

Revision Exercise (Kinematics)

1.

- a) -1 m c) $2 \text{ cm}^2\text{s}^{-1}$ e) Particle never attains rest.
 b) 4 cm s^{-1} d) 36 cm

2.

- a) $v = 0 \text{ ms}^{-1}$; $a = -6 \text{ ms}^{-2}$ d) $s = -4 \text{ m}$; $v = 0 \text{ ms}^{-1}$
 b) -4 m e) $0 < t < 2$ seconds
 c) Distance = 58 m ; Average speed = 11.6 ms^{-1} f) $t > 1$ second

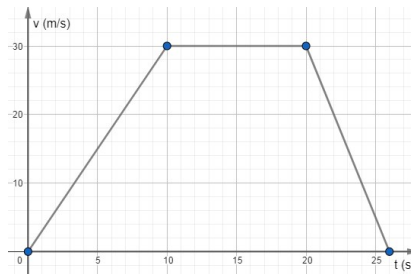
3.

- a) $v = -20 \text{ ms}^{-1}$; Object is moving upwards.
 b) $v = 0 \text{ ms}^{-1}$; Instantaneous rest; Object has attained its maximum height.
 c) $v = 10 \text{ ms}^{-1}$; Object is moving downwards.
 d) $t = 8$ seconds; Duration of flight is 8 seconds.

4.

- a) $v = 65 \text{ ms}^{-1}$ c) $a = 6 \text{ ms}^{-2}$
 b) -1 m d) 134 m

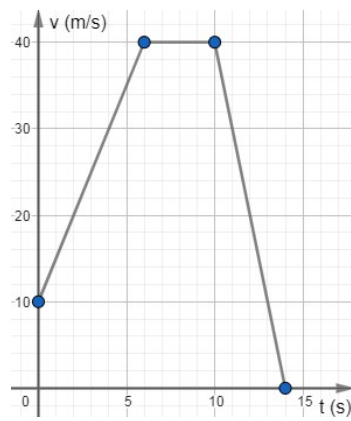
5. a) (i)



(ii) 540 m

(iii) 20.77 ms^{-1}

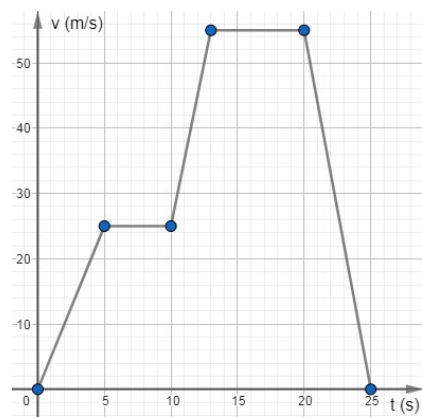
b) (i)



(ii) 390 m

(iii) 27.86 ms^{-1}

c) (i)



(ii) 830 m

(iii) 33.2 ms^{-1}

6.

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|-------------------|----------------------------|------------------|--------------|
| a) (i) 1 | (ii) $\frac{t^2}{2} - 8t$ | (iii) 16 seconds | (iv) 64 m |
| b) (i) 10 | (ii) $5t^2 - 10t$ | (iii) 2 seconds | (iv) 10 m |
| c) (i) -1 | (ii) $-\frac{t^2}{2} + 3t$ | (iii) 6 seconds | (iv) 9 m |
| d) (i) $6t - 2$ | (ii) $t^3 - t^2 - 6t$ | (iii) 3 seconds | (iv) 16.42 m |
| e) (i) $12t - 2$ | (ii) $2t^3 - t^2 - 15t$ | (iii) 3 seconds | (iv) 37.19 m |
| f) (i) $24t - 22$ | (ii) $4t^3 - 11t^2 - 3t$ | (iii) 3 seconds | (iv) 36.04 m |

7. $v = 16 - 2t$.

$$v > 0 \Rightarrow t < 8.$$

Also, $v(8) = 0$ so there is a turning point at $t = 8$.

Particle moves away from O for first 8 seconds of journey.

8. $v = 3t^2 + 2t$; $a = 6t + 2$

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|--|-----------------------------------|
| (i) $v(10) = 320 \text{ ms}^{-1}$ | $a(10) = 62 \text{ ms}^{-2}$ |
| (ii) $v(600) = 1081200 \text{ ms}^{-1}$ | $a(600) = 3602 \text{ ms}^{-2}$ |
| (iii) $v(3600) = 38887200 \text{ ms}^{-1}$ | $a(3600) = 21602 \text{ ms}^{-2}$ |
| (iv) $v(n) = 3n^2 + 2n \text{ ms}^{-1}$ | $a(n) = 6n + 2 \text{ ms}^{-2}$ |

9.

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|--------------------------|------------|-------------|
| (i) 50 ms^{-1} | (ii) 180 m | (iii) 100 m |
|--------------------------|------------|-------------|

10.

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|-------------|-----------------|-------------|-----------------------------|
| (i) 122.5 m | (ii) 10 seconds | (iii) 245 m | (iv) 24.5 ms^{-1} |
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