

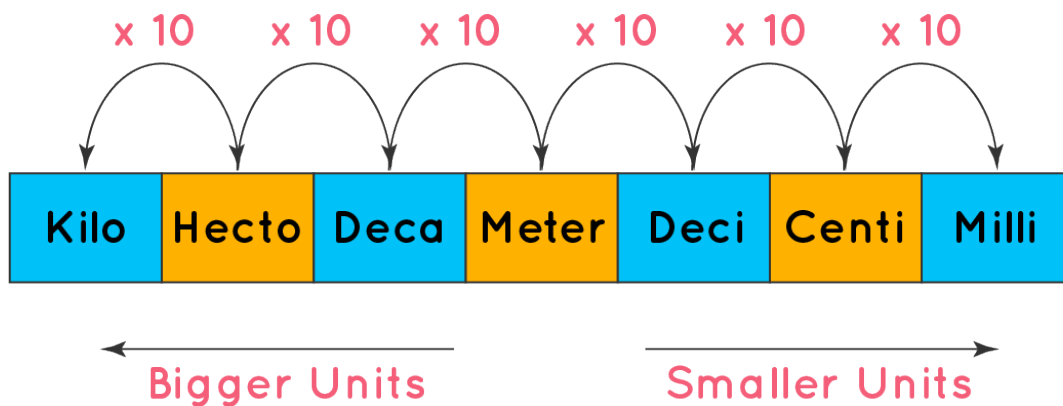
Measuring systems:

1-Imperial:

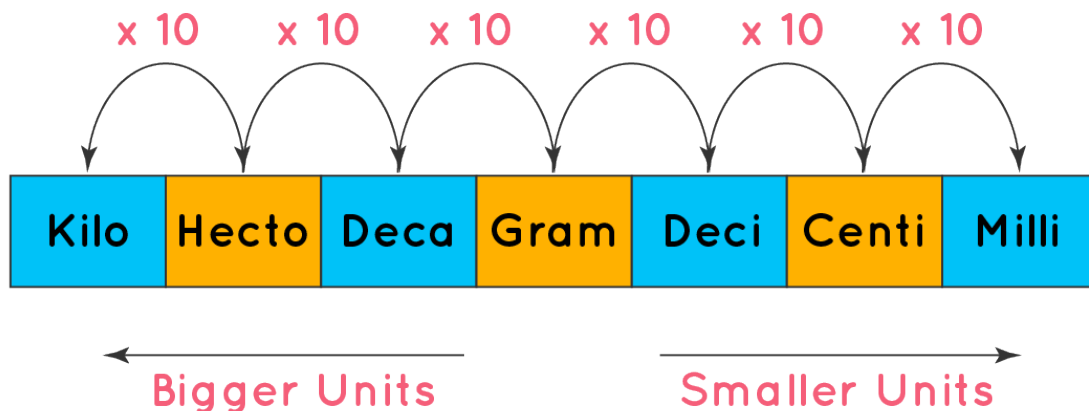
Just like the metrics system, the US follows the imperial system of units, also called the U.S customary units.

2-Metric SI System:

Conversion Metric System for Length

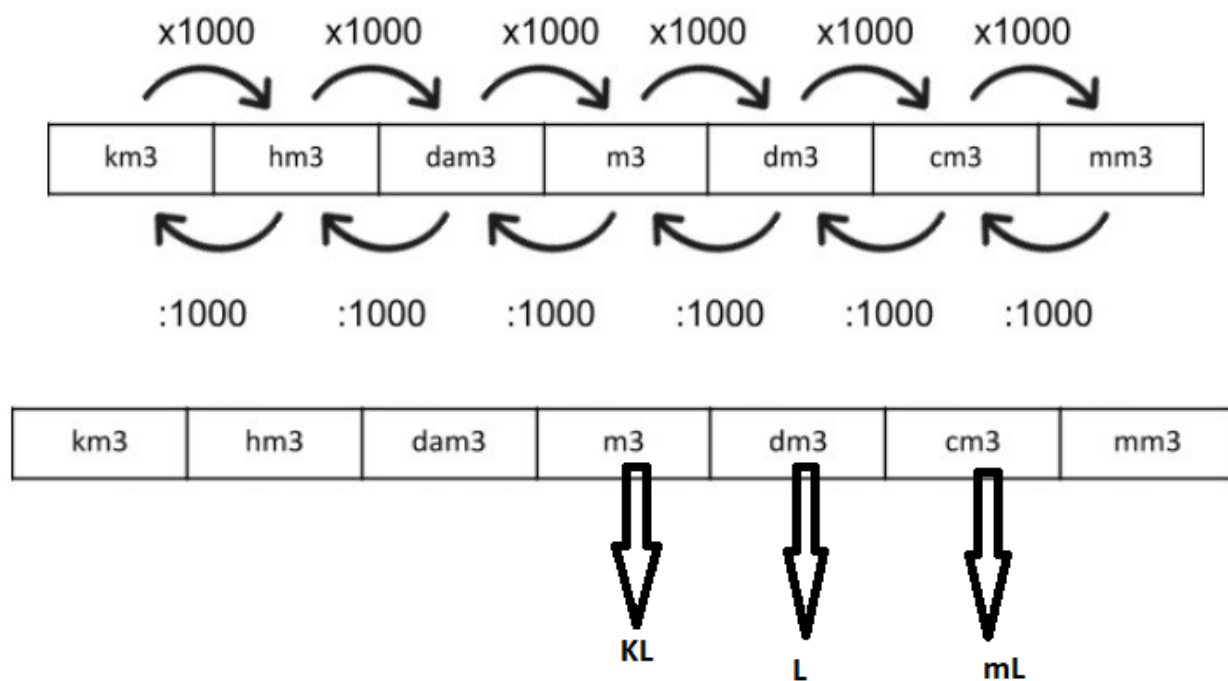


Conversion Metric System for Weight



Prefix	Meaning	Length	Mass	Capacity
kilo-	thousand (1,000)	<i>kilometer</i>	<i>kilogram</i>	<i>kiloliter</i>
hecto-	hundred (100)	<i>hectometer</i>	<i>hectogram</i>	<i>hectoliter</i>
deka-	ten (10)	<i>dekameter</i>	<i>dekagram</i>	<i>dekaliter</i>
*base unit	ones (1)	meter	gram	liter
deci-	tenths (0.1)	<i>decimeter</i>	<i>decigram</i>	<i>deciliter</i>
centi-	hundredths (0.01)	<i>centimeter</i>	<i>centigram</i>	<i>centiliter</i>
milli-	thousandths (0.001)	<i>millimeter</i>	<i>milligram</i>	<i>milliliter</i>

Conversion Metric System for Volume with Length Metric System:



Conversion Metric System for Volume with Mass Metric System:

kiloliter

hectoliter

dekaliter

liter

kilogram

decliter

hectogram

centiliter

dekagram

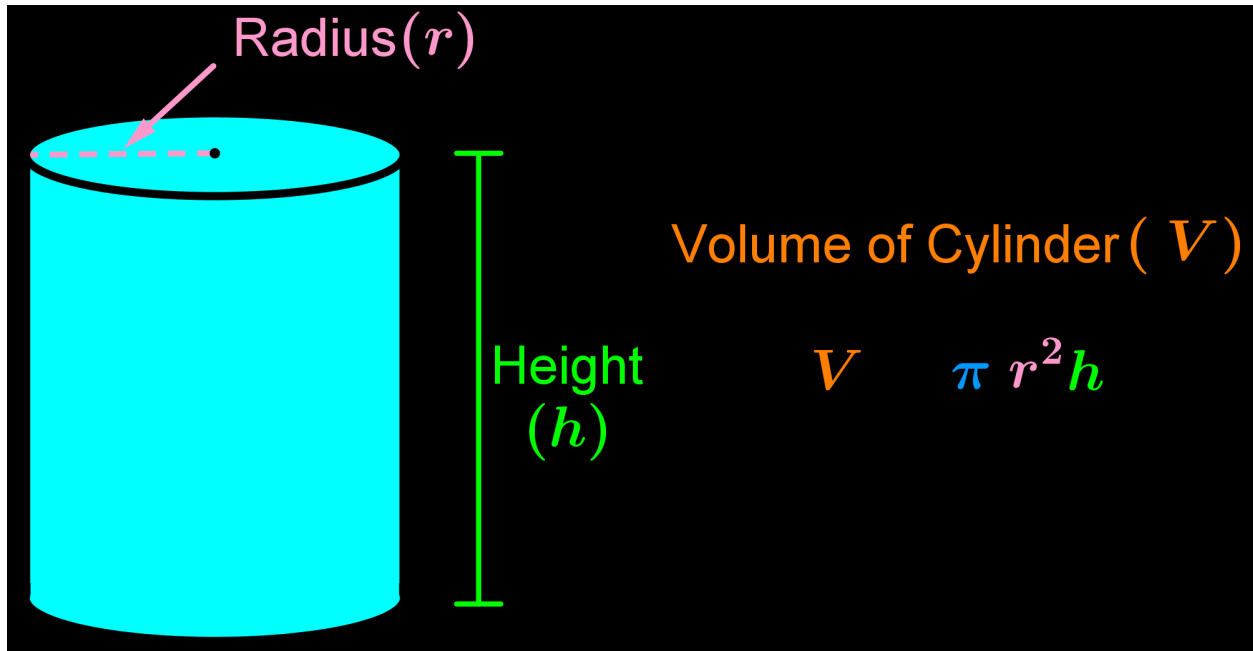
milliliter

gram

decigram

centigram

milligram



- Useful units:

Inches and centimeters:

$$1 \text{ inch} = \text{cm}/2.54$$

Mils and Microns:

A thousandth of an inch is a derived unit of length in a system of units using inches. Equal to 1/1000 of an inch

(Microns is the same as Micrometer) 1 microns = 0.0393701 mils $\text{microns} = \text{mils} / 25.4$

mm and cm are used together

inches " and mils are used together $1 \text{ mils} = 1''/1000$

- Squared Area:

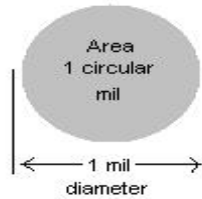
1- Circular mil:

A circular mil is a unit of area, equal to the area of a circle with a diameter of one mil (one thousandth of an inch or 0.0254 mm). It corresponds to approximately $5.067 \times 10^{-4} \text{ mm}^2$.

The area in circular mils, A, of a circle with a diameter of d mils, is given by the formula:

$$A = d^2$$

$$D = \text{square-root}(A)$$



Equivalence to other units of area

1-Square mils:

As a unit of area, the circular mil can be converted to other units such as square inches or square millimetres.

By definition, this area is also equal to 1 circular mil, so:

$$1 \text{ cmil} = \frac{\pi}{4} \text{ mil}^2$$

Which means: $\text{mil}^2 = 4/3.14 * (1\text{cmil}) = 1.273 * (1\text{cmil})$

Area = 0.7854 square mils

Area = 1 circular mil

Area = 1 square mil

Area = 1.273 circular mils



Square inches:

$$1\text{cmil} = 7.854 \times 10^{-7} \text{in}^2$$

Square millimeter:

$$1\text{cmil} = 5.067 \times 10^{-4} \text{mm}^2$$

Note:

$$\text{kCmil} = \text{MCM} = 1000\text{Cmil}$$

We first convert from kcmil to circular mil

Cmil is used with feet' instead of meters

- Wire Size Unit:

Standards:

American Wire Gauge (AWG):

Wire Gauge Conversion Chart									
Diameter			Area		Diameter			Area	
AWG	in.	mm	CMA	mm ²	AWG	in.	mm	CMA	mm ²
4/0 (0000)	0.46	11.68	212000	107	14	0.062	1.57	4110	2.08
3/0 (000)	0.41	10.41	168000	85	15	0.057	1.45	3260	1.65
2/0 (00)	0.365	9.27	133000	67.4	16	0.051	1.30	2580	1.31
1/0 (0)	0.325	8.26	106000	53.5	17	0.045	1.14	2050	1.04
1	0.289	7.34	83700	42.4	18	0.040	1.02	1620	0.823
2	0.258	6.55	66400	33.6	19	0.036	0.91	1290	0.653
3	0.229	5.82	52600	26.7	20	0.032	0.81	1020	0.518
4	0.204	5.18	41700	21.2	21	0.0285	0.72	810	0.41
5	0.182	4.62	33100	16.8	22	0.0253	0.643	642	0.326
6	0.162	4.11	26300	13.3	23	0.0226	0.574	509	0.258
7	0.144	3.66	20800	10.5	24	0.0201	0.511	404	0.205
8	0.128	3.25	16500	8.37	25	0.0179	0.45	320	0.162
9	0.114	2.90	13100	6.63	26	0.0159	0.404	254	0.129
10	0.102	2.59	10400	5.26	27	0.0142	0.361	202	0.102
11	0.091	2.31	8230	4.17	28	0.0126	0.320	160	0.081
12	0.081	2.06	6530	3.31	29	0.0113	0.29	127	0.0642
13	0.072	1.83	5180	2.62	30	0.01	0.254	101	0.0509

Standard wire gauge (SWG) or British / Imperial wire gauge (BWG):

SWG #	Diameter (mm)	SWG #	Diameter (mm)
7/0	12.7	23	0.61
6/0	11.786	24	0.559
5/0	10.973	25	0.508
4/0	10.16	26	0.4572
3/0	9.449	27	0.4166
2/0	8.839	28	0.3759
0	8.23	29	0.3454
1	7.62	30	0.315
2	7.01	31	0.2946
3	6.401	32	0.2743
4	5.893	33	0.254
5	5.385	34	0.2337
6	4.877	35	0.2134
7	4.47	36	0.193
8	4.064	37	0.1727
9	3.658	38	0.1524
10	3.251	39	0.1321
11	2.946	40	0.1219
12	2.642	41	0.1118
13	2.337	42	0.1016
14	2.032	43	0.0914
15	1.829	44	0.0813
16	1.626	45	0.0711
17	1.422	46	0.061
18	1.219	47	0.0508
19	1.016	48	0.0406
20	0.914	49	0.0305
21	0.813	50	0.0254
22	0.711		

Square Area:

mm²

KCmil

Diameter:

Inch

mm

