or about 0.03108*g* /sec.

jeroboam

a large wine bottle holding about 3 liters, 4 times the volume of a regular bottle. A jeroboam is sometimes called a **double magnum**.

Jersey foot

a traditional unit of distance in Jersey, one of the Channel Islands. Also called the *pied-perche*, the Jersey foot is equal to 11 English inches or 0.9167 English foot. The Jersey foot is divided into 12 **Jersey inches**, making 13.09 Jersey inches to an English foot.

jiffy [1]

a unit of time used in computer engineering. A jiffy is the length of one

cycle, or **tick**, of the computer's system clock. In the past, this was often equal to one period of the alternating current powering the computer: 1/60 second in the U.S. and Canada, usually 1/50 second elsewhere. More recently the jiffy has become standardized, more or less, as 0.01 second (10 milliseconds). The word jiffy, with its ordinary meaning of an instant or very brief time, appeared in English during the eighteenth century, but its origin is not known.

jiffy [2]

a unit of time used in chemistry and physics, equal to a "light centimeter," that is, the time required for light to travel a distance of one centimeter. This is a very brief interval indeed, about 33.3564 picoseconds. This definition of the jiffy was proposed by the American physical chemist Gilbert N. Lewis (1875-1946), who was one of the first to apply principles of quantum physics in chemistry. More recently, some physicists have defined the jiffy as the time required for light to travel a distance of one femtometer (fermi); this would make the jiffy equal to 3.335 64 zeptoseconds.

jigger

a unit of volume for liquor, usually considered equal to 1.5 (U.S.) fluid ounces or 44.360 milliliters.

jin

a traditional unit of weight in China, comparable to the English pound. During the European colonial era the jin was identified with the catty, a Malay unit widely used in various forms throughout East and Southeast Asia. Like the catty, the jin was then equal to 1 1/3 pounds or 604.79 grams. Traditionally, it was divided into 16 liang. In modern China, however, the jin is a metric unit equal to exactly 500 grams (1.1023 pounds) and divided into 10 liang. The kilogram itself is usually called the **gongjin**, or "metric jin" (see gong-). The spellings **chin** and **gin** also have been used for the jin.

jitro

a traditional unit of land area in the Czech Republic, identical to the Austrian joch (see below).

jo

an informal unit of area used in Japan to measure the size of rooms in houses and apartments. One jo is the area of a traditional tatami mat, 180 by 90 centimeters or 1.62 square meters (1.94 square yards).

joch

a traditional unit of area in German speaking countries, especially in Austria. One joch is the area of a square 40 klafters (about 83 yards) on a side. This comes to 0.5755 hectare or about 1.422 acres. The plural is **joche**. Joch is also the word for a yoke in German, so this unit represents an area that could be plowed in a day by a yoke of oxen. In what is now the Czech Republic this unit was known as the **jitro**; in Croatia it is the **jutro**.

Jones

a unit of detectivity, that is, the ability of an electronic device to detect radiant energy such as light waves or infrared radiation. In a 1959 paper, R. Clark Jones defined the "specific detectivity" of a device to be $D^* = [\text{square root } (Aw)]/N$, where A is the area of the detector, w is the frequency bandwidth, and N is the power of the noise generated by the device. The quantity D^* is measured in the complex unit $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$, customarily called the "Jones." In modern equipment, detectivities are often quite large, in the range of 10^9 to 10^{12} Jones.

joule (J)

the SI unit of work or energy, defined to be the work done by a force of one newton acting to move an object through a distance of one meter in the direction in which the force is applied. Equivalently, since kinetic energy is one half the mass times the square of the velocity, one joule is the kinetic energy of a mass of two kilograms moving at a velocity of 1 m/s. This is the same as 10^7 ergs in the CGS system, or approximately 0.737 562 foot-pound in the traditional English system. In other energy units, one joule equals about $9.478\ 170 \times 10^{-4}$ Btu, 0.238 846 (small) calories, or $2.777\ 778 \times 10^{-4}$ watt hour. The joule is named for the British physicist James Prescott Joule (1818-1889), who demonstrated the equivalence of mechanical and thermal energy in a famous experiment in 1843. Although Joule pronounced his name "jowl", the unit is usually pronounced "jool" or "jew'l".

journal
a traditional unit of land area in France, equal to the area that could be plowed in a day (*jour* is the French word for day). The unit varied from one region to another, generally in the range 0.3-0.45 hectare (0.75-1.1 acres). The juchart (see below) was a very similar unit used in Switzerland and southern Germany.

JTU
abbreviation for Jackson turbidity unit, a unit formerly used in measuring water quality. The turbidity of water was measured by lighting a candle under a tall glass tube and filling the tube with the water sample until an observer looking down the tube could no longer see the candle flame through the water. The height of the water column determines the turbidity in Jackson turbidity units, using a table constructed for this purpose. Turbidity is usually measured now in a different unit, the NTU, using an instrument called a nephelometer.

juchart or juchert
a traditional unit of land area in southern Germany and German-speaking Switzerland. Like the Austrian joch and the French journal (see above), the juchart represents an area that could be plowed in a day by a yoke of oxen. The juchart varied considerably from place to place, but often it was about 4000 square meters, very close to the size of the English acre. In Bavaria, the juchart was standardized early in the nineteenth century at 3407.27 square meters (0.8420 acre). In Switzerland, after the introduction of the metric system in the mid nineteenth century, the juchart was generally understood to equal 3600 square meters (0.8896 acre). The joch, the journal, and the juchart are ultimately derived from a Roman unit, the **jugerum**, which was smaller, about 2500 square meters. The unit is also called the **tagwerk**("day's work").

jug
an informal name for the Scots pint, a unit of volume equal to about 1.80 U.S. liquid quarts or 1.70 liters. Specifically, the **jug of Stirling** is the actual vessel (on display at the Stirling Museum) which was the legal standard for Scottish volume measurements prior to the introduction of the British Imperial units.

Julian day (JD)
a continuous count of days beginning with January 1, 4713 BC (-4712 CE), which is start of what is called the **Julian period**. The French scholar Joseph Justus Scaliger (1540-1609) introduced the Julian period in 1582 (the same year the Gregorian calendar was proclaimed), defining it to be 7980 years, the product of the 28-year cycle of the Julian calendar (after which the days of the week recur on the same dates), the 19-year Metonic cycle (after which the phases of the Moon recur on the same dates), and the 15-year indiction cycle (a unit of civil time in ancient Rome). It happens that 4713 BC is the last year in which all three cycles started simultaneously. In 1849 the British astronomer John Herschel introduced the Julian day as a means of providing an exact date for astronomical events independent of all calendars. The Julian day begins at noon Universal Time, and exact times of observations are expressed using decimal fractions of the Julian day. The first moment of the year 2004 CE, Universal Time, was JD 2 453 005.5. See also modified Julian day.

Julian epoch (J)
a measure of time used in astronomy. The word *epoch* comes from Greek, and means a fixed or standard instant of time. Other times are stated with reference to this fixed time using years and fractions of years. In 1984, astronomers agreed to fix the standard epoch at 12 hours Universal Time of 2000 January 1 (JD 2 451 545.0). This instant is designated J2000.0. Other times are specified with reference to this time using a year of length 365.25 days, the average length of the year in the Julian calendar. This means that J2001.0, for example, is 18 hours Universal Time of 2001 January 1 (exactly 365.25 days after J2000.0). See Julian year, below.

Julian period
a unit of time equal to exactly 7980 years in the Julian calendar, that is, exactly 2 914 695 days. See Julian day, above.

Julian year (a)
the average length of the year in the Julian calendar, equal to exactly

365.25 days. See year [2]. Astronomers use Julian years in computing the motions of planets and other bodies of the Solar System. This simplifies their calculations, but the results must then be translated to give accurate times in other calendars.

Jupiter

a unit of mass, now being used in astronomy to express the masses of new planets being discovered in orbit around various stars. It's equal to the mass of the planet Jupiter, estimated to be about 1.899×10^{24} metric tons, or, if you please, 1.899 yottatonnes (Yt). By coincidence, this is approximately 0.001 Sun (0.000 955 Sun, to be more exact); it is also about 317.7 times the mass of the Earth.

jutro

a traditional unit of land area in Croatia, the jutro equals 5754.64 square meters (1.422 acres), identical to the Austrian joch (see above) and Czech jitro. This is the area of a square 40 hvati on a side. The word means "morning," that is, it represents the area that could be plowed in one morning. The plural is **jutra**.

K

K

an informal abbreviation for one thousand used in expressions where the unit is understood, such as "10K run" (10 kilometers) or "700K disk" (700 kilobytes or kibibytes). Note that "K" is also the symbol for the kelvin (see below) and is often used as a symbol for the karat. Also note that the symbol for the metric prefix kilo- (1000) is actually k-, not K-. In computer science, K often represents $2^{10} = 1024$ (see below under kibi- and kilo-).

kaf

a symbol for 1000 acre feet. This symbol is commonly used in reservoir management in the U.S. 1 kaf = about 1.2335 million cubic meters.

kairi

the Japanese name for the nautical mile.

kanal

a traditional unit of land area in Pakistan, equal to 20 marlas. Under British rule the marla and kanal were standardized so that the kanal equals exactly 605 square yards or 1/8 acre; this is equivalent to about 505.857 square meters.

kappland

a traditional unit of land area in Sweden. The kappland is equal to 1/32 tunnland or 1750 square Stockholm feet (*kvadratfot*); this is equivalent to 154.26 square meters or about 184.50 square yards.

karat (kt) [1]

a traditional unit of mass for precious stones, now spelled carat in both Britain and the U.S.

karat (kt or K) [2]

a traditional measure of proportion equal to 1/24, used by U.S. jewelers to express the purity of gold alloys. Thus "14-karat gold" is legally required to be at least 14/24, or 58.3%, gold. In Britain this unit is spelled **carat**, like the weight unit for diamonds and other precious stones. American jewelers apparently spell the unit of gold purity with the "k" and the weight unit with the "c" in order to distinguish more clearly between them. (In German, both units are spelled with the "k".)

katal (kat)

a unit of catalytic activity used especially in the chemistry of enzymes. A catalyst is a substance that starts or speeds a chemical reaction. Enzymes are proteins that act as catalysts within the bodies of living plants and animals. A catalyst has an activity of one katal if it enables a reaction to proceed at the rate of one mole per second. The unit, pronounced "cattle," was added to the International System at the 21st General Conference of Weights and Measures in October 1999.

kati

a traditional Malaysian unit of weight, usually spelled catty in English.

kattha or katta

a traditional unit of land area in South Asia, equal to 20 dhurs or 1/20 bigha. Like the bigha, the kattha varied in size from one region to another. In Nepal, where the unit is still in use, the kattha equals about 338 square meters or 442 square yards.

kayser (K)
a CGS unit used to measure light and other electromagnetic waves. The "wave number" in kaysers equals the number of wavelengths per centimeter; thus 1 kayser equals 100 per meter (m^{-1}). The unit honors J. H. G. Kayser (1853-1940), who compiled a giant atlas of chemical spectra. The unit is often abbreviated K, although this conflicts with the symbol for the kelvin.

kbp
a symbol for 1000 base pairs, used in biochemistry and genetics. As is well known, DNA has the form of a double helix, with bases on one strand paired with bases on the other strand. Thus the length of a segment or fragment of DNA is measured by the number of base pairs.

kBtu
a symbol for 1000 British thermal units. This unit of energy equals about 1.055 megajoules (MJ) or 0.2931 kilowatt hour (kWh).

kcmil
a symbol for 1000 circular mils, a unit of area equal to about 0.5067 square millimeter commonly used in stating wire gauges.

keddah
a traditional Egyptian unit of liquid volume also used in other parts of the Middle East. The keddah is equal to about 2.0625 liter (about 2.18 U.S. liquid quarts or 1.815 British Imperial quarts).

keel
a traditional British unit of weight for coal. After considerable variation, the keel of coal was standardized in 1695 as 21.2 long tons, or 47 488 pounds (21.5402 metric tons). This is the approximate weight of coal carried at that time by barges on the river Tyne in northern England; the barges were also called keels, from the Dutch word *kiel* for such a ship.

keg [1]
a traditional unit of volume or quantity, varying with the item contained in the keg. A keg of herring, for example, contains 60 fish. A keg of wine is frequently 12 U.S.gallons (about 45.42 liters), and a keg of beer is 1/2 barrel or 15.5 U.S. gallons (about 58.67 liters). "Keg" comes from an old Norse word for a small barrel.

keg [2]
a traditional unit of weight for nails. A keg of nails weighs 100 pounds and thus has a mass of about 45.359 kilograms.

kelvin (K)
the SI base unit of temperature, previously called the **degree Kelvin (°K)**. One kelvin represents the same temperature difference as one degree Celsius. In 1967 the General Conference on Weights and Measures defined the temperature of the triple point of water (the temperature at which water exists simultaneously in the gaseous, liquid, and solid states) to be exactly 273.16 kelvins. Since this temperature is also equal to 0.01 °C, the temperature in kelvins is always equal to 273.15 plus the temperature in degrees Celsius. The kelvin equals exactly 1.8 degrees Fahrenheit. The unit is named for the British mathematician and physicist William Thomson (1824-1907), later known as Lord Kelvin after he was named Baron Kelvin of Largs. He is best remembered for his pioneering work on the physics of heat, but he was also a strong advocate of the metric system; his support helped establish the now-familiar electrical units such as the ohm, volt, and farad.

ken
a traditional Japanese unit of length comparable to the English fathom. The ken equals 6 shaku, which is about 1.818 meters (5.965 feet). The ken is the length of a traditional tatami mat. At sea, this unit is also called the **hiro**.

kerat
a traditional Middle Eastern unit of length, equal to about 9/8 inch or 2.86 centimeters. The unit has the same Arabic root as the carat or karat.

key
slang for kilo, meaning kilogram.

kgm
an incorrect symbol for the kilogram (see below). The correct symbol is kg. In engineering, "kgm" is sometimes used to distinguish "kilogram mass" from "kilogram force" (kgf). This practice is not recommended.

kgr
another incorrect (but fairly common) symbol for the kilogram. The

proper symbol is **kg**.

kgsc

a non-standard symbol for kilograms (of force) per square centimeter.

kibi- (Ki-)

a binary prefix meaning $2^{10} = 1024$. This prefix, adopted by the International Electrotechnical Commission in 1998, was supposed to replace kilo- for binary applications in computer science. Thus 1024 bytes of storage is officially a **kibibyte**, not a kilobyte. However, computer professionals generally dislike this unit (they say it sounds like a cat food) so the ambiguity in the size of a kilobyte persists. The prefix is a contraction of "kilobinary." The symbol Ki-, rather than ki-, was chosen for uniformity with the other binary prefixes (Mi-, Gi-, etc.).

kilderkin

an old British unit of volume equal to 1/2 barrel or 2 firkins. Based on the current British barrel, this would be 18 (Imperial) gallons, which is about 2.9 cubic feet or 78 liters. Older kilderkins were generally in the range of 16-18 gallons. The word comes from a Dutch word for a small cask.

kilo

a common informal name for a kilogram.

kilo- (k-) [1]

a metric prefix meaning 1000. The prefix is a modification of *chilioi,* the Greek word for a thousand.

kilo- (k-) [2]

in measuring the memory of a computer, the prefix kilo- often means $2^{10} = 1024$ instead of 1000. By a 1998 resolution of the International Electrotechnical Commission, the new prefix kibi- (Ki-) should replace kilo- for 2^{10}. However, this doesn't seem to be happening.

kiloampere (kA)

a unit of electric current equal to 1000 amperes.

kilobar (kbar or kb)

a metric unit of pressure, used particularly in industrial applications and in geology for measuring high pressures. The kilobar equals 1000 bars, 100 megapascals, or about 14 503 pounds per square inch. (Note: in the investment world a kilobar is a bar of gold, silver, or platinum weighing 1 kilogram.)

kilobase (kb)

a unit of genetic information equal to the information carried by 1000 pairs of the base units in the double-helix of DNA; also used as a unit of relative distance equal to the length of a strand of DNA containing 1000 base pairs.

kilobecquerel (kBq)

a unit of radioactivity equal to 1000 atomic disintegrations per second or 27.027 nanocuries (nCi).

kilobit (kbit or kb)

a unit of information equal to 1000 bits, or, in some cases, equal to 1024 bits or 128 bytes. The larger unit is now supposed to be called a **kibibit**.

kilobit per second (kbps, kb/s)

a unit of data transmission rate equal to 1000 bits per second. The symbol kb/s is preferable to kbps for this unit.

kilobyte (kB)

a unit of information equal to 1000 bytes. As a unit of computer storage, however, the kilobyte is usually equal to 1024 bytes, although this should now be called a**kibibyte**.

kilocalorie (kcal)

an ambiguous metric unit of energy. The ambiguity arises because there are two "calories" in common use, identified in this dictionary as the calorie (the small or gram calorie equal to 4.1868 kilojoules) and the Calorie (the large or kilogram calorie equal to 4.1868 megajoules). The term kilocalorie properly means 1000 calories, which is the same as 1 Calorie. In other words, "kilocalorie" is the correct name for the unit known in nutrition simply as the "calorie."

kilocurie (kCi)

a unit of radioactivity equal to 1000 curies or 37 terabecquerels (TBq), that is, 37 trillion atomic disintegrations per second. The strength of the powerful radiation sources used in cancer therapy are customarily stated in kilocuries.

kilocycle (kc)
1000 cycles; a term sometimes used as an informal name for the kilohertz.
kilocycle per second (kc/s)
an older name for the kilohertz.
kilodalton (kDa)
a unit of mass equal to 1000 atomic mass units. See dalton.
kiloelectronvolt (keV)
a unit of work or energy used in physics, equal to 1000 electronvolts.
kilofoot (kft)
a traditional unit of distance equal to 1000 feet or exactly 304.8 meters. This odd combination of a metric prefix and an English unit is used in telecommunications to describe cable lengths and transmission distances.
kilogauss (kGs)
a metric unit of magnetic flux density equal to 1000 gauss or 0.1 tesla. The strength of industrial magnets and solenoids is often expressed in kilogauss, although this unit is being replaced gradually by the tesla.
kilogram (kg) [1]
the base unit of mass in the SI and MKS versions of the metric system. The kilogram is defined as the mass of the standard kilogram, a platinum-iridium bar in the custody of the International Bureau of Weights and Measures (BIPM) near Paris, France. Copies of this bar are kept by the standards agencies of all the major industrial nations, including the U.S. National Institute of Standards and Technology (NIST). One kilogram equals exactly 1000 grams, or about 2.204 622 6 pounds. By design, this is approximately the mass of a liter of water.
kilogram (kg) [2]
a unit of force; see below under **kilogram force**.
kilogram calorie (kcal or kgcal)
the "large calorie" or "food calorie" used in nutrition, equal to 1000 ordinary ("gram") calories. The correct name for this unit is kilocalorie.
kilogram force (kgf)
a unit of force equal to the gravitational force on a mass of one kilogram.

One kilogram of force equals 9.806 65 newtons, or 2.204 622 6 pounds of force in the traditional English system. Using this unit revives the old confusion between mass and weight, one of the worst features of traditional measurement systems, so it is really a very bad idea. However, kilograms of force have been used rather frequently in engineering and physics. This unit is also called the **kilopond**.
kilogram meter (kgf·m or kg·m) [1]
a metric unit of work or energy equal to 9.806 65 joules (J). This is the work done by one kilogram of force (see below) acting through a distance of one meter.
kilogram meter (kgf·m or kg·m) [2]
a metric unit of torque equal to 9.806 65 newton meters (N·m).
kilogram mole, kilogram molecule, kilogram molecular weight (kgmol or kgmole)
various older names for a unit of the amount of a chemical compound. One kilogram mole of a compound is the number of kilograms of the compound equal to the molecular weight of a molecule of that compound measured in atomic mass units. The correct name for this unit is the kilomole (kmol).
kilogram (force) per square centimeter (kgf/cm^2 or kg/cm^2 or kgsc)
a common metric unit of pressure equal to 98.0665 kilopascals (see below) or about 14.2234 pounds per square inch (lbf/in^2 or psi). Similarly, one kilogram force per square meter is equal to 9.806 65 pascals.
kilogram weight (kgf)
a kilogram force (see above).
kilohertz (kHz)
a common unit of frequency equal to 1000 per second or 1 per millisecond. AM radio stations have signal frequencies measured in kilohertz.
kilojoule (kJ)
a common metric unit of work or energy, comparable to the British thermal unit (Btu). In fact, one kilojoule equals approximately 0.947 817 Btu. In other energy units, the kilojoule is also equivalent to 0.238

846 kilocalories, 0.277 778 watt hour, or 737.562 foot-pounds in the traditional English system.

kilokibibyte

a unit of computer memory equal to exactly 1 024 000 bytes. Storage on floppy disks is traditionally stated in multiples of this unit, which has usually been called a "megabyte." But a megabyte should be 1 000 000 bytes, or with a binary understanding it should be 2^{20} = 1 048 576 bytes, and this unit doesn't fit either convention.

kiloline

a metric unit of magnetic flux, equal to 1000 lines [2] or 10 microwebers.

kiloliter (kl or kL)

a metric unit of volume. The kiloliter is identical to the cubic meter: it equals about 35.3147 ft^3, 1.307 95 yd^3, 264.17 U.S. gallons, 219.99 British Imperial gallons, 7.497 U.S. bushels, or 6.049 British Imperial bushels.

kilomega- (kM-)

an obsolete metric prefix denoting 10^9 (1 U.S. billion). This prefix has been replaced by giga- (G-).

kilometer (km)

a common metric unit of length or distance. One kilometer equals exactly 1000 meters, about 0.621 371 19 mile, 1093.6133 yards, or 3280.8399 feet. Oddly, higher multiples of the meter are rarely used; even the distances to the farthest galaxies are usually measured in kilometers. The unit is sometimes pronounced with the accent on the first syllable (similar to the pronunciation of other metric units using kilo-) and sometimes on the second (helping to distinguish it from other metric units using kilo-). Both pronunciations are acceptable; there are no official pronunciations for SI units.

kilometer per hour (km/h)

a common metric unit of speed or velocity. 1 km/h is equal to 5/18 meter per second, 0.621 371 19 miles per hour or 0.911 344 42 feet per second. The only correct symbol for this unit is **km/h**; variations such as kmph or kph should not be used.

kilometer per liter (km/L or km/l)

a fairly common unit of fuel consumption rate for vehicles. Outside the U.S., the official measurement of fuel efficiency is usually liters per 100 kilometers, but many people prefer to express the measurement in kilometers per liter. One kilometer per liter is equal to about 2.352 146 miles per U.S. gallon or 2.824 809 miles perImperial gallon. A consumption rate of x kilometers per liter is equivalent to $100/x$ liters per 100 kilometers.

kilomole (kmol)

a unit of amount of substance equal to 1000 moles. One kilomole of a compound is the number of kilograms of the compound equal to the molecular weight of a molecule of that compound in atomic mass units. The kilomole was formerly called the **kilogram mole**.

kilonewton (kN)

a common metric unit of force, the kilonewton equals 1000 newtons; it is a force that will accelerate a mass of 1 metric ton at the rate of 1 meter per second per second. One kilonewton equals 101.972 kilograms of force, 224.809 pounds of force or 7233.01 poundals.

kilohm or kiloohm

a unit of electric resistance equal to 1000 ohms. The simplified spelling kilohm is approved by the Institute of Electrical and Electronics Engineers (IEEE).

kilo-oersted (kOe)

a CGS unit of magnetic field strength equivalent in MKS units to 79 577.472 ampere-turns per meter. The unit, used for stating the field strengths of industrial magnets, is almost always spelled with the hyphen.

kiloparsec (kpc)

a unit of distance used in astronomy, the kiloparsec equals 1000 parsecs, 3261.631 light years, 3.085 678 x 10^{16} kilometers, or about 19.18 quadrillion miles. The Solar System is located about 8 kiloparsecs from the center of the Milky Way galaxy.

kilopascal (kPa)

a common metric unit of pressure. One kilopascal equals

1000 pascals (Pa), 10 millibars (mb), or about 0.145 038 pounds per square inch (lbf/in^2 or psi), 20.8855 pounds per square foot, 7.502 millimeters of mercury (mm Hg), 0.2953 inches of mercury (in Hg), 4.015 inches of water column (in WC), or 0.3346 foot of head (ft hd).

kilopond (kp)
another name for the kilogram of force (kgf) (see above).

kilorad (krad)
a common unit of radiation dose equal to 1000 rads, 10 grays, or 10 joules of energy per kilogram of mass.

kilosecond (ks or ksec)
a unit of time equal to 1000 seconds (16 minutes 40 seconds). Although it is never used in ordinary life, the kilosecond has many uses in science. One day is equal to 86.4 kiloseconds.

kiloton (kt or KT or kton) [**1**]
an ambiguous unit of mass, ambiguous because it may refer to 1000 U.S. tons (907 185 kilograms), 1000 British tons (1 016 047 kilograms), or 1000 metric tons (1 million kilograms, or 1 gigagram). To reduce this confusion, the metric unit should be written **kilotonne**.

kiloton (kt or KT or kton) [**2**]
a unit of explosive energy equal to 10^{12} thermochemical calories (or one teracalorie). This is approximately the energy released by exploding 1000 U.S. tons (2 million pounds) of TNT. The kiloton is equal to exactly 4.184 terajoules (4.184×10^{12} joules) or about 4 billion Btu.

kilovolt (kV)
a common unit of electric potential equal to 1000 volts. Electric distribution lines operate at potentials of anywhere from several to several hundred kilovolts.

kilovolt ampere (kV·A)
a common unit of load in power engineering, equal to 1000 volt amperes.

kilowatt (kW)
a common metric unit of power, equivalent to 1000 watts, about 1.341 022 horsepower, or 737.562 foot-pounds per second.

kilowatt hour (kW·h or KWH or kw hr)
a commercial unit of electric energy. One kilowatt hour represents the amount of energy delivered at a rate of 1000 watts over a period of one hour. Since the watt is 1 joule/sec and there are 3600 seconds in an hour, the kilowatt hour is equivalent to exactly 3.6 megajoules of energy, or about 3412.141 Btu, 859.846 (kilogram)Calories, or about 2.655 million foot pounds.

kilowatt year (kW·yr)
a commercial unit of electric energy. One kilowatt year represents the amount of energy delivered at a rate of 1000 watts over a period of one year. This equals 8760 kilowatt hours for an ordinary (365 day) year or 8784 kilowatt hours for a leap year. For greater accuracy, it's best to use 365.25 days per year; with this definition, the kilowatt year is exactly 8766 kilowatt hours or 31.5576 gigajoules; this is about 1.2463 million Btu or 969.8 million foot-pounds.

kiloyard (kyd)
a traditional unit of distance equal to 1000 yards (exactly 914.4 meters). This unit is used in the U.S., British, and Commonwealth navies in describing ship distances and target ranges.

kiloyear (kyr)
a unit of time equal to 1000 years, commonly used in archaeology, paleontology, climatology, and related sciences. Of course, a kiloyear is the same as a millennium.

kin
the Japanese version of the catty, a common weight unit of the Far East. The Japanese identified this unit with a traditional unit equal to about 1.323 pounds or almost exactly 600 grams; this is about 0.75% smaller than the Chinese catty.

kip [**1**]
an informal unit of force, sometimes used by engineers to express the amount of weight borne by a structure. One kip equals 1000 pounds (453.59 kilograms) of force or about 4.4482 kilonewtons. The name of the unit is an abbreviation of "kilopound."

kip [**2**]
a symbol for 1000 inch pounds, used as a unit of energy or torque. In this

usage one kip is equal to 83.333 foot pounds (lbf·ft), 112.985 joules (J), or, for torque, 112.985 newton meters (N·m).

kip [3]
an old English word for a bundle of hides. It was sometimes used as a unit of quantity, usually equal to 50.

klafter [1]
a traditional unit of distance in German-speaking countries, comparable to the English fathom. The Austrian klafter is equal to 1.8965 meters (6.22 feet). In Switzerland the klafter was brought into the metric system at exactly 1.8 meters (5.9055 feet). This unit is also called the **faden**.

klafter [2]
a traditional German unit of volume for stacked firewood, comparable to the English cord. A klafter of wood was generally 1 klafter tall and 1 klafter long, but there was less agreement on its width, that is, the length of the logs. A common width was 3 fuss or 0.5 klafter, making the volume about 3.41 steres (cubic meters) or 0.941 cord by the Viennese definition, 3.34 steres or 0.921 cord in northern Germany.

klick, klik
see click.

kmph
a common but incorrect symbol for kilometers per hour. The correct symbol is km/h.

km/t
a symbol for "kilometer per time," used on road signs in Scandinavia, especially Norway, for kilometers per hour.

Knoop hardness (HK or KHN)
a measure of the hardness of a metal introduced by Knoop in 1939. The Knoop test is similar to the Vickers test in that a diamond penetrator is used to indent the sample being tested, but it uses a rhombohedral diamond rather than a pyramidal diamond point. It is similar to the Rockwell test in that the hardness measure is the depth of the penetration rather than its area. The result is measured in kilograms of force per square millimeter but should be stated as an empirical measurement, without units.

knot (kn or kt) [1]
a unit of velocity equal to one nautical mile per hour. Knots are customarily used to express speeds at sea, including the speed of the ship as well as the speeds of the wind and of the current. The word comes from the former method of measuring a ship's speed, which involved use of a knotted cord called the log line. One knot equals about 1.1508 miles per hour, exactly 1.852 kilometers per hour, or 0.5143 meters per second. Since kt is the established symbol for the kilotonne, **kn** is the best choice as a symbol for the knot.

knot [2]
an informal unit of distance equal to the nautical mile.

köddi
a traditional Arabic unit of volume, equal to about 4/3 British Imperial gallon or 7.58 liters.

koku
a traditional Japanese unit of volume, equal to about 180.391 liters (39.68 British Imperial gallons or 6.37 cubic feet). The unit originated as an estimate of the amount of rice needed to feed a person for a year.

kommerzlast
German for "commercial load," now interpreted as a metric unit equal to exactly 3 tonnes (about 6613.9 pounds).

kon
Korean name for the catty.

koyan
a Far Eastern unit of weight equal to 4000 catty or 5333.33 pounds (8/3 short ton).

kph
a common but incorrect symbol for kilometers per hour. The correct symbol is km/h.

krina
a traditional unit of volume in Bulgaria, now expressed in the metric system as being equal to exactly 20 liters (4.40 British Imperial gallons or 5.28 U.S. liquid gallons).

Krügerl or Krügel

a common unit of volume for beer in Austria, equal to 1/2 liter. The name of the unit is related to *Krug*, a jug or tankard.

ksf, ksi

symbol for kips (kilopounds) per square foot or per square inch, traditional engineering units of pressure or stress. 1 ksf = 47.880 257 kilopascals (kPa) and 1 ksi = 6.894 757 megapascals (MPa). These units are often used to express the strength of materials (meaning the maximum pressure the material can resist).

ksym/s

a unit of radio transmission rate equal to 1000 symbols per second.

kulmet

a traditional Latvian unit of volume equal to about 10.93 liters (2.40 British Imperial gallons or 2.89 U.S. liquid gallons). A similar Estonian unit, the **külimet**, equals about 11.48 liters (2.53 British Imperial gallons or 3.03 U.S. liquid gallons).

kunitz or Kunitz unit

a unit used in biochemistry to describe the concentration or activity of the enzyme ribonuclease, which attacks ribonucleic acid (RNA). The action of the enzyme causes an increase in the absorbance of ultraviolet light. One kunitz is the concentration of the enzyme causing an increase in absorbance at a wavelength of 260 nm by 0.001 per mL of enzyme when acting upon highly polymerized DNA at 25 C and pH 5.0 under specified conditions. The unit's name recognizes the Russian-American biochemist M. Kunitz, who proposed the standard test in 1946.

kvadrat-

Scandinavian prefix meaning "square." In particular, a **kvadratmeter** is a square meter. The prefix is common to Danish, Norwegian, and Swedish.

kwan

a traditional Japanese unit of weight equal to 6.25 kin (see above), which is about 8.27 pounds or 3.75 kilograms.

kya

a common abbreviation (in English speaking countries) for "thousand years ago." The "k" is the metric symbol for kilo- (1000).

kyu

a metric unit of distance used in typography and graphic design. The kyu, originally written Q, is equal to exactly 0.25 millimeter, about 0.71 point [2], or about 14.173twips. The spelling "kyu" seems to have been introduced by the software company Macromedia.

Kz

an improper symbol sometimes used mistakenly for the kilohertz (kHz).

L

L

the Roman numeral 50.

L, l

symbols for the liter. The lowercase l is the official symbol, but because it is so easily confused with the numeral 1 the SI permits the capital letter L to be used instead. Sometimes a script version of the lowercase letter is used, but this is not approved by the SI.

láb

the traditional Hungarian foot, equal to about 31.6 centimeters (12.44 English inches). This was the Hungarian version of the Viennese fuß.

labor

a traditional unit of area in Latin American countries. The labor is equal to the area of a square 1000 varas on a side, or 0.04 legua. Using the Texas standard for the vara (33 1/3 inches), this is equivalent to 177.136 acres or 71.685 hectares. The word *labor* means work in Spanish, as it does in English. As a unit it represents the area that could be cultivated by a single farmer, somewhat like the old English hide.

lachter

a traditional unit of length used in mining in Germany and other German-speaking regions. A variation on the fathom, the unit varied regionally (and even from mine to mine) but it was usually close to 2 meters (about 78.74 inches). The lachter was divided into 8 spann or into 80 lachterzoll.

lachterzoll

the "lachter inch," a traditional unit of length equal to 1/80 lachter

(previous entry). This was roughly 2.5 cm, about the same as the English inch but a bit shorter than the standard German zoll. In the 1900s, a decimal lachterzoll equal to 1/100 lachter was also used; this was about 2 cm (0.78 inch or 0.76 zoll).

lai

see rai.

lakh or lac

a traditional unit of quantity in India, equal to 10^5 or 100 000. In India the lakh is used commonly instead of the million and commas are used to isolate the number of lakh; for example, the number 5 300 000 is called 53 lakh and written "53,00,000". See also crore.

lambda [1]

a metric unit of volume equal to the cubic millimeter (mm^3) or microliter (μL). The lambda has been used in chemistry in measuring very small samples. The symbol is the lower case Greek letter lambda.

lambda [2]

a unit of relative distance used in the design of integrated circuits in microelectronics. These circuits are usually designed to be "scalable," so that the same design can be repeated on ever-smaller chips as technology improves. The "feature size" of a design is the width of its smallest element, and one lambda equals one half the feature size. Lambdas of a few tenths of a micrometer (micron) are common.

lambert (La or Lb or L)

a CGS unit of luminance. Luminance is the luminous intensity of a surface, measuring the intensity of the light emitted (or reflected) in all directions per unit of area of the surface. One lambert is the luminance of a surface that emits or reflects one lumen per square centimeter. The lambert is a large unit, and practical measurements tend to be in millilamberts (mLa). A geometric calculation shows that a surface area having an intensity of one candela per square meter emits a total light flux of pi lumens per square meter; as a result, one lambert equals 10^4/pi = 3183.099 candelas per square meter and 1 millilambert equals 3.183 099 candelas per square meter. The lambert honors the German physicist Johann Lambert (1728-1777), who showed that the illuminance of a surface is inversely proportional to the square of the distance from the light source. There has never been agreement on the symbol for the lambert; **La** is a good choice because it is unlikely to be confused with any other unit symbol.

lanac

a traditional unit of land area in countries of the former Yugoslavia. Usage varies. In Serbia, the lanac is equal to about 0.56 hectare (1.38 acres), making it the Serbian equivalent of the Austrian joch and Croatian jutro. In Croatia, however, the lanac is a larger unit equal to 0.7193 hectare (1.777 acres). The word "lanac" means "chain", presumably referring to surveyors' use of chains in measuring land.

land mile

the ordinary statute mile, equal to 5280 feet or 1609.344 meters, is sometimes called a "land mile" to distinguish it from the nautical mile. Similarly, a **land league** is equal to 3 statute miles (5280 yards or 4828.03 meters) as distinguished from 3 nautical miles.

lane meter

a unit of deck area for "roll on/roll off" ships: cargo vessels designed so that containers or other cargo can be rolled on and off the decks of the ship. A lane is a strip of deck 2 meters wide. A lane meter is an area of deck one lane wide and one meter long, that is, 2 square meters (21.528 square feet).

langdo

a traditional unit of land area in Bhutan. Like many European land units, the langdo is the area that a team of oxen can plow in a day. If the land is dry, a langdo is about 1/7 hectare or 1/3 acre; for a wet paddy field the langdo is about 1/10 hectare or 1/4 acre.

langley (Ly)

a CGS unit of heat transmission equal to one thermochemical calorie per square centimeter, or exactly 41.84 kilojoules per square meter (kJ/m^2). Named for the American astronomer Samuel P. Langley (1834-1906), the langley is used to express the rate of solar radiation received by the earth.

lap
an informal unit of distance used in athletic competitions. In athletics ("track"), a lap is the length of one trip around a running track. This may vary from track to track, but at the level of serious competition most tracks have a standard length. In English speaking countries this was formerly 1/4 mile (1320 feet or 402.336 meters). Tracks used in most competitions today have a length of exactly 400 meters (1312.34 feet). In swimming, a lap is one tour of the pool, that is, twice the length of the pool, a distance of exactly 100 meters (328.08 feet) in Olympic-size pools but only 50 meters (164.04 feet) in many recreational and "short-course" pools.

last
an ancient northern European unit used in measuring large quantities, either by mass or volume or both. "Last" is the German word for "load," a meaning which also survives in the English word "ballast." Generally the last is approximately 4000 pounds (about 1800 kilograms) as a mass unit or 80 bushels (about 3 cubic meters) as a volume unit. In the U.S., a last of wool was formerly 12 sacks at 364 pounds per sack, or 4368 pounds (1981.3 kilograms). In the Netherlands, the last is a metric unit of volume equal to exactly 3 cubic meters. In Germany, where the last was previously a volume unit equal to 2.819 cubic meters, it's also a metric unit of mass equal to 2 metric tons (about 4409 pounds). In Britain, a **Riga last** of timber is 80 cubic feet (2.265 cubic meters) of square-sawn timber.

lb, lbf, lbm
lb is the traditional symbol in English, Spanish, and Italian for the pound, derived from the Latin word *libra* for the Roman version of the same unit. The symbols lbf and lbm are used to distinguish between pounds of force and pounds of mass, respectively.

LD
see lunar distance (below).

lea
a traditional unit of length for yarn, varying with the weight of the fibers in the yarn. Typically a lea of wool is 80 yards (73 meters); a lea of cotton or silk 120 yards (110 meters); and a lea of linen 300 yards (274 meters). For cotton and wool, a lea is equal to 1/7 hank. A lea is sometimes called a **skein**.

league
a traditional unit of distance. Derived from an ancient Celtic unit and adopted by the Romans as the *leuga*, the league became a common unit of measurement throughout western Europe. It was intended to represent, roughly, the distance a person could walk in an hour. The Celtic unit seems to have been rather short (about 1.5 Roman miles, which is roughly 1.4 statute miles or 2275 meters), but the unit grew longer over time. In many cases it was equal to 3 miles, using whatever version of the mile was current. At sea, the league was most often equal to 3 nautical miles, which is 1/20 degree [2], 3.45 statute miles, or exactly 5556 meters. In the U.S. and Britain, standard practice is to define the league to be 3 statute miles (about 4828.03 meters) on land or 3 nautical miles at sea. However, many occurrences of the "league" in English-language works are actually references to the Spanish league (the legua), the Portuguese league (legoa) or the French league (lieue). For these units, see below on this page. In the classic Jules Verne novel *Twenty Thousand Leagues under the Sea* (*Vingt Mille Lieues sous les Mers*) the unit in the title is the French metric *lieue*, equal to exactly 4000 meters.

leap
a traditional Welsh unit of distance equal to 6 feet 9 inches or 2.0574 meters.

leap second
an extra second added at the end of a day (June 30 or December 31) to realign timekeeping with the earth's rate of rotation. See day for details.

leap year
a unit of civil time equal to 366 days. See year [2]. Normally, the day of the week on which a specific date falls advances by one day from year to year. For example, August 1 falls on Tuesday in 2006 and on Wednesday in 2007. But following the addition of a extra day on February 29, a date "leaps" over a day of the week: in 2008, a leap year, August 1 leaps over

Thursday to fall on Friday. A leap year is sometimes called a bissextile year.

legua [1]

the Spanish league. The traditional legua is equal to 5000 varas, which is close to 2.6 miles or 4.2 kilometers. Using the Texas definition of the vara, the legua is 2.6305 miles, 13889 feet, or 4233.4 meters. Using the traditional Spanish definition, it would be 2.597 miles, 13712 feet, or 4179.4 meters. Technically, this unit was abolished by Philip II in 1568, but it remained in rather wide use, especially in the Americas. During the late 18th and early 19th centuries, a league of 8000 varas (4.15 miles or 6680 meters) was legal in Spain. At sea, Spanish sailors used the usual marine league (3 nautical miles or 5556 meters) or Philip V's "geographical" league of 1/17.5 degree (3.429 nautical miles or 6350.5 meters). At present, the legua is used informally in Argentina and in other Spanish-speaking countries as a metric unit equal to exactly 5 kilometers (3.107 miles).

legua [2]

a traditional Spanish unit of area equal to one square legua [1]. In Spanish-speaking Latin America and the southwestern states of the U.S. land was customarily measured in leguas, with 1 legua equal to 25 labors (see above) or 25 million square varas. Using the Texas definition of the vara as the starting point, the legua is 4428.4 acres, 6.919 square miles, 1792 hectares, or 17.92 square kilometers. A slightly larger figure, 4439 acres (1796 hectares), is used in California. Larger sizes, between 1800 and 1900 hectares, were formerly used in some parts of South America. In Mexico and Texas, this unit is often called a **sitio**.

légua or legoa

the Portuguese league, equal to 3 milhas (Portuguese miles). This is equal to about 3.836 statute miles or 6174.1 meters.

length (lg)

an informal unit of distance. The distance between competitors in horse races, boat races, and similar situations is naturally expressed in lengths, with one length equal to the average length of a horse, boat, etc. In horse racing, the length of a horse is often understood to be about 8 feet or 2.4 meters. However, since the horses are moving a different speeds the distance between them as they near the finish line is changing. To avoid this uncertainty, the reported distance in lengths is often computed as 5 times the difference in their running times in seconds. This means the length is actually interpreted as a unit of time equal to 1/5 second. (Since the speed of a thoroughbred horse often exceeds 50 feet per second, this calculation understates the distance.)

lethal dose (LD)

a measure used in pharmacology to express the percentage of a population killed by a dose of the substance being studied. The measurement is often given as a subscript. For example, the potency of a drug or pesticide is commonly expressed by stating the size of the LD_{50} dose: the amount of the substance that kills 50% of the test population.

li

a traditional unit of distance in China. A Confucian proverb widely misquoted in the West as "a journey of a thousand miles begins with a single step" actually says "a journey of a thousand li begins with a single step." Although the traditional li was approximately 1/3 mile or 500 meters, the late Imperial governments of China used a li of 1800 ch'ih, which is 2115 feet, about 0.401 mile, or 644.65 meters. In modern China, the li equals exactly 0.5 kilometer or 500 meters. In Chinese, the kilometer itself is usually called a gongli, or "metric li" (see gong).

liang

a traditional Chinese weight unit. During the European colonial period the liang was equal to 1/16 catty, 1/12 pound, or about 37.8 grams; this made it the same as atael. In modern China, the liang equals 1/10 jin or 10 qian; this is exactly 50 grams (1.7637 ounces).

libra or libbra (lb)

a traditional unit of weight in Italian, Spanish, and Portuguese speaking countries. The libra was the Roman unit from which the English pound is descended; the symbol "lb" for the pound comes from this unit. The Roman libra contained only 12 unciae (ounces) and was about 0.722 English pound. The traditional Italian libbra was

often of similar size, but a wide variety of libbras were used in Italian markets over the centuries. The Spanish and Portuguese units are larger, generally in the range from 1.011 to 1.016 English pound (very close to 460 grams). The Spanish libra equals 16 onzas, and the Portuguese libra equals 16 onças. The word "libra" is sometimes used now for the kilogram, a much larger unit.

lieue

the French league. A variety of lieue units were used for land measurement in France, but generally these units were around 2.4-2.5 statute miles in length. In the 18th century, the legal unit was the *lieue de poste*, defined to equal 2000 toises or 2 *milles* (2.4221 miles or 3898 meters). In metric France the lieue is now considered to equal exactly 4 kilometers (2.4855 miles). See league (above). At sea, the lieue was often taken to equal 1/25 degree [2] or 2.4 nautical miles (4445 meters or 2.7619 miles); this unit was gradually replaced by the internationally recognized 3 nautical miles (5556 meters or 3.452 miles). In the classic Jules Verne novel *Vingt Mille Lieues sous les Mers* (*Twenty Thousand Leagues under the Sea*) the unit in the title is the metric *lieue* of exactly 4000 meters.

light second

a unit of distance equal to the distance light travels in a vacuum in one second. In accordance with the official definition of the meter, this distance is exactly 299 792 458 meters (about 186 282.4 miles). Similarly, a **light minute** is 60 light seconds (about 17 987 547 kilometers or 11 176 944 miles) and a **light day** is 1440 light minutes (about 25.902 billion kilometers or 16.095 billion miles).

light watt

a unit measuring the relative power output of a light source. Calculating the power delivered in the form of visible light is rather complicated. For a monochromatic (single frequency) light source such as a laser, the power in light watts equals $683V(l)$, where l is the wavelength of the light and $V(l)$ is the relative power in watts perlumen (W/lm) required to produce a constant brightness sensation in the eye at wavelength l. Values of $V(l)$ are defined by the International Commission on Illumination (CIE). The maximum value of $V(l)$ is 1/683 W/lm = 1.464 mW/lm at the wavelength l = 555 nanometers (nm), the wavelength to which the eye is most sensitive. When the source delivers light over a range of frequencies (as a light bulb does), it is necessary to compute 683 times the integral of $V(l)$ multiplied by the fraction of energy delivered at wavelength l. See also candela and talbot.

light year (ly)

a unit of distance used in astronomy. One light year is the distance that light travels in one year through a vacuum (and, of course, most of the Universe is close to being a vacuum). In the official definition of the International Astronomical Union, the light year is based on the Julian year of exactly 365.25 days or 31 557 600 seconds and the defined speed of light c = 299,792,458 meters per second. Thus one light year equals exactly 9 460 730 472 580.8 kilometers, or 9 460 730 472 580 800 meters. One light year is approximately 5.880 trillion miles.

ligne

a traditional unit of distance in French speaking countries, equal to 1/12 pouce (French inch) and corresponding closely to the English line [1]. The Swiss ligne is used throughout the world by watchmakers; it equals about 2.256 millimeters (0.0888 inch) and is divided into 12 douzièmes. In English the ligne is often pronounced "lean."

ligula

a Roman unit of liquid volume equal to 1/48 sextarius or about 11.07 milliliters. The word literally means "a lick."

line (li or ''') [1]

a traditional unit of distance equal to 1/12 inch (about 2.1167 millimeters). For measuring the thickness of buttons, there is also a smaller line equal to 1/40 inch (0.635 millimeter). The line is called the **ligne** (see above) in French, the **linea** in Spanish, the **linie** in German, and the **liniya** in Russian.

line (li) [2]

a former name for the maxwell, the CGS unit of magnetic flux. The unit was called the line because magnetic fields were traditionally represented by lines depicting the direction of the field; the idea was to quantify the

strength of these lines. This is a small unit, so fields were often measured in megalines; one megaline is equal to 0.01 weber.

line [3]

a traditional unit of area used in printing and advertising, equal to 1/14 inch (1.814 millimeters) multiplied by the width of the printed line. This usage is short for agate line.

linear foot (or "lineal" foot) (ft or lf)

terms used loosely to describe a one-foot length of any long, narrow object. The correct term is **linear foot**; the word "lineal" refers to a line of ancestry, not to length. Boards, pipes, and fencing are typical objects measured and sold by the linear foot. In the moving industry, a linear foot is a one-foot length of a moving van, usually a volume of about 72 cubic feet (roughly 2 cubic meters). Occasionally the term "linear foot" is used as an alternate name for the board foot, but this is appropriate only if the board is 12 inches wide. Terms such as **linear meter** and **linear yard** are used in a similar way to indicate one-meter or one-yard lengths.

link

a traditional unit of distance used by surveyors, equal to 0.01 chain. In Britain, one link is exactly 0.66 feet, or 7.92 inches, or approximately 20.12 centimeters. In the U.S., both 66-foot and 100-foot chains have been used; for a 100-foot chain the link is the same as the foot.

lippie

a traditional unit of volume in Scotland equal to 1/4 Scots peck. This was about 2.27 liters for wheat, peas, or beans and about 3.04 liters for barley or oats.

liter or litre (L or l)

the common metric unit of volume. The liter was originally defined to be the volume occupied by a kilogram of water, and the gram as the mass of a cubic centimeter of water. This would make the liter equal to exactly one cubic decimeter, that is, to the volume of a cube 0.1 meter (or 10 centimeters) on a side. Unfortunately, the physical objects constructed to represent the meter and kilogram disagreed slightly. As measured by the standard meter and standard kilogram, the standard liter turned out to be about 1.000 028 cubic decimeters. This discrepancy plagued the metric system for a long time. In 1901 an international congress accepted the discrepancy and formally defined the liter to be exactly 1.000 028 dm^3. No one was particularly happy with such an awkward definition, and in 1964 the CGPM repealed the definition. In the SI, volumes are to be measured in cubic meters or power-of-ten multiples thereof, not in liters. However, the SI states that the liter "may be employed as a special name for the cubic decimeter." Throughout this dictionary, the liter is used as a name for exactly 1 cubic decimeter, 1000 cubic centimeters, or 0.001 cubic meter. In its renewed guise as the cubic decimeter, the liter is approximately 61.023 744 cubic inches. Compared to the customary volume units, the liter is a little more than a U. S. liquid quart (1.056 688 qt or 33.814 fluid ounces) but a little less than a U. S. dry quart (0.908 08 qt) or a British Imperial quart (0.879 89 qt or 35.195 fluid ounces). Its name comes from a French volume unit, the *litron*, which was in turn derived from the Latin *litra*. The original symbol for the liter was the lower case letter l, but since 1979 the upper case L has also been accepted. The U.S. Department of Commerce specifies that L be used, at least by businesses, to avoid confusion with the numeral 1. The unit is spelled **liter** in the U.S. and **litre** in Britain; there are many other spellings in various languages (see Spelling of Metric Units).

liter atmosphere (L·atm)

a unit of work or energy used in the study of confined gases. The behavior of gases is described, to a first approximation, by the ideal gas law PV = nRT. The ideal gas law is really an energy equation in which the left hand side, pressure P (in atmospheres) times volume V (in liters), measures the potential energy in the confined gas. One liter atmosphere is equal to 101.325 joules, 0.09605 Btu or 74.73 foot pounds.

liter per 100 kilometers (L/100 km)

a measure of fuel consumption rate for vehicles used widely in Europe and elsewhere. Although this unit is specified in the regulations of several countries, it violates SI rules for naming units. The equivalent SI unit is centiliters per kilometer (cL/km). In the U.S., fuel consumption

is stated as the number of miles driven per U.S. gallon of fuel consumed; a consumption rate of *x* liters per 100 km equals exactly 100/*x* liters per kilometer or about 235.215/*x* miles per gallon. In the British Commonwealth, fuel consumption was (and sometimes still is) measured in miles per Imperial gallon; *x* liters per 100 kilometers is equal to 282.481/*x* miles per Imperial gallon.

liter per mil (L/mil)

a measure of fuel consumption rate for vehicles used in Sweden. The Scandinavian mil [4] is equal to 10 kilometers, so 1 liter per mil equals 10 liters per 100 kilometers.

livre

a traditional unit of weight in French speaking countries and in Greece. The livre corresponds to the English pound and to the Spanish libra (see above). The livre is divided into 2 marcs or into 16 onces. The French livre varied from market to market, but the official standard from about 1350 to the introduction of the metric system was the *livre poids de marc* or *livre de Paris* of 489.5 grams (1.079 English pounds). In modern France, the livre is used as an informal metric unit equal to exactly 500 grams or 0.5 kilogram (1.1023 pounds). The traditional Greek livre is also about 500 grams.

load

a traditional, generally informal, unit of volume. In U.S. landscaping and some construction trades a load often means a cubic yard (0.764555 m^3). In ordinary language in the U.S., a load often means the volume of a pickup truck, a varying unit. In Britain prior to modern times, a load was sometimes a standardized unit, but it varied with the commodity being carried. A typical size was 40 bushels (roughly 1.4 cubic meters).

long hundredweight

the British hundredweight, equal to 112 pounds.

long ton

the traditional British ton, equal to 2240 pounds.

longword

a unit of information generally equal to 2 words [2].

lot

a traditional unit of weight in German speaking countries, equal to about 1/2 ounce or 15 grams. "Lot" is the German word for a lead plumbbob, so the unit represents a small lead weight.

Lovibond color units

see degree Lovibond.

Lpf

symbol for liters per flush, a specification found on toilets. U.S. government regulations now require plumbers to install only low-flush toilets of 6.0 Lpf or less. 1 Lpf = 0.264 U.S. gallon per flush (gpf).

lpi

abbreviation for lines per inch, a unit used to state the resolution of display devices (such as television or computer monitor screens), or to state the line spacing of printed pages.

lug [1]

an old English name for a rod [1] (5.5 yards or 5.0292 meters). In some parts of England this unit represented a longer rod of 7 yards (6.4008 meters), a unit also called the **great lug**.

lug [2]

a shallow box or crate for produce such as cherries, grapes, or peaches. The size of a lug varies with the item it contains. Typical lugs hold about 16-28 pounds (7-13 kilograms) of produce in a volume of roughly 1/3 bushel (about 12 liters). This unit seems to be particularly common in produce markets in the midwestern U.S.

lumberg

an older name for the talbot, the unit of luminous (light) energy equal to 1 lumen second.

lumen (lm)

the SI unit for measuring the flux of light being produced by a light source or received by a surface. The intensity of a light source is measured in candelas. One lumen represents the total flux of light emitted, equal to the intensity in candelas multiplied by the solid angle in steradians (1/(4·pi) of a sphere) into which the light is emitted. Thus the total flux of a one-candela light, if the light is emitted uniformly in all directions, is 4·pi lumens. "Lumen" is a Latin word for light.

lumen hour (lm h)
a unit of quantity of light, equal to one lumen of light flux continued for one hour. The **lumen second (lm s)** is defined similarly.
lunar day
another name for the tidal day, a unit of time equal to 24 hours 50 minutes used in tidal predictions.
lunar distance (LD)
the average distance between the Earth and the Moon (technically, the length of the semimajor axis of the Moon's orbit). This unit, equal to about 384 401 kilometers or 238 855 miles, is used to measure the "miss distances" of asteroids passing near the Earth.
lunar month, lunation
names for the average interval between two successive new moons, a unit of time equal to 29.530 59 days. See month [1].
lusec
a unit of power used to express the performance or leakage of vacuum pumps. One lusec represents a flow of one liter per second at a pressure of one micrometer (or micron) of mercury, or 1 L·μmHg/s. Since "u" is sometimes used as a symbol for the micron, the name of the unit is an acronym for liter-micron/second. One lusec is equivalent to 0.001 315 6 atm·cm^3/s or 133.3 Pa·cm^3/s, which is the same as 133.3 microwatts.
luster, lustre, lustrum
a traditional unit of time equal to 5 years. In ancient Rome the Lustrum was a ceremony of expiation and purification for the whole population of the city, carried out every 5 years after the completion of the census. The use of luster or lustrum as a unit of time in English was fairly common in well-educated circles as long as "well-educated" meant classically educated; the unit has pretty much disappeared today.
lux (lx)
the SI unit for measuring the illumination (illuminance) of a surface. One lux is defined as an illumination of one lumen per square meter or 0.0001 phot. In considering the various light units, it's useful to think about light originating at a point and shining upon a surface. The intensity of the light source is measured in candelas; the total light flux in transit is measured in lumens (1 lumen = 1 candela·steradian); and the amount of light received per unit of surface area is measured in lux (1 lux = 1 lumen/square meter). One lux is equal to approximately 0.09290 foot candle.

M

M [1]
an informal abbreviation for million in expressions such as "$500M" for 500 million dollars or "Unemployment Reaches 4M" in a newspaper headline. In binary contexts such as computer memory, M often represents 2^{20} = 1 048 576 (see mebi-, below).
M [2]
the Roman numeral 1000, sometimes used in symbols to indicate a thousand, as in **Mcf**, a traditional symbol for 1000 cubic feet. Given the widespread use of M to mean one million, this older use of M to mean one thousand is very confusing and should be scrapped.
M [3]
the symbol for "molar" in chemistry (see below).
Ma
a symbol for one million years, often used in astronomy and geology. The "a" stands for the Latin *annum*.
mab
symbol for "meters above bottom" (bottom of the sea), a unit used in oceanography.
mace
a traditional Chinese unit for weighing precious metals, especially silver. In the European colonial period, the mace was considered equal to 0.1 tael or liang; this would be 2/15 ounce or about 3.78 grams.
Mach or mach (M or Ma)
a measure of relative velocity, used to express the speed of an aircraft relative to the speed of sound. The name of the unit is often placed before the measurement. Thus "Mach 1.0" is the speed of sound, "Mach 2.0" is twice the speed of sound, and so on. (The actual speed of sound

varies, depending on the density and temperature of the atmosphere. At 0 °C and a pressure of 1 atmosphere the speed of sound is about 1088 ft/s, 331.6 m/s, or 741.8 mi/h). The mach speed is important to the control of an aircraft, especially at speeds close to or exceeding Mach 1.0. The unit is named for the Austrian physicist Ernst Mach (1838-1916).

maf or Maf

a symbol for one million acre feet. This symbol, commonly used in reservoir management in the U.S., should be written **Maf**. 1 Maf = about 1.2335 billion (10^9) cubic meters.

magnitude (mag) [1]

a unit traditionally used in astronomy to express the apparent brightness of stars, planets, and other objects in the sky. For centuries, the brightest stars were said to be of the "first magnitude," with fainter ones of the "second magnitude" and so on down to "sixth magnitude" for the faintest stars visible to the unaided eye. When it became possible to measure stellar brightnesses precisely, it was discovered that stars of a given traditional magnitude were roughly 2.5 times brighter than stars of the next magnitude. Astronomers agreed to define the magnitude scale so that a difference of exactly 5.0 mag corresponds to a brightness difference of exactly 100 times. A difference of 1.0 mag then corresponds to a brightness difference of the fifth root of 100 or about 2.512 times. The scale is upside down: brighter stars have lower, not higher magnitudes, in keeping with the historical origin of the scale. The zero point (0.0 mag) is set arbitrarily so that the stars historically listed as "first magnitude" have magnitude measurements of 1.5 mag or brighter. The brightest stars and planets have negative magnitudes on this scale.

magnitude (mag) [2]

a unit used in earth science to measure the intensity of earthquakes. Geologists actually use several scales to measure earthquake intensity, but the one best known to the public is the Richter magnitude scale, developed in 1935 by Charles F. Richter (1900-1985) of the California Institute of Technology. The Richter magnitude is computed from the measured amplitude and frequency of the earthquake's shock waves received by a seismograph, adjusted to account for the distance between the observing station and the epicenter of the earthquake. An increase of 1.0 in the Richter magnitude corresponds to an increase of 10 times in the amplitude of the waves and to an increase of about 31 times more energy released by the quake. The most powerful earthquakes recorded so far had magnitudes of about 8.5. The Richter magnitude measures the intensity of the earthquake itself, not the intensity of the earthquake's effects: the effects also depend on the depth of the earthquake, the geology of the area around the epicenter, and many other factors. Earthquake effects are rated using the Mercalli scale (see below).

magnum

a traditional unit of volume for wine, generally equal to 2 bottles. This is now exactly 1.5 liters (about 2.114 U.S. quarts).

mahnd

a traditional Arab weight unit equal to about 2.04 pounds or 925 grams.

mål

a Norwegian word for "measure," mål has been used as a name for various traditional Norwegian units. As a land measure, the mål is currently defined to be the same as the dekare, that is, exactly 1000 square meters (0.1 hectare or 0.2471 acre). The mål has also been used as a unit of volume equal to the dekaliter (10 liters).

mandel

a traditional German unit of quantity equal to 15.

man hour

a common unit of labor equal to the work of one person for one hour. The name **person hour** is increasingly used for this unit.

manpower

an informal unit of power equal to 0.1 horsepower or about 74.57 watts. The unit seems to have been invented by American engineers.

manzana

a traditional unit of land area in Central America. The manzana is the area of a square 100 varas on a side; it thus varies according to the length of the vara. The Costa Rican manzana equals 0.698 896 hectares or about 1.727 acres. Very similar units are used in Guatemala, Honduras, and Nicaragua. The word *manzana* means an apple, but the unit is

probably related to *manzanar*, orchard.

marathon

a traditional unit of distance used in athletics. The length of a marathon is exactly 42 195 meters (about half an inch longer than 26 miles 385 yards). Invented for the first modern Olympic Games at Athens in 1896, the marathon recalls a run made in 490 BC by a Greek soldier (possibly Pheidippides) to bring to Athens the news of the Greek victory over the Persians at the Battle of Marathon. However, the actual distance from Marathon to Athens is only about 36.75 kilometers. The 1896 run was exactly 40 kilometers from the Marathon Bridge to the Olympic Stadium. At the 1908 Olympics in London, a course of 26 miles 385 yards brought runners from Windsor Castle to White City Stadium (the story is that exactly 26 miles was intended, but Queen Alexandra insisted that the finish line be moved in front of the royal box). The marathons at the Olympic Games varied in length until the 1924 Olympics in Paris, when the International Olympic Committee adopted the 1908 London distance as official.

marc, marco, or mark

traditional units of weight in various countries of Western Europe. In each country the unit equals 1/2 the unit corresponding to the English pound. Thus the French**marc** equals 1/2 livre, 8 onces or about 244.75 grams; the Spanish **marco** equals 1/2 libra or about 230 grams; the German mark equals 1/2 pfund or about 280.5 grams; and the English mark equals 8 ounces or 226.8 grams. The English unit was used almost entirely for measuring precious metals.

marine league

an informal name for the league as used at sea: a unit of distance generally equal to 3 nautical miles (5556 meters).

mark twain

see twain.

marla

a traditional unit of area in Pakistan. The marla was standardized under British rule to be equal to the square rod [1], that is, 272.25 square feet, 30.25 square yards, or 25.2929 square meters.

mas

symbol for milliarcsecond, a unit of angular measure commonly used in astronomy.

masha

a traditional unit of mass in India and Pakistan, standardized under British rule as 15 grains, 1/12 tola, or about 0.972 gram. In Pakistan, the unit is still used sometimes for the weight of precious metals.

masl

a common symbol for "meters above sea level" used in geology and geography.

maß (mass)

a unit of volume for beer in Germany and Austria, usually equal to one liter today. The traditional Bavarian maß was about 1.07 liters.

mAU

a symbol for the milli-absorbance unit. An increase in absorbance of 1 mAU corresponds to a reduction in transmittance of about 0.2305%.

maund

a traditional unit of weight in India and throughout South Asia. The maund varied considerably, but during the period of British rule in India it was standardized at about 82.286 pounds or 37.3242 kilograms. The maund is divided into 40 seers. Since 1980, Pakistan has used a metric version of the maund equal to exactly 40 kilograms (88.185 pounds), thus making the seer equal to the kilogram.

maxwell (Mx)

a CGS unit of magnetic flux, equal to 10^{-8} weber. In a magnetic field of strength one gauss, one maxwell is the total flux across a surface of one square centimeter perpendicular to the field. This unit was formerly called the line [2]. The newer name honors the British physicist James Clerk Maxwell (1831-1879), who presented the unified theory of electromagnetism in 1864.

MBF or MBM

traditional symbols for 1000 (not one million) board feet, a unit of volume for timber equal to 250/3 = 83.333 cubic feet or 2.360 cubic meters. "BM" stands for "board measure."

mbsl
a common symbol for "meters below sea level" used in geology and oceanography.

MBH, MBtuh
symbols for 1000 (not one million) Btu (British thermal units) per hour, a unit traditionally used in the U.S. heating and air conditioning industry to state rates of heating or cooling. One MBH equals about 0.293 071 kilowatt.

mc- or mc [**1**]
alternate symbol for micro- (see below). This prefix is often seen in the symbol **mcg** for the microgram. The use of the symbol mc- for micro- became established because typewriters and early dot matrix printers did not have the proper symbol µ-. Also, many hospitals require the use of mc- in all handwritten notes and records, because a hastily written "µ" may be mistaken for an "m," leading to serious dosing errors. However, the use of mc- for micro- is also confusing and should be avoided as much as possible. One source of confusion is that mc- may be interpreted as "millicenti-", a mistake that could also lead to dangerous dosing errors. Occasionally, **mc** has been used as a symbol for the micron (see below).

mc [**2**]
Italian abbreviation for the cubic meter (*metro cubico*). This is a non-standard symbol; the proper symbol is m^3.

MCF
a traditional symbol for 1000 (not one million) cubic feet, a unit of volume equal to about 28.317 cubic meters.

Mcfd
a symbol for 1000 (not one million) cubic feet per day, a unit of water flow used by many U.S. water supply companies and agencies. 1 Mcfd = 19.665 liters (5.195 U.S. gallons) per minute.

Mcfe
a symbol used in the natural gas industry for 1000 (not one million) cubic feet of gas equivalent (cfe). This is really an energy unit equal to about 1.091 gigajoules (GJ).

mcg
an alternate symbol for the microgram. Although the SI symbol µg is preferable in print, the symbol mcg is used widely in medicine, and its use is required in many hospitals and clinics. This is because a handwritten µg is too easily mistaken for the milligram symbol mg, possibly leading to serious medical errors.

mcL
a symbol sometimes used for the microliter (µL).

MCM
a symbol for 1000 circular mils, a unit of area equal to about 0.5067 square millimeter commonly used in stating wire gauges. This symbol is being replaced by the less-confusing symbol **kcmil**.

MCU
a symbol for **milk clotting unit**, used for measuring dosage of bromelain, an enzyme used as a digestive aid and for reduction of pain and inflammation. This unit cannot be converted to a weight unit, because different preparations of the enzyme differ in activity. Bromelain is also measured in gelatin digesting units (GDU); 1 MCU equals approximately 2/3 GDU.

mease
a unit of quantity formerly used by fishermen. The mease equals the number of herring in a basket, roughly 620.

measure
a musical unit representing a series of beats [2] (rhythmic stresses) with one primary or accented stress. A measure is also called a **bar** because the end of a measure is represented in musical notation by a vertical bar.

measurement ton (MTON or MT)
a unit of volume used for measuring the cargo of a ship, truck, train, or other freight carrier, equal to exactly 40 cubic feet, or approximately 1.1326 cubic meters. This unit was traditionally called a freight ton (see ton [5]), but that term now means a metric ton of freight in most international usage. However, the confusion seems impossible to dispel; some shippers are now using "measurement ton" to mean a metric ton of freight. (The way out of this dilemma is simple: measure volume in cubic

meters and weight in metric tons.)

mebi- (Mi-)

a binary prefix meaning 2^{20} = 1 048 576. This prefix, adopted by the International Electrotechnical Commission in 1998, is intended to replace mega- for binary applications in computer science. (This replacement does not seem to be happening.) The prefix is a contraction of "megabinary."

MED

a common symbol for "minimum erythemal dose," the smallest amount of ultraviolet radiation that produces observable reddening (erythema) of the skin. (Skin is sensitive to reddening by radiation in only a narrow band of wavelengths around 300 nanometers.) The MED obviously varies from one person to another. Doctors and tanning salon operators typically use a value of 200 joules per square meter (J/m^2), which represents the MED of a highly sensitive individual; persons with dark skin have MED's in the range of 1000 J/m^2. Regulatory agencies are moving to use of the standard erythemal dose (SED), a unit equal to exactly 100 J/m^2. In tanning, a dose rate of one MED per hour is equivalent to 55.55 milliwatts per square meter of skin surface.

meg

informal contraction of "megabyte," used in computer science.

mega- (M-) [1]

a metric prefix meaning 10^6, or one million. (The form meg- is often used before a vowel, as in *megohm* for one million ohms.) The prefix is also common in ordinary language, meaning "very large," as in *megabucks* or *megadose*. The prefix is derived from the Greek word for large, *megas*.

mega- (M-) [2]

in measuring the storage capacity of a computer, the prefix mega- often means 2^{20} = 1 048 576 instead of an even one million. By a 1998 resolution of the International Electrotechnical Commission, the new prefix mebi- (Mi-) is supposed to replace mega- for 2^{20}.

megabar (Mbar)

a metric unit of pressure. The megabar equals one million bars, 100 gigapascals (GPa) or about 14.503 million pounds per square inch. Such intense pressures are found inside the earth or in various advanced scientific experiments.

megabarrel (Mbbl, Mbo, MMb, or Mb)

a unit of volume used in the energy industry, equal to one million barrels of oil. One megabarrel equals 42 million U. S. gallons, which is about 158.987 megaliters (ML).

megabase (Mb)

a unit of genetic information equal to the information carried by 1 million pairs of the base units in the double-helix of DNA; also used as a unit of relative distance equal to the length of a strand of DNA containing 1 million base pairs. In humans, one megabase corresponds approximately to a gene separation of one centimorgan.

megabecquerel (MBq)

a unit of radioactivity equal to one million atomic disintegrations per second or 27.027 microcuries.

megabyte (MB)

this unit of information is very common in the computer world, but it is poorly defined. Often it means 1 000 000 bytes, but sometimes it means 2^{20} = 1 048 576 bytes. As if that weren't confusing enough, the 1.44 megabytes stored on "high density" floppy disks are actually megabytes of 1 024 000 bytes each. This uncertainty is a major reason for the recent decision of the International Electrotechnical Commission to establish new binary prefixes for computer science.

megacycle (Mc)

1 million cycles, a term sometimes used as an informal name for the megahertz.

megacycle per second (Mc/s)

an older name for the megahertz.

megadalton (MDa)

a unit of mass equal to one million atomic mass units. See dalton.

megaflops (Mflops)

a unit of computing power equal to one million floating point operations per second. See flops.

megagram (Mg)
an SI unit of mass equal to one million grams or 1000 kg. This means the megagram is identical to the tonne (metric ton). Large masses are almost always stated in tonnes in commercial applications, but megagrams are often used in scientific contexts. One megagram equals about 2204.623 pounds.

megahertz (MHz)
a common unit of frequency equal to one million per second. Frequencies of radio waves are commonly stated in megahertz.

megajoule (MJ)
a common metric unit of work or energy. The megajoule equals one million joules, which is approximately 737 562 foot pounds, 947.8170 Btu, 238.846 (kilogram)Calories, or 0.277 778 kilowatt hours.

megakelvin (MK)
a unit of temperature equal to one million kelvins. This unit is used in astrophysics; temperatures in megakelvins are found in the interiors of stars or in highly excited plasmas. The reciprocal megakelvin (MK^{-1}) is used in colorimetry.

megalerg
a CGS unit of energy equal to 10^6 ergs or 0.1 joule (0.073 756 foot pound). The "l" was added to "mega-erg" to make the unit pronounceable.

megaline
a metric unit of magnetic flux, equal to one million lines [2] or 0.01 weber.

megaliter (Ml or ML)
a metric unit of volume equal to 1000 cubic meters. Commonly used in reservoir and water system management outside the U.S., the megaliter equals 264 172 U.S.gallons or 0.810 713 acre foot.

megalithic yard
a unit of distance equal to about 83 centimeters or 2.72 feet, defined in 1951 by the Scottish engineer Alexander Thom (1894-1985). Thom claimed this unit was used in the construction of many megalithic monuments, including Stonehenge. If so, the unit was probably measured by the length of a workman's arm.

megameter (Mm)
a metric unit of distance equal to 1000 kilometers or about 621.371 miles. Although this appears to be an appropriate unit for longer distances on the earth, the megameter is seldom used.

megampere (MA)
a unit of electric current equal to one million amperes. This unit is used in plasma physics and fusion research.

meganewton (MN)
a metric unit of force equal to one million newtons. One meganewton equals about 101 972 kilograms of force or 224 809 pounds of force. The main engines of the U.S. space shuttle have a maximum thrust of about 2.28 meganewtons.

megaohm (megohm)
a common unit of electric resistance equal to one million ohms. The spelling **megohm** is also used.

megaohm (megohm) centimeter
a unit of resistivity, used for pure water and for other substances having relatively high resistivity. In the case of water, resistivity is a measure of purity: the higher the purity, the higher the resistivity. The resistivity of a conductor in megaohm centimeters is defined to be its resistance (in megaohms) multiplied by its cross-sectional area (in square centimeters) divided by its length (in centimeters). One megaohm centimeter equals 10 000 ohm meters.

megaparsec (Mpc)
the longest distance unit in common use, the megaparsec is used by astronomers studying the most distant quasars and galaxies. One megaparsec equals one millionparsecs, 3.2616 million light years or 30.857×10^{18} kilometers (30.857 zettameters).

megapascal (MPa, MP)
a common metric unit of pressure or stress equal to one million pascals or one newton per square millimeter. One megapascal equals 10 bars or approximately 145.038 pounds per square inch (lbf/in^2 or psi) or 20 885.5 pounds (10.443 U.S. tons) per square foot. The

symbol MP is used fairly commonly in engineering, but it is not correct: use MPa.

megapixel

a unit used to describe the size or resolution of an image or of a digital camera. One megapixel is one million pixels (picture elements, or "dots"). For example, a rectangular image 1000 pixels by 1000 pixels is comprised of one megapixel.

megapond (Mp)

a metric unit of force equal to 1000 kilograms of force (kgf). The megapond also equals 9806.65 newtons, or 2204.6226 pounds of force in the traditional English system. Although it is considered obsolete, the megapond is still used sometimes by engineers in Europe, especially in Germany.

megaton (Mton or Mt)

a unit of energy used for measuring the energy of an explosion, especially a nuclear explosion. Supposed to be the amount of energy released by the explosion of one million (short) tons of TNT, the megaton is defined to equal 4.18×10^{15} joules (4.18 petajoules), 1.16 billion kilowatt hours, or roughly 4 trillion Btu.

megatonne (Mt)

a metric unit of mass or weight equal to one million metric tons (tonnes), one teragram (Tg), or about 2.2046 billion pounds.

megawatt (MW)

a common metric unit of power. One megawatt is equal to one million watts, about 1341.02 horsepower, or 947.817 Btu per second.

megawatt hour (MW·h)

a metric unit of energy, especially electrical energy. One megawatt hour equals exactly 3.6 gigajoules (GJ), about 3.412 million Btu, or about 2.655 billion foot pounds.

megawatt day (MW·d or MWD)

a unit of energy used in the nuclear power and nuclear weapons industries. One megawatt day equals exactly 24 megawatt hours, 86.4 gigajoules (GJ), about 81.89 million Btu, or about 63.7 billion foot pounds.

megayear (Myr or Ma)

a unit of time equal to one million years.

megohm

a common unit of electric resistance equal to one million ohms. This simplified spelling of **megaohm** is approved by the Institute of Electrical and Electronics Engineers (IEEE).

meile

A traditional distance unit in German speaking countries, the meile is much longer than the mile units of western Europe. Typically the meile was equal to 4000klafters (fathoms) or 24 000 fuß (German feet). In Austria this came to 7586 meters (4.714 miles); in northern Germany it was 4.6805 miles or 7532.5 meters. A version of the meile called the *geographische meile* was defined to equal exactly 4 (Admiralty) nautical miles (24 320 feet, 4.6061 miles, or 7412.7 meters). The geographische meile was designed to equal 1/15 degree [2] or 4/3 league. See also mil [4], the Scandinavian version of this unit.

mel

a unit of perceived musical pitch, originally defined by Stevens, Volkmann, and Newmann in 1937. Our perception of musical pitch is complex. Although tones of higher frequency are perceived as being higher in pitch, tones separated by equal intervals (frequency ratios), such as octaves, will not be perceived as being equally spaced in pitch. A pure tone of frequency 1000 hertz, at a sound level 40 decibels above the faintest sound a listener can hear, is defined to have a pitch of 1000 mels, and tones perceived as being equally spaced in pitch are separated by an equal number of mels. Because perceptions of pitch depend on a number of factors other than frequency, it is not possible to give a straightforward conversion between hertz and mels. For tones above 1000 hertz the perceived pitch in mels is lower than the frequency in hertz; a 10-kilohertz tone is perceived at around 3000 mels. For tones lower than 1000 hertz the perceived pitch is a little higher than the frequency in hertz.

melchior

a huge bottle of champagne, holding about 18 liters.

Mercalli intensity scale
an empirical scale for rating the effects of an earthquake, as opposed to its strength (see magnitude [2] above). Mercalli estimates are stated as Roman numerals (I-XII) to avoid confusion with magnitude estimates on the Richter scale. The scale is named for the Italian geologist Giuseppe Mercalli (1850-1914), who devised the first version in 1902; the modified version used in the U.S. and Canada was developed by Charles F. Richter in 1956.

mercantile pound (lb merc)
a historic English unit of weight, the mercantile pound (*libra mercatoria*) was the commercial predecessor of the avoirdupois pound [1]. Used from about 1100 to 1300, the mercantile pound contained 15 troy ounces [2] or 7200 grains. This is equivalent to about 1.0286 avoirdupois pounds or 466.55 grams.

-merous
an ending meaning "-parted," added to a number to create an adjective. Thus "8-merous" means "having 8 parts." The suffix, frequently used by botanists, is derived from the Greek *meros*, "part."

mesh
a traditional unit used to measure the fineness of woven products such as fishing nets, fencing fabric, window screening, etc., equal to the number of strands perinch. For *n* mesh fabric, the distance between strands is $1/n$ inch or $25.4/n$ millimeter.

met
a unit of metabolism. Metabolism, the sum of all the processes going on in the body to sustain life, is measured in units of power expended per unit of body surface area. One met is the metabolism of a seated, resting person, equal to about 58.15 watts per square meter (W/m^2) or 13.89 calories per second per square meter ($cal/m^2 \cdot s$) regardless of the person's size. Measurements of human metabolism generally fall in the range 0.8-3.0 met, although athletes can achieve 10 met or more.

meter or metre (m)
the metric and SI base unit of distance. Originally, the meter was designed to be one ten-millionth of a quadrant, the distance between the Equator and the North Pole. (The Earth is difficult to measure, and a small error was made in correcting for the flattening caused by the Earth's rotation. As a result, the meter is too short by a bit less than 0.02%. That's not bad for a measurement made in the 1790's.) For a long time, the meter was precisely defined as the length of an actual object, a bar kept at the International Bureau of Weights and Measures in Paris. In recent years, however, the SI base units (with one exception) have been redefined in abstract terms so they can be reproduced to any desired level of accuracy in a well-equipped laboratory. The 17th General Conference on Weights and Measures in 1983 defined the meter as that distance that makes the speed of light in a vacuum equal to exactly 299 792 458 meters per second. The speed of light in a vacuum, *c*, is one of the fundamental constants of nature. Since *c* defines the meter now, experiments made to measure the speed of light are now interpreted as measurements of the meter instead. The meter is equal to approximately 1.093 613 3 yards, 3.280 840 feet, or 39.370 079 inches. Its name comes from the Latin *metrum* and the Greek *metron*, both meaning "measure." The unit is spelled **meter** in the U.S. and **metre** in Britain; there are many other spellings in various languages (see Spelling of Metric Units).

meter-atmosphere
another name for the atmo-meter.

meterlambert or meter-lambert
another name for the nit, an MKS unit of luminance equal to one candela per square meter. The name is coined by analogy with the footlambert.

meter per second (m/s)
the metric and SI unit of speed or velocity. One meter per second is equal to exactly 3.6 kilometers per hour (km/h) or about 2.236 936 miles per hour or 3.280 840 feet per second.

methuselah
a large wine bottle holding about 6 liters, 8 times the volume of a regular bottle.

Metonic cycle
a unit of time equal to 19 years, used in astronomy in predicting the

phases of the Moon. By coincidence, 19 years is equal to 6939.602 days and 235 lunar months is equal to 6939.689 days, just 125 minutes longer. As a result, the phases of the Moon repeat almost exactly after 19 years. (Since 19 years can contain either 3 or 4 leap days, the recurrence isn't always exact as to the day of the month.) Many lunar calendars, such as the Chinese and Jewish calendars, share this 19-year cycle. The cycle is named for the ancient Greek astronomer Meton, who first used it for predictions around 433 BC.

metric carat
the current internationally-recognized carat, equal to exactly 200 milligrams.

metric grain
a unit of mass sometimes used by jewelers, equal to 50 milligrams or 1/4 carat. This unit is often used for pearls and is sometimes called the **pearl grain**.

metric horsepower
a unit of power, defined to be the power required to raise a mass of 75 kilograms at a velocity of 1 meter per second. This is approximately 735.499 watts or 0.986 32horsepower. The unit is known in French as **cheval vapeur**, in Spanish as **caballo de vapor**, and in German as **Pferdestärke**.

metric hundredweight
an informal unit of mass equal to 50 kilograms or approximately 110.231 pounds, close to the traditional British hundredweight of 112 pounds. This unit is also known by its German name, the zentner, or (in English) the centner.

metric mile
an informal unit of distance used mostly in athletics. The metric mile is equal to 1500 meters or 1.5 kilometers (approximately 0.932 057 statute mile or 4921.26feet). In U.S. high school competition the term is sometimes used for a race of 1600 meters (0.994 194 miles or 5249.34 feet).

metric pound
an informal name for a mass of 500 grams (0.5 kilogram or 1.1023 pound).

metric quintal
a unit of mass equal to 1 decitonne, 100 kilograms or about 220.462 pounds. See quintal for a more complete description.

metric slug
see TME.

metric ton (t or MT)
an alternate name for the tonne. In the United States, the Department of Commerce recommends that the tonne be called the metric ton to distinguish it clearly from the traditional American ton. The proper symbol for the unit is simply t.

metric ton unit (mtu)
a unit of mass used in mining to measure the mass of the valuable metal in an ore. Customarily, the metric ton unit is defined to be one metric ton of ore containing 1% metal, but it is the metal, not the ore, that is being measured. Thus the unit is really a unit of mass equal to 10 kilograms (22.0462 pounds).

MeV
the symbol for one million electronvolts. Thanks to Einstein's equation $E = mc^2$ equating mass wth energy, the MeV can be regarded either as a unit of energy equal to 160.217 646 2 femtojoules, or as a unit of mass equal to 1.782 662 x 10^{-27} gram or 0.001 073 544 atomic mass unit. This is 1.956 951 times the mass of the electron (m_e).

MFD, mfd
common but incorrect symbols for the microfarad (see below). The correct symbol is μF, or mcF if μ is not available.

mg-at
an obsolete symbol for "milligram atom", an equally obsolete name for the millimole (mmol).

Mgd
an abbreviation for millions of gallons per day (Mgal/d), a unit used in reservoir management to express the rate at which water is withdrawn, or could be withdrawn, for drinking or for some other purpose. 1 Mgd equals approximately 3.785 43 megaliters per day, or 3785.43 cubic

meters per day, or 133 681 cubic feet per day.

mg/dl

symbol for milligram per deciliter, a unit used in U.S. medicine to measure the concentration of cholesterol and other substances in the blood. 1 mg/dl equals 0.01 grams per liter (g/L). Internationally, the SI unit for data of this type is millimoles per liter (mmol/L); see the table of SI Units for Clinical Data for conversions of many common measurements.

mg-eq

an obsolete symbol for "milligram equivalent", an equally obsolete name for the milliequivalent (mEq).

mg/kg

symbol for milligram per kilogram, a unit used in medicine to measure dosage rates. 1 mg/kg is equivalent to 10^{-6} g/g or 1 part per million based on the patient's body weight.

mgon

symbol for the milligon (milligrad), a unit of angle measure equal to 0.001 gon, 10^{-5} right angle, 0.0009°, 3.24 seconds of arc, or 15.708 microradians (μrad). Surveying equipment is often marked in "mgons."

mho

an older name for the siemens, which is defined to be the reciprocal of the ohm. In case you didn't notice already, "mho" is "ohm" spelt backwards.

mic

an informal name for the microgram, pronounced "mike."

mickey

a unit used in computer science in programming mice and similar input devices. One mickey is the length of the smallest detectable movement of the mouse. This depends on the equipment. Typical values are in the range 1/200 to 1/300 inch or roughly 0.1 millimeter. Obviously, the name comes from the Disney cartoon character Mickey Mouse.

micro- (μ- or mc- or u-)

a metric prefix meaning 10^{-6} (one millionth). The prefix comes from the Greek prefix *mikro-*, meaning small. In print the prefix is sometimes abbreviated mc- or u- when the Greek letter mu (μ) is not available.

microampere (μA)

a unit of electric current equal to 10^{-6} ampere.

microarcsecond (μas)

a unit of angle measurement sometimes used in astronomy. The microarcsecond equals 10^{-6} arcsecond or about 4.8481 picoradian.

microbar (μbar)

a CGS unit of pressure equal to 0.001 millibar, 0.1 pascal, 1 dyne per square centimeter (1 barye), or about 0.002 089 pounds per square foot. The microbar is used commonly in acoustics and sound engineering.

microcurie (μCi)

a common unit of radioactivity. The microcurie equals 10^{-6} curie or 37 kilobecquerels; this corresponds to a radioactivity of 37 000 atomic disintegrations per second.

microdegree (μdeg) [1]

a unit of angle measure equal to a millionth of a degree or exactly 36 milliarcseconds.

microeinstein (μE)

a unit of light energy concentration used in measuring the flux or density of light or any form of electromagnetic radiation. The microeinstein is equal to 10^{-6} einsteinor one micromole of photons. The density of photosynthetically active radiation, for example, is reported in microeinsteins per second per square meter ($\mu E/s \cdot m^2$).

microequivalent (μEq or μeq)

a unit of relative amount of substance equal to 10^{-6} equivalent weight. This unit is used, for example, in stating the concentrations of ions in drinking water.

microfarad (μF)

a common unit of electric capacitance equal to 10^{-6} farad.

microflick (μf)

a unit of spectral radiance used in optical and communications engineering, equal to 10^{-6} flick, or 1 microwatt per steradian per square centimeter of surface per micrometer of span in wavelength. This is mathematically equivalent to 10 milliwatts per steradian per cubic meter.

microgram (μg or mcg)
a metric unit of mass equal to 0.001 milligram (mg) or one millionth of a gram. Ingredients of drugs and vitamins are often stated in micrograms.
microgray (μGy)
a unit of radiation dose equal to a millionth of a gray or 0.1 millirad. Small doses of this size are often provided by natural sources in the environment.
microinch (μin)
a traditional unit of distance equal to 10^{-6} inch, 0.001 mil, or 25.4 nanometers (nm). The microinch is used rather widely to state the roughness of optical surfaces, precise tolerances in machining, and for other industrial purposes.
microliter (μl, μL, mcl, or mcL)
a metric unit of volume equal to 0.001 milliliter or 1 cubic millimeter (mm^3). Microliters are used in chemistry and medicine to measure very small quantities of liquid. This unit has also been called the **lambda**.
micrometer (μm)
a common metric unit of distance equal to 0.001 millimeter or about 0.039 370 mil. The name **micron** is also used for this unit.
micromicro- (μμ-)
an obsolete metric prefix denoting 10^{-12}. The prefix has been replaced by pico- (p-).
micromicrofarad (μμF or mmfd)
an older name for the picofarad (10^{-12} farad). Though it is obsolete now, this name is still seen marked on many capacitors.
micromicron (μμ)
a former name for a millionth of a micron, that is, 10^{-12} meter. The name **bicron** was also used for this unit, which is now called the picometer (pm).
micromole (μmol)
a unit of amount of substance equal to a millionth of a mole (see below). This unit is used very commonly in biochemistry, since a mole of a large organic molecule can be quite a large amount.
micron (μ) [1]

a metric unit of distance equal to one millionth of a meter. "Micron" is simply a shorter name for the micrometer. In 1968 the CGPM decided to drop the micron as an approved unit and recommend that micrometers be used instead. Microns, however, are still in common use.
micron (μ) [2]
an informal unit of pressure widely used in vacuum technology. In this use, a micron is a micron of mercury, that is, 0.001 mm Hg or approximately 1.333 microbars(μbar or μb) or 133.3 millipascals (mPa). For all practical purposes, 1 micron is identical to 1 millitorr (mTorr).
micronewton (μN)
a unit of force equal to a millionth of a newton or 0.1 dyne. The unit is often used in astronautical engineering to describe the tiny forces applied to spacecraft to adjust their attitudes in space.
micropascal (μPa)
an SI unit of pressure equal to 10^{-6} pascal or 1 micronewton per square meter. This very small unit is used to measure the pressure of sound waves.
micropoise (μP, μPo, or μPs)
a unit of dynamic viscosity used primarily for describing the viscosities of gases. One micropoise equals 10^{-6} poise or 10^{-7} pascal second (Pa·s).
microrad (μrad)
a unit of radiation dose equal to a millionth of a rad or 10 nanograys.
microradian (μrad)
a unit of angle measure equal to 10^{-6} radian. The microradian equals about 0.208 533 milliarcsecond (mas).
microrem (μrem)
a unit of effective radiation dose equal to a millionth of a rem or 10 nanosieverts. Doses in this range are much smaller than those provided by natural sources of radioactivity in the environment.
microsecond (μs or μsec)
a unit of time equal to a millionth of a second.
microsievert (μSv)
a unit of radiation dose equal to 10^{-6} sievert or 0.1 millirem. The radiation doses resulting from exposure to natural sources such as radon

gas in the atmosphere are often measured in this unit.

microstrain (μstrain)

a common engineering unit measuring strain. An object under strain is typically deformed (extended or compressed), and the strain is measured by the amount of this deformation relative to the same object in an undeformed state. One microstrain is the strain producing a deformation of one part per million (10^{-6}).

microtesla (μT or mcT)

a common unit of magnetic field intensity equal to 10^{-6} tesla. The unit is widely used to measure the strength of electromagnetic fields generated by powerlines or electronic equipment. By comparison, the strength of the Earth's own magnetic field at the surface is about 50 microteslas. One microtesla equals 0.01 gauss.

microvolt (μV or mcV)

a unit of electric potential equal to 10^{-6} volt. This unit is used in cardiology and other medical fields to measure the small potentials within the nervous system.

middy

an informal unit of volume for beer used in many Australian pubs. A middy is generally 285 milliliters (or 10 British fluid ounces), larger than a pony but smaller than aschooner.

miglio

the traditional Italian mile. The miglio equals 1628 yards, which is 0.925 English mile or about 1488.6 meters. This is 32 yards (29.3 meters) shorter than the classical Roman mile.

miil or mijl

alternate spellings for the Scandinavian mil [4] (see below).

mil [1]

a unit of distance equal to 0.001 inch: a "milli-inch," in other words. Mils are used, primarily in the U.S., to express small distances and tolerances in engineering work. One mil is exactly 25.4 microns, just as one inch is exactly 25.4 millimeters. This unit is also called the **thou**. With the increasing use of metric units in the U.S., many machinists now avoid the use of "mil" because that term is also a handy slang for the millimeter.

mil [2]

a unit of angle measure, used in the military for artillery settings. At one time the U. S. Army used a mil equal to 1/1000 of a right angle, 0.1 grad, 0.09°, or 5.4 arcminutes (often written 5.4 moa; see "moa" below). Later this was changed to 1/1600 right angle, or 0.05625° (3.375 moa). In target shooting, the mil is often understood to mean 0.001 radian or 1 milliradian, which is about 0.0573° or 3.43775 moa. In Britain, the term **angular mil** generally refers to the milliradian. 1 milliradian corresponds to a target size of 10 millimeters at a range of 10 meters, or 3.6 inches at 100 yards.

mil [3]

a common slang name for the milliliter (mL) or the millimeter (mm).

mil [4]

in Scandinavia, the mil, pronounced like "meal" in English, is a traditional distance unit considerably longer than Roman or English miles. In Denmark, the traditional mil was 24 000 Danish feet, which is 4.6805 miles or 7.5325 kilometers (this is the same as the north German meile; see above). The Danish mil has sometimes been interpreted as exactly 7.5 kilometers (4.6603 miles). In Sweden, the traditional mil was 36 000 Swedish feet, which is 6.641 miles or 10.687 kilometers. In Sweden and Norway the mil is now interpreted as a metric unit equal to exactly 10 kilometers (6.2137 miles).

mil [5]

an alternate spelling of the mill [1] (see below).

mile (mi) [1]

a traditional unit of distance. The word comes from the Latin word for 1000, *mille*, because originally a mile was the distance a Roman legion could march in 1000paces (or 2000 steps, a pace being the distance between successive falls of the same foot). There is some uncertainty about the length of the Roman mile. Based on the Roman foot of 29.6 centimeters and assuming a standard pace of 5 Roman feet, the Roman mile would have been 1480 meters (4856 feet); however, the measured distance between surviving milestones of Roman roads is often closer to 1520 meters or 5000 feet. In any case, miles of similar lengths were used

throughout Western Europe. In medieval England, several mile units were used, including a mile of 5000 feet (1524 meters), the modern mile defined as 8 furlongs (1609 meters), and a longer mile similar to the French mille (1949 meters). None of these units corresponded with the Scottish mile (1814 meters) or the Irish mile (2048 meters). In 1592, Parliament settled the question in England by defining the **statute mile** to be 8 furlongs, 80 chains, 320 rods [1], 1760 yards or 5280 feet. Using the international definition of the foot as exactly 30.48 centimeters, the international statute mile is exactly 1609.344 meters. (In technical U.S. usage, the statute mile is defined in terms of the survey foot and equals about 1609.3472 meters; this unit is called the **survey mile**). In athletics, races of 1500 or 1600 meters are often called **metric miles**. See also nautical mile.

mile (mi) [2]
an informal name for mile per hour, sometimes seen on U.S. road signs with markings such as "Speed Limit 25 miles."

mile per gallon (mi/gal or mpg) [1]
the unit customarily used in the United States to measure the fuel efficiency of motor vehicles. 1 mile per U.S. gallon [1] equals about 0.4252 kilometers per liter. In most other countries, however, the usual measure of fuel consumption is liters per 100 kilometers; x miles per U.S. gallon is equal to $235.215/x$ liters per 100 kilometers.

mile per gallon (mi/gal or mpg) [2]
the unit formerly used in Britain, Canada, Australia, and other British Commonwealth nations to measure the fuel efficiency of motor vehicles, analogous to the U.S. unit but based on the Imperial gallon [3]. Although still used sometimes, this unit has been replaced officially by liters per 100 kilometers; x miles per Imperial gallon is equal to $282.481/x$ liters per 100 kilometers. One mile per Imperial gallon is equal to about 0.8327 mile per U.S. gallon.

mile per hour (mi/h or mph)
a traditional unit of velocity. One mile per hour equals exactly 22/15 feet per second, approximately 1.609 kilometers per hour (km/h), or exactly 0.447 04 meter per second (m/s).

mil-foot
a mil-foot is a section of wire one foot long and one mil in diameter; this would be a unit of volume equal to about 0.0377 cubic inches or 0.6178 cubic centimeters. However, the unit is used primarily in statements of resistivity in ohms per mil-foot or of density in pounds per mil-foot. The unit is also called the **circular mil-foot**.

milha
the traditional Portuguese mile, one of the "longest miles" of western Europe at 2282.75 yards (1.297 statute miles or 2087.3 meters).

military pace
another name for a step. In the U.S. Army, the military pace is defined to be exactly 30 inches (76.2 centimeters) for ordinary "quick time" marching and 36 inches (91.44 centimeters) for double time marching. The same definitions are generally used by marching bands.

mill [1]
an informal unit of quantity or of proportion, equal to 0.001. When Congress established the U. S. monetary system in 1791, it provided for 10 mills to the cent and 100 cents to the dollar; thus the mill was an amount of money equal to $0.001. Although the mill is unfamiliar now as a monetary unit, it has come to represent a one thousandth part as a proportion. Many towns in the United States set their property tax rates in mills, for example.

mill [2]
slang for one million.

milla
the traditional Spanish mile, equal to 5000 pies (Spanish feet) or 8 estadios. This is about 1392 meters, 4567 feet, or 0.865 statute mile.

mille [1]
the traditional French mile, equal to 1000 toises. This is equal to about 6394.4 feet, 1.211 statute mile, or 1949 meters. In modern France, the *mille* sometimes means the nautical mile (*mille marin*), equal to exactly 1852 meters.

mille [2]
in French-speaking Canada, the English statute mile of

5280 feet (1609.344 meters).

mille [3]
the Latin word for 1000, sometimes used in English in very learned or literary contexts.

millenary
a unit of quantity equal to 1000.

millennium
a traditional unit of time equal to 1000 years. The plural is **millennia** or sometimes **millenniums**.

milli- (m-)
a metric prefix meaning 0.001 (one thousandth). The prefix was coined from the Latin number *mille*, one thousand.

milliampere (mA)
a common unit of electric current equal to 0.001 ampere.

milliampere hour (mA·h)
a common unit of electric charge, used (for example) in stating the capacity of batteries for cell phones and other electronic equipment. One milliampere hour is the charge accumulated by a current of 1 milliampere in 1 hour; this is equal to exactly 3.6 coulombs (C).

milliarcsecond (mas)
a unit of angular measure commonly used in astronomy. One milliarcsecond is equal to 0.001 arcsecond, 0.277 77 microdegrees, or 4.848 137 nanoradians.

milliard [1]
a unit of quantity equal to 10^9, which is what Americans call a billion. See Using Numbers and Units for more on the "billion" controversy.

milliard [2]
a unit of volume used by engineers to describe a large quantity of water. One milliard equals one cubic kilometer, which is 1 billion (10^9) cubic meters or about 810 767 acre feet.

millibar (mb)
a common metric unit of atmospheric pressure, equal to 0.001 bar, 100 pascals, 1000 dynes/cm^2, about 0.0295 inches (0.7501 millimeters) of mercury, or about 0.014 504 lb/in^2. A millibar is the same thing as a **hectopascal** (hPa), and some weather agencies have replaced the millibar with the hectopascal in an effort to conform with the SI. However, many meteorologists resist this change and continue to use millibars. In fact, an appropriate SI unit for atmospheric pressure would be the kilopascal (10 millibars or 0.145 038 lb/in^2).

millicandela (mcd)
a unit of light intensity equal to 0.001 candela. The intensity of the light-emitting diodes (LEDs) used in electronics are stated in millicandelas.

millicurie (mCi)
a common unit of radioactivity. One millicurie represents radioactivity at the rate of 37 million atomic disintegrations per second, that is, 37 megabequerels.

millidegree (mdeg) [1]
a unit of angle measure equal to 0.001° or exactly 36 arcseconds.

millidegree (mdeg) [2]
a unit of temperature equal to 0.001°, usually meaning 0.001 °C.

milliequivalent (mEq or meq)
a unit of relative amount of substance commonly used in chemistry. One mEq equals 0.001 equivalent weight.

millier
a former name for the tonne or metric ton. This name, obsolete now, was used in Britain to avoid confusion with the British long ton.

millifarad (mF)
a common unit of electric capacitance equal to 0.001 farad.

milligal (mGal or mgal)
a unit of acceleration used in geology to measure subtle changes in gravitational acceleration. One milligal equals 10 micrometers per second per second, or 10^{-5}meters per second per second. The unit should really be called the milligalileo.

milligauss (mG)
a unit of magnetic flux density equal to 0.001 gauss, 0.1 microtesla, or 100 nanoteslas. The magnetic fields generated by power lines and electronic equipment are often measured in milligauss.

milligram (mg)

a very common metric unit of mass equal to 0.001 gram or 1000 micrograms (μg or mcg). One milligram equals approximately 0.015432 grain or 35.274 x 10^{-6}ounce.

milligram per deciliter (mg/dl or mg/dL)
a conventional unit in medicine for measuring concentrations of cholesterol and many other substances in the blood. Internationally, the SI unit for data of this type is millimoles per liter (mmol/L); see the table of SI Units for Clinical Data for conversions of many common measurements.

milligray (mGy)
a common unit of radiation dose equal to 0.001 gray, 0.1 rad, or 1 millijoule of energy per kilogram of matter. Because the gray itself is such a large unit, many practical radiation measurements are made in milligrays. In particular, the exposures cause by X-ray equipment are typically in the milligray range.

millihenry (mH)
a common metric unit of electric inductance equal to 0.001 henry.

millihg
an informal name (pronounced "millig") for the millimeter of mercury (see below).

millihorsepower (mhp)
a unit of power equal to 0.55 foot-pound per second or 0.7457 watt. This unit is commonly used to state the power of small electric motors.

millijoule (mJ)
a common metric unit of work or energy equal to 0.001 joule or 10^4 ergs.

milli-k
a unit used in nuclear engineering to describe the "reactivity" of a nuclear reactor. One milli-k is a reactivity of 0.001 or 0.1%; the origin of the name is that *k* is a common symbol for reactivity. This unit was introduced in the Canadian nuclear power industry. For a discussion of reactivity, see inhour.

millikelvin (mK)
a unit of temperature equal to 0.001 kelvin or 0.001 degree Celsius (°C). This unit is used mostly by scientists investigating substances cooled very close to absolute zero.

millilambert (mLb)
a common metric unit of illumination equal to 0.001 lambert or 10 lux (lx).

millilux (mlx)
a metric unit of illumination equal to 0.001 lux. The natural illumination at night is measured in millilux.

milliliter (ml or mL)
a very common metric unit of volume. One milliliter equals 0.001 liter, exactly one cubic centimeter (cm^3 or cc), or approximately 0.061 023 7 cubic inch or 16.231 U.S. minims (see below). The milliliter is used almost entirely for measuring the volumes of liquids, with solids being measured in cubic centimeters. Note: until 1964 the milliliter was equal to 1.000 028 cubic centimeters; see liter for a discussion of this history.

millimass unit (mu or mmu)
a unit of mass equal to 0.001 atomic mass unit, used in physics and chemistry. This unit is also called the millidalton (mDa). The millimass unit is an SI unit, but its proper SI symbol is **mu**, not the older symbol **mmu**.

millimeter (mm)
a very common metric unit of distance. One millimeter equals 0.001 meter, 0.1 centimeter, about 0.039 370 inch, or 39.370 mils.

millimeter of mercury (mm Hg)
a unit of pressure equal to the pressure exerted at the Earth's surface by a column of mercury 1 millimeter high. When a traditional mercury barometer is used, the pressure is read directly as the height of the mercury column in millimeters. One millimeter of pressure is equivalent to approximately 0.03937 in Hg, 0.01933 lbf/in^2, 1.333 millibars, or 133.3 pascals. In medicine, blood pressure is traditionally recorded in mm Hg. In engineering, the millimeter of mercury is often replaced by the torr, the two units being equal to within 1 part per million. Hg, the chemical symbol for mercury, is taken from the Latin *hydrargyrum*, "water-silver," describing the silvery liquid metal.

millimeter of water (mmH_2O)

a unit of pressure equal to the pressure exerted at the Earth's surface by a column of water 1 millimeter high. This is a small pressure, about 9.8067 pascals, 0.098 067 millibars, 0.03937 inch of water, or 0.204 pounds per square foot. The French symbol is mm CE (*colonne d'eau*), and the German symbol is mm WS (*Wassersäule*).

millimeter of water gauge (mm WG)
another common name for the millimeter of water column. The word "gauge" (or "gage") after a pressure reading indicates that the pressure stated is actually the difference between the absolute, or total, pressure and the air pressure at the time of the reading.

millimicro- (mμ-)
an obsolete metric prefix denoting 10^{-9} or one billionth. This prefix has been replaced by nano- (n-).

millimicron (mμ)
a former metric unit of distance equal to 0.001 micron or 10^{-9} meter. The millimicron has been replaced by its equivalent, the nanometer (nm).

millimole (mmol)
a very common unit of amount of substance equal to 0.001 mole (see below).

millimole per liter (mmol/l or mmol/L)
the SI unit in medicine for measuring concentrations of cholesterol and many other substances in the blood. A table is provided for conversion of conventional units, such as milligrams per deciliter (mg/dL), to SI units.

milline
a traditional unit of advertising. One milline equals the height of a line of "agate" type (5.5 points, or about 2 mm) times the width of a column times one million copies of the publication.

millinewton (mN)
a metric unit of force equal to 0.001 newton, 100 dynes, or about 0.101 972 gram of force (gf).

millinile
a unit used in British nuclear engineering to describe the "reactivity" of a nuclear reactor. One millinile is a reactivity of 10^{-5}. For a discussion of reactivity, see inhour.

milliocctave (mO)
a unit used in music to describe the ratio in frequency between notes. The difference between two frequencies in milliocctaves is equal to 1000 times the base-2 logarithm of the ratio between the two frequences. One milliocctave equals exactly 1.2 cents [3] or about 0.30103 savart. If two notes differ by 1 milliocctave, the ratio between their frequencies is $2^{1/1000}$ or approximately 1.000 6934.

millioersted (mOe)
a name sometimes used for the milligauss as a unit of magnetic flux density.

milliosmole (mOsm)
a unit of osmotic pressure, equal to 0.001 osmole, commonly used in biology and medicine.

milliparsec (mpc)
a unit of distance in astronomy equal to 0.001 parsec. Used in studying crowded parts of the universe such as globular clusters and galactic centers, the milliparsec is equal to about 206.265 astronomical units, 11.913 light days, or 30.8568 terameters (30.8568 x 10^9 kilometers or 49.6486 million miles).

millipascal (mPa)
an SI unit of pressure equal to 0.001 pascal or 1 millinewton per square meter. This very small unit is used to measure the pressure of sound waves.

millipascal second (mPa·s)
an SI unit of dynamic viscosity equal to the centipoise (cP). This unit is gradually replacing the centipoise in many contexts.

milliphot (mph)
a unit of illuminance or illumination equal to 0.001 phot or 10 lux.

millipoise (mP, mPs, or mPo)
a metric unit of dynamic viscosity equal to 0.001 poise or 0.1 millipascal second (mPa·s).

millirad (mrad)
a unit of radiation dose equal to 0.001 rad or 10 micrograys.

milliradian (mrad)
a unit of angle measure equal to 0.001 radian. The milliradian equals about 0.057 296°, 3.437 75 arcminutes, or 3" 26.265'. In Britain this unit is often called the**angular mil**.
millirem (mrem)
a common unit of radiation dose equal to 0.001 rem or 10 microsieverts (μSv). A millirem is roughly the radiation dose you would receive from wearing a luminous dial watch for a year.
millisecond (ms or msec)
a common unit of time equal to 0.001 second.
millisiemens (mS)
a common unit of conductance equal to 0.001 siemens or 1 milliampere of current per volt of potential difference. The millisiemens is often used to measure the salinity of seawater or brackish water, since adding salt to water makes it much more conductive of electricity.
millisievert (mSv)
a unit commonly used to measure radiation dose. One millisievert equals 0.001 sievert or 0.1 rem.
millitesla (mT)
a common unit of magnetic field intensity equal to 0.001 tesla or 10 gauss. Since the tesla is quite a large unit, many practical measurements are made in milliteslas.
millivolt (mV)
a common unit of electric potential equal to 0.001 volt.
milliwatt (mW)
a common unit of power equal to 0.001 watt.
milliwatt hour (mW·h)
a common metric unit of work or energy, representing the energy delivered at a rate of one milliwatt for a period of one hour. This is equivalent to exactly 3.6 joules(J) of energy, or about 0.003 412 Btu, 0.859 846 (small) calories, or about 2.655 foot pounds.
mina
a historic unit of weight, originating in Babylonia and used throughout the eastern Mediterranean. The mina is roughly comparable to the pound, but over the centuries it varied quite a bit. In Babylonian times it was a large unit, roughly 2 pounds, almost as much as a kilogram. The Hebrew mina, frequently mentioned in the Bible, is estimated at 499 grams (1.10 pounds). The Greek mina was equal to 100 drachmai or 431 grams (0.95 pound). In Biblical times the mina was equal to 60 shekels, and there were 60 minas in a talent.
miner's inch
a traditional unit of water flow in the western United States. The unit originally represented streamflow through an opening one inch (25.4 mm) square at a specified distance below the surface of the water; this distance varied from 4 to 6 inches. In Idaho, Kansas, Nebraska, New Mexico, North and South Dakota, Utah, and Washington the miner's inch is legally defined to equal 9 gallons per minute or 1.2 cubic feet per minute (about 34.07 liters per minute). In Arizona, California, Montana, Nevada, and Oregon the definition is 1.5 cubic feet per minute (42.48 L/min). In Colorado, the legal equivalent is 1.5625 cubic feet per minute (44.25 L/min). See also water inch.
-minex
a suffix used to create small numbers. The number *n*-minex is 10^{-n}, which is 0.000...0001 with a total of *n*-1 zeros between the decimal marker and the 1. Thus one millionth (0.000001), for example, is 6-minex. See also dex and -plex.
minim (m or min) [1]
a traditional unit of volume used for very small quantities of liquids. In pharmacy, the term drop traditionally meant the same thing as 1 minim. The minim is defined to be 1/60 fluid dram or 1/480 fluid ounce. The U. S. minim is equal to about 0.003 760 cubic inch or 61.610 microliters, while the British minim is equal to about 0.003 612 cubic inch or 59.194 microliters. As you might guess, the word comes from the Latin *minimus*, small.
minim [2]
a unit of relative time in music equal to 1/2 whole note (a half note) or 1/4 breve.
minipin

an informal unit of volume for beer and other alcoholic beverages, used mostly in Britain. A minipin is 1/2 of a polypin; this is about 17 Imperial pints or 10 liters (roughly 2.64 U.S. gallons).

minute (′) [0]

a historic unit of proportion equal to 1/60. The Romans lacked our flexible terminology for fractions; they followed Babylonian and Greek practice in visualizing quantities as being divided into 60 parts, so they could express fractions consistently in 60ths. A 60th part was called a *pars minuta prima* ("first small part") of the whole. For smaller fractions, a 60th part was divided into 60 smaller parts, each called a *pars minuta secunda* ("second small part"). The *minuta prima* has come down to us as "minute," the *minuta secunda* is our "second," and the *prima* leads to the traditional symbol ′ being called a "prime."

minute (min or ′ or m) [1]

a unit of time equal to 60 seconds or to 1/60 hour.

The SI specifies **min** as the symbol for the time unit and ′ as the symbol for the minute of arc (see below).

minute (′ or m or moa) [2] or minute of arc or minute of angle

a unit of angular measure equal to 60 arcseconds or to 1/60 degree. This unit is often called the **arcminute** to distinguish it from the minute of time. There are 21 600 arcminutes in a circle. The SI defines **min** as the symbol for the time unit (see above) and recommends ′ as the symbol for the minute of arc. The symbol **moa** is often used in target shooting. The international standard ISO 31 requires that angles be stated in degrees and decimal fractions of the degree, without use of arcminutes and arcseconds.

minute (′ or m) [3]

a unit of angular measure used in astronomy. Astronomers measure right ascension (see hour [2]) in time units by dividing the equator into 24 hours instead of 360 degrees. This makes 1 minute of right ascension equal to 15 arcminutes.

minute [4]

a unit of time equal to 1/60 day or 24 minutes in the modern sense. This was the original definition of the minute as a unit of time. The modern definition of 1/60 hour did not appear until the invention of mechanical clocks made it practical to measure such small intervals of time.

minute (min or m or ′) [5]

a unit of sidereal time in astronomy; see sidereal day.

minutum

in medieval times, a unit of time equal to 1/10 hour, or 6 minutes in modern terminology. This unit was divided into 4 moments (see below).

minyan

a traditional Hebrew unit of quantity equal to 10, the number of males aged 13 or over required for a Jewish worship service. (In many modern congregations, both males and females can be included in a minyan.)

mips

a unit of computing power equal to one million instructions per second. An "instruction" is a single program command to the computer's central processor. In a particular computer, there is a definite relationship between the rate at which instructions are processed, in mips, and the "clock speed" of the processor, measured inmegahertz (MHz). However, this relationship varies considerably between computers, so it is usually not meaningful to compare the mips rates of dissimilar machines. See also megaflops (above).

mired

a name used in colorimetry for the reciprocal megakelvin (MK^{-1}). The word is an acronym for "micro-reciprocal degree"; it is pronounced *my-red*, in two syllables.

MIU

symbol for one million international units. Dosages of certain drugs, such as various forms of interferon, are commonly stated in this unit.

MJD

see modified Julian day (below).

mKB

symbol for "meters from the Kelly bushing," used in the oil and gas industry to indicate the length of a bored well as measured from the large bushing at the top of the shaft. Since the drilling is usually not exactly vertical, this measurement will be larger than the actual depth of

the bottom of the well. The symbol **mTVD** is often used for true vertical depth.

mkono
a traditional unit of distance in East Africa, standardized under British rule as 1/2 yard (18 inches, or 45.72 centimeters). This unit is an African version of the cubit.

mkp
a common symbol for the meter kilopond, a metric unit of torque equal to 9.806 65 newton meters (N·m) or 7.233 01 pound feet.

Mlb, Mlbs (1)
common symbols for one million pounds. Although "Mlbs" is seen frequently, symbols need not take the terminal -s in the plural and this dictionary takes the position that they should not; "Mlb" is correct. (Also note that the "l" is not capitalized in the symbol for the pound.)

Mlb (2)
a traditional unit of mass for steam, equal to 1000 (not one million) pounds. This is one of many uses of the Roman numeral M to represent a multiple of 1000; all these uses should be replaced by the metric prefix k- (kilo-).

mM
a common symbol in chemistry for millimolar, that is, millimoles per liter. The SI does not allow the use of this symbol.

MM
an abbreviation for one million, seen in a few traditional units such as those listed below. The abbreviation is meant to indicate one thousand thousand, M being theRoman numeral 1000. However, MM actually means 2000, not one million, in Roman numeration. Since the single letter M is now used commonly for one million, the use of MM is confusing and strongly discouraged.

m/m
an abbreviation for "by mass," used in chemistry and pharmacology to describe the concentration of a substance in a mixture or solution. 2% m/m means that the mass of the substance is 2% of the total mass of the solution or mixture.

MMb, MMbo
symbols for one million barrels of oil; see megabarrel above.

MMBF or MMBM
symbols sometimes used in U.S. forestry for one million board feet. One MMBF represents a volume of 83 333 cubic feet or 2360 cubic meters. "BM" stands for "board measure."

MMBtu
a traditional symbol for one million Btu (about 1.055 057 gigajoules (GJ)), a unit used widely in the energy industry. This unit is also called the **dekatherm**.

MMcf
a symbol for one million cubic feet (28 316.85 m^3, or 28.316 85 megaliters). Similarly, **MMMcf** is used for one billion cubic feet.

MMcfe
a symbol used in the natural gas industry for one million cubic feet of gas equivalent (cfe). This is really an energy unit equal to about 1.091 terajoules (TJ). Similarly,**MMMcfe** is used for one billion cubic feet of gas equivalent: 1.091 petajoules (PJ).

mmg
an obsolete symbol for the microgram, mmg stands for "millimilligram," that is, 0.001 milligram. This symbol should never be used. The SI symbol for the microgram is μg, and an acceptable alternate (often used in medicine) is mcg.

mmHg
symbol for the millimeter of mercury (see above), a unit of pressure equal to 133.3 pascals.

MMM
an abbreviation for one billion (10^9), seen in a few traditional units such as those mentioned above. The abbreviation is meant to indicate one thousand thousand thousand, M being the Roman numeral 1000. However, MMM actually means 3000, not one billion, in Roman numeration.

MMscfd
symbol for one million standard cubic feet per day, the customary unit

for measuring the production and flow of natural gas. "Standard" means that the measurement is adjusted to standard temperature (60 °F or 15.6 °C) and pressure (1 atmosphere).

-mo

a "unit" traditionally used in printing to describe the page size of a book or other publication. In traditional printing, large sheets are printed, folded, and then cut to manufacture the book. After the cut is made, the sheet has been divided into a certain number of "leaves." Each leaf, folded at the spine of the book, comprises two pages front and back. When sheets were cut to form 4, 8, or 12 leaves, the resulting pages were described as quarto (4to), octavo (8vo) or duodecimo (12mo), respectively. Later, the suffix -mo from duodecimo was made into a suffix that can be attached to any number to indicate the number of leaves per sheet; thus 16mo indicates 16 leaves per sheet. **Link:** book sizes, from Bookbinding and the Conservation of Books, by Matt T. Roberts and Don Etherington, posted by Stanford University.

moa

an acronym for "minute of angle," that is, for the arcminute (see minute [2], above). This unit is commonly used in target shooting to express the angular size of targets or the spacing between marks on a reticle (the grid of lines seen in the eyepiece of a rifle). By coincidence, 1 moa is very nearly equal to a target size of 1 inchat 100 yards; in fact, 1 moa = 1.047 20 inches at 100 yards or 10.4720 inches at 1000 yards. In metric units, 1 moa = 2.9089 centimeters at 100 meters.

modified Julian day (MJD)

a count of days used by astronomers, space agencies, and others. Astronomers have long used the Julian day, a count of days beginning at noon Universal Time January 1, 4713 BC, as a means of specifying a date independent of all calendars. One problem with this is that the numbers are large, more than 2.4 million, for current dates. Also, the old astronomical custom of beginning a day at noon is awkward for converting Julian dates to the ordinary calendar. To ease these problems, space engineers introduced the modified Julian date, equal to the Julian date minus 2 400 000.5. The result is a count of days beginning at 0 hours (midnight) Universal Time on 17 November 1858. Thus (for example) 0 hours 1 January 2005 is MJD 53371.0.

module

a unit of volume for raw cotton in the U.S. When cotton is harvested, machinery is used to compact it into bundles called modules for transportation to the gin. A cotton module is 8 ft by 8 ft by 20 ft, or 1280 cubic feet (about 36.25 cubic meters). This unit is essentially the same as the TEU, the volume of a standard 20 ft container.

Mohs hardness scale

a 1-10 scale for estimating the hardness of a mineral, introduced by the German geologist Friedrich Mohs (1773-1839) in 1812. To apply the scale, one attempts to scratch the mineral with standard minerals assigned hardness numbers as follows: diamond 10, corundum 9, topaz 8, quartz 7, orthoclase 6, apatite 5, fluorite 4, calcite 3, gypsum 2, and talc 1. If, for example, the mineral is scratched by quartz but not by orthoclase, then its hardness is between 6 and 7.

moiety

another name for a half, from the French *moitié*.

molad

Hebrew name for the lunar (synodic) month (see month [1] below). This unit, 29.530 59 days, is crucial in the regulation of the Jewish lunisolar calendar.

molal (m), molar (M)

these notations, traditionally used by chemists to describe the concentration of chemical solutions, often appear to be units of measurement. It's easy to get them confused. The term "molal" describes the concentration of a solution in moles per kilogram of solvent (mol/kg), while "molar" describes a concentration in moles per liter (mol/L). A solution described as 1.0 μM has a concentration of 1.0 μmol/L. These units are not approved by the General Conference on Weights and Measures. Their use is declining, but still substantial.

molar volume

a unit used by chemists and physicists to measure the volumes of gases. The behavior of gases under ordinary conditions (not at very high

pressures or very low temperatures) is governed by the Ideal Gas Law. This law says that the volume V of a gas is related to its temperature T and pressure P by the formula PV = nRT, where n is the number of moles of gas present and the gas constant R equals 8.314 joules per mole per kelvin. The molar volume is the volume one mole of gas occupies at standard temperature (273.16 kelvins, or 0 °C) and standard pressure (1 atmosphere, or 101.325 kilopascals). The molar volume is equal to 22.414 liters or 0.7915 cubic foot. (Occasionally the term "molar volume" is used for the volume occupied by a mole of a substance which is not a gas; in such cases the molar volume will be different for each substance.)

mole (mol)

the SI base unit of the *amount* of a substance (as distinct from its mass or weight). Moles measure the actual number of atoms or molecules in an object. An earlier name is **gram molecular weight**, because one mole of a chemical compound is the same number of grams as the molecular weight of a molecule of that compound measured in atomic mass units. The official definition, adopted as part of the SI system in 1971, is that one mole of a substance contains just as many elementary entities (atoms, molecules, ions, or other kinds of particles) as there are atoms in 12 grams of carbon-12 (carbon-12 is the most common atomic form of carbon, consisting of atoms having 6 protons and 6 neutrons). The actual number of "elementary entities" in a mole is called **Avogadro's number** after the Italian chemist and physicist Amedeo Avogadro (1776-1856). Careful measurement determines Avogadro's number to be approximately 602.214 179 x 10^{21}. In the American system of naming big numbers, that's 602 sextillion 214 quintillion 179 quadrillion, give or take about 50 quadrillion.

moment

a medieval unit of time equal to 1/40 hour or 1.5 minutes. This meaning has come down to us only as "a brief interval of time." The moment was divided into 12ounces [4] of 7.5 seconds each.

momme [1]

a traditional Japanese weight unit corresponding to the Chinese mace

(see above). Jewelers continue to use the momme to measure the weight of cultured pearls; for this purpose it equals exactly 3.75 grams (about 0.132 ounce) or 18.75 carats. The unit is commonly pronounced "mommy" in English.

momme [2]

a traditional unit used to measure the "weight" (density per unit area) of silk. The measure is the weight in momme [1] of a standard strip of silk 25 yards long by 1.49inches wide, an area of 1341 square inches or about 0.8652 square meter. This makes the silk momme equal to about 3.62 grams per square yard or 4.33 grams per square meter.

MON

abbreviation for motor octane number. See octane number.

mondo point

another name for a millimeter, when used to measure shoe and boot sizes. Ski boots, for example, are sized in mondo points.

month (mo or mon) [1]

a unit of time marked by the revolution of the Moon around the Earth. In many traditional societies the appearance of the first tiny crescent moon after the New Moon signaled the start of the month. This start of the month, based on the first appearance of the Moon, is still proclaimed from mosques in Islamic countries. Thus the**lunar month** is defined as the average interval between two successive moments of New Moon. Astronomers call this period the **synodic month**. Its length is 29.530 59 days.

month (mo or mon) [2]

a civil unit of time equal to approximately 1/12 year, but varying from 28 to 31 days [3]. The Sun and the Moon are our traditional time keepers, but they are badly out of step with each other. A solar year equals approximately 12.368 lunar months. The large fraction in this number makes it difficult to design a calendar with a whole number of months in each year. There are at least three solutions to the problem:

[i] Use **leap months**. In the traditional Chinese and Jewish calendars most years have 12 months, but some have a 13th month. In these **luni-solar** calendars the length of the year varies from 354 to 384 days.

[ii] Define 12 synodic lunar months to be a year and don't worry about the length of the year. This is the solution of the Islamic calendar. Since the Islamic year has only 354 or 355 days, its length does not match the cycle of the seasons.
[iii] Observe the solar year and let the months be 12 arbitrary periods; don't worry about the Moon. This is the solution adopted by Julius Caesar, who established the civil calendar we use today. In this calendar, all months have 30 or 31 days except the second month, February. February has 28 days in ordinary years and 29 in leap years. See also year [2].

moog
a proposed unit in synthetic music, equal to one volt per octave. The unit would honor Robert Moog (1934-2005), the inventor of the Moog synthesizer.

morgan (M)
a unit of genetic separation used in genetics and biotechnology. If two locations on a chromosome have probability *p* of being separated during recombination in a single generation, then the distance between those locations is *p* morgan. In practice, measurements are made in centimorgans, each centimorgan representing a 1% probability. The unit honors the American geneticist Thomas Hunt Morgan (1866-1945), who received the Nobel Prize for Medicine in 1933 for his pioneering work in studying the genetics of the fruit fly *Drosophila*.

morgen
a traditional unit of land area in Northern Europe. "Morgen" means "morning," and most likely the unit arose as the area a yoke of oxen could plow in one morning. The Dutch morgen, also used in Dutch colonies including old New York, equals about 2.10 acres or 0.850 hectare. In South Africa, this unit was defined to equal 10 246 square yards, which is 2.1169 acres or 0.8567 hectare. In Scandinavia and northern Germany, the morgen is a smaller unit equal to about 0.63 acre or 0.25 hectare (2500 square meters). The Prussian morgen, standardized at 2553.22 square meters, was in common use during the nineteenth century. In Austria and southern Germany, the morgen was often the same as a joch, typically defined to be 0.5755 hectare or about 1.422 acres.

mou
see mu (below).

mouse unit (MU or U)
an unofficial unit of toxicity used in pharmacology. A mouse unit is the dose of a toxin that kills 50% of mice (that is, it is the LD_{50} dose for mice). Typically the mice are assumed to have a mass of 20 grams, the toxin is administered by intraperitoneal injection, and mortality is measured over a standard period that may vary according to the toxin. The size of the mouse unit (in milliliters or international units) depends on the specific toxin.

MP, MPa
symbols for the megapascal, a unit of pressure or stress (see above). MPa is the correct symbol; MP should not be used.

mppcf
abbreviation for million particles per cubic foot, a unit used to measure concentration of dust particles, mostly in industrial settings. 1 mppcf is equivalent to about 35.315 million particles per cubic meter. The symbol **mp/f³** is sometimes used for this unit.

mq
Italian abbreviation for the square meter (*metro quadrato*). Similarly, **cmq** is a square centimeter and **kmq** is a square kilometer. These are non-standard symbols; the correct symbol for the square meter is m^2.

msl or MSL
abbreviation for "above mean sea level," often seen in measurements of altitude, as in **m (msl)** for meters above mean sea level or **ft msl** for feet above mean sea level. "Mean sea level" is defined to be the average height of the sea, for all stages of the tide, as measured over a 19-year Metonic cycle (see above).

Mstb
a symbol commonly used in the oil industry for 1000 stock tank barrels.

msw
symbol for "meters of seawater," a conventional unit of pressure. The

pressure exerted by seawater varies slightly with temperature and salinity, but for practical purposes the convention is that each meter imposes a pressure of 0.1 bar or 10 kilopascals (about 0.102 kilograms of force per square centimeter or 1.45 pounds per square inch). Sometimes the convention is that each meter is equivalent to 0.1 atmosphere (0.1013 bar), which is practically the same thing. In English units, 1 msw = 3.28 feet of seawater (fsw). Underwater pressure gauges are frequently calibrated in this unit.

Msym/s
a unit of radio transmission rate equal to 1 million symbols per second.

MT
a common U.S. abbreviation for the metric ton or tonne (1000 kilograms).

mtu
see metric ton unit, above.

mu or mou
a traditional unit of land area in China. The traditional mu is about 675 square meters or 800 square yards. However, the colonial customs authorities used a larger mu equal to 8273.75 square feet, 919.3 square yards, or 768.65 square meters. In modern China, the mu is often reckoned to be exactly 1/15 hectare, which is 666.667 square meters or 797.327 square yards.

mud
a traditional Dutch unit of volume for grains and other dry commodities. Originally varying from market to market, the unit was declared equal to the hectoliter (about 3.5315 cubic feet or 2.838 U.S. bushels) when the metric system was introduced in the Netherlands. With this definition it is still in use.

mug [1]
an informal contraction of "metric slug". See TME.

mug [2]
another name for a slinch.

mutchkin
a traditional Scottish unit of liquid volume. The mutchkin is about 15 British fluid ounces, which is about 426 milliliters or almost exactly 0.9 U.S. pint.

mwe
abbreviation for meter of water equivalent, a unit used in nuclear physics to describe the shielding around a reactor, accelerator, or detector. 1 mwe of any material (such as rock, gravel, etc.) is a thickness of that material providing shielding equivalent to one meter of water.

MWe, MWt
symbols used in the electric power industry to describe the size of generating plants. MWe is the symbol for the actual output of a generating station in megawatts of electricity; MWt is used for the heat energy, or thermal output, required to operate the generators. Thermal output is typically about three times the electric output.

Mya or mya
a common abbreviation (in English speaking countries) for "million years ago." The form "Mya" is recommended, since the capital M, taken from the metric prefix mega- (M-), is the appropriate symbol for a million.

myria- (my-)
a metric prefix meaning 10 000. This prefix was part of the original metric system of 1795 and was used throughout the nineteenth and early twentieth centuries. It has been obsolete officially since 1960, when the CGPM adopted the standard list of SI prefixes. The ancient Greek word *myrios* means countless, without number. This was modified by later Greeks to form a word *myrioi* meaning ten thousand. The word **myriad**, generally used today to mean an indefinitely large number, originally meant the number 10 000.

myriagram (myg)
a metric unit of mass equal to 10 000 grams or 10 kilograms (about 22.046 pounds). Although it is considered obsolete now, the myriagram was a useful unit comparable to the English quarter or Spanish arroba.

myriameter (mym)
an obsolete metric unit of distance equal to 10 000 meters or 10 kilometers (about 6.2137 miles).

N

N
a unit of refractive index sometimes used in atmospheric science. The index of refraction of the atmosphere is only slightly greater than 1. The value of the index in N units is the number of millionths by which the index exceeds one; that is, an index of refraction *n* is equivalent to $(n - 1) \times 10^6$ N units.

nail
an old English unit of length equal to 1/20 ell. Like the ell, the nail was used for measuring cloth; traditionally, it represented the length of the last two joints (including the fingernail) of the middle finger. The nail is equivalent to 1/16 yard, 1/4 span, 2.25 inches, or exactly 5.715 centimeters.

nano- (n-)
a metric prefix meaning 10^{-9}, or one billionth. The prefix comes from the Greek word *nanos*, dwarf.

nanoacre
a humorous unit of area on a computer chip, equal to one billionth of an acre or about 4.047 square millimeters.

nanobar (nb or nbar)
a CGS unit of pressure equal to 10^{-9} bar or 0.1 millipascal (mPa). The nanobar is frequently used in meteorology to express the partial pressure of atmospheric ozone.

nanocurie (nCi)
a common unit of radioactivity. The nanocurie equals 10^{-9} curie or 37 becquerels; this corresponds to a radioactivity of 37 atomic disintegrations per second.

nanofarad (nF)
a common metric unit of electric capacitance equal to 10^{-9} farad. This unit was previously called the **millimicrofarad (mμF)**.

nanogram (ng)
a metric unit of mass equal to 10^{-9} gram, or one millionth of a milligram.

nanogray (nGy)
a unit of radiation dose equal to 10^{-9} gray or 0.1 microrad (μrad). This unit often occurs in the study of inhalation exposures.

nanoliter (nl or nL)
a metric unit of volume equal to 10^{-9} liter or 0.001 cubic millimeter.

nanometer (nm)
a metric unit of distance equal to 10^{-9} meter. Introduced in 1951, the nanometer replaced the **millimicron**. One nanometer equals 0.001 micrometer or 10 angstroms.

nanomole
a unit of amount of substance equal to 10^{-9} mole. This unit is common in biochemistry, since a mole of a large organic molecule can be quite a large amount.

nanon
an informal name for the nanometer.

nanonewton (nN)
a metric unit of force equal to 10^{-9} newton (see below) or 0.1 millidyne. Nanonewtons measure the force of solar radiation and the tiny forces exerted within living cells.

nanoradian (nrad)
a unit of angle measure equal to 10^{-9} radian. The nanoradian equals about 0.208 533 milliarcsecond (mas). Such tiny angles are encountered in astronomy and in geological measurements.

nanosecond (ns)
a unit of time equal to 10^{-9} second.

nanosievert (nSv)
a unit of radiation dose equal to 10^{-9} sievert or 0.1 microrem.

nanostrain (nstrain)
an engineering unit measuring strain. An object under strain is typically deformed (extended or compressed), and the strain is measured by the amount of this deformation relative to the same object in an undeformed state. One nanostrain is the strain producing a deformation of one part per billion (10^{-9}). Strains in geological formations are often measured in this unit.

nanotesla (nT)

a unit of magnetic field strength equal to 10^{-9} tesla or 10^{-5} gauss. The unit is used in geology to measure small changes in the Earth's magnetic field.

nat or natural unit

a unit of information content used in information and communications theory. The nat is similar to the shannon but uses the natural logarithm (to the base *e*) instead of the logarithm to the base 2. If the probability of receiving a particular message is *p*, then the information content of the message is $-\log_e p$ nats. For example, if a message is a string of 5 letters or numerals, with all combinations being equally likely, then a particular message has probability $1/36^5$ and the information content of a message is $5(\log_e 36) = 17.9176$ nats. One nat equals $\log_2 e = 1.442\,695$ shannons or $\log_{10} e = 0.434\,294$ hartleys.

nautical mile (nmi, naut mi, n mile, or NM)

a unit of distance used primarily at sea and in aviation. The nautical mile is defined to be the average distance on the Earth's surface represented by one minute of latitude. This may seem odd to landlubbers, but it makes good sense at sea, where there are no mile markers but latitude can be measured. Because the Earth is not a perfect sphere, it is not easy to measure the length of the nautical mile in terms of the statute mile used on land. For many years the British set the nautical mile at 6080 feet (1853.188 meters), exactly 800 feet longer than a statute mile; this unit was called the **Admiralty mile**. Until 1954 the **U.S. nautical mile** was equal to 6080.20 feet (1853.249 meters). In 1929 an international conference in Monaco redefined the nautical mile to be exactly 1852 meters or 6076.115 49 feet, a distance known as the **international nautical mile**. The international nautical mile equals about 1.1508 statute miles. There are usually 3 nautical miles in a league. The unit is designed to equal 1/60 degree [2], although actual degrees of latitude vary from about 59.7 to 60.3 nautical miles. (Note: using data from the Geodetic Reference System 1980, the "true" length of a nautical mile would be 1852.216 meters.)

Ncm

a symbol for the newton centimeter, a metric unit of torque equal to 0.01 newton meter (see below) or about 1.416 12 inch ounces (in·oz) in traditional English units.

Ndm³

a symbol sometimes used for the **normal liter** (see below). Recall that a liter is the same as a cubic decimeter (dm^3).

nebuchadnezzar

a huge wine bottle holding about 15 liters, 20 times the volume of a regular bottle.

neck (nk)

an informal unit of distance used to measure the distance one horse leads another at the finish of a race. The neck is usually interpreted to be 1/4 length or a little less; this is roughly 2 feet or 0.6 meter.

neper (Np)

a unit expressing the ratio of two numbers as a natural logarithm; the ratio *r* corresponds to (1/2) ln *r* nepers. Quantities differ by 1 neper if one is $e^2 = 7.389056$ times the other. One neper is equal to about 8.685 890 decibels, and in general *n* nepers equal $20n/(\ln 10)$ decibels. The neper is accepted for use with SI units, and it may become an SI unit in the future. The unit recognizes the Scottish mathematician John Napier (1550-1617), the inventor of the logarithm (Napier often spelled his name Jhone Neper, and he used the Latin form Ioanne Napero in his writings).

nest

an old English unit of quantity equal to 3. This unit was often, but not always, used for items that nest together, such as 3 bowls or 3 hampers.

net ton (NT)

the name "net ton" is used in at least two ways: (1) as another name for the U.S. or short ton of 2000 pounds (see ton [1]), and (2) as another name for the register ton, a unit of volume equal to 100 cubic feet (see ton [3]), in describing the cargo-carrying capacity of a ship as opposed to the entire interior volume. To avoid confusion, it is better to use "short ton" for use (1) and "net register ton" for use (2).

new candle

an older name (introduced in 1937) for the candela, a unit of light intensity.

new style (NS)
a notation used after dates to indicate that the date is stated in the Gregorian calendar (the calendar now in general use) rather than in the Julian calendar (see year [2]). The notation is used primarily for Gregorian dates between 15 October 1582, when the Gregorian calendar was adopted in Catholic Europe, and 14 September 1752, when it was adopted in Britain. See also old style.

newton (N)
the SI unit of force. A force of one newton will accelerate a mass of one kilogram at the rate of one meter per second per second. The corresponding unit in the CGSsystem is the dyne; there are 10^5 dynes in one newton. In traditional English terms, one newton is about 0.224 809 pounds of force (lbf) or 7.233 01 poundals. The newton is also equal to about 0.101 972 kilograms of force (kgf) or kiloponds (kp). The newton is named for Isaac Newton (1642-1727), the British mathematician, physicist, and natural philosopher. He was the first person to understand clearly the relationship between force (F), mass (m), and acceleration (a) expressed by the formula $F = ma$.

newton meter (N·m)
the SI unit of torque. Torque, the tendency of a force to cause a rotation, is the product of the force and the distance from the center of rotation to the point where the force is applied. Torque has the same units as work or energy, but it is a different physical concept. To stress the difference, scientists measure torque in newton meters rather than in joules, the SI unit of work. One newton meter is approximately 0.737 562 pound foot.

newton second (N·s)
the SI unit of impulse, equal to the amount of momentum added to an object if a force of one newton is applied for one second. The newton second equals about 0.224 809 pound second (lbf·s) in traditional English units. Impulse and momentum have the same dimensions, but momentum is measured in kilogram meters per second (kg·m/s) in the SI.

ngarn
a unit of land area in Thailand. The ngarn equals 1/4 rai, 100 talangwah (tw), or exactly 400 square meters (478.396 square yards or just under 0.1 acre).

niacin equivalent (NE)
a unit used in nutrition. An essential nutrient, niacin is supplied in normal diets from tryptophan, an amino acid found in many foods. However, only a small fraction of tryptophan is converted into niacin in the body. Accordingly, 1 niacin equivalent is equal to 1 milligram of actual niacin or to 60 milligrams of tryptophan.

nibble
a unit of information used in computer science. A nibble is 4 bits or 1/2 byte. The cuter spelling **nybble**, suggested by byte, is sometimes used. In different contexts, a group of 4 bits is sometimes called a **quadbit** or a **hexit**.

nile
a unit used in nuclear engineering to describe the "reactivity" of a nuclear reactor. One nile is a reactivity of 0.01 or 1%. Since this is a rather large amount, reactivity is measured for practical purposes in milliniles, with one millinile = 10^{-5}. The nile was invented in the British nuclear power industry. For a discussion of reactivity, seeinhour.

nine [1]
a measure of "fineness" or purity of gold and other materials. For example, gold that is 99.99% pure, or .9999 fine, is called "4 nines fine."

nine [2]
a measure of reliability, or "availability," used in computer engineering. For example, a component has "3 nines" of reliability if it operates correctly 99.9% of the time, or, equivalently, if its failure rate is 0.1%. Thus each nine represents a reduction of 90% in the failure rate. If the probability of correct operation is p, then the reliability, in nines, is equal to $-\log_{10}(1-p)$.

nip
an informal unit of liquid volume. The term "nip" often means "a small amount," with no precise equivalent. In U.S. bartending, a nip is often taken to be 2 fluid ounces (about 59 milliliters). In Britain, a nip of spirits is considered to be 1/6 gill (about 22.95 milliliters or

0.776 U.S. fluid ounce); a nip of beer is 1/4 pint (the same as a gill, 4 fluid ounces or about 117.7 milliliters) or sometimes 1/3 pint (189.4 milliliters).

nit (nt)

an MKS unit of luminance, equal to one candela per square meter, or 10^{-4} stilb. The nit is not approved as part of the SI, but it has been approved since 1947 by the International Commission on Illumination (CIE) and is in wide use. The name of the unit comes from the Latin *niteo*, to shine. This unit is sometimes called the**meterlambert**, by analogy with the footlambert.

Nm or N·m [1]

symbol for newton meter, a unit of torque (see above).

Nm [2]

abbrevation for **normal metric**, a symbol for the density of worsted yarns. Yarn is described as *a*/*b* Nm if it is *a*-ply (has *a* individual strands) and there are *b*kilometers of yarn per kilogram. An example might be 2/40 Nw, describing a 2-ply yarn having 40 kilometers per kilogram. If the yarn is single-ply, the *a* is often omitted, so a single-ply yarn is described as *b* Nm.

noeud

the French word for the knot (1.852 km/h), the traditional unit of velocity at sea. This unit is still used officially in France; for example, Météo France uses it in maritime weather forecasts.

noggin

a traditional unit of liquid volume, used primarily in Ireland. Like the gill, the noggin is often taken to equal 1/4 pint; sometimes it is taken to be 1/2 pint.

noise criterion (NC), noise rating (NR)

units used in enginering to measure the acceptability of sound levels in enclosed spaces. The noise rating (NR) system was introduced by Kosten and van Os in 1962. Numerically, the NR rating is equal to the sound level in decibels at a frequency of 1000 hertz, but the rating requires lower levels at the more objectionable higher frequencies. The noise criterion (NC) system, introduced by Beranek in 1957, is similar, but it is designed more toward preserving speech communication, requiring lower levels of both high and low frequencies. It was updated in 1971, and the updated system is called PNC (prefered noise criterion).

nonet

a unit of quantity equal to 9, used mostly in music to describe an ensemble of 9 instruments.

nook

a traditional unit of land area in northern England. Originally the nook was 1/2 virgate; a virgate, often called a **yardland** in the north, was about 30 acres in southern England but tended to be closer to 40 acres in the north. A nook of land thus came to be 20 acres or about 8.094 hectares.

normal (N)

a term used in chemistry to describe a solution having a concentration of 1 gram equivalent per liter. The normal concentration of an ion is effectively equal to themolar concentration divided by the valence (the number of free or missing electrons) of the ion.

normal cubic meter (Nm^3)

a unit of mass for gases equal to the mass of 1 cubic meter (35.3147 ft^3) at a pressure of 1 atmosphere and at a standard temperature, often 0 °C (32 °F) or 20 °C (68 °F). The term **standard cubic meter** is also used; sometimes both are used, with different temperatures. Because industry practice varies, these terms should always be defined wherever they occur. The symbol Nm^3, though common, is not permissible under the SI because that symbol means "newton cubic meter." An acceptable SI symbol would be "m^3 normal." See also sccm.

normal liter (NL or Nl or Ndm^3)

a unit of mass for gases equal to the mass of 1 liter (0.035 3147 ft^3) at a pressure of 1 atmosphere and at a standard temperature, often 0 °C (32 °F) or 20 °C (68 °F). Air flow is often stated in normal liters per minute (Nl/min).

nose

an informal unit of length, equal to roughly half the length of a horse's

head, used in expressing the results of a horse race.

note

a unit of relative time in music, also called a **whole note**, equal to 1/2 breve.

nox

a unit of (low) illumination equal to 0.001 lux. This unit was used in Germany during World War II to describe permitted levels of lighting during air raids. "Nox" is the Latin word for "night."

noy

a unit of perceived noisiness introduced by the American acoustics engineer K. D. Kryter in 1959. An observer uses the unit to described the noise levels he or she experiences as multiples of a standard level. The standard level, one noy, is defined to be the noisiness of a random noise signal within the frequency band from 910 to 1090 hertz at a sound pressure level of 40 decibels. As you have already guessed, the unit's name is chosen so that its plural is pronounced "noise." A jet aircraft takeoff is rated at about 110 noys.

NTU

abbreviation for **nephelometric turbidity unit**, a unit used in measuring water quality. Turbidity is an optical property: the scattering and absorption of light by solids suspended in water. Turbid water has a cloudy or hazy appearance. An instrument called a nephelometer (from a Greek word meaning "cloudy") measures turbidity directly by comparing the amount of light transmitted straight through a water sample with the amount scattered at an angle of 90° to one side; the ratio determines the turbidity in NTU's. The instrument is calibrated using samples of a standard solution such as formazin, a synthetic polymer. Drinking water should not have a turbidity above 1 NTU, although values up to 5 NTU are usually considered safe. Outside the U.S., this unit is usually called the FNU (formazin nephelometric unit).

nu

a measure of the dispersiveness (or constringence, as it is called) of a lens or prism. If b, y, and r are the indices of refraction at blue, yellow, and red wavelengths, respectively, then the nu value is $(y - 1)/(b - r)$.

The measure is represented by the Greek letter nu, and sometimes the symbol "nu" is used as if it were a unit, as in 65 nu.

Nw

symbol for **normal worsted**, a unit measuring the density of worsted yarns. Worsted yarn is described as a/b Nw if it is a-ply (has a individual strands) and there are b560-yard hanks of yarn per pound. An example might be 2/40 Nw, describing a 2-ply yarn having 40 hanks (22 400 yards) per pound. If the yarn is single-ply, the a is often omitted, so a single-ply worsted yarn is described as b Nw.

nybble

see nibble, above.

~O~

obol, obolos, obolus

a historic unit of weight or mass. The obol is a very small weight that originated as the weight of a tiny Greek coin. In ancient Greece the *obolos* was equal to 1/6 drachma, or roughly half a gram (8 grains). In Rome, the *obolus* was equal to 1/48 Roman ounce (*uncia*) or about 0.57 gram. In modern Greece, the *obolos* is an informal name for the decigram (0.1 gram).

o'clock [1]

a contraction of the phrase "of the clock," used in English after a statement of time. This phrase has been traced to the early 1400s at least; it is fairly common in the works of Shakespeare. Earlier, time was usually stated in hours and minutes, and this is still the case in most languages. Thus "10 o'clock" is "10 hours" in most of the world.

o'clock [2]

an informal angular measure that works by describing an angle in terms of the face of a standard (12-hour) clock. Each hour "o'clock" spans an angle of 30°, so "4 o'clock" means an angle of 120° measured clockwise from dead ahead or some other agreed-upon point of reference.

octad

a unit of quantity equal to 8.

octane number or octane rating
a measure used to express the ability of gasoline to reduce engine knocking. Gasoline is a complex mixture of hydrocarbons: compounds containing hydrogen and carbon. Beginning chemistry students learn that "octane" is the name of a hydrocarbon whose molecules contain 8 carbon atoms and 18 hydrogen atoms, the 8 carbons being arranged in a long chain. The compound cars need to prevent knocking is not that octane but a different compound of 8 carbon atoms and 18 hydrogen atoms called iso-octane or, in the more precise language of chemical nomenclature, 2,2,4-trimethylpentane. (In an iso-octane molecule there are only 5 carbons in the chain. Carbons 6 and 7 are attached to the sides of the chain at the #2 position, and the last carbon is hooked onto the #4 position; chemists call this a branched hydrocarbon.) To determine the octane rating of gasoline, a sample of the gasoline is compared to a laboratory mixture of iso-octane and another hydrocarbon called heptane (heptane has 7 carbons and 16 hydrogens, with the 7 carbons in a chain). The mixture is adjusted until it has the same anti-knocking characteristics as the gasoline being tested. The octane rating is the percentage of iso-octane required in the laboratory mixture to produce this equality of knocking behavior. In fact, it's even more complicated: there are two ways to do the test, producing two ratings called the research octane number (RON) and the motor octane number (MON). The MON is typically 8 or 10 points lower than the RON for the same batch of fuel. In the U.S., the number posted on the gas pump is the average of the RON and MON; this average is called the pump octane number (PON). There is a similar unit, cetane number, used for rating diesel fuel. The octane rating is often misunderstood as a measure of the energy content of the fuel, but what it actually measures is the tendency of the fuel to burn rather than explode.

octant [**1**]
a unit of angle measure equal to 1/8 circle, 45°, or pi/4 radians.

octant [**2**]
a unit of solid angle measure. One octant is 1/8 sphere, or pi/2 steradians, or about 5156.6 square degrees.

octarius
an obsolete name for the British Imperial pint (34.678 cubic inches or approximately 568.261 milliliters), used in British medicine and pharmacy during the nineteenth century. The octarius was equal to 1/8 congius (gallon).

octave
a unit used in music to describe the ratio in frequency between notes. Two notes differ by one octave if the higher note has exactly twice the frequency of the lower one. The name, derived from the Latin numeral 8 (*octo*), refers to the traditional sequence of 8 notes in the musical scale (in English: do, re, mi, fa, so, la, ti, do). Both ends of the scale are included, so 2 octaves include 15 notes (first do through third do) instead of 16. Outside of music, the octave is also used to describe a group of 8 objects sequenced somewhat like musical notes. For example, in the Christian religious calendar an octave is a period of 8 days beginning with a feast day and ending with the day one week after the feast day.

octavillo
a traditional Spanish unit of dry volume. The octavillo equals about 289 milliliters (a little more than a cup, in U.S. terminology). This is equivalent to about 17.64 cubic inches, 0.525 U.S. pint, or 0.5086 British Imperial pint. Since octavillo means "eighth," one would expect the octavillo to be 1/8 of some other unit, but this is not the case. There are 4 octavillos in a cuartillo, 16 in an almude, and 48 in a fanega.

octennium
a unit of time equal to 8 years.

octet [**1**]
a unit of quantity equal to 8. The name comes from the Latin numeral *octo*.

octet [**2**]
a unit of information equal to 8 bits, used primarily in telecommunications. In most contexts, this is the same as a byte, but the byte can sometimes vary in size while the octet is always exactly 8 bits.

octuple, octuplet

a group of 8 items, especially 8 identical items; the word octuplet is also used for one member of the group.

odds

a statement of the probabilities that an event will or will not happen. If the probability is $a/(a + b)$ that the event will happen and $b/(a + b)$ that it will not happen, then the odds are *a-b* (or *a to b*, or *a:b*) in favor of the event and *b-a* (or *b to a*, or *b:a*) against the event. In the division of the probability into $a + b$ parts the values of *a*and *b* are usually chosen so that both numbers are small whole numbers with the smaller number equal to 1 if possible. Generally the odds are stated in whichever form puts the larger number first, and in many cases this will be the odds against the event. Thus 4-1 odds on a horse in a horse race can be viewed as an estimate that the probability of the horse's winning is 1/5. In some cases, odds are used to express probabilities explicitly: for example, if a geologist says that the odds are 5-1 against a volcano erupting this year, that is an estimate that the probability of an eruption is about 1/6. In betting situations, odds are at least a rough estimate for probabilities, but what they actually establish is the payoff ratio: if an event has *a-b* odds, then you must bet *b* in order to receive $a + b$ if the event happens. Thus the odds can be viewed as the ratio of potential profit *a* to wager *b*. This traditional use of the word "odd" is believed to come from the old English word *ord* for a spear point, hence something hazardous.

Oechsle

see degree Oechsle.

oersted (Oe) [1]

the CGS unit of magnetic field strength. The oersted is defined to be the field strength in a vacuum at a distance 1 centimeter from a unit magnetic pole. A field of one oersted generates a magnetomotive force of 1 gilbert per centimeter of conductor. There is no named MKS unit of field intensity, but the oersted is equivalent in MKS units to 79.577 472 ampere-turns per meter. The unit honors Hans Christian Ørsted (1777-1851), a Danish physicist, who discovered electromagnetism in 1820. Before 1930 this unit was called the gauss [2].

oersted (Oe) [2]

another name for the gauss [1] as a unit of magnetic flux density.

ohm [1]

the SI unit of electric resistance, reactance, and impedance. If a conductor connects two locations having different electric potentials, then a current flows through the conductor. The amount of the current depends on the potential difference and also on the extent to which the conductor resists the flow of current. For direct current circuits, this property of opposition to current flow is called the resistance. In alternating current circuits, the current flow is also affected by reactive components, capacitors or inductors, that react to the change in the current over time. This opposition is called reactance; impedance measures the combined effect of resistance and reactance. All three quantities are measured in ohms. One ohm is the resistance, reactance, or impedance that requires a potential difference of one volt perampere of current. The unit honors the German physicist Georg Simon Ohm (1787-1854). The capital Greek letter omega is used as the symbol for the ohm, since "O" would be easily misinterpreted as a zero.

ohm [2]

a traditional German unit of liquid volume, no longer in use. The ohm, spelled **aume** in English, was generally equal to 1/6 fuder or roughly 150 liters (40 U.S. gallons).

ohm meter

a unit of resistivity, measuring the extent to which a substance offers resistance to passage of an electric current. The resistivity of a conductor in ohm meters is defined to be its resistance (in ohms) multiplied by its cross-sectional area (in square meters) divided by its length (in meters).

ohm per square

a unit of resistivity for surface films and other materials whose thicknesses are considered to be negligible. The resistivity of a very thin conductor is defined to be its resistance (in ohms) multiplied by its width and divided by its length. If the conductor is square in shape, then its length and width are the same and its resistivity is numerically equal to the resistance of the square, which is actually the same no matter what

the size of the square is. Therefore the resistivity could be stated in ohms, but it is conventional to state it in "ohms per square." One can consider the square to have sides equal to one unit, the size of the unit being immaterial.

ogdoad

another name for an octad; this very learned spelling is a transliteration of the ancient Greek.

oitavo

a traditional Portuguese unit of liquid volume comparable to 1/2 gallon in the U.S. system. The oitavo equals 1/32 fanega or about 1.73 liters (0.46 U.S. liquid gallon or 0.38 British Imperial gallon).

oka or oke

a traditional unit of weight in Turkey and throughout the eastern Mediterranean. The oka is approximately 2.8 pounds or 1.28 kilograms, although its size varied somewhat over the large area formerly included in the Turkish empire. In Greece, the oka was standardized at 1282 grams and remained in use until traditional units were prohibited in 1959. The Greek oka was divided into 400 dramja; in Cyprus, under British rule, the oka was divided into 400 drachms and remained in use until the 1980s. The oka was also used sometimes as a unit of liquid volume, representing the volume (roughly 1.25 liters) occupied by an oka (weight) of water or wine.

okta

a unit of proportion equal to 1/8, used in meteorology to record the fraction of the sky covered by clouds. For example, if half the sky is cloud-covered, the coverage is reported to be 4 oktas. The name of the unit comes from the Greek numeral 8, *okto*. It was coined to provide a word meaning "eighth" in all languages.

öl

a traditional Hungarian distance unit comparable to the English fathom. The öl was equal to 6 láb or about 1.896 meter (6.22 English feet), making it the Hungarian version of the Viennese klafter.

old style (OS)

a notation used after a date stated in the Julian calendar (see year [2]).

The Julian calendar was replaced by the Gregorian calendar in 1582 or soon thereafter in predominantly Catholic countries of Europe. It remained in use in Britain, a Protestant country, until 1752, and in Russia, an Orthodox country, until 1918. In addition, the first day of the new year in England, until 1752, was 25 March instead of 1 January. Thus George Washington, the first U.S. president, was born on 11 February 1731 OS, or 22 February 1732 in the Gregorian calendar. Link: adoption dates for the Gregorian calendar in various countries. Wikipedia has a useful chart with similar information.

olf

an empirical unit of indoor odor intensity introduced by the Danish environmental scientist P.O. Fanger in 1988. One olf is defined as the odor intensity produced by one 'standard' person (a standard person is also defined). The name comes from the Latin *olfacere*, to smell. Ventilation reduces pollution, and the resulting pollution in ventilated, enclosed spaces is measured in decipols.

olk

a traditional Iraqi unit of land area, now identified with the are, the metric unit of area equal to 100 square meters. Like the are, the olk is approximately 1076.3910 square feet or 0.02471 acre. There are 25 olk in the Iraqi dunum, the common unit of agricultural land area in the country.

olympiad

a unit of time equal to four years. In ancient Greece, the olympiad referred to the four-year interval between successive Olympic Games. The first Greek olympiad was the period 776-773 BC. The olympiad was revived in 1896 when the modern Olympics began. The period 2005-2008, called the "28th Olympiad of the modern era," is the 696th olympiad by the original Greek reckoning.

omer

a ancient unit of volume for grains and dry commodities, used in the Bible. The omer was equal to 0.1 ephah; this is believed to equal about 4.032 liters, 246.05 cubic inches, 0.9154 U.S.dry gallon, or 0.8869 British Imperial gallon.

omn. bih.
traditional abbreviation for the Latin *omni bihorio*, once every two hours, a unit of frequency sometimes used in medical prescriptions. The abbreviation **alt. h.** (*alternis horis*, every other hour) is equivalent.
omn. hor.
traditional abbreviation for the Latin *omni hora*, once every hour, a unit of frequency sometimes used in medical prescriptions. The abbreviation **q. h.** (*quaque hora*, each hour) is equivalent.
onça, once, oncia, onza
traditional names for the ounce unit in Romance languages. The Portuguese **onça** and Spanish **onza** equal 1/16 libra or about 28.69 grams (1.012 ounce); the French**once** equals 1/16 livre or about 30.59 grams (1.079 ounce). The Italian **oncia** or **onza** is no longer used, but traditionally it equaled 1/12 libra or about 27.3 grams (0.96 ounce).
ons
a Dutch unit of weight or mass, now used as a metric unit equal to the hectogram (100 grams, or about 3.5274 ounces).
open window unit (owu)
the original name of the unit of sound absorption now called the sabin.
order of magnitude
a logarithmic unit used to compare the sizes of quantities. Two quantities differ by one order of magnitude if one is 10 times the other, by two orders of magnitude if one is 10·10 = 100 times the other, and so on. Thus a difference of *n* orders of magnitude means the larger quantity is 10^n times the smaller one.
osmolal, osmolar
notations used by chemists to describe the concentration of ions in chemical solutions. The term "osmolal" describes an ion concentration of a solution in moles per kilogram of solvent (mol/kg), while "osmolar" describes an ion concentration in moles per liter (mol/L).
osmole (Osm)
a unit of osmotic pressure used in physical chemistry, cell biology, and medicine. If chemical solutions are separated by a semipermeable membrane (a membrane that resists the passage of dissolved substances but permits the passage of the solvent, usually water), then the solvent will diffuse across the membrane to equalize the concentrations. This process is called *osmosis*. Solutions with higher concentrations of dissolved substances are said to have higher *osmotic pressure* than solutions having lower concentrations; thus the solvent moves from an area of low osmotic pressure to an area of higher osmotic pressure. One osmole is the osmotic pressure of a one molar solution (that is, a solution with a concentration of one mole per liter of solvent) of a substance that does not dissociate, such as sugar (glucose) in water. Osmotic pressure depends on the total number of dissolved particles, so for a substance that dissociates into two ions, such as ordinary salt (sodium chloride), a one molar solution has an osmotic pressure of 2 osmoles. In practice, most measurements are in milliosmoles (mOsm). Typical values range from 20 mOsm for fresh water through 290 mOsm for typical human blood plasma to 1010 mOsm for salt water from the open ocean.
ostent
a medieval name for the time unit now called the minute. (In medieval times a minute was equal to 1/10 hour, or 6 modern minutes). The ostent was equal to 8 ounces [4] (see below).
ounce (oz or oz av) [1]
a traditional unit of weight. The **avoirdupois ounce**, the unit commonly used in the United States, is 1/16 pound or about 28.3495 grams. The avoirdupois ounce also equals 175/192 = about 0.911 457 troy ounce or 437.5 grains. The word ounce is from the Latin *uncia*, meaning a 1/12 part, because the Roman pound was divided into 12 ounces. The word "inch," meaning 1/12 foot, has the same root. The symbol oz is from the old Italian word *onza* (now spelled *oncia*) for an ounce. Seeavoirdupois weights for additional information.
ounce (oz, oz t, toz, or oz ap) [2]
a second traditional unit of mass or weight. The **troy ounce**, traditionally used in pharmacy and jewelry, is 1/12 troy pound, 480 grains, or about 31.1035 grams. Thus the troy ounce equals 192/175 = 1.09714 avoirdupois ounces. This unit is the traditional measure for gold and

other precious metals; in particular, the prices of gold and silver quoted in financial markets are the prices per troy ounce. The troy ounce is divided into 20 pennyweight or into 8 troy drams [2]. See troy weights for additional information. The troy ounce is sometimes abbreviated oz t or toz to distinguish it from the more common avoirdupois ounce; in traditional pharmacy it was abbreviated oz ap.

ounce (oz or fl oz) [3]
a traditional unit of liquid volume, also called the fluid ounce (fl oz).

ounce [4]
an old term for a 1/12 part, the English equivalent of the Latin *uncia* (see def. [1] above). In medieval times, the word was used sometimes for a unit of distance equal to 1/12 yard or 3 inches. It was also used for a unit of time equal to 1/12 moment, or 7.5 seconds. In some settings, an ounce of time was divided into exactly 47atoms.

ounce force (ozf or oz)
a traditional unit of force, equal to the force experienced at the earth's surface by a mass of one ounce. One ounce force equals 1/16 pound force or about 0.278 014newton.

ounce mole (ozmol)
a unit of amount of substance. One ounce mole of a chemical compound is the same number of ounces as the molecular weight of a molecule of that compound measured in atomic mass units. Thus the ounce mole is equal to 28.349 52 moles.

ounce per gallon (oz/gal)
a traditional unit of mass concentration. One ounce per U.S. gallon equals 7.489 152 grams per liter (g/L). In Britain, 1 ounce per Imperial gallon is equal to 6.236 023 grams per liter.

ounce per square foot (oz/ft^2)
a traditional unit of density, still used widely in the U.S. for stating the density of coatings, the "weight" of leather, the rates of application for lawn chemicals, and many other applications. One ounce per square foot is equal to 0.305 152 kilogram per square meter (kg/m^2).

ounce weight (oz)
a traditional unit for measuring the density (incorrectly called the "weight") of a fabric. In most cases, the stated ounce density of a fabric is its density in ounces per square yard (oz/yd^2). 1 ounce per square yard is equal to 33.9057 grams per square meter (g/m^2 or gsm). However, when the fabric is shipped in rolls or bolts of a standard width, the ounce density is sometimes figured in ounces per linear yard, the width being understood. For example, for a bolt of wool having a standard width of 60 inches (1.524 meters), a density of 1 ounce per linear yard corresponds to 31.0034 grams per linear meter, or, taking the width into account, 20.3434 grams per square meter.

oxgang
an old English unit of land area equal to 1/8 hide or roughly 15 acres (6 hectares). The hide was considered the area a farmer could plow with a team of 8 oxen, so an oxgang was the area he could plow with a single ox. The unit was also called the **bovate**, from the Latin word *bos* for an ox or cow.

P

P or p
a common short form of PM or pm (see below), used in statements of time.

paardekracht (pk)
the Dutch word for the metric horsepower.

pace [1]
a traditional unit of distance equal to the length of a person's "full" pace, that is, the distance between two successive falls of the *same* foot. Thus one pace equals two steps. The Romans counted 1000 paces in a mile with each pace being a little over 58 inches (or about 148 centimeters). In English speaking countries, the pace is usually defined to be exactly 5 feet (or 152.4 centimeters); this unit is also called the **great pace** or **geometrical pace**. Obviously, a good metric version of the pace is exactly 1.5 meters.

pace [2]
in military use, the term "pace" is often used as an alternate name for the

step; see military pace.

pack (pk)

a commercial unit specifying the number of items per package. In retail trade, packages containing 4 items (for example) are often described as "4 pack" or "4pk." The symbol pk is also used for the peck (see below).

pack year

a unit of quantity for cigarettes used in medicine to measure a patient's smoking history. One pack year is the equivalent of smoking one 20-cigarette pack per day for one year, that is, a total of 7300 cigarettes.

packen

a traditional Russian unit of weight equal to 1200 funte, 30 pudi (see pud below), 1083 pounds, or 491.4 kilograms.

pair (pr)

a unit of quantity equal to 2. The word is from the Latin *paria*, meaning "equals." Originally a pair was simply a group of similar objects, number unspecified. Eventually this meaning was specialized to refer to a group of two.

pair royal

a unit of quantity equal to 3, used in cribbage to describe three cards of the same rank. This usage recalls the original meaning of "pair" as a group of equivalent objects, not necessarily two in number. Four cards of the same rank form a "double pair royal."

Palermo scale

a scale used by astronomers to assess the risk of an impact on the earth by a comet or asteroid. The scale value is a logarithmic measure of the risk of impact compared to the average risk of an impact by objects of the same size or larger over the years until the date of the potential impact by the newly discovered object. If the object in question has probability p of impact at a time T years in the future, the Palermo scale value is $PS = \log_{10}(p/(0.03TE^{-4/5}))$, where E is the projected energy of the impact in megatons of TNT. A possible impact is considered to be of concern if the Palermo scale value exceeds -2, that is, if the impact is more than 1% as likely as a random impact. The scale is used to prioritize the need for further observations of an object. See also Torino number.

palm [1]

a traditional unit of distance equal to the width of a person's palm. The palm equals 4 digits or 1/6 cubit, which is about 3 inches or 7.5 centimeters. This unit was used very commonly in medieval and early modern Britain. Similar units, all equal to 1/4 the local "foot" unit, were used throughout northern Europe.

palm [2]

a traditional unit of distance equal to the length of a person's hand, from the wrist to the end of the middle finger. In the English system this unit is equal to 9 inches (22.86 centimeters) and is usually called a span. The confusion between the two palm units is ancient. In Roman times, the longer unit was known as the *palmus major* and the shorter one as the *palmus minor.* In the nineteenth century, the 3-inch version was more common in Britain and the 9-inch version was more common in the U.S., perhaps because some Americans were familiar with the comparable Spanish *palmo* (see below).

palm [3]

a name sometimes used in Dutch for the decimeter (10 centimeters, or about 3.937 inches).

palmful

an informal unit of volume popularized recently by Rachael Ray on her television shows in the U.S. Ray uses the palmful to mean a tablespoon (15 milliliters).

palmo

a traditional unit of distance in Spain and Portugal. The traditional Spanish palmo equals 9 pulgadas (see below) or 1/4 vara: this is about 20.9 centimeters in Spain and a little more than that in Spanish Latin America. In Texas, 1/4 vara comes to 8 1/3 inches (21.17 centimeters). Under the metric system in Spain, the palmo is an informal unit equal to 20 centimeters. The Portuguese palmo equals 0.1 braça or about 22.0 centimeters (8.66 inches). These units are based on the width of a person's outstretched hand, from the tip of the thumb to the tip of the little finger, a definition identical to that of the English span.

parasang

a historic unit of distance comparable to the European league. The unit originated in Persia but was used throughout the ancient Middle East and Mediterranean. It was equal to roughly 3.5-4.0 miles or about 6 kilometers. In Arabic the unit is called the **farasang**.

Paris foot

an English name for the French royal foot (*pied de roi*, see below).

Paris point

a unit of length equal to 2/3 centimeter (0.2625 inch) used to measure shoe size in most European countries.

parsec (pc or psc)

a non-metric unit of distance used in astronomy. As the Earth makes its orbit around the Sun, nearby stars appear to shift their positions in relation to the background of distant stars. This shift, called the *parallax* of the star, is very small, less than one arcsecond even for the nearest stars. One parsec is the distance at which a star would appear to shift its position by one arcsecond during the time in which the Earth moves a distance of one astronomical unit (au) in the direction perpendicular to the direction to the star. Using this unit makes it easy to compute distances: the distance to a star, in parsecs, is simply one divided by the parallax, in arcseconds. If the parallax is 0.01 arcsecond, the distance is 100 parsecs. One parsec divided by one astronomical unit (the length of the semimajor axis of the Earth's elliptical orbit) is the trigonometric function of 0.01 arcsecond called the cotangent; from this relation we can compute that one parsec equals 206 264.8 au. This is the same as about 3.261 56 light years, 30.856 78 petameters (30.856 78 x 10^{12} kilometers), or 19 173 510 000 000 miles.

part [1]

a unit used in informal statements of proportion or in prescriptions for mixtures. The fraction of an ingredient present is the number of parts of that ingredient divided by the total number of parts present. For example, hummingbirds can be attracted to feeders with a mixture of 1 part sugar dissolved in 4 parts water (equivalent to a solution of 1/5 sugar and 4/5 water, by volume).

part [2]

a medieval unit of time equal to 1/15 hour or 4 minutes.

part [3]

in calculations involving the Jewish calendar, an informal name for the helek, a unit of time equal to exactly 10/3 seconds. There are 1080 parts in an hour.

particle flux unit (pfu)

a unit used to measure the rate at which energetic particles, such as protons, are received by spacecraft. These flux rates are a major component of the "space weather," the environment in which satellites and other spacecraft operate. One pfu is a rate of one particle per square centimeter of detector area per steradian of solid angle scanned per second of time. (A steradian is about 7.96% of a sphere.) In SI units, 1 pfu = 10^{-4} $m^{-2}sr^{-1}s^{-1}$.

part per billion (ppb)

a unit of proportion equal to 10^{-9}.

part per million (ppm)

a unit of proportion equal to 10^{-6}.

part per quadrillion (ppq)

a unit of proportion equal to 10^{-15}.

part per thousand (ppth or ppt)

a unit of proportion equal to 0.001, also called **per mill** (see below).

part per trillion (ppt)

a unit of proportion equal to 10^{-12}.

pascal (Pa)

the SI unit of pressure. The pascal is the standard pressure unit in the MKS metric system, equal to one newton per square meter or one "kilogram per meter per second per second." Sounds impressive, but in traditional English terms a pascal is only 0.000 145 pounds per square inch (0.020 885 lbf/ft^2 or 0.007 50 mmHg). Thus pressure is more commonly measured in kilopascals (kPa), with 1 kPa = 0.145 lbf/in^2. Air pressure is also measured in hectopascals (hPa), with 1 hPa = 1 millibar. The unit is named for Blaise Pascal (1623-1662), French philosopher and mathematician, who was the first person to use a barometer to measure differences in altitude.

pascal second (Pa·s)
the SI unit of dynamic viscosity, equal to 10 poises or 1000 centipoises. Some scientists propose calling this unit the **poiseuille (Pl)**, but that name has not been accepted by the General Conference on Weights and Measures.

pat
an individual serving of butter. In the U.S. food industry, restaurant servings of butter were traditionally packaged at 48 pats per pound, making each pat 1/3 ounce(about 9.45 grams). Less-generous portions such as 60, 64, or 72 pats per pound are also available (margarine is often supplied in these smaller portions). Outside the U.S., butter is traditionally packaged at 100 pats per kilogram, making each pat 10 grams, but packages of 125 per kilogram (8-gram pats) or 150 per kilogram (6.67-gram pats) are also available. In U.S. recipes, a pat of butter is typically 2 teaspoons (1/3 fluid ounce, or about 10 milliliters).

pcf, pci
symbols for pound per cubic foot or per cubic inch, traditional engineering units of density. 1 pcf = 16.018 46 kg/m^3 and 1 pci = 1728 pcf = 27 679.90 kg/m^3.

pé
the traditional Portuguese foot, equal to 12 polegadas or about 33.324 centimeters (13.12 inches).

pearl grain
a unit of mass equal to 1/4 carat or 50 milligrams; see grain [2].

pebi- (Pi-)
a binary prefix meaning 2^{50} = 1 125 899 906 842 624. This prefix, adopted by the International Electrotechnical Commission in 1998, is supposed to replace peta- for binary applications in computer science. The prefix is a contraction of "petabinary."

peck (pk)
a traditional unit of volume, formerly used for both liquids and solids but now used mostly for dry commodities such as grains, berries, and fruits. A peck is 2 gallons, 8 quarts, or 1/4 bushel. In the U. S. customary system, a peck holds 537.605 cubic inches or approximately 8.8098 liters. In the British Imperial system, a peck is a little larger, holding 554.84 cubic inches or approximately 9.0923 liters. In Scotland, the traditional peck held about 9.1 liters for wheat, peas, or beans and about 12.1 liters for barley or oats. The word "peck", originally spelled "pek", comes from the name of a similar old French unit; the origin of the French unit is not known.

pencil hardness
a traditional measure of the hardness of the "leads" (actually made of graphite) in pencils. The hardness scale, from softer to harder, takes the form ..., 3B, 2B, B, HB, F, H, 2H, 3H, 4H, ... The letters stand for Black, Hard, and Firm. (There is no industry standard defining the scale, so there is some variation between manufacturers in how it is applied.) In the U.S., many manufacturers use a numerical scale in which the grades B, HB, F, H, 2H correspond approximately to numbers 1, 2, 2-1/2, 3, and 4, respectively. The pencil hardness scales are not just used for pencils, however. They are used widely to state the durability of paints and other semi-soft coatings. The hardness rating of a coating is the hardness of the hardest pencil that does not penetrate and gouge the coating. This "scratch" hardness scale is analogous to the well-known Mohs hardness scale used in geology to measure the hardness of minerals.

-penny (-d)
an ending added to a number to indicate the size of a nail, as in "sixpenny (6d) nail" or "tenpenny nail." It's not clear exactly how this terminology began, although the usual guess is that tenpenny nails originally cost ten pence per hundred. There is, very roughly, a linear relation between the size designations and length: an *n*-penny nail is roughly (1/2) + (1/4) *n* inches long. This makes the tenpenny nail about 3 inches long, the eightpenny about 2.5 inches, and so on.

penny
in traditional British usage, another name for part [1] as used with sums of money. An expression such as "the fourth penny" means 1/4 of the sum.

pennyweight (dwt or pwt)
a unit of weight in the traditional troy system (see also pound [2]), equal

to 24 grains or 1/20 troy ounce. One pennyweight is approximately 1.5552 gram. The d in the traditional symbol dwt is from the Latin word *denarius* for the small coin which was the Roman equivalent of a penny. (The letter d was also the symbol for the penny in the traditional English monetary system.) See troy weights for additional information.

pentad [1]
a unit of quantity equal to 5.

pentad [2]
a unit of time equal to 5 days. This unit is common in meteorology, where forecasts are frequently made for periods of 5 days at a time.

per annum (PA)
a traditional unit of frequency equal to once a year.

percent or per cent or per centum (% or pct or pc)
a unit of proportion, equal to 0.01. The word is Latin, meaning "by the hundred." The symbol % can be placed after any number; mathematically, its effect is an immediate division by 100.

percentage point
a unit of proportion, equal to 0.01 or 1%. This unit is used commonly to describe changes in rates or other quantities that are stated as percentages. For example, an interest rate that rises from 8% to 10% is said to rise by two percentage points. Notice that if the changing rates are percentages of a quantity y then the percentage points are also percentages of y. This is different from looking at the proportional change in the rates themselves: in our example, an increase from 8% to 10% is an increase of one-fourth (25%) in the actual interest rate. It often happens that a change of a few percentage points has a dramatic effect on the rate in question.

percentile
a unit used in statistics to describe a portion of the individuals or events being studied. Suppose the data are arranged by numerical scores, from highest to lowest. A score belongs to the 78th percentile, for example, if it is greater than 78% of the scores but it is not greater than 79% of the scores. This procedure divides the scores into 100 percentiles, numbered 0th through 99th.

perch [1]
an alternate name for the rod [1] (16.5 feet or 5.0292 meters), introduced in the twelfth century by the Norman conquerors of England. The word perch (*perche* in French: see below) comes from the Latin *pertica* (pole). The Romans also had a distance unit called the *pertica*, but it was shorter: 10 Roman feet (9.71 English feet or 2.96 meters).

perch [2]
a unit of area equal to one square perch [1]. A perch of area covers exactly 272.25 square feet or about 25.292 85 square meters. There are 40 perches in a rood and 160 perches in an acre.

perch [3]
a traditional unit of volume for stone and other masonry. A perch of masonry is the volume of a stone wall one perch (16.5 feet) long, 18 inches high, and 12 inches thick. This is equivalent to exactly 24.75 cubic feet, 0.916 667 cubic yard, or about 0.700 842 cubic meter.

perch [4]
a traditional unit of distance in Ireland standardized at 21 English feet (6.4008 meters) or 14/11 English perch or rod. Since the Irish perch was 27.27% longer than the English, the Irish chain, furlong, and mile were longer in the same proportion..

perche [1] or perch [5]
a traditional unit of distance in French North America. The perche equals 18 pieds (see below) or 3 toises. By legal definition in Canada this equals 19.1835 English feet or 5.847 13 meters.

perche [2] or perch [6]
a traditional unit of area in French North America, equal to one square perche [1]. A perche of area is therefore equal to 0.01 arpent, about 368.007 square feet (40.8896 square yards) or 34.189 square meters.

per diem (PD)
a traditional unit of frequency equal to once a day.

perfect ream
see printer's ream (below).

perm

a traditional unit of water vapor permeability, that is, the ability of a material to permit the passage of water vapor. If we want to keep things dry, we wrap them in something having low permeability. A material has a permeability of one perm if it allows transmission of one grain of water vapor per square foot of area per inch of mercury (inHg) of pressure difference per hour. The value depends somewhat on temperature, however. At 0 °C, one perm equals about 5.721×10^{-11} kilograms per square meter per pascal per second (kg/(m²·Pa·s)) or about 0.2060 mg/(m²·Pa·h); at room temperature the equivalent is about 5.745×10^{-11} kg/(m²·Pa·s). [The SI unit, kg/(m²·Pa·s), simplifies to seconds per meter (s/m).] The lower the perm value, the better the vapor barrier.

per mensem

a traditional unit of frequency equal to once a month.

per mill, per mil, or per mille

a unit of proportion, equal to 0.001 or 1 per thousand. Unlike percent, per mill is usually written as two words, although the one-word spellings **permill** and **permil**are also used. Its symbol, not available to most web browsers, is like the percent symbol but with two zeroes in the denominator (roughly, $^{0}/_{00}$). The spelling "per mill" seems to be more common in the U.S., "per mil" being more common in Britain.

perm inch

a traditional unit of water vapor permeance. The perm value (see above) does not depend on the thickness of the material used as a water barrier. The permeance is the product of the perm value and the thickness, measured in inches. One perm inch equals about 1.453×10^{-12} kg/(m·Pa·s) at 0 °C or about 1.459×10^{-12}kg/(m·Pa·s) at room temperature. The SI unit kg/(m·Pa·s) actually simplifies to seconds (s).

person hour

a gender-nonspecific version of **man hour**, a unit of labor equal to the work of one person for one hour.

perthousand

another name for per mill (see above). In typography, "perthousand" is often used as the name of the per mill character.

pes

the Roman foot, equal to 29.67 centimeters (about 11.68 inches). The pes was divided into 12 unciae (inches). There were 5 pes (or *pedes*) in 1 passus (pace, see above), 10 in a decempeda, 625 in a stadium, and 5000 in the Roman mile.

peta- (P-)

a metric prefix denoting 10^{15} (one U.S. quadrillion). One parsec, for example, equals 30.857 petameters. The prefix was chosen to suggest the Greek *penta*, meaning 5, this being the fifth prefix (n = 5 in 10^{3n}) in the SI system of metric prefixes. The prefix is usually pronounced *pet-a*, with a short "e" sound, rather than *pee-ta*.

petabecquerel (PBq)

a unit of radioactivity equal to 10^{15} atomic disintegrations per second or 27 027.03 curies.

petaflops (Pflops)

a unit of computing power equal to one quadrillion (10^{15}) floating point operations per second. See flops. Current computers cannot achieve this power; it is a goal for future generations of supercomputers.

petagram (Pg)

a metric unit of mass equal to 10^{15} grams or 1 gigatonne (one billion metric tons). This unit is used in atmospheric science and other scientific contexts where large masses are considered.

petahertz (PHz)

a unit of frequency equal to 10^{15} hertz. The frequencies of infrared and visible light waves are expressed in petahertz.

petajoule (PJ)

a metric unit of energy. One petajoule equals 947.817 billion Btu, 277.7778 gigawatt hours, or about 9.48 megatherms.

petameter (Pm)

a metric unit of distance equal to 10^{12} kilometers. This is equivalent to about 621.371 billion miles or 0.1057 light year. The distance from the earth to the nearest star (other than the sun) is about 40 petameters.

pF [1]

symbol for the picofarad.

pF [2]

a unit formerly used in agricultural science to measure "soil suction" or soil moisture tension. Soil moisture tension is the pressure that must be applied to the moisture in the soil to bring it to hydraulic equilibrium with an external pool of water. This was measured in pF units as the logarithm of the pressure in centimeters of water. Currently measurements are usually made directly in kilopascals (kPa).

pferdestärke (PS)

German word for horsepower, meaning the metric horsepower. The symbol ps is used for horsepower in both the Japanese and German automotive industies.

Pfiff

a traditional unit of liquid volume for beer in Austria. A Pfiff (the German word means "whistle") is a small quantity of beer. Traditionally it was equal to 1/2 Seidel, which would be about 177 milliliters (5.99 U.S. fluid ounces), but in current use it is generally 200 milliliters (6.76 U.S. fluid ounces), which is 2/3 of the metric Seidel in Austria.

pfu

symbol for the particle flux unit (see above).

pfund (pfd)

a traditional German weight unit corresponding to the English pound (see below). The pfund is equal to 16 unze or 32 lot. Traditionally the pfund varied in size from market to market, and the various German states adopted different standards, ranging from something close to the English pound (454 grams) to the Viennese pfund at about 1.2 pounds (560 grams). When Germany was unified in the late nineteenth century, the pfund was redefined as a metric unit equal to exactly 500 grams (about 1.102 31 pound). There's no change in the plural.

pH

a logarithmic measure used to state the acidity or alkalinity of a chemical solution. The properties of a liquid solution we call "acid" are caused by the presence of hydrogen ions (H^+). The pH of a solution is a measure of the concentration of these hydrogen ions. Technically, the pH of a solution is defined to be the negative logarithm of the concentration, measured in moles per liter. This unit is inverted in the sense that lower pH readings correspond to greater acidity, and therefore more hydrogen ions. Lowering the pH by 1.0 means multiplying the ion concentration by a factor of 10. Mathematically the scale is open at both ends, but in practice pH values usually fall in the range from 0 to 14. Pure water at 25 °C (77 °F) has a pH close to 7.0. Numbers below 7 indicate increasing acidity, while numbers above 7 indicate increasing alkalinity. The pH ("potential of Hydrogen") scale was invented in 1909 by the Danish chemist Søren Peter Lauritz Sørensen (1868-1939).

Ph Eur unit

a unit used in the European Union to measure the potency of a vitamin or drug, that is, its expected biological effects. For each substance to which this unit applies, the European Directorate for the Quality of Medicines has determined the biological effect associated with a dose of 1 Ph Eur unit. Other quantities of the substance can then be expressed in terms of this standard unit. In many cases, the Ph Eur unit is equal to the international unit (IU).

phi unit

a logarithmic unit used to measure grain sizes for sand, grit, and gravel. The 0 point of the scale is a grain size of 1 millimeter, and each increase of 1 in the phi number corresponds to a decrease in grain size by a factor of 1/2. Thus 1 phi unit is a grain size of 0.5 mm, 2 phi units is 0.25 mm, and so on; in the other direction, -1 phi unit corresponds to a grain size of 2 mm and -2 phi units to a size of 4 mm.

phon

a logarithmic measure of sound loudness closely related to the decibel. Decibels are used for objective measurements, that is, they measure the actual pressure of the sound waves as recorded using a microphone. Phons are used for subjective measurements, that is, measurements made using the ears of a human listener. A sound has loudness *p* phons if it seems to the listener to be equal in loudness to the sound of a pure tone of frequency 1 kilohertz and strength *p* decibels. A measurement in phons will be similar to a measurement in decibels, but not identical, since the perceived loudness of a sound depends on the distribution of frequencies in the sound as well as the pressure of the sound waves. In

the U.S., sound loudness is frequently measured in sones rather than phons: a sound of loudness *s* sones has loudness $10 \log_2 s + 40$ phons. In English the unit is pronounced "fon" rather than "phone."

phot (ph)

the CGS unit of illuminance or illumination, equal to one lumen per square centimeter or 10 000 lux. See also lambert. The name is usually pronounced to rhyme with "not" rather than "note."

photon [1]

a quantum of light energy, or, more generally, of any form of electromagnetic energy having a single wavelength, direction, and polarization.

photon [2]

a former name for the unit of retinal illuminance now called the troland.

pi

a very famous mathematical unit. The circumference of a circle is equal to pi multiplied by the diameter, so pi is equal to the ratio between the circumference and diameter of a circle, *any* circle. It turns out that pi is an irrational number, which means that its decimal expansion is nonterminating and nonrepeating. To 25 significant digits, pi equals 3.141 592 653 589 793 238 462 643. The Swiss mathematician Leonhard Euler (1707-1783) adopted the lower case Greek letter pi for this ratio in 1737; although he was not the first to use it, he popularized it through his many mathematical writings. Pi sometimes appears to be a unit of angle measure equal to pi radians or 180°. This is because mathematicians regard angle measurement as dimensionless (length divided by length) and therefore omit the unit "radians".

pic

see pik, below.

pica (pi or pc)

a unit of length used by typographers and printers. One pica equals 12 points, 4.22 mm, or a bit less than 1/6 inch. "Pica type" is type that sets six lines to the inch. The origin of this word is not known. In the Catholic Church, a "pica" is a book of daily services, so it is possible that pica type got its name from being used to print picas. The unit is pronounced "pike-ah."

pico- (p-)

a metric prefix denoting 10^{-12} (one trillionth). The prefix, pronounced "peek-o" in English, is coined from the Italian *piccolo*, small.

picocurie (pCi)

a common unit of radioactivity, used to measure radioactivity occurring naturally in the environment. One picocurie equals 10^{-12} curie or 0.037 becquerel; this corresponds to one atomic disintegration about every 27 seconds--a very low rate of activity.

picofarad (pF)

a common unit of electric capacitance equal to 10^{-12} farad. This unit was formerly called the **micromicrofarad (μμF)**.

picogram (pg)

a metric unit of mass equal to 10^{-12} gram or one millionth of a microgram.

picoliter (pl or pL)

a metric unit of volume equal to 10^{-12} liter or 1000 cubic micrometers. Engineers at Eastman Kodak recently reported a technique for producing ink droplets as small as several picoliters.

picolo

a unit of volume for champagne, equal to 1/4 bottle (187.5 milliliters).

picomole (pmol)

a unit of amount of substance equal to 10^{-12} mole. This unit is common in biochemistry; since a mole of a large organic molecule can be quite a large amount, a picomole is larger than one might think.

picosecond (ps)

a unit of time equal to 10^{-12} second.

picotesla (pT)

a unit of magnetic field strength equal to 10^{-12} tesla or 10^{-8} gauss.

picul

a unit of weight comparable to the European quintal, widely used in East Asia during the colonial period. The picul is equal to 100 catties, typically about 133.3 pounds or 60.5 kilograms. In recent years the picul has been used as a metric unit equal to 60 kilograms (132.28 pounds)

in Thailand or 50 kilograms (110.23 pounds) in China. The unit is pronounced "pickle."

pie

the traditional foot of Spain. The pie equals 1/3 vara or 12 pulgadas (see below). The pie used in Spain is about 27.86 centimeters or 10.97 inches, but in Spanish Latin America the pie is generally longer. The Argentine length is 28.89 centimeters or 11.37 inches; in Texas, 1/3 vara is 11 1/9 inches or 28.22 centimeters.

piece (pc)

a unit of quantity, equal to 1. This unit, like count (ct) is used to indicate that a measurement represents an exact count of items.

pied

the traditional French foot. Pieds of various lengths were used in France, but the one best remembered now is the royal foot (**pied de roi**), called the **Paris foot** in English and the **foot (French measure)** in Canadian law. The pied de roi equals about 32.48 centimeters or 12.79 inches; the official Canadian definition is 12.789 inches (32.484 06 centimeters). Today the word *pied* is sometimes used informally in France as a metric unit equal to 30 centimeters. In French Canada, *pied* is generally used to refer to the English foot.

piede

the traditional foot of Italy. The unit, no longer used, varied considerably from one region to another; one common length was about 29.8 centimeters, but lengths of 34.8 cm and 38 cm were traditional in Venice and Bologna, respectively.

pieze (pz)

a metric unit of pressure, part of the "metre-tonne-second" system sometimes used by European engineers. The pieze is a pressure of one sthene per square meter, or 1000 newtons per square meter, or one kilopascal. This is not such a large pressure; one pieze equals 10 millibars or about 0.145 pound per square inch. The name of the unit comes from the Greek *piezein*, to press. The unit, spelled *pièze* in French, is pronounced "pee-ezz" in English.

pik or pic

a traditional unit of distance in the Eastern Mediterranean and Near East. The pik varied considerably but a typical value is about 28 inches (71 centimeters). This is an "arm" unit, like the Italian braccio and the Russian arshin.

pin

a traditional British unit of volume, used for beer. A pin is very different from a pint: it is equal to 1/8 barrel or 4.5 Imperial gallons (20.457 liters). There are 2 pins in a firkin. See also polypin (below).

pinch

an informal unit of volume used in food recipes. Historically a pinch was defined as "an amount that can be taken between the thumb and forefinger" but without any definite equivalent in other units. Recently kitchen supply stores in the U.S. and other countries have begun selling sets of "minispoons" in which the spoon labeled "pinch" is designed to hold exactly 1/2 dash or 1/16 teaspoon, which is roughly 0.01 fluid ounce or 0.3 milliliter.

ping

a traditional unit of area in Taiwan, equal to about 3.305 square meters (3.953 square yards). This is the same unit known in Korea as the pyong (see below).

pint (pt) [1]

a traditional unit of volume equal to 1/2 quart. There are three different quarts in use in Britain and the United States, and hence there are three different pints: [i] the U. S. liquid pint, equal to exactly 28.875 cubic inches, 16 fluid ounces, or approximately 473.176 milliliters; [ii] the U. S. dry pint, equal to 33.600 cubic inches or approximately 550.611 milliliters; and [iii] the British Imperial pint, equal to 20 British fluid ounces, 34.678 cubic inches or approximately 568.261 milliliters. The origin of the word pint is unclear. It may come from the Latin *pincta*, painted, referring to a marking at the one-pint level on a larger container.

pint (pt) [2]

a traditional unit of volume in Scotland equal to 2 choppins or 4 mutchkins. The Scots pint varied with time and locality, but it was eventually standardized as the volume of the **Stirling jug**, a vessel

holding about 104.2 cubic inches or 1.708 liters. This is almost exactly 3 Imperial pints or 3.6 U.S. liquid pints.

pint (pt) [3]

a unit of volume used in South Australian pubs. A pint of beer is generally 425 milliliters in South Australia, or roughly 3/4 Imperial pint (15 fluid ounces). In Queensland a pint glass typically holds 560 milliliters, very nearly an Imperial pint.

pint (pt) [4]

a British unit of volume, known as the **reputed pint**, equal to 2/3 of the standard Imperial pint. This is exactly 13/3 fluid ounces, 23.12 cubic inches, or 378.841 milliliters.

pip

the smallest measured change in a currency conversion rate. This depends on the relative values of the two currency units: in converting euros to U.S. dollars, for example, a pip is 0.0001, but in converting U.S. dollars to Japanese yen a pip is 0.01. This unit is also called a tick [2].

pipa

a traditional Portuguese unit of liquid volume, originally very similar in size to the English pipe (see next entry). The pipa has become a metric unit equal to exactly 500 liters, which is 0.5 cubic meter, 132.085 U.S. gallons, or 109.996 British Imperial gallons.

pipe

like the butt, the pipe is a traditional unit of liquid volume generally equal to 2 hogsheads. In the U.S., this means a pipe equals 126 U.S.gallons, about 16.844 cubic feet or 476.96 liters. In Britain it's more complicated, because traditional British hogsheads were of different sizes depending on what they contained. The British pipe was usually used as a wine measure, but even different types of wine had different size pipes.

pitch

another name for "characters per inch," a unit used in printing.

pixel

a picture element. Pixels do not have a fixed size; their diameters are generally measured in micrometers (microns). Although the pixel is not a unit of measurement itself, pixels are often used to measure the resolution (or sharpness) of images. As a hypothetical example, a 600 x 1000 pixel image has 4 times the pixel density and is thus 4 times sharper than a 300 x 500 pixel image, assuming the two images have the same physical size.

pk

usually a symbol for "pack." In Dutch, the symbol for paardekracht (the metric horsepower).

planck

an MKS unit of "action" (energy expended over time) or of angular momentum. The planck is equal to 1 joule second (J·s) or about 0.7375 foot pound second (ft·lb·s). The unit honors the German physicist Max Planck (1858-1947), the originator of quantum theory.

Planck length

a unit of distance representing the scale at which gravity, and perhaps space itself, becomes quantized (discrete) rather than continuous. This is the shortest distance that is meaningful in our understanding of the laws of physics. The Planck length is defined to be the square root of Gh/c^3, where G is the universal gravitational constant, h is Planck's constant, and c is the speed of light. This makes the Planck length about 4.051×10^{-35} meter.

Planck time

a unit of time equal to the time required for a photon moving at the speed of light to travel the distance of one Planck length. This is the shortest time that is meaningful in our understanding of the laws of physics, representing the scale at which time itself may become quantized (discrete) rather than continuous. The Planck time is about 1.351×10^{-43} second.

Platonic year

a unit of time used in astronomy. The earth's axis of rotation is not fixed in space; the attraction of the moon causes it to slowly trace out a circle in the sky. This motion, called precession, changes the orientation of the sky as seen from the earth's surface: the poles appear to shift their locations and the sun's point of crossing the equator slowly rotates

through the constellations of the Zodiac. The Platonic year is the length of time required for one complete precessional rotation: about 25 800 years. The unit is named for the ancient Greek philosopher Plato (ca. 428-348 BCE). It is sometimes called the **great year**.

-plet

a suffix used to create units of quantity. Thus *triplet*, for example, is a unit of 3. However, words having this ending are also used to mean one member of the group rather than the group as a whole.

plethron

an ancient Greek unit of distance equal to 100 Greek feet or 1/6 stadion. The Greek foot was slightly longer than the English foot, so the plethron was approximately 100-105 English feet or 31-33 meters. Often represented as the length of a cord, the unit was frequently used for measuring land areas. The plural is **plethra**.

-plex

a suffix used to create large numbers. The number *n*-plex is 10^n, which is 1 followed by *n* zeros. Thus a googol is 100-plex, for example. The American mathematician Edward Kasner, who invented the googol in 1938, also defined a "googolplex" to be 1 followed by a googol of zeros, thus suggesting this generalization. See also dex and -minex.

plf [1]

symbol for pounds per linear foot (lbm/ft), a common unit of load in engineering. 1 plf = 1.488 164 kilograms per meter (kg/m). The symbol is also used sometimes for pounds of force per linear foot (lbf/ft), in which case 1 plf = 14.593 90 newtons per meter (N/m).

plf [2]

a common abbreviation for "per linear foot." In this use, 1 plf = 3.280 840 per meter (/m).

pli

a common abbreviation for pounds per linear inch. For load, 1 pli = 17.857 97 kg/m. For pounds of force per linear inch, 1 pli = 175.1268 N/m.

plotter unit

a unit of distance used in typography equal to 1/40 millimeter or 25 micrometers. This, the smallest distance addressed by Hewlett Packard plotters, has become a fairly familiar term in digital graphics design.

-ply

an ending used to indicate the number of folds or layers in an object; thus 4-ply means having 4 layers. The suffix comes from the Latin *plicare*, to fold.

PM or pm

abbreviation for the Latin *post meridiem*, "after noon," used after a time to indicate that the time occurs after 12:00 noon. Thus 4:30 pm is the same as 16:30. The notations "AM" and "PM" are used extensively in English speaking countries and especially in the United States, where time is usually not stated on a 24-hour basis. Note: By convention, midnight is represented as 12:00 am and noon as 12:00 pm. In text, however, it is best to avoid the use of 12:00 am or 12:00 pm since the reader may not be aware of these conventions.

PMPO

abbreviation for "peak music power output," which is often claimed by electronics manufacturers as a unit measuring the effective power output of amplifiers, stereo systems, etc. Buyer beware! There is no industry standard for this "unit," so it is impossible to determine just what it means.

PN

a symbol for "nominal pressure," a measure used for rating piping, valves, fittings, etc. Nominal pressure is essentially the pressure rating of the piping system, measured in bars at a temperature of 20 °C (68 °F). (One bar equals 100 kilopascals or approximately 14.5038 pounds per square inch in traditional English units.) Industrial standards organizations, such as the American National Standards Institute (ANSI), set standards for pipes and fittings based on PN ratings; these standards specify in detail the size, composition, and strength of each component.

PNC

an abbreviation for **preferred noise criterion**, a unit used in engineering to measure the level of background noise in rooms or other enclosed spaces. Introduced in 1971, the unit is similar to the older noise

criterion (NC), but a PNC rating requires lower levels of high and low frequencies than the corresponding NC rating. PNC ratings below 40 are generally required for residential or classroom spaces. PNC ratings are typically 10-15% lower than raw measurements of the sound level indecibels.

PNU

abbreviation for protein nitrogen unit, a measure of the potency of the compounds used by doctors in allergy skin tests. One PNU is defined as 0.01 microgram (μg) of phosphotungstic acid-precipitable protein nitrogen. Unfortunately, the potency measurements depend on the technique of measurement used, so results of one manufacturer are not comparable to those of another manufacturer. As a result, although PNU's are still used, they are being replaced by bioequivalent allergy units (BAU), which are measured by actual skin testing using reference preparations of standard potency.

point (pt) [1]

a unit of angle measure equal to 1/32 of a circle. Compasses are read by suspending the compass needle over a compass card traditionally inscribed with a 32-point star. Each point of the star represents a named direction; for example, the first five points from north towards east are labeled North, North-by-East, North-Northeast, Northeast-by-North, and Northeast. The difference between two directions can be expressed as a certain number of these compass points. One point equals 11°15' of arc or pi/16 radians.

point (pt) [2]

a unit of length used by typographers and printers. When printing was done from hand-set metal type, one point represented the smallest element of type that could be handled, roughly 1/64 inch. Eventually, the point was standardized in Britain and America as exactly 1/72.27 = 0.013 837 inch, which is about 0.35 mm (351.46 micrometers). In continental Europe, typographers traditionally used a slightly larger point of 0.014 83 inch (about 1/72 pouce, 0.377 mm, or roughly 1/67 English inch), called a **Didot point** after the French typographer Firmin Didot (1764-1836). In the U.S., Adobe software defines the point to be

exactly 1/72 inch (0.013 888 9 inch or 0.352 777 8 millimeters), a unit sometimes called the **big point (bp)**. The German standards agency DIN has proposed that all these units be replaced by multiples of 0.25 millimeters (1/101.6 inch). See also kyu.

point (pt) [3]

a percentage point (see above).

point (pt) [4]

a unit of mass used for precious stones such as diamonds. One point equals 0.01 carat, or exactly 2 milligrams.

point (pt) [5]

a unit of quantity equal to 1. This unit is used to express changes in an arbitrary score or index, such as the score in an athletic contest. In finance, a change of one point in the Dow Jones average or similar indices represents a change of 1.00 in the index.

point (pt) [6]

a unit used to represent the smallest significant change in an arbitrary ratio. This usage is common in sports. Most sports "averages" are actually ratios of successful performances divided by attempted performances; baseball's batting average is a good example. These ratios are computed to a fixed number of decimal places, usually three, and a point represents a change of 1 in the last decimal place. Thus the batting averages .314 and .302 are said to differ by 12 points.

point (pt) [7]

another name for a mil [1], a unit of distance equal to 0.001 inch. Points are used with this meaning to measure the thickness, or **caliper**, of paper or card stock in the paper industry. One point equals 25.4 micrometers or microns.

point (pt) [8]

a measure of the specific gravity of a liquid, typically used in brewing and winemaking. Specific gravity is the mass of a sample of the liquid divided by the mass of an equal volume of pure water. It is a dimensionless (unitless) number, typically a little larger than 1. Each "point" represents an increase of 0.001 above 1. For example, a liquid of specific gravity 1.048 is described as 48 point.

point [9]
a medieval unit of time equal to 1/5 hour, or 12 minutes. The point was divided into 8 moments.

poise (P, Ps, or Po)
a CGS unit of dynamic viscosity. Viscosity is a frictional property (actually, several related properties) of liquids and gases: due to friction between molecules, the liquid or gas resists flowing to a greater or lesser extent. Dynamic viscosity is measured by stating the force needed to move a standard area of one layer of the liquid or gas with respect to another layer, the two layers being parallel and separated by a standard distance filled with the same liquid or gas. If a force of one dyne is needed to move one square centimeter of the liquid or gas relative to a second layer one centimeter away at a speed of one centimeter per second, then the viscosity is one poise. The unit is named for the French physician Jean Louis Marie Poiseuille (1799-1869). Generally speaking, liquids have viscosities measured in centipoises and gases have viscosities measured in micropoises. The SI recognizes no named unit for dynamic viscosity; in SI units, one poise equals 0.1 pascal second (Pa·s). The poise is also equivalent to 14.5038 x 10^{-6} reyn. **P** is the proper symbol for the unit, but Ps and Po are also used.

poiseuille (Pl)
an MKS unit of dynamic viscosity equal to 1 pascal second or 10 poises or 1000 centipoises (cP). The poiseuille has been proposed, but not accepted, as an SI derived unit. See previous entry for more detail.

pol
an empirical unit of indoor air pollution introduced by the Danish environmental scientist P.O. Fanger in 1988. One olf is defined as the air pollution produced by one "standard person", and one decipol is the perceived air pollution level in a space having a pollution source of strength one olf and ventilation with unpolluted air at the rate of 1 liter/second. In practice, nearly all measurements are made in decipols.

pole [1]
another name for a rod [1].

pole [2]

a unit of area equal to one square pole [1]. A pole of area covers exactly 272.25 square feet or about 25.292 85 square meters. There are 40 poles in a rood and 160 poles in an acre.

pole [3]
see unit magnetic pole.

polegada
the Portuguese "inch" unit, equal to 1/12 pé, 2.777 centimeters, or 1.093 inches.

pollex (poll)
the Latin word for "thumb," sometimes used to mean the inch in botanical descriptions.

polypin
an informal unit of volume for beer and other alcoholic beverages, used mostly in Britain. A polypin of beer comes in a plastic container, often inside a rectangular cardboard box; it holds 32-36 Imperial pints (18.2-20.5 liters) or, in the metric version, exactly 20 liters (5.28 U.S. gallons). The word polypin is actually a registered trademark of Biovision GmbH; it is the name of the polythene plastic used for the lining of the container. The traditional British pin of beer (see above) is exactly 36 pints.

PON
abbreviation for pump octane number. See octane number.

poncelet (p)
a unit of power formerly used in France but now obsolete. The poncelet is defined to be the power required to raise a mass of 100 kilograms at a velocity of 1 meter per second. This is equivalent to 980.665 watts or exactly 4/3 metric horsepower (1.315 traditional horsepower). The unit was named for the French mathematician and engineer Jean-Victor Poncelet (1788-1867). It was replaced in French engineering by the metric horsepower (*cheval vapeur*).

pond [1]
the Dutch pound, historically about 494 grams (1.089 English pounds). This unit was also used in the former Dutch Indies (now Indonesia) and throughout Southeast Asia. In the Netherlands, the pond has been

reinterpreted now as a metric unit equal to exactly 500 grams (1.1023 pounds), like the German pfund.

pond (p) [**2**]
a metric unit of force, formerly more common and still used for some purposes. A pond is equal to a gram weight, that is, the gravitational force on a mass of one gram; thus it is equal to 980.665 dynes or 0.002 204 622 6 pounds of force. The kilopond was used more often than the pond. The name of the unit is from the Latin*pondus*, weight.

pony [**1**]
a small glass for liquor. In the U.S., a pony generally holds exactly 1 (U.S.) fluid ounce or about 29.6 milliliters. The word "pony" means a small horse, hence anything smaller than normal--in this case, a smaller shot glass.

pony [**2**]
a small glass for beer. In New South Wales, Victoria, South Australia, and Western Australia, a pony of beer holds 140 milliliters (about 5 British fluid ounces).

pony [**3**]
a small keg of beer. In the U.S., a **pony keg** holds 1/4 barrel or 7.75 U.S. gallons (about 29.34 liters).

pood
see pud.

porosity
in the paper industry, "porosity" is generally measured by the time (in seconds) required for 100 cubic centimeters of air to pass through one square inch of the paper at a standard pressure difference. Thus the porosity unit is square inch seconds per deciliter ($s{\cdot}in^2/dl$). This is sometimes called a **Gurley unit** after the name of a test procedure. In SI units, 1 $s{\cdot}in^2/dl$ = 6.4516 seconds per meter column of air (s/m).

pot [**1**]
a traditional unit of volume in many countries of Europe, roughly comparable to the liter or to the English quart. In Switzerland, the pot is now a metric unit equal to 1.5 liters. In Belgium, the pot is interpreted as 1.5 liters for dry quantities, but only 0.5 liters for liquids. The traditional pot is equal to 0.967 liters in Denmark and to 0.965 liters in Norway.

pot [**2**]
a unit of volume used in Australian pubs. A pot of beer is 285 milliliters in Queensland and Victoria, 575 milliliters in Western Australia.

pot [**3**]
a traditional unit of volume in Jersey (Channel Islands). Still used to measure milk, the pot has always been roughly comparable to 1/2 gallon. In the current definition, one pot equals 69.5 Imperial fluid ounces (1.7375 quarts) or about 1.975 liters.

pottle
a traditional unit of volume equal to 1/2 gallon. The unit's name is from the French *potel*, a type of bottle.

pouce
the French "inch" unit, equal to 1/12 pied (see above). Based on the pied de roi, the pouce equals about 1.066 inches or 2.707 centimeters. The word *pouce* means "thumb" in French.

poumar
an acronym for one pound per million yards, a unit of yarn density formerly used in the U.S. textile industry. One poumar equals about 0.496 055 tex.

pound (lb, lbm, or #) [**1**]
a traditional unit of mass or weight. The Romans used a pound (the *libra pondo*, "pound of weight") divided into 12 ounces. All the countries of western Europe used similar units, divided into 12 or 16 ounces, until the advent of the metric system. 12-ounce pounds were common in Italy and southern France, but in Spain and northern Europe 16-ounce pounds became the norm. The word libra is used for this unit in Italy, Spain, and Portugal; in France it is called the livre. Further north, the Latin word *pondo* ("weight") is the origin of the names of the English pound, Dutch pond, Danish pund, German pfund, and Russian funt. In England, two different "pound" units became standard. The unit now in general use in the United States is the **avoirdupois pound**, so-called from a French phrase *avoir du poids*, literally "goods of weight," indicating simply that the goods were being sold by weight

rather than by volume or by the piece. The avoirdupois pound is divided into 16 ounces. By international agreement, one avoirdupois pound is equal to exactly 453.592 37 grams; this is exactly 175/144 = 1.215 28 troy pounds. See avoirdupois weights for additional information. The traditional symbol **lb** stands for *libra*, the Latin word for the unit. The avoirdupois pound is sometimes abbreviated **lb av** or **lb ap** to distinguish it from the less common troy pound. The symbol **lbm** is used in science to distinguish the pound of mass from the pound of force (lbf): see **pound force**, below.

pound (lb t or lb or #) [2]
a second traditional unit of mass or weight. The **troy pound**, named for the French market town of Troyes, was the unit used in England by apothecaries and jewelers. The troy pound is divided into 12 ounces like the Roman pound. One troy pound is 373.242 grams, or exactly 144/175 = 0.822 858 avoirdupois pounds (13.165 72 avoirdupois ounces). The troy and avoirdupois pounds are connected by the grain: there are 5760 grains in a troy pound and 7000 grains in an avoirdupois pound. Seetroy weights for additional information. The troy pound should be abbreviated lb. t. to distinguish it from the more common avoirdupois pound.

pound (lbf or lb) [3]
a traditional unit of force; see **pound force**, below.

pound (lb) [4]
a traditional unit measuring the weight of paper; see **pound weight**, below.

poundal (pdl or pl)
an English unit of force used in engineering. Since traditional measuring systems, including the English system, did not distinguish between force and mass units, the poundal was defined to provide a unit clearly measuring force rather than mass. One poundal is the force that accelerates a mass of one pound at the rate of one foot per second per second. Since the acceleration of gravity averages about 32.174 ft/sec^2 at the Earth's surface, one poundal is about 1/32.174 = 0.031 081 pound of force. One poundal is also equal to approximately 0.138 255 newton, or 13 825.5 dynes. The newton, the SI unit, is now the preferred unit of force in engineering and technical work. The poundal was invented in the 1870s by the British mathematician James Thomson, who also named the radian.

pound cut (lb cut)
a traditional unit of concentration for shellac in the U.S. One pound cut means that the shellac was manufactured by dissolving one pound of dry, bleached shellac in one gallon of alcohol solvent (about 120 grams of shellac per liter of solvent). The most common concentrations sold are 3, 4, and 5 lb cut, but diluted solutions of 1/4 to 1 lb cut are sometimes used as sealers or polishes.

pound foot (lbf ft or lb ft)
a traditional unit of torque. Torque is the tendency of a force to cause a rotation; it is the product of the force and the distance from the center of rotation to the point where the force is applied. Thus it can be measured in pounds of force times feet of distance. One pound foot is equal to approximately 1.355 818 newton meter (N·m) in SI units. Algebraically, torque has the same units as work or energy, but it is a different physical concept. To stress the difference, scientists and engineers traditionally measure torque in pound feet (or newton meters) and work or energy in foot pounds (or joules).

pound force (lbf or lb)
a traditional unit of force. Traditional measuring systems did not distinguish between force and mass units. A force of one pound is simply the gravitational force experienced at the Earth's surface by a mass of one pound. To compute this force, we multiply the mass by the acceleration of gravity, following Newton's law $F = ma$. Since one pound of mass is 0.453 592 kilograms and the acceleration of gravity averages 9.806 65 meters per second per second at the surface of the Earth, one pound force equals the product of these two numbers, 4.448 221 615 newtons. The symbol **lbf** should be used for the pound force to distinguish it from the pound of mass.

pound mass (lbm)
see pound [1], above.

pound mole (lbmol)
a unit of amount of substance. One pound mole of a chemical compound is the same number of pounds as the molecular weight of a molecule of that compound measured in atomic mass units. Thus the pound mole is equal to exactly 453.592 37 moles.

pound per square foot (lbf/ft² or psf)
a traditional unit of pressure. 1 psf equals about 47.880 pascals (Pa), 0.478 80 millibars (mb), or 0.192 79 inch of water (in WC).

pound per square inch (lbf/in² or psi)
a traditional unit of pressure. 1 psi equals 144 pounds per square foot (psf), 6.894 75 kilopascals (kPa), 68.9475 millibars (mb), 2.036 inches of mercury (in Hg), 27.7612 inches of water (in WC), or 70.5134 centimeters of water (cm H_2O). See below for related notations such as "psig."

pound weight (lb wt or lb)
a traditional U.S. unit measuring the weight or thickness of paper. Paper is described as, say, 24 pound weight if one ream (500 sheets) cut in a standard size (called the base size or basis size) has a mass of 24 pounds. For bond paper, the base size is 17 inches by 22 inches (43.18 by 55.88 centimeters), exactly four times the area of an 8.5 inch by 11 inch sheet. This means a ream of 8.5 inch by 11 inch, 24-pound bond paper has a mass of 6 pounds. A table of basic sizes is provided. The metric measure of paper weight is the areal density in grams per square meter (g/m^2 or "gsm"). 1 lb wt is equivalent to 3.76 g/m^2 for bond paper, 1.48 g/m^2 for text stock, 2.70 g/m^2 for card stock, and varying amounts for the other types of paper.

pous
the ancient Greek foot, a unit of distance equal to about 30.7 centimeters, a little longer than the modern English foot. The plural is **podes**. The pous was divided into 16 daktylos (digits). There were 100 podes in a plethron and 600 in a stadion.

power (x) [1]
a unit expressing the magnifying power of an optical system. The power is defined to be the angular diameter of the image formed by the system divided by the angular diameter of the original object being observed. In simple telescopes this is equal to the focal length of the primary objective (the big lens or mirror) divided by the focal length of the eyepiece lens. For binoculars, the power is customarily followed by the diameter of the objective lenses, in millimeters, so "8x40" indicates binoculars with a magnifying power of 8 and lenses of diameter 40 mm.

power (x) [2]
a measure of the focal power of a lens equal to 40 times the focal length, or 40 divided by the refractive power in diopters. For example, a 2.00 diopter lens in a pair of reading glasses is also described as 20 power.

power (x) [3]
a term indicating that a measurement is a multiple of some standard quantity. For example, in computer technology, a 16x CD-ROM drive spins a disk 16 times faster than a "standard" speed drive.

pp
a traditional abbreviation for "pages."

ppb, ppm, ppq, ppt, pptr
abbreviations for units of proportion: ppb = part per billion (10^{-9}), ppm = part per million (10^{-6}), ppq = part per quadrillion (10^{-15}), and ppt = part per trillion (10^{-12}), respectively. However, the abbreviation "ppt" is also used sometimes for part per thousand (10^{-3}). To avoid this confusion, "pptr" is an alternate abbreviation for part per trillion.

ppcm, ppi [1]
abbreviations for pixels per centimeter and pixels per inch, respectively. A pixel is a single "picture element", so these units measure the resolution, or fineness, of an image.

ppi [2]
abbreviation for pages per inch, a measure of paper thickness.

ppi [3]
abbreviation for pores per inch, a measure of porosity for polyurethane foams and other industrial foam and filter products.

printer's ream
a unit of quantity for paper. An ordinary ream is 480 or 500 sheets; a printer's ream is 516 sheets. The additional amount is to allow for sheets

that may be spoiled in shipment. The unit is also called the **perfect ream**.

prism diopter (PD)

a unit used in optics to measure the deflection of light by a prism. One prism diopter represents a deflection of 1 centimeter measured at a distance of 1 meter from the prism. Mathematically, the deflection in prism diopters is equal to 100 times the tangent of the angle through which the path of the light is bent in passing through the prism.

proof (prf)

a traditional unit of proportion used for measuring the strength of distilled liquors, including medicinal solutions of alcohol as well as alcoholic beverages such as whiskey. The proof rating of a liquor is the alcohol content of the liquid expressed as a percentage of the alcohol content of a standard mixture, called the **proof liquor**. In the United States, the proof liquor is legally defined so to contain exactly 50% alcohol measured by volume. As a result, the U. S. proof rating is equal to exactly twice the percentage of alcohol present, measured by volume. Thus "86 proof" means 43% alcohol. In Britain proof ratings are no longer used, but the former proof liquor contained 57.27% alcohol by volume. This means that 86 proof Scotch, in the U.S., was formerly 75 proof in Britain.

PRU

abbreviation for the **peripheral resistance unit**, used in physiology and medicine to assess blood flow in the capillaries. A measurement in PRU's is equal to the blood pressure in millimeters of mercury divided by the flow rate in milliliters per minute. That is, 1 PRU equals 1 mmHg·min/mL = 133.3 Pa·min/mL (or, in proper SI units, almost exactly 8 GPa·s/m^3).

ps

see pferdestärke above.

psi, psia, psid, psig

traditional symbols for pressure units used in hydraulics and plumbing. **psi** is a symbol for pound per square inch (see above). **psig** is a symbol for pound per square inch *gauge*; this means that the pressure has been read from a gauge which actually measures the difference between the pressure of the fluid and the pressure of the atmosphere. **psia** means pound per square inch *absolute*, which is the total pressure including the pressure of the atmosphere. **psid**, pound per square inch*differential*, is a symbol for a difference between two pressures, neither of which is atmospheric pressure. Corresponding symbols for pound per square foot (**psf**, etc.) are also used.

PSU or psu

an abbreviation for **practical salinity unit**, a standard measure of the salinity of seawater. The "unit" is actually a dimensionless (unitless) ratio obtained by measuring the conductivity of the water sample. Seawater of salinity 35 PSU has the same conductivity as a standard solution of potassium chloride (KCl) with a concentration of 3.243 56 % by mass; a sample of salinity 1 PSU would have conductivity 1/35 that of the standard solution. With this definition, measurements in PSU are very nearly the same as direct measurements of salt ion concentration in parts per thousand.

pu

A unit of distance used during the colonial era in China. The pu equals 5 ch'ih, 5.875 feet, or 1.7907 meters.

pud or pood

a traditional unit of weight in Russia. The pud equals 40 funte or 1/30 packen; this is about 16.381 kilograms or 36.11 pounds. The plural is **pudi**.

puff (pF)

an informal name for the picofarad , a unit of electric capacitance.

pulgada

the traditional Spanish inch, equal to 1/12 pie (see above). The pulgada varies from about 23.2 to 24.1 millimeters (0.913 to 0.949 inch).

pull

a measure of the angular deflection in an overhead utility line at a pole where the line changes direction. In the U.S., the measurement is defined by drawing an imaginary line between two points on the utility line 100 feet from the corner pole, one point in each direction. The pull is then

defined to be the minimum distance between this imaginary line and the corner pole (in feet). Pull p is related to the angle a of deflection by the formula $p = 100 \cdot \sin(a/2)$; this quantity is directly proportional to the sideways force exerted on the corner pole.

puncheon

a traditional unit of liquid volume. The puncheon is often reckoned as equal to 70 gallons. In the U. S. system that would be about 9.358 cubic feet or 264.98 liters; in the British Imperial system it would be about 11.238 cubic feet or 308.34 liters. There are other versions of the unit; in one version a puncheon of wine equals 84 wine (or U.S.) gallons (roughly 308 liters); in another, a puncheon of beer equals 72 gallons (roughly 272.5 liters).

pund

the Scandinavian pound, now reinterpreted as a metric unit equal to 500 grams (1.1023 pounds), like the German pfund. The traditional Swedish (Stockholm) pund was equal to about 425.1 grams (14.995 ounces).

punnet

a small square or sometimes rectangular container for fruit or vegetables, such as strawberries or bean sprouts. When used as a unit of measure, a punnet is generally the same thing as a dry pint in the U.S. or an Imperial pint in Britain; see pint [1] above. However, grocers use punnets of several sizes to package berries, fresh mushrooms, etc.

pyong

a traditional Korean unit of area equal to about 3.306 square meters or 3.954 square yards. The pyong is widely used in Korea to measure areas both inside and outside buildings. The Taiwanese ping (see above) corresponds closely to the pyong.

pyron

a unit used to measure the heat flow delivered by solar radiation. The pyron is equal to one calorie per square centimeter per minute, which is exactly 697.8 watts per square meter (W/m^2) if the IT calorie is used in the definition, or 697.633 W/m^2 if the 15° calorie is used. The name is coined from the Greek word *pyr* for fire.

Q

q- [1]

a symbol for the Latin *quaque*, "every," often used in medical prescriptions and orders. The symbol is used in combinations such as **q8h**, "every 8 hours," or **q2d**, "every other day."

q- [2]

a former German prefix meaning *quadrat-*, "square," seen in combinations such as **qm** (*Quadratmeter* or square meter) and **qkm** (*Quadratkilometer* or square kilometer). The SI does not allow use of this symbol; it is rarely used in current works but often seen in older documents.

Q

a metric unit of distance equal to exactly 0.25 millimeter (9.8425 mils) used by typographers and page designers in Japan, in Germany, and in other countries in preference to the traditional point [2]. One Q is equal to about 0.71 point, a little more or less depending on the exact definition of the point. This unit is also spelled **kyu**.

q.d.

abbreviation for the Latin *quaque die*, once a day, a unit of frequency traditionally used in medical prescriptions. This notation is sometimes modified for a lesser frequency by imbedding a number of days in the middle, as in **q.2d.**, every two days.

q.h.

abbreviation for the Latin *quaque hora*, once an hour, a unit of frequency traditionally used in medical prescriptions. This notation is sometimes modified for a lesser frequency by imbedding a number of hours in the middle, as in **q.3h.**, every three hours.

qian

a traditional Chinese weight unit. In modern China the qian is equal to 0.1 liang, or exactly 5 grams (0.1764 ounce).

q.i.d.

abbreviation for the Latin *quater in die*, four times a day, a unit of frequency traditionally used in medical prescriptions.

qintar
a traditional Arabic unit of weight, often called the cantar in English. The qintar is the Arabic counterpart of the European quintal (see below). The unit varied in size from market to market and over time. In recent years, the qintar has been interpreted as an informal metric unit equal to 50 kilograms (110.23 pounds); traditional qintars tended to be a few percent larger than this. The qintar is equal to 100 rotls.

quad
a unit of energy equal to 10^{15} (one U.S. quadrillion) Btu or about 1.055 exajoules (EJ) or 293.07 terawatt hours (TWh).

quadbit
a unit of information equal to 4 bits or 1/2 byte. This unit is used in telecommunications, where data is frequently transmitted in quadbits. In other contexts, the same unit is called a **tetrad**, a **nibble**, or a **hexit**.

quadrant (quad) [1]
a unit of angle measure equal to 1/4 circle, pi/2 radians, 90°, or 100 grads.

quadrant (quad) [2]
a unit of distance equal to the distance from the North Pole to the Equator. The metric system was originally designed to make this distance exactly 10 million meters. The actual meter comes close to the design, but it is a little short. In the Geodetic Reference System 1980 the value given for the quadrant is 10 001 965.7293 meters (6214.93337 miles). In principle, the quadrant is divided into 5400 nautical miles; in fact, 5400 international nautical miles equal 10 000 800 meters.

quadrat- (q-)
a German prefix meaning "square." For example, the square kilometer is the quadratkilometer (qkm or km^2) in German.

quadrennium
a traditional unit of time equal to four years.

quadrimester
a unit of time equal to 4 months. Rare in the U.S., this unit is widely used elsewhere to describe an academic term of 4 months duration.

quadrumvirate
a unit of quantity equal to 4. The word was coined on the pattern of triumvirate.

quadruplet
a group of 4 items, especially 4 identical items; the word is also used for one member of the group.

quadword
a unit of information equal to 4 shortwords, 8 bytes or 64 bits. See also word [2].

quantum
a unit of relative energy used in physics. At the small scales studied in particle physics, energy often occurs in discrete packets or units called **quanta**. The amount of energy in a quantum depends on the frequency of the radiation carrying the energy; it is equal to the frequency (in hertz) multiplied by Planck's constant, $6.626\,069 \times 10^{-34}$ joule second (J·s). The word "quantum" is also used in other contexts where physical quantities occur as multiples of a discrete unit. For example, the quantum of electric charge is *e*, the charge on a single electron.

quart (qt) [1]
a traditional unit of volume, so-called because it equals exactly 1/4 (one quarter) of a gallon. However, there are several possible gallons to consider: [i] in the U. S. customary measure system for liquid volumes (such as milk, for example), one quart is exactly 57.75 cubic inches, 32 fluid ounces, or approximately 0.946 3529 liters; [ii] in the U. S. customary measure system for dry volumes (pecans or strawberries, for example), one quart is 67.201 cubic inches, or approximately 1.101 221 liters; [iii] finally, in the British Imperial system, used for both liquid and dry commodities, one quart is 69.354 cubic inches, 40 fluid ounces, or exactly 1.136 5225 liters. In all cases, the quart equals 2 pints.

quart (qt) [2]
a unit of volume, smaller than the standard quart [1], used for measuring wine. Wine bottles have often been called "quarts," although they were smaller than standard quarts. In the U.S., wine was often measured by the **champagne quart**, which contains only 26 U.S. fluid ounces instead

of 32. This is equivalent to about 46.92 cubic inches or approximately 768.912 milliliters. In Britain, wine was sold by the **reputed quart**. Following the establishment of Imperial measure, the reputed quart was fixed at 2/3 Imperial quart, which is equivalent to 1/6 Imperial gallon, exactly 26 2/3 fluid ounces, about 46.24 cubic inches, or 757.682 milliliters (this is nearly identical to the U.S. fifth). These measures have mostly disappeared in favor of the international wine bottle, which contains exactly 750 milliliters.

quart (qt) [3]
a traditional unit of volume in Scotland equal to 2 Scots pints. This is almost exactly 3 British Imperial quarts, 3.6 U.S. liquid quarts, or 3.41 liters.

quarter (qtr or Q or Qr) [1]
a traditional unit of weight equal to 1/4 hundredweight. In Britain, one quarter equals 28 pounds (12.7006 kilograms); in the United States, one quarter equals 25 pounds (11.3398 kilograms). In the U.S., "quarter" is also used informally to mean 1/4 ton, or 500 pounds (226.80 kilograms).

quarter (qtr or Q) [2]
a civil unit of time equal to 3 months or 1/4 year. The quarter is widely used as a time unit in business and economics. Given the layout of the Gregorian calendar in civil use throughout the world (see year [2]), the quarter varies in length from 90 to 92 days [3] depending on its starting date.

quarter (qtr or Q) [3]
a unit of angle measure equal to 1/4 circle; another name for a quadrant.

quarter (qtr or Q) [4]
a unit of angle measure, sometimes used at sea, equal to 1/4 of a compass point (see point [1]). In this use, a quarter equals 2°48'45" = 2.8125° or pi/64 = 0.049 087radian.

quarter (qtr or Q) [5]
a traditional unit of volume used for measuring grain. A quarter of grain is 8 bushels (about 282 liters, based on the U.S. bushel, or 291 liters, based on the British Imperial bushel), presumably because this quantity of grain weighs roughly 1/4 ton. This unit also known traditionally as the seam.

quarter (qtr or Q) [6]
an informal unit of distance equal to 1/4 mile, 2 furlongs, or 402.336 meters. This unit is used in athletics and horse racing.

quarter (qtr or Q) [7]
an informal unit of time equal to 1/4 hour or 15 minutes. This unit occurs in informal expressions of time, such as "quarter after 10" for 10:15.

quarter (qtr or Q) [8]
a unit of relative time used in sports, equal to 1/4 the total playing time of a competition. A quarter is 15 minutes in American football, 12 minutes in professional basketball.

quarter (Q) [9]
a unit of distance equal to 0.25 millimeter. See Q, above, and point [2].

quarter (qtr or Q) [10]
a unit of distance equal to 1/4 yard or 9 inches (22.86 centimeters). The quarter with this definition was frequently used in cloth measurement in medieval England, and it has continued to be used on occasion down to the present day. In particular, the English ell was often described as being equal to 5 quarters. This unit is identical to the span.

quartern [1]
an old English word for a quarter of anything, "quartern" has been used to represent 1/4 of various units. In the U.S., the term seems to have been used mostly as an alternate name for the gill, which is equal to 1/4 pint or about 118.3 milliliters.

quartern [2]
a traditional English unit of weight equal to 1/4 stone, 3.5 pounds, or about 1.5876 kilogram. See also quartern-loaf, below.

quartern [3]
a traditional unit of volume for dry goods equal to 1/4 peck or 2 quarts. This corresponds to 2.2731 liters in the British Imperial system or 2.2025 liters in the U.S. system. The unit is much more common in Britain.

quartern [4]
a traditional English unit of quantity equal to 25, or 1/4 of 100.
quartern-loaf
a traditional English unit of weight for bread. A quartern-loaf is made from a quartern [2] of flour. The finished loaf usually weighs somewhere between 4 and 5 pounds (very roughly 2 kilograms).
quarter tone
a unit used in music to describe the ratio in frequency between notes. The quarter tone, equal to 1/24 octave, is the basic interval in a 24-tone scale. Two notes differ by a quarter tone if the ratio in their frequencies is $2^{1/24} = 1.0293$.
quartet
a unit of quantity equal to 4.
quartile
a statistical unit equal to 25 percentiles, or 1/4 of a ranked sample.
quarto [1]
a traditional Italian unit of volume, equal to about 73.6 liters or 2.60 cubic feet.
quarto [2]
a traditional Portuguese unit of volume, not related to the Italian quarto nor to the English quart. The Portuguese quarto equals 2 oitavos, which is about 3.46 liters or 0.92 U.S. gallon. There are 16 quartos in a fanega, 124 in a pipa.
quarto [3]
in English, quarto is a page size; see -mo.
quaver
a unit of relative time in music equal to 1/8 whole note or 1/16 breve.
Quevenne scale
see degree Quevenne.
quincena
a unit of time in Spanish-speaking countries, generally considered equivalent to the English fortnight: two weeks or 14 days. However, the word is derived from *quince*, fifteen, indicating a period of two weeks that begins on one day and ends on the fifteenth day, two weeks later. Like fortnight, quincena is often used informally to refer to a period of approximately two weeks or half a month. The same unit is called the **quindicina** in Italian, the **quinzena** in Portuguese and the **quinzaine** in French.
quinquennium
a traditional unit of time equal to five years.
quintal (q) [1]
a traditional unit of weight in France, Portugal, and Spain. Quintal is also the generic name for a historic unit used in commerce throughout Europe and the Arab world for more than 2000 years. The unit began as the Latin *centenarius*, meaning "comprised of 100" because it was equal to 100 Roman pounds. The centenarius passed into Arabic as the cantar or *qintar* and then returned to Europe through Arab traders in the form *quintal*. The German zentner and English hundredweight are familiar forms of this same unit in northern Europe. The traditional French quintal equaled 100 livres (48.95 kilograms or 107.9 pounds), but today the word "quintal" in France usually means a larger metric unit (see next entry). The Spanish quintal is 100 libras (about 46 kilograms or 101 pounds). The Portuguese quintal is larger; it is equal to 128 libras (about 129.5 pounds or 58.75 kilograms). "Kwintal" is the English pronunciation given in standard English dictionaries, but "kintal" (closer to the Spanish pronunciation) and "kantal" (closer to the French) are also used.
quintal (q) [2]
a common metric unit of mass equal to 100 kilograms or approximately 220.4623 pounds. Notice that the metric ton is roughly equal to its non-metric predecessors, but the metric quintal is about twice the size of the traditional quintal.
quintet
a unit of quantity equal to 5.
quintile
a statistical unit equal to 20 percentiles, or 1/5 of a ranked sample.
quintuplet
a group of 5 items, especially 5 identical items; the word is also used for

one member of the group.

quinzaine, quinzena

see **quincena** above.

quire (qr)

a traditional unit of quantity used for counting sheets of paper. The word is from Latin, meaning "by fours." A quire was originally comprised of 24 sheets cut from four of the large sheets produced by the paper maker. In modern use a quire is often reckoned as 25 sheets, so that a ream of 20 quires is now 500 sheets rather than the traditional 480.

Q unit

a unit of heat energy equal to one quintillion (10^{18}) Btu, 1000 quads, or about 1.055 zettajoules (ZJ).

R

R

a commercial unit used to measure the effectiveness of thermal insulation. A thermal insulator is a material, manufactured in sheets, that resists conducting heat energy. Its thermal conductance is measured, in traditional units, in Btu's of energy conducted times inches of thickness per hour of time per square foot of area per Fahrenheit degree of temperature difference between the two sides of the material. The **R value** of the insulator is defined to be 1 divided by the thermal conductance per inch. This means R is an abbreviation for the complex unit combination hr·ft^2·°F/Btu. In SI units, an R value of 1 equals 0.17611 square meter kelvins per watt (m^2·K/W). In clothing insulation units this is about 1.136 clo or 1.7611 tog. Usually the symbol R is placed before the numerical value, as in R15 or R-15. See also RSI (below).

rad (rd)

a metric unit measuring radiation dose. One rad is equal to a dose of 0.01 joule of energy per kilogram of mass (J/kg), or 100 ergs of energy per gram of mass. The SIunit of radiation dose is the gray (Gy); one rad equals 0.01 gray or 1 centigray. "Rad" is an acronym for "radiation absorbed dose."

radar mile

the time required for a radar signal to travel a distance of one mile from the transmitter to an object, and then return to the receiver. Both ordinary (statute) and nautical miles are used: the **radar statute mile** is about 10.8 microseconds (μs) and the **radar nautical mile** is about 12.4 microseconds. A **radar kilometer** would be about 6.7 microseconds.

radian (rad)

a unit of angle measure widely used in mathematics and science. One radian is the angle at the center of a circle that cuts off an arc of length equal to the radius. Since the circumference equals 2 pi times the radius, one radian equals 1/(2 pi) of the circle, or approximately 57.295 779°. Using radians to measure angles seems unnatural at first. However, when angles are stated in radians the constant pi tends to disappear from the equations, and this greatly simplifies calculation. For example, the length of an arc is simply its radius multiplied by its angular measure in radians, and the area of a sector of a circle is simply its angular measure in radians multiplied by half the square of the radius. The radian was defined and named by James Thomson in 1873. Thomson was a mathematics professor at Queen's College, Belfast, Northern Ireland, and the brother of the famous physicist William Thomson, Lord Kelvin.

radian per second (rad/s)

a common unit of angular velocity. One radian per second is equal to about 9.54930 rpm. This unit has been called a **strob**.

radiation unit

an older name for the becquerel.

radiocarbon year (^{14}C yr, yr BP)

a unit used in stating the nominal ages of plant or animal remains dated by radiocarbon testing. A very small proportion (roughly 1 part per trillion, or 10^{-12}) of the carbon in the ecosystem is radioactive carbon-14, which decays to nitrogen-14 with a half life of about 5760 years. While a plant or animal is alive, the fraction of radioactive carbon in its body remains equal to the fraction in the atmosphere at that time. After a plant or animal dies, as the carbon-14 trapped in its body slowly decays, the

age of the tissue can be measured by the fraction of radioactive carbon remaining. The age T of a sample, in radiocarbon years, is computed from the formula T = -8033 ln (R/A), where R is the measured ratio of carbon-14 to ordinary carbon-12 in the sample and A is a benchmark ratio measured in the atmosphere in 1950. Results are often stated as years before present (yr BP), with 1950 chosen to be the "present." The results are inaccurate for several reasons. Obviously, 1950 is no longer the present. Another problem is that the formula assumes a half life of 5568 years, which is now known to be too short (the actual value is 5730±40 years). Most importantly, the ratio of carbon-14 to ordinary carbon-12 in the atmosphere varies slightly over time. Much research has been done to determine the necessary corrections. As an example, a sample with a nominal age of 12 000 radiocarbon years has an actual age of about 14 000 years. A table is provided, and atechnical report (pdf document) posted by the University of Arizona has full details.

rai

a traditional unit of land area in Thailand. The rai is now considered to equal exactly 1600 square meters, which is 0.16 hectare or approximately 0.3954 acre. The rai is divided into 4 **ngan**. The unit is called the **hai** in northern Thailand and the **lai** in Laos. The word means "field," that is, an upland field rather than a rice paddy.

Rankine

an absolute temperature scale; see degree Rankine.

ratel

see rotl (below).

rayl

one of two units of sound impedance. When sound waves pass through any physical substance the pressure of the waves causes the particles of the substance to move. The sound impedance is the ratio between the pressure and the particle velocity it produces. The impedance is 1 rayl if unit pressure produces unit velocity. InMKS units, this means 1 rayl equals 1 pascal-second per meter (Pa·s/m), or (equivalently) 1 newton-second per cubic meter (N·s/m^3). Confusingly, the same name, rayl, is used for the corresponding CGS unit, 1 dyne-second per cubic centimeter (dyn·s/cm^3). The CGS rayl equals 10 MKS rayls. The units are named for Robert John Strutt, the fourth Lord Rayleigh (1875-1947).

rayleigh (R)

a CGS unit of light intensity used in astronomy and physics to measure the brightness of the night sky, auroras, etc. One rayleigh represents the light intensity of one million photons of light emitted in all directions per square centimeter of receiver per second, or, in SI units, 795.775 x 10^6 per square meter per steradian (m^{-2}·sr^{-1}). A dark night sky has a light intensity of roughly 250 rayleighs. The unit honors the English mathematician and physicist John William Strutt, the third Lord Rayleigh (1842-1919).

ream (rm) (1)

a traditional unit of quantity used for counting sheets of paper. The word is thought to be derived from the Arabic *rizmah*, meaning a bundle. A ream is equal to 20quires, which would be 480 sheets with the traditional definition of a quire as 24 sheets. In recent years, however, the ream has been redefined to equal 500 sheets. (Working backwards, this changes the definition of a quire from 24 to 25 sheets.) The new definition reflects the current practice of marketing many kinds of paper in packages of 500 sheets. The older size of 480 sheets is now called a **short ream**.

ream (rm) (2)

a traditional unit of area equal to 3000 square feet (about 278.709 square meters). This unit represents the total area of a ream (1) of 500 full-size sheets of paper, each sheet being 3 feet by 2 feet. The "area ream" is used commonly in the U.S. paper industry for kraft paper, paperboard, and similar products, and it is also being used for non-paper products such as window films and other plastic films.

Réaumur

a temperature scale; see degree Réaumur.

rebah

an ancient Hebrew unit of weight or mass equal to 1/4 shekel. The word means "quarter" in Hebrew.

rebar sizes
numerical size designations for steel reinforcing bars ("rebars") used to strengthen concrete. The size number is the diameter of the rod in 8ths of an inch (1/8 inch = 3.175 millimeters); thus a rod 1 inch in diameter is a #8 rebar.

reciprocal megakelvin (MK^{-1})
a unit used in colorimetry and photography to measure the wavelength of light, especially for selecting filters to adjust the "color temperature." Light waves of a specific wavelength w meters can be assigned a temperature T using the theory of blackbody radiation. A blackbody is an ideal object that absorbs all the radiation it receives. If a blackbody is heated to temperature T, the radiation it gives off will have maximum intensity at wavelength w, where w and T are related by Wien's law, $wT = 2.90 \times 10^{-3}$ meter kelvins. The reciprocal of temperature, $1/T = w/(2.90 \times 10^{-3})\ K^{-1}$, is thus a measure of wavelength. The wavelengths of visible light fall in the range 400 nanometers (extreme violet) to 700 nanometers (extreme red), corresponding to reciprocal temperatures in the range from roughly 130 MK^{-1} to 240 MK^{-1}. The reciprocal megakelvin has also been called the **mired**.

recommended dietary allowance (RDA)
units used in the U.S. to measure the amounts of certain nutrients found in foods or provided by supplements such as vitamin tablets. Each nutrient has its own RDA unit. **Link: Dietary Reference Intakes** from the University of Texas.

redshift (z)
a unit of relative distance used in astronomy. The universe is expanding, so distant galaxies are receding from the earth. The faster the speed of recession, the farther the object. Just as sound from a receding train is lowered in pitch, light from distant galaxies is shifted toward longer wavelengths, that is, toward the red end of the spectrum. The redshift equals z if the wavelength of light is z + 1 times the normal wavelength; thus a redshift of 0.40 means that the wavelength of the light is 40% longer than normal. Using the Hubble space telescope, astronomers have measured redshifts greater than 5.0.

Redwood second
an obsolete unit of kinematic viscosity given by readings on the Redwood viscometers commonly used in Britain and elsewhere. The reading is the time, in seconds, for 50 milliliters of a sample of a liquid to flow through the device. The viscosity in centistokes is given roughly by the formula 0.260 t - (0.0188 / t), where t is the flow time in seconds.

register ton (RT)
a unit of cargo capacity equal to 100 cubic feet (about 2.832 cubic meters); see ton [3]. The symbol **RT** seems to be in wide use for this unit, but it is also used for the refrigeration ton (see ton [7]) and for the revenue ton (see below).

rehoboam
a large wine bottle holding about 4.5 liters, 6 times the volume of a regular bottle. The "h" is silent in English pronunciation.

rem
a unit used for measuring the effective (or "equivalent") dose of radiation received by a human or some other living organism. One rem is equal to 0.01 sievert (Sv) or 10 millisieverts, which means it equals the actual dose received in rads (see above), multiplied by a "quality factor" which is larger for more dangerous forms of radiation. The rem is related to the rad in the same way that the sievert is related to the gray. "Rem" is an acronym for "roentgen equivalent: man," meaning that it measures the biological effects of ionizing radiation in humans. The unit was introduced in 1944 by the physicist H.M. Parker of the Manhattan Project.

rep
an obsolete unit of absorbed radiation dose equal to the absorption of 93 ergs of energy per gram. This is equivalent to 0.93 rad (see above) or 9.3 milligrays (mGy). "Rep" is an acronym for "roentgen equivalent: physical." The definition was made because a dose of 1 rep of beta rays was considered biologically equivalent to a dose of 1 roentgen (see below) of X rays.

reputed pint
see pint [4].

reputed quart
see quart [2].
res or RES
symbol for "resolution," a unit defined to be the number of dots or pixels per millimeter in an image. The unit is often stated before the measurement. RES 1 is equal to 25.4 dots per inch (dpi).
retinol equivalent (RE)
a unit of dosage for retinol (vitamin A) and for related substances such as beta carotene. One RE is equivalent to 5 international units (IU), or 1.5 micrograms, of retinol. U.S. nutritional authorities recommend that an adult diet provide 1000 RE per day.
revenue ton or tonne (RT)
a unit used for billing in the shipping industry. The size of a shipment in revenue tons is the number of metric tons or the number of cubic meters in the shipment, whichever is larger.
revolution (r or rev)
a unit of angle measure equal to a full circle, 360°, or 2 pi radians.
revolution per minute (RPM or rpm or r/min)
a unit of angular velocity, used particularly for rotation rates in mechanics. One r/min equals 0.104 720 radian per second. The tachometers on auto dashboards are usually calibrated in units of 1000 r/min.
reyn
a unit of dynamic viscosity in the customary English system.
See poise for a description of dynamic viscosity. With force measured in pounds of force (lbf), one reyn equals 1 lbf·s/in^2, approximately 68.947 57 kilopoise, or 6.894 757 kilopascal second. The unit, pronounced "ren", was named for a British scientist, Osborne Reynolds (1842-1912).
rhe
a unit of fluidity, the opposite of viscosity. The unit, pronounced "ree", was introduced by the American chemist F.C. Bingham in 1928; he defined it as the reciprocal of the centipoise. However, it came to be used instead as the reciprocal of the poise itself, so the fluidity of a substance in rhes is 1 divided by its dynamic viscosity in poise. In SI units, the rhe equals 10 per pascal-second (10 (Pa·s)$^{-1}$). The name of the unit comes from the Greek *rhein*, to flow.
Rhine foot or Rheinfuss
the foot unit, or fuss, traditionally used in western and northern Germany.
rhm
a unit used in physics to measure the strength of gamma rays, a form of high-energy radiation emitted by some radioactive substances. A source of strength 1 rhm produces ionization at the rate of 1 roentgen per hour at a distance of 1 meter from the source. The letters "rhm" stand for roentgen-hour-meter.
Rhode Island
the smallest state of the U.S., Rhode Island has long served as an informal unit of area in statements such as "an iceberg 1.5 times the size of Rhode Island has broken off from Antarctica." Rhode Island has a land area of about 1045 square miles or 2706 square kilometers. Europeans might note that Luxembourg (2586 square kilometers) provides a comparable unit. See also Wales.
ri
a traditional Japanese unit of distance, sometimes called the **Japanese league** because it is of similar length to the European league. The ri equals 2160 ken or 12 960 shaku (the shaku being the Japanese equivalent of the foot). This is about 3927 meters or 2.44 statute miles.
rice cup
a common name in English for the Japanese go, a unit of dry and liquid capacity equal to about 180 milliliters or 3/4 of a U.S. cup. Japanese rice cookers usually come with measuring cups having this capacity.
Richter scale
a logarithmic scale measuring earthquake intensity. See magnitude [2].
rick
a traditional unit of volume for firewood. A rick represents a stack of split firewood 4 feet high and 8 feet long, the logs being of a standard length, usually 16 inches. This is equivalent to 1/3 cord or 1.208 steres. However, because the size of a rick has been manipulated by vendors,

it is illegal to sell firewood by the rick in several U.S. states. A rick is sometimes called a **face cord** or **tier**. The name of the unit comes from a old Norse word for a stack of wood.

ridge

a traditional Welsh unit of distance equal to 3 leaps or 20 feet 3 inches (6.1722 meters).

Riga last

a traditional British unit of volume used for measuring timber. The Riga last is named for the Latvian capital, Riga, which was a major port for the shipment of timber from Russian forests. A Riga last is 80 cubic feet (2.265 cubic meters) of square-sawn timber or 65 cubic feet (1.841 cubic meters) of round timber. See also last.

right angle

a common unit of angle measure equal to 1/4 circle, 90°, 100 grads, or pi/2 radians.

ring

a traditional English unit of quantity for boards and staves, which were shipped encircled by metal rings. A ring equals 4 shocks, or 240 boards.

ring size

a measure of the inside diameter or inside circumference of a ring (the kind worn on a finger). A variety of ring sizing systems are used in various countries. In the U.S., a ring of size n has an inside circumference of $1.43 + 0.102 \cdot n$ inches, or about $36.3 + 2.60 \cdot n$ millimeters. (There is some variation, because U.S. ring sizes have never been standardized). In Britain, traditional ring sizes are stated as letters A, B, etc.; if we replace the letters by numbers n (A = 1, B = 2, etc.), then a ring of British size n has an inside circumference of $36.25 + 1.25 \cdot n$ millimeters, or about $1.43 + 0.049 \cdot n$ inches. A difference of 1 U.S.size thus corresponds rather closely to two letters in the British system. In Japan, sizing is by the inside diameter in increments of 1/3 millimeter; a ring of Japanese size n has an inside diameter of $(n + 38)/3$ millimeters and an inside circumference of $39.8 + 1.047 \cdot n$ millimeters. There is an international standard (ISO 8653) defining the ring size to be the inside circumference in millimeters, minus 40. Rings are now sized by this standard in most of Europe, so a ring of European size n has an inside circumference of exactly $40 + n$ millimeters. (The British scale is aligned with the European scale, with British size C corresponding to European size 0 and a difference of four British letters corresponding to 5 European sizes.)

rms or RMS

an abbreviation for root mean square (see below), a mathematical technique for averaging the values of a changing quantity.

Rockwell hardness (RH-)

a measure of the hardness of a metal introduced by Rockwell in 1922. In a Rockwell hardness test, a penetrator makes an indentation in the metal under two constant loads, a "minor" load (generally 10 kilograms) and then a "major" load. The difference in penetration depth between the two loads provides the measure of the hardness, usually read from a gauge on the testing machine. There are several Rockwell scales for different ranges of hardness. The most common are the B scale (**RHB**), for which a steel ball is used as the penetrator, and the C scale (**RHC**), for which a cone-shaped diamond is used. The B scale is appropriate for soft metals, the C scale for hard metals. Rockwell hardness numbers are not proportional to Brinell or Vickers hardness readings.

rod (rd) [1]

a traditional unit of distance equal to 5.5 yards (16 feet 6 inches or exactly 5.0292 meters). The rod and the furlong were the basic distance units used by the Anglo-Saxon residents of England before the Norman conquest of 1066. The Saxons generally called this unit the *gyrd*, a word which comes down to us as the name of a different unit, the yard. "Rod" is another Saxon word which meant just what it means today: a straight stick. The Normans preferred to call the *gyrd* a **pole** or a **perch**(a word of French origin, meaning a pole; see perche). The length of the rod was well established at least as early as the eighth century. It may have originated as the length of an ox-goad, a pole used to control a team of 8 oxen (4 yokes). Scholars are not sure how the rod was related to shorter units. It may have been considered equal to 20 "natural" feet (actual foot lengths; see foot), or it may have been measured "by hand"

as 30 shaftments. In any case, when the modern foot became established in the twelfth century, the royal government did not want to change the length of the rod, since that length was the basis of land measurement, land records, and taxes. Therefore the rod was redefined to equal 16.5 feet, because with reasonable precision that happened to be its length in terms of the new foot. This length was called the "king's perch" at least as early as the time of King Richard the Lionheart (1198). Although rods and perches of other lengths were used locally in Britain, the king's perch eventually prevailed. The relationship between the rod and the other English distance units was confirmed again by the Parliamentary statute of 1592, which defined the statute mile to be either 320 rods or 1760 yards, thus forcing the rod to equal exactly 5.5 yards or 16.5 feet.

rod (rd) [2]
a unit of area equal to one square rod [1]. A rod of area covers exactly 272.25 square feet or about 25.292 85 square meters. There are 40 rods in a rood and 160 rods in an acre.

roede
a traditional Dutch unit of distance (see rood [1] below), reinterpreted in 1820 as a metric unit equal to exactly 10 meters (32.8084 feet). The roede has also been used as a unit of area equal to one square (linear) roede; this is equal to 100 square meters or 1 are.

roentgen or röntgen (R)
a non-metric unit used to measure the ionizing ability of radiation. Radiation often ionizes atoms it strikes, stripping one or more electrons from them. The biological effects of radiation are caused in large part by excessive ionization within living cells, so it is important to measure this ionizing ability of radiation. For x-rays and gamma rays, this is often done by measuring the electric charge released when air is ionized by the radiation. The roentgen is an old unit used for this purpose; one roentgen equals a charge release rate of 258 microcoulombs per kilogram of air. The unit is named for one of the early investigators of radioactivity, the German physicist Wilhelm Konrad Röntgen (1845-1923). In English it is usually pronounced "rent-gen" with a hard *g* sound; sometimes the soft *g* ("rent-jen") is used.

rood [1]
an old unit of distance, used in several ways. Rood (or roede) is an old Dutch word meaning a rod or pole. So the rood is in some cases another name for a rod [1]. But in old England and Scotland the rood was often longer than a "modern" rod of 16.5 feet; sometimes it was 20 feet, 21 feet, or even 24 feet. In Afrikaans-speaking South Africa, the rood was a standardized measure equal to 12 Cape feet, which is 12.396 English feet or 3.7783 meters.

rood [2]
a traditional unit of area used to measure land. A rood is the area of a narrow strip of land one furlong (40 rods, or 660 feet) long and one rod (16.5 feet) wide. Thus the rood is equal to 40 square rods (or perches), which equals 1210 square yards, or 10 890 square feet, or exactly 1/4 acre. That would be the area of a lot 22 yards wide and 55 yards deep, about the size of many suburban lots. One rood is approximately 1011.714 square meters, or 0.101 171 4 hectare.

root mean square (rms)
a notation used after various measurements to indicate that the root mean square method has been used to measure or compute an average value for the measurement. Usually the quantity being measured varies in a periodic way; typical examples include the voltage of an alternating current or the intensity of a sound wave. In the rms method, the varying quantity is first squared (S), then a mean (M) or average of the squared values is obtained, and then the square root (R) of this mean value is computed. For many purposes this procedure gives the best measure of the "typical" or "effective" value of the quantity.

RON
abbreviation for research octane number. See octane number.

ropani
a unit of land area in Nepal, equal to about 508.7 square meters or 5475 square feet (0.05087 hectare or almost exactly 1/8 acre). The ropani is divided into 16 annas.

rope
another name for the rood [1], the distance unit.

rotl, rotel, rottle, ratel, or arratel
a traditional Arab unit of weight corresponding to the Roman libra, the French livre, and the English pound. There was considerable variation in the unit from time to time and from place to place, but usually the rotl was about 0.9-1.15 pound (450-530 grams). However, in some areas of the Near East, such as Syria and Palestine, larger rotls of 5.5 to 6 pounds (2.5-2.8 kilograms) were used. This unit has many spellings in European languages.

round
the basic unit of time in boxing, equal to 3 minutes.

royal foot
the French pied de roi, also called the **Paris foot** in English.

rpm
a very common abbreviation for revolutions per minute (see above).

R_{SI} or RSI
a symbol for the R-value of insulation when stated in SI units: square meter kelvins per watt ($m^2 \cdot K/W$). R_{SI} 1 is equivalent to R 5.678.

run
a unit of density for woolen yarn, used in the U.S. Yarn is described as *n* run if there are *n* 1600-yard hanks of the wool per pound. Actual yarn ranges from about 0.5 run to 8 run. The unit is also called the **American run**.

rundlet
a traditional measure of liquid volume, dating back to the Middle Ages. A rundlet is a small barrel usually holding 18 wine (U.S.) gallons (roughly 68.1 liters).

running foot
another name for a linear foot. Terms such as **running meter** and **running yard** are used similarly.

rute
a traditional German unit of distance corresponding to the English rod [1]. In fact, "rute" is the German word for rod. The rute had varying lengths, as short as 10 fuß (German feet) and as long as 16 fuß. This could be anywhere from about 3 meters to 4.5 meters.

rutherford (Rd)
a practical unit of radioactivity equal to the megabecquerel (MBq). This means 1 rutherford represents 1 million radioactive disintegrations per second. The unit is named for the New Zealand nuclear physicist Ernest Rutherford, later named Lord Rutherford (1871-1937), whose study of radioactivity led to the discovery in 1911 that most of the mass of an atom is concentrated in a tiny nucleus.

rydberg
a former name for the kayser, the CGS unit of wave number. The name honored the Swedish physicist Johannes Rydberg (1854-1919).

S

sabin
a non-metric unit of sound absorption used in acoustical engineering. One sabin is the sound absorption of one square foot of a perfectly absorbing surface--such as an open window! The sound absorption of a wall or some other surface is the area of the surface, in square feet, multiplied by a coefficient which depends on the material of the surface and also on the frequency of the sound. These coefficients are carefully measured and tabulated. The unit honors Wallace Sabine (1868-1919), a Harvard University professor who founded the systematic study of acoustics about 1895. Sabine used this unit, which he called the **open window unit (owu)**, as early as 1911.

sack [1]
a traditional unit of volume. Sacks of different commodities are of different sizes, but a typical measure is 3 bushels (about 105.7 liters based on the U.S. bushel, or 109.1 liters based on the British Imperial bushel).

sack [2]
a traditional unit of weight, varying for different commodities shipped in sacks. In Britain, for example, the sack was a traditional measure for wool, fixed by Edward III at 364 pounds (26 stone) in 1340. In the U.S., a sack of salt is traditionally equal to 215 pounds, a sack of cotton

140 pounds, and a sack of flour 100 pounds. A sack of concrete is traditionally 94 pounds in the U.S., 87.5 pounds in Canada.

sadzhen or sagene

a traditional Russian unit of distance corresponding roughly to the English fathom and French toise. Early in the 1700s, Czar Peter the Great fixed the length of the sadzhen at exactly 7 English feet. This equals 3 arshin or 2.1336 meters. **Sagene** is an older transliteration of the Russian word.

Saffir-Simpson category

a ranking of the strength of a hurricane, introduced by two American meteorologists and used by the U.S. National Weather Service to rank storms in the Atlantic and northeastern Pacific Oceans. A complete description, from the U.S. Atlantic Oceanographic and Meteorological Laboratory in Miami, is provided.

S.A.G. foot

the South African geodetic foot (see below).

sailmaker ounce (smoz)

a traditional unit measuring the weight (per unit area) of sailcloth. The weight in sailmaker ounces is the weight in ordinary (avoirdupois) ounces of a piece of cloth 36 inches by 28.5 inches. Thus 1 smoz is equal to 1.263 ounces per square yard (oz/yd^2) or 42.828 grams per square meter (g/m^2 or gsm). However, spinnakers (the large triangular foresails of yachts) are traditionally named by the fabric weight before it is finished, so these names do not correspond exactly to the sailmaker-ounce weights. A "half-ounce" spinnaker, for example, has a weight of about 0.85 smoz or 37 gsm, and a "three-quarter-ounce" spinnaker has a weight of about 1 smoz.

salmanazar

a large wine bottle holding about 9 liters, 12 times the volume of a regular bottle.

saltspoon (ssp)

a unit of volume formerly used in U.S. food recipes. The saltspoon equals 1/4 teaspoon or about 1.2 milliliters.

sao

a traditional unit of land area in Vietnam. The sao varies somewhat from province to province. It is equal to 360 square meters (430.6 square yards) in many places, but as much as 500 square meters (598.0 square yards) in others.

saros

a unit of time used in astronomy, mostly in predicting solar and lunar eclipses. The saros is equal to 6585.32 days [1] (6585 days 7 hours 23 minutes), which is exactly 223 lunar months. (This is either 10.32 or 11.32 days more than 18 years, depending on the number of leap years during the period.) Astronomers in ancient times discovered that the saros is very nearly equal to 19 eclipse years (6585.78 days). This means that one saros after an eclipse the Sun, Moon, and Earth return almost exactly to the same position and another, very similar eclipse occurs. However, because of the 7 hours 23 minutes included, the Earth has turned about one third of a revolution and the new eclipse occurs about 116° of longitude west of the preceding one. After 3 saros, the eclipse returns nearly to its original location. Thus eclipses at a particular location tend to repeat with a period of 3 saros or 54 years and about 1 month. Thus the last total solar eclipse in North Carolina, on 1970 March 7, will repeat on 2024 April 8 and again on 2078 May 11.

saturation

a measure of the brightness of a color; see color units.

savart

a unit used in music to describe the ratio in frequency between notes. The difference between two frequencies in savarts is equal to 1000 times the logarithm of the ratio between the two frequences. Thus there are $1000 \cdot \log(2) = 301.03000$ savarts in an octave. (In applications, this is sometimes rounded to 300.) The savart is equal to about 3.9863 cents [3] or 3.3219 millioctaves. Two notes differ by one savart if the higher note has a frequency equal to $2^{1/301.03} = 1.002\,305$ times the frequency of the lower note. The unit is named for a French physicist, Félix Savart (1791-1841); although best known for his work in electromagnetism, Savart also did pioneer research in the physics of sound.

Saybolt Universal second
units of kinematic viscosity given by readings on Saybolt viscometers. The Saybolt Universal viscometer is used for liquids having viscosities below 1000 centistokes (or 10 stokes, see entry for stokes below). The Saybolt Furol viscometer is used for more viscous road and fuel oils ("furol" is an acronym for fuel and road oils). In both cases the reading is the time, in seconds, for 60 milliliters of a sample to flow through the device. The Furol viscosity readings are roughly 1/10 the Universal readings. For liquids whose viscosity exceeds 50 centistokes at 37.8 °C (100 °F) one SSU is approximately 0.2158 centistokes or 0.2158 mm^2/s. For very viscous liquids (viscosity exceeding 500 centistokes) at 50 °C (122 °F), one SSF is approximately 2.120 centistokes or 2.120 mm^2/s. Exact equations were published in 1996 by the American Society for Testing and Materials (ASTM practice D2161). The Saybolt seconds are considered obsolete, but they have been used traditionally in the petroleum industry and are common in technical articles.

scale
a measure describing the resolution of a map, architectural plan, or some similar document. A map, for example, might be described as "1:250 000 scale". In general, 1:*n* scale means that 1 unit of distance on the map or plan represents *n* of the same units in fact. It doesn't matter what unit of distance is used, as long as it is the same in both cases. On a 1:250 000 scale map, 1 centimeter on the map represents 250 000 centimeters (exactly 2.5 kilometers) on the ground. On the same map, one inch on the map represents 250 000 inches (about 3.9457 miles) on the ground. The use of the terms "larger" and "smaller" referring to scale is often confusing. A 1:*m* scale map has larger scale than a 1:*n* scale map if *m* is less than *n*. For example, a 1:100 000 scale map has larger scale than a 1:250 000 scale map, and the same place or object will appear larger on the larger scale map. Mathematically, the notation 1:*n* is simply another way of writing the ratio 1/*n*.

sccm, scfm, scfh, scfd, scim (etc.)
symbols for "standard cubic centimeters per minute", "standard cubic feet per minute", "standard cubic feet per hour", "standard cubic feet per day", and "standard cubic inches per minute." Many similar abbreviations are in use. These are units of flow rate for gases, and the term "standard" indicates that the flow rate assumes a standard temperature and a standard pressure of 1 atmosphere. There is some variation in the standard temperature. For natural gas, the petroleum industry uses a standard temperature of 60 °F (15.6 °C). For air flow, the standard temperature is sometimes 32 °F (0 °C) or 68 °F (20 °C) and a standard relative humidity must also be specified. The actual air flow is often designated with an "a" instead of an "s", as in "acfm".

scheffel or schepel
traditional units of dry volume. The German scheffel and Dutch schepel have both been redefined within the metric system, but in very different ways: the scheffel equals 50 liters (1.4189 U.S. bushels) and the schepel 10 liters (0.2838 U.S. bushels). Both words are usually translated "bushel" in English, and both units were originally closer to the English bushel; the schepel was roughly 0.75 bushel or about 26 liters. See also **skep** (below).

schock
a traditional German unit of quantity equal to 60. See shock [1] below.

schooner
an informal unit of liquid volume. A schooner is a large tumbler or drinking glass holding about 400 milliliters or 13.5 U.S. fluid ounces. Similarly, in Queensland, New South Wales, and the Northern Territory (Australia) a schooner of beer holds 425 milliliters. In South Australia, however, a schooner is only 285 milliliters.

schoppen
a traditional German unit of liquid volume for wine, now interpreted most often as 250 milliliters (1/4 liter or about 8.45 U.S. fluid ounces).

schtoff
a traditional Russian unit of volume equal to 10 charki. This is equivalent to about 1.23 liters or 1.30 U.S. liquid quarts.

scim
see above under **sccm**.

score

a traditional unit of quantity equal to 20. The score, like the dozen, helps us describe a moderate number of objects. This is one of the many cases in which English has two words for similar concepts, one word from the Old French spoken in 1066 by the Norman conquerors of England and one from the Old English spoken by the Anglo-Saxon people they conquered. In this case, dozen is the French word and score is the Old English word, derived from the Norse word *skor* meaning a notch cut in a stick as a tally mark. The suffix -score can be added to a number, as in threescore (60) or fivescore (100).

Scots foot, Scots mile

traditional distance units in Scotland. The Scots foot equals 1.005 405 4 English foot (about 12.065 English inches or 30.645 centimeters). The Scots mile equals 320falls or 5920 Scots feet, which is about 5952 English feet (1.127 English mile or 1814.2 meters). The English foot and statute mile, of course, are now official in Scotland.

Scoville unit

a unit measuring the concentration of capsaicin, the "hot" ingredient in chile peppers. A measurement of, say, 50 000 Scoville units means that an extract from the pepper can be diluted 50 000 to 1 with sugared water and the "burn" of the capsaicin will still be barely detectable by the human tongue. (In practice, the measurements are now made with liquid chromatography.) The unit was invented in 1912 by the American pharmacologist Wilbur L. Scoville, who was working on the use of capsaicin in the muscle pain-relieving ointment Heet. Actual chile peppers have capsaicin concentrations from 5000 to 500 000 Scoville units.

scruple (s)

a unit of weight in the traditional (troy) system used by English apothecaries, equal to 20 grains, 1/24 troy ounce [2] or approximately 1.2960 gram. See also dram [2], and see troy weights for additional information. The name of the unit is from the Latin *scrupulus*, meaning a small, sharp stone. (This word also came to mean "something which causes pain or annoyance," such as a pebble in one's shoe, and this led to our other use of the word "scruple" to mean an ethical consideration.)

Units similar to the scruple were used throughout Europe; the French and Russian **scrupule,** Italian **scrupolo**, and German **skrupul** are equal to 20 of the local unit corresponding to the grain and all are equivalent to something in the range 1.1-1.3 grams.

se

a traditional Japanese unit of area equal to about 99 square meters or 118.4 square yards.

seah

an ancient Hebrew measure of both liquid and dry volume. The seah was equal to about 13.44 liters (about 3.55 U.S. liquid gallons or 2.96 British Imperial gallons).

seam

a traditional unit of volume. A seam of grain was 8 bushels: this would be equivalent to 290.95 liters based on the British Imperial bushel, or 281.91 liters based on the older U.S bushel. Take your pick. The Anglo-Saxon word "seam" meant the load of a pack animal. (The same word also came to mean the stitching of the packsaddle, and that's the origin of our other uses of the word today.) We don't know how large the seam was in Saxon times, but it was equal to 8 bushels at least by the end of the thirteenth century. The seam continued in use to the early nineteenth century, but in later years it was more often called a quarter [5]. The unit was sometimes called the **soam**.

sea mile

another name for the nautical mile.

season

a portion of a year. The word "season," derived from a Latin word meaning the time for sowing, originally meant one of the periods of the agricultural year. It has come to be used informally to mean the period of time characterized by any activity (such as the "football season") or more specifically as an informal unit of time equal to roughly 1/4 year. Ideas of what constitutes a season in this latter sense vary from country to country. In North America, the astronomical seasons begin at the instants of equinox (for spring and fall) or solstice (for summer and winter), on or near the 21st days of March, June, September, and

December. In meteorology, however, the seasons begin on the 1st days of March, June, September, and December.

second (s or sec or ") [1]

a fundamental unit of time in all measuring systems and the SI base unit of time. The name simply means that this unit is the second division of the hour, the minute being the first (see minute [0]). The second was defined as 1/86 400 mean solar day until astronomers discovered that the mean solar day is actually not constant (seeday [2]). The definition was then changed to 1/86 400 of the specific mean solar day 1900 January 1. Since we can't go back and measure that day any more, this wasn't a real solution to the problem. In 1967, scientists agreed to define the second as that period of time which makes the frequency of a certain radiation emitted by atoms of cesium-133 equal to 9 192 631 770 hertz (cycles per second). In other words, if we really want to measure a second, we count 9 192 631 770 cycles of this radiation. This definition allows scientists to reconstruct the second anywhere in the world with equal precision.

second (" or s or sec) [2]

a unit of angular measure equal to 1/60 arcminute. This unit is also called the **arcsecond** to distinguish it from the second of time. One second is a very small angle indeed: there are 1 296 000 seconds in a circle. The SI defines s as the symbol for the time unit (see above) and recommends " as the symbol for the arcsecond. The international standard ISO 31 recommends that angles be stated in degrees and decimal fractions of the degree, without use of arcminutes and arcseconds.

second (" or s or sec) [3]

a unit of longitude used in astronomy. Astronomers measure right ascension in time units by dividing the equator into 24 hours instead of 360 degrees. (Right ascension is the longtitude coordinate for positions in the sky; see hour [2]). This makes 1 second of longitude equal to 15 arcseconds.

second (" or sec) [4]

a unit of viscosity defined by the time required for a specified amount of a liquid to flow through a particular viscometer. The Saybolt second (see above) was used in the U.S., the Redwood second in Britain, and the Engler degree in continental Europe.

second (s or sec) [5]

a unit measuring the fuel efficiency of rocket engines. The measure is obtained as the thrust of the engine divided by the weight of fuel consumed per second (weight being measured at the earth's surface, or at 1 g). Since both thrust and weight are forces, their units cancel and the ratio is measured in seconds. This ratio is often called "specific impulse," although the true specific impulse (measured in speed units) is the ratio of the thrust to the mass (not weight) of fuel consumed per second.

second (s or ") [6]

a unit of sidereal time in astronomy; see "sidereal day" below.

second-day-foot (sdf)

a unit of volume for water sometimes used in U.S. hydrology. A second-day-foot is the volume of water accumulated in one day by a flow of one cubic foot per second; this is equal to exactly 86 400 cubic feet or about 2446.58 cubic meters. One second-day-foot is equivalent to approximately 1.9835 acre feet. Also known as the **day-second-foot (dsf)**.

second-foot

an informal name for the cubic foot per second as a flow rate for water.

section (sec)

a traditional unit of area in the U.S. and western Canada, nominally equal to 1 square mile. This unit is used by the U.S. Public Land Survey System, which applies to most of the U.S. except for the original 13 states, Alaska, and Hawaii, and by the similar Dominion Lands Survey System in the four western provinces of Canada. Because sections were surveyed using grids of north-south and east-west boundaries, their actual size varies slightly (by less than 1%) due to the Earth's curvature, depending on their position within the specific grid. Nominal quarter-section lots in the U.S. would also be slightly smaller because space was taken from them for roads, but Canada allowed space for roads between adjacent sections.

SED
a symbol for **standard erythemal dose**, a unit used to measure the amount of skin-reddening ultraviolet radiation received by a person in the sun or in a tanning salon. One SED is equal to a dose of 100 joules per square meter (J/m^2) of skin surface. The radiation producing skin reddening is confined to a narrow range of wavelengths around 300 nanometers, so the energy is measured only in these wavelengths using a standardized procedure. A tanning rate of one SED per hour is equivalent to 27.778 milliwatts per square meter (mW/m^2) of skin surface.

seemeile
the German name for the nautical mile.

seer [1]
a traditional weight unit in India and South Asia. The seer equals 1/40 maund, and, like the maund, it varied considerably from one area to another. The official size in British India was 2.057 15 pounds or 0.9331 kilogram. In Pakistan, the seer is now considered equal to the kilogram. The unit is sometimes spelled **ser**.

seer [2]
a traditional unit of dry volume in northern India, equal to a little more than a liter. This is roughly the volume of a seer [1] of grain.

SEER
an abbreviation for **seasonal energy efficiency rating**, a U.S. and Canadian measure of the efficiency of an air conditioner. The rating is equal to the total output of the air conditioner over an entire cooling season, in Btu, divided by the total electrical energy consumed, in watt hours. Since this is a ratio of two energy units, the result is a dimensionless (unitless) number. In 2005 the required SEER for home central air conditioning systems was raised from 10 to 13. See also EER and COP.

Seidel
a traditional unit of liquid volume in Austria. The traditional Seidel was equal to about 354 milliliters; this is about 12.0 U.S. fluid ounces or about 12.5 British fluid ounces. In southern Germany the Seidel was larger, about 535 milliliters or 18.09 U.S. fluid ounces. Today a Seidel of beer in southern Germany and Austria is a small mug holding 300 milliliters (10.14 U.S. fluid ounces) in Austria or 500 milliliters (16.91 U.S. fluid ounces) in Germany.

semester (sem)
an informal unit of time. The word semester comes from the Latin words for "six months," and originally a semester was understood to equal 6 months or 1/2 year. However, the word is now used chiefly to mean half the academic year at a school or college, a period of time which can vary from 15 to 21 weeks.

semester hour (sem hr)
a unit of academic credit, supposedly equal to one semester's study for a period of one hour per week. However, "academic hours" slightly shorter than regular hours (often 50 or 55 minutes per class) are typically used in these calculations.

semi-
a common English prefix meaning 1/2. In statements of frequency, *bi-* and *semi-* have become confused and it isn't always clear what a word like "semimonthly" means. This is how it's supposed to work: in adverbs of frequency, semi- means "twice every" or "every half." Bells on a ship ring **semihourly** (every half hour) and the tides usually occur **semidiurnally** (twice a day); a **semiweekly** newspaper is published twice in a week; a **semimonthly** payroll is paid twice every month; and days and nights have the same length **semiannually** (twice a year). For something that happens once every two time units, use bi-.

semibreve
a unit of relative time in music equal to 1 whole note or 1/2 breve.

semicircle
a unit of angle measurement equal to 1/2 circle, pi radians, or 180°.

semih
abbreviation for semihourly (every half hour) sometimes used in medical prescriptions.

semiquaver
a unit of relative time in music equal to 1/16 whole note or 1/32 breve.

semitone
a unit used in music to describe the ratio in frequency between notes. The unit is actually used in two slightly different ways. In one use, two notes are said to differ by one semitone if the higher note has frequency exactly 16/15 = 1.0667 times the frequency of the lower one. Also, the semitone is used as a synonym for the half step in the standard chromatic scale; in this use, two notes differ by a semitone if the higher note has frequency exactly $2^{1/12}$ = 1.0595 times the frequency of the lower one.
sennight
an old English name for a week, formed as a contraction of *seven nights*. The word is pronounced like "senate."
septennium
a unit of time equal to 7 years.
septet
a unit of quantity equal to 7.
septuple, septuplet
a group of 7 items, especially 7 identical items; the word septuplet is also used for one member of the group.
ser
see seer (above).
sester
an old English unit of measure for honey. It seems to have been equal to about 2 U.S. gallons, 1.7 Imperial gallons, or 7.5 liters.
sestet
another name for a sextet, a unit of quantity equal to 6. This spelling is used in poetry to describe a six-line stanza and is sometimes used in music for an ensemble of 6 instruments.
seven
a unit of volume for beer in New South Wales and some other sections of Australia. A seven of beer is a glass holding 200 milliliters (about 7 Imperial fluid ounces). This volume is called a butcher in South Australia and a glass [3] many other parts of Australia.
seventh
a unit used in music to describe the ratio in frequency between notes. Two notes differ by one seventh if the higher note has frequency exactly 15/8 times the frequency of the lower one. On the standard 12-tone scale, the seventh is approximated as 11 half steps, corresponding to a frequency ratio of $2^{11/12}$ = 1.8877.
sextarius
a Roman unit of liquid volume. The word means "sixth", and the unit was equal to 1/6 congius. The sextarius held about 530 milliliters, roughly the capacity of the British and U.S. pints (568.261 and 473.176 milliliters, respectively).
sextet
a unit of quantity equal to 6.
sextuple, sextuplet
a group of 6 items, especially 6 identical items; the word sextuplet is also used for one member of the group.
SF
a common symbol for the square foot (ft^2).
SFM
a traditional symbol for surface feet per minute, a unit measuring the rate at which a rotating tool, such as a lathe or saw, processes material. The term surface foot refers to the length of the material, similar to the linear foot.
SG
a common symbol for specific gravity, sometimes appended to a measurement as if it were a unit, as in "1.134 SG" for a specific gravity of 1.134. (Specific gravity is a mathematical ratio of densities, so it has no unit.)
shackle
a traditional unit of length used for measuring the lengths of nautical cables and chains, especially anchor chains. Anchor chains are formed by using shackles to join short lengths of chain. When the anchor is dropped and the chain runs out, a seaman counting the number of shackles can report the total length of chain deployed. The size of the unit therefore varied somewhat, depending on the length of the short chains used. In Britain, the unit became standardized in the 16th century

at 12.5fathoms (75 feet or 22.86 meters). In 1949, the Royal Navy adopted a length of 15 fathoms, which is 90 feet or 27.432 meters; this brought the British shackle in line with the U.S. unit, which is usually called the shot.

shade number

a unit of light transmission for the protective glasses used in welding. If T is the fraction of visible light transmitted, the shade number is $1 + 7(-\log_{10} T)/3$. For example, if 1% of the light is transmitted, the shade number is 4.

shaftment

an old English unit of distance equal to 2 palms. A shaftment is the distance from the tip of the outstretched thumb to the opposite side of the palm of the hand. The ending "-ment" is from the old English word *mund*, hand. The shaftment was an important unit in Saxon England, where it was equal to about 16.5 centimeters (6.5inches). After the modern foot came into use in the twelfth century, the shaftment was reinterpreted as exactly 1/2 foot or 6 inches (15.24 centimeters). The shaftment continued in common use through at least the fifteenth century, but it is now obsolete.

shake

an informal unit of time equal to 10^{-8} second or 10 nanoseconds (ns). This unit originated in nuclear physics. In an atomic explosion, fast-moving neutrons break apart atoms of uranium or plutonium; the fission of these atoms releases additional neutrons which keep the reaction going. The shake is the approximate lifetime of an individual neutron. The word shake and the expression "shake of a lamb's tail" have long been used in English to mean a very brief period of time.

shaku

a Japanese word meaning "measure" or "scale", also used for several traditional units in Japan: [1] As a unit of distance, the shaku is the Japanese foot, equal to about 30.30 centimeters or 11.93 inches; [2] As a unit of area, the shaku equals 330.6 square centimeters (51.24 square inches); [3] As a unit of volume, the shaku equals about 18.04 milliliters (0.61 U.S. fluid ounce).

shannon (Sh)

a unit of information content used in information and communications theory. The definition is based on the idea that less-likely messages are more informative than more-likely ones (for example, if a volcano rarely erupts, then a message that it is erupting is more informative than a message it is not erupting). If a message has probability p of being received, then its information content is $-\log_2 p$ shannons. For example, if the message consists of 10 letters, and all strings of 10 letters are equally likely, then the probability of a particular message is $1/26^{10}$ and the information content of the message is $10(\log_2 26) = 47.004$ shannons. This unit was originally called the bit [2], because when the message is a bit string and all strings are equally likely, then the information content turns out to equal the number of bits. One shannon equals $\log_{10} 2 = 0.301\,030$ hartley or $\log_e 2 = 0.693\,147$ nat. The unit is named for the American mathematician Claude Shannon (1916-2001), the founder of information theory.

sheaf

a traditional measure for grain and various other commodities. A sheaf of grain is a bundle of stalks having a standard size, typically 30 to 36 inches (roughly 75-90 centimeters) in circumference. A sheaf of arrows is a bundle or quiver of 24.

shed

an exceptionally small unit of area used in particle physics. Like its big brother, the barn, the shed is used to express the apparent cross-sectional area of a particle from which other particles are scattered. One shed equals 10^{-24} barn, which is 10^{-52} square meter or 0.0001 square yoctometer (ym^2).

shekel or sheqel

an ancient Hebrew unit of weight (and also a coin having that weight). The shekel was the Hebrew version of a Babylonian unit used throughout the Middle East. Accounts differ on its size. A frequently quoted equivalent is 1/60 mina, which is equal to about 8.3 grams or 0.29 ounce (avoirdupois); other sources quote a value of 11.3 grams or 0.40 ounce or various other values in the range 7-14 grams (0.25-0.5

ounce).

sheng

a traditional unit of liquid volume in China. Like the Indian seer (see above), the sheng is a little more than a liter; 1.035 liter (1.094 U.S. quart) is one quoted equivalent.

shetland

a unit of volume for beer in Western Australia, equal to 115 milliliters (4 Imperial fluid ounces). This quantity is a smaller version of the 5-ounce pony; its name refers to Shetland ponies, small horses from the Shetland Islands north of Scotland.

shift

a unit of time equal to the scheduled period of work at a factory or other place of business. Businesses operating on a 24-hour basis typically organize the day into three daily shifts of 8 hours each. This usage is consistent with the old English meaning of "shift" as an arrangement or division.

shipping ton

a traditional unit measuring the volume (not the weight) of items shipped by sea. The **U.S. shipping ton** is the same as the freight ton (see ton [5]), 40 cubic feet or about 1.1326 cubic meters. The **British shipping ton** is 5% larger at 42 cubic feet (1.1893 cubic meters).

sho

a traditional Japanese unit of liquid volume. The sho equals 1.8039 liter, which is 1.9061 U.S. quarts or 1.5872 British Imperial quarts.

shock or shook [1]

a unit of quantity equal to 5 dozen, 3 score, or 60. The unit is more common in German, where the word is spelled **schock**, than it is in English. In cooperage (the making of barrels), a bundle of 60 barrel staves is traditionally called a shock.

shock or shook [2]

a traditional measure of grain or straw. A shock of grain is usually 12 sheaves (see above), sometimes 10.

shoe size

All shoe sizes express in some way the approximate length of the shoe, or at least the length of the last, the form on which the shoe is made. In the U.S., a difference of one full shoe size represents a length difference of 1/3 inch (8.47 mm), so shoe size n represents a length of $Z + n/3$, where Z is the length of a size 0 shoe (if there were such a thing). The value of Z is 3-11/12 inches (99.5 mm) for infants' and boys' shoes, 3-7/12 inches (91.0 mm) for girls' shoes, 7-11/12 inches (201.1 mm) for women's shoes, and 8-1/4 inches (209.6 mm) for men's shoes. The size number for a woman's shoe is 1 larger than for a man's shoe of the same length (for example, a man's 7-1/2 is the same length as a woman's 8-1/2). In Europe, shoe sizes are measured in Paris points, a unit equal to 2/3 centimeter. Ski boots and hiking boots worldwide are measured in mondo points, which are simply millimeters. **Link:** Wikipedia has information on other shoe size systems used in Britain, Japan, and Australia.

Shore hardness

a hardness measure determined by a Shore durometer. See duro.

short hundredweight

a common name for the U.S hundredweight or cental (100 pounds).

short ream

the traditional ream of 480 sheets of paper. The standard size for the ream has been increased in recent years to 500 sheets.

short ton (st or tn)

a common name for the U.S. ton (2000 pounds).

short ton unit (stu)

a unit of mass used in mining to measure the mass of the valuable metal in an ore. Customarily, the short ton unit is defined to be one U.S. ton of ore containing 1% metal, but it is the metal, not the ore, that is being measured. Thus the unit is really a unit of mass equal to 20 pounds (about 9.072 kilograms).

shortword

a unit of information generally equal to 1/2 word [2].

shot [1]

a traditional unit of liquid volume. The term "shot" is often used informally to mean "a small serving." In the U.S. a shot is legally equal

to one fluid ounce or 29.574 milliliters. However, many bartenders use larger shot glasses holding 1.25 fluid ounces (37.0 milliliters), and some shot glasses hold the same as a jigger: 1.5 fluid ounces or 44.4 milliliters.

shot [2]

another name for a shackle as unit of length for anchor chains. In this use, common in the U.S., a shot equals 15 fathoms, 90 feet or 27.432 meters. The origin of this name for a length of chain is not certain. It may be a corruption of "shut," since anchor chains are formed by shutting clasps or shackles to join shorter lengths of chain.

shovel

an informal unit of volume. In U.S. building trades, a common rule of thumb is that a cubic yard contains about 150 standard (no. 2) shovels of material. This means that a shovel contains about 5 liters and a cubic meter is about 200 shovels.

shower unit

a unit of distance used in studying cosmic radiation; it is the distance a charged particle travels in a given material while its energy decreases by 50%. Thus it depends on the material: in air the shower unit is very long, about 230 meters, but in water it is only 30 centimeters.

sidereal day

a unit of time used in astronomy, equal to the period of time in which the earth makes one rotation relative to the stars. If we could view the earth from outside the Solar System, we would see that it actually completes 366.242 rotations during one year (one revolution around the sun). We only count 365.242 because one rotation is cancelled out for us by our tour around the sun. Thus the sidereal day, the average interval between two successive risings of the same star, is shorter than the mean solar day (see day) by 1/366.242. The sidereal day equals 23 hours 56 minutes 4.090 54 seconds, or 86 164.090 54 seconds. Like the regular day it is divided into 24 **sidereal hours**, each sidereal hour being divided into 60 **sidereal minutes** and each sidereal minute into 60 **sidereal seconds**. The sidereal hour equals 59 minutes 50.17 seconds; the sidereal minute equals 59.8362 seconds, and the sidereal second equals 0.997 270 second. Traditionally, observatories had clocks set to this sidereal cycle, and astronomers still use sidereal time in making telescope settings.

Siegbahn unit

another name for the X unit, a unit of distance used for describing the wavelength of x-rays. The name honors the Swedish physicist Karl M.G. Siegbahn (1886-1978), who received the Nobel Prize in Physics in 1924 for his work in x-ray spectroscopy.

siemens (S)

the SI unit of electric conductance, susceptance, and admittance. The most important property of a conductor is the amount of current it will carry when a voltage is applied. Current flow is opposed by resistance in all circuits, and by also by reactance and impedance in alternating current circuits (see ohm). Conductance, susceptance, and admittance are the inverses of resistance, reactance, and impedance, respectively. To measure these properties, the siemens is the reciprocal of theohm. In other words, the conductance, susceptance, or admittance, in siemens, is simply 1 divided by the resistance, reactance or impedance, respectively, in ohms. The unit is named for the German electrical engineer Werner von Siemens (1816-1892). See also mho.

sieve [1]

a traditional measure of the fineness of a wire screen (such as the screening used in a sieve). Higher sieve numbers correspond to finer screens. In The U.S., 10 sieve fabric has openings of 2 millimeters; 100 sieve has openings of 0.15 millimeters. A similar but slightly different scale was used in Britain. In the metric system, sieve fineness is specified by the diameter of the openings, in millimeters or micrometers. **Link:** sieve comparison table from Screen Technology Group, Inc.

sieve [2]

a flat basket for fruits and vegetables, sometimes used as unit of volume in southeastern England. A sieve is approximately equal to a bushel [1], that is, about 35 liters.

sievert (Sv)

an SI unit used for measuring the effective (or "equivalent") dose of radiation received by a human or some other living organism. Various

kinds of radiation have different effects on living tissue, so a simple measurement of dose as energy received, stated in grays or rads, does not give a clear indication of the probable biological effects of the radiation. The equivalent dose, in sieverts, is equal to the actual dose, in grays, multiplied by a "quality factor" which is larger for more dangerous forms of radiation. An effective dose of one sievert requires 1 gray of beta or gamma radiation but only 0.05 gray of alpha radiation or 0.1 gray of neutron radiation. One sievert equals 100 rem. The sievert is a large unit, so radiation doses are often measured in millisieverts (mSv). The unit honors the Swedish physicist Rolf Sievert (1898-1966), who worked over many years to measure and standardize the radiation doses used in cancer treatment.

sigma

an informal name for the standard deviation (see below). The lower case Greek letter sigma is the usual symbol for the standard deviation.

sign

an informal unit of angle measure originating in astrology. The Sun's annual path through the sky, called the Zodiac, is divided into 12 parts called signs, each sign corresponding roughly to one of the classic twelve constellations through which the Sun passes. Thus 1 sign is equal to 1/12 circle, or 30°.

sitio

a name used traditionally in Mexico and the southwestern U.S. for the square legua (see legua [2]), a unit of area equal to 25 million square varas or about 1800 hectares. The word means "place."

sixth

a unit used in music to describe the ratio in frequency between notes. Two notes differ by one **minor sixth** if the higher note has frequency exactly 8/5 times the frequency of the lower one, or by a **major sixth** if the higher note has frequency exactly 5/3 times the frequency of the lower one. On the standard 12-tone scale the minor sixth is approximated (roughly) by 8 half steps, corresponding to a frequency ratio of $2^{2/3} = 1.5874$; the major sixth is approximated by 9 half steps, corresponding to a frequency ratio of $2^{3/4} = 1.6818$.

skein

a coil of yarn or cord. In retail trade, a skein is a highly variable unit, varying from one type of yarn to another and often from one manufacturer to another. In textile manufacturing, however, the skein is a unit of length equal to the lea.

skep, skæppe, skjeppe

a traditional unit of dry volume in northern Europe. Use of the unit was spread by Norse traders. In Britain, the **skep** was eventually identified with the bushel and the word survives as a name for a farm basket or a domed beehive. The Danish **skæppe** and Norwegian **skjeppe** are equal to 18 pots; this is equivalent to 17.407 liters (0.494 U.S. bushel) in Denmark and 17.370 liters (0.493 U.S. bushel) in Norway. The Dutch **schepel** and German **scheffel** (see above) are versions of this same unit.

skock

a traditional Swedish unit of quantity equal to 60. See shock [1] above.

skot

a unit of (low) luminance equal to 0.001 apostilb. This unit was used in Germany during World War II to describe permitted levels of lighting during air raids. One skot is the brightness of a surface produced by 1 **nox** or 0.001 lux of light. The name comes from the ancient Greek *skotos*, darkness.

slinch

a unit of mass invented by the U.S. National Aeronautics and Space Administration (NASA). The unit is part of a system based on the pound of force and the inch. One slinch is the mass accelerated at one inch per second per second by a force of one pound; thus the slinch equals exactly 12 slugs (see below) or about 386.088 pounds (175.1268 kilograms). The word is a contraction of *slug-inch*. In the U.S. military aircraft industry, this unit is sometimes called a **mug**. It has also been called a **snail**.

slm, slpm

symbols for standard liters per minute. 1 slm = 1000 sccm; see above under sccm.

slug
a unit of mass in the English foot-pound-second system. One slug is the mass accelerated at 1 foot per second per second by a force of 1 pound. Since the acceleration of gravity (g) in English units is 32.174 04 feet per second per second, the slug is equal to 32.174 04 pounds (14.593 90 kilograms). The slug was formerly used in calculations in mechanics and engineering, but it has been largely abandoned in favor of metric units. The unit was called the "engineer's mass unit" during the late nineteenth century. The British physicist A. M. Worthington first called it a slug in a 1902 textbook. (Probably he had in mind older uses of the word to mean a weight or a projectile. In the 1600's a slug was a roughly shaped lump of metal shot from a primitive cannon.)

slyke
a unit of buffer value in chemistry, defined to be the concentration of acid or base that must be added to a solution to change its pH by one unit. One slyke is equal to one millimole of acid or base per liter of solution (mmol/L). The unit is attributed to and named for D.D. Van Slyke (1883-1971), an American physician and chemist.

sm
a symbol sometimes used in English for the **statute mile** (5280 feet or 1609.344 meters).

smidgen
a very small quantity of material. Until recently, no one thought a smidgen was an actual unit of measure, but recently kitchen supply stores in the U.S. and other countries have begun selling sets of "minispoons" in which the smallest spoon, labeled "smidgen," is designed to hold exactly 1/2 pinch or 1/32 teaspoon, which is roughly 0.005 fluid ounce or 0.15 milliliter. The word is a diminutive of "smutch" or "smudge"; it originally meant a small spot.

smite
an old English word for a small amount of something; in recipes, a pinch. Originally the word probably meant one of the pieces into which something had been smashed.

smoot
a humorous unit of distance invented in 1958 by a fraternity at the Massachusetts Institute of Technology. The fraternity pledges of Lambda Chi Alpha measured the length of Harvard Bridge using pledge Oliver R. Smoot ('62). According to Smoot himself, the bridge turned out to be 364.4 smoots long "plus epsilon," but this has been recorded as 364.4 smoots "plus an ear." The bridge is still marked in smoots. Proposals to change the definition of the unit by remeasuring it with Smoot's son Steve (MIT '89) or daughter Sherry ('99) were rebuffed. One smoot equals 67 inches (170.18 centimeters). Oliver Smoot became an attorney but continued his interest in standards and measurement. He is a past Chairman of the Board of Directors of the American National Standards Institute (ANSI), and he was President of the International Organization for Standardization (ISO) in 2003-04.

smoz
symbol for the sailmaker ounce (see above).

snail
another name for a slinch (see above).

Snellen fraction
a ratio (such as 20/20 or 20/100) measuring the acuity (sharpness) of a person's eyesight for objects at a distance. The denominator (number after the slash) is the distance at which the detail of a letter on a standard test chart would subtend an angle of one arcminute, and the numerator (number before the slash) is the testing distance, the distance at which the person correctly identifies the letter. By custom, the ratio is often stated with a standard testing distance such as 20 feet or 6 meters; thus 20/100 (or 6/30) means that the person located 20 feet (or 6 meters, respectively) from the chart can identify a letter subtending an angle of one arcminute at a distance of 100 feet (30 meters). The fraction is also stated as a percentage, for example "20% vision" rather than 20/100. The unit is named for the Dutch ophthalmologist Herman Snellen (1834-1908), who developed the first standard methods for measuring visual acuity.

snit
a U.S. unit of volume for liquor equal to 2 jiggers, 3 U.S. fluid ounces, or

88.7 milliliters. The origin of this unit is unknown.

soam

another name for a seam (see above).

soendre

a traditional unit of land area in Bhutan, equal to roughly 1/20 acre or about 200 square meters.

sol

a unit of time on Mars, equal to the average length of the Martian day as it would appear to an observer on the red planet. The sol equals 24 hours 39 minutes 35 seconds, which is 88 775 seconds or about 1.0275 Earth days.

solar neutrino unit (snu)

a unit used by astrophysicists to measure the rate at which neutrinos from the Sun are detected on Earth. Neutrinos are elementary particles with no charge and little or no mass (in 1999 it was reported that neutrinos do have a small mass). Scientists want to detect neutrinos because they carry crucial information about processes deep inside the Sun, but neutrinos are very hard to catch: most of them pass right through the Earth without interacting with anything. The solar neutrino unit, therefore, is extremely small: it is defined to be 10^{-36} neutrino capture per target atom per second.

-some

a suffix added to a number to create a unit of quantity. For example, a foursome is a group of four. The suffix comes from the use of "some" as a pronoun meaning a number of individuals, as in "Some Like It Hot."

sone

a unit of subjective sound loudness. One sone is the loudness of a pure tone of frequency one kilohertz and strength 40 decibels. A sound has loudness *s* sones if a listener judges it to be *s* times louder than a sound of 1 sone. The phon is another unit of sound loudness; a sound of loudness *p* phons has loudness $2^{(p-40)/10}$sones. The sone is often used in industrial engineering to express the perceived loudness of engines, fans, and other items of industrial equipment. The unit was introduced by S.S. Stevens and H. Davis in 1938. Its name is from the Latin word *sonus*, sound.

sotka

a Russian name for the are, a metric unit of area equal to 100 square meters. This unit is commonly used to state the areas of small tracts of land. One sotka is approximately 1076.4 square feet, 119.60 square yards, or 0.02471 acre. The unit is sometimes transliterated from the Cyrillic as **cotka**.

sound transmission class (STC)

a rating of the ability of building materials to stop the transmission of unwanted sounds. The rating is designed so that it expresses, as best one can with a single figure, the sound transmission loss in decibels when sound passes through the material. To determine the STC rating, test sounds of 16 different frequencies are transmitted through the barrier. The data is then smoothed to a standard contour using an established protocol, and the STC rating is the "smoothed" sound transmisson loss at a frequency of 500 hertz. Ordinary conversation can be understood through a window pane rated STC 25; a wall rated STC 50 stops all but the loudest shouting.

South African geodetic foot (S.A.G. ft)

a unit of distance used for surveying and geodetic measurement throughout southern Africa. The S.A.G. foot is slightly shorter than the standard British or American foot; it equals 30.479 726 54 centimeters or 0.999 991 898 49 foot.

span

a traditional unit of distance equal to 9 inches (approximately 22.9 centimeters) or 1/4 yard. This distance represents the span of a man's hand with fingers stretched out as far as possible. The Old English word *spann* meant precisely this unit of measure; all the other uses of the word "span" came later.

spat [1]

a unit of solid angle measure equal to the sphere, that is, 4(pi) steradians (see below). This usage comes from the Latin word *spatium*, space, since a solid angle of 1 spat covers all of space surrounding the vertex of the angle.

spat [2]
an informal unit of distance formerly used by astronomers. The spat is equal to the terameter (Tm, or 10^{12} meters). This is equivalent to about 6.6846 astronomical units. The origin of this usage is not clear; "spat" may be an acronym for "space unit" or "space-time".

SPF
abbreviation for "sun protection factor," a rating for lotions protecting against sunburn. The rating indicates how many times longer a person who uses the lotion can remain in the sun with an equivalent effect. For example, a person who would not sunburn in 10 minutes without protection can remain in the sun up to 150 minutes by using a lotion rated SPF 15.

sphere
the traditional unit of solid angle measure, divided into 4(pi) steradians (see below). There are also 129 600/(pi) = 41 252.96 square degrees in a sphere. This unit is also called the spat (see above).

spherical degree
a unit of relative surface area for spheres, equal to 1/720 the total surface area or pi·R^2/180, where R is the radius of the sphere. Thinking in terms of the Earth's surface, this is the area of the region in one hemisphere (northern or southern) bounded by the equator and two meridians of longitude one degree apart.

spin
a unit of angular momentum used in particle physics. The spin unit is equal to Planck's constant *h* divided by 2pi, or approximately 105.457 27 x 10^{-36} joule second (J·s). The spin of an elementary particle is always a simple multiple of this unit.

spindle
a traditional measure of length used for yarn. The length varied with the material; a spindle of cotton yarn, for example, was 15 120 yards (13.826 km), and a spindle of jute was 14 400 yards (13.167 km). The cotton spindle was also equal to 18 hanks.

splash
see dash [2].

split
a unit of volume for liquor equal to 4 jiggers, 6 U.S. fluid ounces, or 177.4 milliliters. The same name is used for a small wine bottle holding 1/4 the volume of a regular bottle; this would be about 187.5 milliliters. The unit appears to have originated as half the volume of a 12-ounce bottle of soda, which bartenders would split between two drinks.

spoonful
an informal unit of volume, sometimes an alternate name for the teaspoon.

square (sq) [1]
a traditional unit of area, often used for measuring roofing material, finished lumber, and other building materials. One square equals 100 square feet, 11.111 square yards, or about 9.290 square meters.

square [2]
relative to resistivity measurements, see ohm per square.

square block
see block [3].

square centimeter (cm^2)
the CGS unit of area. 1 cm^2 equals 100 mm^2, 10^{-4} m^2, or approximately 0.155 000 3 in^2.

square chain (ch^2 or sq ch)
a traditional unit of area in English surveying, defined to be the area of a square whose side equals Gunter's chain (4 rods [1] or 22 yards). Thus the square chain equals 16 square rods, 484 square yards, 4356 square feet, or exactly 0.1 acre. In metric terms, the square chain equals about 4.0569 ares or 405.69 square meters.

square degree (sq deg)
a unit of solid angle measure. Since one degree of ordinary angle measure equals pi/180 radians, one square degree is defined to be $(pi/180)^2$ = 0.000 304 617 4 steradian. There are 4·180^2/(pi) = 129 600/(pi) = 41 252.961 25 square degrees in a sphere.

square foot (ft^2 or sq ft)
a traditional unit of area. 1 ft^2 equals 144 in^2 or exactly 929.0304 cm^2 (0.092 903 04 m^2).

square inch (in^2 or sq in)
a traditional unit of area. 1 in^2 equals exactly 6.4516 cm^2 or 645.16 mm^2.
square kilometer (km^2)
a common metric unit of area. One square kilometer equals 100 hectares, 10^6 square meters, approximately 247.105 acres, or approximately 0.386 102 square mile.
square meter (m^2)
the SI unit of area, equal to 10^4 square centimeters, approximately 10.763 91 square feet, or approximately 1.195 990 square yard.
square mile (mi^2 or sq mi)
a traditional unit of area. One square mile is equal to 640 acres, 3 097 600 square yards, 258.9988 hectares, or 2.589 988 square kilometers.
square rod (rd^2 or sq rd)
a traditional unit of area. One square rod is equal to 272.25 square feet, 30.25 square yards, or 25.2929 square meters.
square yard (yd^2 or sq yd)
a traditional unit of area. 1 yd^2 equals 9 ft^2, 1296 in^2, or exactly 0.836 127 36 m^2.
ss
a traditional abbreviation for 1/2, from the Latin *semis*. In medieval times the symbol was often written as the long s, an obsolete character that looks something like *f* without the crossbar.
SSU
a symbol for the Saybolt Universal second (see above).
stack (stk)
a traditional unit of volume used in Britain for coal and firewood. The stack equals 4 cubic yards, which is 108 cubic feet or about 3.058 cubic meters. As a firewood measure, a stack equals 27/32 = 0.843 75 cord.
stade, stadion or stadium
a historic unit of distance originating in ancient Greece. Greek athletic fields were all of roughly the same size, and the **stadion**, equal to 600 podes (feet), was the traditional length of the field. Archaeological measurements show that the stadion was a little more than 200 yards or a little less than 200 meters. The stadion at Olympia, where the original Olympic Games were held, measures 630.8 feet or 192.3 meters; at Athens the stadion was 606.9 feet or 185.0 meters. **Stadium** is the Latin spelling; in the Roman world the stadium was equal to 625 Roman feet (*pes*) or 1/8 Roman mile. This is equivalent to 606.95 feet, 202.32 yards, or 185.00 meters. The plural is **stadia**.
standard (std)
a traditional unit of volume used in northern Europe to measure the volume of finished lumber. The standard equals 165 cubic feet, which is equivalent to 1980 board feet or about 4.672 cubic meters.
standard atmosphere
see atmosphere.
standard cubic meter
see normal cubic meter; also see sccm above.
standard deviation (sd)
a mathematical unit used to describe the "spread" or dispersion of a set of data. Each item in the data set has a deviation from the mean (the ordinary average) of the data. The standard deviation is computed by taking the squares of these individual deviations, averaging these squares, and then taking the square root. If the data set conforms to a known distribution, such as the normal ("bell curve") distribution, then one can compute the percentage of the data which will fall within a certain distance of the mean, as measured in standard deviations. For example, if the data set conforms to the normal distribution, 68.3% of the data will fall within one standard deviation of the mean and only about 4.5% will fall outside 2 standard deviations from the mean.
standard gravity (*g* or grav)
the average acceleration of gravity at the earth's surface, conventionally defined to be exactly 9.806 65 meters per second per second, or about 32.174 05 feet per second per second. The unit is popularly known as the *g* or gee.
standard volume
a unit sometimes used by chemists and physicists to measure the volumes of gases. The behavior of gases under ordinary conditions (not at very high pressures or very low temperatures) is governed by

the Ideal Gas Law. This law says that the volume V of a gas is related to its temperature T and pressure P by the formula PV = nRT, where n is the number of moles of gas present and the gas constant R equals 8.314 joules per mole per kelvin. One standard volume is the volume one kilomole of gas occupies at standard temperature (273.16 kelvins, or 0 °C) and standard pressure (1 atmosphere, or 101.325 kilopascals). The standard volume is equal to 22.414 cubic meters or 29.316 cubic yards.

stang

a traditional Welsh unit of land area generally equal to 3240 square yards, 0.6694 acre, or 0.2709 hectare.

stanine

a statistical unit used in educational testing. Test scores are normalized (mathematically transformed) so that they have a mean ("average") of 5 and a standard deviation of 2. This tranformation naturally divides the ranked scores into 9 classes called stanines 1-9. The percentage of scores in each stanine is 4, 7, 12, 17, 20, 17, 12, 7, and 4, respectively. The technique originated in the U.S. military during World War II, and the word is a contraction of "standard of nine."

stapp

a unit used to express the effects of acceleration or deceleration on the human body. One stapp represents an acceleration of 1 g for a period of 1 second, or 9.80665 meters per second per second for 1 second. The unit is named for the U.S. Air Force physician John P. Stapp (1910-1999), a pioneer in research on the human effects of acceleration during the 1940s and 1950s.

stat-

a prefix indicating that an electrical unit is part of the CGS electrostatic system. These units are also indicated by the notation **esu** (as in "volt esu"). Although these units are defined naturally as part of the CGS system, they are usually much too large or much too small for most applications. They have been replaced almost completely by the corresponding SI units. Following are the SI equivalents for each of the "stat" units:

Electric current: 1 **statampere** = 3.3356×10^{-10} amperes

Electric charge: 1 **statcoulomb** = 3.3356×10^{-10} coulombs

Capacitance: 1 **statfarad** = 1.1126×10^{-12} farads = 1.1126 picofarads

Inductance: 1 **stathenry** = 8.9876×10^{11} henrys

Resistance: 1 **statohm** = 8.9876×10^{11} ohms

Potential: 1 **statvolt** = 299.79 volts

Power: 1 **statwatt** = 10^{-7} watts

stb

symbol for the stock tank barrel (see below).

stein

a German beer mug. Steins come in various sizes, but the most common size seems to be 1/2 liter (1.057 U.S pint or 0.880 British Imperial pint).

steinkast

see stone's throw (below).

step [1]

a traditional unit of distance, equal to 1/2 pace. The step is traditionally equal to 30 inches or 76.2 centimeters. However, U.S. marching bands often use a shorter step of 22.5 inches (57.15 centimeters), so that 8 steps are made every 5 yards; this works well on American football fields, which have a chalkline every 5 yards. Using this shorter step is called marching "8 by 5."

step [2]

a unit used in music to describe the ratio in frequency between notes. Two notes differ by a step if the higher note has frequency exactly $2^{1/6}$ = 1.12246 times the frequency of the lower one. This unit is often called the **full step** to distinguish it from the half step.

steradian (sr)

the standard unit of solid angle measure in mathematics. Just as there are 2pi radians in a circle, there are 4pi steradians in a sphere. Thus one steradian equals about 0.079 577 sphere. There are 129 600/pi = 41 252.96 square degrees in a sphere, so 1 steradian also equals about 3282.806 square degrees. The unit originated in the 1870s by analogy with the radian.

stere (st)

a metric unit of volume, equal to one cubic meter or one kiloliter

(about 35.3147 cubic feet or 1.307 95 cubic yards). Although it dates from the origin of the metric system in 1798, the stere has never been used as much as the liter. In Europe it is used primarily as a measure for firewood; for this purpose, the stere equals about 0.2795 cord or 2.207 cord feet. The name comes from the Greek *stereos*, solid.

sthene (sn)

a metric unit of force, part of the "metre-tonne-second" system sometimes used by European engineers. One sthene is the force required to accelerate a mass of one tonne at a rate of 1 m/s^2. Thus the sthene is equal to the kilonewton, so 1 sthene is equivalent to 10^8 dynes, 224.809 pounds of force or 7233.01 poundals. The name comes from the Greek word *sthenos*, strength.

stick (stk) [1]

an informal unit used to measure butter. In the United States, butter is usually sold in 1-pound packages containing 4 sticks; thus 1 stick equals 1/4 pound (roughly 113 grams). On the other hand, 1 stick is also considered equal to 1/2 cup (roughly 118 milliliters). Thus the unit is used both as a weight measure and as a volume measure.

stick (stk) [2]

an informal unit of distance used in electrical work in the U.S. One stick is equal to 10 feet (3.048 meters), because electrical conduit of various kinds is traditionally supplied in 10-foot lengths called sticks.

stilb (sb)

a CGS unit of luminance, equal to one candela per square centimeter or 10^4 nits (candelas per square meter). This is equal to 10^4pi = 31415.9 apostilbs. The name, believed to have been coined by the French physicist André Blondel (1863-1938) about 1920, comes from a Greek word *stilbein* meaning "to glitter".

stimp

a measure of the "speed" of a green in golf. The speed is measured by a device called a stimpmeter after its inventor, Edward Stimpson. A golf ball rolls down a ramp inclined at an angle of 20° and then rolls across a level section of the green; the stimp rating is the number of feet the ball travels. A rating of less than 10 stimp is a slow green; championship greens usually have stimp ratings of about 12.

stock tank barrel (stb)

a unit of volume used in the oil industry. A stock tank barrel is the same as the petroleum barrel [2], that is, 42 U.S. gallons or about 158.987 liters, but the oil is required to be at a temperature of 60 °F (15.556 °C). The corresponding metric unit is the standard cubic meter (scm) with the oil at 15 °C. One stock tank barrel is about 0.15899 standard cubic meter.

stoke or stokes (St)

a CGS unit of kinematic viscosity. Kinematic viscosity is defined to be dynamic viscosity (see poise) divided by the density of the liquid; this gives a quantity which depends only on the type of the liquid, independent of its concentration or density. The quotient turns out to have units $length^2$/time. Being a CGS unit, the stokes is therefore defined to be 1 cm^2/s, equivalent to 10^{-4} m^2/s or 0.001 076 391 ft^2/s. The SI has no named unit of kinematic viscosity, requiring the use instead of m^2/s. The unit, called the stokes in Britain and the stoke in the U.S., is named for a British mathematician and physicist, Sir George Gabriel Stokes (1819-1903), who described the basic principles of fluid mechanics in 1845.

stone (st)

a traditional British unit of weight, rarely used in the U.S. Originally the stone varied in size, both from place to place and according to the nature of the item being weighed. A stone of sugar was traditionally 8 pounds, while a stone of wool could be as much as 24 pounds. Eventually the stone was standardized at 14 pounds avoirdupois or approximately 6.350 29 kilograms -- a convenient size because it makes the stone equal to exactly 1/2 (long) quarter [1] or 1/8 (long) hundredweight. In Britain today the stone is commonly used for stating the weight of persons or animals. No -s is added for the plural.

stone's throw

an informal expression in English for "a short distance." 50 meters (164 feet) would be a comfortable stone's throw for most people, although athletes could throw a stone more than twice that distance. The

expression may be derived from an old Norse unit, the *steinkast* (stone throw), for which equivalents between 40 and 60 meters have been listed by various authors.

stop

a unit of relative exposure used in photography. In optics, a "stop" is a ring-shaped baffle or shield used to reduce the aperture (the diameter of the opening) of a lens. In photography, the amount of light used to record the image can be controlled either by varying the aperture, by varying the length of time the shutter is open to admit light, or by some combination of these two methods. Two exposures differ by one stop if one is made with twice the light of the other; similarly, they differ by *n* stops if one is made with 2^n times the light of the other. Since the light transmitted varies with the square of the aperture of the lens, narrowing ("stopping down") the aperture by one stop multiplies the f ratio by the square root of 2. On many cameras, aperture settings are provided, or marked on a continuous scale, with f ratios ("f stops") at successive powers of the square root of 2.

storey or story

an informal unit of distance equal to the average distance between floors of a building. In British English the spelling is "storey" and the plural is "storeys"; Americans write "story" and "stories." Typically a story equals 10 to 12 feet (3.0-3.6 meters) in tall buildings or around 9 feet (2.75 meters) in residential buildings. The origin of this use of the word "story" is not entirely clear, but in medieval times a tier of sculptures or stained glass windows on the front of a cathedral was called a stor(e)y because it usually told a story, and the number of stories was a measure of the size of the building.

STP or stp

an abbreviation for standard temperature and pressure. This notation often appears with statements of the volume of gases; it means the volume measurement is made at or adjusted to a temperature of 0 °C (32 °F) and a pressure of 1 atmosphere, or 101.325 kilopascals.

streck

a unit of angle measurement used in the Swedish military, equal to 1/17.5 degree. This is equivalent to 3.429 minutes of arc (moa), 1.0159 mil (in NATO terminology) or 0.9973 milliradian.

stremma

a traditional Greek unit of area, now redefined to equal exactly 1000 square meters or 0.1 hectare (0.24710 acre).

stride

another name for a pace.

strike

a traditional British unit of volume, varying considerably but usually more than a bushel. A convenient equivalent is 2 Imperial bushels (roughly 2.5 cubic feet or 73 liters).

strob

a metric unit of angular velocity. The strob represents a rotation rate of one radian per second or 9.54930 rpm. The name comes from the Greek *strobos*, meaning "rotating."

Strong-Cobb Unit (SC)

an ad hoc unit of force previously used to measure the hardness of tablets in the pharmaceutical industry. The Strong-Cobb test machine applied pressure using a hand-operated air pump, and the hardness was read on a gauge marked in 30 arbitrary units called Strong-Cobb units. It is generally believed that 1.4 Strong-Cobb units represented roughly 1 kilogram of force, so each Strong-Cobb unit represented roughly 0.7 kilogram of force or about 7 newtons.

strontium unit (SU)

a unit of radioactive concentration used to measure the presence of the very dangerous radioisotope strontium 90 in the body or elsewhere. In the body or the environment, strontium atoms tend to replace or become mixed with atoms of calcium. One strontium unit is a concentration of 1 picocurie per gram of calcium (pCi/g Ca). In SI units this is equal to exactly 37 becquerels per kilogram (Bq/kg), that is, 37 atomic disintegrations per kilogram per second.

stu

see short ton unit, above.

stubbie

a traditional Australian beer bottle holding 375 milliliters.

stunde

the German word for the hour. In Switzerland, the stunde is also a unit of distance defined to be 4800 meters (2.983 miles) -- approximately the distance a person can walk in an hour. The definition is consistent with the custom everywhere of informally adopting time units as distance units, as when we say "I live 10 minutes from school."

sturgeon

a proposed unit of magnetic reluctance. Reluctance is the opposite of inductance (see henry). The reluctance in sturgeons equals 1 divided by the inductance in henrys; one sturgeon is also equal to one ampere per weber (A/Wb). The unit honors the English engineer William Sturgeon (1783-1850), the inventor of the electromagnet.

Sun or solar mass

a unit of mass used in astronomy to express the masses of stars. Stars are so massive that it's difficult to grasp their relative sizes. Using the Sun's mass as a unit helps us visualize them relative to something familiar. The best current estimate of the mass of the Sun is 1.9891×10^{30} kilograms or 1.9891×10^{27} tonnes; this is about 1048 times the mass of Jupiter and about 332 900 times the mass of the Earth.

superficial

an adjective used to convert a unit of length into a unit of area. "Superficial", in this use, means "square": a **superficial foot**, for example, is equal to a square foot, and a **superficial yard** is equal to a square yard. In Australia and New Zealand, a superficial foot often means the super foot [2] (see below).

super foot [1]

a British commercial unit of area equal to one square foot. The name originated as an abbreviation (ft. super. or super. ft.) for the superficial foot.

super foot [2]

in Australia and New Zealand a super foot is a unit of volume for timber or lumber, equal to the volume of a board one foot square and one inch thick. This unit is the same as the North American board foot.

surface foot

another name for a linear foot. See SFM (above).

survey foot

a former U.S. definition of the foot as exactly 1200/3937 meter or about 30.480 060 96 centimeters. This was the official U.S. definition of the foot from 1866 to 1959; it makes the meter equal exactly 39.37 inches. In 1959 the survey foot was replaced by the **international foot**, equal to exactly 30.48 centimeters. However, the survey foot remains the basis for precise geodetic surveying in the U.S.

SUS

a symbol for the Saybolt Universal second (see above).

suture sizes

suture sizes are stated in both traditional and metric units. The traditional size numbers take into account more than diameter; they consider the tensile strength and other factors as well, so that sutures of the same size perform similarly in the body even if the diameter differs. The traditional sizes are numbers greater than or less than zero, but the negative sizes are indicated by "-0" after the number rather than a minus sign in front of it. Thus the scale from smaller to larger sizes is ...4-0, 3-0, 2-0, ..., 2, 3, 4, ... The metric size number is simply the diameter of the suture in tenths of a millimeter. Since this does not consider tensile strength, surgeons do not have a fixed conversion between traditional and metric sizes.

svedberg (S)

a unit equal to 10^{-13} second (0.1 picosecond), used to measure sedimentation coefficients in ultracentrifuge technology. The sedimentation coefficient of a particle is defined to be $s/(w^2r)$, where s is the sedimentation rate, w is the angular velocity of the centrifuge (in radians per second), and r is the radius at which the particle is being spun; this calculation gives a quantity in time units. The unit honors the Swedish chemist Theodor Svedberg (1884-1971), who received the Nobel Prize in Chemistry for 1926 for the invention of the ultracentrifuge and its use in studying the properties of colloids.

sverdrup

a unit of flow sometimes used in oceanography to express the flow of ocean currents. One sverdrup equals one million cubic meters per second, which is also one cubic hectometer per second. The unit honors the Norwegian oceanographer and Arctic explorer H. U. Sverdrup (1888-1957).

SWG

abbreviation for Standard Wire Gauge. See gauge [3] and the table of wire gauge equivalents.

swing

an informal unit of time describing the length in days of one work cycle. For example, a worker who works 7 days in a row and then gets 3 days off is said to have a swing of 10 days. This usage doesn't seem to be related to the "swing shift," which is a shift that begins in the afternoon and ends at night.

SWU

symbol for the **separative work unit**, a unit used in the nuclear power industry to describe the work required to enrich uranium (that is, to increase the fraction of uranium 235, the isotope which undergoes fission to produce energy). The details are quite complex, but roughly speaking about 4.5 SWU are needed to enrich 1 kilogram of uranium, more or less depending on the degree of enrichment needed for a particular reactor.

symbol per second (sym/s)

a unit of transmission rate for radio signals, especially for the transmissions between satellites and ground stations. In the simplest form of transmission, data can be sent in bits, which have only two states (on or off). To increase data transmission rates as much as possible, information is sent in units called "symbols", which have a number of states, so that each symbol can include several bits of information. In practice, transmission rates are usually stated in ksym/s (thousands of symbols per second) or Msym/s (millions of symbols per second). See also baud and bit per second.

T

T [1]

informal abbreviation for "trillion," meaning the American trillion 10^{12}.

T [2]

symbol for the Dvorak T-number, a subjective estimate of the strength of a tropical cyclone based on its appearance in satellite imagery. The T-numbers range from T1.0 to T8.0 in steps of 0.5; ratings above T2.5 indicate a tropical storm and ratings above T4.0 indicate a hurricane or typhoon. The scale was developed by the U.S. meteorologist Vernon Dvorak in 1974. Wikipedia has details.

T [3]

the symbol for the tesla (see below).

tablespoon or tablespoonful (tbsp, tblsp, Tsp or T) [1]

a unit of volume used in food recipes. In the U.S., the tablespoon is equal to 1/2 fluid ounce; this is about 14.8 milliliters. In Canada, the traditional tablespoon is 1/2 Imperial fluid ounce (14.2 milliliters). In Britain, traditional tablespoons varied somewhat in size, and various older references give sizes in the range from 1/2 to 5/8 Imperial fluid ounce (14.2-17.6 milliliters). Under the metric system the tablespoon has become more or less standardized at 15 milliliters in Britain, Canada, and New Zealand, 20 milliliters in Australia. The U.S. tablespoon equals 3 teaspoons or 1/16 cup; the traditional British tablespoonful was often equal to 4 teaspoonfuls or 1/10 teacupful. The metric tablespoon equals 3 teaspoons (4 in Australia).

tablespoon or tablespoonful (tbsp, tblsp, Tsp, or T) [2]

a unit of volume used in bartending. U.S. bartenders use a tablespoon of 3/8 fluid ounce or 1/4 jigger; this is equivalent to about 11.1 milliliters.

tael or tahil

a traditional unit of weight used throughout eastern Asia. During the colonial period, the tael was more or less standardized throughout the region at 4/3 ounceavoirdupois (1/16 catty, 1/12 pound, or about 37.8 grams). In Japan, however, the tael was identified with a slightly smaller traditional unit and is considered equal to 1.323 ounces (37.51 grams).

The tael is usually considered equal to the Chinese liang.

tagwerk

see juchart.

talangwah (tw)

the square wah, a common unit of area in Thailand, equal to exactly 4 square meters or 43.0556 square feet. There are 100 talangwah in 1 ngarn, 400 in 1 rai.

talbot (T)

a unit of luminous (light) energy. One talbot is the energy carried by a light flux of one lumen in one second, that is, the talbot is the same as the lumen second (lm·s). For light of wavelength 555 nanometers (nm), the wavelength to which the eye is most sensitive, the talbot equals 1.464 millijoule. For other wavelengths l, the talbot equals $1.464 \cdot V(l)$ millijoules, where $V(l)$ is the "luminous efficiency," a factor representing the relative sensitivity of the eye at wavelength l. Although the talbot is compatible with the SI, it has not been accepted as part of the International System; the symbol T would not be acceptable since it duplicates the symbol for the tesla. The unit, previously called the **lumberg**, is now named for the British physicist W.H. Fox Talbot (1800-1877).

talent

a historic unit of weight, used in various forms throughout the eastern Mediterranean. The Hebrew sacred talent, mentioned in the Bible, was equal to 60 minas or about 30 kilograms (66 pounds). The Greek talent, also equal to 60 minas, was smaller, 25.8 kilograms or about 57 pounds.

tan [1]

a traditional Chinese weight unit, now spelled **dan** in English transliteration. During the European colonial era the tan was equal to 100 cattys or 1600 taels. This is equivalent to 133.333 pounds, making the tan comparable to the European quintal as a commercial weight unit. In modern China the tan, or rather the dan, is equal to 100 jin, which is exactly 50 kilograms (110.231 pounds).

tan [2]

a traditional unit of land area in Japan equal to 10 se or about 991.7 square meters (0.099 hectare or 0.245 acre).

tarea

a traditional unit of land area in the Dominican Republic and some parts of Central America. The tarea is generally equal to 900 square varas, so it is the area of a square 30 varas (about 25.05 meters) on a side. In the Dominican Republic, the tarea equals about 628 square meters or 751 square yards; this is 0.0628 hectare or 0.155 acre. The Spanish word *tarea* means a task or job, so this unit, like many land area units, originated as the area which could be "worked" in a given time.

tarefa

a traditional unit of land area in Brazil, varying in size from one locality to another but generally at least 3000 square meters (0.3 hectare or 0.741 acre). In the states of Alagoas, Rio Grande do Norte, and Sergipe the tarefa equals 3025 square meters (0.3025 hectare or 0.748 acre); in Ceará the unit equals 3630 square meters (0.363hectare or 0.897 acre); and in Bahia the tarefa is 4356 square meters (0.4356 hectare or 1.076 acre). The Portuguese word *tarefa*, like the Spanish *tarea*, means a task or job.

tatami

a Japanese unit of area equal to the area of a traditional tatami mat, 0.5 ken by 1 ken or about 90 centimeters by 180 centimeters (roughly 1.62 square meters or 17.5 square feet). This unit, used especially for measuring the area of rooms in houses and apartments, is also called the **jo**.

tce

a symbol for **tonne of coal equivalent**, a unit of energy used in the international energy industry. 1 tce represents the energy available from burning one tonne (metric ton) of coal; this is considered equivalent to exactly 0.7 tonnes or approximately 5.2 barrels of oil, or 890 cubic meters of natural gas. 1 tce is equivalent to 29.308 gigajoules (GJ), 27.778 million Btu (MM Btu) or dekatherms, or 8.141 megawatt hours (MWh).

Te, te

non-standard symbols for the tonne (metric ton), used by some

engineers in the UK. The only proper symbol for the tonne is **t**. If it is necessary to distinguish the tonne from the British Imperial ton, use **tn** for the British unit.

teacupful

a unit of liquid volume used in British food recipes. The teacupful is the same volume as an Imperial gill: 5 fluid ounces, 8.670 cubic inches, or about 137.7 milliliters.

teaspoon or teaspoonful (tsp or t) [**1**]

a unit of volume used in food recipes. The U.S. teaspoon is equal to 1/3 tablespoon or 1/48 cup; this is equivalent to 1/6 fluid ounce, about 0.30 cubic inches, or approximately 4.9 milliliters. In Canada, the traditional teaspoon is 1/6 Imperial fluid ounce or about 4.74 milliliters. In Britain, a traditional **teaspoonful** in the kitchen was equal to 1/8 Imperial fluid ounce or approximately 3.55 milliliters, but the medical teaspoonful was usually 5 milliliters. In metric kitchens in Britain, Canada, Australia, and New Zealand, a teaspoonful is exactly 5 milliliters.

teaspoon or teaspoonful (tsp or t) [**2**]

a unit of volume used in bartending. U.S. bartenders use a teaspoon equal to 1/8 fluid ounce or 1/12 jigger; this is equivalent to about 3.7 milliliters.

technical atmosphere (at)

a metric unit of pressure equal to one kilogram of force per square centimeter. The technical atmosphere equals about 980.665 millibars (mb), 98.0665 kilopascals (kPa), approximately 28.96 inches of mercury (in Hg), or 14.223 pounds of force per square inch (lbf/in^2). This is about 97% of the average pressure of the earth's atmosphere at sea level.

tebi- (Ti-)

a binary prefix meaning 2^{40} = 1 099 511 627 776. This prefix, adopted by the International Electrotechnical Commission in 1998, replaces tera- for binary applications in computer science. The prefix is a contraction of "terabinary."

tenth-meter

an old name for the angstrom, a unit of distance equal to 10^{-10} meter.

tera- (T-)

a metric prefix meaning 10^{12}, or one trillion. The prefix was derived from the Greek word for monster, *teras*. (Our words "terrible" and "terrific" have this same root.) The three prefixes mega-, giga-, and tera- thus mean something like "huge," "gigantic," and "monstrous," respectively. But also, and apparently by coincidence, the prefix tera- suggests the Greek *tetra*, meaning 4. This is significant because tera- is the fourth prefix, following kilo-, mega-, and giga-, in the list of SI prefixes for multiples of 1000^n. This coincidence was exploited in defining the subsequent prefixes peta-, exa-, zetta-, and yotta-, corresponding to the powers $n = 5$ through 8 in 1000^n, so that they suggest the Greek numbers *penta*, *hexa*, *hepta*, and *okta* for 5, 6, 7, and 8, respectively.

terabecquerel (TBq)

a unit of radioactivity equal to 10^{12} atomic disintegrations per second or 27.027 curies.

teraflops (Tflops)

a unit of computing power equal to one trillion (10^{12}) floating point operations per second. See flops.

teragram (Tg)

a metric unit of mass equal to 10^{12} grams or 1 megatonne (one million metric tons). This unit is frequently used in atmospheric science and other scientific contexts where large masses are considered.

terahertz (THz)

a unit of frequency equal to 10^{12} per second or 1 per picosecond. Infrared and visible light waves have frequencies measured in terahertz.

terajoule (TJ)

a metric unit of energy commonly used in the energy industry, equal to 10^{12} joules. One terajoule equals 947.817 million Btu, 277.7778 megawatt hours (MW·h), or about 9480 therms (see below).

terameter (Tm)

a metric unit of distance equal to 10^{12} meters or 10^9 kilometers. This is about 6.6846 astronomical units. The distance from Saturn to the Sun is about 1.43 terameters.

terannual

an adjective meaning 3 times per year or once every 4 months. Not to be confused with triennial (once every 3 years).

terawatt (TW)

a metric unit of power equal to one trillion (10^{12}) watts or about 1.341 billion horsepower.

terawatt hour (TW·h)

a metric unit of energy equal to one billion kilowatt hours (kW·h), 3.6 petajoules (PJ), or about 3.412 trillion Btu.

tertian

a traditional unit of volume for liquids. The tertian, like the tierce (see below) takes its name from the Latin for 1/3. It equals 1/3 tun, which is 2 tierces or 84 U.S.gallons (about 318 liters).

tesla (T)

the SI unit of flux density (or field intensity) for magnetic fields (also called the magnetic induction). The intensity of a magnetic field can be measured by placing a current-carrying conductor in the field. The magnetic field exerts a force on the conductor, a force which depends on the amount of the current and on the length of the conductor. One tesla is defined as the field intensity generating one newton of force per ampere of current per meter of conductor. Equivalently, one tesla represents a magnetic flux density of one weber per square meter of area. A field of one tesla is quite strong: the strongest fields available in laboratories are about 20 teslas, and the Earth's magnetic flux density, at its surface, is about 50 microteslas (μT). One tesla equals 10 000 gauss. The tesla, defined in 1958, honors the Serbian-American electrical engineer Nikola Tesla (1856-1943), whose work in electromagnetic induction led to the first practical generators and motors using alternating current.

tetrad [1]

a unit of quantity equal to 4.

tetrad [2]

a unit of digital information equal to 4 bits or 1/2 byte. This unit, in various contexts, is also called a **nibble**, a **quadbit**, or a **hexit**. The unit seems to be more common in German, where it is spelled **tetrade**.

TEU

a unit of cargo capacity, especially for container ships. These ships carry cargo in standard metal boxes, called containers, which can be transferred easily to trains or trucks. TEU is an abbreviation for "twenty-foot equivalent unit." One TEU represents the cargo capacity of a standard container 20 feet long, 8 feet wide, and (usually) a little over 8 feet high, or half the capacity of a similar container 40 feet long. One TEU equals about 12 register tons (see ton [3] below) or 34 cubic meters.

TeV

the symbol for one trillion (10^{12}) electronvolts. Thanks to Einstein's equation $E = mc^2$ equating mass wth energy, the TeV can be regarded either as a unit of energy equal to 160.217 646 2 nanojoules, or as a unit of mass equal to 1.782 662 x 10^{-21} gram or 1073.544 atomic mass units.

tex

a metric unit used in the textile industry to measure the density of a single fiber of yarn. One tex equals a density of one gram per kilometer of length, or 1 mg/m. One tex equals 10 drex or 9 denier.

therblig

a unit of physical activity used in time-and-motion studies in industrial engineering. A therblig represents one of 18 standardized activities identified by the American industrial psychologists Frank B. Gilbreth (1868-1924) and Lillian Moller Gilbreth (1878-1972): search, find, select, grasp, hold, position, assemble, use, disassemble, inspect, transport loaded, transport unloaded, pre-position for next operation, release load, unavoidable delay, avoidable delay, plan, and rest for overcoming fatigue. The word is Gilbreth spelled backwards (considering "th" as one letter).

therm (thm)

a commercial unit of heat energy. The therm is equal to 100 000 Btu. Because there have been several definitions of the Btu, there are two official definitions of the therm. In the U.S., the legal definition (made in 1968) is that the therm equals 105.4804 megajoules. The European Union's definition, made in 1979 using the more current IT Btu, is

105.5060 megajoules. Either way the therm is equal to about 25 200 (large) calories or about 29.3 kilowatt hours of electrical energy. One therm can also be provided by about 96.7 cubic feet of natural gas. The therm has sometimes been confused with the thermie (see below). The names of both units come from the Greek word for heat, *therme*.

thermal ohm

an informal name for the SI unit of thermal resistance, kelvins per watt (K/W) or degrees Celsius per watt (°C/W). The thermal resistance of an insulating material, in thermal ohms, is the R-value (in SI units, equal to 0.1442 times the R-value in English units) divided by the thickness of the material, in meters. The name expresses an analogy between heat flow and electric current: the temperature difference (in kelvins or °C) corresponds to electric potential difference (in volts), while the heat flow rate (in watts, equal to joules per second) corresponds to electric current (in amperes). By Ohm's Law, the ratio of potential to current is the electric resistance (measured in ohms). Thus the corresponding ratio of temperature difference to heat flow rate is measured in thermal ohms.

thermie (th)

a metric unit of heat energy, part of the meter-tonne-second system sometimes used by European engineers. The thermie is equal to the amount of energy required to raise the temperature of 1 tonne of water by 1°C. The thermie is equivalent to 1000 (large) calories, 4.1868 megajoules or 3968.3 Btu.

thermochemical calorie (cal_{th})

a form of the calorie formerly used in chemistry. The thermochemical calorie was defined in 1935 to equal exactly 4.184 joules. This is slightly smaller than the International Steam Table calorie (4.1868 joules) defined in 1956.

thimbleful

an informal unit of volume, often used as a prototypical small amount in statements such as "a thimbleful of matter from a neutron star would weigh 100 million tons." A thimble holds just about one cubic centimeter (or one milliliter).

third [1]

a unit used in music to describe the ratio in frequency between notes. Two notes differ by a **minor third** if the higher note has frequency exactly 6/5 times the frequency of the lower one, or by a **major third** if the higher note has frequency exactly 5/4 times the frequency of the lower one. On the standard 12-tone scale, the minor third is approximated by 3 half steps, corresponding to a frequency ratio of $2^{1/4}$ = 1.1892; the major third is approximated by 4 half steps, corresponding to a frequency ratio of $2^{1/3}$ = 1.2599.

third (‴) [2]

a unit of time equal to 1/60 second. The symbol for this rarely-used unit is a triple prime, suggesting a natural progression from the minute (′) through the second (″) to the third (‴).

third-octave

a unit of frequency interval describing a band of frequencies such that the highest frequency is $2^{1/3}$ = 1.260 times the lowest. This unit is commonly used in noise control and abatement.

thou [1]

an alternate name for what Americans call a mil: a unit of distance equal to 0.001 inch (25.4 micrometers). This name originated in Britain, but it is now common in the U.S. also.

thou [2]

an informal contraction of "thousand," sometimes used as a unit of quantity.

thrave

a traditional measure of grain in Scotland and northern England. A thrave is usually 24 sheaves, each about 30 inches (76 centimeters) in circumference.

thread

a traditional unit of length for cotton yarn, equal to 54 inches (1.5 yards, or 137.16 centimeters). There are 80 threads in a skein or lea.

thumb

another name for an inch.

tical

a traditional unit of weight in southeast Asia, originating as the weight of a coin of the same name. In Myanmar (Burma), where the unit is still in use for measuring the weights of precious metals and drugs, the tical is equivalent to 16.4 grams.

tick [**1**]

an informal unit of time equal to the length of one cycle of a clock. A tick of a computer's system clock, also called a jiffy, is usually 0.01 second. A tick in athletics is the smallest increment of time measured in a timed competition, usually 0.1 second or 0.01 second.

tick [**2**]

a unit used in finance and investing to express the smallest measured change in a price or index. For example, at the Chicago Board of Trade in the U.S. a tick in the price of many agricultural commodities is equal to 1/4 cent ($0.0025) per bushel [3].

TID

abbreviation for the Latin *ter in die*, three times a day, a unit of frequency traditionally used in medical prescriptions.

tidal day

a unit of time equal to the average period between two successive passages of the moon through the meridian (the imaginary line across the sky from due north to due south). High and low tides repeat with this period (on the average), so the unit is fundamental to predictions of these tides. The tidal day, also called the **lunar day**, is equal to approximately 24 hours 50.272 minutes (1490.272 minutes).

tier

another name for a rick, a unit of firewood volume equal to 1/3 cord.

tierce

an old English unit of volume, equal to 1/3 butt or 42 United States gallons. The tierce is almost exactly 159 liters. The name of the unit is French; it is derived from the Latin *tertius* meaning 1/3. The tierce is identical to the petroleum barrel [2].

timber

a traditional unit of quantity for furs equal to 2 score or 40. This unit, which persisted at least into the nineteenth century, originated because furs were shipped in bundles of 40 pressed between two boards or timbers.

time

statements of the time of day are made in various ways in different countries. To avoid confusion in international communications, the International Organization for Standardization (ISO) established (in 1986) International Standard 8601 for representation of dates and times. The ISO 8601 format for time statements is HH:MM, or HH:MM:SS, where HH is the hour number (00 to 23), MM is the minute number (00 to 59), and SS is the second number (00 to 59, except on those very rare occasions where a "leap second" 60 has been introduced as described under day [2]) . Decimal fractions of the second can be added, as in 07:14:23.625. Colons are specified as the separators in the representation (if separators are used at all; HHMMSS is also acceptable). The times called 1:23 am and 1:23 pm in U.S. practice are represented as 01:23 and 13:23, respectively. Midnight can be represented as 00:00 of the new day or as 24:00 of the day ending. For additional information, see ISO's Date and Time Format FAQ.

time zone [**1**]

a unit representing the difference in time between a given location and Universal Time. Under ISO 8601 (see previous entry), the difference is positive if the local time is later than Universal Time and negative if it is earlier; this means that time zones are generally positive in the Eastern Hemisphere and negative in the Western Hemisphere. U.S. Eastern Standard Time is time zone -05, while Pacific Standard Time is time zone -08. For some areas, the difference between local time and Universal Time is not an exact number of hours; these time zones are specified by giving the time difference in hours and minutes. For example, Newfoundland Standard Time is time zone -03:30 or -0330. The time zone is added after a time: for example, 13:23-08 represents 1:23 pm U.S. Pacific Standard Time and is equivalent to 21:23 Universal Time. The same instant is 22:23 in Central European Time, represented by 22:23+01. The traditional acronyms for time zones, such as EST for Eastern Standard Time, may be confusing or meaningless,

especially outside their country of origin, so they should not be used in international communications. Worldtimezone.com has up-to-the-moment time and time zone information for the entire world.

time zone [2]

an informal unit used to express differences in longitude between two places on the Earth. On the average, a time zone spans 15° of longitude. Of course, actual time zones have irregular boundaries, so this is only approximate. At the latitudes of the continental U.S., time zones average about 800 miles wide.

tin

an informal unit of volume equal to approximately 8 Imperial fluid ounces (227 milliliters, or roughly the same as a U.S. cup). This is the volume of an English 50-cigarette tin, formerly common as a kitchen unit in North Africa and the Middle East. It is still seen in books of recipes from that area.

tithe

a traditional unit of proportion equal to 1/10. The word "tithe" is an old one, drawn directly from the Anglo-Saxon word for a tenth.

tithing

an old English unit of land area equal to 1/10 hundred or 10 hides. Very roughly, the tithing was about 12 acres or a little less than 5 hectares.

TMC ft

an abbreviation for "thousand million cubic feet," commonly used in water management in India. One TMC ft is equivalent to about 28.317 million cubic meters or 22 956.8 acre feet. One TMC ft/day is about 11 574 cubic feet per second or 327.74 cubic meters per second.

TME

a German abbreviation for Technische Mass Einheit (engineering mass unit). One TME is the mass accelerated at 1 m/s^2 by a force of 1 kgf. One TME is equal to 9.80665 kilograms or 21.6200 pounds. This unit is sometimes called the **metric slug** in English, since the slug is defined in a similar way in the English system.

to

a traditional Japanese unit of volume. The to equals 10 sho, which is about 18.039 liters, 3.968 British Imperial gallons, or 4.765 U.S. liquid gallons.

tod

a traditional unit of weight equal to 2 stone or 1 quarter. The tod is thus equivalent to 28 pounds or about 12.7 kilograms. "Tod" is an old German word meaning a load.

toe

a symbol for **tonne of oil equivalent**, a unit of energy used in the international energy industry. 1 toe represents the energy available from burning approximately one tonne (metric ton) of crude oil; this is defined by the International Energy Agency to be exactly 10^7 kilocalories, equivalent to approximately 7.4 barrels of oil, 1270 cubic meters of natural gas, or 1.4 tonnes of coal. 1 toe is also equivalent to 41.868 gigajoules (GJ), 39.683 million Btu (MM Btu) or dekatherms, or 11.630 megawatthours (MWh).

tog

a metric unit used to describe the insulating properties of cloth. If the flow of heat through the cloth is 1 watt per square meter, then the insulating value in togs is 10 times the temperature difference, in Celsius degrees (or kelvins), between the two sides of the cloth. This makes the tog equal to exactly 0.1 m^2K/W or about 0.645clo. "Togs," now a slang word in English, is derived from an old Dutch/North German word *tuig* or *tög* meaning "the clothes you're wearing."

toise

a traditional French unit of distance comparable to the British fathom. Like the fathom, the toise originally represented the distance between the fingertips of a man with outstretched arms. Introduced by Charlemagne in 790, the toise is such an ancient unit that *toiser* has become a verb meaning "to measure" or "to size up." The toise equals six *pieds* (French feet). Feet of different lengths were used in France, but based on the 18th century Paris *pied* the toise equals 6.395 (English) feet or 1.949 meters. This unit was widely used in the 19th century and hasn't died out entirely today. Note that the French have a second fathom-size unit, the brasse, equal to 5 pieds (about 1.624 meters or 5.328 English

feet). The brasse was the unit commonly used at sea, while the toise was used on land.

tola

a traditional unit of weight in India and South Asia. Like the seer and the maund, the tola varied considerably from one area to another. The official size in British India was 180 grains, which is about 0.4114 ounce (avoirdupois) or 11.664 grams. There are 80 tolas in a seer, 3200 in a maund.

tolerance unit

a unit of relative distance used by engineers when they put round pegs in round holes. Whenever a shaft passes through a hole, a small distance (the tolerance) must be left so that the shaft will be able to turn. If the diameter of a shaft is D millimeters, one tolerance unit for that shaft is 0.001D + 0.45(cube root of D). The cube root term allows proportionately more tolerance for smaller shafts. The actual tolerance can then be stated as a multiple of the tolerance unit.

toman

a historic unit of quantity equal to 10 000. The word is of ancient Persian origin; it survives in several languages of western Asia and is used today in Turkey and Iran.

ton (tn or T or t) [1]

a traditional unit of weight equal to 20 hundredweight. In the United States and Canada, there are 100 pounds in the hundredweight and exactly 2000 pounds (907.185 kilograms) in the ton. In Britain, there are 112 pounds in the hundredweight and 2240 pounds (1016.047 kilograms) in the ton. To distinguish between the two units, the British ton is called the **long ton** and the American one is the **short ton**. In old England, a "tun" was a large cask used to store wine. Because these tuns were of standard size, more or less, the tun came to represent both a volume unit, indicating the capacity of a cask, and also a weight unit, indicating the weight of a cask when it was full. The best symbol to use for this unit is **tn**. In the U.S. mining industry, **T** is used to distinguish the traditional ton from the metric ton, but T is the SIsymbol for the tesla. The symbol **t**, traditionally used for the long or short ton, is now reserved for the metric ton.

ton (t) [2]

a metric unit of mass, equal to 1000 kilograms, or approximately 2204.623 pounds avoirdupois. This **metric ton** is a bit smaller than the British long ton. The metric ton is now known officially as the **tonne** (see below).

ton (RT or rT) [3]

a unit used traditionally to measure the cargo capacity of a merchant ship. During the Middle Ages, merchant ships were rated by the number of tuns of wine they could carry. Today the merchant marine ton is defined to be exactly 100 cubic feet, or approximately 2.8316 cubic meters. This unit is often called the **register ton**, since it is recorded in official registers of ships. The symbol **RT** seems to be in wide use for this unit, but it is also used for the refrigeration ton (definition [7] below).

ton (DT or dT) [4]

a unit of volume used traditionally to measure the "displacement" of ships, especially warships. One way to describe the size of a ship is to state the volume of sea water it displaces when it is afloat: in other words, the volume of that part of the ship below the waterline. The actual weight of sea water varies somewhat according to its temperature and how salty it is, but for this purpose it has been agreed that a long ton of sea water occupies about 35 cubic feet. Accordingly the **displacement ton** is defined to be exactly 35 cubic feet, or approximately 0.9911 cubic meter. Since this is a much smaller unit than the register ton, warships have a much higher "tonnage" than merchant ships of approximately the same dimensions. The symbol **DT** is recommended for this unit.

ton (FT) [5]

a traditional unit of volume used for measuring the cargo of a ship, truck, train, or other freight carrier. This **freight ton** is exactly 40 cubic feet, or approximately 1.1326 cubic meters. However, the term "freight ton" is also being used to mean a metric ton of freight, volume not specified. Perhaps because of this confusion, the 40 cubic foot unit is often called the **measurement ton (MTON)**. But the confusion seems impossible to dispel; some shippers are now using "measurement ton" to mean a

metric ton of freight. To further complicate the situation, the freight ton is also called the **U.S. shipping ton**; the **British shipping ton** is 5% larger at 42 cubic feet (1.1893 cubic meters).

ton (tn or T) [6]

a unit of energy used for measuring the energy of an explosion, especially a nuclear explosion. In this usage, one ton is supposed to be the amount of energy released by the explosion of one short ton of TNT. This is defined in the U.S. to equal exactly 4.184 gigajoules (GJ) or roughly 4 million Btu.

ton (RT) [7]

a unit of power used in refrigeration engineering. One ton of refrigeration is intended to be the power required to freeze one short ton of water at 0°C in 24 hours. This is assumed to be exactly 12 000 Btu per hour (Btu/h or "Btuh"), which is equivalent to 200 Btu/min, 3.516 853 kilowatts, 4.7162 horsepower, or 0.8396 (kilogram)Calorie per second (Cal/s). The symbol **RT** seems to be in wide use for this unit, but it is also used for the register ton (definition [3] above).

ton [8]

British slang for 100, especially the sum of 100 pounds, a speed of 100 miles per hour, or a score of 100 in darts or cricket. The origin of this usage is not clear.

tønde

the Danish word for "barrel," traditionally used as a unit of volume equal to 144 pots or about 139 liters. The tønde holds 30.6 British Imperial gallons, making it comparable to the barrel Similarly, one of the meanings of the German word *Tonne* is "barrel."

tønde land

a traditional Danish unit of land area, originally the area that could be planted with a tønde of seed. The tønde land equals 14 000 square alen, which is about 5516 square meters, 0.5516 hectare, or 1.363 acre.

tone

another name for the step [2] as a musical unit describing the ratio in frequency between notes.

tonelada

a traditional weight unit of Spain and Portugal corresponding to the English and metric ton. The traditional Spanish tonelada equals 2000 libras or about 2028 pounds(919.9 kilograms). The Portuguese tonelada, however, equals 1728 Portuguese libras or arratels; this is about 1748.6 pounds or 793.15 kilograms.

tonne (t)

a metric unit of mass equal to 1000 kilograms or approximately 2204.623 pounds avoirdupois. The SI uses this French spelling for the metric ton (see ton [2] above) to distinguish it clearly from the long and short tons of customary English usage. Large masses are often stated as multiples of the tonne, although technically the SI requires that masses be stated as multiples of the gram. Thus a mass of 10^3 tonnes = 10^6 kg = 10^9 g is often called 1 kilotonne (kt) instead of 1 gigagram. In the United States, the Department of Commerce recommends that the tonne be called the **metric ton**.

tonneau

the traditional French ton, equal to 2000 livres or about 979 kilograms (1.079 U.S. ton). The tonneau was also used as a measure of volume equal to 42 cubic pieds(50.84 cubic feet, or about 1440 liters). In the wine trade, the tonneau was a shipment of 100 cases, or 1200 bottles (about 900 liters of wine).

ton of force (tnf or tn)

a traditional unit of force, equal to 2000 pounds of force (about 8.8964 kilonewtons) in the U.S. and 2240 pounds of force (about 9.9640 kilonewtons) in Britain.

ton per square inch (tnf/in^2 or tsi)

a unit of pressure traditionally used in engineering. In the U.S., 1 tsi = 2000 pounds per square inch or about 13.790 megapascals (MPa). In Britain, 1 tsi = 2240 pounds per square inch or about 15.444 megapascals.

Torino number

an arbitrary scale adopted in 1999 to express the likelihood that an asteroid or comet might collide with the Earth causing damage. Named for Torino (Turin), Italy, site of a June 1999 conference on near-Earth

objects, the scale is intended to convey accurately the appropriate level of concern caused by newly-discovered objects, thus discouraging sensational press reports. The scale ranges from 0 (object certain to miss the Earth or too small to cause significant damage) to 10 (object certain to hit the Earth and large enough to cause catastrophic damage and global climate disruption). An official description of the scale is included. See also Palermo scale.

torr (Torr)

a non-metric unit of pressure equal to exactly 1/760 atmosphere, about 1.333 22 millibars, 133.322 pascals, or 0.019 337 pound per square inch (psi). The pressure of 1 atmosphere is almost exactly equivalent to the pressure of a column of 760 millimeters of mercury in a mercury barometer. As a result, 1 torr is the same thing as 1 mmHg within 1 part per million. In engineering, the pressures of near-vacuums are often stated in torr. The unit is named for Evangelista Torricelli (1608-1647), the Italian scientist who invented the barometer.

tot

a unit of volume for liquor. Generally the term is used informally, with no fixed definition. However, in British pubs the usual understanding is that a tot is 1/6 gill; this is equivalent to 5/6 Imperial fluid ounce or about 23.7 milliliters.

tour

another name for a shift in the oil industry. The unit is pronounced "tower." A tour, like a shift, is usually 8 hours in length.

tovar

a traditional weight unit of Bulgaria, equal to 100 oka; this is roughly 280 pounds or 128 kilograms.

tower weights

the weight system used as the basis for English coinage during the medieval era; it is named for the Tower of London, where the Royal Mint was located. The system was based on the tower pound of 5400 grains (about 0.7714 avoirdupois pounds or 349.91 grams). The pound was divided into 12 ounces, and each ounce contained 20 pennyweight, making the pound equal to 240 pennyweight. (This structure was later echoed, in a reversed way, by the traditional English monetary system, in which the pound was divided into 20 shillings and each shilling into 12 pence.) In 1527, Henry VIII abolished the tower pound in favor of the slightly larger troy pound (see troy weights, below).

township (twp)

a traditional unit of area in the U.S. and western Canada. In the U.S. this unit equals 36 sections, or the area of a square nominally 6 miles on a side (about 93.24 square kilometers). Like the section, it is used by the U.S. Public Land Survey System, which applies to most of the country except for the original 13 states, Alaska, and Hawaii. In the four western provinces of Canada, the similar Dominion Lands Survey System used townships made of 36 square sections plus a road allowance between them. From 1871 to 1881 this allowance was 1.5 chains (99 feet), making the township nominally 6.1125 miles on a side (37.36 square miles or 96.77 square kilometers); it was then reduced to 1 chain with some roads removed, making the townships nominally 6.0375 by 6.075 miles (36.68 square miles or 95.00 square kilometers). In both countries the actual size varied slightly due to the curvature of the Earth. See section.

toz

a symbol for the troy ounce [2], the traditional unit for weighing precious metals.

tpi

an abbreviation for "threads per inch," a unit commonly used to describe screws and other items with similar threads.

traffic unit (TU)

an alternate name for the erlang.

tray

an informal unit of volume used for berries in U.S. retail produce markets. Berries are typically stocked in corrugated cardboard trays holding six containers of one (dry)quart each, a total volume of about 6.6 liters.

trey

an old English word for three, derived from the old French *treis* (now spelled *trois*). The word survives as the name for a three-spot showing in dice or a three card in card games.

triad

a unit of quantity equal to 3.

triennial

an adjective meaning once every 3 years. Not to be confused with terannual (3 times per year).

triennium

a traditional unit of time equal to 3 years.

trilliard

a unit of quantity equal to 10^{21}, which is one sextillion in American terminology or 1000 trillion in traditional British terminology. The name is coined to parallel*milliard*, which has long been a name for 1000 million.

trimester

a unit of time equal to 3 months or 1/4 year; another name for the quarter [2]. At certain U.S. colleges a trimester is an academic term roughly 14 weeks long. In reckoning the length of human pregnancies, a trimester is a unit of 14 weeks, with the first trimester beginning on the first day of the last menstrual period.

trio

a traditional unit of quantity equal to 3. The word is Italian. It originated in music during the Baroque era (early 1700's) in its meaning as a composition in three parts.

triple, triplet

a group of 3 items, especially 3 identical items; the word **triplet** is also used for one member of such a group. Mathematicians prefer **triple** for an ordered string of three elements.

triumvirate

a unit of quantity equal to 3. The name comes from the Latin *trium virum*, "of three men," and was first used to describe the governing alliance of Julius Caesar with Pompey the Great and Marcus Licinius Crassus in 60 BCE.

troland (Td)

a unit used in photometry to measure the amount of light reaching the retina of the eye. The "retinal illuminance" in trolands is equal to the luminance of the light shining on the eye, measured in candelas per square meter (cd/m^2), multiplied by the area of the pupil open to the light, in square millimeters (mm^2). This calculation makes the troland technically equal to the microcandela (μcd), a unit of luminous intensity, but retinal illuminance is a physical quantity different from luminous intensity. The unit is named for the American experimental psychologist Leonard T. Troland (1889-?).

troy weights

a traditional English weight system of great antiquity, apparently in use since long before the Norman conquest of 1066. The system is believed to be named for the French market town of Troyes, where English merchants traded at least as early as the time of Charlemagne (early ninth century). The system is based on the troypound [2] of 5760 grains. The pound was divided into 12 ounces (of 480 grains), each containing 20 pennyweight, with each pennyweight equal to 24 grains. Apothecaries, however, divided the troy ounce into 8 drams (of 60 grains), each containing 3 scruples, with each scruple equal to 20 grains. The origin of the troy system is not clear, but a number of scholars believe the dram corresponds to the denarius, a Roman coin that weighed about 60 English grains and (when used as a weight) was also divided into 3 scruples. The troy system was always the theoretical basis of the traditional English monetary system, in which there were 12 pence (pennies) to the shilling and 20 shillings to the pound. However, in medieval England pennies did not actually weigh a troy pennyweight, because they were made using the tower weight system (see above) and thus weighed 22.5 grains instead of 24. In 1527, Henry VIII abolished the tower pound and made the troy system official for coinage; thereafter silver shillings weighed exactly 0.6 troy ounce. The smaller troy weights continued in common use in pharmacy and monetary affairs into the early twentieth century, but the troy pound was abolished in 1878 to avoid any commercial confusion with the avoirdupois pound. The troy

system is nearly obsolete today, but the prices of precious metals are still quoted by the troy ounce.

trug

a basket having a shallow, boat-like shape. Invented in Sussex, England, trugs come in many sizes; small ones are often used by gardeners to carry cut flowers. In the U.S., a trug of grain was formerly considered to equal exactly 2/3 U.S. bushel (23.493 liters).

truss

a traditional weight unit, generally equal to 4 stone or 56 pounds (about 25.4 kilograms). The truss was used primarily for measuring hay. In 1795, Parliament specified that a truss of hay should equal 56 pounds for old hay or 60 pounds (about 27.2 kilograms) for new hay.

tsubo

an informal unit of area used in Japan to measure area inside buildings. One tsubo is an area of about 3.3 square meters (3.95 square yards), an area that can be covered neatly by two traditional tatami mats. See tatami, above.

t'sun [**1**]

a Chinese unit of distance equal to 0.1 ch'ih or about 1.41 inches (3.58 centimeters).

t'sun [**2**]

a unit of relative distance used in acupuncture. One t'sun is the distance between the two outer folds in the bent middle finger, or (according to some sources) the width of the thumb. This is a personal unit, different for each person and used to locate acupuncture points on that person's body. The unit is also spelled **cun** and is sometimes called the **anatomical Chinese inch (ACI)** or **body inch** in English.

tu

a traditional Chinese unit of distance equal to 250 li. Using the late nineteenth century definition of the li as 2115 feet, the tu was equal to 100.14 miles or 161.13 kilometers.

tub [**1**]

an old English unit of mass or weight for butter, equal to 84 pounds (38.10 kilograms). In Newfoundland, a tub of coal was formerly equal to 100 pounds.

tub [**2**]

a wide, low container for liquids, generally not of any standard size. During the Prohibition era in the U.S. (1920-1933) liquor smugglers often carried their cargo in tubs holding 4 gallons (15.14 liters). In this they were following an old English tradition dating back at least to tea smugglers of the eighteenth century, who used similar 4-gallon tubs. There are some cases in which the tub has had a legal definition. In Newfoundland, for example, a tub of herring held 16 Imperial gallons (72.74 liters) and a tub of salt held 18 Imperial gallons (81.83 liters).

tumbler

another name for the U.S. cup.

tumblerful

another name for the breakfast cup, a unit of volume used in British food recipes.

tun

a unit of volume used for wine and other liquids. "Tun" is an old French word for a large cask used in shipping wine. Tuns of various sizes were used throughout the Middle Ages. More recently the tun has been regarded as equal to 2 butts or 252 U. S. gallons; this is equivalent to 33.6875 cubic feet or about 953.93 liters. See ton [3] and tonneau, above.

tunnland

a traditional unit of land area in Sweden. The tunnland is equal to 56 000 square Stockholm feet (*kvadratfot*); this is equivalent to 4936.4 square meters, 0.493 64hectare, or about 1.220 English acre. The tunnland was divided into 32 kappland. Like the Danish tønde land (see above), this unit originated as the area that could be planted with one *tunn* (barrel) of seed.

-tuple

a suffix added to a number by mathematicians to create units of quantity; a 7-tuple, for example, contains 7 objects, listed in a specified order. The suffix has the same Latin root as **-ply**, meaning -fold.

turbidity unit

see NTU.

turn

another name for a revolution, that is, a unit of angle measure equal to 360°.

tw

symbol for the talangwah (see above), a Thai unit of area equal to 4 square meters.

Twaddle scale

a specific gravity scale; see degree Twaddle.

twain

an old word for the number two, derived from the Anglo-Saxon *twegen*. The American author Samuel Clemens (1835-1910), who had been a riverboat pilot on the Mississippi in his youth, took his literary name from a traditional riverboat phrase "mark twain", meaning "exactly two" fathoms of water. This was the minimum depth needed for the boats to operate safely without running aground.

twelfth

a unit used in music to describe the ratio in frequency between notes. Two notes differ by a twelfth if the higher note has frequency exactly 3 times the frequency of the lower one. On the standard 12-tone scale, the perfect twelfth is approximated as 19 half steps, corresponding to a frequency ratio of $2^{19/12} = 2.9966$.

twelvemonth

an old English name for a year.

twip

a unit of distance used in computer graphics for high-resolution control of the elements of an image. One twip is equal to 1/1440 inch, about 17.639 micrometers, or 0.070 556 kyu. "Twip" is an acronym for "twentieth of a point," which is accurate if the point [2] is interpreted as being exactly 1/72 inch.

typp

abbreviation for thousand yards per pound, a unit formerly used to describe yarn density. 1 typp equals about 2.015 907 meters per gram, and *n* typp corresponds to a yarn density of 2.015 907/*n* tex (see above).

U

u [1]

the SI symbol for the unified atomic mass unit, as defined in 1960 and accepted by both chemists and physicists.

u [2]

a common replacement for the Greek letter μ as a symbol for the micron or micrometer. The correct symbol for this unit is μm.

u-

a common replacement for μ- as a symbol for the SI prefix micro- (10^{-6}). The symbol is frequently seen in combinations such as **ug** for the microgram (μg). The use of u- was approved by the International Organization for Standardization in its standard ISO 2955, issued in 1974. The problem at that time was that many of the character sets in common use did not include the Greek letter μ. This is much less of a problem today, so ISO 2955 has been withdrawn and is no longer in effect. The message from all standards agencies now is: use μ-, not u-, for micro-.

U [1]

a commercial unit of thermal conductance (heat flow). The **U factor**, as it is also called, is the conductance through an insulator as measured in Btu's of energy conducted times inches of thickness per hour of time per square foot of area per °F of temperature difference between the two sides of the material. The U factor is numerically equal to 1 divided by the R value.

U [2]

a unit of distance used to measure the height of the standard racks in which audio, video, or computer components are mounted. 1U is equal to 1.75 inches (44.45 millimeters), so that, for example, a 2U component is 3.5 inches high, and a 22U rack houses a stack of components 38.5 inches high.

U [3]

usual symbol for the enzyme unit.

U [4]
German symbol for a turn or revolution (*Umdrehung*), usually seen in combinations such as **U/min**, the German equivalent of the English symbol rpm for revolutions per minute.

ua
an alternate symbol for the astronomical unit (au).

UI
an alternate symbol for the international unit (IU). In many languages, the two words of the phrase "international unit" are reversed. In French, for example, the phrase is *unité international*.

uld, ulp
units of data precision used in computer science. The symbol **ulp** stands for "unit in the last place," the smallest increment in a variable that can be recorded internally by the machine. Similarly, **uld** stands for "unit in the last digit," a change by 1 in the last (right-most) digit of data represented decimally.

um, ums
symbols sometimes used for the micrometer (micron). The symbol **um** is acceptable in situations where the Greek letter mu (μ) is not available to make the proper symbol μm. However, the "plural" symbol **ums** is never acceptable, because the SI prohibits adding -s to a symbol to form a plural.

uncia [1]
a Latin name for the fraction 1/12, subsequently used in many ways to represent a twelfth part. The Romans had no mathematical notation for fractions. When they needed to refer to a fractional part of anything, they would often state its nearest equivalent in *unciae*.

uncia [2]
the Roman ounce, equal to about 27.2875 grams or 0.9625 ounce avoirdupois. There were 12 ounces in a Roman pound, and the word *uncia* means a 12th part; its name gives us both the ounce and the inch.

uncia [3]
the Roman inch, equal to about 2.473 centimeters or 0.9734 English inch.

unit [1]
when counting, the word "unit" means "one." For example, if a car dealer expects a shipment of 20 units, that means 20 cars.

unit [2]
a shorthand word for a variety of named "units," particularly the international unit in pharmacology.

unit [3] **(of blood)**
a unit of volume for human blood and various blood components or products. A unit of whole blood is 450 milliliters, which is about 0.9510 U.S. pint. For components of blood, one unit is the amount of that substance that would normally be found in one unit of whole blood. The adult human body contains roughly 12 units of whole blood. Note: although the unit is defined by volume, it is actually measured by mass at blood collection centers. Since the density of human blood is 1.053 kilograms per liter, the mass of a unit of blood is about 474 grams or 16.7 ounces.

unit [4] **(of heroin)**
a unit of mass or weight for heroin equal to exactly 700 grams (0.7 kilogram or about 1.543 pounds). This unit, standard in the southeast Asian drug trade, is also called the **Asian unit** in U.S. drug enforcement.

unit [5] **(of alcohol)**
a unit of the alcohol content of beverages, used primarily in Britain. One unit of alcohol represents an alcohol content of 10 milliliters or, by weight, 8 grams. The alcohol content of a liter of a beverage is numerically equal to the percentage of alcohol by volume, so that, for example, a wine that is 12% by volume contains 12 units per liter, or 9 units in a standard 750 ml (3/4 liter) bottle.

unit [6] **(of energy)**
in Britain, another name for the kilowatt hour, which was formerly called the Board of Trade unit.

unit call (UC)
a measure of telecommunications traffic density. The unit call is a dimensionless "unit" representing a traffic density of 100 call-

seconds per hour, or 1/36 erlang.

unit case

a conventional unit of sales volume in the U.S. soft drink industry. A unit case consists of soft drinks, syrup, powder, or whatever equivalent to 24 eight-ounce servings (6 quarts or about 5.678 liters).

unit (magnetic) pole

a CGS unit measuring the strength of a magnetic pole. A unit magnetic pole repels an identical pole at a distance of one centimeter in a vacuum with a force of onedyne. The unit magnetic pole equals about 125.6637 nanowebers (nWb) or 12.566 37 maxwells (Mx).

Universal Time (UT or Z)

the correct name for the time system previously called Greenwich Mean Time (GMT): the standard time at longitude 0°. Universal Time is five hours later than Eastern Standard Time in the U.S. It is always stated on the 24-hour clock; thus an event occurring at 1:26:15 pm Eastern Standard Time occurs at 18:26:15 UT (five hours after 13:26:15). Technically, the time shown on clocks is figured from Coordinated Universal Time (**UTC**), an international system of time measurement regulated by very precise atomic clocks. From time to time (either on June 30 or December 31), UTC is adjusted by the addition of a "leap second". This event, widely reported in the press but poorly understood by the public, keeps UTC within 0.9 seconds of mean solar time at longitude 0° as measured by the Earth's slightly uneven rotation. Seeday [2] for additional information.

unze

a traditional German weight unit, corresponding to the English ounce. The unze equals 1/16 pfund. Although the pfund has been assimilated into the metric system (as 500 grams), the unze is effectively obsolete. It varied in size from about 28 to 35 grams. The word comes directly from the Latin *uncia*; the plural is **unzen**.

urna

a Roman unit of volume equal to 4 congii, 24 sextarii, or 1/2 amphora. This is equivalent to about 12.75 liters (3.37 U.S. liquid gallons or 2.80 British Imperial gallons). The Latin word *urna* was also used more broadly to mean a jug, giving rise to the English word *urn*.

U.S. shipping ton

the freight ton [5]; see also shipping ton.

USP unit

a unit used in the United States to measure the potency of a vitamin or drug, that is, its expected biological effects. For each substance to which this unit applies, the U. S. Food and Drug Administration has determined the biological effect associated with a dose of 1 USP unit. Other quantities of the substance can then be expressed in terms of this standard unit. In most cases, the USP unit is equal to the international unit (IU). "USP" is a registered trademark of the United States Pharmacopeial Convention, Inc., a private standards organization that establishes standards for the pharmaceutical industry.

V

V

the SI symbol for the volt (see below).

VAC

a common symbol for the voltage in an alternating current (AC) circuit (see **var** below for comments on alternating current). The SI does not allow symbols to be modified with additional information; instead of "12 VAC," write "AC 12 V."

vagon

a traditional unit of mass or weight in countries of the former Yugoslavia. Originally considered to be the weight that could be carried by a wagon, the unit has been "metrized" and is now defined to be equal to the dekatonne, that is, 10 metric tons or 22 046.23 pounds avoirdupois.

val

a symbol used in Europe, especially in Germany, for the equivalent weight.

var

a unit of the reactive electric power delivered by an alternating current (AC) circuit. In an AC circuit, the electric potential or voltage

(measured in volts) and the current (in amperes) alternate direction, varying smoothly according to sine curves. In a purely resistive circuit, current is in phase with voltage. In a purely inductive circuit, the variations of the current would lag the variations in the voltage by 1/4 cycle, or 90°. In real circuits, the current can be separated into two parts: a part in phase with the voltage, and the "reactive" part, which lags the voltage by 90°. The reactive part does no net work; it simply heats the conductor. Reactive current does perform important magnetizing and voltage-regulation functions in real circuits. The reactive power is the product of the voltage and the reactive part of the current. The name of the unit is an acronym for volt-ampere-reactive.

vara

a traditional unit of distance in Spanish- and Portuguese-speaking countries. The length of the vara varied (no pun intended), but in Spanish Latin America it was generally about 33 inches or a little longer. In Texas, where it was often used in land measurement, the vara was defined to equal exactly 33 1/3 inches, which is equivalent to 84.667 centimeters. In California, the vara was considered equal to 33 inches (83.82 centimeters) and in Mexico the former standard was 32.993 inches (83.802 centimeters). In southern South America the vara was usually about 34 inches (86.4 centimeters). The Spanish vara is shorter; it equals 32.908 inches or 83.587 centimeters. The Portuguese vara, on the other hand, is much longer; it equals 5 palmos or about 110 centimeters (43.3 inches). The word *vara* means a stick or pole.

VDC

a common symbol for the voltage in a direct current (DC) circuit. In DC circuits, both voltage and current are constant. The SI does not allow symbols to be modified with additional information; instead of "12 VDC," write "DC 12 V."

vedro

a traditional Russian unit of volume equal to 100 charki. The vedro is about 12.30 liters (3.249 U.S. liquid gallons or 2.706 British Imperial gallons). In Bulgaria, the vedro has also been used informally as a name for the dekaliter (exactly 10 liters or 2.642 U.S. liquid gallons). The word vedro means a bucket.

verge

an old name for the yard, taken from the Latin word *virga* for a twig or stick. In modern French, *verge* is the customary word for the English yard.

vergee

a traditional unit of land area in the Channel Islands, a British territory just off the coast of France. The unit varied from one parish to another. In Jersey, a common estimate is that the vergee is equal to about 0.44 acre (about 0.178 hectare or 2130 square yards). In Guernsey it is somewhat smaller, about 0.4 acre (0.162 hectare or 1940 square yards). The name of the unit is a old Norman word meaning an orchard.

vershok or verchok

a traditional Russian unit of distance equal to 1/16 arshin, 1.75 inches or 4.445 centimeters. The plural is **vershki**.

verst, versta, vehrsta

a traditional Russian unit of distance, formerly used throughout eastern Europe. The verst equals 1500 arshin, which is 3500 feet, 0.662 88 mile, or 1066.8 meters.Although **vehrsta** is the best transliteration of the Russian, the spelling **verst** is common in English. The German spelling **werst** is also used sometimes. In Finnish the unit is called the **virsta**. The Russian plural is **vehrsty**.

Vickers hardness number (HV or VHN)

a measure of the hardness of a metal introduced by Vickers in 1922. In the Vickers test (suitable for surface-hardened metals), a pyramidal diamond is pressed into the material being tested. The Vickers hardness is the amount of force applied to the diamond divided by the area of the indentation the diamond makes in the material; in practice the diagonal of the pyramidal indentation is measured and the result, computed in kilograms of force per square millimeter, is read from a table. (The reading should be stated as an empirical measurement, without units.) Up to about HV 500, the Vickers hardness is about 1.04 times the Brinell hardness.

viertel [1]

a traditional unit of volume in several European countries. Oddly, although the name means "quarter" in German the traditional viertel is not really 1/4 of any other unit. The Danish viertel equals 8 pots or about 7.74 liters (2.04 U.S. liquid gallons or 1.70 British Imperial gallons). In Switzerland the viertel is 40 schoppen, which is exactly 15 liters (3.9626 U.S. liquid gallons or 3.3000 British Imperial gallons).

viertel [2]

a unit of volume for wine in Austria, equal to exactly 1/4 liter (250 milliliters) or about 8.45 U.S. fluid ounces.

violle

an obsolete unit of light intensity equal to 20.17 candelas. One violle is the intensity of a square centimeter of platinum, glowing at its melting temperature of 1769 °C (3216 °F). The unit is named for the French physicist Jules Violle (1841-1923), who proposed it in 1881; it was the first unit of light intensity that did not depend on the properties of a particular lamp.

virgate

an old English unit of land area equal to 1/4 hide. This is roughly 30 acres or 12 hectares. The virgate was also called the **yardland** or **yard of land**.

viscosity grade (VG)

a commercial rating of industrial lubricants. The grade numbers are approximately equal to the kinematic viscosity of the lubricant in centistokes. A table is provided showing the range of viscosities acceptable for each grade under the current standard of the International Organization for Standardization (ISO).

vision

a term often used with a Snellen fraction in phrases such as "20/20 vision."

viss, vis, vise

a traditional unit of mass or weight in southern India and southeast Asia, equal to 100 ticals. The name is derived from the Tamil *visai*. The traditional size of the viss is about 1640 grams (about 3.62 pounds), but it is currently used in the Southeast Asian drug trade as a metric unit equal to exactly 1600 grams (1.6 kilograms or 3.527 pounds). This metric unit is called the **choi** or **joi** in Laos and Thailand.

volcanic explosivity index (VEI)

a measure of the severity of a volcanic eruption. The VEI scale is from 0 to 8; an index value of *v* corresponds to an output of at least 10^{3+v} cubic meters of magma. The Mt. St. Helens eruption of 1980 was a 5 on this scale, and the largest eruption of historic times (the Tambora eruption of 1815) rated a 7. A table is provided.

volt (V)

the SI unit of electric potential. Separating electric charges creates potential energy, which can be measured in energy units such as joules. Electric potential is defined as the amount of potential energy present per unit of charge. Electric potential is measured in volts, with one volt representing a potential of one joule per coulomb of charge. The name of the unit honors the Italian scientist Count Alessandro Volta (1745-1827), the inventor of the first battery. (Note: I am sometimes asked about standard line voltages in different countries. Steve Kropla has a helpful chart with this information.)

volt ampere (V·A)

a unit of electrical load used in power engineering. In an alternating current circuit, if the potential (measured in volts) and the current (measured in amperes) vary in phase with each other, then the power delivered (measured in watts) is the product of the potential and the current. In actual circuits, the potential and current are usually out of phase (see var, above), causing the device receiving the power to draw more current than its wattage requirements would suggest. The product of the potential and the actual current is the load, in volt amperes.

volume unit (vu)

a unit used in telecommunications to describe the volume of a radio or television signal carrying complex information such as speech or music. These waves vary wildly in amplitude in order to represent the message they carry, so it is difficult to describe mathematically how large their "average" amplitude is. To solve this problem, the American Standards Association decided in 1951 to establish as a reference a signal which

generates 1 milliwatt of power in a circuit having an impedance of 600 ohms. The volume of an incoming signal, in volume units, is equal to the number of decibels by which it exceeds this reference level. Thus the volume unit is (in a complicated way) a variation of the decibel.

volumetric unit (vu)
a unit of volume equal to 200 cubic feet (5.663 cubic meters), used in the U.S. forest products industry for wood chips and other by-products of lumber production.

volumetric weight
a measure of the size of a package used for billing purposes in the airline industry. The volumetric weight of a package, in kilograms, is equal to *lwh*/6000, where *l*, *w*, and *h* are the maximum length, width, and height measurements of the package, in centimeters. Shippers are billed for the larger of the volumetric weight and the actual weight of the package. Since the calculation assumes a density of only 1/6 gram per cubic centimeter (1/6 the density of water), the volumetric weight is used only for rather light packages that take up a lot of space on the aircraft.

v/v
an abbreviation for "by volume," used in chemistry and pharmacology to describe the concentration of a substance in a mixture or solution. Thus 2% v/v means that the volume of the substance is 2% of the total volume of the solution or mixture. See also w/v.

W

W
the SI symbol for the watt (see below).

wah
a traditional unit of distance in Thailand, now aligned with the metric system as exactly 2 meters (6.562 feet). This unit is the Thai version of the fathom. It is seen mostly in connection with the talangwah or square wah (4 square meters or 4.784 square yards), a common unit of area in Thailand.

Wales
in Britain, Wales has long served as an informal unit of area, much as Rhode Island has been used in the U.S. Wales has an area of about 8015 square miles or 20 760 square kilometers; it is 7.67 times the size of Rhode Island.

wan
a unit of quantity in China equal to 10 000. In Chinese, the wan is used much as the thousand is used in the West, as a basic unit for large quantities. Thus 100 000 is 10 wan, and 1 000 000 is 100 wan. However, as in the case of the Greek word *myrios* (myriad), the word *wan* is also used in Chinese to mean an indefinitely large number.

watch [1]
a traditional unit of time, defined as the time a sentry stands watch or a ship's crew is on duty. In ancient Rome, the night was divided into four watches, each roughly three hours long. More recently, one watch is usually equal to 4 hours on both land and sea. At sea, the evening watch (16-20 hours, or 4-8 pm) is often divided into two shorter watches called "dog watches." When dog watches are in effect, sailors will have watch assignments that rotate through the day instead of falling at the same hours every day. Watches at sea are divided into 8 bells (4 bells for dog watches). The word *watch* is derived from an old English word *wæccan* which meant "stay awake."

watch [2]
another name for a shift. This use was popularized in the U.S. by CNN Headline News and by the NBC television series *Third Watch*.

water column (WC)
a notation seen in pressure measurements. See inch of water, centimeter of water, or millimeter of water.

water horsepower (whp or Whp)
a unit of power used in the U.S. primarily in rating pumps. If a pump has a capacity of *Q* gallons per minute and develops a pressure ("head") of *P* feet of head, then its power rating is *QP*/3956 water horsepower. This calculation assumes the density of water to be 8-1/3 pounds per U.S. gallon, which is approximately correct but not exact. As a result,

the water horsepower equals 746.043 watts (550.253 foot pounds per second), slightly more than the ordinary mechanical horsepower.

water inch

a traditional unit of water flow, supposed to equal the flow through a circular opening one inch in diameter, assuming the flow is caused only by gravity. However, this flow rate also depends on the pressure of the water above the opening. One estimate is 14 U.S. pints per minute or 2520 U.S. gallons per day [2] (this is equivalent to 6.624 liters per minute); this estimate assumes the water level is constantly 1/12 inch (1 line) above the top of the opening. Another is 500 cubic feet per day, which is much larger: 3740 U.S. gallons per day or about 9.832 liters per minute. The latter estimate may depend on a mid-nineteenth century British engineering definition which required the hole to be centered 1 inch and 1 line below the water surface, placing the top of the opening 7/12 inch (7 lines) below the water level. See alsominer's inch.

watt (W)

the SI unit of power. Power is the rate at which work is done, or (equivalently) the rate at which energy is expended. One watt is equal to a power rate of one joule of work per second of time. This unit is used both in mechanics and in electricity, so it links the mechanical and electrical units to one another. In mechanical terms, one watt equals about 0.001 341 02 horsepower (hp) or 0.737 562 foot-pound per second (lbf/s). In electrical terms, one watt is the power produced by a current of oneampere flowing through an electric potential of one volt. The name of the unit honors James Watt (1736-1819), the British engineer whose improvements to the steam engine are often credited with igniting the Industrial Revolution.

watt hour (W·h)

a common metric unit of work or energy, representing the energy delivered at a rate of one watt for a period of one hour. This is equivalent to exactly 3.6 kilojoules (kJ) of energy, or about 3.412 141 Btu, 0.859 846 (kilogram) Calories, or about 2655 foot pounds.

watt year (W·yr)

a metric unit of energy, representing the energy delivered at a rate of one watt for a period of one year. The watt year, equal to about 31.5569 megajoules (MJ), is used in discussions of the rate of global warming.

wave or wavelength

a unit of relative distance equal to the length of a wave: this could be a light wave, a radio wave, or even an ordinary water wave. In communications engineering, the length of an antenna is often stated in waves. In optics, the surfaces of lenses and mirrors are sometimes required to be polished to within a very small fraction of a wavelength of green light (546 nanometers).

weber (Wb)

the SI unit of magnetic flux. "Flux" is the rate (per unit of time) at which something crosses a surface perpendicular to the flow. If the something is a magnetic field, then the magnetic flux across a perpendicular surface is the product of the magnetic flux density, in teslas, and the surface area, in square meters. If a varying magnetic field passes perpendicularly through a circular loop of conducting material, the variation in the field induces a electric potential in the loop. If the flux is changing at a uniform rate of one weber per second, the induced potential is one volt. This means that numerically the flux in webers is equal to the potential, in volts, that would be created by collapsing the field uniformly to zero in one second. One weber is the flux induced in this way by a current varying at the uniform rate of oneampere per second. The weber is a large unit, equal to 10^8 maxwells, and practical fluxes are usually fractions of one weber. (Because of this, when we want to induce an electric potential in a conductor with a changing field, as we do in all electric generators, transformers and electric motors, we loop the conductor into hundreds of coils, thus adding together the small voltages induced in each loop by the changing field.) The unit honors the German physicist Wilhelm Eduard Weber (1804-1891), one of the early researchers of magnetism.

week (wk)

a traditional unit of time equal to seven days [3]. The custom of the seven-day week, with one day set aside for rest and religious observance, goes back more than 3000 years to the ancient civilizations of the Middle East. The seven days originally had an astrological significance; there is

one day for each of the five visible planets and one each for the sun and the moon. Christians and Moslems inherited the seven-day cycle from the Jewish religion. The Romans picked up the idea from the Persians and were using the week as early as the first century. When the Emperor Constantine legalized Christianity in the Roman Empire, early in the fourth centuryCE, the Christian version of the week, with Sunday as the day of religious observance, became official throughout the Empire. Since none of the units of Roman date-keeping (the month, the quarter, and the year) equal a whole number of weeks, this made it necessary for the first time to have tables (we call them calendars!) showing the ever-changing relationship between the days of the week and the dates of the month. **Link**: The World Calendar Association promotes efforts to reform the calendar so that weeks and months would have a fixed relationship. **Link**: A perpetual calendar provides calendars for any month and year in the current (Gregorian) calendar.
Note: There are different traditions as to which day of the week is the first. In the U.S., most calendars show Sunday as the first day of the week, but the International Organization for Standardization (ISO) specifies that the week begins with Monday. There are also different ideas about how to number the weeks of the year, which is sometimes necessary for business purposes. The official solution to this question is that week 1 of the year is the week (beginning with Monday) that contains January 4. By this convention, week 1 of 2010 will be the week January 4-10, 2010. **Link**: ISO 8601 from Markus Kuhn.

werst
a German spelling, sometimes seen in English as well, for a Russian distance unit, the verst.

wet ton, dry ton
units used to measure sludge, slurries, compost, and similar mixtures in which solid material is soaked with or suspended in water. A wet ton is an ordinary ton [1] of the material in its natural, wet state; a dry ton is a larger quantity of the slurry, containing a ton of the solid material plus a variable amount of water.

wey
a historic English unit. The word comes from the old English *wæge*, meaning weight, and originally the wey was a weight unit representing about two hundredweight. Later it came to be used as a volume unit for a variety of dry commodities. Its size varied. Roughly speaking, the wey represented about 40 bushels, 2 cubic yards, or 1.5 cubic meters.

whole note
a unit of relative time in music, also called a semibreve.

whole step, whole tone
alternate names for the step [2], a unit used in music to express the ratio in frequency between two tones.

Winchester bushel
the traditional British name for what is now the U.S. bushel; see bushel [1].

Winchester quart
an informal British unit of volume used for certain chemicals shipped in cylindrical, narrow-necked bottles. A Winchester quart originally held 2 British Imperial quarts(about 2.273 liters); now it generally holds exactly 2.5 liters. This unit is not related to the Winchester bushel, and the origin of its name is not known.

wind chill temperature index (WCTI)
a measurement of the combined cooling effect of low air temperature and wind on the human body. The index was first defined by the American Antarctic explorer Paul Siple in 1939. As originally used by U.S. meteorologists, the wind chill index (WCI) was computed from the temperature T (in °F) and wind speed V (in mi/hr) using the formula:
$WCI = 0.0817(3.71\ sqrt(V) + 5.81 - 0.25V)(T - 91.4) + 91.4$.
In 2001, U.S. and Canadian meteorologists agreed on a revised definition of the wind chill temperature index (WCTI). The U.S. version, with the temperature in °F and wind speed in miles per hour, is
$WCTI = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275TV^{0.16}$.
The Canadian formula, with temperatures in °C and wind speed in km/h, is
$WCTI = 13.12 + 0.6215T - 11.37V^{0.16} + 0.3965TV^{0.16}$.
A chart is provided. The new formula gives higher temperatures, but

these temperatures, unlike the old WCI numbers, are supported by clinical experiments.

wine gallon

a former English unit of volume equal to 231 cubic inches. The wine gallon was adopted as the official gallon for liquid measurement in the United States, so now it is usually called the U.S. liquid gallon.

wineglass

an informal unit of volume used in U.S. bartending, equal to 4 (U.S.) fluid ounces or about 118.3 milliliters. This unit is the same as the traditional gill.

wineglassful

a unit of volume used in British food recipes. The wineglass holds 2.5 (British Imperial) fluid ounces, 5 tablespoonfuls, 1/2 gill, or about 71.0 milliliters. One wineglassful is equal to 0.30 U.S. cup.

word [1]

a unit of information in typing. Typing speed is usually expressed in words per minute (**wpm**). For this purpose, a "word" is considered to be exactly 5 characters (spaces included). For example, a typing speed of 30 wpm is equivalent to 150 characters per minute or a keystroke rate of 2.5 hertz.

word [2]

a unit of information in computer science, often representing the amount of data processed by a computer in a single instruction. The size of a word in bits is a characteristic of the computer system.

working level (WL)

a unit of radiation exposure used for measuring exposure to radon gas in the U.S. One working level represents a concentration of short-lived radon decay products in one liter of air resulting in the ultimate emission of 1.3×10^5 MeV or 20.8 nanojoules (nJ) of energy. Exposures are measured in working level months (WLM). Cumulative exposure of workers is measured in **working level months (WLM)**, representing exposure to one working level for 170 hours. In underground mining, U.S. law says miners must not be exposed to levels exceeding 1 WL and cumulative exposure must not exceed 4 WLM per year. In other industries, exposures are limited to 0.3 WL. In homes, the U.S. Enviromental Protection Agency recommends exposure levels not exceeding 4 pCi/L, or 0.04 WL.

workweek or work week [1]

a unit of time equal to the length of time a person "normally" works in a week. In many countries and in many industries, a specific number of hours, such as 35 or 40, constitutes a workweek either by law, by contract, or by custom, and workers who work more than that during a calendar week are entitled to be paid overtime wages.

workweek or work week [2]

a unit of time equal to the number of working or business days in a week (see above). During the nineteenth century the workweek was usually 6 days [3] but it is now 5 or 4 in most countries. Of course, individual workweeks are shorter if civil or religious holidays occur during the week.

wrench sizes

wrenches in the U.S. are sized in fractions of an inch or in multiples of 1/4 inch, while metric wrenches are sized in millimeters.

WS

German abbreviation for *Wassersäule*, water column, seen in pressure measurements. See centimeter of water or millimeter of water.

w/v

an abbreviation for "weight by volume," a slightly confusing phrase used in chemistry and pharmacology to describe the concentration of a substance in a mixture or solution. The weight by volume is the mass (in grams) of the substance dissolved in or mixed with 100 milliliters of solution or mixture. For example, the concentration of fluoride in toothpaste is usually about 0.15% w/v, meaning that there is 0.15 gram of fluoride per 100 milliliters of toothpaste. Thus 1% w/v is equal to 1 gram per deciliter (g/dL) or 10 grams per liter (g/L).

w/w

an abbreviation for "by weight," used in chemistry and pharmacology to describe the concentration of a substance in a mixture or solution. Properly speaking, 2% w/w means that the mass of the substance is 2%

of the total mass of the solution or mixture. The metric symbol g/g has the same meaning as w/w.

wyde

a unit of information in computer science, equal to 2 bytes or 16 bits. This name for the "double byte" was proposed by the American computer scientist Donald Knuth. It has achieved at least some use, but it is not well established.

X

× or x or X

the usual symbol for power as a unit of magnification. More generally, × or x is used with its mathematical meaning, "times," to indicate that a measurement is a multiple of some standard or reference measurement. For example, an image marked 200× is shown at 200 times actual size (that is, distances are 200 times actual size), and a 10x CD-ROM drive is one capable of transferring data 10 times faster than the "normal" or standard speed.

X unit (Xu)

a unit of distance formerly used for measuring the wavelength of x-rays and gamma rays. The X unit is approximately 1.0021 x 10^{-13} meter, 0.001 0021 angstrom, or 100.21 femtometers. The wavelength of these powerful forms of radiation is now measured in picometers (pm) or femtometers (fm). The unit was defined by the Swedish physicist K. M. G. Siegbahn in 1925, at a time when the wavelengths could not be measured directly. The definition was made in terms of the spacing between planes of the calcite crystals used in the measuring apparatus. Siegbahn, who received the Nobel Prize in Physics in 1924 for his work in X-ray spectroscopy, aimed to define a unit equal to approximately 10^{-13} meter, and he succeeded admirably. In his honor the unit was also called the **Siegbahn unit**.

Y

yard (yd) [1]

a traditional unit of distance equal to 3 feet or 36 inches. The word comes from a Saxon word *gyrd* or *gyard* meaning a stick, although the unit known as the *gyrd* in Saxon times was actually the rod [1], not the yard. The yard was established after the Norman conquest of 1066. According to tradition, King Henry I decreed that the yard should be the distance from the tip of his nose to the tip of his outstretched finger, thus defining the yard as exactly 1/2 fathom. Whether this actually happened or not, it does seem that the yard and the English foot were set at close to their modern lengths during or around the time of Henry's reign (1100-1135). The length of the oldest known standard yardstick, believed to date from 1445, agrees with the modern length within less than 0.1 millimeter. Today one yard is officially equal to exactly 91.44 centimeters or 0.9144 meter; this definition was adopted in the U.S. in 1959 and in Britain by the Weights and Measures Act of 1963.

yard (yd) [2]

the yard is traditionally used as a unit of area for materials sold in standard rolls, such as cloth, carpet, linoleum, fencing, and so on. In each case, one yard represents an area one yard long and as wide as the roll width. See bolt.

yard (yd) [3]

a cubic yard (about 764.6 liters). Bulk commodities like sand or topsoil are often sold by the "yard."

yard of ale

a traditional Scottish measure of volume. A yard of ale is roughly 2.5 pints (1.4 liters) served in a slender glass one yard [1] tall.

yard of land, yardland

one of several traditional units of area in old England; a "yard of land" sometimes meant a virgate (roughly 30 acres) and sometimes a rood (1/4 acre).

year (a or y or yr) [1]

a unit of time, defined to be the period of time required for the Earth

to make one revolution around the Sun. To be more precise, the year we use in ordinary life (described in the next entry) is designed to approximate the interval between two arrivals of the Sun at the Tropic of Capricorn, marking the summer solstice in the Southern Hemisphere and the winter solstice in the Northern Hemisphere. Astronomers call this unit the **tropical year**. There are 365.242 199 days in a tropical year, or, to be even more precise, 31 556 925.9747 seconds. Since the symbol *yr* is specific to English, the symbol for the year often used in scientific writing or other international contexts is *a*, taken from the Latin word, *annus*. Thus 1 Ma stands for a million years and 1 Ga for a billion years.

year (a or y or yr) [2]

a traditional unit of time usually equal to 365 or 366 days. We need a whole number of days for the *calendar year* used in ordinary life. Ancient astronomers knew that the year [1] is approximately 365 days long, and we now know the correct figure is approximately 365.242 days. If we use 365 as the number of days in every calendar year, the extra 0.242 day adds up quickly and causes large errors in predicting the seasons. To solve this problem, the Roman emperor Julius Caesar decreed in 46 BC that the calendar year should have 365 days generally, but that every fourth year should have an extra, or 366th, day. The longer year is called a **leap year**. In this**Julian calendar**, four years equal exactly 1461 days, so the average **Julian year** is exactly 365.25 days.

This was a big step toward accuracy in the calendar, but the Julian year is too long by 0.008 day, or a little over 11 minutes. By the time of the Renaissance, these 11-minute errors had accumulated to a total error of about 10 days (since the Council of Nicaea in 325 AD, which set the rules for deciding when Easter should be celebrated). The spring equinox was occurring near March 11 instead of March 21. In 1582, Pope Gregory XIII decreed that 10 days should be dropped from the calendar: the day after 1582 October 4 was October 15. To reduce future errors, the pope further decreed that years divisible by 100 are not leap years unless they are also divisible by 400. Thus 2000 and 2400 are leap years, but 2100, 2200, and 2300 are not. It took many years, but the Gregorian calendar has now been accepted as the civil calendar in all countries of the world.

With the Gregorian adjustment, there are exactly 146 097 days in every 400 years, and the average **Gregorian year** is exactly 365.2425 days. The Gregorian year is still too long, but by less than half a minute. It will take thousands of years for this error to accumulate to 1 day, so the calendar year and the tropical year are in good enough agreement to last us a long time.

yi

a unit of quantity in Chinese, equal to 100 000 000. The yi is used with the wan (10 000) in expressing large numbers, one yi being the same as one wan wan (ten thousand ten-thousands).

y/o

a common symbol for "years old."

yocto- (y-)

a metric prefix denoting 10^{-24} (one septillionth). Adopted by the CGPM in 1990, the prefix is derived from the Latin *octo* and Greek *okto*, meaning 8, because this is the eighth prefix (n = 8 in 10^{-3n}) in the SI system of metric prefixes. The *y* was added arbitrarily to provide a non-confusing letter for abbreviations.

yoke

another name for a pair. The yoke is used in describing teams of animals, especially oxen, used to pull plows or wagons.

yotta- (Y-)

a metric prefix denoting 10^{24} (one septillion). The prefix was coined to parallel the prefix yocto-.

yottameter (Ym)

a metric unit of distance equal to 10^{24} meters or 10^{21} kilometers. One yottameter equals 32.408 megaparsecs (Mpc) or 105.7 million light years. We ought not to need longer distance units than this, because the radius of the observable universe is not more than about 200 yottameters.

Z

Z
a common symbol for Universal Time. This symbol is often used with a 4-digit statement of the time in hours and minutes; thus 8:43 UT is written 0843 Z. The symbol is often pronounced "zulu," the name of the letter Z in the international radio alphabet.

z
symbol for redshift, a unit of relative distance used in astronomy.

zak
a Dutch unit of volume, now interpreted as a metric unit equal to the hectoliter (100 liters). The hectoliter is equivalent to 26.417 U.S. gallons, 21.999 British Imperial gallons, or 3.5315 cubic feet. This is a metric version of the British sack.

zentner (Ztr)
a traditional German unit of weight or mass, comparable to the traditional quintal and to the English hundredweight. Similar units were used in Scandinavia. Originally the zentner was equal to 100 pfund, or German pounds. 100 pfund varied from 110 to as much as 120 pounds avoirdupois (49.9-54.4 kilograms), depending on the market. After the introduction of the metric system in Germany, the zentner was redefined to equal to exactly 50 kilograms, which is about 110.231 pounds. In English, the zentner is commonly spelled **centner**.

zepto- (z-)
a metric prefix denoting 10^{-21} (one sextillionth). Adopted by the CGPM in 1990, the prefix is derived from the Latin *septem*, meaning 7, because this is the seventh prefix (n = 7 in 10^{-3n}) in the SI system of metric prefixes. The *s* was replaced by a *z* to avoid confusion with the abbreviation for the second, which is an SI base unit.

zetta- (Z-)
a metric prefix denoting 10^{21} (one sextillion). The prefix was coined to parallel the prefix zepto-.

zettameter (Zm)
a metric unit of distance equal to 10^{21} meters or 10^{18} kilometers. One zettameter equals about 32.408 kiloparsecs (kpc) or 105 702 light years. This is a little more than the diameter of the Milky Way galaxy in which we live.

Zhubov scale
a scale for reporting ice coverage of polar seas; see ball.

zoll
the traditional German inch, equal to 1/12 fuss. Originally the zoll was equal to 1.037 inches (about 2.634 centimeters). In Switzerland, it is now considered a metric unit equal to exactly 3 centimeters (1.1811 inches). There's no change in the plural.

Typeset by Brian Guadalupe

If you so requested, here are my Twitter, YouTube, Soundcloud, and Instructables accounts.

Don't forget to drop me a letter!

Print version *soon*.