Planner

# Real-life graphs

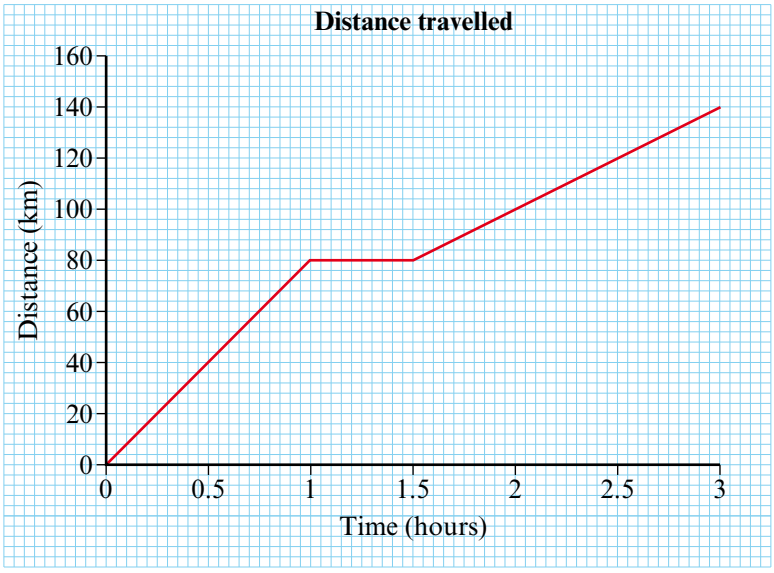
- Solving distance–time problems
- Drawing graphs of linear functions
- Giving plausible explanations for non-linear graphs
- Sketching graphs to represent a variety of situations

Keywords

You should know

explanation 1a | explanation 1b | explanation 1c

**1** The distance–time graph shows Amy's journey by car.




**a** There are three stages to Amy's journey. Explain what the graph is showing at each stage.

**b** How far did Amy travel altogether in 3 hours?

**c** What was Amy's speed for the first hour of the journey (in kilometres per hour)?

**d** What was her speed in the third stage of the journey?

**e** What was her average speed for the whole journey?

**f** For what fraction of the total time was she stationary?

**2** Oxbow and Tranby are two towns 16 km apart.

Khayam leaves Oxbow at 09:00 and walks at a constant speed of 8 km/h towards Tranby.

Emma leaves Tranby at 09:20 and cycles towards Oxbow. She stops at a shop 4 km from Tranby at 09:40 for 10 minutes before continuing her journey. She arrives at Oxbow at 10:50.

**a** On the same diagram and using a scale of 2 cm for 10 minutes on the time axis and 1 cm for 1 km on the distance axis, draw the distance–time graph to show both journeys.

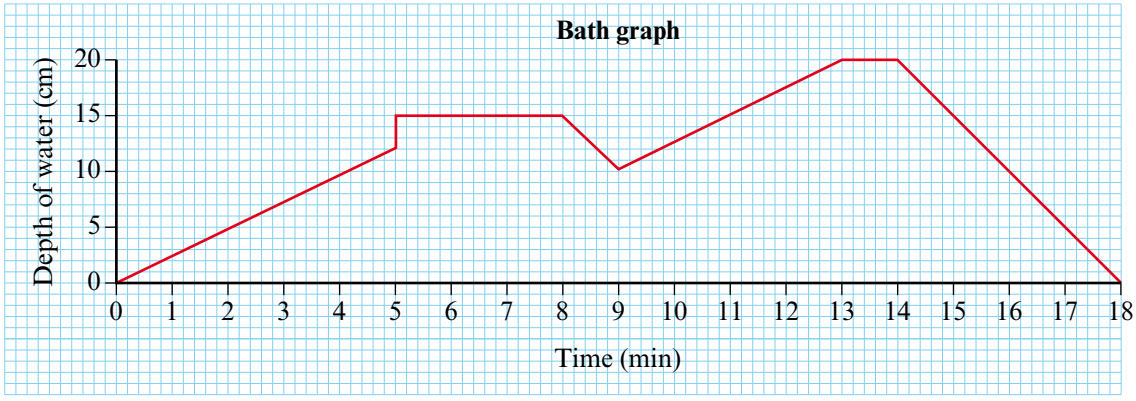
**b** Use your graph to find these.

**i** the time that Khayam arrives in Tranby

**ii** the time that Khayam and Emma pass each other

**iii** Emma's average speed for the whole journey

**3** The graph below shows the story of Baz's bath.




**a** What was the maximum depth of the water?

**b** At what speed did the depth of water increase during the first 5 minutes?

**c** How could you explain the sudden increase in depth after 5 minutes?

**d** What do you think happened between 5 and 8 minutes?

**e** How long did the bath take to empty at the end?

**f** At what speed did the depth of water decrease at the end?

**g** How would the graph change if Baz had jumped out to answer the phone after 12 minutes?

**4** **a** For each of these equations, make a table of values for the relationship from 0 to 5 on the horizontal axis and draw the graph.

| **e.g. *s*** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **e.g. *t*** | | | | | | |

**i** $s = 40t$ when $t$ = time in hours and $s$ = distance travelled (in kilometres)

**ii** $p = \frac{d}{2}$ for the exchange rate from US dollars to pounds sterling, where $p$ is the number of pounds and $d$ is the number of dollars

**iii** $V = 5t + 15$ where $V$ is the volume of water (in litres) in a storage tank and $t$ the time taken (in minutes)

**b** Which of the graphs does *not* pass through the origin? Why?

**5** For each of these sentences, write an equation linking two variables then sketch a graph to illustrate the relationship between the variables.
Make sure you state what your variables are in each case.

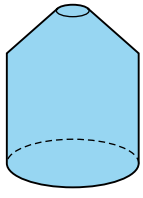
**a** A car consumes fuel at the rate of one litre for every 10 kilometres.
It starts its journey with a full tank of 50 litres and ends the journey with the tank empty.

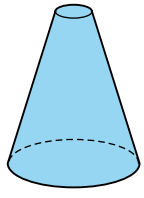
**b** The temperature of a pan of water increases at the rate of 8°C per minute.

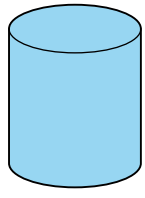
**c** The number of members of a football club remains constant from year to year.

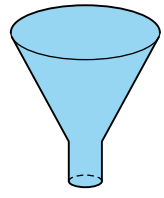
explanation 2a | explanation 2b | online

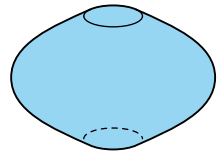
**6** Water is poured at a constant speed into different containers. For each of these container shapes, sketch a graph showing the depth of water against time.

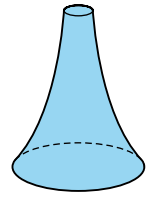
**a** 

**b** 

**c** 

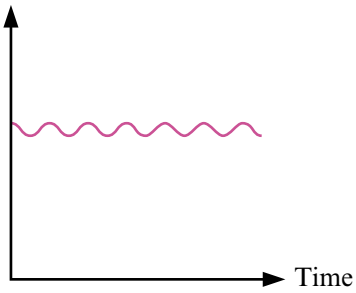
**d** 

**e** 

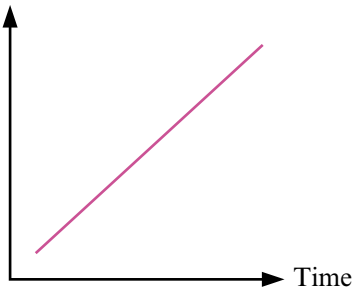
**f** 

**7** Match each graph to one of the descriptions below.

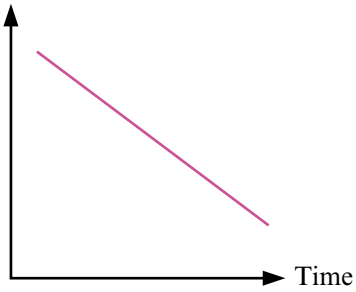
**i**



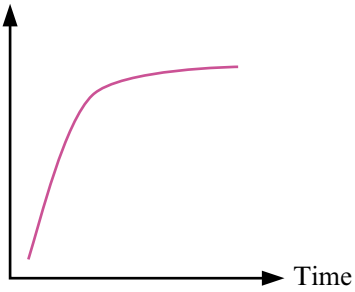

**ii**



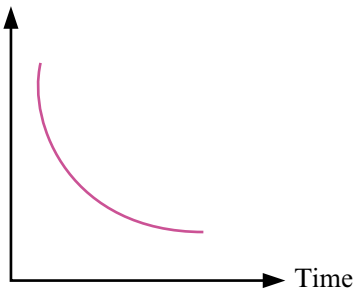

**iii**



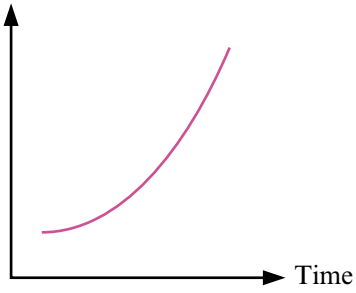

**iv**




**v**




**vi**




**a** The distance from a post of someone who is running away from the post but who is attached to the post by a bungee rope.

**b** The amount of compound interest earned on an investment of £100.

**c** The cost of a telephone call.

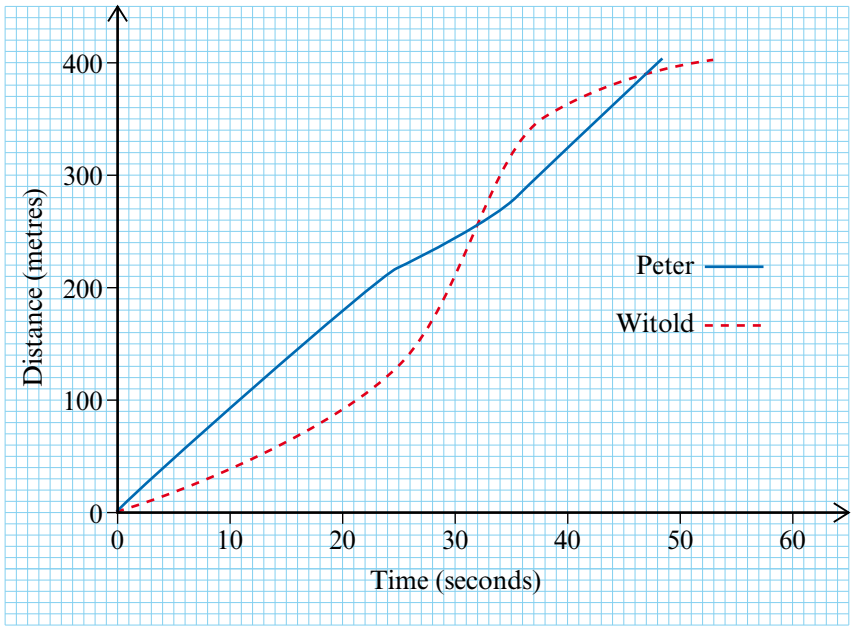
**d** The temperature in a room heated by a thermostatically controlled radiator.

**e** The number of children left in a school hall when everyone is leaving after assembly.

**f** The temperature of a cup of coffee left in a cool room.

**8** Peter and Witold are two runners in a 400 m race.

The story of their race in shown on the graph.




**a** Who led for the first part of the race?

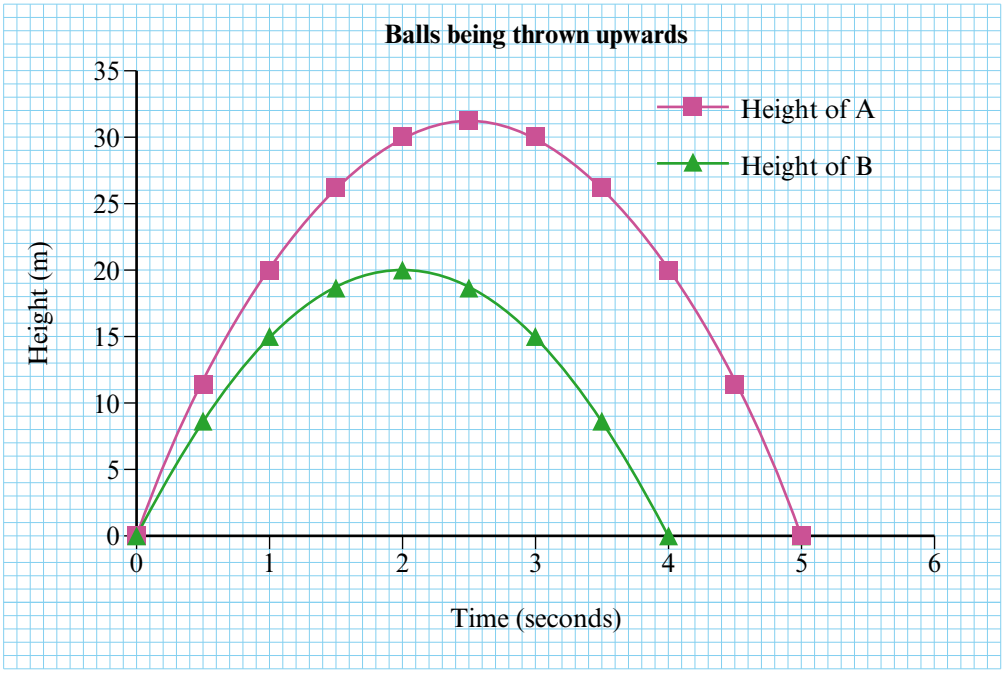
**b** At what times were the two athletes level with each other?

**c** Who won the race and what was their winning time?

**d** Which athlete was running the faster at the finish?

**e** Calculate the average speed of the winning athlete in metres per second.

**9** Two balls were thrown upwards at the same time.
The graph shows the heights of the balls at different times.




**a** Estimate the difference in the maximum height reached by the two balls.

**b** How long did it take each ball to reach its maximum height?

**c** How many seconds after the balls were thrown was their difference in height approximately 10 m?

**d** How long did it take ball A to fall 20 m from its maximum height?

explanation 3

**10** Sketch speed–time graphs to represent these situations.

**a** a car travelling at a constant speed along a motorway

**b** a cyclist travelling up a steep hill and then down the other side

**c** an aeroplane coming in to land

**d** a car left on a hill with its handbrake off