

seven units, honest digits, and how wrong you're allowed to be

The seven fundamental units

Length

metre (m)

Mass

kilogram (kg)

Time

second (s)

Temperature

kelvin (K)

Electric current

ampere (A)

Luminous intensity

candela (cd)

Amount of substance

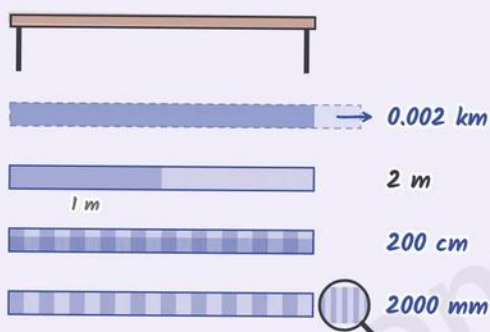
mole (mol)

systems: CGS centimetre gram second, MKS metre kilogram second, FPS foot pound second, and SI (1971). All but FPS are decimal, so a conversion only shifts the point

A physical quantity

- a physical quantity = a number $\times$ a unit: without its unit the number means nothing
- change the unit and the number changes the other way:

$$n_1 u_1 = n_2 u_2$$



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the same length in four units: the smaller the unit, the bigger the number; $n_1 u_1 = n_2 u_2$

The two supplementary units *

- plane angle: radian (rad), $d\theta = ds/r$, arc over radius
- solid angle: steradian (sr), $d\Omega = dA/r^2$; a whole sphere subtends 4π sr
- both are ratios of like quantities, so both are dimensionless

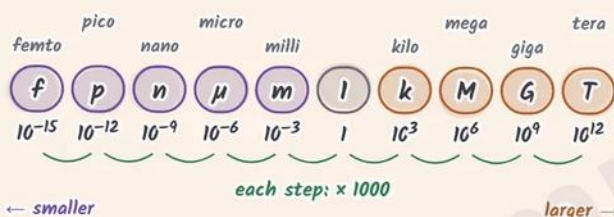
free marks in theory

Conventions for writing SI units

- full name starts small even for a person (newton, joule); the symbol is capital (N, J)
- no plural, no full stop: 20 N, never 20 Ns or 20 N.
- one ratio: m/s^2 or $m \cdot s^{-2}$, never $m/s/s$
- never mix a name with a symbol: J/kg K, not joule/kg K
- one prefix only: 10^{-6} s is a microsecond, never 1 mm s
- a space between multiplied units: ms is a millisecond, $m \cdot s^{-1}$ a speed

Prefixes

- a prefix is a power of ten on the unit: shift the decimal point



the prefixes from femto to tera: each step is $\times 1000$