

# 9IC SPEED

1 Write down three different units that can be used for speed.

m/s km/h mph

**SB**

2 A horse and rider cover 54 km in 9 hours.

a Calculate the mean speed.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{54 \text{ km}}{9 \text{ h}}$$

$$\text{mean speed} = 6 \text{ unit km/h}$$

b Explain why the fastest speed during the journey was higher than your answer to part a. unless the horse kept a constant speed throughout the whole journey. It would have been travelling faster than this some time and slower some of the time.

3 The distance-time graph shows four children cycling.

a Who cycled the fastest? Explain how you can tell this from the graph. describe the steepness of the line  
Ali - the line is the steepest. His line shows him covering 100 m

in the shortest time.

b Who stopped after 10 seconds? Explain your answer.

Thom - The line becomes horizontal (flat)

c Sunil cycles 40 m in 10 seconds, stops for 5 seconds and then cycles 60 m in the next 10 seconds. Draw a line on the graph to show Sunil's journey.

di How far did Saniya travel in 20 seconds? 100m

ii Calculate her speed.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{100 \text{ m}}{20 \text{ s}}$$

$$\text{speed} = 5 \text{ unit m/s}$$

4a Cars A and B are moving towards each other. Car A is travelling at 30 km/h, and car B is travelling at 40 km/h. What is their relative speed?

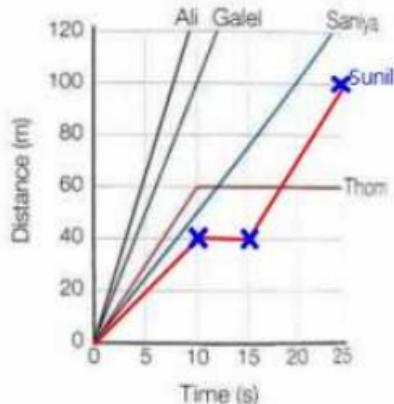
$$30 \text{ km/h} + 40 \text{ km/h} = 70 \text{ km/h}$$

b Cars A and B travel at the same speeds as before, but in the same direction. How fast is

$$\text{car B travelling relative to car A? } 40 \text{ km/h} - 30 \text{ km/h} = 10 \text{ km/h}$$

c Draw a smile on each face to show your confidence in your answers – the bigger the smile, the more confident you are.

Distance-time graph for cycle rides



1 A car travels at 40 km/h for half an hour, then at 30 km/h for the next half hour. It covers the last 90 km of the journey at 60 km/h.

a Calculate how far the car travels in the first half hour of the journey.

$$\begin{aligned} \text{distance} &= \text{speed} \times \text{time} \\ &= 40 \text{ km/h} \times 0.5 \text{ h} \\ &= 20 \text{ km} \end{aligned}$$

distance = 20 unit km

2 The distance-time graph shows the movement of a toy car.

a Work with a partner, and write down how you can use the gradient of the graph to work out the speed of the toy car between D and E.

$$\text{gradient} = \frac{\text{vertical change}}{\text{horizontal change}}$$

$$\begin{aligned} \text{vertical change} &= \text{distance} \\ \text{horizontal change} &= \text{time} \end{aligned}$$

so gradient = speed

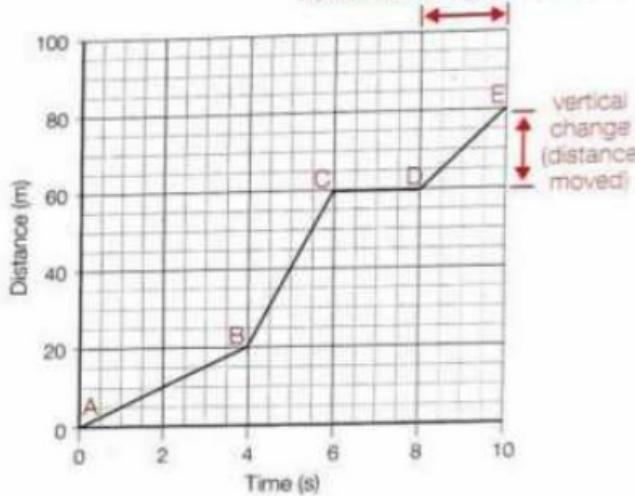
$$\text{distance} = \text{speed} \times \text{time} \quad \text{time} = \frac{\text{distance}}{\text{speed}}$$

b Calculate how long the car took to complete the last part of its journey.

$$\begin{aligned} \text{time} &= \frac{\text{distance}}{\text{speed}} \\ &= \frac{90}{60} \end{aligned}$$

time = 1.5 unit h

Distance-time graph for a toy car  
horizontal change (time taken)



b Ask your teacher to check your method. If it is incorrect, work with others in your group. Ask your teacher to check it again. Keep doing this until you have it correct.

c Calculate the speed of the car between D and E.

$$\text{gradient} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{80 - 60}{10 - 8} = 20 / 2 = 10 \text{ m/s}$$

speed = 10 unit m/s

3 Calculate the gradient (speed) of line A-B on the graph.

$$\text{gradient} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{20 - 0}{4 - 0} = 20 / 4 = 5 \text{ m/s}$$

speed = 5 unit m/s

## 9IC

SPEED-TIME  
GRAPHS (WS)

1 The speed-time graph shows how the speed of a motorcycle changed over a short journey.

- Write C on the part (or parts) of the graph that show the motorcycle travelling at a constant speed.
- Write I on the part (or parts) of the graph where the motorcycle is increasing its speed.
- Write D where the speed is decreasing.

2 Look at the graph in question 1.

- How long does the motorcycle spend travelling at 40 m/s? **40 - 20**

**20** s

b Calculate how far it travels in this time.

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

$$= 40 \times 20$$

$$\text{distance} = \underline{\quad} \text{unit} \quad \underline{\quad} \text{m}$$

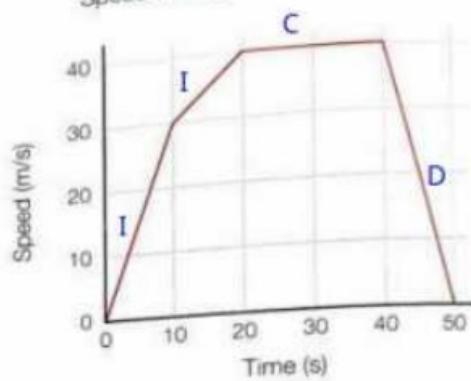
3 The table shows the speeds of some toy cars.

Draw a speed-time graph for the toy cars on the axes on the right. Remember to give your graph a title and to label the axes.

Time (s)	Speed (m/s)
0-4	5
4-6	20
6-8	0
8-10	10

4 Discuss your answer to question 3 with a partner. Make any corrections you need using a different colour.

Speed-time graph for a motorcycle



Speed-time graph of toy cars

