



Commonly used metric system units, symbols, and prefixes

In the International System of Units – SI – each physical quantity – length, mass, volume, etc. – is represented by a specific SI unit. Larger and smaller multiples of that unit are made by adding SI prefixes.

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Commonly used metric system units and symbols

Quantity measured	Unit	Symbol	Relationship
Length, width, distance, thickness, girth, etc.	millimeter	mm	10 mm = 1 cm
	centimeter	cm	100 cm = 1 m
	meter	m	
	kilometer	km	1 km = 1000 m
Mass ("weight")*	milligram	mg	1000 mg = 1 g
	gram	g	
	kilogram	kg	1 kg = 1000 g
	metric ton	t	1 t = 1000 kg
Time	second	s	
Temperature	degree Celsius	°C	
Area	square meter	m ²	
	hectare	ha	1 ha = 10 000 m ²
	square kilometer	km ²	1 km ² = 100 ha
Volume	milliliter	mL	1000 mL = 1 L
	cubic centimeter	cm ³	1 cm ³ = 1 mL
	liter	L	1000 L = 1 m ³
	cubic meter	m ³	
Speed, velocity	meter per second	m/s	
	kilometer per hour	km/h	1 km/h = 0.278 m/s
Density	kilogram per cubic meter	kg/m ³	
Force	newton	N	
Pressure, stress	kilopascal	kPa	

Power	watt kilowatt	W kW	1 kW = 1000 W
Energy	kilojoule megajoule kilowatt hour	kJ MJ kW·h	1 MJ = 1000 kJ 1 kW·h = 3.6 MJ
Electric current	ampere	A	

* See *Is it "weight" or "mass"?* in the FAQ.

The most commonly used metric prefixes

This table shows the most commonly used SI prefixes. For a complete list of SI prefixes, including their origins, see [SI prefixes and their etymologies](#).

Prefix	Symbol	Factor	Numerically	Name
giga	G	10^9	1 000 000 000	billion**
mega	M	10^6	1 000 000	million
kilo	k	10^3	1 000	thousand
centi	c	10^{-2}	0.01	hundredth
milli	m	10^{-3}	0.001	thousandth
micro	μ	10^{-6}	0.000 001	millionth
nano	n	10^{-9}	0.000 000 001	billionth**

** The terms *billion*, *trillion*, etc., can be ambiguous. The terms are used here in the American English sense, but British English traditionally defined *billion* as a million million, rather than a thousand million. However, recent British usage tends to match the American meanings.

A note about usage

Although unit names are ordinary words, note that unit symbols

- are case-sensitive, so uppercase and lowercase letters have different meanings — for example, mm is the millimeter (one-thousandth of a meter), but Mm is the megameter (one million meters);
- don't have singular and plural forms — it's 1 mL, 2 mL (no "s" at the end); and
- aren't abbreviations, so there's no period after a unit symbol (unless it happens to fall at the end of a sentence).

For more details on usage, including some common errors, read the USMA's page on [correct SI-metric usage](#). In addition, [the FAQ](#) includes some information on usage.

Some examples and relationships among units

1 mL = 1 cm³

1 milliliter is the same volume as 1 cubic centimeter.

1 mL of water has a mass of approximately 1 g

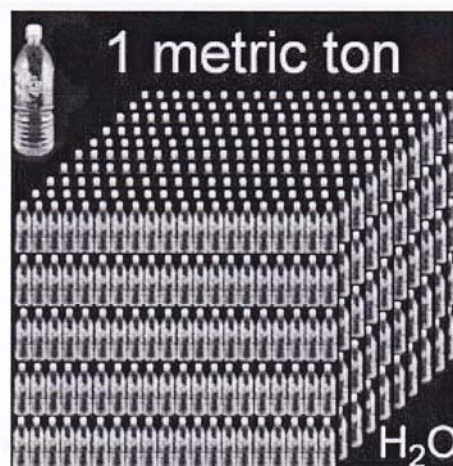
The mass of 1 milliliter of water is approximately 1 gram.

1 L of water has a mass of approximately 1 kg

The mass of 1 liter of water is therefore approximately 1 kilogram.

1 m³ of water has a mass of approximately 1 t

There are 1000 liters in a cubic meter, so the mass of 1 cubic meter of water is approximately 1000 kilograms or 1 metric ton.



1 liter of water weighs 1 kilogram, so 1 cubic meter — 1000 liters — of water weighs 1000 kilograms or 1 metric ton.

The mass of a nickel is 5 g

A US nickel weighs 5 grams, and a penny weighs 2.5 grams.

A typical doorknob is 1 m high

Although there's no precise standard for doorknob heights, they're often about 1 meter above the floor.



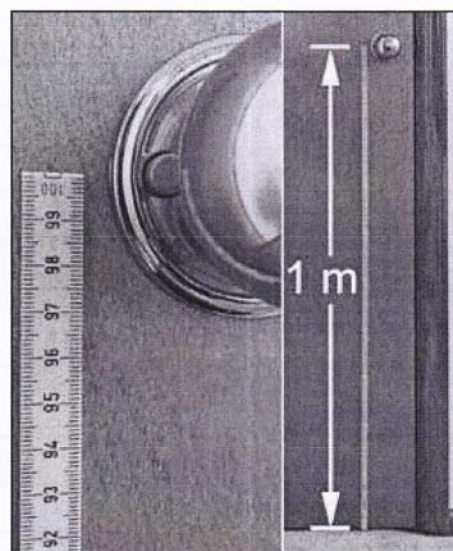
A US cent weighs exactly 2.5 g, while the nickel weighs exactly 5 g.

The diameter of a CD or DVD is 12 cm

A CD or DVD is 12 centimeters (120 millimeters) across. The diameter of the center hole is 15 millimeters.

1 ha is 100² m²

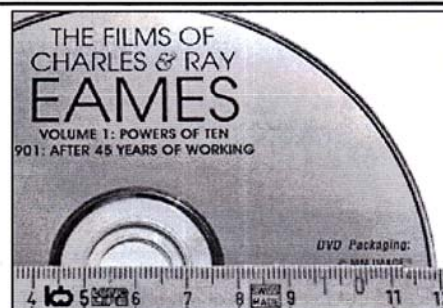
1 hectare is 10 000 square meters, equivalent to the area of a square 100 meters on a side. A football field is about 100 meters long, so imagine a square the length of a football field on each side, and that's 1 hectare.



A doorknob is typically about 1 m high.

Approximate conversion factors from inch-pound to metric units

This table gives easily remembered, approximate conversion factors for some common units, as well as more precise factors. **Boldfaced values are exact.** But remember, estimated values don't warrant precise conversions. If "it was about 100 yards away," then it was about 100 meters away. Only if it was *exactly* 100 yards away would one convert the measurement to 91.44 meters.



The diameter of a CD or DVD is 12 cm.

To convert from	to	multiply by	More precisely, multiply by	Note
acres (US survey)	hectares (ha)	0.4	0.404 687 3	
feet (ft)	meters (m)	0.3	0.3048	
fluid ounces (fl oz)	milliliters (mL)	30	29.573 53	2
gallons (gal)	liters (L)	3.8	3.785 411 784	2
inches (in)	centimeters (cm)	2.54	2.54	
knots	kilometers per hour (km/h)		1.852	
miles (mi)	kilometers (km)	1.6	1.609 344	
miles per gallon (mi/gal)	liters per 100 km (L/(100 km))		divide 235.215 by mi/gal	
miles per hour (mi/h)	kilometers per hour (km/h)	1.6	1.609 344	
nautical miles	kilometers		1.852	
ounces (oz)	grams (g)	28	28.349 52	1
pound-force (lbf)	newtons (N)		4.448 222	
pounds (lb)	kilograms (kg)	0.45 or divide by 2.2	0.453 592 37	1
pounds per square inch (lbf/in ²)	kilopascals (kPa)		6.894 757	
quarts (qt)	liters (L)	0.9	0.946 352 946	2
square feet (ft ²)	square meters (m ²)	0.1	0.092 903 04	
square miles (mi ²)	square kilometers (km ²)	2.6	2.589 988	
yards (yd)	meters (m)	0.9	0.9144	

Note 1. Ounces and pounds refer to avoirdupois units.

Note 2. Fluid ounces, quarts, and gallons refer to US liquid measures.