KS3 SCIENCE · PHYSICS

Speed and motion revision sheet

Name _____



1. Speed

- **Speed** tells you how far something travels in a certain time.
- In science, speed is usually measured in **metres per second (m/s)**. A speed of 6 m/s means 6 metres travelled every second.
- Other units of speed are **kilometres per hour (km/h)** and **miles per hour (mph)**.
- Compare speeds in the **same unit**. To change m/s into km/h, multiply by 3.6: a speed of 10 m/s is 36 km/h.
- The higher the speed, the shorter the time for the same journey.
- Typical speeds: walking about 1.5 m/s, cycling about 6 m/s, a cheetah about 30 m/s, a passenger jet about 250 m/s.



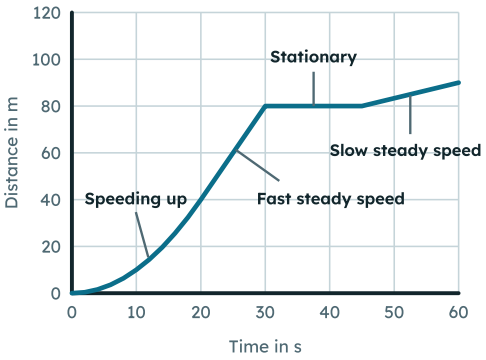
2. Calculating speed

speed = distance ÷ time

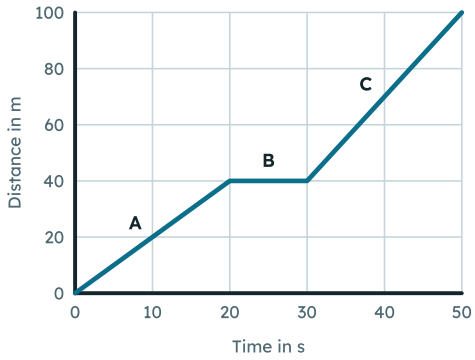
- Measure the **distance** with a tape measure or a metre rule. Measure the **time** with a stopwatch.
- The unit follows the measurements. Metres and seconds give **m/s**. Kilometres and hours give **km/h**.
- **Average speed** = total distance ÷ total time. Use it when a journey has faster and slower parts.

Worked examples. A runner covers 100 m in 20 s: speed = 100 m ÷ 20 s = 5 m/s.
A car travels 150 km in 3 hours: average speed = 150 km ÷ 3 h = 50 km/h.
A cyclist rides at 5 m/s for 20 s: distance = 5 × 20 = 100 m.

3. Distance-time graphs



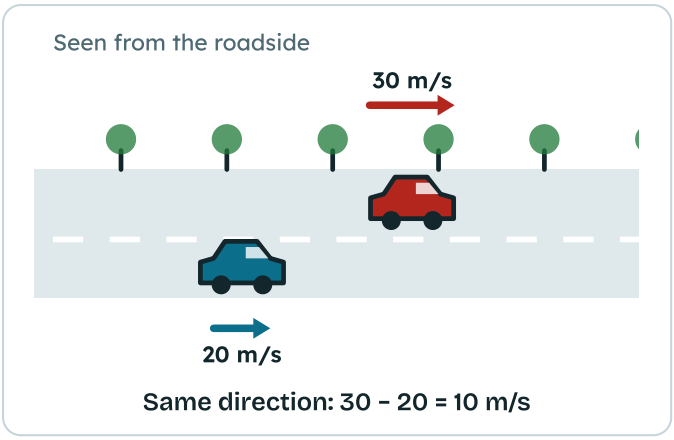
The slope of the line shows the speed

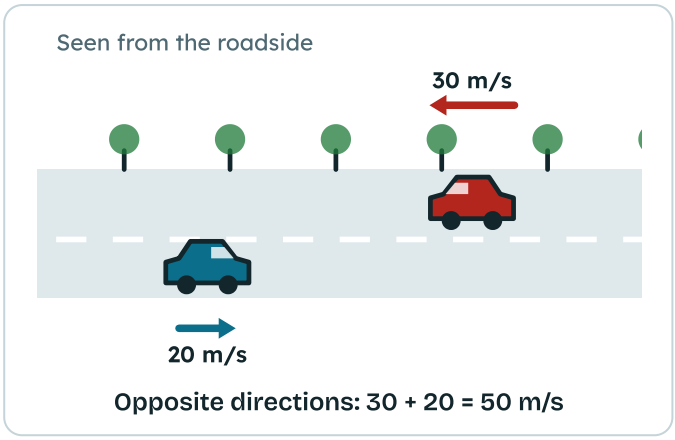


Speed in part A = 40 m ÷ 20 s = 2 m/s

- A **straight line that slopes up** shows a steady speed. A **steeper** line shows a faster speed.
- A **flat line** shows that the object is **stationary**. Time passes, but the distance does not change.
- A **curved line** shows that the speed is changing: the object is accelerating.
- To find a speed from the graph, read off the distance covered in one part and the time it took. Then divide. In part C the object covers 60 m (from 40 m to 100 m) in 20 s, so its speed is 3 m/s.
- Average speed for the whole journey = total distance ÷ total time = 100 m ÷ 50 s = 2 m/s.

4. Relative motion





- How fast something seems to move depends on how the **observer** is moving. This is **relative motion**.
- **Same direction: subtract the speeds.** From the blue car, the red car seems to pull ahead at only 10 m/s.
- **Opposite directions: add the speeds.** From the blue car, the red car seems to rush past at 50 m/s.
- **Same speed and same direction:** the relative speed is zero. The passenger in the seat next to you does not seem to move.
- From a moving car, trees at the roadside seem to slide backwards at the speed of the car.

Watch out

- A flat line on a distance-time graph means **stopped**. It does not mean moving at a steady speed.
- Always give the **unit** with a speed: m/s, km/h or mph.
- Put two speeds in the **same unit** before you compare them.
- For the speed in one part of a graph, use the distance covered **in that part**, not the total so far.

Key words

Speed: how far something travels in a certain time

Time: how long something takes

Kilometres per hour: a unit of speed: the kilometres travelled each hour (km/h)

Average speed: total distance divided by total time

Tape measure: an instrument that measures a distance

Gradient: how steep a line on a graph is

Stationary: not moving

Relative motion: how something seems to move to an observer who is moving too

Observer: the person who watches and measures

Distance: how far something has moved

Metres per second: the unit of speed used most in science (m/s)

Miles per hour: the unit of speed on road signs in the UK (mph)

Stopwatch: an instrument that measures a time

Distance-time graph: shows how far something has travelled at each moment of a journey

Steady speed: a speed that stays the same

Acceleration: how quickly speed increases or decreases

Relative speed: the speed of one object measured from another object

Pictures are illustrations made for this sheet, not real photographs.