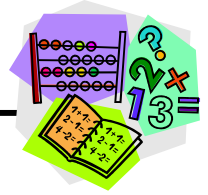


# The Metric System



The **Metric System** was created so that people around the world could talk about measurement using the same standard system.

The Metric System is sometimes called the SI System. SI refers to *System International*, commonly known as Standard International Units.

The following **prefixes** (word beginnings) are used with all SI measurements to represent different amounts of each **base unit**.

## Metric System Prefixes

SI Prefixes							
	milli	centi	deci	base unit	deca	hecto	kilo
Relationship to base unit	$\frac{1}{1000}$ of the base unit	$\frac{1}{100}$ of the base unit	$\frac{1}{10}$ of the base unit	1	10 base units	100 base units	1000 base units
	1000 milli = 1 base unit	100 centi = 1 base unit	10 deci = 1 base unit	1	$\frac{1}{10}$ deca = 1 base unit	$\frac{1}{100}$ hecto = 1 base unit	$\frac{1}{1000}$ kilo = 1 base unit

Example: Any measurement that starts with “kilo” means 1000 times the base unit. If the base unit is metres, “kilo” refers to 1000 metres.

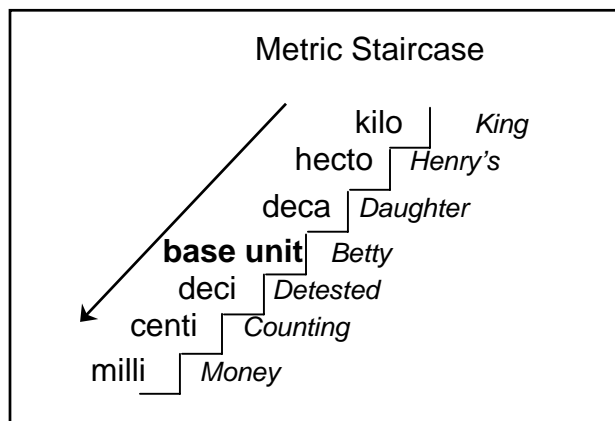
## Metric System Base Units

Measurement	Base Unit	Abbreviation	Measuring Tool/Instrument
Length	metre	m	metre-stick
Mass	gram	g	balance scale
Capacity	litre	L	graduated cylinder, measuring cup
Volume	centimetre cubed	cm <sup>3</sup>	graduated cylinder, measuring cup
Temperature	degree Celsius	°C	thermometer
Time	seconds	s	clocks, 24 hour timepieces

# Converting Metric Units

## Larger to Smaller Units

The diagram below shows the metric prefixes as a staircase to demonstrate how the prefixes make the base unit smaller or bigger.



Use this ACRONYM to help you remember the order of the units:

**K**ing  
**H**enry's  
**D**aughter  
**B**etty  
**D**etested  
**C**ounting  
**M**oney

When converting from larger to smaller metric units, multiply by 10 for each step down the staircase (each change in prefix).

Question	Explanation	Solution
How many deci in 1 base unit?	1 step down, $\times 10$	1 base unit = 10 deci
How many centi in 1 base unit?	2 steps down, $10 \times 10$	1 base unit = 100 centi
How many milli in 1 base unit?	3 steps down, $10 \times 10 \times 10$	1 base unit = 1000 milli
How many base units in 1 kilo?	3 steps down, $10 \times 10 \times 10$	1 kilo = 1000 base units
How many milli in 1 kilo?	6 steps down, $10 \times 10 \times 10 \times 10 \times 10 \times 10$	1 kilo = 1 000 000 milli

## Examples

- A) How many **centimetres** in 32 **metres**?

$$32 \times 10 \times 10 = 3200$$

There are 3200 centimetres in 32 metres.

- B) How many **milligrams** in 4 **centigrams**?

$$4 \times 10 = 40$$

There are 40 milligrams in 4 centigrams.

- C) Convert 76 **kilolitres** to **litres**.

$$76 \times 10 \times 10 \times 10 = 76\ 000$$

76 kilolitres converts to 76 000 litres.

Another way to convert units using the metric staircase is to move the decimal one space to the right for each step downward.

## Examples

- A) How many **centimetres** in 24 **metres**?

2 steps down from metre to centimetre

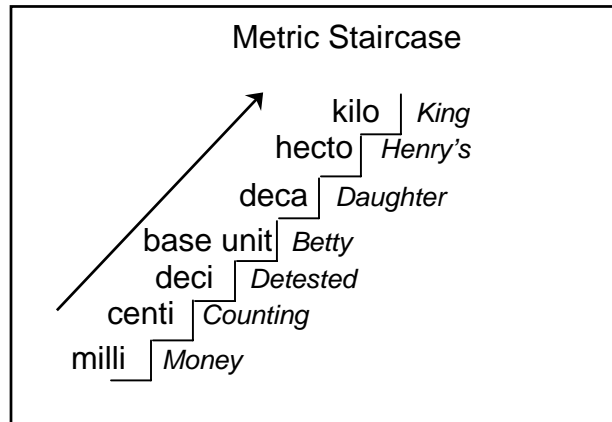
24    Move the decimal 2 spaces to the right. Use zeros as place holders.  
There are 2400 centimetres in 24 metres.

- B) Convert 7.2 **kilometres** to **metres**.

3 steps down from kilometres to metres

72    Move the decimal 3 spaces to the right. Use zeros as place holders.  
There are 7200 metres in 7.2 kilometres.

## Smaller to Larger Units



To convert from smaller to larger metric units, multiply by  $\frac{1}{10}$  (or 0.1) for each step up the staircase.

**OR**

Divide by 10 for each step up the staircase.

**Remember that  $n \div 10 = n \times \frac{1}{10}$ , so the operation is the same!**

Question	Explanation	Solution
How many centi in 1 milli?	1 step up, $\times \frac{1}{10}$	1 milli = 0.1 centi
How many deci in 1 milli?	2 steps up, $\times \frac{1}{10} \times \frac{1}{10}$	1 milli = 0.01 deci
How many base units in 1 milli?	3 steps up, $\times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$	1 milli = 0.001 base units
How many kilo in 1 base unit?	3 steps up, $\times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$	1 base unit = 0.001 kilo

## Examples

A) How many **kilometres** in 396.2 **metres**?

$$396.2 \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = 396.2 \times \frac{1}{1000} = 0.3962 \quad \text{OR} \quad 396.2 \div 1000 = 0.3962$$

There are 0.3962 kilometres in 396.2 metres.

B) Convert 64 **milligrams** to **centigrams**.

$$64 \times \frac{1}{10} = 6.4 \quad \text{OR} \quad 64 \div 10 = 6.4$$

64 milligrams can be converted to 6.4 centigrams.

Another way to convert units using the metric staircase is to move the decimal one space to the left for each step upward.

## Examples

A) Convert 1448 **millimetres** to **metres**.

3 steps up from millimetres to metres  
1448 Move the decimal 3 spaces to the left.  
1448 millimetres is 1.448 metres.

B) 62.3 **litres** is how many **kilolitres**?

3 steps up from litres to kilolitres  
0623 Move the decimal 3 spaces to the left. Use zeros as place holders.  
62.3 litres is 0.0623 kilolitres.

C) 97 **centigrams** is how many **grams**?

2 steps up from centigrams to grams  
97 Move the decimal 2 spaces to the left.  
97 centigrams is 0.97 grams.

### Think About ...

... how you use measurement at **home** and think of an example of when you or someone in your family used measurement at home.

... how you use measurement in your **community** and think of an example of a metric measurement that is posted for everyone in your community to see.

... how people use measurement in the **workplace** and think of an example of a job in which measurement is very important.



## Practice: Converting Metric Units

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1. Complete the following conversions.
  - a) How many centimetres in 47 metres?
  - b) How many milligrams in 6 centigrams?
  - c) Convert 83 kilolitres to litres.
  - d) How many centimetres in 32 metres?
  - e) Which is bigger, 120 centimetres or 1.2 metres?
  - f) Which is smaller, 44 mm or 44 dm?
  - g) Which is bigger, 3.6 g or 365 milligrams?
  - h) Which is smaller, 3320 m or 3.2 km?
  - i) Convert 5.6 kilometres to metres.
  - j) How many kilometres in 123.6 metres?
  - k) Convert 78 milligrams to centigrams.
  - l) Convert 2338 millimetres to metres.
  - m) 46.7 litres is how many kilolitres?
  - n) 88 centigrams is how many grams?

