

Distance-time and velocity-time graphs

About 40 minutes Calculator allowed 35 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-distance-time-and-velocity-time-graphs/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 17 [2 marks]
- 120 g of liquid A, density 0.8 g/cm^3 , is mixed with 108 g of liquid B, density 1.2 g/cm^3 . Work out the density of the mixture.
- Write $5x^2 - 30x - 8$ in the form $a(x + p)^2 + q$.

Answer

Answer

- A3** From chapter 17 [2 marks] **A4** From chapter 20 [2 marks]
- Solve the simultaneous equations $xy = -48$ and $y = x + 14$.
- A tangent from T touches a circle, centre O , at P . $TP = 9$ cm and $OT = 15$ cm. Find the radius of the circle.

Answer

Answer

B Example, then your turn

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

EXAMPLE 1

A van drives 48 km in 0.8 h, waits 0.45 h, then drives 36 km in 0.75 h. Work out its average speed for the whole journey.

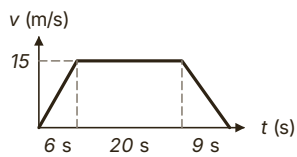
Hint Total distance $\div$ total time, wait included.

- B1** A bus drives 39 km in 0.6 h, stops for 0.25 h, then drives 30 km in 0.65 h. Work out its average speed for the whole journey. [3 marks]

Answer

EXAMPLE 2

A tram speeds up steadily from rest to 15 m/s in 6 s, holds 15 m/s for 20 s, then slows steadily to rest in 9 s. Find its first acceleration and its total distance.



Not drawn accurately

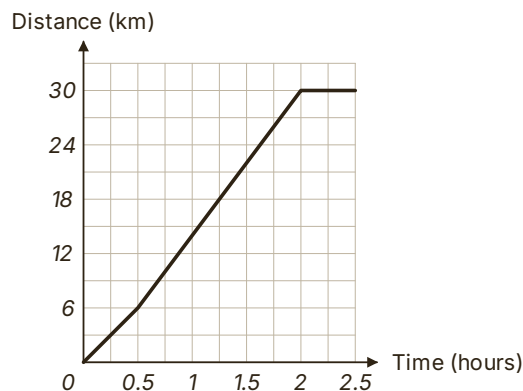
Hint Sketch the graph. Gradient gives acceleration; area gives distance.

- B2** A lift speeds up steadily from rest to 4 m/s in 2.5 s, moves at 4 m/s for 7 s, then slows steadily to rest in 2 s. Find its first acceleration and its total distance. [4 marks]

Answer m/s^2 and m

c Practice

- C1** The graph shows a car's journey. Work out the car's speed between 0.5 hours and 2 hours. [2 marks]

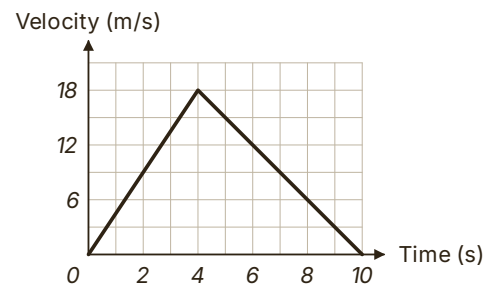


Answer

- C3** A car speeds up steadily from 8 m/s to 20 m/s in 12 s. Find the distance it travels. [2 marks]

Answer

- C2** The graph shows the velocity of a cart. Work out its deceleration as it comes to rest. [2 marks]



Answer

- C4** A cyclist accelerates from rest to 9 m/s at 1.5 m/s^2 . How long does it take? [2 marks]

Answer

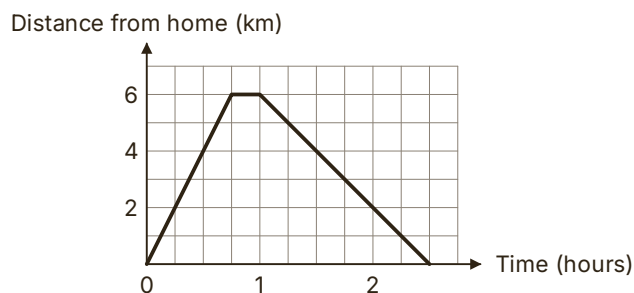
- C5** One section of a graph is a horizontal line. What does that section tell you (a) on a distance-time graph, (b) on a velocity-time graph? [2 marks]

D Exam-style questions

- D1** Jo drives 45 km at 30 km/h, then another 45 km at 90 km/h. She says, "My average speed was 60 km/h." [3 marks]

Explain why Jo is wrong, and work out her average speed.

- D2** Nadia walks from home to a café, stops there, and then walks home. The graph shows her walk.



- (a) Work out her speed on the way home. [2 marks]

Answer

- (b) Work out her average speed for the whole walk, including her stop. [2 marks]

Answer

Total for D2: 4 marks

E Extension

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

- E1** A car is moving at 6 m/s. It speeds up steadily for T seconds until it reaches 18 m/s, then at once slows steadily to rest in 12 seconds. Its average speed for the whole journey is 10 m/s. Find the value of T . [3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write the total distance and the total time in terms of T .
- Hint 2** Distance = $\frac{1}{2}(6 + 18)T + \frac{1}{2} \times 18 \times 12 = 12T + 108$,
 and time = $T + 12$.
- Hint 3** $\frac{12T + 108}{T + 12} = 10$, so $12T + 108 = 10T + 120$, $2T = 12$
 and $T = 6$.

How did it go?

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

- I can find a speed from a distance-time graph and an average speed for a whole journey. ☐ ☐ ☒
- I can find an acceleration and a distance from a velocity-time graph. ☐ ☐ ☒