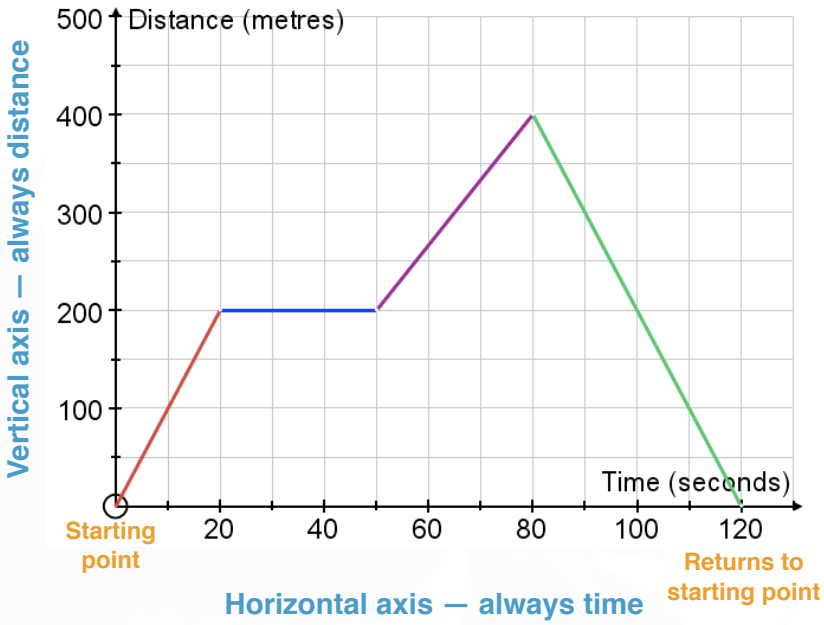
Distance-Time Graphs

Starter

1. **(Review of last lesson)** Jane's top running speed is 15 km/h. Jessie's top running speed is 10 m/s. Who is faster?

Notes

Here is an example of a distance-time graph.



Red line — the object is moving **away from** the **starting point**
Blue line — the distance is not changing so the object is ***not moving*** i.e. it is ***stationary***
Purple line — the object is moving **away from** the **starting point**
Green line — the object is moving **towards** the **starting point**

Speed from a distance-time graph

For the **red** line, the object travels 200 m in 20 seconds. Hence, we can calculate its speed:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{200}{20} = 10 \text{ m/s}$$

N.B. The steeper the line, the faster the speed.

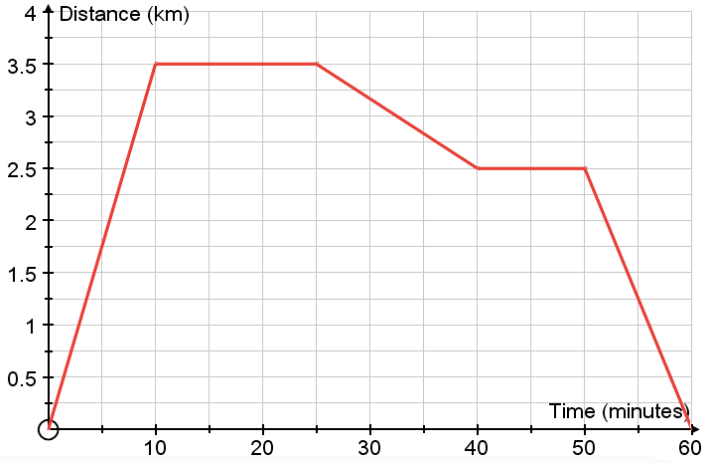
E.g. 1 Answer these questions based on the distance-time graph above.

(a) How long is the object **stationary** for?
(b) Calculate the speed indicated by the **purple** line.
(c) Calculate the speed on the **return** journey.
(d) What is the total distance travelled?

Working: (a) The object is stationary from 20 s to 45 s so 25 s

(b) $$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{200}{30} = 6.67 \text{ m/s}$$

E.g. 2 John went to his local shop to buy some food. On his way home he stopped to chat to a friend. The distance-time graph shows his journey. Based on the graph, answer these questions.



(a) How long was John in the shop?

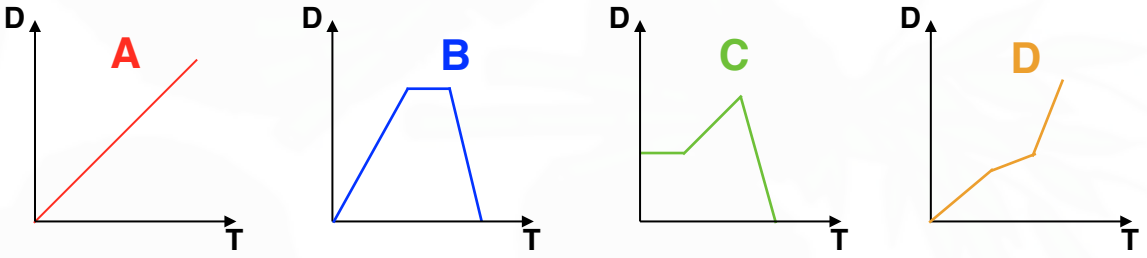
(b) What was John's speed, in km/h, on the way to the shop?

(c) How long did John stop to talk to his friend?

(d) Apart from when John was stopped, when was his speed the lowest and how fast was he travelling in km/h?

(e) State the total distance travelled.

E.g. 3 Jack cycles along a flat road, then up a hill, then down the other side. Which Distance-Time graph best describes Jack's journey?



Working:

Not **A** — it is unlikely will stay the same speed on the journey.

Not **B** — the second part of the graph suggests Jack is stationary, which is not true. The third part has Jack returning to the starting point, which is also not true.

Not **C** — the first part of the graph suggests Jack is stationary, which is not true. The third part has Jack returning to the starting point, which is also not true.

D is correct — the second part is the not as steep as the other parts since Jack is cycling up a hill. The third part is the steepest as we would expect Jack to be fastest going downhill.

Video: Distance-time graphs

Solutions to Starter and E.g.s

Exercise

p123 Ex 18.4 Qu 1-11

Summary

For distance-time graphs:

- The horizontal axis is always time.
- The vertical axis is always distance.
- A line moving upwards generally means moving away from the starting point.
- A line moving downwards generally means moving towards the starting point.
- A horizontal line means the object is not moving i.e. it is stationary.