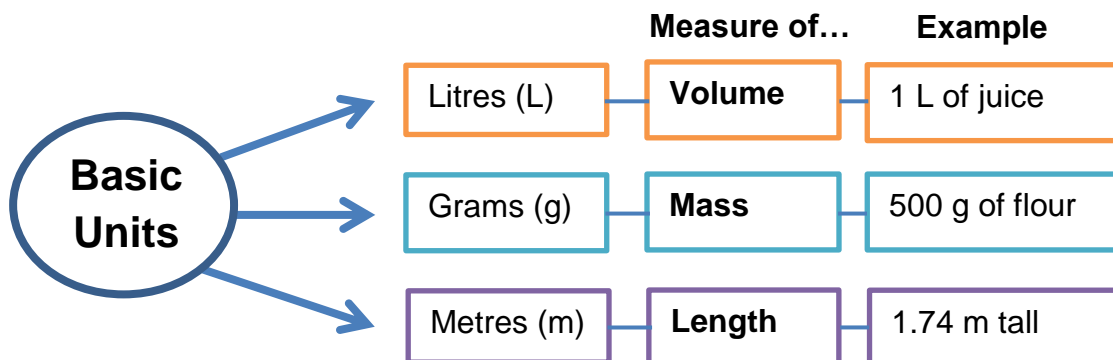


Conversions in the Metric System

The metric system is a system of measuring. It is used for three basic units of measure: **metres (m)**, **litres (L)** and **grams (g)**.



What makes the metric system so useful is that all three units of measure are based on the powers of ten (including 0.000001, 0.001, 0.01, 0.1, 1, 10, 100, 1000).

Let's examine the **METRIC SYSTEM CONVERSION chart** to understand this idea better.

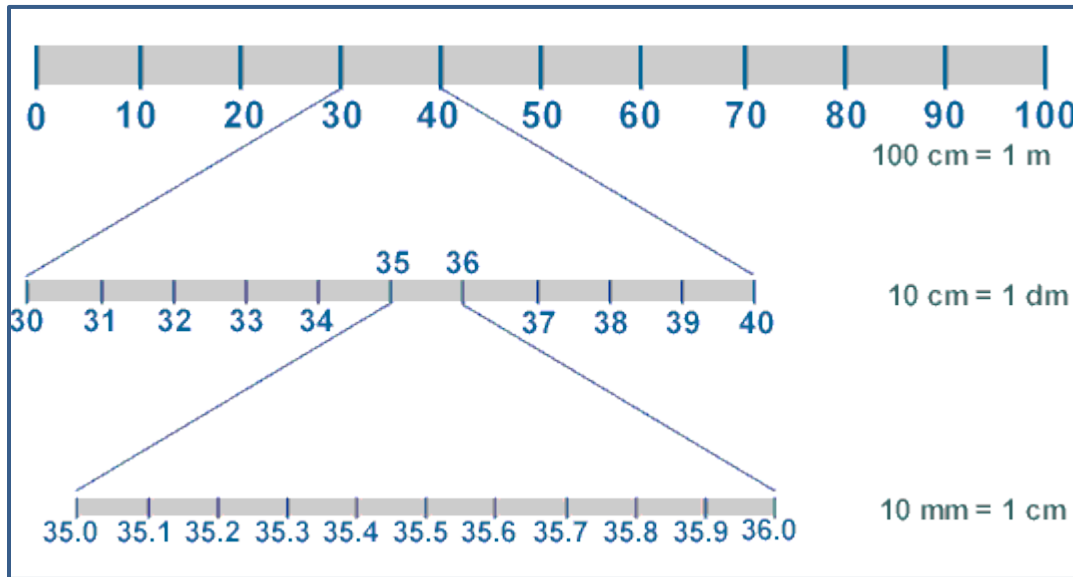
Units	kilo-	hecto-	deka	base	deci	centi-	milli-	micro
Values	1,000	100	10	1	0.1	0.01	0.001	0.000001
Prefix	k-	h-	da-	m g L	d-	c-	m-	mc- or μ-
Values (compared to base)	1000x bigger	100x bigger	10x bigger	1	10x smaller	100x smaller	1000x smaller	1,000,000 x smaller

In this chart, the metre (m), gram (g), and litre (L) have a value of 1. Units of measurement to the right of the base unit are becoming smaller and smaller. Units of measure to the left of the base unit are becoming larger and larger.

For example, given a metre we notice the following unit conversions to the right of the base unit:

There are 10 dm in a metre, Thus, 1 dm = 1/10 m = 0.1 m	There are 100 cm in a metre, Thus, 1 cm = 1/100 m = 0.01 m	There are 1000 mm in a metre, Thus, 1 mm = 1/1000 m = 0.001 m
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Conversions in the Metric System



Since the metric system of measurement is based on powers of ten (10) converting between units is a snap!

PART A – Ratio & Proportion Method

Example 1: Convert 1.74 m into cm.

To convert meters to centimeters we need to first identify the larger unit. Looking at the Metric System chart we notice that a centimeter is 100 times smaller than a meter.

$$\text{Thus, } 1 \text{ m} = 100 \text{ cm}$$

Knowing this we can set up a **proportion** to convert 1.74 m into cm.

Remember! A **proportion** is a comparison of two equal ratios in which order matters.

On the Left Hand Side (L.H.S.) of the proportion, list the ratio we know. On the Right Hand Side (R.H.S), list the ratio we are trying to find out. Solve for the unknown value using cross multiplication.

$$\frac{m}{cm} = \frac{m}{cm}$$
$$\frac{1 \text{ m}}{100 \text{ cm}} = \frac{1.74 \text{ m}}{x \text{ cm}}$$
$$1(x) = 1.74(100)$$
$$x = 174 \text{ cm}$$

Thus, there are 174 cm in 1.74 m.

Conversions in the Metric System

Example 2: Convert 4 g into mg.

First we need to identify the larger unit. Looking at the Metric System Chart we notice that a milligram is 1000 times smaller than a gram.

$$\text{Thus, } 1 \text{ g} = 1000 \text{ mg.}$$

Knowing this we can set up a proportion to convert 4 g into mg.

On the Left Hand Side (L.H.S.) of the proportion, list the ratio we know. On the Right Hand Side (R.H.S), list the ratio we are trying to find out. Solve for the unknown value using cross multiplication.

$$\frac{g}{mg} = \frac{g}{mg}$$

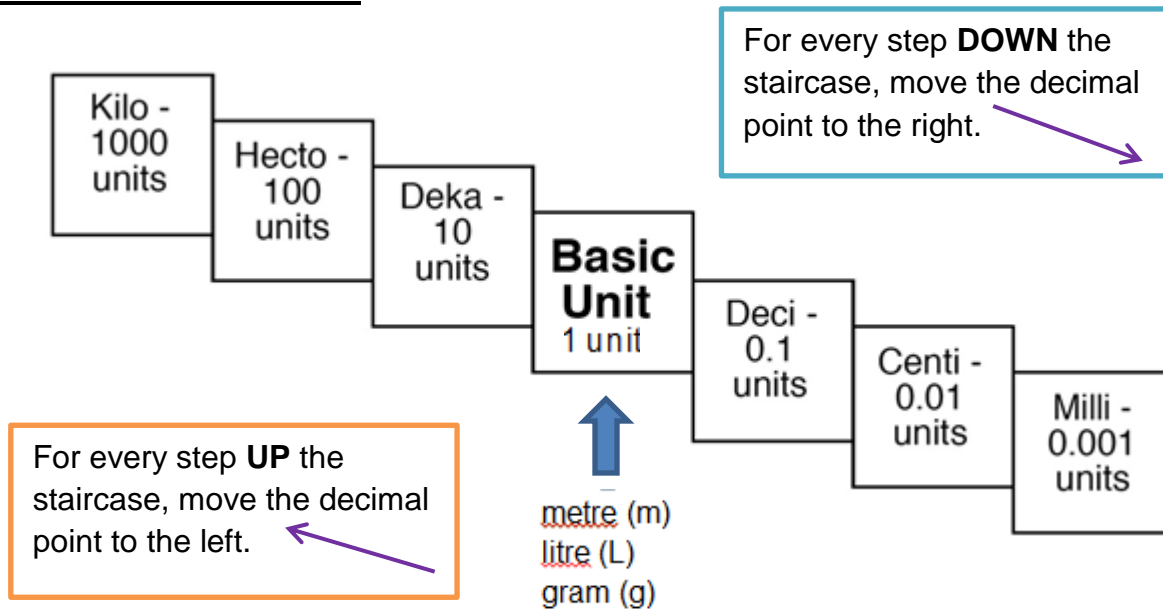
$$\frac{1 \text{ g}}{1000 \text{ mg}} = \frac{4 \text{ g}}{x \text{ mg}}$$

$$1(x) = 4(1000)$$

$$x = 4000 \text{ mg}$$

Thus, there are 4000 mg in 4 g.

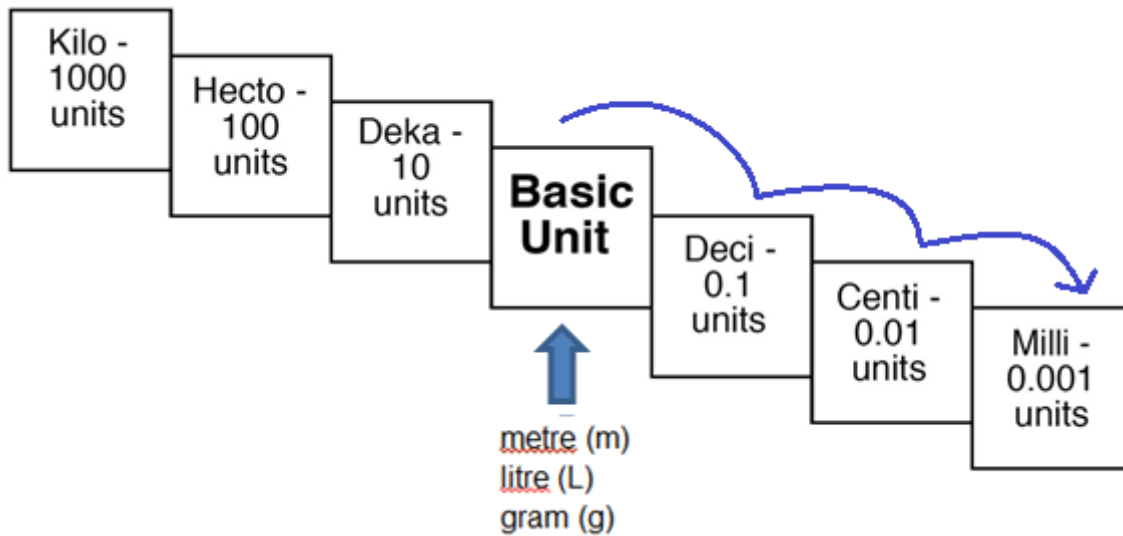
PART B – Ladder Method



Note: When moving down the stairs we are multiplying by 10, 100, 1 000 or 1 000 000. When moving up the stairs we are dividing by 10, 100, 1 000, or 1 000 000.

Conversions in the Metric System

Example 3: Convert 0.0254 L into mL.



Beginning at the base unit litre (L), we have to take three steps **DOWN** the stairs to reach milliliters (mL).

Thus, we will multiply 0.0254 by 1 000 by moving the decimal point three spaces to the right.

$$0.0254 \times 1\,000 = 0.0254$$

Thus, there are 25.4 mL in 0.0254 L.

Example 4: Convert 35809.2 mg into kg.

Beginning at milligrams (mg), we have to take six steps up the stairs to reach kilograms (kg).

Thus, we will divide 35809.2 mg by 1 000 000 by moving the decimal point six spaces to the left.

$$35809.2 \div 1\,000\,000 = 35809.2$$

Thus, there is 0.0358092 kg in 35809.2 mg.

Notice that both starting units (mm and cm) cancel out and you are left with the desired unit (dm).

Conversions in the Metric System

Exercises:

1. Convert the following larger units of the Metric System to the equivalent smaller units.

- | | | | |
|--------------|----|-------------|----|
| a) 5 g = | mg | f) 1 g = | mg |
| b) 2 L = | mL | g) 54 g = | mg |
| c) 3.5 g = | mg | h) 2.5 L = | mL |
| d) 0.03 g = | mg | i) 3.6 cm = | mm |
| e) 0.002 L = | mL | j) 18 cm = | mm |

2. Convert the following smaller units of the Metric System to the equivalent larger units.

- | | | | |
|--------------|----|-------------|---|
| a) 610 mL = | L | f) 90 mg = | g |
| b) 306 mm = | cm | g) 115 mL = | L |
| c) 1520 g = | kg | h) 68 mL = | L |
| d) 890 mg = | g | i) 110 mg = | g |
| e) 2500 mL = | L | j) 500 mg = | g |

Solutions:

- | | | | | | |
|----------------|-------------|----|-------------|--------------|----|
| 1. a) 5 g = | 5000 | mg | f) 1 g = | 1000 | mg |
| b) 2 L = | 2000 | mL | g) 54 g = | 54000 | mg |
| c) 3.5 g = | 3500 | mg | h) 2.5 L = | 2500 | mL |
| d) 0.03 g = | 30 | mg | i) 3.6 cm = | 36 | mm |
| e) 0.002 L = | 2 | mL | j) 18 cm = | 180 | mm |
| | | | | | |
| 2. a) 610 mL = | 0.61 | L | f) 90 mg = | 0.09 | g |
| b) 306 mm = | 30.6 | cm | g) 115 mL = | 0.115 | L |
| c) 1520 g = | 1.52 | kg | h) 68 mL = | 0.068 | L |
| d) 890 mg = | 0.89 | g | i) 110 mg = | 0.11 | g |
| e) 2500 mL = | 2.5 | L | j) 500 mg = | 0.5 | g |