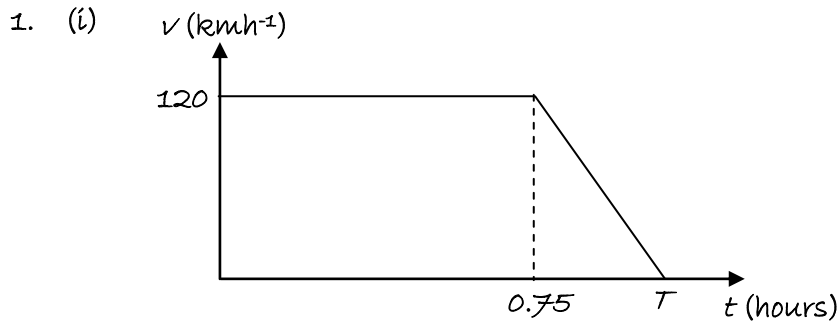


Section 2: Velocity and acceleration

Solutions to Exercise level 2



- (ii) Distance = area under graph
 Distance covered at constant speed = $120 \times 0.75 = 90$
 This is $\frac{6}{7}$ of the distance from A to B
 so the distance from A to B = $\frac{7}{6} \times 90 = 105$ km.

- (iii) Distance travelled during deceleration = 15 km
 $15 = \frac{1}{2}(T - 0.75) \times 120$
 $0.25 = T - 0.75$
 $T = 1$

$$\begin{aligned} \text{Final deceleration} &= \frac{120}{0.25} = 480 \text{ kmh}^{-2} \\ &= \frac{480000}{3600^2} = \frac{1}{27} \text{ ms}^{-2} \end{aligned}$$

2. (i) Distance travelled in first 5 seconds = $\frac{1}{2} \times 5 \times 30 = 75$ m.
 Distance travelled in next 5 seconds = $5 \times 30 = 150$ m
 Distance travelled in first 10 seconds = 225 m.

- (ii) Acceleration during last part of journey = $\frac{-30}{15} = -2 \text{ ms}^{-2}$.

- (iii) Distance travelled in first 5 seconds = 75 m (from (a))
 Distance travelled in next 10 seconds = $10 \times 30 = 300$ m
 Distance travelled in final 15 seconds = $\frac{1}{2} \times 15 \times 30 = 225$ m
 Total distance travelled = 600 m.

3. Area under graph = $\frac{1}{2} \times 90 \times v$
 $45v = 900$
 $v = 20 \text{ ms}^{-1}$

Edexcel AS Maths Kinematics 2 Exercise solutions

4. (i) Initial acceleration = 2 $\Rightarrow \frac{16}{T} = 2 \Rightarrow T = 8$

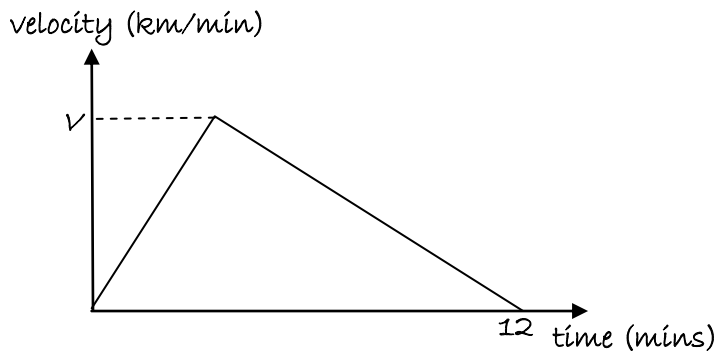
using area of a trapezium

(ii) Area under graph = $\frac{1}{2}(40 + 22) \times 16 = 496$

Distance travelled = 496 m.

(iii) Average speed = $\frac{\text{distance travelled}}{\text{time}}$
 $= \frac{496}{40}$
 $= 12.4 \text{ ms}^{-1}$

5.



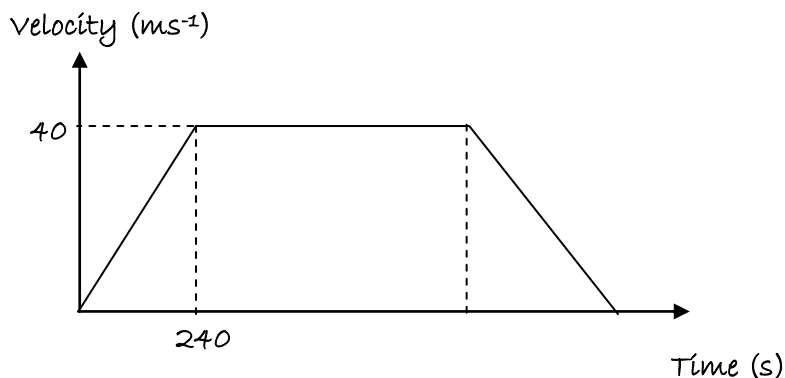
Area under graph = $\frac{1}{2} \times 12V = 6V$

Distance travelled = 12 km $\Rightarrow 6V = 12$

$\Rightarrow V = 2 \text{ km/min} = 120 \text{ kmh}^{-1}$

The assumptions that the acceleration and deceleration are uniform are probably not realistic.

6.



Area under graph during acceleration = $\frac{1}{2} \times 240 \times 40 = 4800$

Area under graph during deceleration = 1500

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$$1500 = \frac{1}{2}t \times 40$$

$$t = 75$$

$$\text{Time spent decelerating} = 75 \text{ s}$$

Total area under graph = 30000, so area under graph at constant speed =
 $30000 - 4800 - 1500 = 23700$.

$$\text{Time spent at constant speed} = \frac{23700}{40} = 592.5 \text{ s}$$

$$\begin{aligned} \text{Total time for journey} &= 240 + 75 + 592.5 = 907.5 \text{ s} \\ &= 15.125 \text{ minutes.} \end{aligned}$$