

# Metric & Imperial Units

## Metric Units

- Developed in Europe in 18<sup>th</sup> Century
- Based on decimal system where each unit is divided into blocks of 10, 100 or 1000 smaller units.
- The three main units for decimal measurement are
  - length in metres (m)
  - mass in kilograms (kg)
  - volume in cubic metres (m<sup>3</sup>) or capacity in litres (l)
- Common equivalences you need to know:
  - Length
    - 10mm = 1 cm
    - 100cm = 1 m
    - 1000m = 1km
  - Mass
    - 1000g = 1kg
    - 1000kg = 1 tonne
  - Volume
    - 1000cm<sup>3</sup> = 1 litre

## Imperial Units

- Used in UK until early 1970's, still used extensively in USA.
- Much less intuitive to see the relationships between units.
  - length in inches, feet and yards {12 inches = 1 foot, 3 feet = 1 yard}
  - mass in pounds (lb), ounces (oz) and stones {16oz = 1lb, 14 lb = 1 stone}
  - volume in fluid ounces, pints and gallons {20 floz = 1 pint, 8 pints = 1 gallon}

## Converting between units

In an exam you may be asked to convert between metric and imperial units.

You will be given the equivalences between a pair of imperial units, for example that 1 yard = 3 feet.

You may be given the equivalences between some lesser known metric and imperial units, for example that 1 acre = 0.4047 hectare.

You are expected to know the following approximate equivalences:

**8km ≈ 5 miles**

**1kg ≈ 2.2 lb**

**1 litre ≈ 1.75 pints**

Past Paper Questions

1.

Aled weighs 12 stone 8 pounds. Thomas weighs 85 kilograms.  
Which of the two is the heavier, and by how much?

[5]

1 stone = 14 pounds

1 kilogram is approximately 2.2 pounds.

$$\begin{array}{r} \text{Aled} \quad 12 \times 14 = 168 \\ \quad \quad \quad + 8 \quad | \\ \hline \quad \quad \quad 176 \text{ lb} \end{array}$$

$$\text{Thomas} \quad 85 \times 2.2 = 187 \text{ lb}$$

So Thomas is heavier by 11 pounds

2.

Sian is driving along a road in Germany, which has a speed limit of 80km per hour.  
She is driving at 55 mph.

By how much is her speed above or below the speed limit?

$$\begin{array}{ccc} 5 \text{ miles} \approx 8 \text{ km} & & \\ \downarrow \times 11 & & \downarrow \times 11 \\ 55 \text{ mph} & & 88 \text{ km/h} \end{array}$$

So she is 8km/h over speed limit.

[3]

3.

There are 1760 yards in a mile.

How many yards are there in a kilometre?

[2]

$$\begin{array}{ccc} 5 \text{ miles} \approx 8 \text{ km} & & \\ \downarrow \div 8 & & \downarrow \div 8 \\ 0.625 \text{ miles} & & 1 \text{ km} \end{array}$$

$$\text{So } 0.625 \times 1760 = 1100 \text{ yards}$$

4.

A cycle club organised a race that takes place over a fortnight. In the race, the competitors travelled a distance of 320 miles in England and 480 kilometres in France.

In which country did the race cover the most distance?

What was the difference between these distances?

[3]

$$\left. \begin{array}{l} 5 \text{ miles} \approx 8 \text{ km} \\ 320 \text{ miles} \approx 512 \text{ km} \end{array} \right\} \times$$

More covered in England by ~~480~~ km  
32

Country in which most distance was covered was England

Difference in the distance covered was 32 km

5.

At the time when the pyramids were built, the Egyptians used different measures from those we use today.

It is believed that

1 pyramid inch = 1.0010846752 inches

1 pyramid cubit = 25 pyramid inches.

We also know that

1 inch = 2.54 cm.

Complete the following table.

[4]

Measure	Equivalent to
1 pyramid cubit	25.027 ... inches, correct to 3 decimal places
1 pyramid inch	2.543 ... cm, correct to 4 significant figures

$$25 \times 1.0010846752 = 25.027$$

$$2.54 \times 1.0010846752 = 2.543$$