MR SULLY UNFOLDS PHYSICS ANSWERS

Speed, velocity and distance–time graphs

AQA 4.5.6.1
Forces · Paper 2
Foundation & Higher

Name _____ Class _____ Date _____

Speed tells you how fast something is moving. Velocity also tells you which direction. Distance–time graphs show motion at a glance.

KEY IDEAS

- Speed = distance ÷ time (s = vt). Typical speeds: walking 1.5 m/s, running 3 m/s, cycling 6 m/s; sound in air 330 m/s.
- **Distance** and **speed** are scalars. **Displacement** and **velocity** are vectors (they include direction).
- On a distance–time graph, the **gradient** is the speed. A horizontal line means stationary.

Section A · Recall and calculate

Grade 4–5

1 What is the difference between speed and velocity? [1]

Velocity is speed in a given direction (velocity is a vector).

2 A cyclist travels 1800 m in 300 s. Calculate her average speed. [2]

v = 1800 ÷ 300 = 6 m/s

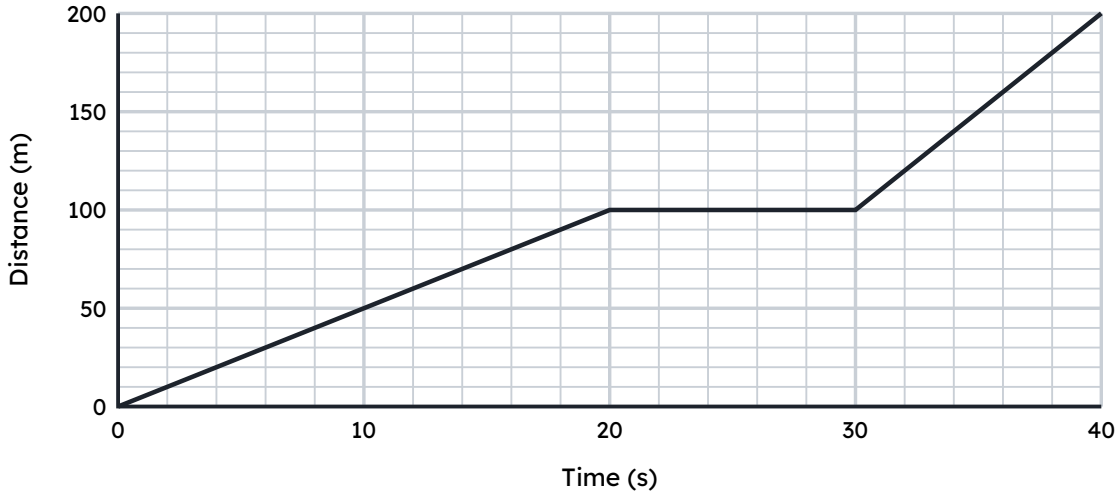
3 Give a typical speed for a person walking. [1]

About 1.5 m/s

Section B · Read the graph

Grade 5–6

4 The distance–time graph shows a student's walk.



a Describe the motion between 20 s and 30 s. [1]

Stationary (not moving).

b Calculate the speed in the first 20 s. [2]

Speed = 100 ÷ 20 = 5 m/s

c State when the student was moving fastest. Explain how you can tell. [2]

Between 30 s and 40 s,

because the line is steepest (biggest gradient).

Section C · Stretch

Grade 7+

5 A car travels 6 km in 5 minutes. Calculate its average speed in m/s. [3]

6 km = 6000 m, 5 min = 300 s

v = 6000 ÷ 300

v = 20 m/s

6 Explain why a car moving around a roundabout at a constant speed has a changing velocity. (Higher) [2]

Velocity includes direction.

The car's direction is changing, so its velocity is changing.

Exam-style question

AQA style

7 Sound travels at 330 m/s in air. A student sees lightning and hears the thunder 3 s later.

a Calculate how far away the lightning was. [2]

s = vt = 330 × 3

s = 990 m

b Explain why the student sees the lightning before hearing the thunder. [1]

Light travels much faster than sound.

c On an accelerating object's distance–time graph, describe how to find its speed at one particular time. (Higher) [2]

Draw a tangent to the curve at that time,

then calculate the gradient of the tangent.

Total: _____ / 19

How confident am I?	Not yet	Nearly	Got it
I can use s = vt with correct units	☐	☐	☐
I can read speed from a distance–time graph	☐	☐	☐
I can explain the difference between speed and velocity	☐	☐	☐