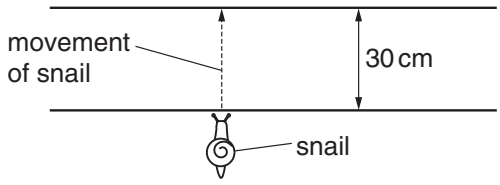
Chapter 2. Describing motion

2.1 Understanding speed

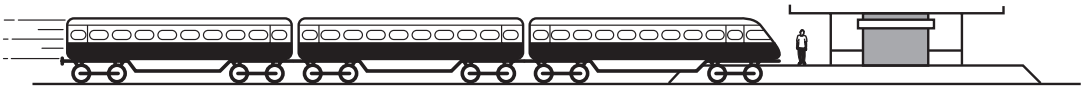
1 A snail crosses a garden path 30 cm wide at a speed of 0.2 cm/s.



How long does the snail take?

A 0.0067 s **B** 6.0 s **C** 15 s **D** 150 s

2 A child is standing on the platform of a station, watching the trains.



A train travelling at 30 m / s takes 3 s to pass the child.

What is the length of the train?

A 10 m **B** 30 m **C** 90 m **D** 270 m

3 A tunnel has a length of 50 km. A car takes 20 min to travel between the two ends of the tunnel.

What is the average speed of the car?

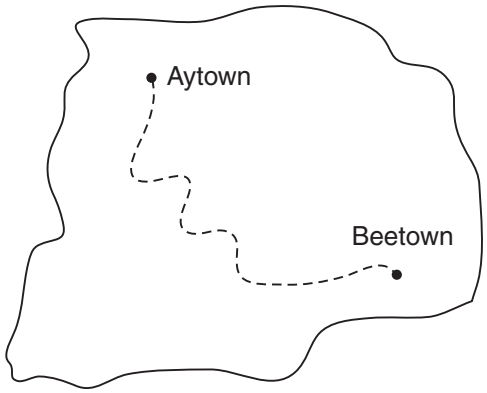
A 2.5 km / h

B 16.6 km / h

C 150 km / h

D 1000 km / h

4 A train travels along a track from Aytown to Beetown. The map shows the route.



The distance travelled by the train between the towns is 210 km. It moves at an average speed of 70 km / h.

How long does the journey take?

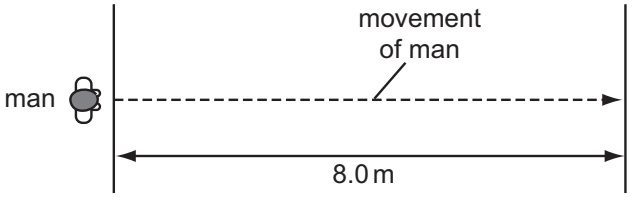
A less than $\frac{70}{210}$ hours, because the journey is not in a straight line

B exactly $\frac{70}{210}$ hours

C exactly $\frac{210}{70}$ hours

D more than $\frac{210}{70}$ hours, because the journey is not in a straight line

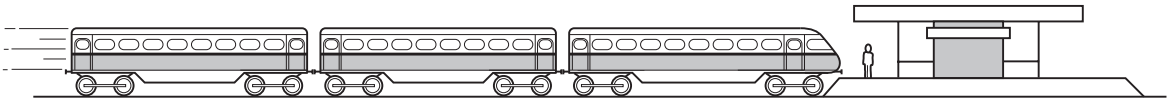
5 A man crosses a road 8.0 m wide at a speed of 2.0 m / s.



How long does the man take to cross the road?

A 4.0 s **B** 6.0 s **C** 10 s **D** 16 s

6 A child is standing on the platform of a station, watching the trains.

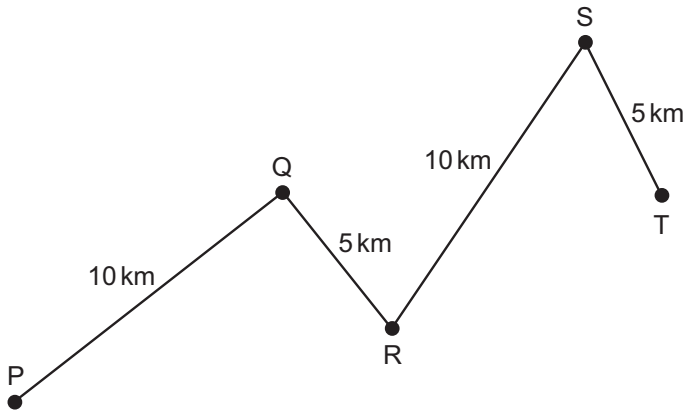


A train travelling at 30 m / s takes 3 s to pass the child.

What is the length of the train?

A 10 m **B** 30 m **C** 90 m **D** 135 m

7 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

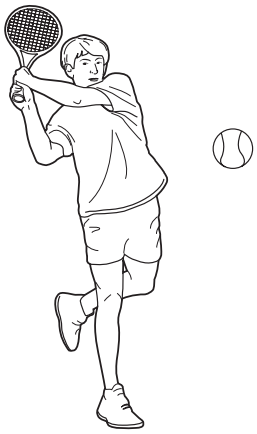
A 10 km / hour

B 20 km / hour

C 30 km / hour

D 60 km / hour

8 A tennis player hits a ball hard and 0.4 s later hears an echo from a wall.



The speed of sound in air is 330 m / s.

How far away is the player from the wall?

A 66 m **B** 132 m **C** 264 m **D** 825 m

9 The circuit of a motor racing track is 3 km in length. In a race, a car goes 25 times round the circuit in 30 minutes.

What is the average speed of the car?

A 75 km / hour

B 90 km / hour

C 150 km / hour

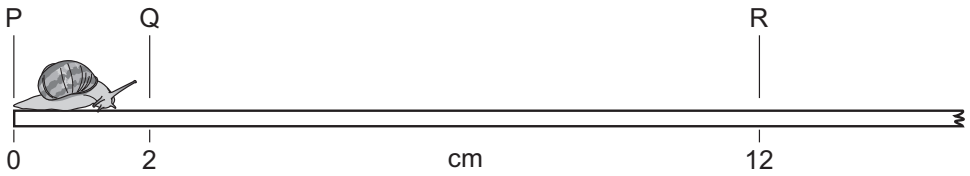
D 750 km / hour

10 A car travels 100 km. The highest speed of the car is 90 km/h, and the lowest speed is 30 km/h. The journey takes two hours.

What is the average speed for the journey?

A 30 km / h **B** 50 km / h **C** 60 km / h **D** 90 km / h

11 A snail moves along a ruler. It takes 20 s to move from Q to R.



What is its average speed from Q to R?

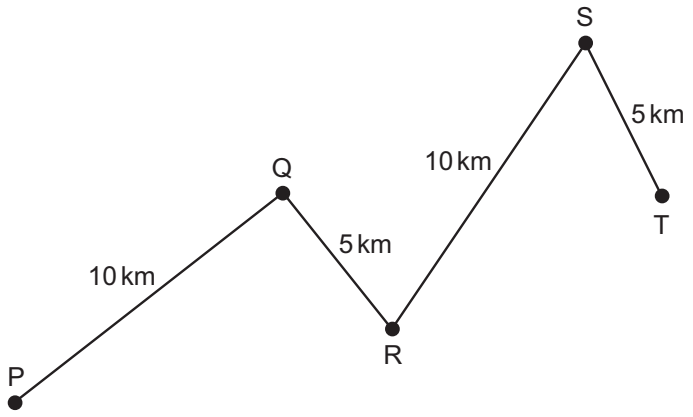
A $\frac{12}{20}$ cm / s

B $\frac{12-2}{20}$ cm / s

C $\frac{20}{12}$ cm / s

D $\frac{20}{12-2}$ cm / s

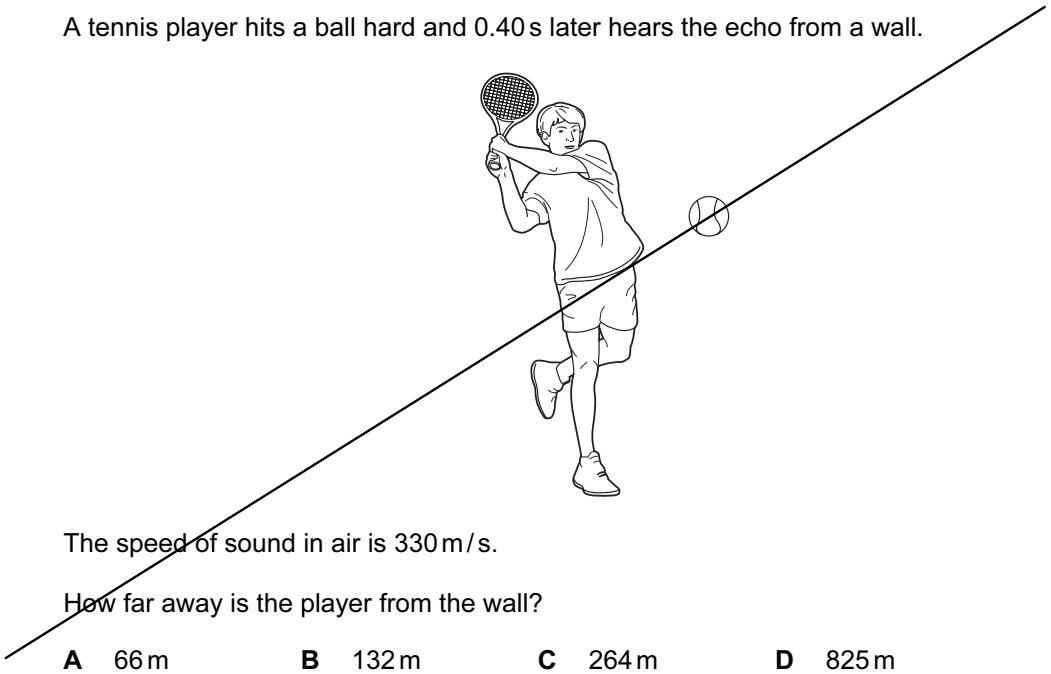
12 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

A 10 km / hour **B** 20 km / hour **C** 30 km / hour **D** 60 km / hour

13 A tennis player hits a ball hard and 0.40 s later hears the echo from a wall.



The speed of sound in air is 330 m / s.

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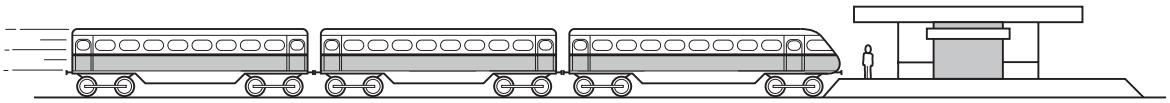
14 A child is standing on the platform of a station.



A train travelling at 30 m / s takes 3.0 s to pass the child.

What is the length of the train?

A 10 m **B** 27 m **C** 30 m **D** 90 m

15 In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

What is the average speed of the car?

A 1.5 km / h **B** 90 km / h **C** 144 km / h **D** 216 km / h

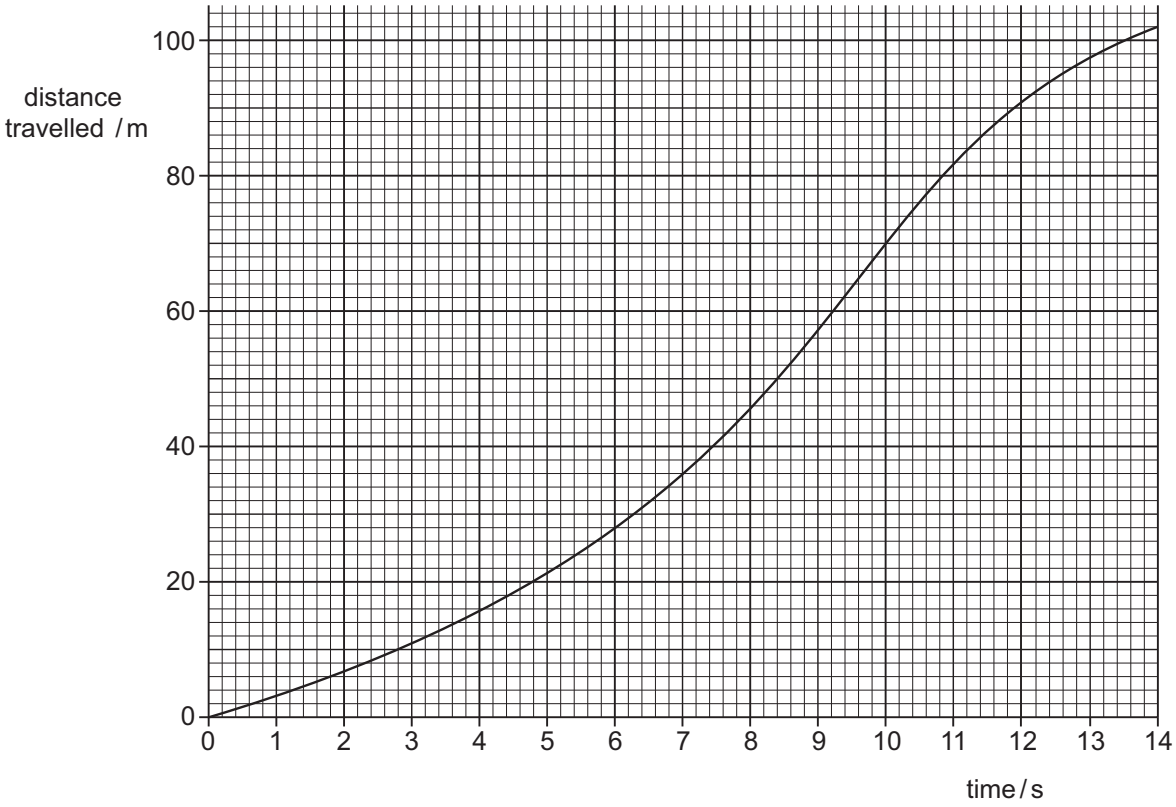
16 In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

What is the average speed of the car?

A 1.5 km / h **B** 90 km / h **C** 144 km / h **D** 216 km / h

2.2 Displacement - time graph

1 The graph shows the progress of an athlete in a 100 m race.



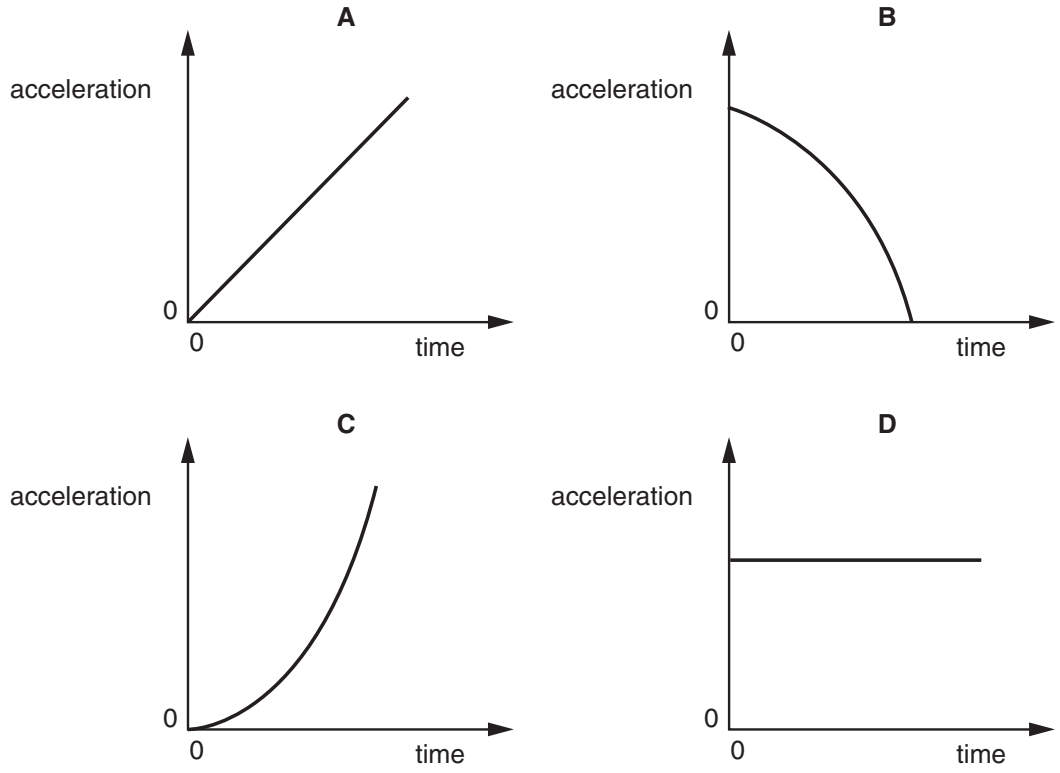
What time was taken to travel 10 m from the start?

A 2.4 s **B** 2.8 s **C** 65 s **D** 70 s

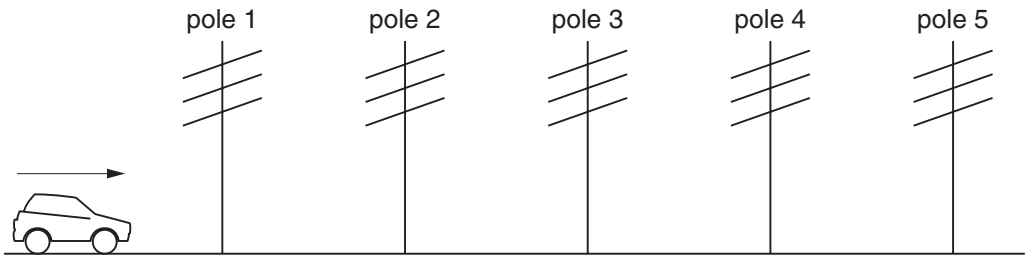
2.3 Understanding acceleration

1 A stone falls freely from the top of a cliff into the sea. Air resistance may be ignored.

Which graph shows how the acceleration of the stone varies with time as it falls?



2 Five telegraph poles are positioned at equal distances along the side of a road.



A car accelerates until it is level with pole 4. The car then continues along the road at a steady speed. The times taken to travel between one pole and the next are measured.

Which time is the greatest?

The time between

A pole 1 and pole 2.

B pole 2 and pole 3.

C pole 3 and pole 4.

D pole 4 and pole 5.

3 A racing car is fitted with an on-board computer. Every time the car passes the starting line, the computer records the distance travelled in the next 2 seconds.

Which set of data shows that the car is increasing in speed during the 2 seconds?

A

time / s	distance travelled / m
0	0
1	100
2	200

B

time / s	distance travelled / m
0	0
1	90
2	180

C

time / s	distance travelled / m
0	0
1	80
2	190

D

time / s	distance travelled / m
0	0
1	100
2	180

4 Four students try to explain what is meant by acceleration.

Which student makes a correct statement?

A It is related to the changing speed of an object.

B It is the distance an object travels in one second.

C It is the force acting on an object divided by the distance it travels in one second.

D It is the force acting on an object when it is near to the Earth.

5 A car travels at various speeds during a short journey.

The table shows the distances travelled and the time taken during each of four stages P, Q, R and S.

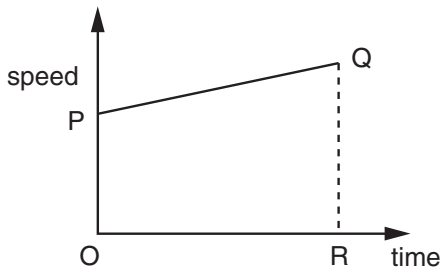
stage	P	Q	R	S
distance travelled / km	1.8	3.6	2.7	2.7
time taken / minutes	2	2	4	3

During which two stages is the car travelling at the same speed?

A P and Q **B** P and S **C** Q and R **D** R and S

2.4 Velocity - time graphs

1 The graph shows how the speed of a car changes with time.



Which of the following gives the distance travelled in time interval OR?

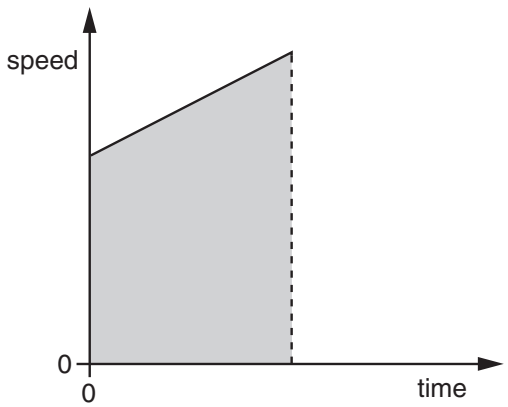
A the area OPQR

B the length PQ

C the length (QR – PO)

D the ratio QR/PO

2 The diagram shows a speed-time graph for a body moving with constant acceleration.



What is represented by the shaded area under the graph?

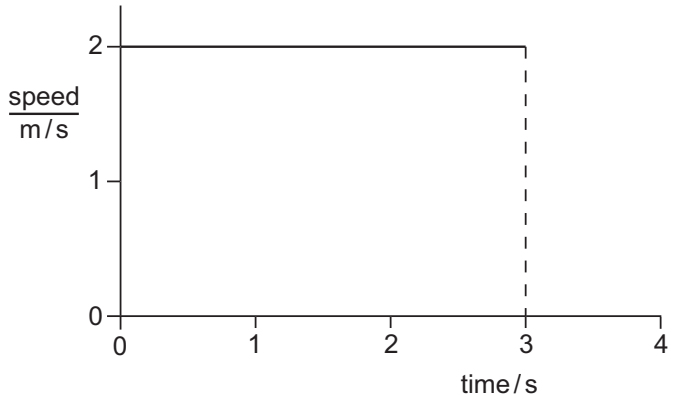
A acceleration

B distance

C speed

D time

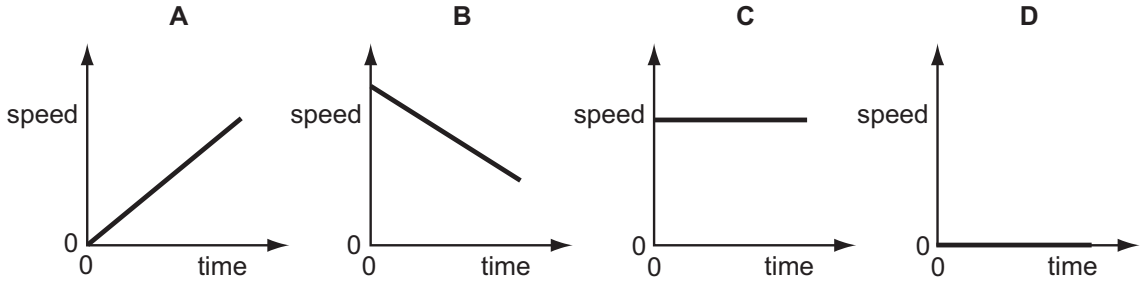
3 The diagram shows the speed-time graph for an object moving at constant speed.



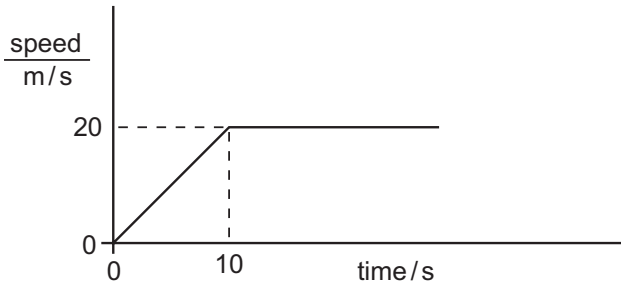
What is the distance travelled by the object in the first 3 s?

A 1.5 m **B** 2.0 m **C** 3.0 m **D** 6.0 m

4 Which speed/time graph applies to an object at rest?



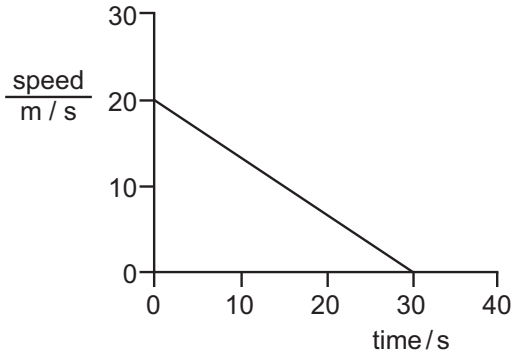
5 A car accelerates from traffic lights. The graph shows how the car's speed changes with time.



How far does the car travel before it reaches a steady speed?

A 10 m **B** 20 m **C** 100 m **D** 200 m

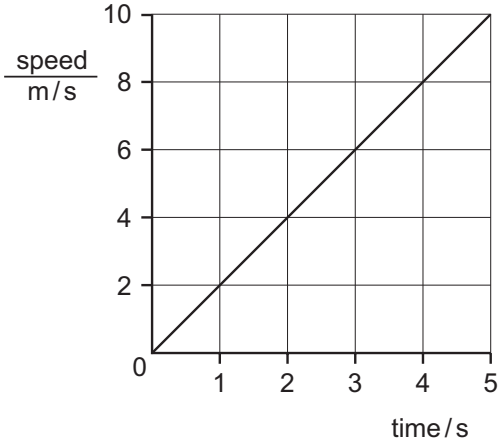
6 The graph represents part of the journey of a car.



What distance does the car travel during this part of the journey?

A 150 m **B** 300 m **C** 600 m **D** 1200 m

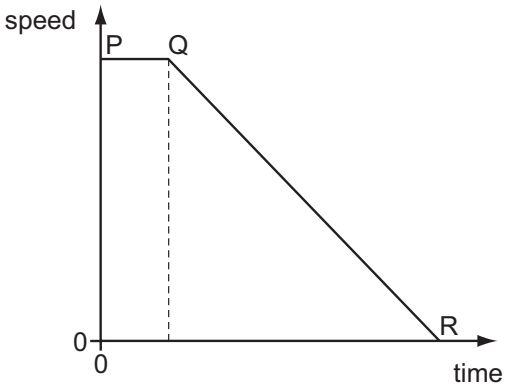
7 The graph represents the movement of a body accelerating from rest.



After 5 seconds how far has the body moved?

A 2 m **B** 10 m **C** 25 m **D** 50 m

8 A cyclist is riding along a road when an animal runs in front of him. The graph shows the cyclist's motion. He sees the animal at P, starts to brake at Q and stops at R.



What is used to find the distance travelled after he applies the brakes?

A the area under line PQ

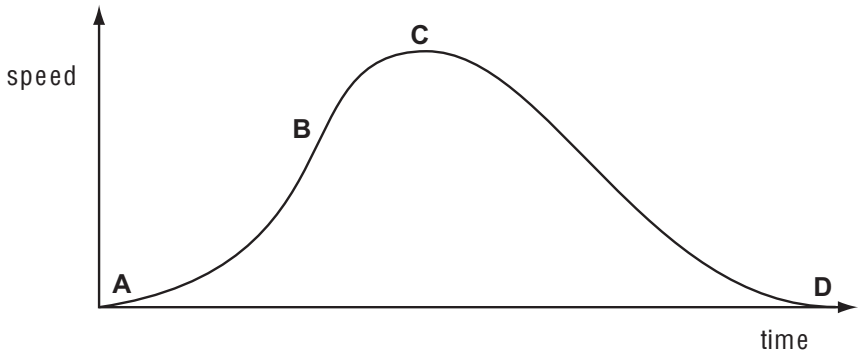
B the area under line QR

C the gradient of line PQ

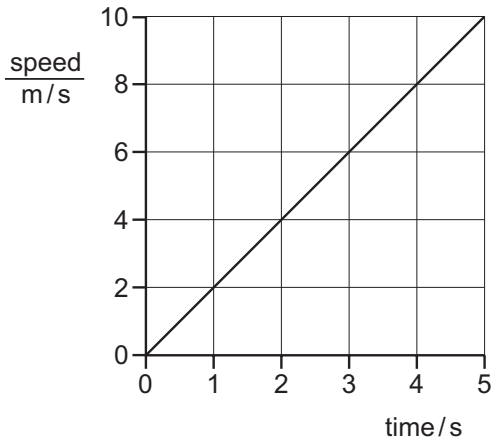
D the gradient of line QR

9 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus the greatest?



10 The graph represents the movement of a body.



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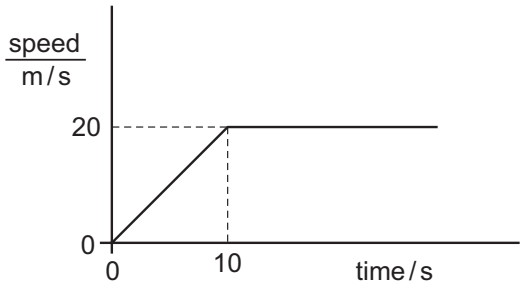
A 2 m **B** 10 m **C** 25 m **D** 50 m

11 A car accelerates from traffic lights. The graph shows the car's speed plotted against time.



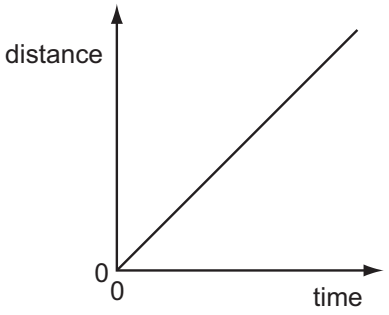
How far does the car travel before it reaches a constant speed?

A 10 m **B** 20 m **C** 100 m **D** 200 m

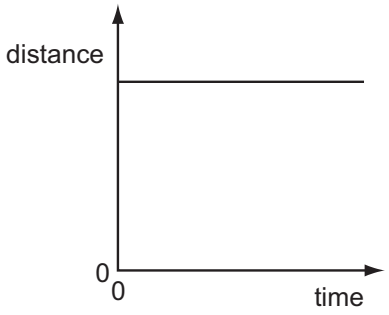
12 Two distance / time graphs and two speed / time graphs are shown.

Which graph represents an object that is at rest?

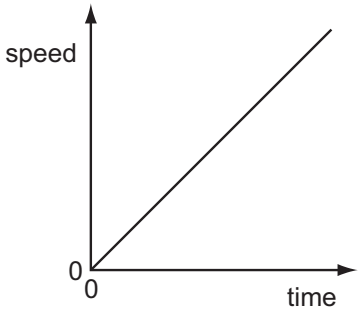
A



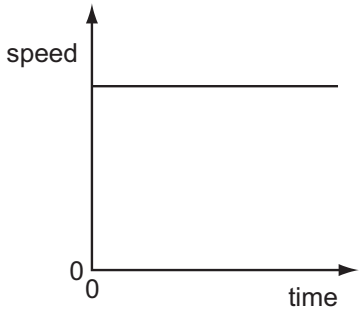
B



C



D



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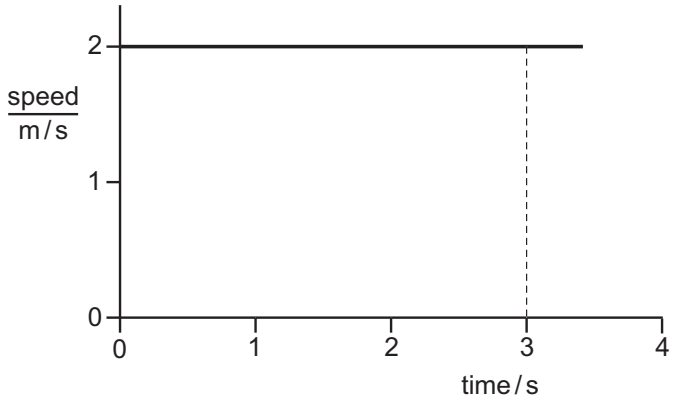


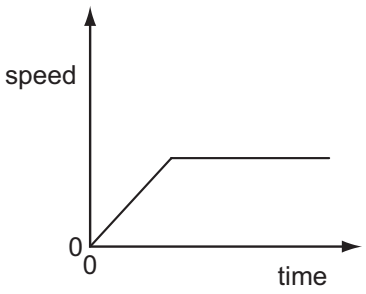
What is the distance travelled by the object in the first 3 s?

A 1.5 m **B** 2.0 m **C** 3.0 m **D** 6.0 m

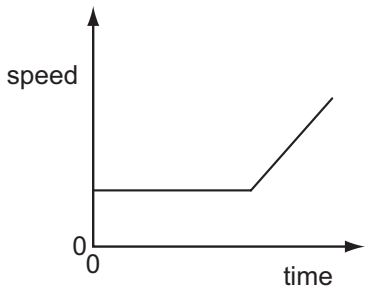
14 An object moves initially with constant speed and then with constant acceleration.

Which graph shows this motion?

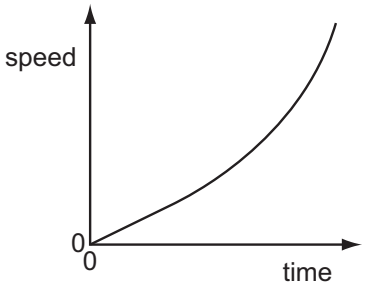
A



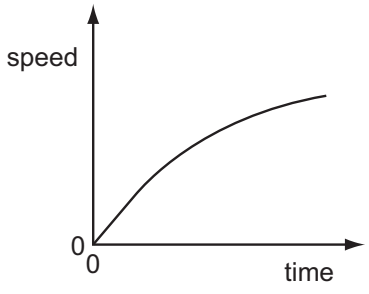
B



C



D



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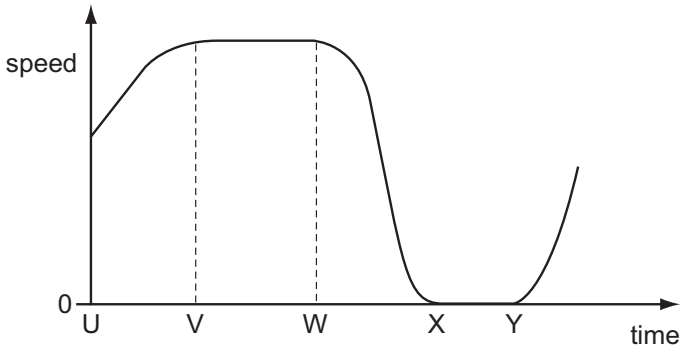
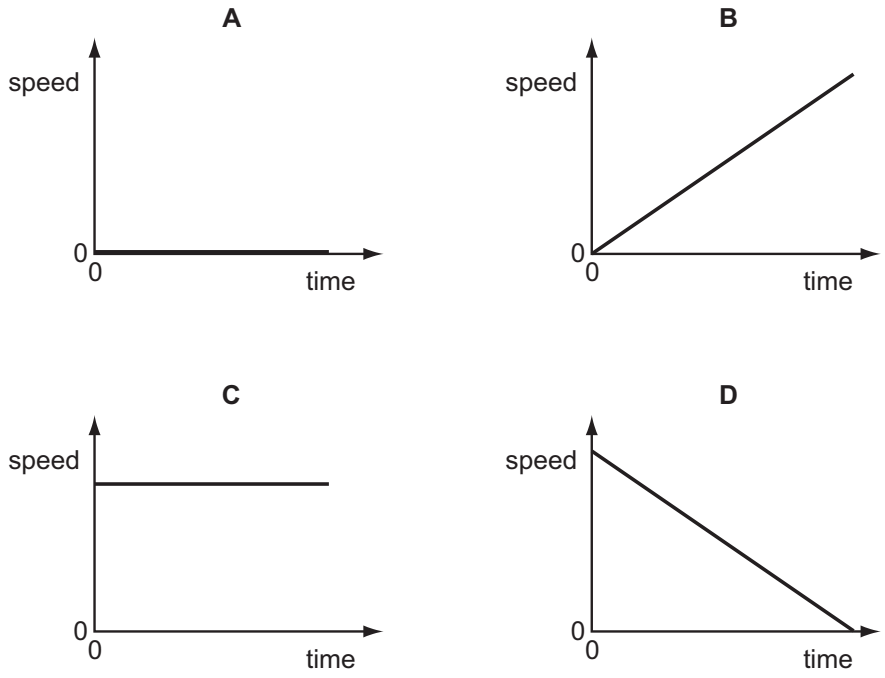


Between which two times is the car stationary?

A U and V **B** V and W **C** W and X **D** X and Y

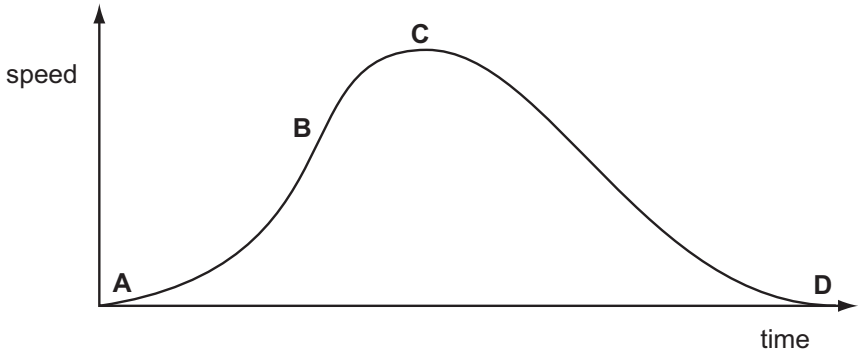
16 A car is moving downhill along a road at a constant speed.

Which graph is the speed / time graph for the car?



17 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus greatest?



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