



Time graphs

Year 8 About 60 minutes No calculator 46 marks

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark]

Parking is £1.50 for each hour or part of an hour. Find the cost of 2 hours 10 minutes.

A2 Needed today [1 mark]

Write 2 hours 15 minutes in hours, as a decimal.

Answer

Answer

- A3** Needed today [1 mark]

A bus goes 30 km in 45 minutes at a steady speed. How far does it go in 15 minutes?

A4 From chapter 4 [1 mark]

Find the median of 3, 8, 5, 11, 7.

Answer

Answer

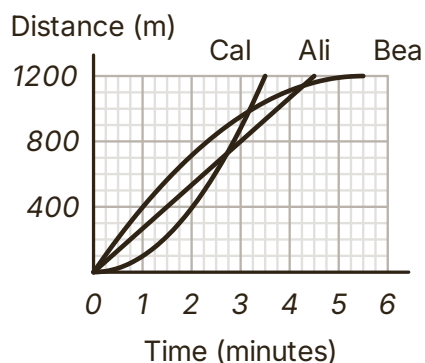
B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

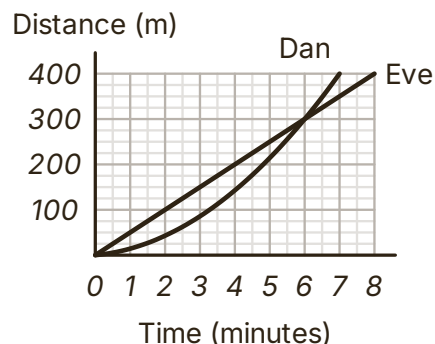
The graph shows three runners in a 1200 m race. (a) Who ran at a steady speed? Give a reason. (b) Who was in the lead after 2 minutes? (c) Who won, and by how many seconds?



Hint A straight line means the same distance every minute. The higher graph at a time is the one in front. Each runner finishes where the graph reaches 1200 m.

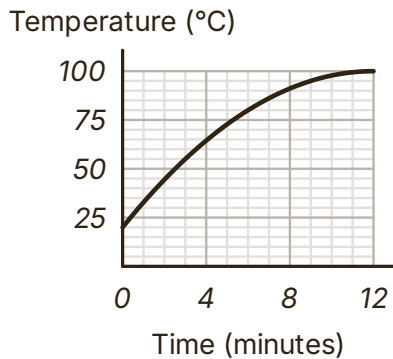
B1 The graph shows two swimmers in a 400 m race. [4 marks]

(a) Who swam at a steady speed? (b) At what time did Dan overtake Eve? (c) Who won, and by how many seconds?



EXAMPLE 2

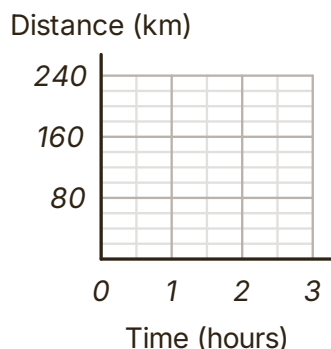
The graph shows the temperature of some soup as it is heated. (a) Estimate the temperature after 3 minutes. (b) How long does it take the soup to reach 80°C ? (c) By how much does the temperature rise in the first 3 minutes?



Hint To read a temperature, go up from the time to the curve, then across. To read a time, go across from the temperature to the curve, then down.

EXAMPLE 3

A coach travels at a steady speed of 80 km/h for 3 hours. (a) Make a table of the distance it has travelled after 0, 1, 2 and 3 hours. (b) Draw a distance–time graph. (c) Use your graph to find how far the coach travels in $1\frac{1}{2}$ hours, and how long it takes to travel 200 km.



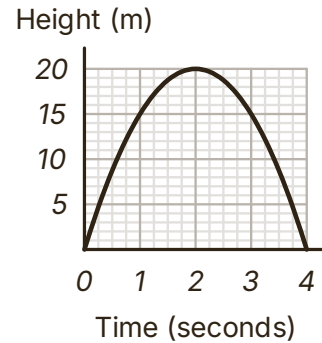
Hint At a steady speed the distance goes up by 80 km every hour, so the graph is a straight line from $(0, 0)$.

B2 A ball is thrown up into the air. [3 marks]

The graph shows its height.

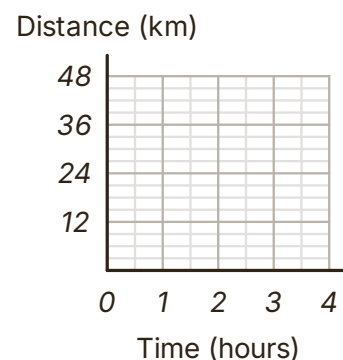
(a) Write down the greatest height the ball reaches. (b)

Write down the two times when the ball is 15 m above the ground.

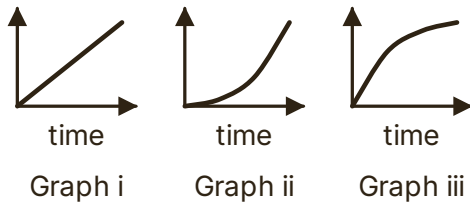
**B3** A cyclist rides at a steady speed of 12 km/h for 4 hours. [4 marks]

speed of 12 km/h for 4 hours.

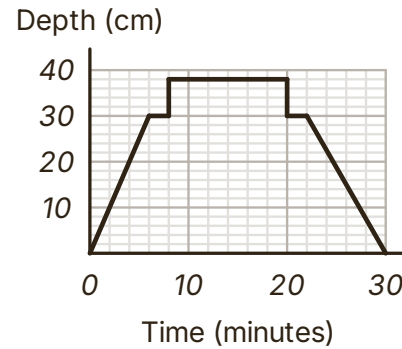
(a) Draw a distance–time graph on the grid. (b) Use your graph to find how far she rides in $2\frac{1}{2}$ hours. (c) Use your graph to find how long it takes her to ride 42 km.



- C1** Each graph has time across the bottom. Match each situation to a graph. A: the depth of water in a bath filled by a tap at a steady rate. B: the distance travelled by a car that speeds up as it pulls away from traffic lights. C: the height of a sunflower that grows quickly at first and then more slowly. [3 marks]



- C2** The graph shows the depth of water in Sam's bath. He gets in, and later gets out. Then he pulls out the plug. How long was Sam in the bath, and how long did the bath take to empty? [3 marks]



Answer A: ... B: ... C: ...

- C3** Water drips into a bucket at a steady rate. After 4 minutes the water is 6 cm deep. How deep is it after 10 minutes? After how many minutes is it 21 cm deep? [3 marks]

D Exam-style questions

GCSE Foundation

- D1** Jo says, "On a distance–time graph, a flat line shows someone travelling at a steady speed." [2 marks]

Is Jo correct? Give a reason for your answer.

D2 Leon cycles from home. The distance–time graph shows his journey.

- (a) How far from home was Leon [1 mark]
at 10:00?

Answer ... km

- (b) Leon stopped twice. Work out [2 marks]
the total time he was
stopped.

Answer ... hours

- (c) Work out Leon's speed on his way home. Give your answer in km/h. [2 marks]

Answer ... km/h

- (d) Was Leon cycling faster before his first stop or after it? Give a reason for your [2 marks]
answer.

Total for D2: 7 marks

D3 The graph shows the temperature of an oven.

- (a) Write down the time when the oven [1 mark]
was switched off.

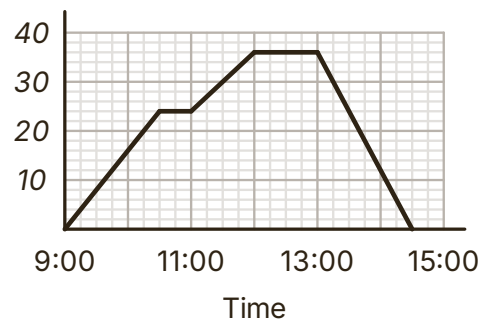
Answer ... minutes

- (b) For how long was the oven at a [3 marks]
temperature of 150 °C or more?

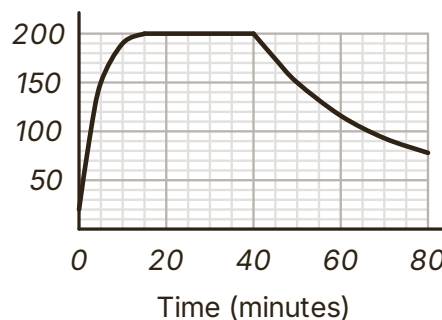
Answer ... minutes

Total for D3: 4 marks

Distance from home (km)



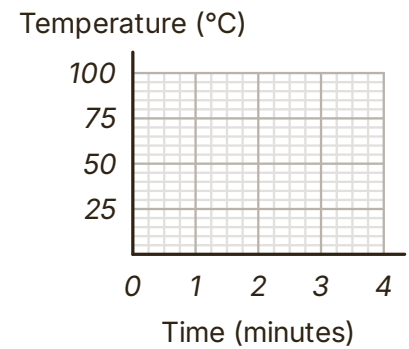
Temperature (°C)



D4 Water in a kettle is at 20°C . The kettle is switched on. The water heats at a steady rate and reaches 100°C after 4 minutes.

(a) Draw a graph on the grid to show the temperature of the water for the 4 minutes. [2 marks]

(b) Use your graph to find the temperature after $1\frac{1}{2}$ minutes. [1 mark]



Answer ... $^{\circ}\text{C}$

(c) Use your graph to find when the water reaches 65°C . Give your answer in minutes and seconds. [2 marks]

Answer ... min ... s

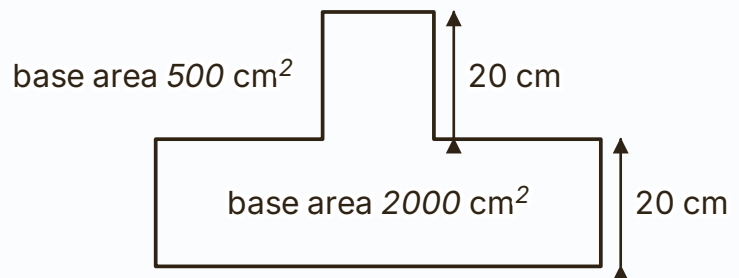
Total for D4: 5 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 The empty tank is made of two cuboids. Water flows in at 4 litres a minute (1 litre = 1000 cm^3). How long does it take for the water to be 10 cm deep, and how long to be 30 cm deep? Which part of the depth-time graph is steeper? Give a reason. [4 marks]



Answer

Not drawn accurately

Extension hints

Cover these with paper. Uncover one at a time.

- E1 Hint 1** Work out how many minutes it takes to fill each part of the tank: volume = base area $\times$ height.
- Hint 2** The bottom part holds $2000 \times 20 = 40\,000\text{ cm}^3$, so it takes $40\,000 \div 4000 = 10$ minutes, and 10 cm deep takes 5 minutes.
- Hint 3** The top part holds $500 \times 20 = 10\,000\text{ cm}^3$, which takes 2.5 minutes. So 30 cm deep is 10 cm into the top part: $10 + 1.25 = 11.25$ minutes. The top part is steeper, because the water rises faster when the tank is narrower.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can read values from a time graph, forwards and backwards. ☐ ☐ ☐

I can draw a distance-time graph for a steady speed. ☐ ☐ ☐

I can describe a journey or a story from the shape of a graph. ☐ ☐ ☐

I can work out a speed or a length of time from a graph. ☐ ☐ ☐