

Worksheet: Distance–time graphs

Topics: Distance–time graphs

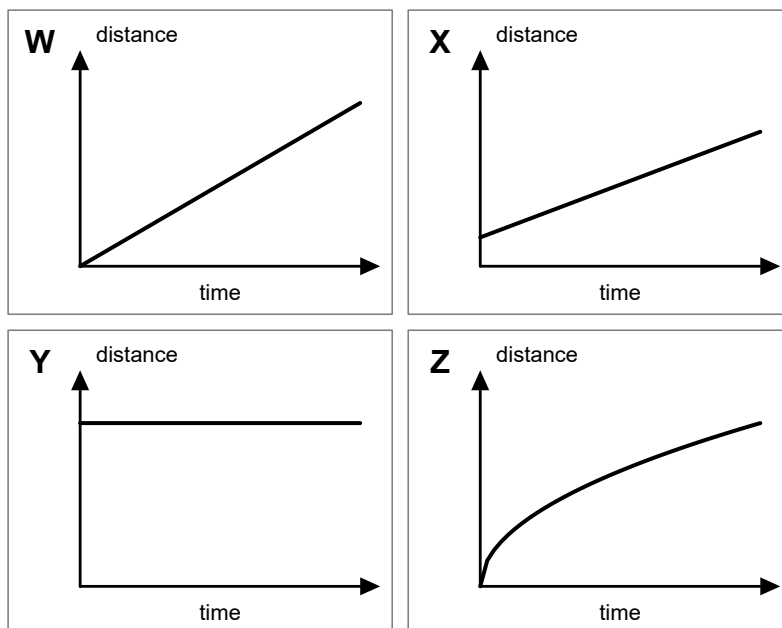
DATE

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Figure 1 shows four distance–time graphs, W, X, Y and Z.

Figure 1



0 1 . 1

Which graph shows an object moving at a constant, non-zero speed, starting from a non-zero distance?

Tick (✓) **one** box.

W

☐

X

☐

Y

☐

Z

☐

[1 mark]

0 1 . 2

Which graph shows an object that is stationary throughout?

Tick (✓) **one** box.

W

☐

X

☐

Y

☐

Z

☐

[1 mark]

0 1 . 3

Explain how graph Z shows that the object's speed is decreasing.

.....

.....

[1 mark]

0 2

0 2 . 1

On a distance–time graph, what does a steeper gradient represent?
Tick (✓) **one** box.

- A greater distance
- A greater speed
- A longer time
- A smaller speed

☐

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[1 mark]

0 2 . 2

A student walks at a constant speed and covers 350 m in 250 s.
Calculate their speed.

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.....

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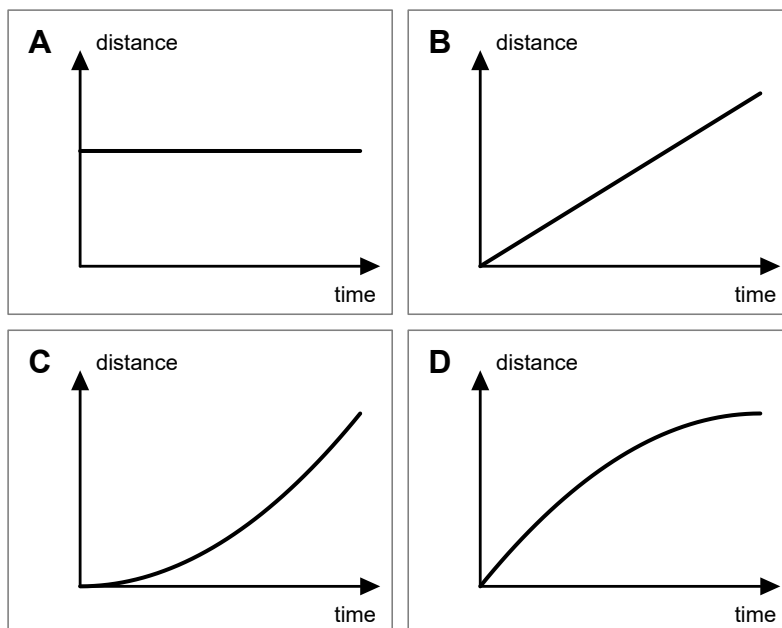
Speed = m/s

[2 marks]

0 3

Figure 2 shows four distance–time graphs, A, B, C and D.

Figure 2



0 3 . 1

Which graph shows an object that is stationary?

Tick (✓) **one** box.

A

☐

B

☐

C

☐

D

☐

[1 mark]

0 3 . 2

Which graph shows an object moving at a constant speed?

Tick (✓) **one** box.

A

☐

B

☐

C

☐

D

☐

[1 mark]

0 3 . 3

Which graph shows an object that is speeding up?

Tick (✓) **one** box.

A

☐

B

☐

C

☐

D

☐

[1 mark]

0 3 . 4

Explain how graph D shows that the object is slowing down.

.....

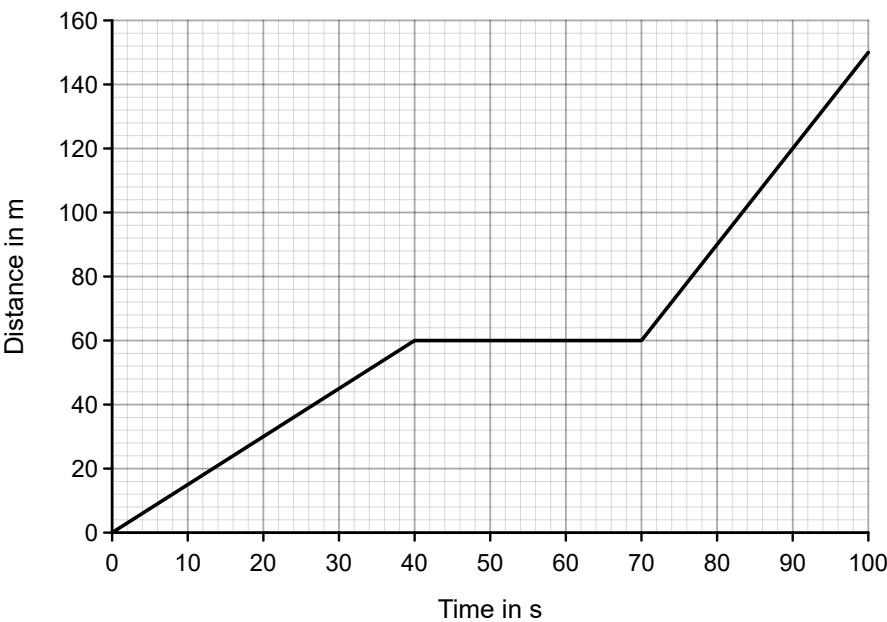
.....

[1 mark]

0 4

Figure 3 shows a distance–time graph for a student walking to a shop.

Figure 3



0 4 . 1

Describe the motion of the student between 40 s and 70 s.

.....

.....

[1 mark]

0 4 . 2

Calculate the speed of the student during the first 40 s.
Use the equation:
speed = distance ÷ time

.....

.....

.....

.....

Speed = m/s

[2 marks]

0 4 . 3

During which part of the journey was the student moving fastest? Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 5

A student wants to obtain a distance–time graph for a toy car as it moves across the floor.

0 5 . 1

Describe how the student could use an ultrasonic position sensor connected to a data logger to obtain a distance–time graph for the car.

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.....

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.....

[3 marks]

0 5 . 2

Suggest one advantage of this method over a student using a stopwatch and metre rule to record distance manually at intervals.

.....

.....

[1 mark]

0 6

Table 1 shows a runner’s total distance and total time at four checkpoints in a race. The runner starts at time 0 s.

Table 1

Checkpoint	Total distance in km	Total time in s
1	5	1500
2	10	3100
3	15	4750
4	20	6500

0 6 . 1

Calculate the runner’s average speed for the whole 20 km.

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.....

.....

Average speed = m/s

[3 marks]

0 6 . 2

Determine, with calculations, during which 5 km section of the race the runner's average speed was greatest.

.....

.....

.....

.....

[2 marks]

0 6 . 3

A distance–time graph is drawn for the runner, with straight lines joining the points.
Describe how the gradient of the graph changes from one section to the next, and explain what this shows.

.....

.....

.....

.....

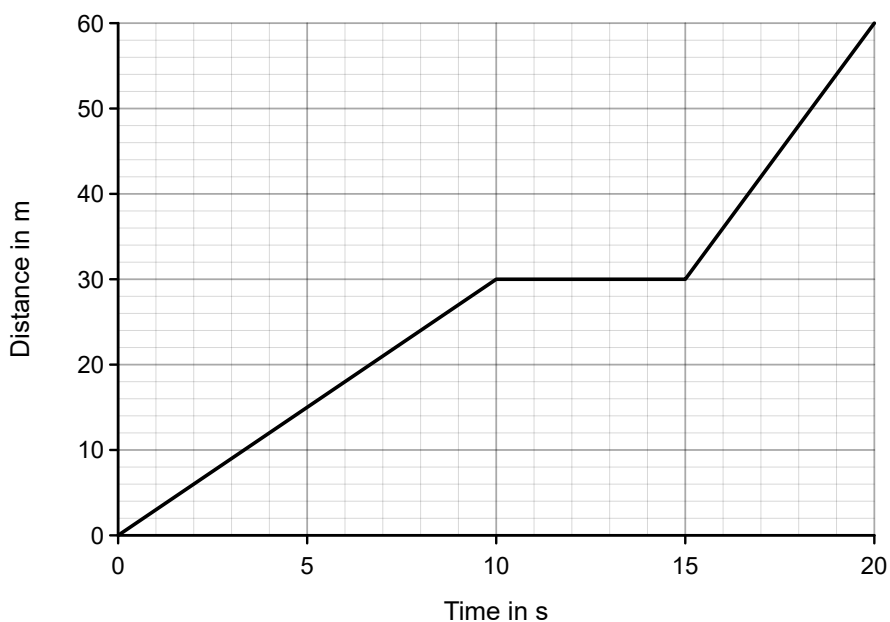
[2 marks]

.....

0 7

A cyclist rides along a straight road to a friend's house, stopping on the way at a road junction. Figure 4 shows the distance–time graph for the journey.

Figure 4



0 7 . 1

Use Figure 4 to determine the speed of the cyclist during the first 10 s.

.....

.....

.....

.....

Speed = m/s

[2 marks]

0 7 . 2

For how long was the cyclist stopped at the junction?

.....

.....

.....

Time = s

[1 mark]

0 7 . 3

Calculate the average speed of the cyclist for the whole journey shown.

.....

.....

.....

.....

.....

Average speed = m/s

[3 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Distance–time graphs · 32 marks

Question 1 (3 marks)

01.1 [1 mark]

Correct: X

01.2 [1 mark]

Correct: Y

01.3 [1 mark]

Answer: The gradient decreases (the graph gets less steep) over time.

- the gradient of the graph decreases (the graph becomes less steep) as time increases (1)
-
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: A greater speed

02.2 [2 marks]

Answer: 1.4 m/s

- $v = 350 \div 250$ (1)
 - 1.4 (m/s) (1)
-
-

Question 3 (4 marks)

03.1 [1 mark]

Correct: A

03.2 [1 mark]

Correct: B

03.3 [1 mark]

Correct: C

03.4 [1 mark]

Answer: The gradient (slope) is decreasing.

- the gradient (slope) of the graph decreases (1)
-

Question 4 (5 marks)

04.1 [1 mark]

Answer: The student is stationary.

- stationary / not moving (1)

04.2 [2 marks]

Answer: 1.5 m/s

- speed = $60 \div 40$ (1)
- 1.5 (m/s) (1)

04.3 [2 marks]

Answer: Between 70 s and 100 s, where the graph is steepest.

- between 70 s and 100 s (1)
- the gradient (slope) of the graph is steepest (1)

Question 5 (4 marks)

05.1 [3 marks]

Answer: Point a position sensor at the car; the data logger records distance at frequent regular intervals and plots it against time automatically.

- set up the position sensor so that it faces the car and can detect the car throughout its motion (1)
- the sensor (and data logger) automatically records the car's distance from the sensor at very short, regular time intervals (1)
- the data logger (or connected computer) plots this distance and time data directly as a distance–time graph (1)

05.2 [1 mark]

Answer: It records far more, and more precise, data points than manual timing could.

- it can record many more data points, much more frequently and precisely, than would be possible by hand, giving a smoother and more detailed graph (1)

Question 6 (7 marks)

06.1 [3 marks]

Answer: 3.08 m/s

- total distance = 20 km = 20 000 (m) (1)
 - average speed = $20\,000 \div 6500$ (1)
 - 3.08 (m/s) (1)
-

06.2 [2 marks]

Answer: The first section, start to checkpoint 1 (3.33 m/s).

- average speed calculated for each section: 3.33, 3.13, 3.03 and 2.86 (m/s) (1)
 - the first section (from the start to checkpoint 1) (1)
-

06.3 [2 marks]

Answer: The gradient decreases section by section, showing the runner's speed decreases.

- the gradient decreases (the graph becomes less steep) in each later section (1)
 - the gradient represents the speed, so the runner slows down during the race (1)
-

Question 7 (6 marks)

07.1 [2 marks]

Answer: 3 m/s

- gradient = $30 \div 10$ (1)
 - 3 (m/s) (1)
-

07.2 [1 mark]

Answer: 5 s

- 5 (s) (1)
-

07.3 [3 marks]

Answer: 3 m/s

- total distance = 60 (m) (1)
 - total time = 20 (s), including the stop (1)
 - average speed = $60 \div 20 = 3$ (m/s) (1)
-