Fully-Worked Solutions

CHAPTER 9 Speed and Acceleration

UPSKILL 9.1

1 $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$= \dfrac{87 \text{ km}}{1\frac{1}{2} \text{ h}}$

$= 58 \text{ km/h}$

2 $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$= \dfrac{5.2 \text{ km}}{\frac{40}{60} \text{ h}}$

$= 7.8 \text{ km/h}$

3 (a)

0	0.5 h	1 h	1.5 h	2 h
	+0.5, +20	+0.5, +20	+0.5, +20	+0.5, +20
5 km	25 km	45 km	65 km	85 km

The distance travelled in every half an hour is 20 km. Thus, the data shows uniform speed.

(b)

0	5 min	10 min	15 min	20 min
	+5, +10	+5, +20	+5, +30	+5, +40
50 m	60 m	80 m	110 m	150 m

The distance travelled in every 5 minutes increases. Thus, the data shows non-uniform speed.

4 (a) The graph shows that the distance travelled in each second is 2.5 m. Thus, the graph represents uniform speed.

(b) The graph shows that the distance travelled in each second is not the same. Thus, the graph represents non-uniform speed.

5 Total distance = 180 + 100 = 280 km
Total time taken = 2.5 + 0.5 + 1 = 4 hours

$\text{Average speed} = \dfrac{280}{4}$

$= 70 \text{ km/h}$

6 (a) $300 \text{ m/min} = \dfrac{300 \text{ m}}{60 \text{ s}}$

$= 5 \text{ m/s}$

(b) $1\,200 \text{ m/min} = \dfrac{(1\,200 \div 1\,000)}{1 \div 60}$

$= 72 \text{ km/h}$

(c) $180 \text{ km/h} = \dfrac{(180 \times 1\,000)}{1 \times 60 \times 60 \text{ s}}$

$= 50 \text{ m/s}$

7 $\text{Total distance} = 40 \times \dfrac{45}{60} + 180$

$= 210 \text{ km}$

$\text{Total time} = \dfrac{45}{60} + 2\dfrac{45}{60}$

$= 3.5 \text{ hours}$

$\text{Average speed} = \dfrac{210}{3.5}$

$= 60 \text{ km/h}$

8 Distance JL = Distance JK + Distance KL

$= 80 \times 3\dfrac{30}{60} + 120 \times \dfrac{1}{2}$

$= 280 + 60$

$= 340 \text{ km}$

UPSKILL 9.2

1 $\text{Acceleration} = \dfrac{(0 - 60) \text{ km}}{\frac{2}{3} \text{ h}} = -90 \text{ km/h}^2$

2 $\text{Acceleration} = \dfrac{(0 - 20) \text{ m/s}}{10 \text{ s}} = -2 \text{ m/s}^2$

$\text{Deceleration} = 2 \text{ m/s}^2$

3 $\text{Acceleration} = \dfrac{(20 - 0)}{\frac{1}{5} \times 60} = \dfrac{5}{3} \text{ m/s}^2$

4 $36 \text{ km/h per second} = \dfrac{36\,000 \text{ m}}{3\,600 \text{ s}} \text{ per second}$

$= 10 \text{ m/s}^2$

5 (a) $\text{Acceleration} = \dfrac{(200 - 50) \text{ m/min}}{2 \text{ min}} = 75 \text{ m/min}^2$

(b) $75 \text{ m/min}^2 = \dfrac{\frac{75}{1\,000} \text{ km}}{\left(\frac{1}{60}\right)^2 \text{ h}^2} = 270 \text{ km/h}^2$

(c) $75 \text{ m/min}^2 = \dfrac{75 \text{ m}}{(60)^2 \text{ s}^2} = \dfrac{1}{48} \text{ m/s}^2$

6 (a) Initial speed = 0 m/s

$\text{Final speed} = \dfrac{54\,000 \text{ m}}{3\,600 \text{ s}} = 15 \text{ m/s}$

$\text{Acceleration} = \dfrac{15 - 0}{20} = 0.75 \text{ m/s}^2$

(b) $\dfrac{v - 0}{30} = 0.75 \text{ m/s}^2$

$v = 22.5 \text{ m/s}$

7 Initial speed = 90 km/h

$= \dfrac{90\,000 \text{ m}}{3\,600 \text{ s}}$

$= 25 \text{ m/s}$

Final speed = 126 km/h

$= \dfrac{126\,000 \text{ m}}{3\,600 \text{ s}}$

$= 35 \text{ m/s}$

$\text{Acceleration} = \dfrac{35 - 25}{10} = 1 \text{ m/s}^2$

Summative Practice 9

Section A

1 Change in distance of P > Change in distance of Q > Change in distance of R
$\therefore$ Speed of P > Speed of Q > Speed of R
Answer: **A**

2 $108 \text{ km/h} = \dfrac{108\,000 \text{ m}}{3\,600 \text{ s}} = 30 \text{ m/s}$

Answer: **C**

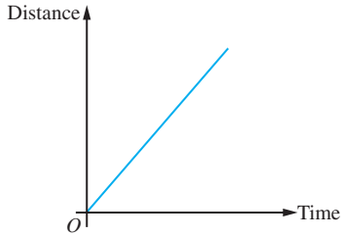
3 $25 \text{ m/s} = \dfrac{25 \text{ m}}{1 \text{ s}}$

$= \dfrac{\frac{25}{1\,000} \text{ km}}{\frac{1}{3\,600} \text{ h}}$

$= 90 \text{ km/h}$

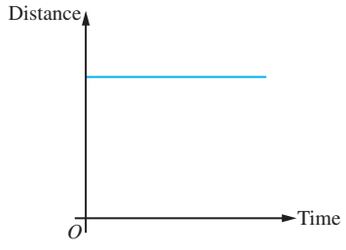
Answer: **B**

4 **A**



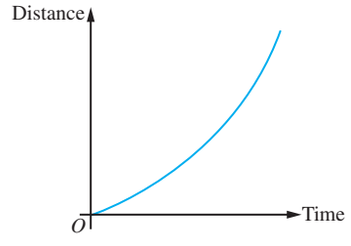
Uniform speed

B



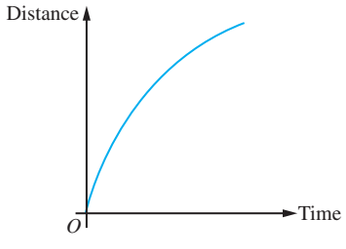
Stationary

C



Increase in speed

D



Decrease in speed

Answer: **A**

5 Total distance travelled $= 80 \text{ km} + 72 \text{ km/h} \times 1\frac{1}{4} \text{ h}$

$= 170 \text{ km}$

Total time taken = 1 hour 15 minutes + 1 hour 15 minutes

= 2 h 30 min

= 2.5 h

Average speed $= \dfrac{170}{2.5} = 68 \text{ km/h}$

Answer: **B**

6 720 km/h per hour $= 720 \text{ km/h}^2$

$= \dfrac{720 \text{ km}}{60^2 \text{ min}^2}$

$= 0.2 \text{ km/min}^2$

Answer: **B**

7 Acceleration $= \dfrac{30 - 0}{12} = 2.5 \text{ m/s}^2$

Answer: **D**

8 Acceleration $= \dfrac{50 - 80}{5} = -6 \text{ m/min}^2$

Answer: **D**

9 Let v be the speed of the car, in km/h, after 10 minutes

$180 = \dfrac{v - 50}{\frac{10}{60} \text{ h}}$

$30 = v - 50$

$v = 80$

Answer: **A**

10 Acceleration $= \dfrac{(0 - 28) \text{ m/s}}{\frac{1}{15} \times 60 \text{ s}}$

$= -7 \text{ m/s}^2$

$\therefore$ The deceleration is 7 m/s^2

Answer: **B**

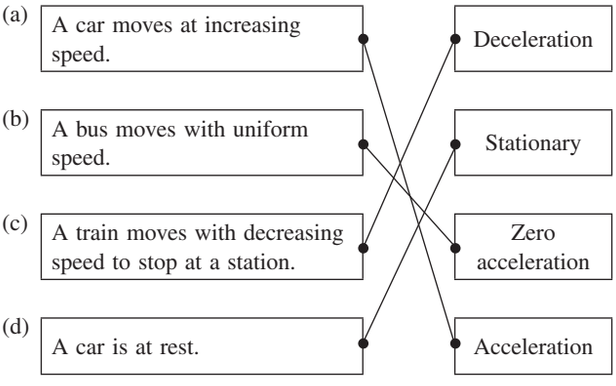
Section B

1 (a) (i) Uniform speed

(ii) Uniform speed

(b) km/minute^2, m/s^2

2

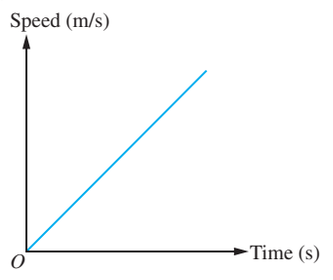
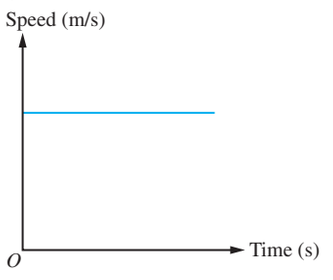
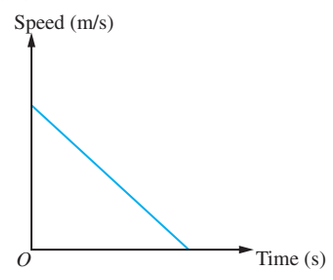


3

Part of the graph	Acceleration
PQ	$\frac{8}{5} = 1.6 \text{ m/s}^2$
RS	$-\frac{12}{5} = -2.4 \text{ m/s}^2$

Section C

1 (a)

(i)	(ii)	(iii)
		
Acceleration	Zero acceleration	Deceleration

(b) (i) $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$= \dfrac{10.5}{2}$

$= 5.25$ km/h

(ii) $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$= \dfrac{50}{\frac{90}{60}}$

$= 33.33$ km/h

(c) Let v be the average speed of Encik Muthahir's car from town Q to town R

Distance PR = Distance PQ + Distance QR

$$340 = 80 \times \left(3 + \frac{30}{60}\right) + v \times \frac{1}{2}$$

$$340 = 280 + \frac{1}{2}v$$

$$60 = \frac{1}{2}v$$

$$v = 120 \text{ km/h}$$

2 (a) 180 km/h per second

$= \dfrac{180 \times 1\,000 \text{ m}}{1 \times 60 \times 60 \text{ s}^2}$

$= 50 \text{ m/s}^2$

(b) Initial speed = 90 km/h

Final speed = 90 km/h − 30% of 90 km/h

$= 90 - \dfrac{30}{100} \times 90$

$= 63$ km/h

Acceleration $= \dfrac{63 - 90}{25} = -1.08$ km/h per second

$\therefore$ Deceleration = 1.08 km/h per second

(c) (i) $30 - 10 = 20$ s

(ii) $-0.8 = \dfrac{v - 20}{10}$

$v - 20 = -8$

$v = -8 + 20$

$v = 12$