



- 1** A graph shows the total cost of hiring a ladder plotted against the number of days of hire.

The graph is a straight line with gradient 6.

Interpret what the gradient tells you about the cost of hiring the ladder.

Cost is measured in pounds and hire time in days.

(1 mark)

The gradient of a cost graph is the rate of change of cost

A gradient of 6 means the cost goes up by £6 for each extra day

- 2** Water is poured into a tank at a steady rate.

The graph of depth of water, in cm, against time is a straight line that crosses the vertical axis at 20.

Interpret the value 20.

(1 mark)

The vertical intercept is the value when time = 0

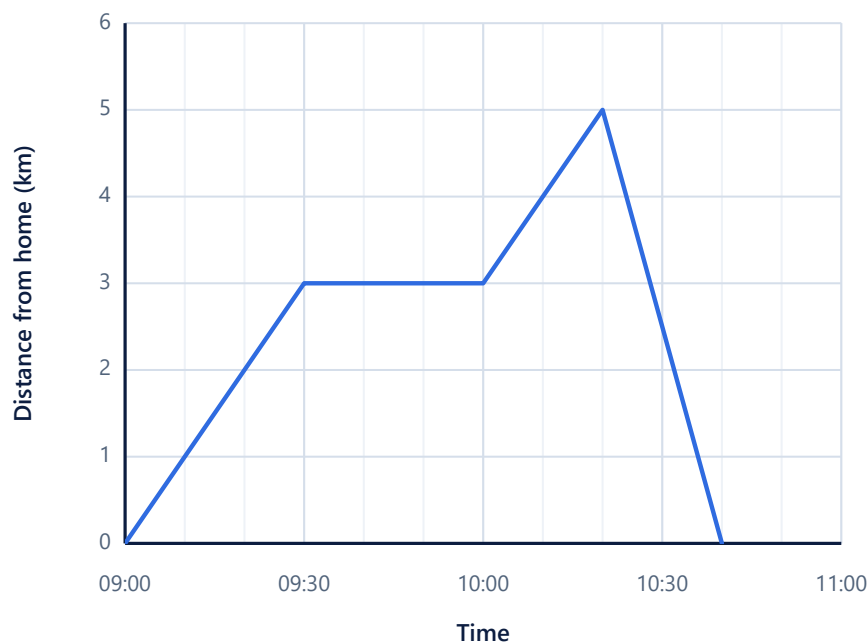
So the depth of water at the start was 20 cm

3

Zara leaves home at 09:00 and walks to her friend Amaya's house. She stays there for a while, then walks on to the library. From the library she cycles straight home.

The distance-time graph shows her journey.

- How far is Amaya's house from Zara's home?
- How long does Zara stay at Amaya's house?
- Work out Zara's speed, in km/h, from Amaya's house to the library.
- Work out Zara's speed, in km/h, as she cycles home.



(4 marks)

a) first flat part

3 km

b) flat from 09:30 to 10:00

30 minutes

c) 3 km to 5 km, 10:00 to 10:20

2 km in 20 minutes

x 3 to make 1 hour

6 km in 60 minutes

6 km/h

d) 5 km back home, 10:20 to 10:40

5 km in 20 minutes

x 3 to make 1 hour

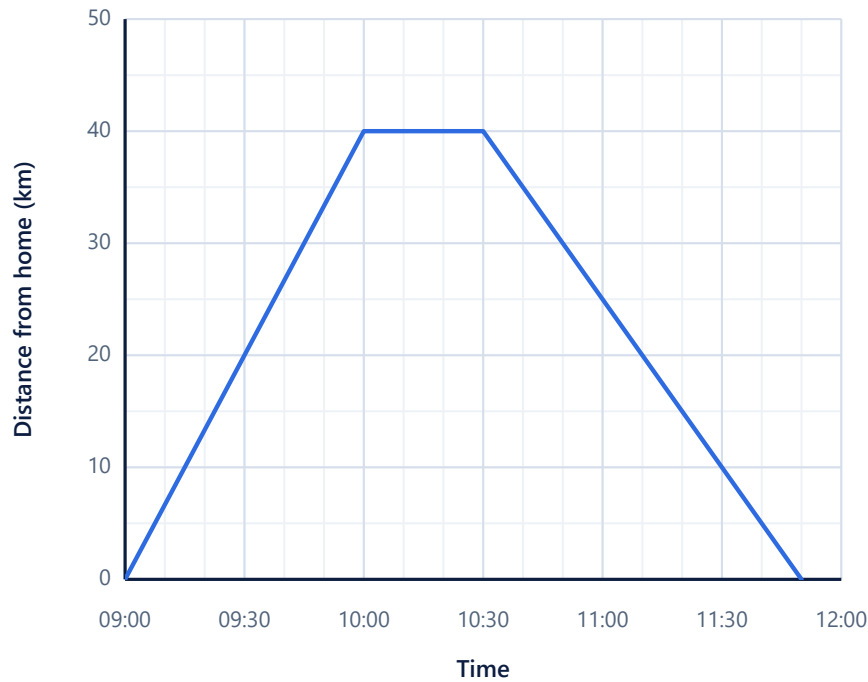
15 km in 60 minutes

15 km/h

4

The distance-time graph shows Marek's car journey from home to a garden centre and back.

- For how many minutes does Marek stay at the garden centre?
- Work out his speed, in km/h, on the way to the garden centre.
- Work out his speed, in km/h, on the way home.



(3 marks)

a) The horizontal section runs from 10:00 to 10:30, so 30 minutes

b) He travels 40 km between 09

00 and 10:00, so speed = $\frac{40}{1} = 40 \text{ km/h}$

c) He travels 40 km between 10

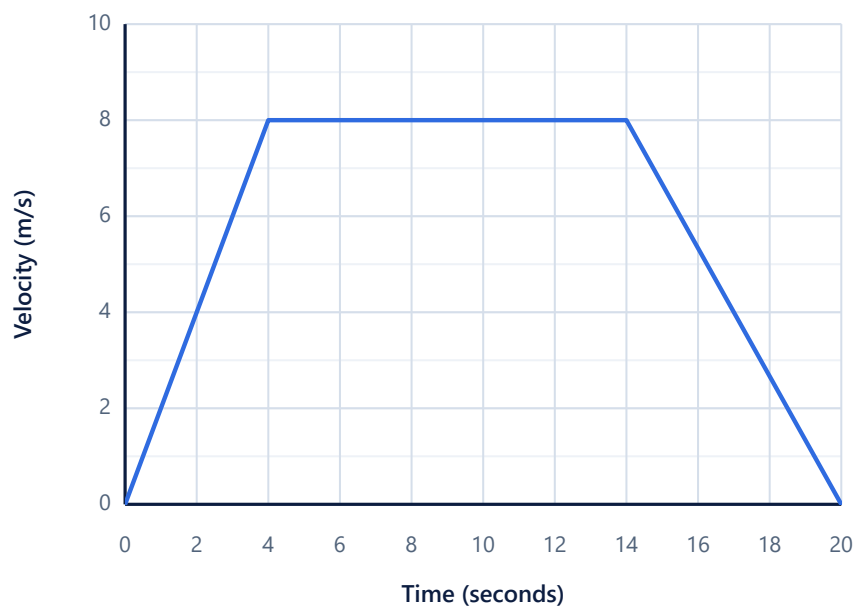
30 and 11:50, which is 80 minutes = $\frac{4}{3}$ hours

Speed = 40 divided by $\frac{4}{3} = 30 \text{ km/h}$

5

The velocity-time graph shows the first 20 seconds of a cycle race for Tomasz.

- Write down Tomasz's velocity after 10 seconds.
- Describe how Tomasz is moving between 4 seconds and 14 seconds.
- For how many seconds is Tomasz slowing down?



(3 marks)

a) read up from 10 s

8 m/s

b) flat line = velocity not changing

constant velocity of 8 m/s

c) line slopes down from 14 s to 20 s

$$20 - 14 = 6$$

6 seconds

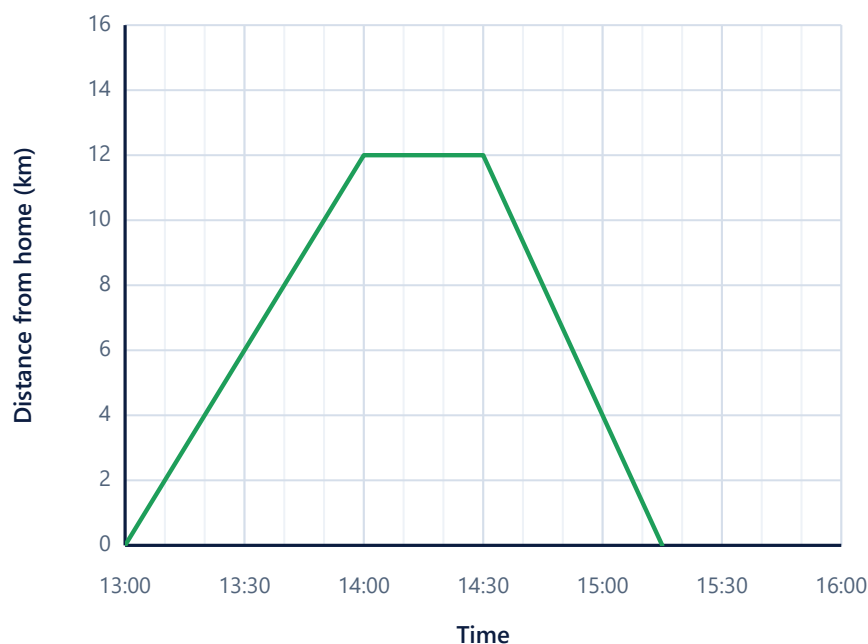
6

Leo leaves home at 13:00 and cycles at a steady speed of 12 km/h for 1 hour.

He then rests for 30 minutes.

He then cycles straight home at a steady speed of 16 km/h.

- On the grid, draw a distance-time graph for Leo's journey.
- At what time does Leo get home?



(4 marks)

a) first part

$$\text{distance} = 12 \times 1 = 12 \text{ km}$$

(13:00, 0) to (14:00, 12)

rest: flat line

(14:00, 12) to (14:30, 12)

way home: time = distance $\div$ speed

$$\text{time} = 12 \div 16$$

$$\text{time} = 0.75 \text{ hours}$$

$$\text{time} = 45 \text{ minutes}$$

(14:30, 12) to (15:15, 0)

graph drawn through these points

b)

$$14:30 + 45 \text{ min} = 15:15$$

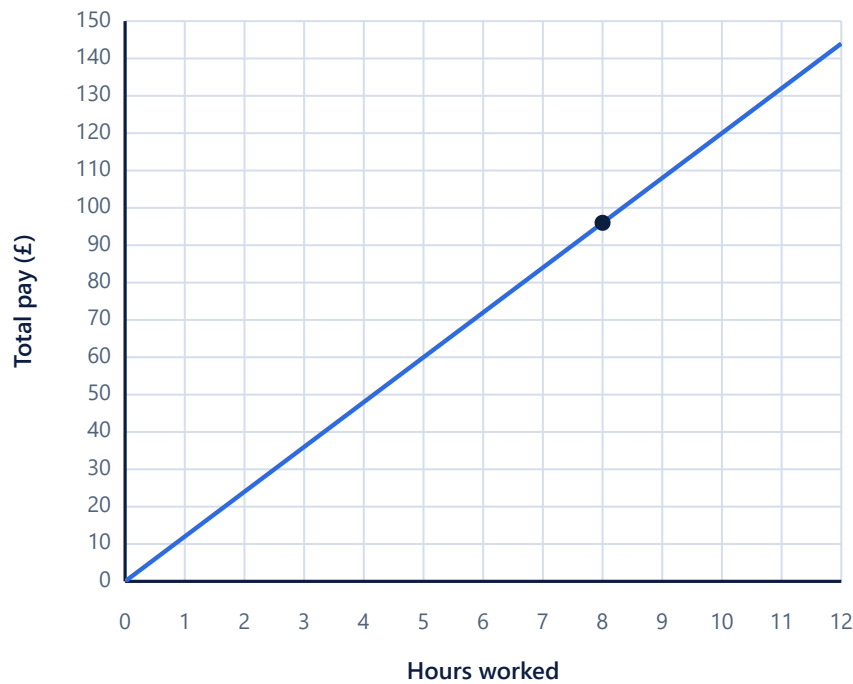
15:15

7

A graph shows Kelly's total pay plotted against the number of hours she works.

The graph is a straight line through (0, 0) and through the point (8, 96), where pay is in pounds.

- Work out Kelly's hourly rate of pay.
- Work out Kelly's total pay for working 11 hours.



(3 marks)

a) 8 hours of work pays £96, so hourly rate = $\frac{96}{8} = £12$

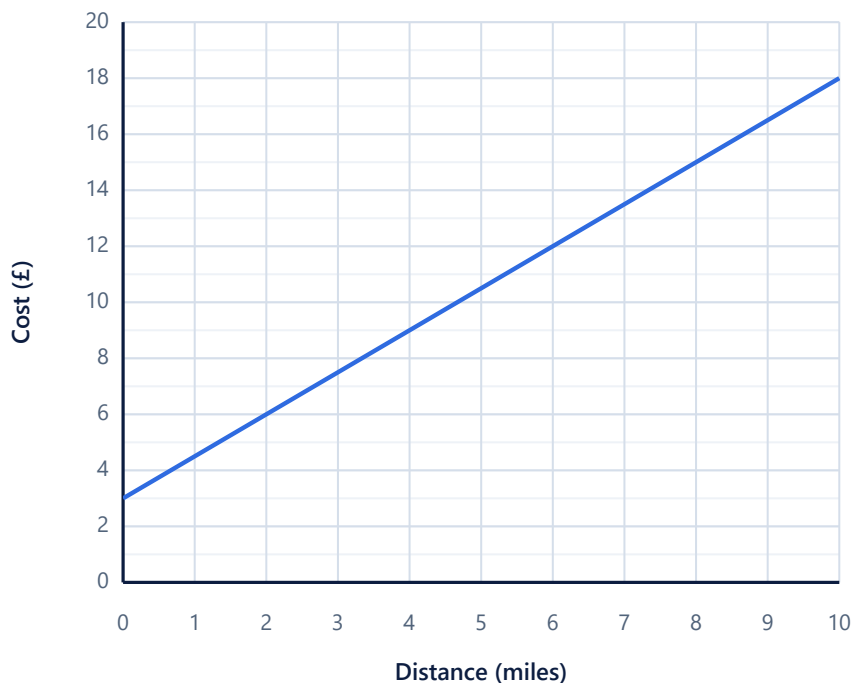
b) Pay for 11 hours = 11 times 12 = £132

8

A taxi company shows its fares on a graph of cost against distance.

The graph is a straight line through (0, 3) and (10, 18), where cost is in pounds and distance is in miles.

- Write down the fixed charge for any journey.
- Work out the cost per mile.
- Work out the fare for a journey of 6 miles.



(3 marks)

a) The vertical intercept is 3, so the fixed charge is £3

b) Gradient = $\frac{18 - 3}{10 - 0} = \frac{15}{10} = £1.50$ per mile

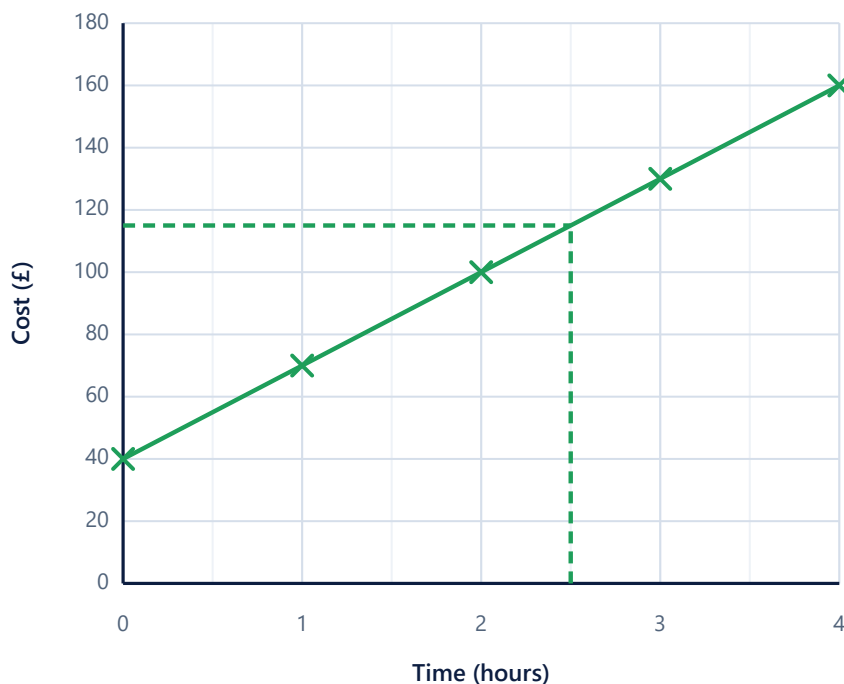
c) Fare = $3 + 6 \text{ times } 1.50 = 3 + 9 = £12$

9

A plumber charges a call-out fee of £40 plus £30 for each hour of work.

Time (hours)	0	1	2	3	4
Cost (£)	40				

- Complete the table.
- On the grid, draw a graph of the cost against the time.
- A job costs £115. Use your graph to find how long the job took.
- Is the cost directly proportional to the time? Give a reason.



(4 marks)

a) + 30 each hour

$$40 + 30 = 70$$

$$70 + 30 = 100$$

$$100 + 30 = 130$$

$$130 + 30 = 160$$

70, 100, 130, 160

b) plot (0, 40), (1, 70), (2, 100), (3, 130), (4, 160)

straight line from (0, 40) to (4, 160)

c) across from 115, then down

reads 2.5 hours

check

$$40 + 30 \times 2.5 = 115$$

2.5 hours

d) direct proportion needs a line through (0, 0)

No, it starts at £40, not £0

10

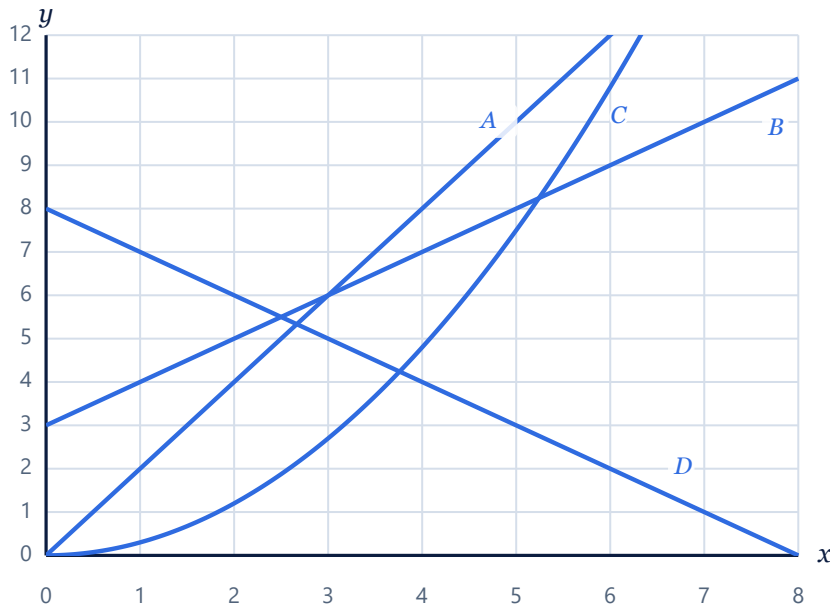
The grid shows four graphs, A, B, C and D.

a. Which graph shows y directly proportional to x ? Give two reasons.

Petrol at a garage costs the same amount for every litre. Mr Okafor buys 10 litres for £14.50 and Mrs Hughes buys 30 litres for £43.50

b. Show that the cost is directly proportional to the number of litres.

c. Work out the cost of 24 litres.



(4 marks)

a) straight line through (0, 0)

A: straight and through (0, 0)

b) cost of 1 litre

$$14.50 \div 10 = 1.45$$

$$43.50 \div 30 = 1.45$$

same price per litre, so directly proportional

c)

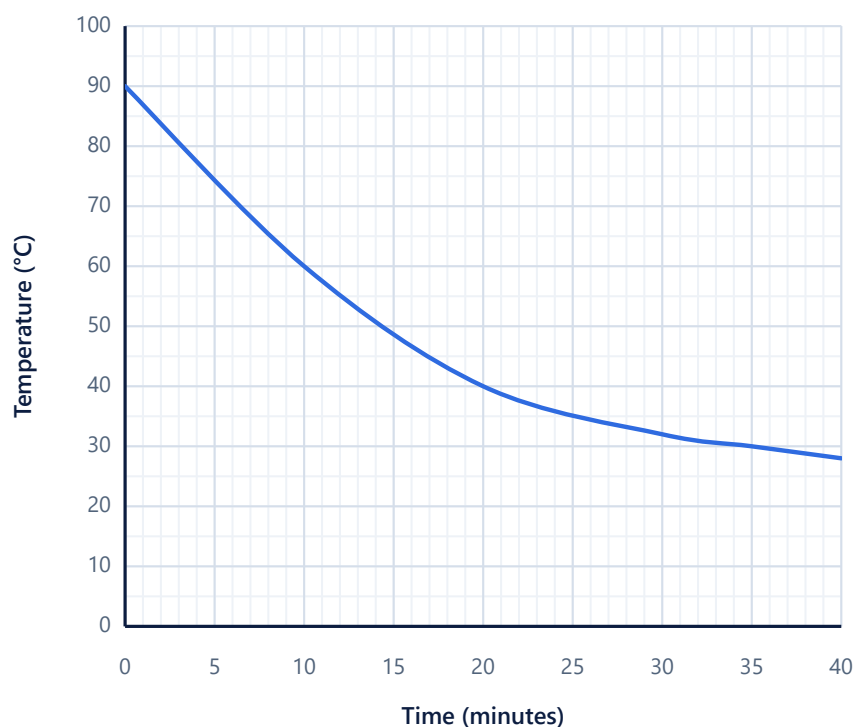
$$24 \times 1.45 = 34.80$$

£34.80

11

The graph shows the temperature of a cup of coffee as it cools.

- Write down the temperature of the coffee at the start.
- Find the temperature of the coffee after 20 minutes.
- Find how long the coffee takes to cool to 30°C .



(3 marks)

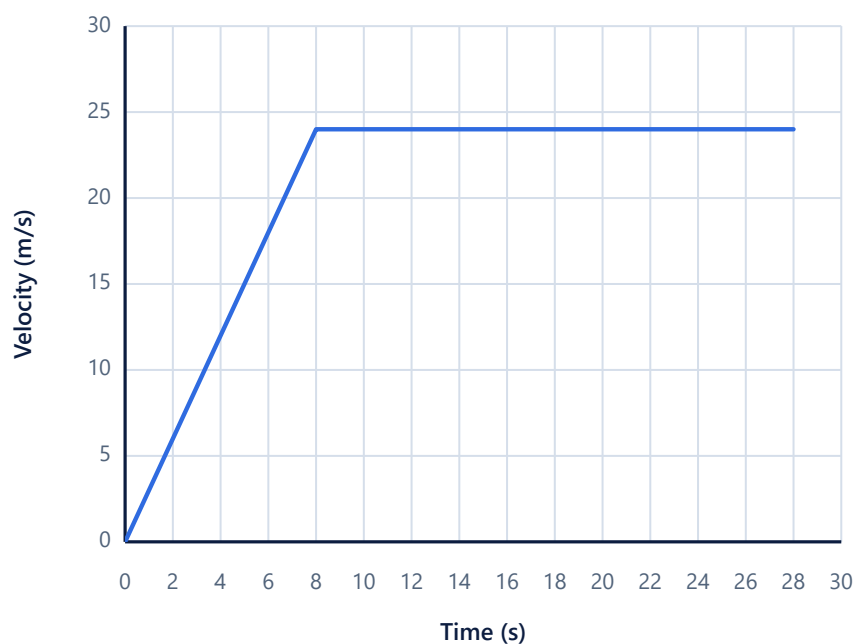
- Read the curve at time 0: the temperature is 90°C
- Read up from 20 minutes to the curve and across: 40°C
- Read across from 30°C to the curve and down: 35 minutes

12

A car starts from rest and accelerates uniformly to a velocity of 24 m/s in 8 seconds.

It then travels at a constant velocity of 24 m/s for a further 20 seconds.

- Work out the acceleration of the car during the first 8 seconds.
- Work out the total distance travelled by the car in the 28 seconds.



(3 marks)

a) Acceleration = change in velocity divided by time = $\frac{24}{8} = 3$

m/s²

b) Distance = area under the velocity-time graph

First 8 seconds (triangle)

$$\frac{1}{2} \times 8 \times 24 = 96 \text{ m}$$

Next 20 seconds (rectangle)

$$20 \times 24 = 480 \text{ m}$$

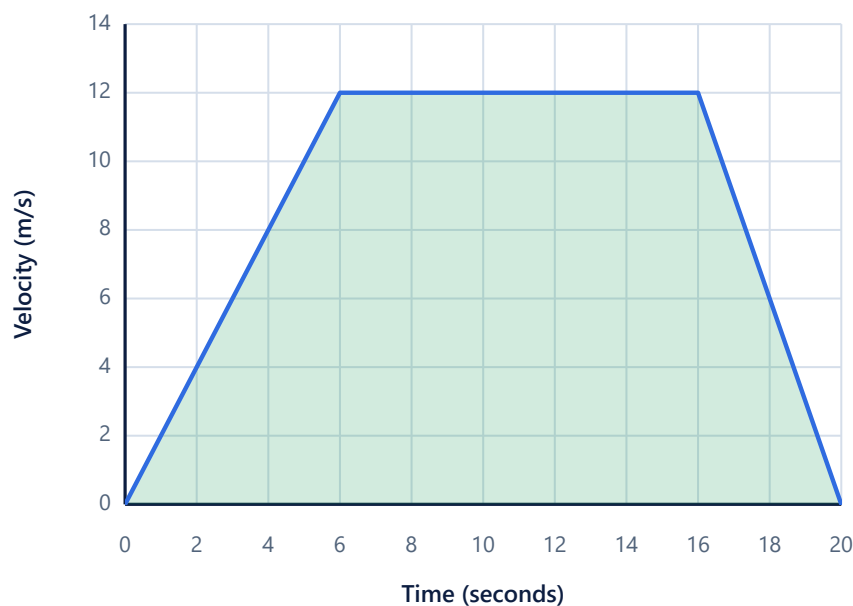
$$\text{Total distance} = 96 + 480 = 576 \text{ m}$$

EXTENSION QUESTIONS

13

The velocity-time graph shows a tram moving between two stops.

- Work out the acceleration of the tram in the first 6 seconds.
- Work out the deceleration of the tram in the last 4 seconds.
- Work out the total distance between the two stops.



(5 marks)

a) acceleration = gradient

$$\text{acceleration} = \frac{12}{6}$$

$$\text{acceleration} = 2$$

$$\boxed{2 \text{ m/s}^2}$$

b) slope down: 12 m/s lost in 4 s

$$\text{deceleration} = \frac{12}{4}$$

$$\text{deceleration} = 3$$

$$\boxed{3 \text{ m/s}^2}$$

c) distance = area under the graph

$$\text{triangle} = \frac{1}{2} \times 6 \times 12 = 36$$

$$\text{rectangle} = 10 \times 12 = 120$$

$$\text{triangle} = \frac{1}{2} \times 4 \times 12 = 24$$

$$\text{total} = 36 + 120 + 24$$

$$\text{total} = 180$$

$$\boxed{180 \text{ m}}$$