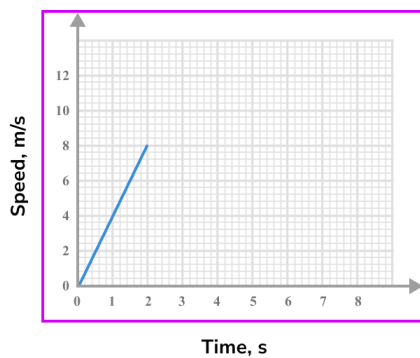THIRD SPACE
LEARNING

# Speed-Time Graphs - Worksheet

Skill

Group A - Drawing speed-time graphs

Complete/draw the speed time graphs using the information provided:

1) An object accelerates from rest for 2 seconds and reaches 8 m/s. It maintains that speed for a further 6 seconds. Complete the speed-time graph.
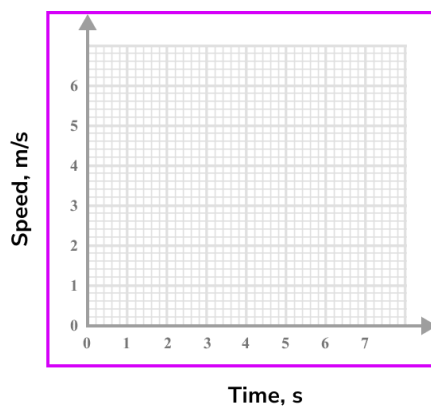

2) An object is travelling at a constant speed of 3 m/s for 4 seconds. It then accelerates reaching a speed of 6 m/s after a further 4 seconds. Complete the speed-time graph.
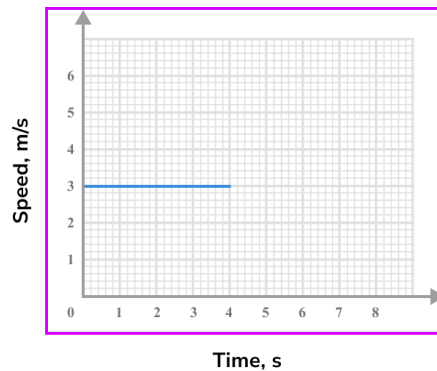

3) A vehicle is travelling at a constant speed of 40 km/h for 1.5 hours. It then decelerates, coming to rest after a further 2 hours. Complete the speed-time graph.
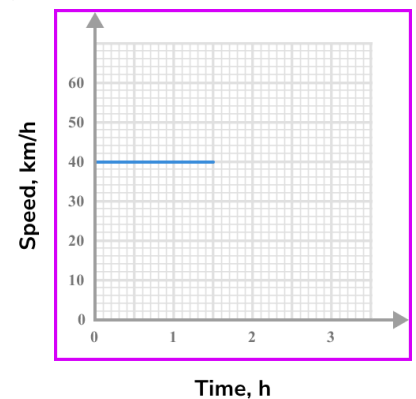

4) An object accelerates from rest for 3 seconds reaching a speed of 5 m/s. It then maintains this speed for a further 4 seconds. Use the axes to draw a speed-time graph.

5) An object travels at a constant speed of 12 m/s for 2 seconds. It then decelerates for 3 seconds until it reaches a speed of 8 m/s, which it maintains for a further 4 seconds. Use the axes to draw a speed-time graph.
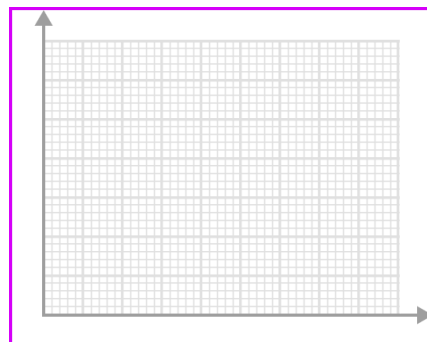
6) A vehicle accelerates from rest reaching a speed of 60 km/h after 30 minutes. It maintains this speed for a further 30 minutes and then decelerates to 40km/h after another 30 minutes. It stays at this speed for a further 30 minutes. Use the axes to draw a speed-time graph.
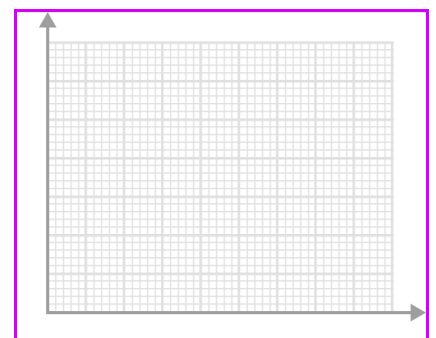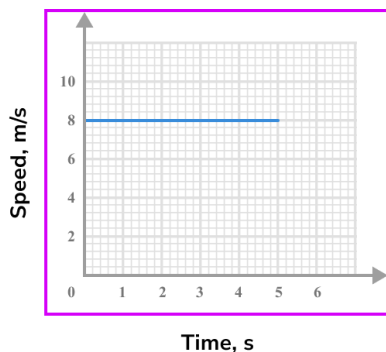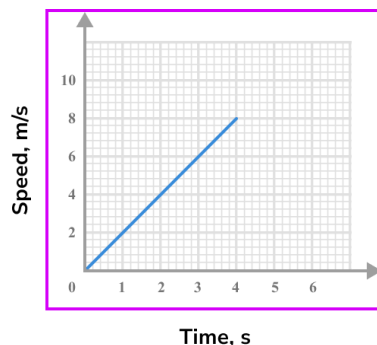
Speed-Time Graphs - Worksheet

Group B - Finding the acceleration from a speed-time graph

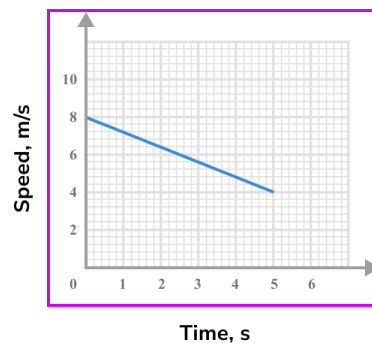Find the acceleration required from the speed-time graphs:
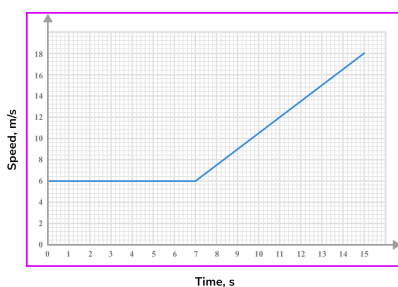
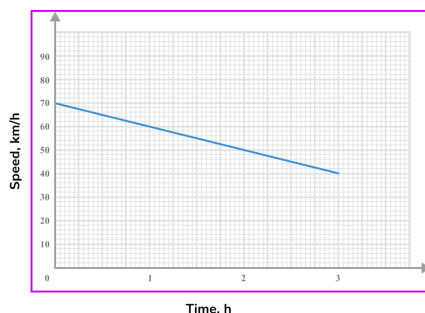**1)** State the acceleration

2) Find the acceleration

3) Find the acceleration

4) Find the acceleration in the last part of the journey.
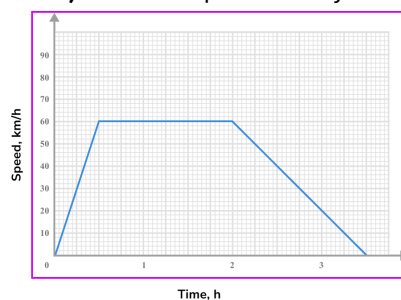

5) Find the deceleration

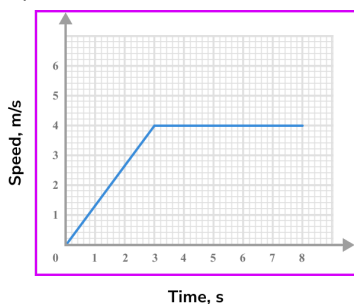**6)** Find the acceleration in
   a) The first part of the journey
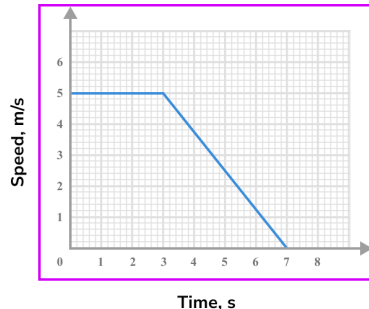   **b)** The last part of the journey

Group C - Find the total distance and average speed from a speed-time graph.

Find the total distance travelled and the average speed from the speed-time graphs:
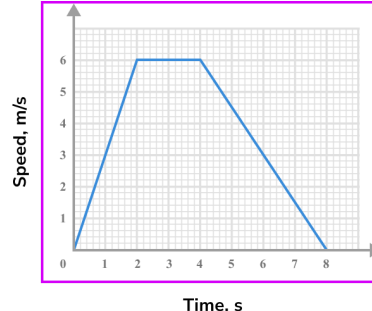
1)

2)

3)

4)
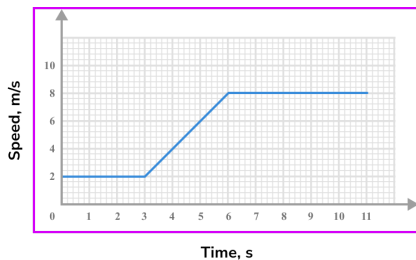
5)

6)
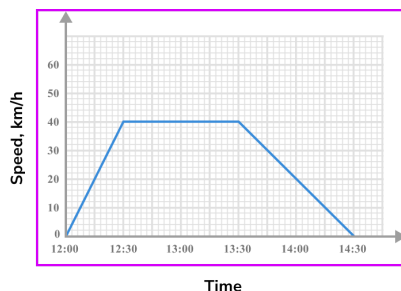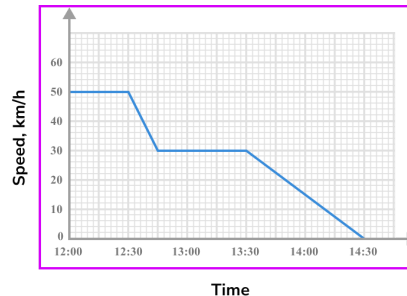
Speed-Time Graphs - Worksheet

Applied

1)   An electric go-kart has two gears, High and Low. Each gear produces a constant acceleration.

A driver set off from rest in Low gear, accelerated for 6 seconds, changed to High gear and accelerated for a further 6 seconds.

The table shows the speeds reached at those times.

Time, s	0	6	12
Speed, m/s	0	5	8

(a)   Use the axes to draw the speed-time graph for the go-kart.
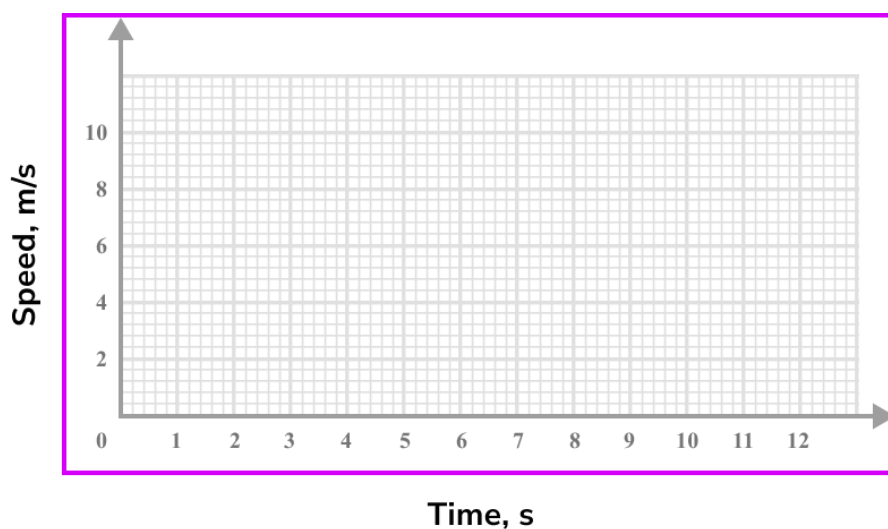
(b)   Which gear produces a greater acceleration? Explain your answer.

Speed-Time Graphs - Worksheet

2)   A student was trying to measure the acceleration of a free-falling marble caused by gravity and air resistance.

They dropped the marble from the roof of a building and the marble hit the floor after 2 seconds.

The speed-time graph shows the motion of the marble.

Time, s

If the marble was dropped from a height of 18 metres.

Find:

(a)   The speed the marble reached when it hit the floor.

(b)   The acceleration of the marble while it was falling.

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4
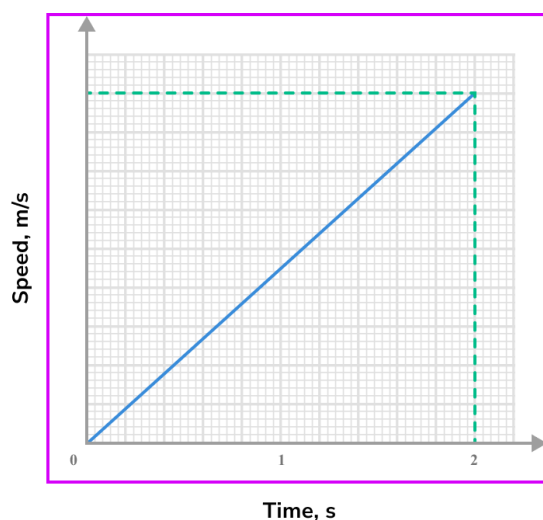
Speed-Time Graphs - Worksheet

3)   The speed-time graph shows the speed of an object in the first 120 metres of its journey.
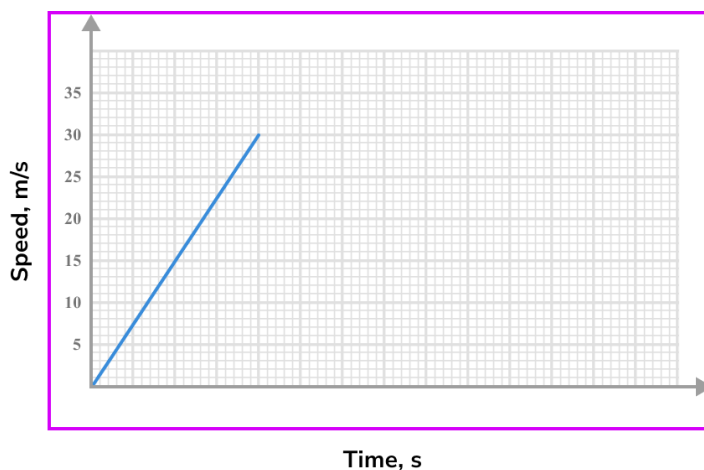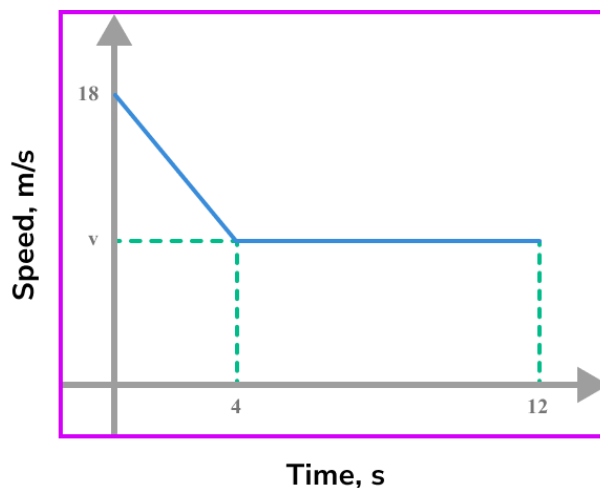

Time, s

(a)   Use the information to label the horizontal axis.

(b)   The object maintained this speed for a further 270 metres. Add a line to the speed-time graph to show this part of the journey.

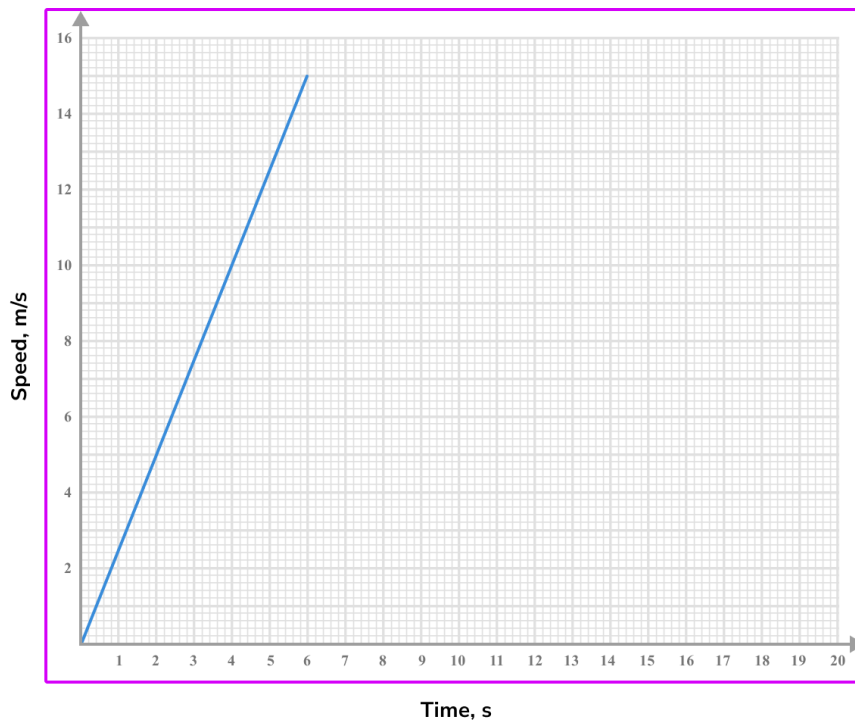**4)**   The speed-time graph shows the speed of an object over a 12 second period.

Time, s

The object travelled a total distance of 146 metres.

(a)   Find v.

(b)   Find the deceleration of the object for the first part of its motion.

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Speed-Time Graphs - Exam Questions

1) The speed-time graph shows the first part of a journey by a car.

(a) Find the acceleration of the car for the first part of its journey.

....

(1)

After the first 6 seconds of its journey, the car maintains its speed for a further 8 seconds before then slowing down at a constant rate of 5 m/s^2 until stationary.

(b) Complete the speed-time graph for the car.
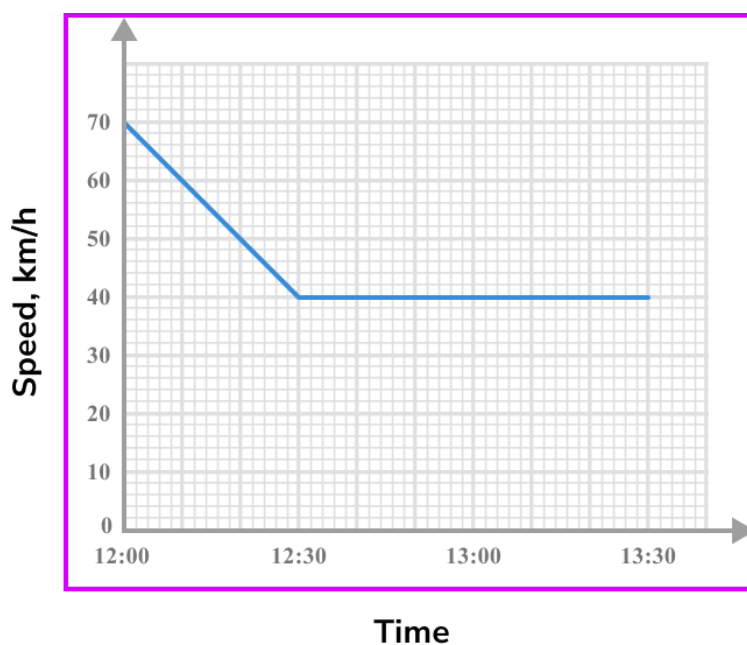
(2)

(c) Find the total distance travelled by the car.

....

(3)

(6 marks)

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Speed-Time Graphs - Exam Questions

2) The speed-time graph shows the speed of a train between 12:00 and 13:30.

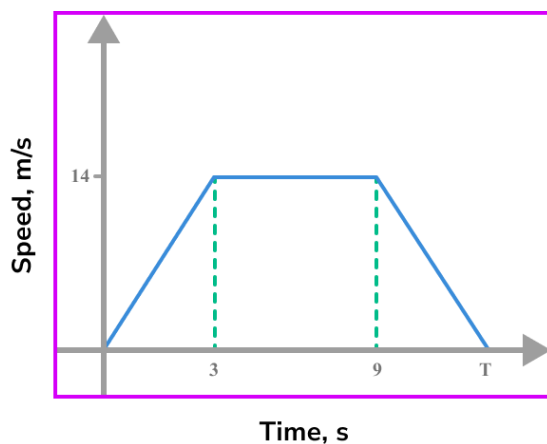**(a)** Find the total distance travelled by the train in that time.

....

(3)

(b) Find the average speed of the train between 12:00 and 13:30.

....

(2)

(5 marks)

Speed-Time Graphs - Exam Questions

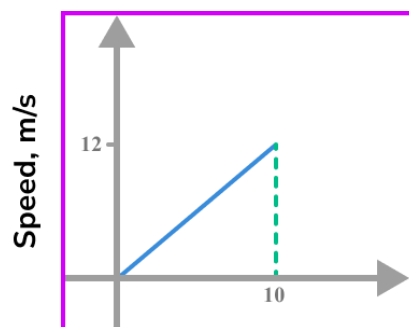**3)** The speed-time graph shows the speed of an object over a period of T seconds.

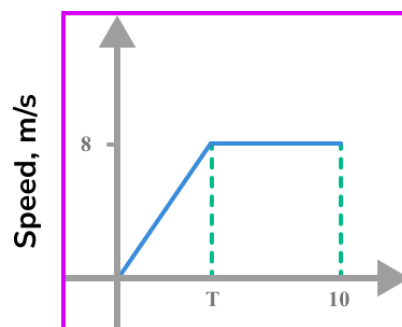If the total distance travelled by the object is 154 metres. find the value of T.

....
(4 marks)

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Speed-Time Graphs - Exam Questions

4)   The two speed-time graphs show the speed of two objects over a 10
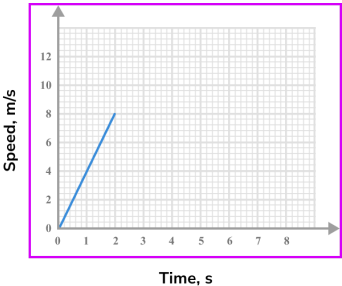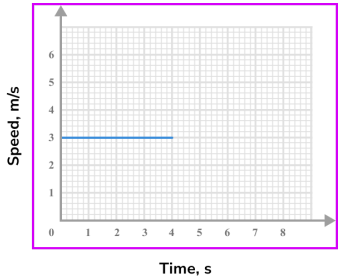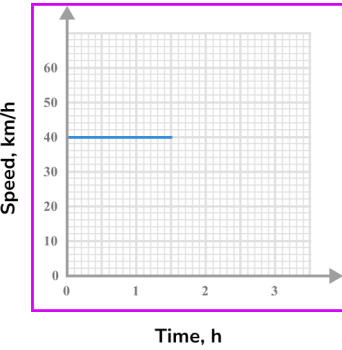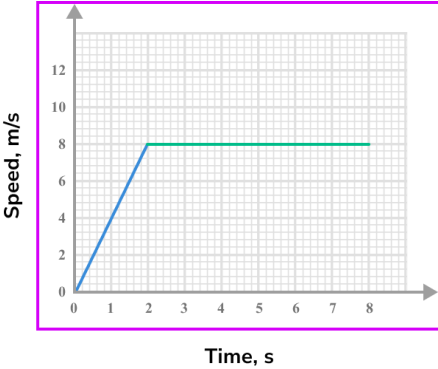second period. Both objects travelled the same total distance.
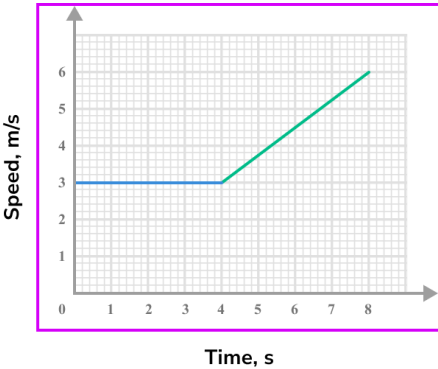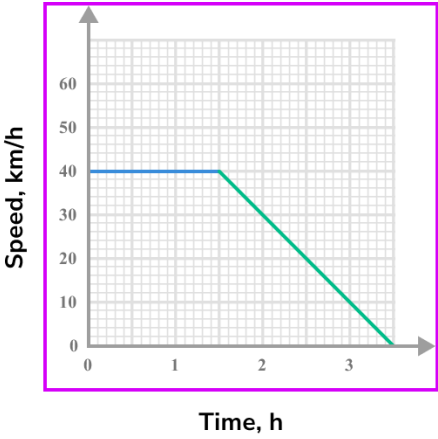
Find the value of T.

....

(4 marks)

Speed-Time Graphs - Answers

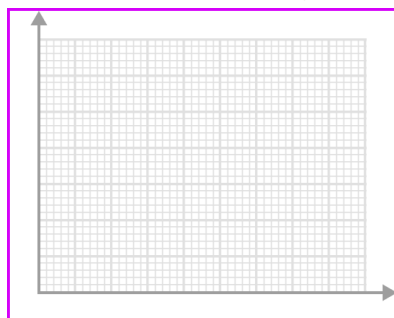|	Question	Answer
	Skill Questions	
Group A	Complete/draw the speed time graphs using the information provided: **1)** An object accelerates from rest for 2 seconds and reaches 8 m/s. It maintains that speed for a further 6 seconds. Complete the speed-time graph.	**1)**
	2) An object is travelling at a constant speed of 3 m/s for 4 seconds. It then accelerates reaching a speed of 6 m/s after a further 4 seconds. Complete the speed-time graph.	**2)**
	3) A vehicle is travelling at a constant speed of 40 km/h for 1.5 hours. It then decelerates, coming to rest after a further 2 hours. Complete the speed-time graph.	**3)**

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Speed-Time Graphs - Answers
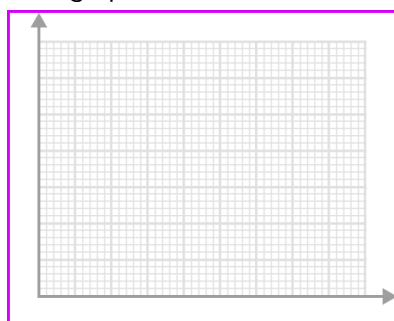
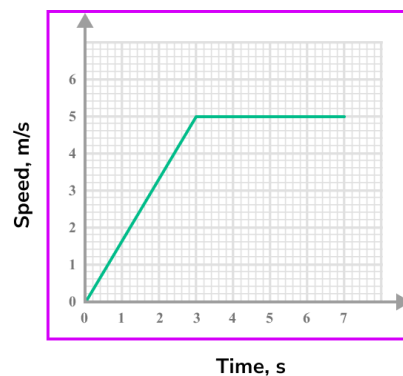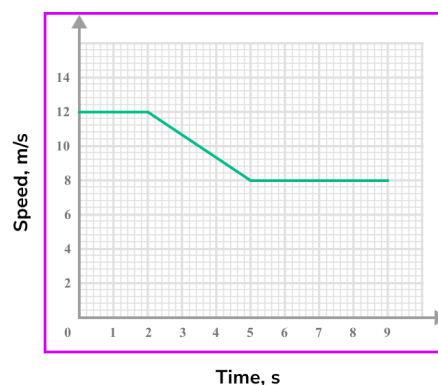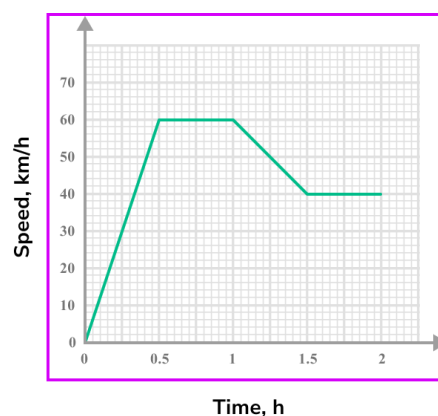| Group A contd	**4)** An object accelerates from rest for 3 seconds reaching a speed of 5 m/s. It then maintains this speed for a further 4 seconds. Use the axes to draw a speed-time graph.	**4)**
	5) An object travels at a constant speed of 12 m/s for 2 seconds. It then decelerates for 3 seconds until it reaches a speed of 8 m/s, which it maintains for a further 4 seconds. Use the axes to draw a speed-time graph.	**5)**
	6) A vehicle accelerates from rest reaching a speed of 60 km/h after 30 minutes. It maintains this speed for a further 30 minutes and then decelerates to 40km/h after another 30 minutes. It stays at this speed for a further 30 minutes. Use the axes to draw a speed-time graph.	**6)**

Speed-Time Graphs - Answers

Group B	Find the acceleration required from the speed-time graphs:	
	1) State the acceleration	**1)** $0 \ m/s^2$
	2) Find the acceleration	**2)** $2 \ m/s^2$
	3) Find the acceleration	**3)** $-0.8 \ m/s^2$
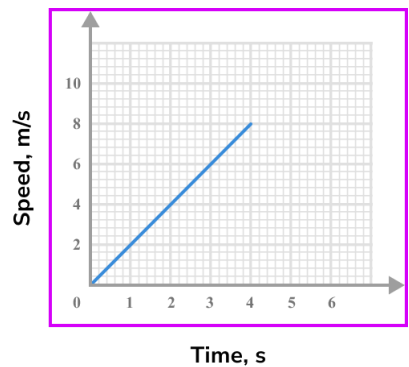
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12
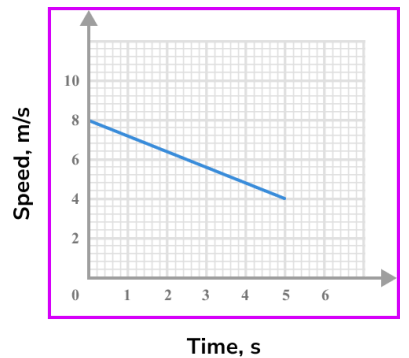
Speed-Time Graphs - Answers

Group B contd	**4)** Find the acceleration in the last part of the journey.	**4)** $1.5 \ m/s^2$
	5) Find the deceleration	**5)** $10 \ km/h^2$
	6) Find the acceleration in **(a)** The first part of the journey **(b)** The last part of the journey	**6)** **(a)** $120 \ km/h^2$ **(b)** $-40 \ km/h^2$
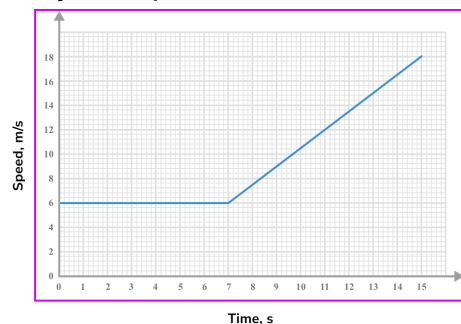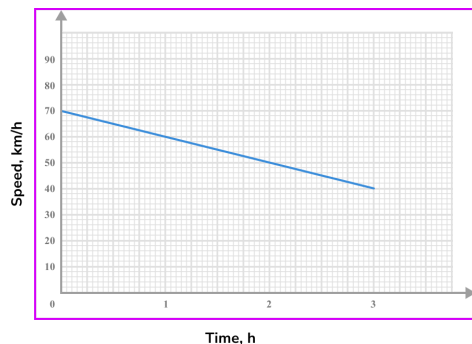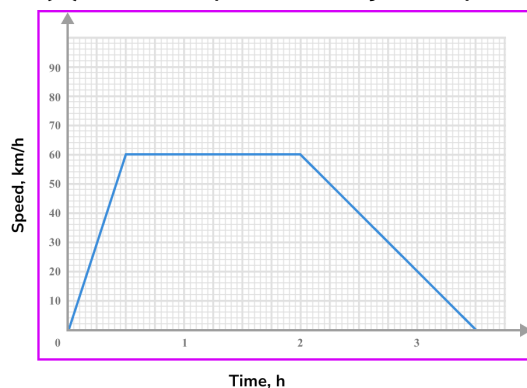
Speed-Time Graphs - Answers
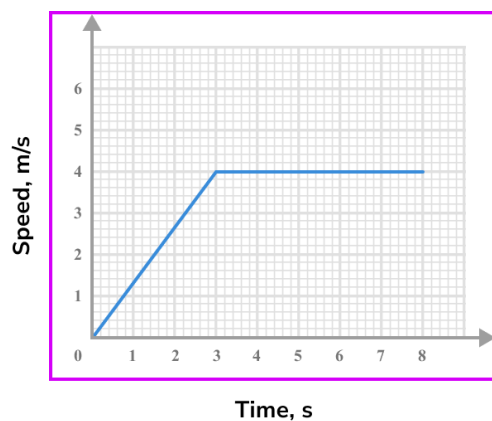
Group C	Find the total distance travelled and the average speed from the speed-time graphs:	
	1)	**1)** $26\,m$ $3.25\,m/s$
	2)	**2)** $25\,m$ $3.57\,m/s$
	3)	**3)** $30\,m$ $3.75\,m/s$

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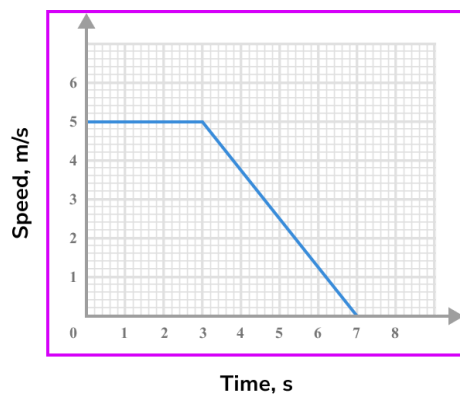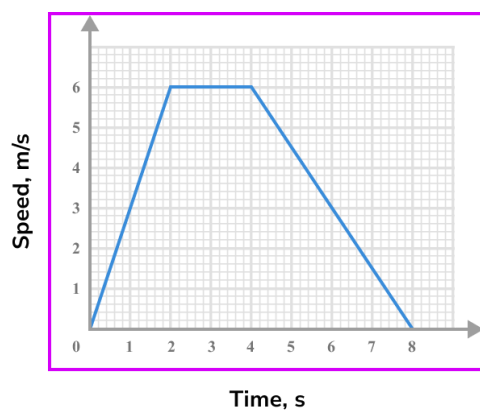
Speed-Time Graphs - Answers
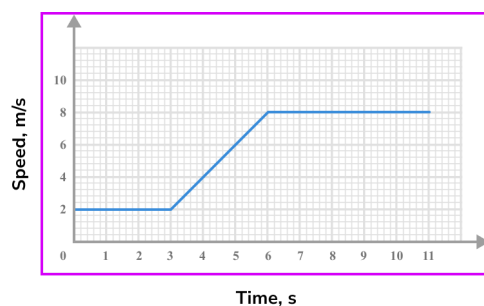
Group C contd	4)	4) $61\ m$ 5. $545\ m/s$
	5)	5) $70\ km$ $28\ km/h$
	6)	6) $72.5\ km$ $29\ km/h$
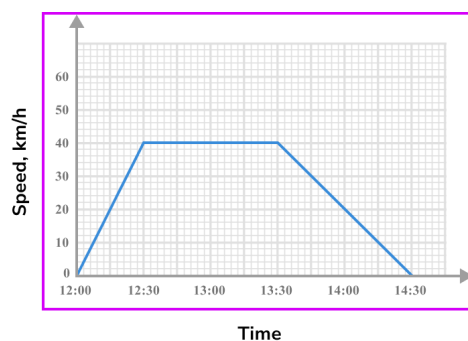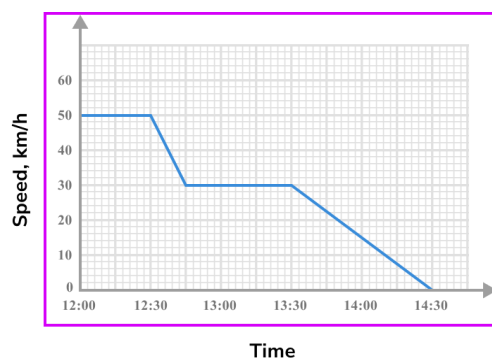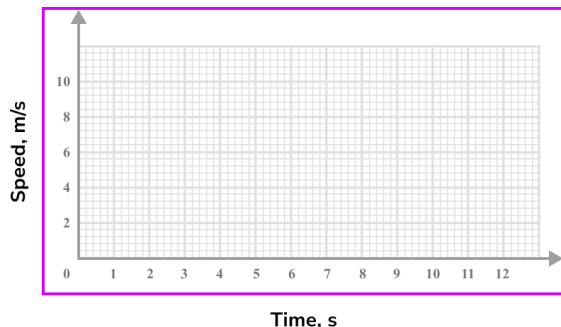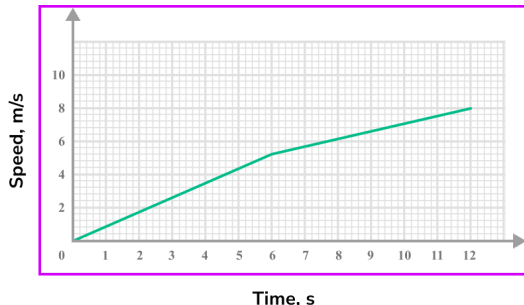
Speed-Time Graphs - Answers

	Question	Answer
	Applied Questions	
1)	An electric go-kart has two gears, High and Low. Each gear produces a constant acceleration. A driver set off from rest in Low gear, accelerated for 6 seconds, changed to High gear and accelerated for a further 6 seconds. The table shows the speeds reached at those times.	

Time, s	0	6	12
Speed, m/s	0	5	8

a) Use the axes to draw the speed-time graph for the go-kart.

a)

b) Which gear produces a greater acceleration? Explain your answer

b) Low, the line is steeper.

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Speed-Time Graphs - Answers
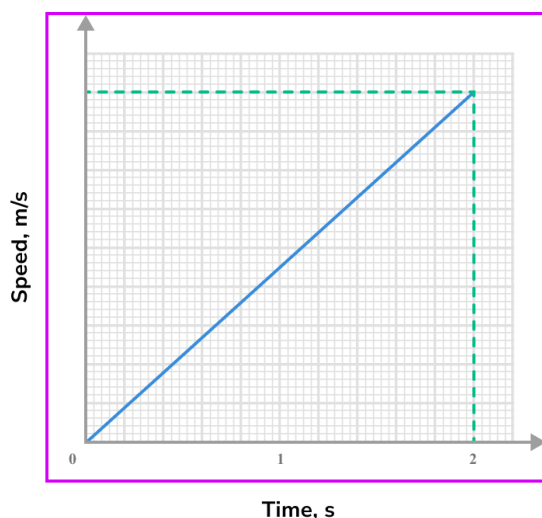
2)	A student was trying to measure the acceleration of a free-falling marble caused by gravity and air resistance. They dropped the marble from the roof of a building and the marble hit the floor after 2 seconds. The speed-time graph shows the motion of the marble. If the marble was dropped from a height of 18 metres. Find: **a)** The speed the marble reached when it hit the floor. **b)** The acceleration of the marble while it was falling.	**a)** 18 m/s **b)** 9 m/s^2

Speed-Time Graphs - Answers

3) The speed-time graph shows the speed of an object in the first 120 metres of its journey.
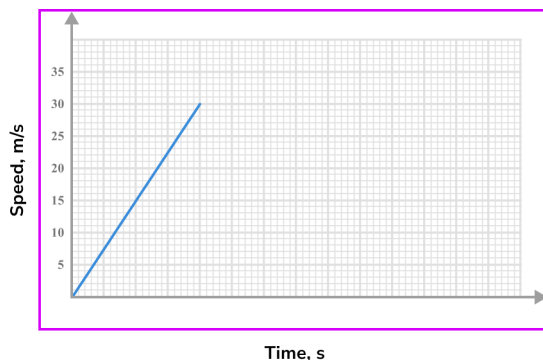
Time, s

a) Use the information to label the horizontal axis.

a)

b) The object maintained this speed for a further 270 metres. Add a line to the speed-time graph to show this part of the journey.

b)

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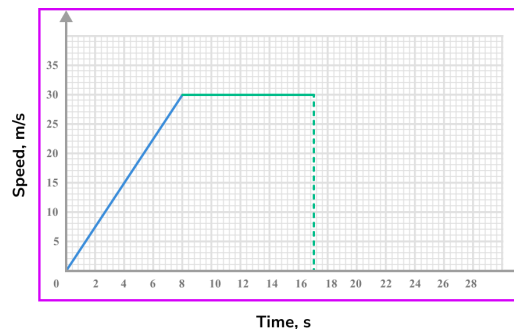
Speed-Time Graphs - Answers
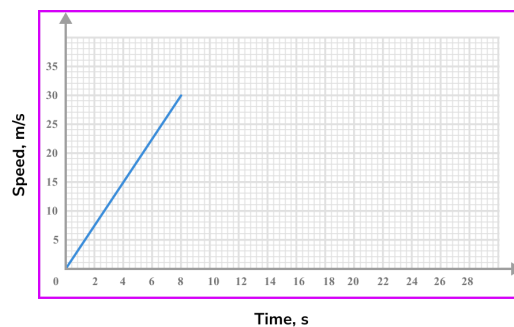
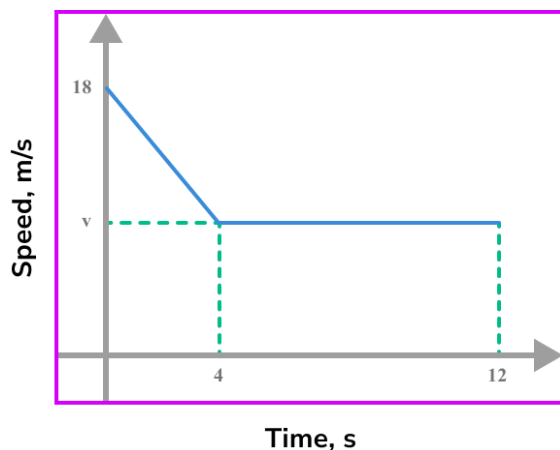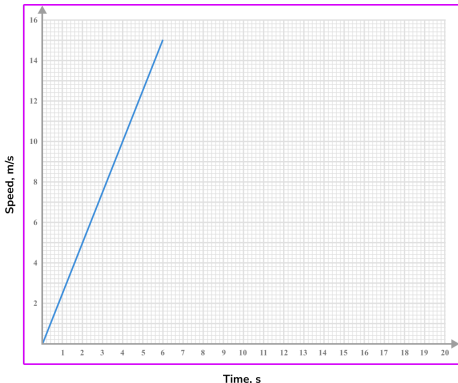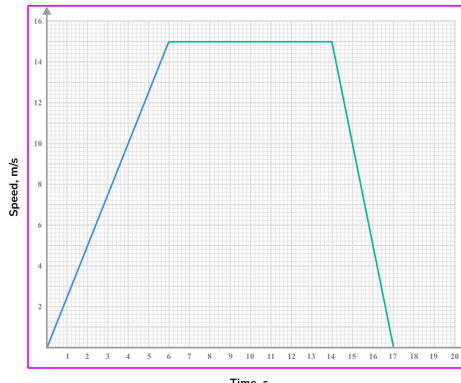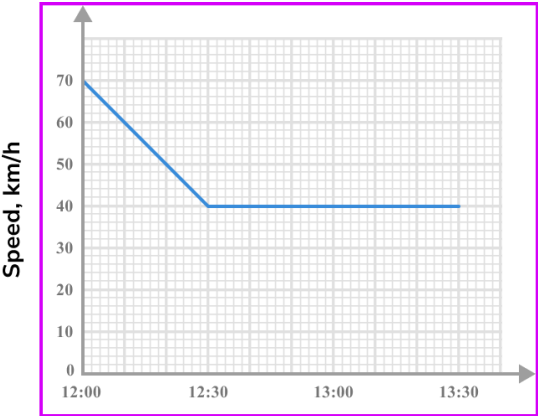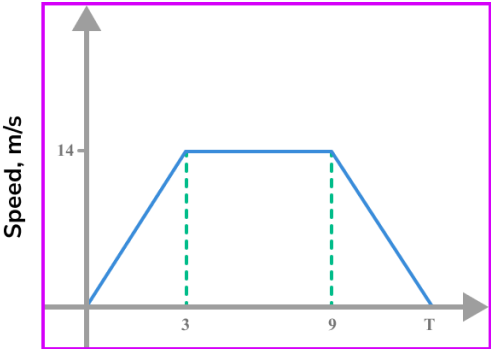| 4)	The speed-time graph shows the speed of an object over a 12 second period. The object travelled a total distance of 146 metres. **a)** Find v. **b)** Find the deceleration of the object for the first part of its motion.	**a)** $v = 11$ m/s **b)** 1.75 m/s^2
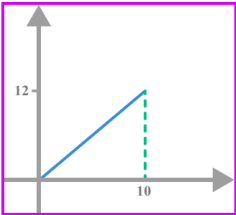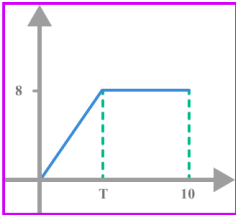
Speed-Time Graphs - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	The speed-time graph shows the first part of a journey by a car.		
(a)	Find the acceleration of the car for the first part of its journey.	**(a)** $15 \div 6 = 2.5m/s^2$	**(1)**
	After the first 6 seconds of its journey, the car maintains its speed for a further 8 seconds before then slowing down at a constant rate of $5\ m/s^2$ until stationary.		
(b)	Complete the speed-time graph for the car.	**(b)** Horizontal line drawn from (6,15) to (14,15) Line drawn from (14,15) to (17,0)	**(1)** **(1)**
(c)	Find the total distance travelled by the car.	**(c) At least one of the following seen:** $\frac{15 \times 6}{2}$ **or** 45 $15 \times (14 - 6)$ **or** 120 $\frac{15 \times (17-14)}{2}$ **or** 22.5 $45 + 120 + 22.5$ **oe** $187.5m$	 **(1)** **(1)** **(1)**

Speed-Time Graphs - Mark Scheme

2)	The speed-time graph shows the speed of a train between 12:00 and 13:30.		
	 Time		
(a)	Find the total distance travelled by the train in that time.	**(a) At least one of the following seen:** $(\frac{70+40}{2}) \times 0.5$ **or** 27.5 40×1 **or** 40	**(1)**
		$40 + 27.5$	**(1)**
		$67.5km$	**(1)**
(b)	Find the average speed of the train between 12:00 and 13:30.	**(b)** $Their\ 67.5 \div 1.5$ $45\ km/h$	**(1)** **(1)**
3)	The speed-time graph shows the speed of an object over a period of T seconds. **Time, s** If the total distance travelled by the object is 154 metres. Find the value of T	**At least one of the following seen:** $\frac{14\times3}{2}$ **or** 21 $14 \times (9-3)$ **or** 84	**(1)**
		$21 + 84 + \frac{14\times(T-9)}{2} = 154$ **oe**	**(1)**
		$14(T-9) = 98$ **oe**	**(1)**
		$T = 16$	**(1)**

Speed-Time Graphs - Mark Scheme

4)	The two speed-time graphs show the speed of two objects over a 10 seconds period. Both objects travelled the same total distance. Find the value of T.	$\frac{12\times10}{2}$ **or** 60	**(1)**
		$\frac{8\times T}{2} + 8(10 - T) = 60$ **oe**	**(1)**
		$80 - 4T = 60$ **oe**	**(1)**
		$T = 5$	**(1)**

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