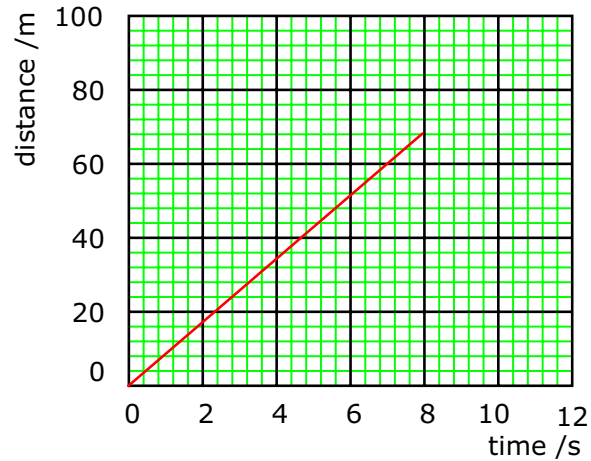


## Distance-time graphs

**Name & Set**

- 1 Someone runs a race at a steady speed. The runner's motion is plotted as a distance-time graph below.



- (i) Over what distance was the race run?

\_\_\_\_\_ [1]

- (ii) How long did the runner take to cover this distance?

\_\_\_\_\_ [1]

- (iii) How can we conclude from the graph that the runner ran at a steady speed during the race?

\_\_\_\_\_  
 \_\_\_\_\_ [1]

- (iv) What was the runner's average speed?

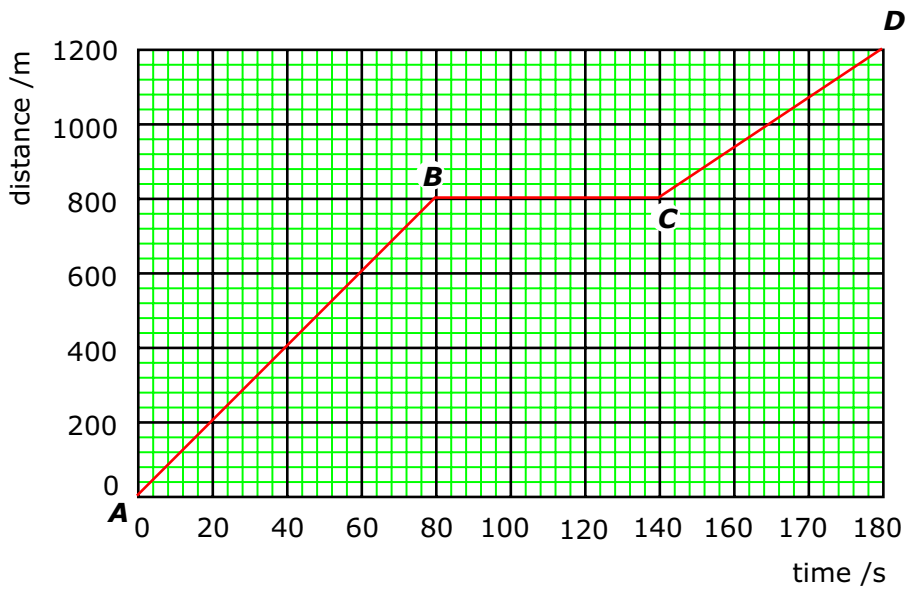
\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

- (v) On the same axes plot a graph for a runner who ran 96 m in 12 seconds at a steady speed. [1]

- (vi) Calculate the speed at which this runner ran the race.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

2 A cyclist cycles from home to work. The distance-time graph below shows his motion.



Describe the motion of the cyclist in words in each stage.

(i) Between A & B \_\_\_\_\_ [1]

(ii) Between B & C \_\_\_\_\_ [1]

(iii) Between C and D \_\_\_\_\_ [1]

(iv) How does the cyclist's motion between A & B compare to that between C & D?

\_\_\_\_\_ [1]

(v) How far does the cyclist travel between A and B?

\_\_\_\_\_ [1]

(vi) How long does it take the cyclist to cover this distance?

\_\_\_\_\_ [1]

(vii) Calculate the cyclist's speed between A & B.

\_\_\_\_\_

(viii) Calculate the cyclist's speed between C & D. [2]

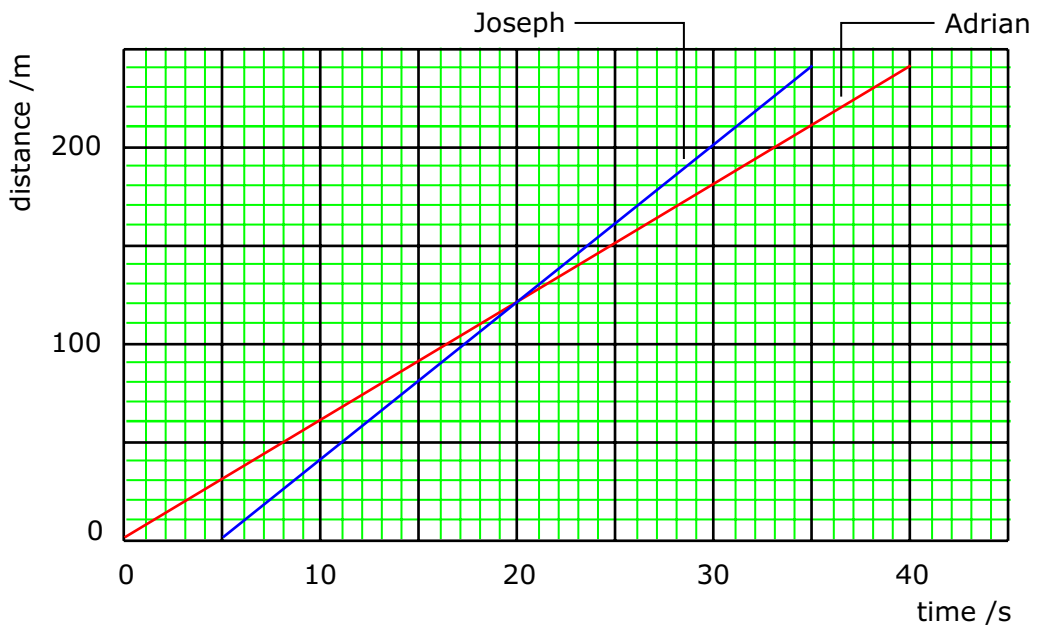
\_\_\_\_\_

(vii) Calculate the cyclist's average speed over the whole journey. [2]

\_\_\_\_\_

\_\_\_\_\_ [2]

- 3 Adrian and Joseph decide to race one another. Joseph claims that he is the faster runner and gives Adrian a head start. The graph below shows their motion during the race.



(a) Over what distance was the race run?

\_\_\_\_\_ [1]

(b) How many seconds head start did Joseph give Adrian?

\_\_\_\_\_ [1]

(c) For how many seconds had Adrian been running when he was overtaken by Joseph?

\_\_\_\_\_ [1]

(d) How far from the start did Joseph overtake Adrian?

\_\_\_\_\_ [1]

(e) How long did Joseph take to run the race?

\_\_\_\_\_ [1]

(f) What was Adrian's average speed?

\_\_\_\_\_ [1]

(g) What was Joseph's average speed, *while he was running*?

\_\_\_\_\_  
\_\_\_\_\_ [1]

(h) Who won the race?

\_\_\_\_\_  
\_\_\_\_\_ [1]

4 A cyclist takes 20 minutes to travel 6 km, cycling at a steady speed. A motorist sets off on the same journey 10 minutes after the cyclist and arrives at the final destination 5 minutes before the cyclist.

(a) How many metres does the cyclist travel?

\_\_\_\_\_ [1]

(b) How many seconds does it take the cyclist to cover this distance?

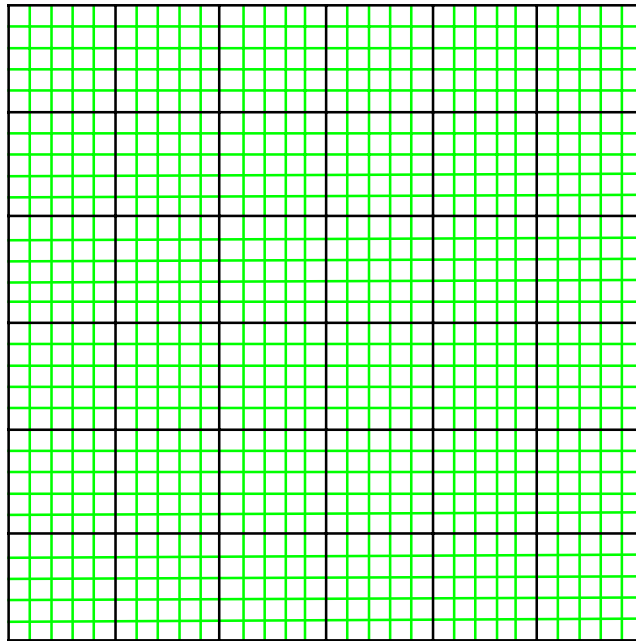
\_\_\_\_\_ [1]

(c) Calculate the cyclist's speed over his journey.

\_\_\_\_\_ [2]

(d) Draw a distance/time graph for cyclist on the grid below.

[4]



(e) How many seconds does the motorist take to cover the same distance as the cyclist?

\_\_\_\_\_ [1]

(f) Draw a distance/time graph for the motorist on the same grid as the one for the cyclist.

[2]

(g) Calculate the motorist's speed.

\_\_\_\_\_

\_\_\_\_\_ [3]

(f) How far has the cyclist travelled when he is overtaken by the motorist?

\_\_\_\_\_ [1]

5 Two people set off to make the same journey between two villages 5 km apart. One goes by car and the other by cycle.

(a) The cyclist cycles at steady speed of 5 m/s.

(i) How many metres does the cyclist travel?

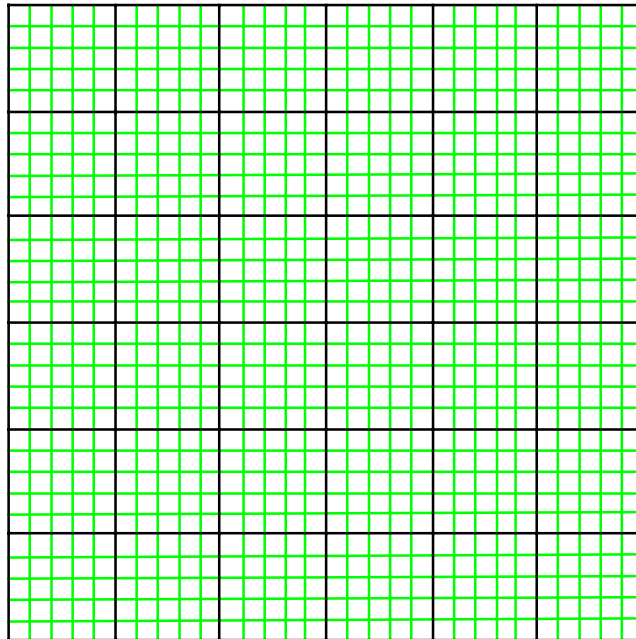
\_\_\_\_\_ [1]

(ii) How many seconds does it take the cyclist to complete the journey?

\_\_\_\_\_ [1]

(iii) Plot a distance-time graph for the cyclist on the grid below.

[4]



(b) The car sets off 500 seconds **after** the cyclist and travels at a constant speed of 20 m/s.

(i) How many seconds does it take the car to complete the journey?

\_\_\_\_\_ [1]

(ii) Use your answer to (d) to plot the car's journey on the same distance-time graph as the cyclist. [2]

(iii) How many seconds does the motorist wait for the cyclist to arrive at journey's end?

\_\_\_\_\_ [1]

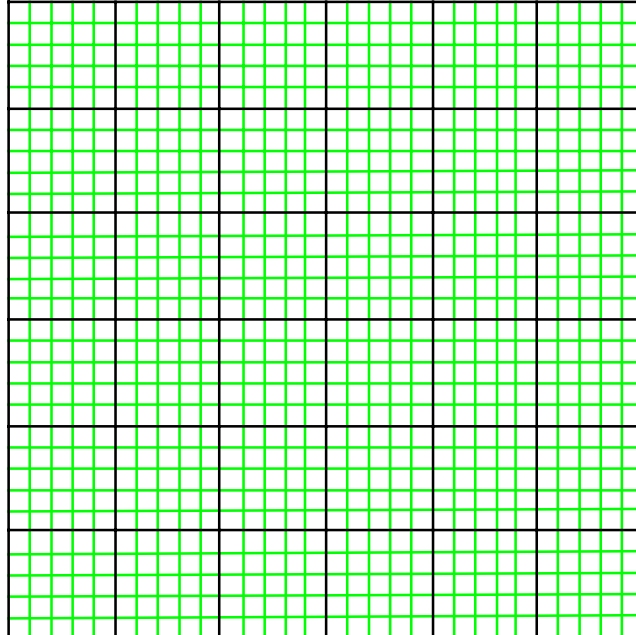
6 Anna and Bill walk the same route from home to school. They don't leave at the same time. Anna sets off first, followed by Bill 5 minutes later. The distance from their home to the school is 1.2 km. Anna walks at a steady speed of 1 m/s. Bill walks faster, at 1.5 m/s.

(a) (i) How many seconds does it take Anna to complete the walk to school?

\_\_\_\_\_ [1]

(ii) Draw a distance-time graph for Anna's walk on the grid below

[4]



(c) (i) How long does it take Bill to reach school?

\_\_\_\_\_ [1]

(ii) Draw a distance-time graph for Bill's walk on the grid above.

[2]

(iii) Does Bill catch up with Anna? How can you tell this from the graph?

\_\_\_\_\_ [1]

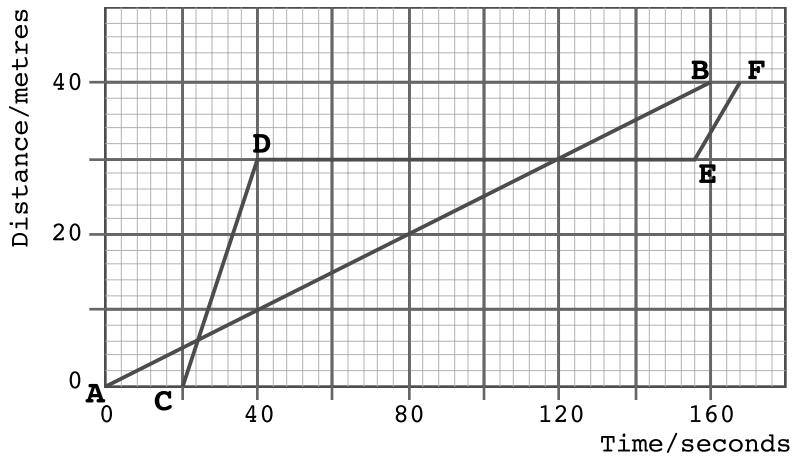
(iv) How long does it take Bill to catch up with Anna from the moment he sets out from home, and how far are they from school when he does?

\_\_\_\_\_ [1]

(v) Does Bill reach school before Anna? If so, how long must he wait for Anna to arrive?

\_\_\_\_\_ [2]

- 7 The tortoise and the hare run a race against each other. The distance time graph for their race is shown below. The motion of the tortoise is shown by the line AB. That of the hare is shown by the line CDEF.



Use the graph to answer the following questions.

- (a) Over what distance was the race run?

---

- (b) What was the average speed of the tortoise in metres per second over this distance?

---

- (c) How many seconds start did the tortoise have over the hare?

---

- (d) Describe what the hare was doing between the points

C and D \_\_\_\_\_

D and E \_\_\_\_\_

E and F \_\_\_\_\_

- (e) How long had the tortoise been moving when it was overtaken by the hare?

---

- (f) What the average speed (in m/s) of the hare over the race (i.e. from B to E)?

---

- (g) Who won the race and why?

---