


Metric Units and Conversions

What is a Unit Conversion?

- A unit conversion is a changing of one unit to another.
- Unit Examples:
 - meters
 - grams
 - inches
 - feet
 - pounds
 - seconds
- **Any time you write down a number in physics, you should have a unit written after it!!!**

What is a Metric Unit?

- Metric units are the universally excepted units around the world (except for the US). They are the easiest to convert.
- Metric Unit Examples:
 - meters
 - liters
 - grams



Base Units – all other metric units are based off of these (km, cm, ml, kg)

Dimensional Analysis

Common Metric Units (Prefixes)

Abbreviation

- Mega- M
- kilo- k
- hecto- h
- deka- da or D
- Base- m, l, g
- deci- d
- centi- c
- milli- m
- micro- μ
- nano- n

Metric Conversion Factors

- $1 \text{ km} = 1000 \text{ m}$
- $100 \text{ cm} = 1 \text{ m}$
- $1000 \text{ mm} = 1 \text{ m}$
- $10 \text{ mm} = 1 \text{ cm}$

Knowing these conversion factors makes calculating conversions easy!

These also work for liters and grams. Just replace the base unit (m) with a (g) or (l).

Conversion Factor Cards

- Each group has a set of cards with common conversion factors on them that you will be using for the next two days.

Front

$$\frac{1 \text{ m}}{100 \text{ cm}}$$

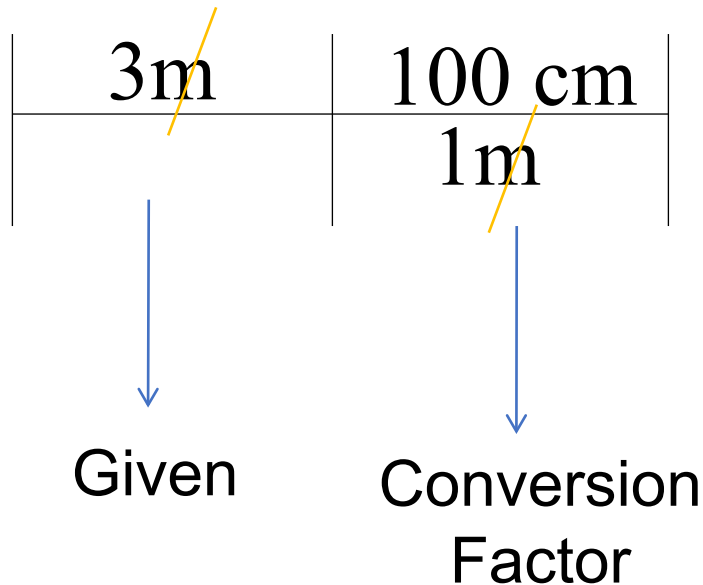
Back

$$\frac{100 \text{ cm}}{1 \text{ m}}$$

Dimensional Analysis

- A mathematical way to convert one unit to another. This works for metric units and non-metric (English) units.
- This works by taking the unit you are given and multiplying it by a conversion factor.

Example 1: Convert 3m to cm

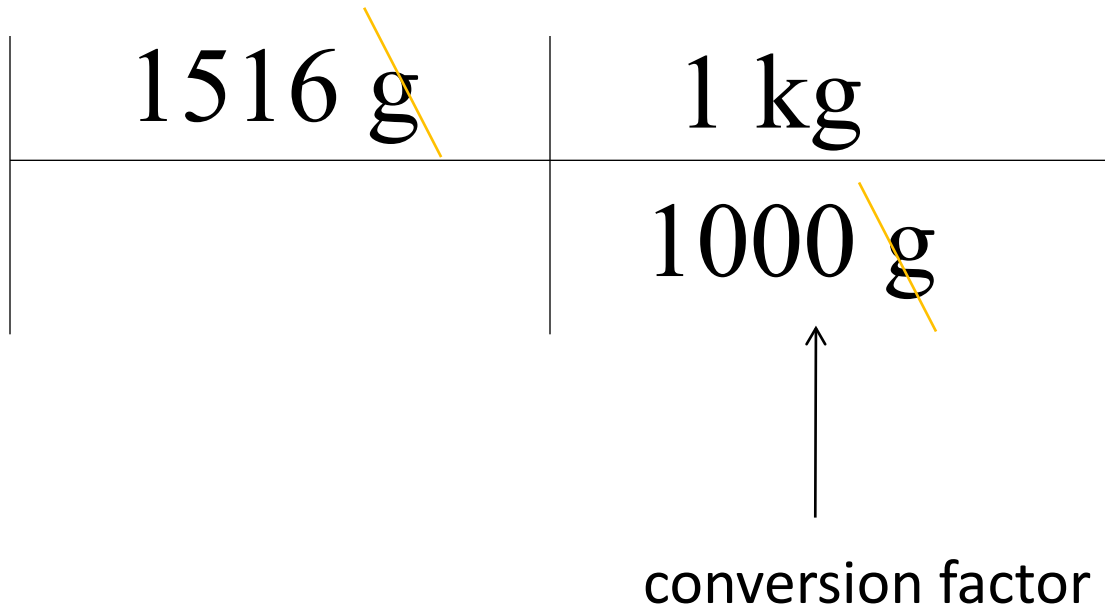


$$\frac{(3 \times 100)}{1} = 300\text{cm}$$

For meters to cancel out, meters in the conversion factor must be on the opposite side of the fraction (fence).

Multiply every number on top of the fence and divide by the bottom.

Example 2: Convert 1516 g to kg



$$\frac{(1516 \times 1)}{1000} = 1.516 \text{ kg}$$

Whiteboard Problem 1

- Convert 1200 cm to m.

$$\frac{1200 \cancel{\text{cm}}}{100 \cancel{\text{cm}}} \mid \frac{1 \text{ m}}{1} = \frac{(1200 \times 1)}{100} = 12 \text{ m}$$

Whiteboard Problem 2

- Convert 5200 mL to L.

$$\begin{array}{|c|c|} \hline 5200 \cancel{\text{mL}} & 1 \text{ L} \\ \hline & 1000 \cancel{\text{mL}} \\ \hline \end{array} = \frac{(5200 \times 1)}{1000} = 5.2 \text{ L}$$

Example 3: Convert 7200mm to km

7200 mm	1 cm	1 km
	10 mm	100,000 cm

$$\frac{(7200 \times 1 \times 1)}{(10 \times 100,000)} = .0072 \text{ km}$$

Whiteboard Problem 3

- Convert 3 m to mm.

$$\frac{3\cancel{\text{m}} \quad 100\cancel{\text{cm}} \quad 10\text{mm}}{1\cancel{\text{m}} \quad 1\cancel{\text{cm}}} = \frac{(3 \times 100 \times 10)}{(1 \times 1)}$$

$$= 3000 \text{ mm}$$

Non-Metric (English) Unit Conversions

- Common Conversion Factors

- 5280 ft = 1 mile
- 12 in = 1 ft
- 1 mile = 1600 m
- 1 in = 2.54 cm
- 3 ft = 1 yard



English to Metric
conversion factors

Example 4: Convert 2 miles to ft

2 mi	5280 ft
	1 mi

$$\frac{(2 \times 5280)}{1} = 10,560 \text{ ft}$$

Whiteboard Problem 4

- Convert 3.2 ft to inches.

$$\frac{3.2 \cancel{\text{ft}}}{1 \cancel{\text{ft}}} \times \frac{12 \text{ in}}{1} = \frac{(3.2 \times 12)}{1} = 38.4 \text{ in}$$

Example 5: Convert 5 ft to cm

5 ft	12 in	2.54 cm
	1 ft	1 in

$$\frac{(5 \times 12 \times 2.54)}{(1 \times 1)} = 152.4 \text{ cm}$$

Whiteboard Problem 5

- Convert 50 inches to m.

$$\begin{array}{|c|c|c|} \hline 50 \cancel{\text{in}} & 2.54 \cancel{\text{cm}} & 1 \text{ m} \\ \hline & 1 \cancel{\text{in}} & 100 \cancel{\text{cm}} \\ \hline \end{array} = \frac{(50 \times 2.54 \times 1)}{(1 \times 100)} = 1.27 \text{ m}$$

Warm-Up

Solve using Dimensional Analysis

1. Convert 45 inches to cm.

2. Convert 8 m to inches.

Warm-Up

Using Dimensional Analysis

1. Convert 10ft to cm.

2. Convert 5 km to in.