

## What do I need to be able to do?

By the end of this unit you should be able to:

- Solve speed, distance, time questions
- Use distance time graphs
- Solve density, mass, volume problems
- Solve flow problems
- Use flow graphs
- Interpret rates of change and their units

## Keywords

**Convert:** change

**Mass:** a measure of how much matter is in an object. Commonly measured by weight

**Origin:** the coordinate (0, 0)

**Volume:** the amount of 3D space a shape takes up

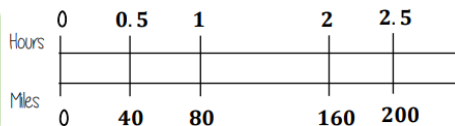
**Substitute:** putting numbers where letters are – replacing numbers into a formula

## Speed, Distance, Time

'per' for every  
e.g. 80 miles per hour (mph)  
Travel 80 miles every hour

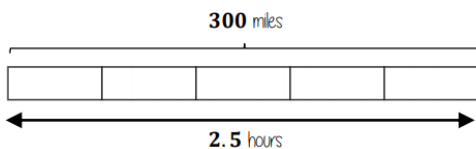
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

You can use a double number line to help you calculate distance



e.g. A boat travels at a constant speed for 2.5 hours. It travels 300 miles.

Bar models can help to calculate mph

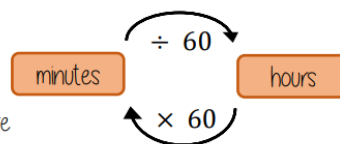


Each part is half an hour  
Each part is 60 miles

## Speed, Distance, Time



Before calculations – make sure you are working in the same units as the speed



Learn or learn how to rearrange the formula for speed, distance and time

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

Substitute in the variables given

$$\text{distance} = \text{speed} \times \text{time}$$

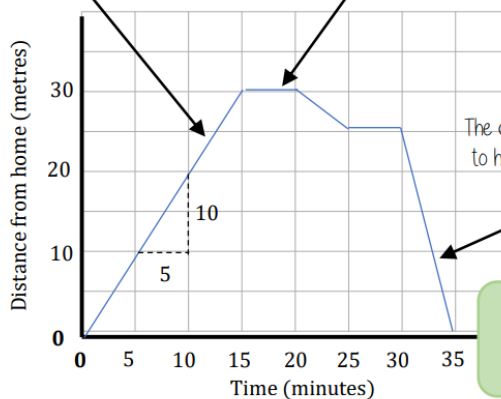
## Distance – Time graphs

The steeper a gradient the faster the speed

Gradient = speed

$\frac{10}{5} = 2$  metres per min

Horizontal lines represent staying still



The distance coming closer to home shows the return journey

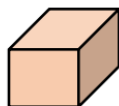
Units are important  
Meters per minute

## Density, Mass, Volume

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{volume} = \frac{\text{mass}}{\text{density}}$$

$$\text{mass} = \text{volume} \times \text{density}$$



$$\text{volume of prism} = \text{Area of cross section} \times \text{Depth}$$

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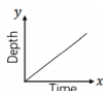
## Flow problems & graphs



This will fill at a constant rate, then as the space decreases it will speed up and the neck of the bottle fill at a faster constant speed



The cylinder will fill at a constant speed



Units are important  
Ensure any volume calculations are the same unit as the rate of flow

## Rates of change & units

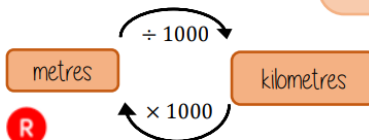
Common rates of change relationships

Revisit your conversions between units of length and capacity

Speed: miles per hour

Exchange rates: euros per pounds

Density: mass per volume



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