

Exercise walk-through

# C2.9

## Graphs in practical situations

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IGCSE Mathematics

## You must be able to

- Read practical graphs with their axis units
- Interpret gradient and stationary sections
- Plot cumulative journey times and find a whole-journey average

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The method

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## Method — Key knowledge: Graphs in practical situations

Read both axis labels and units before interpreting a graph. On a distance-time graph the gradient is speed; a horizontal section means stopped. Plot time horizontally and distance vertically, joining consecutive data points. On a conversion graph, read one quantity across to the line and then to the other axis. Average speed uses the whole journey time.

## Exercises 2.1·2.3

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**2.1** A distance-time line rises from 0 km at 0 h to 24 km at 3 h. Find its speed. [2]

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**2.2** A graph is horizontal from 09:20 to 09:55. State what happens and for how long. [2]

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**2.3** A conversion line follows  $Y = 7X$ . Find  $Y$  when  $X = 12$  and  $X$  when  $Y = 56$ . [2]

## Exercises 2.1·2.3

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**2.1** A distance-time line rises from 0 km at 0 h to 24 km at 3 h. Find its speed. [2]

**2.1**

- $v = \Delta d / \Delta t = 24/3 = 8$  km/h.
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**2.2** A graph is horizontal from 09:20 to 09:55. State what happens and for how long. [2]

**2.2**

- No distance change means **stopped for 35 minutes**.
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**2.3** A conversion line follows  $Y = 7X$ . Find  $Y$  when  $X = 12$  and  $X$  when  $Y = 56$ . [2]

**2.3**

- $Y = 7(12) = 84$ ;  $X = 56/7 = 8$ .

## Exercise 2.4

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**2.4** Draw a distance-time graph through  $(0, 0)$ ,  $(1, 6)$ ,  $(2, 6)$ ,  $(4, 14)$ , using  $h$  and  $km$ . [2]

## 3 Exam-style questions

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## Exercise 2.4

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**2.4** Draw a distance-time graph through  $(0, 0)$ ,  $(1, 6)$ ,  $(2, 6)$ ,  $(4, 14)$ , using  $h$  and  $km$ . [2]

### 3 Exam-style questions

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**2.4**

- **Plot the four points and join consecutive points by straight lines.** The middle section is horizontal.

## Exercise 3.1 (a)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(a) A walker covers 9 km in 2 h, stops for 30 min, then covers 6 km in 1.5 h. Give the time-distance coordinates for the whole journey. [2]

## Exercise 3.1 (a)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(a) A walker covers 9 km in 2 h, stops for 30 min, then covers 6 km in 1.5 h. Give the time-distance coordinates for the whole journey. [2]

(a)

- With time in hours:  $(0, 0)$ ,  $(2, 9)$ ,  $(2.5, 9)$ ,  $(4, 15)$ . Join consecutive points.

## Exercise 3.1 (b)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(b) Find the speed in the final moving section.

[2]

## Exercise 3.1 (b)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(b) Find the speed in the final moving section.

[2]

(b)

- $v = 6/1.5 = 4 \text{ km/h.}$

## Exercise 3.1 (c)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(c) Find the average speed for the whole journey.

[2]

## Exercise 3.1 (c)

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**3.1** Apply the graphs in practical situations methods below. Show working and include units where appropriate.

(c) Find the average speed for the whole journey.

[2]

(c)

- $v_{\text{average}} = 15 / (2 + 0.5 + 1.5) = 15 / 4 = \mathbf{3.75} \text{ km/h.}$

## Exercise 3.2 (a)

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**3.2** A car travels 30 km in 30 min, rests for 15 min, then travels another 45 km in 45 min.

(a) Give the distance-time coordinates, in minutes and km, at the start and each change of activity. Draw the graph. [3]

## Exercise 3.2 (a)

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**3.2** A car travels 30 km in 30 min, rests for 15 min, then travels another 45 km in 45 min.

(a) Give the distance-time coordinates, in minutes and km, at the start and each change of activity. Draw the graph. [3]

(a)

- Plot  $(0,0)$ ,  $(30,30)$ ,  $(45,30)$ ,  $(90,75)$ .
- Label minutes and km on the axes and join consecutive points by straight segments, including the horizontal rest.

## Exercise 3.2 (b)

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**3.2** A car travels 30 km in 30 min, rests for 15 min, then travels another 45 km in 45 min.

(b) Find the speed in each moving section and the average speed for the whole journey. Explain the difference. [3]

## Exercise 3.2 (b)

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**3.2** A car travels 30 km in 30 min, rests for 15 min, then travels another 45 km in 45 min.

(b) Find the speed in each moving section and the average speed for the whole journey. Explain the difference. [3]

(b)

- $v_1 = 30/(30/60) = 60$  and  $v_2 = 45/(45/60) = \mathbf{60}$  km/h.
- Whole-journey  $v = 75/(90/60) = \mathbf{50}$  km/h.
- The rest lowers the average despite equal moving speeds.