

YAKEEN NEET 2.0

2026

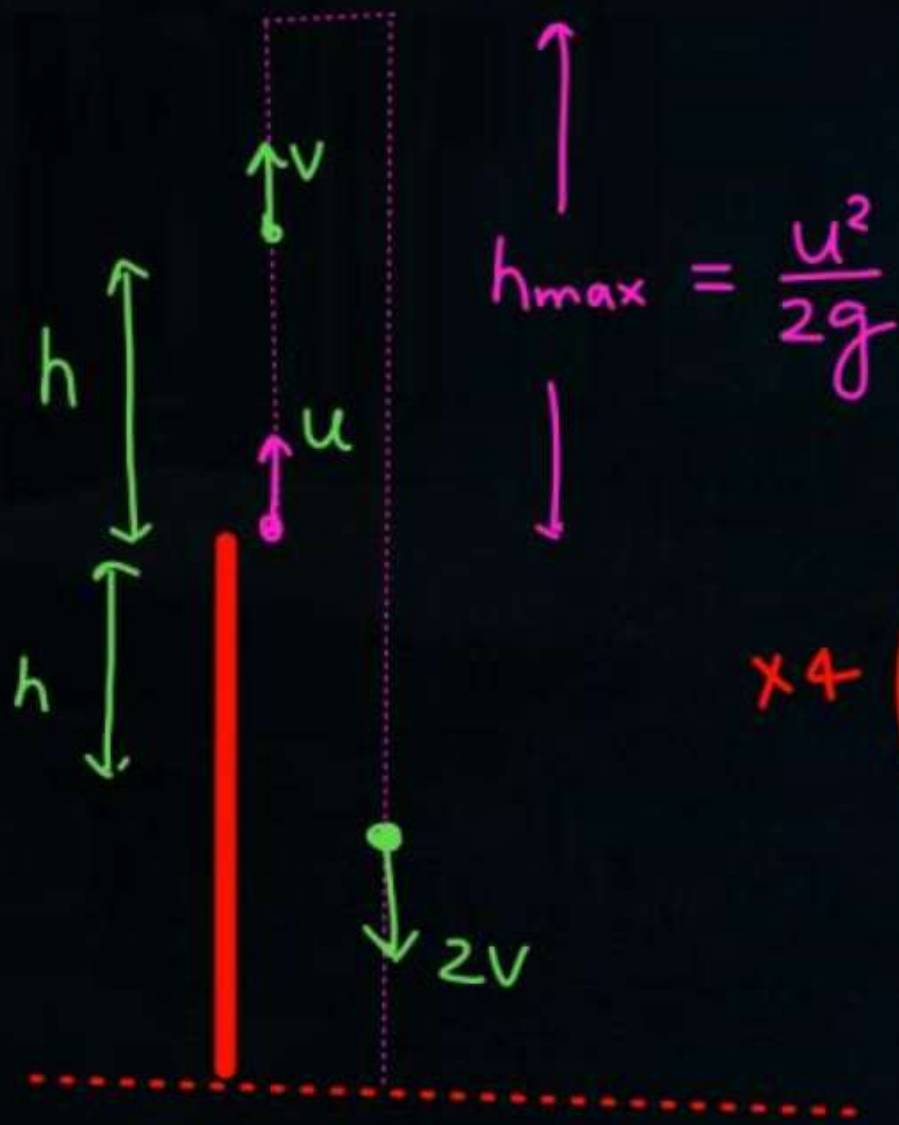
Kinematics

PHYSICS

KPP-16

By – Saleem Ahmed Sir





$$h_{\max} = \frac{u^2}{2g}$$

$$v^2 = u^2 - 2gh$$

$$(2v)^2 = u^2 + 2(-g)(-h)$$

$$4v^2 = u^2 + 2gh$$

x4

$$4v^2 = 4u^2 - 8gh$$

$$0 = -3u^2 + 10gh$$

$$u^2 = \frac{10gh}{3}$$

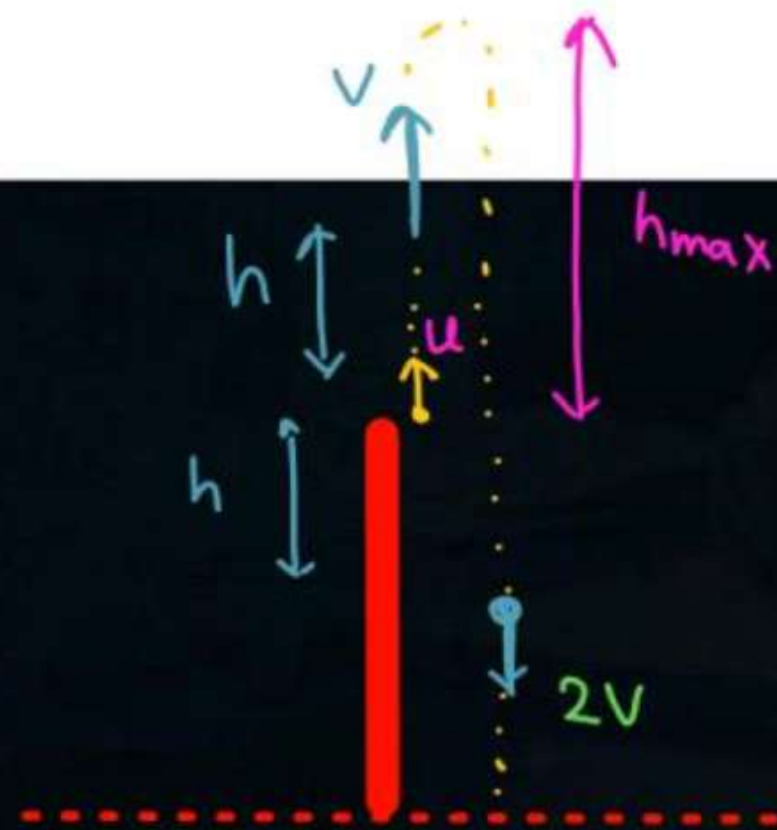
$$h_{\max} = \frac{u^2}{2g} = \frac{10gh}{3 \times 2g} = \frac{5h}{3}$$

①

From the top of a tower, a ball is thrown vertically upwards. When the ball reaches h below the tower, its speed is double of what it was at height h above the tower. Find the greatest height attained by the ball from the tower.

एक मीनार के शीर्ष से एक गेंद को ऊर्ध्वाधर ऊपर की ओर फेंका जाता है। जब यह मीनार से h ऊंचाई नीचे आती है उस क्षण इसकी चाल उस चाल से दुगुनी हो जाती है, जब यह मीनार से h ऊंचाई ऊपर थी। गेंद मीनार से अधिकतम कितनी ऊंचाई तक गई थी?

Ans. $5h/3$

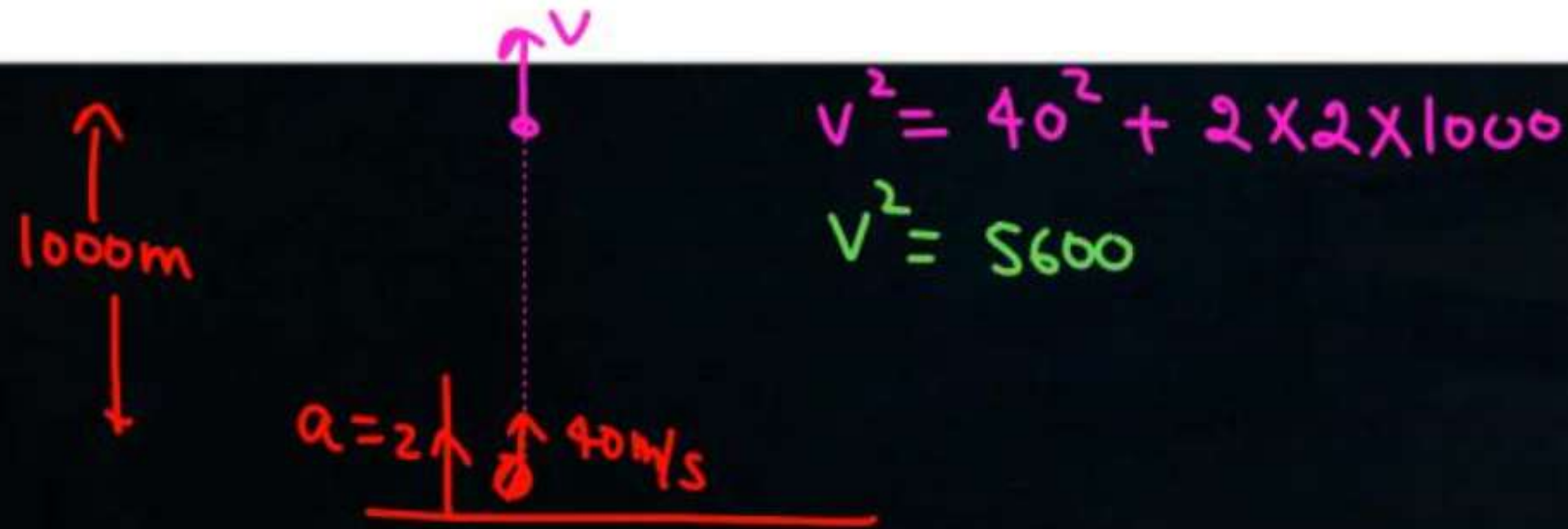


②

A rocket is fired vertically upwards with initial velocity 40 m/s at the ground level. Its engines then fired and it is accelerated at 2 m/s^2 until it reaches an altitude of 1000 m . At that point the engines shut off and the rocket goes into free-fall. If the velocity (in m/s) just before it collides with the ground is 40α . Then fill the value of α . Disregard air resistance ($g = 10 \text{ m/s}^2$).

एक रॉकेट को धरातल से 40 m/s प्रारम्भिक वेग के साथ ऊर्ध्वाधर ऊपर की ओर प्रक्षेपित किया जाता है। अब इसके इंजनों को चालू किया जाता है तथा यह 1000 m की ऊँचाई तक पहुँचने तक 2 m/s^2 से त्वरित होता है। इस बिन्दु पर इसके इंजन बंद हो जाते हैं तथा यह मुक्त रूप से गिरने लगता है। यदि धरातल से टकराने से ठीक पूर्व इसका वेग (m/s में) 40α हो तो α का मान ज्ञात कीजिए। वायु प्रतिरोध को नगण्य माने। ($g = 10 \text{ m/s}^2$)

Ans. 4





$$v_f^2 = v^2 + 2(-10)(-1000)$$

$$v_f^2 = 5600 + 20000$$

$$v_f = \sqrt{25600} = \underline{\underline{160}} = 40 \alpha$$

$$\boxed{\alpha = 4}$$

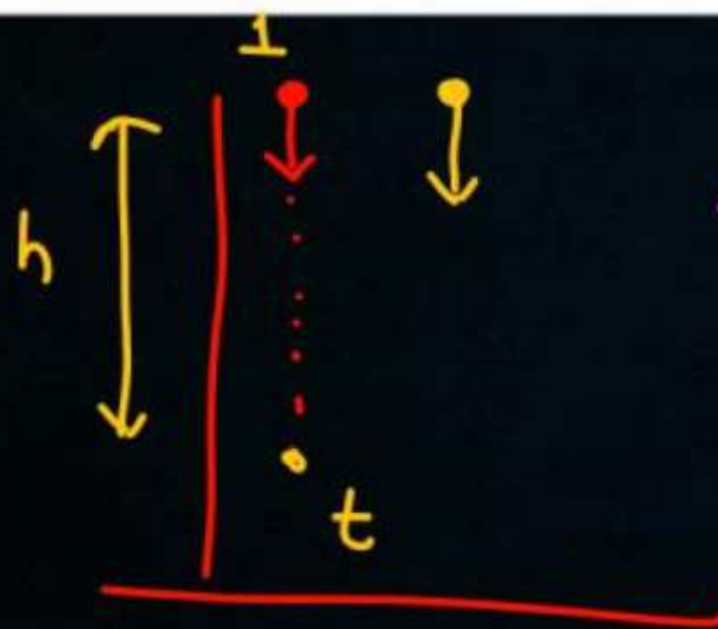
(m-2) $\cancel{m}gh + \frac{1}{2}\cancel{m}v^2 = \frac{1}{2}\cancel{m}v_f^2 + 0$

$$2gh + v^2 = v_f^2$$

③
hotw

A stone is dropped from the top of a tall cliff, and 1s later a second stone is thrown vertically downward with a velocity of 20 ms^{-1} . How far below the top of the cliff will the second stone overtake the first? एक पत्थर को किसी ऊँची पहाड़ी के शीर्ष पर से नीचे गिराया जाता है। इसके 1s पश्चात् एक दूसरे पत्थर को ऊर्ध्वाधर नीचे की ओर 20 ms^{-1} वेग से फेंका जाता है। यह दूसरा पत्थर पहाड़ी के शिखर से कितनी दूर नीचे प्रथम पत्थर से आगे निकल जाएगा ?

Ans. $\frac{45}{4} \text{ m}$



1st $h = 0 + \frac{1}{2} g t^2$
2nd $h = 20(t-1) + \frac{1}{2} g (t-1)^2$

HW

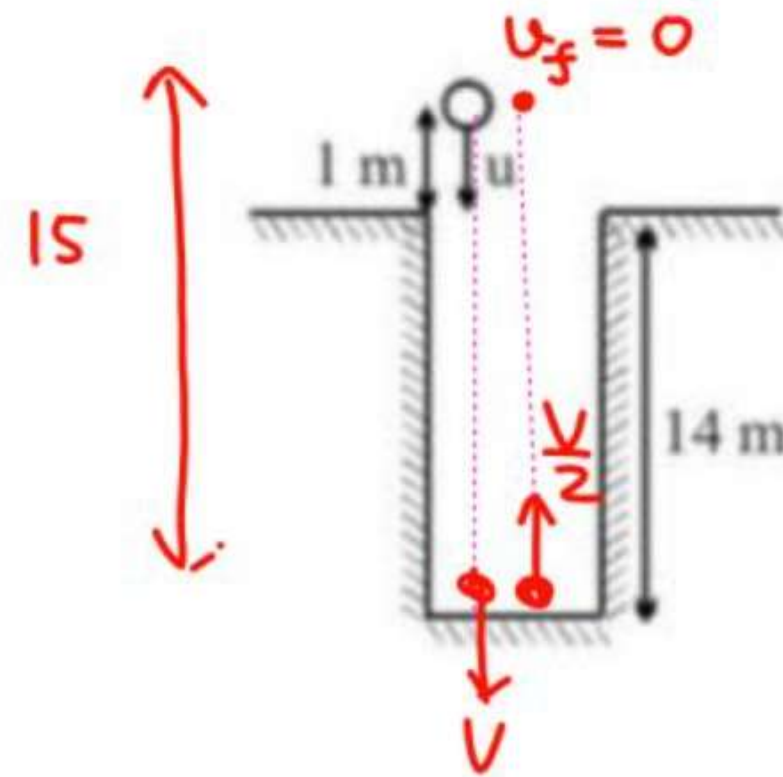
4 Notes A boy throws a ball with speed u in a well of depth 14 m as shown. On bounce with bottom of the well the speed of the ball gets halved. What should be the minimum value of u (in m/s) such that the ball may be able to reach his hand again? It is given that his hands are at 1 m height from top of the well while throwing and catching.

एक लड़का किसी गेंद को u चाल से चित्रानुसार 14 m गहरे कुँए में फेंकता है। कुँए के तल से टकराने पर गेंद की चाल आधी हो जाती है। u (m/s में) का न्यूनतम मान क्या होना चाहिये ताकि गेंद पुनः उसके हाथों तक पहुँच सके? गेंद को फेंकते तथा पकड़ते समय लड़के के हाथ कुँए के शीर्ष से 1 m की ऊँचाई पर होते हैं।

$$15 = \frac{(v/2)^2}{2 \times 10}$$

$$15 = \frac{v^2}{80}$$

$$v^2 = 15 \times 80$$



$$v^2 = u^2 + 2 \times 10 \times 15$$

$$u^2 = v^2 - 300$$

$$u^2 = 1200 - 300$$

$$u^2 = 900$$

$$u = 30$$

Ans. 30

5
notes

The engine of a motorcycle can produce a maximum acceleration 5 m/s^2 . Its brakes can produce a maximum retardation 10 m/s^2 . If motorcyclist start from point A and reach at point B. What is the minimum time in which it can cover if distance between A and B is 1.5 km. (Given : that motorcycle comes to rest at B)

किसी वाहन का इंजन 5 ms^{-2} का अधिकतम त्वरण उत्पन्न कर सकता है। इसके ब्रेक 10 ms^{-2} का अधिकतम मंदन उत्पन्न कर सकते हैं। वाहन बिन्दु A से गति प्रारम्भ करता है तथा बिन्दु B तक पहुँचता है। वह न्यूनतम समय जिसमें यह A व B के मध्य 1.5 km की दूरी तय कर लेगा, है- (दिया है : वाहन बिन्दु B पर विरामावस्था में आ जाता है।)

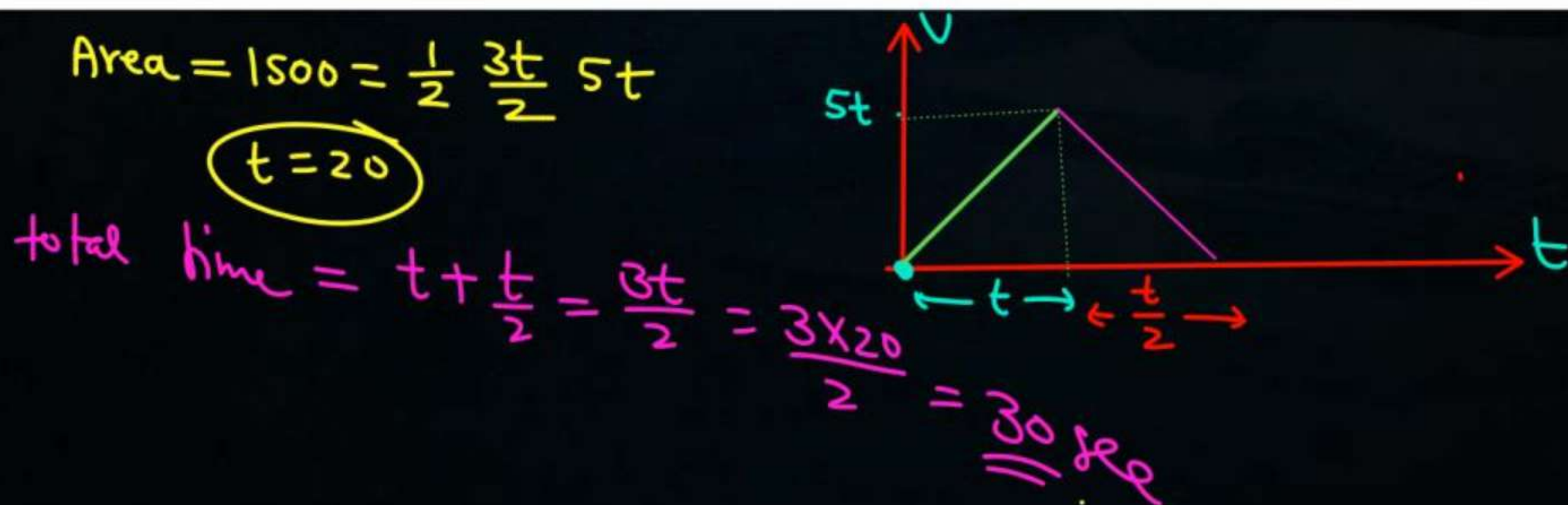
(A) 30 sec

(B) 15 sec

(C) 10 sec

(D) 5 sec

Ans. (A)



6

A body falls freely from rest. It covers as much distance in the last second of its motion as covered in the first three seconds. The body has fallen for a time of :

एक वस्तु को विरामावस्था से मुक्त रूप से छोड़ा जाता है। यह प्रथम तीन सेकण्ड में जितनी दूरी तय करती है, अपनी गति के अंतिम सेकण्ड में उतनी दूरी तय कर लेती है। वस्तु को गिरने में लगा कुल समय होगा

(A) 3 s

✓ (B) 5 s

(C) 7 s

(D) 9 s

Ans. (B)

$$0 + \frac{1}{2} \times 10 \times 3^2 = 0 + \frac{1}{2} (2n-1) \times 10$$

$$n=5$$

7

A ball is thrown vertically upward with initial velocity 30 m/sec. What will be its position vector at time $t = 5$ sec taking origin at the point of projection, vertical up as positive y-axis and horizontal as x-axis:-

एक गेंद को प्रारम्भिक वेग 30 m/sec से ऊर्ध्वाधर ऊपर की ओर फेंका जाता है। प्रक्षेपण बिन्दु को मूलबिन्दु, ऊर्ध्वाधर ऊपर की दिशा को धनात्मक y-अक्ष तथा क्षैतिज को x-अक्ष मानने पर समय $t = 5$ sec पर इसका स्थिति सदिश होगा :-

☒ (A) (0, 25)

(B) (0, 20)

(C) (0, 45)

(D) (0, 5)

Ans. (A)

$$y = 30 \times 5 - \frac{1}{2} \times 10 \times 5^2$$
$$= 150 - 125 = 25$$



8

A particle moves along the X-axis as $x = u(t - 2s) + a(t - 2s)^2$

~~(A)~~ The initial velocity of the particle is u

~~(B)~~ The acceleration of the particle is a

(C) The acceleration of the particle is $2a$

(D) At $t = 2s$ particle is at the origin.

एक कण x अक्ष के अनुदिश $x = u(t - 2s) + a(t - 2s)^2$ के अनुसार गति करता है तो :-

(A) कण का प्रारम्भिक वेग u होगा।

(B) कण का त्वरण a होगा।

(C) कण का त्वरण $2a$ होगा।

(D) $t = 2s$ पर कण मूल बिन्दु पर होगा।

Ans. (C,D)

$$x = u(t - 2) + a(t - 2)^2$$

$$v = u + a \cdot 2(t - 2) \times 1$$

$$v = u + 2a(t - 2)$$

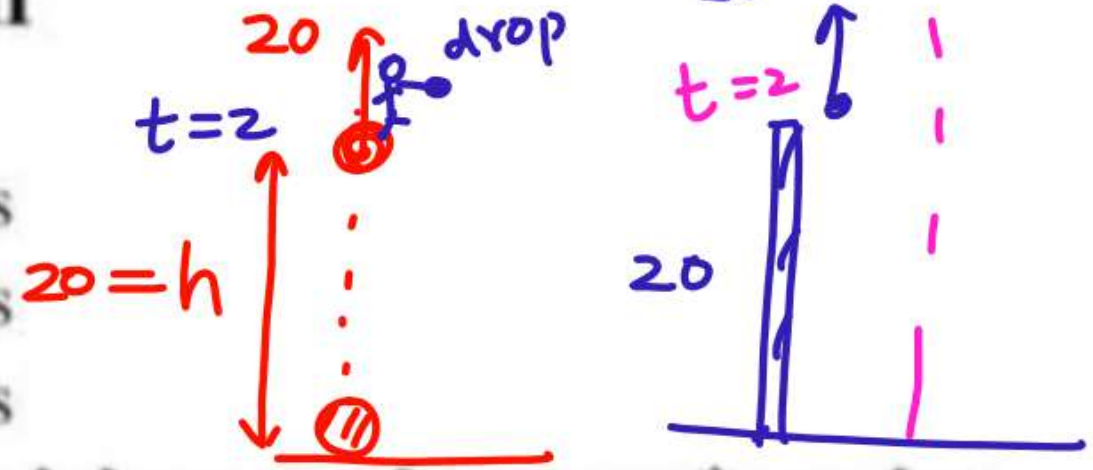
$$a_c = 0 + 2a(1)$$

$$\frac{1}{2} 2a(t - 2)^2$$

10 A balloon rises up with constant net acceleration of 10 m/s^2 . After 2 s a particle drops from the balloon. After further 2 s match the following : ($g = 10 \text{ m/s}^2$)

- Column-I**
- (A) Height of particle from ground
 - (B) Speed of particle (P)
 - (C) Displacement of Particle
 - (D) Acceleration of particle Q

- Column-II**
- (P) Zero
 - (Q) 10 SI units
 - (R) 40 SI units
 - (S) 20 SI units



एक गुब्बारा 10 m/s^2 के नियत त्वरण के साथ ऊपर उठता है। 2 s पश्चात् गुब्बारे से एक कण गिराया जाता है। अगले 2s पश्चात् के लिये निम्न का मिलान SI मात्रकों में कीजिये। ($g = 10 \text{ m/s}^2$)

- स्तम्भ-I**
- (A) जमीन से कण की ऊँचाई
 - (B) कण की चाल
 - (C) कण का विस्थापन
 - (D) कण का त्वरण

- स्तम्भ-II (S.I. इकाई)**
- (P) 0
 - (Q) 10
 - (R) 40
 - (S) 20

$$(20)^2 = 0 + 2 \times 10 \times h$$

$$h = 20$$

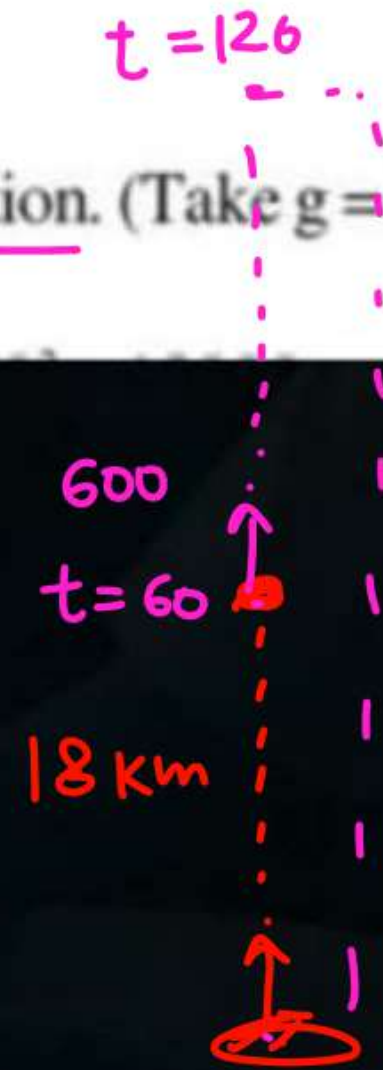
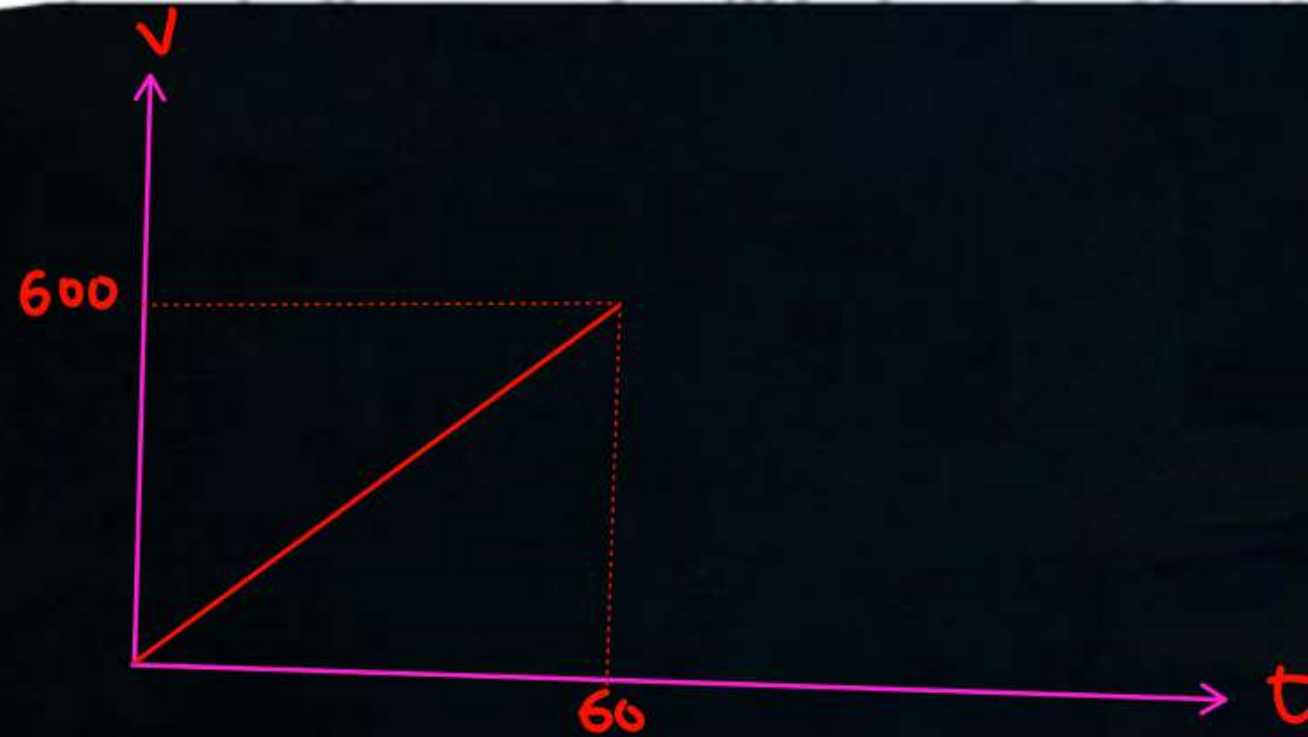
Ans. (A) - (R); (B) - (P); (C) - (S); (D) - (Q)

9 A rocket is fired vertically up from the ground with a resultant vertical acceleration of 10 m/s^2 . The fuel is finished in 1 minute and it continues to move up.

(a) What is the maximum height reached?

(b) After finishing fuel, calculate the time for which it continues its upwards motion. (Take $g = 10\text{ m/s}^2$)

$$\frac{1}{2} \times 60 \times 600 \\ = \underline{18000}$$



10

A particle is thrown with a speed 60 ms^{-1} at an angle 60° to the horizontal. When the particle makes an angle 30° with the horizontal in downward direction, its speed at that instant is v . What is the value of v^2 in SI units ?

एक कण को क्षैतिज से 60° कोण बनाते हुये 60 ms^{-1} की चाल से फेंका जाता है। जब कण क्षैतिज के साथ नीचे की ओर 30° कोण बनाता है तो उस क्षण पर इसकी चाल v है। v^2 का मान क्या है ?

Ans. 1200



$$V = \frac{60}{\sqrt{3}}$$

$$V^2 = \frac{60 \times 60}{3} = 1200$$

$$60 \cos 60 = V \cos 30$$

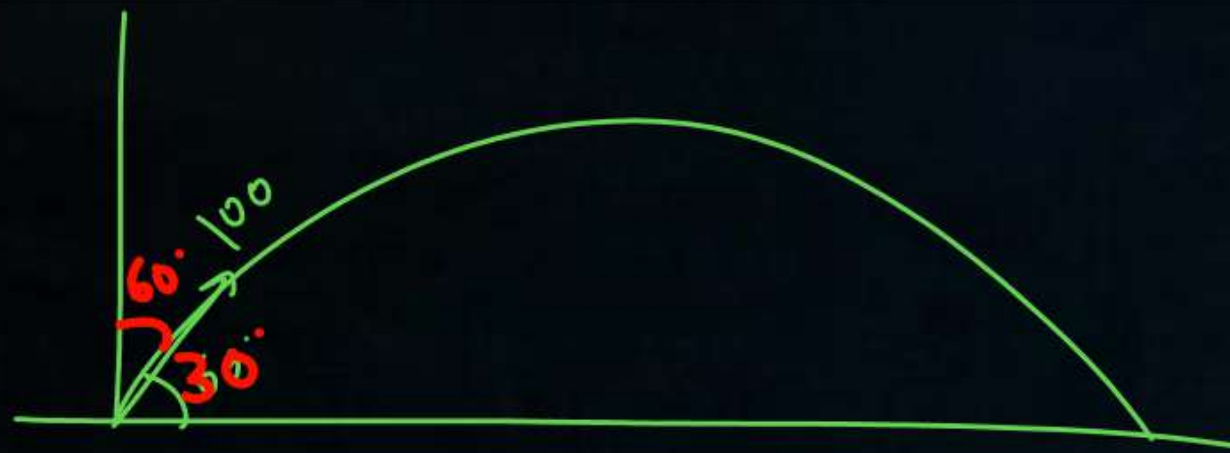
$$30 = v \times \frac{\sqrt{3}}{2}$$

11

A particle is projected upwards with a velocity of 100 m/s at an angle of 60° with the vertical. Find the time when the particle will move perpendicular to its initial direction, taking $g = 10 \text{ m/s}^2$.

एक कण को ऊर्ध्वाधर से 60° कोण पर 100 m/s वेग से ऊपर की ओर प्रक्षेपित किया जाता है। वह समय ज्ञात कीजिए जब कण अपनी प्रारम्भिक दिशा के लम्बवत् गति करेगा। ($g = 10 \text{ m/s}^2$)

Ans. 20 s



$$\vec{u} = 50\sqrt{3}\hat{i} + 50\hat{j}$$

$$\vec{v} = 50\sqrt{3}\hat{i} + (50 - 10t)\hat{j}$$

$$\vec{u} \cdot \vec{v} = 0$$

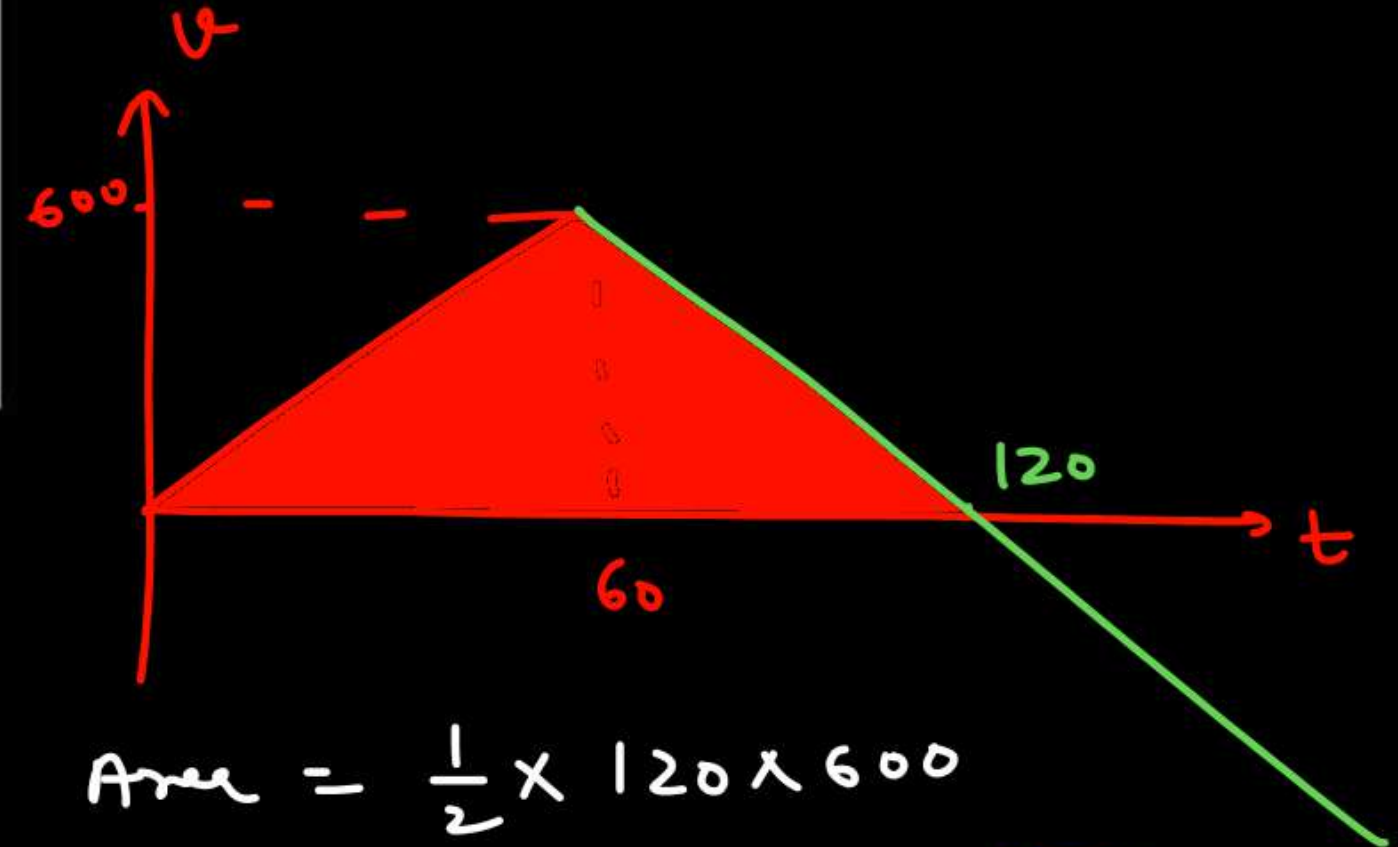
$$7500 + 2500 - 500t = 0$$

$$t = 20$$

Question - 09



A rocket is fired vertically up from the ground with a resultant vertical acceleration of 10 m/s^2 . The fuel is finished in 1 minute and it continues to move up. What is the maximum height reached?



$$\text{Area} = \frac{1}{2} \times 120 \times 600$$

$$= \underline{36000 \text{ m}} = \underline{36 \text{ km}}$$

Ans : 36

Question - 10



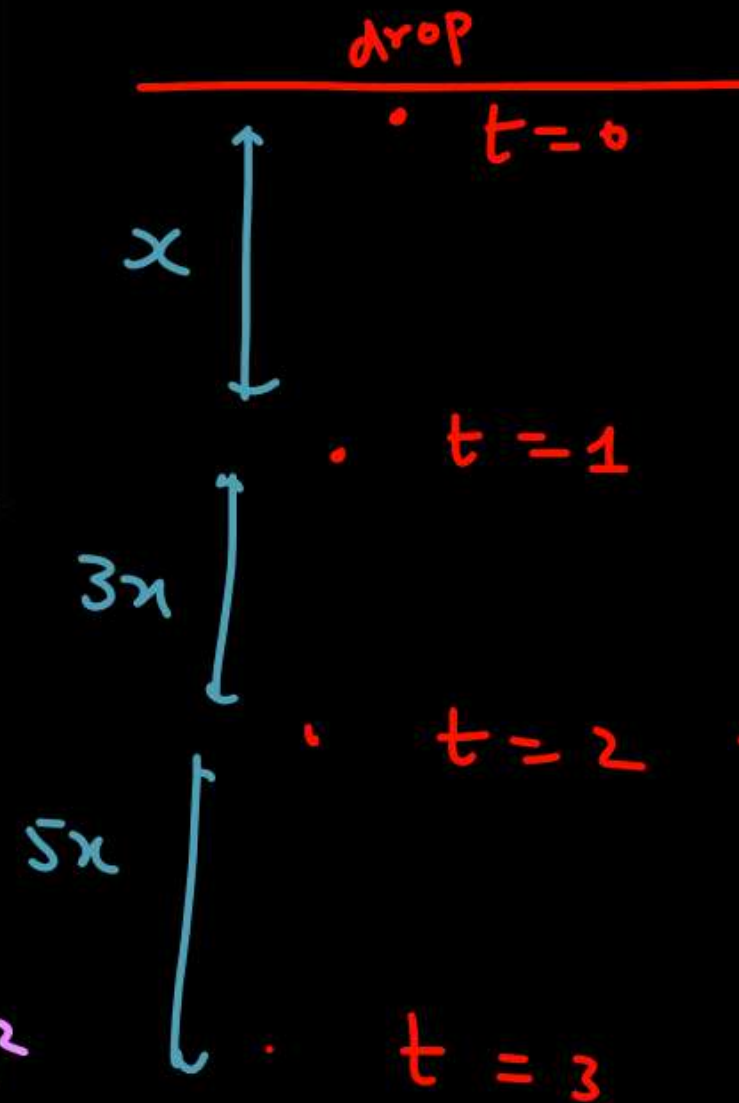
A body is freely dropped from a height h above the ground. Find the ratio of distances fallen in first one second, first two seconds, first three seconds, also find the ratio of distances fallen in 1st second, in 2nd second, in 3rd second etc.

$$x, 4x, 9x$$

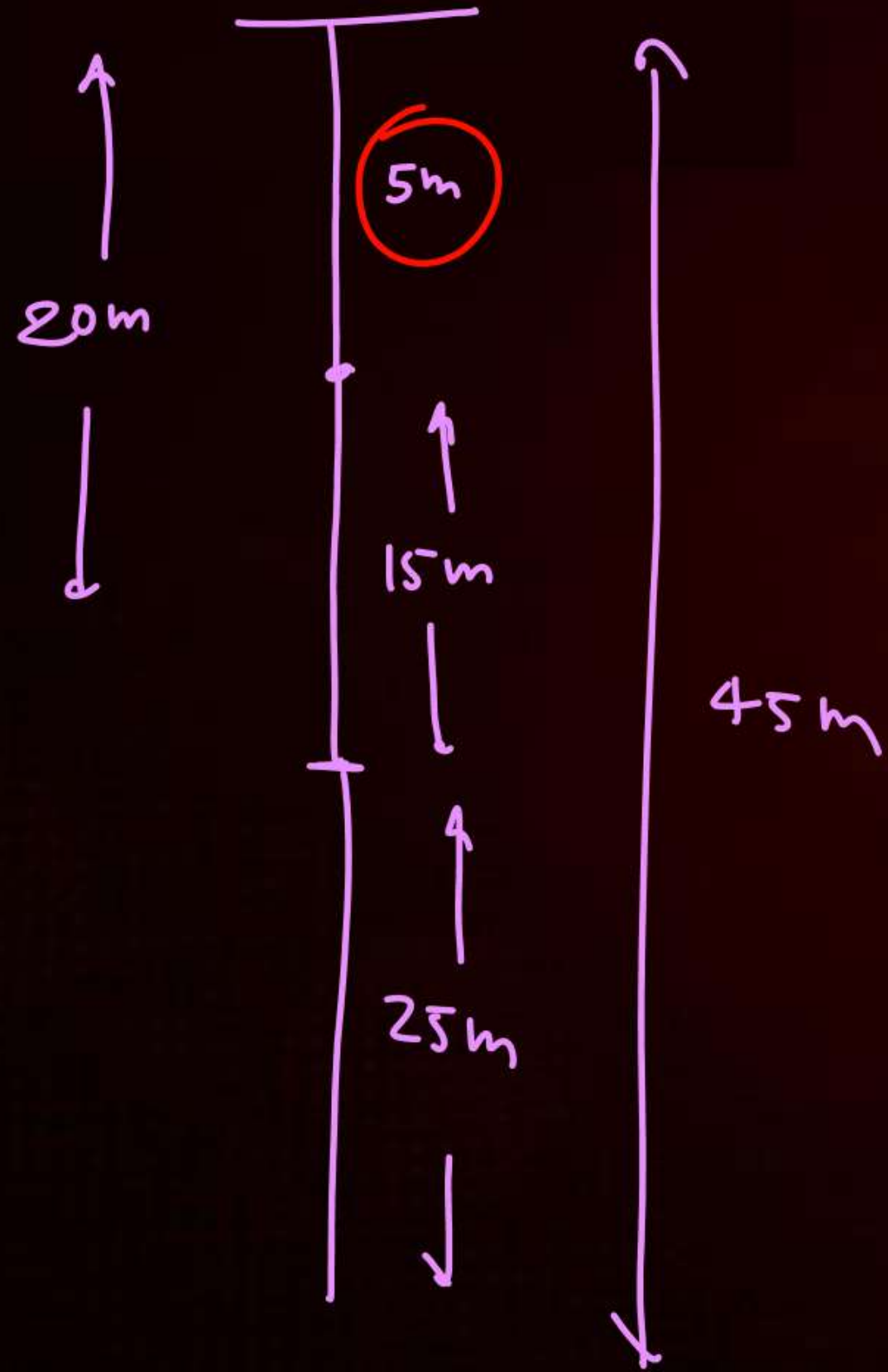
$$t=0 \rightarrow t=1 \quad h_1 = 0 + \frac{1}{2} \times 10 \times 1^2 = 5$$

$$t=0 \rightarrow t=2 \Rightarrow h_2 = 20$$

$$t=0 \rightarrow t=3 \Rightarrow h_3 = 45$$



Ans : (*)



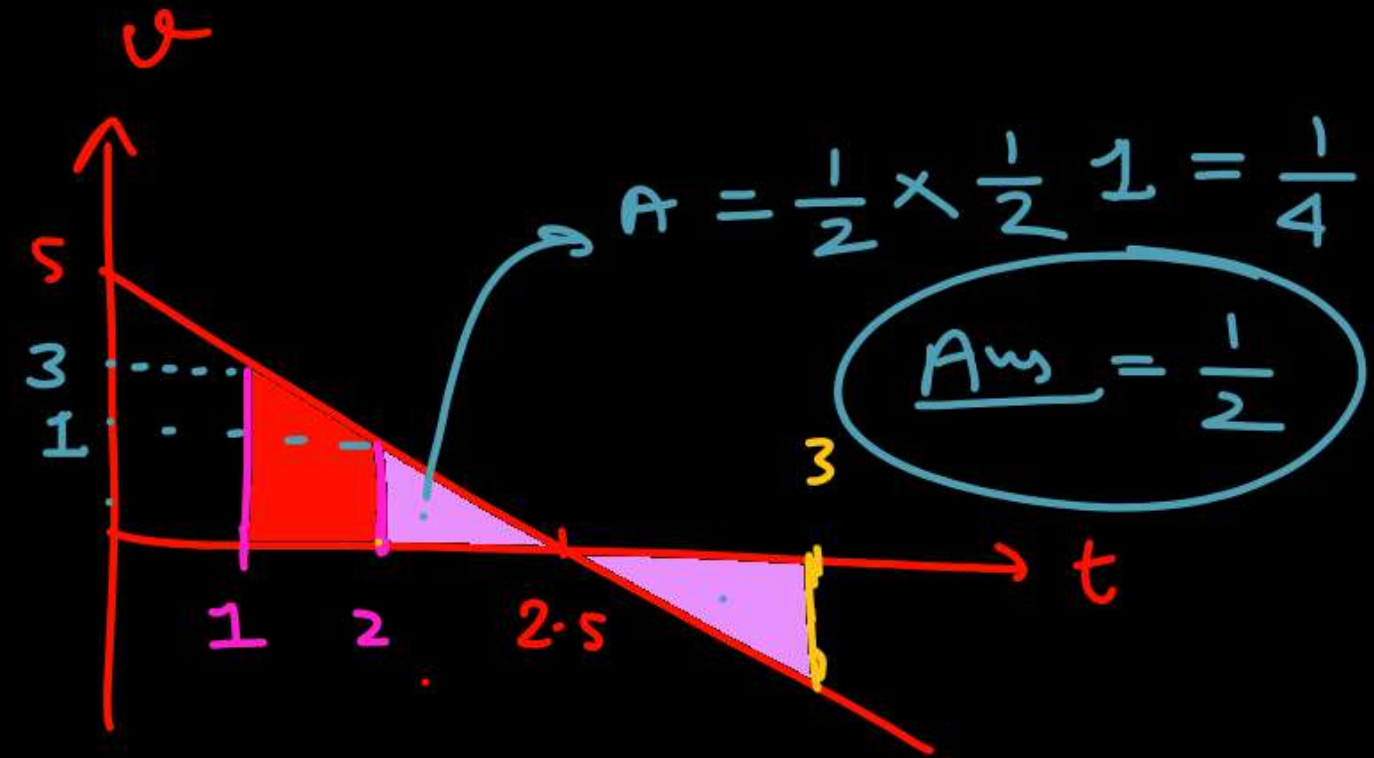
$$5 : 15 : 25$$
$$1 : 3 : 5$$

Question - 11



Consider a particle initially moving with a velocity of 5 ms^{-1} starts decelerating at a constant rate of 2 ms^{-2} .

- (a) Determine the time at which the particle becomes stationary.
- (b) Find the distance travelled in the second second.
- (c) Find the distance travelled in the third second.



$$\frac{1}{2} \times 4 \times 1 = 2$$

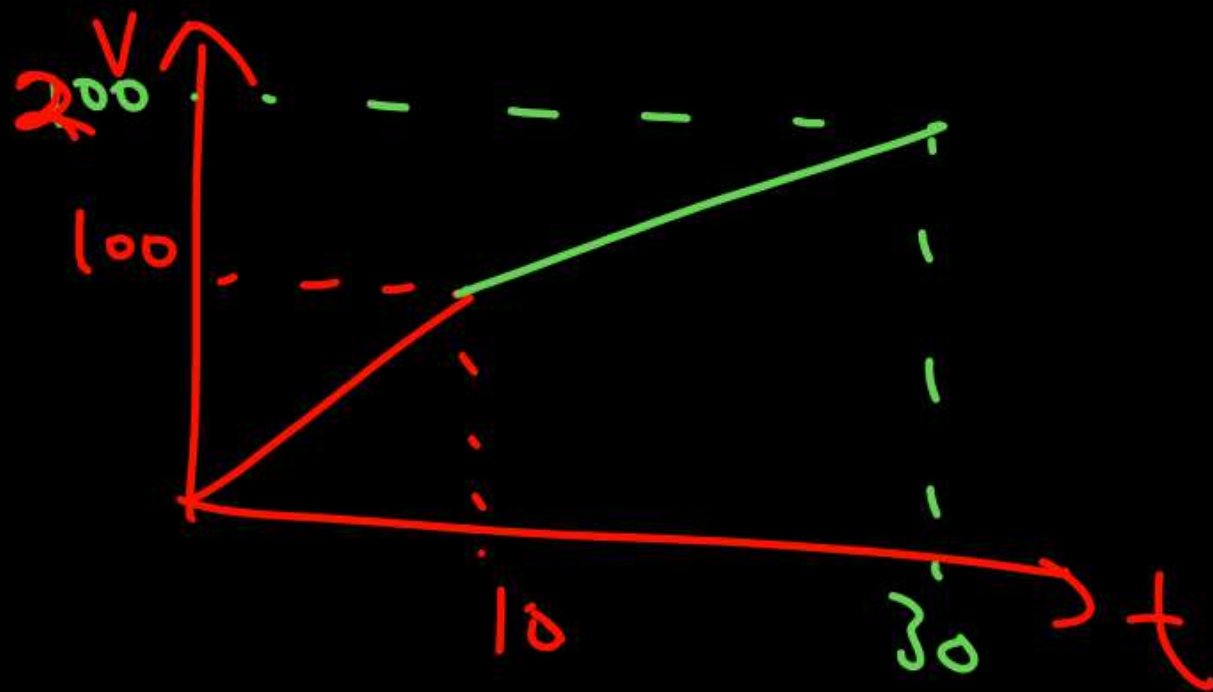
Ans : (2.5 s, 2 m, 0.5 m)

Question - 12



If a body starting from the rest travels with a uniform acceleration of 10 ms^{-2} for first 10 second and with uniform acceleration 5 ms^{-2} for next 20 seconds, then average acceleration of the body for 30 s is: $= \frac{200 - 0}{30}$

- (1) 15 ms^{-2} (2) 10 ms^{-2}
(3) 20 ms^{-2} (4) $20/3 \text{ ms}^{-2}$



Ans : (4)

Question - 13



A moving train is stopped by applying brakes. It stops after traveling 80 m. If the speed of the train is doubled and retardation remains the same. It will cover a distance:

$$x = \frac{u^2}{2a}$$

- (1) Same as earlier
- (2) Double the distance traveled earlier
- ☒ (3) Four time the distance traveled earlier
- (4) Half the distance traveled earlier

Ans : (3)

Question - 14



The bus moving with a speed of 30 km/h is brought to a stop by applying brakes after 6 m. If the same bus is moving at a speed of 90 km/h, then the minimum stopping distance is:

- (1) 36 m (2) 45 m
(3) 60 m (4) ☒ 54 m

$$v^2 = 0 + 2as$$

$$s = \frac{v^2}{2a}$$

$$\frac{s_1}{s_2} = \frac{v_1^2}{v_2^2}$$

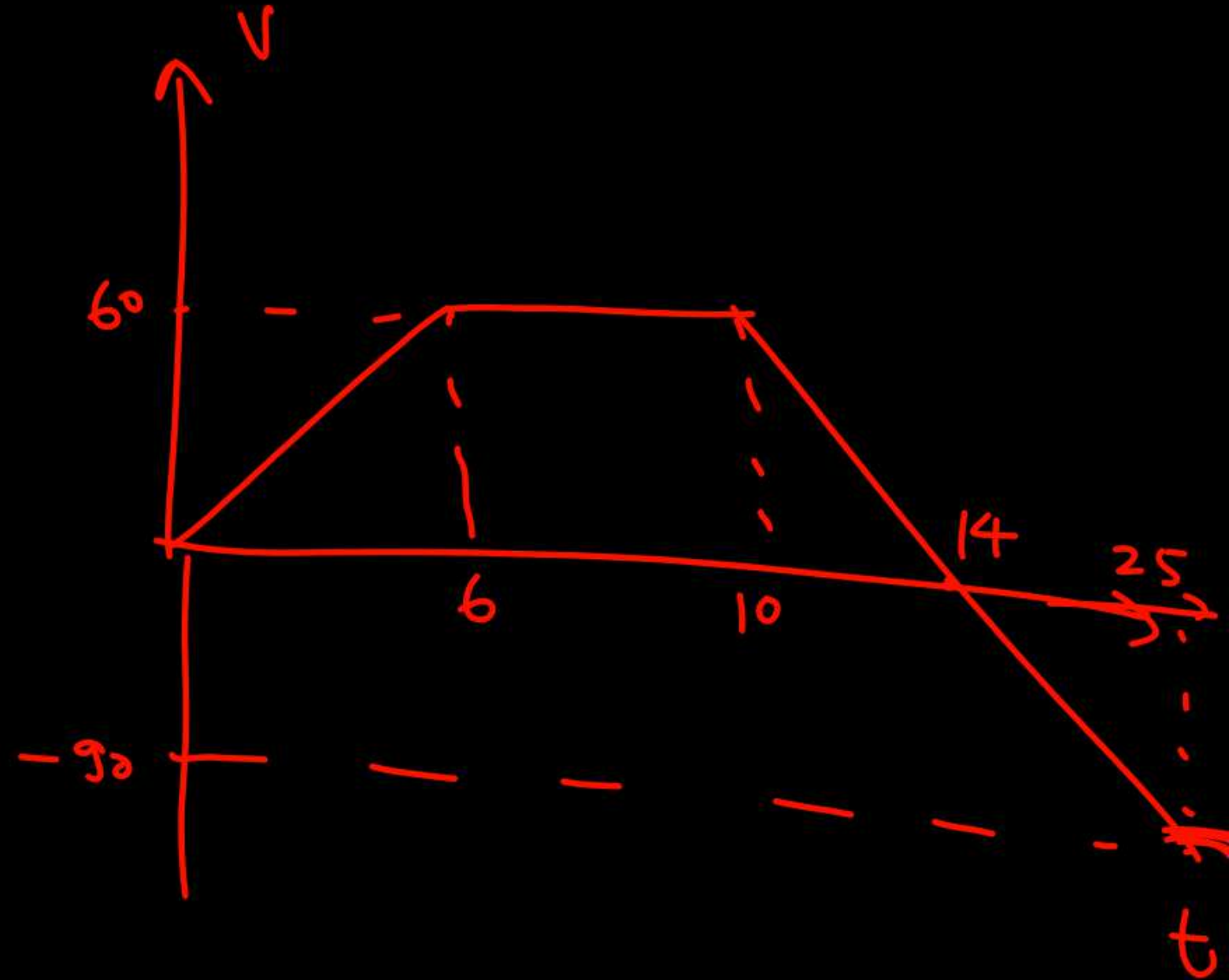
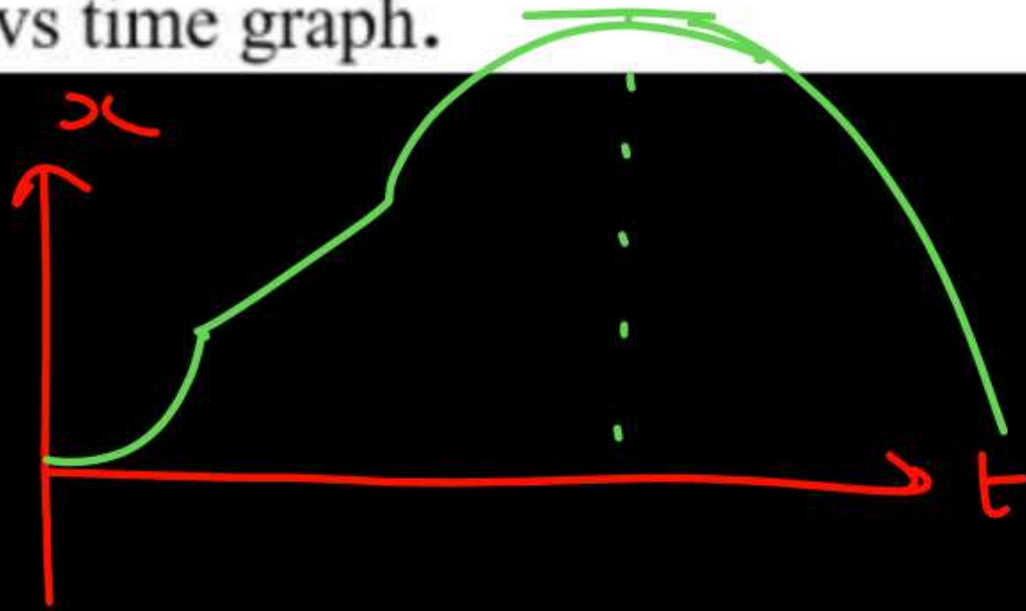
$$\frac{6}{s_2} = \left(\frac{30}{90} \right)^2$$

Ans : (4)

Question - 15

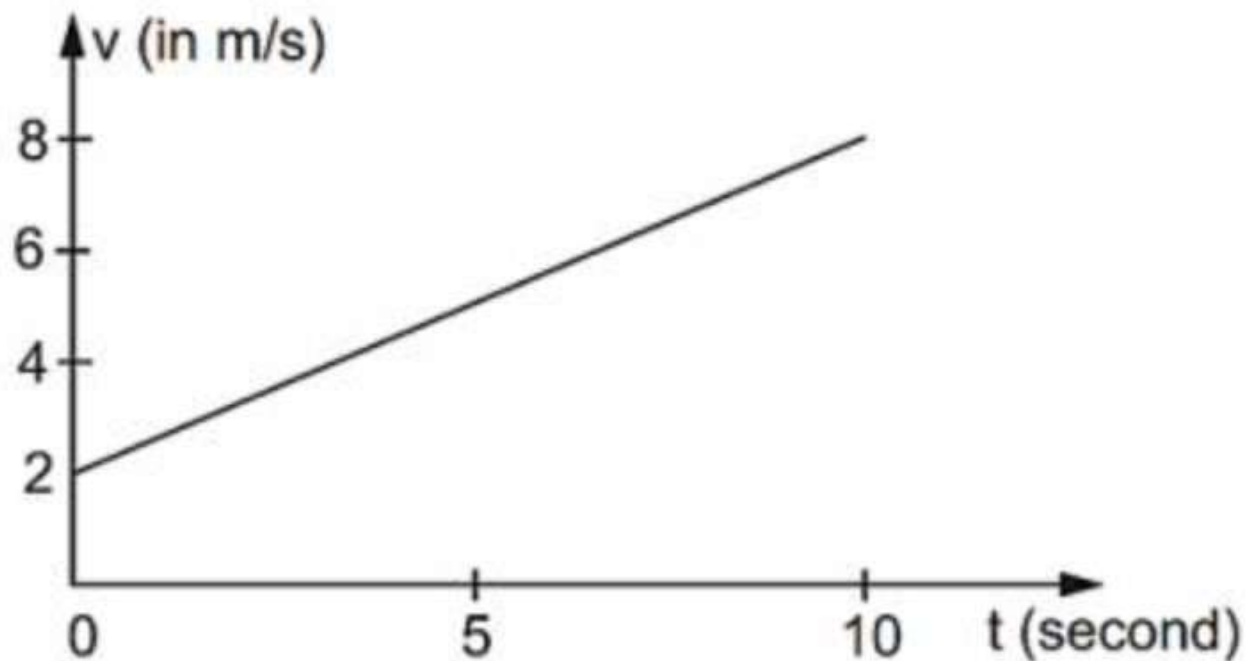


A particle start motion from rest having acc $+10 \text{ m/s}^2$ for six second After that it travel with zero acc (const velocity) for four second. then acc. of particle become -15 m/s^2 for next 10 second and then it travel with const. velocity for next three second. Draw $x-t$ and distance vs time graph.



Ans : (*)

Figure shows the graph of velocity versus time for a particle going along the X-axis. Find (a) the acceleration, (b) the distance travelled in 0 to 10 s and (c) the displacement in 0 to 10 s.

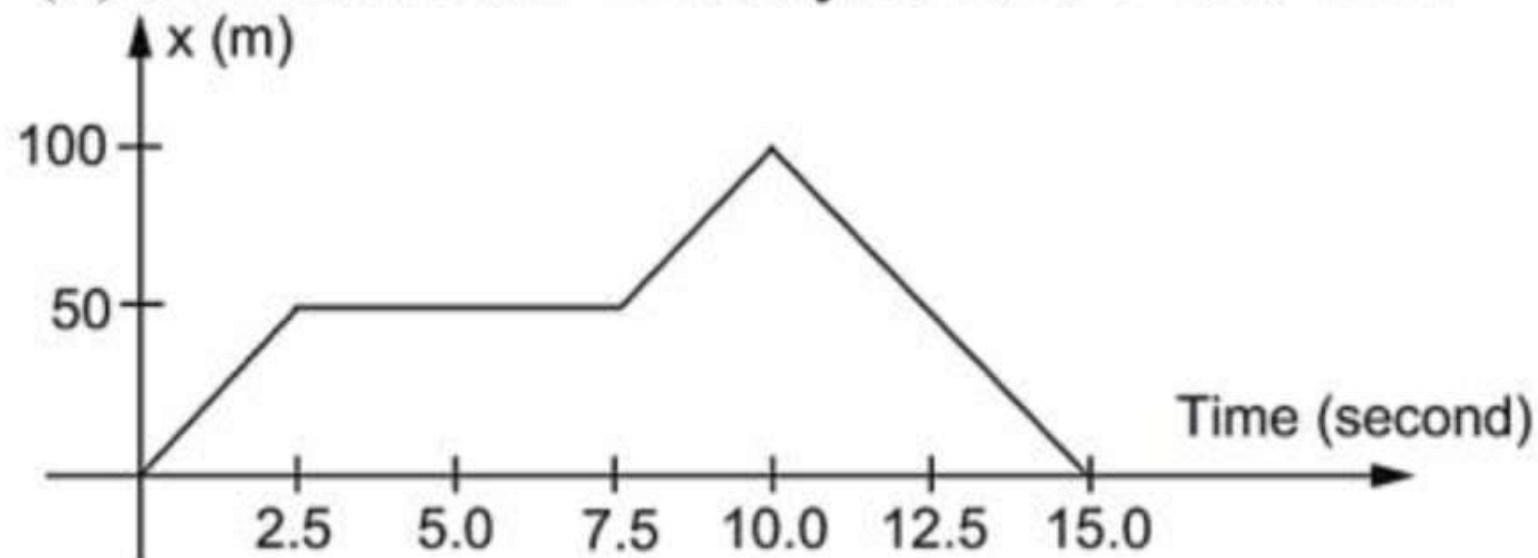


Ans : (a) 0.6 m/s^2 , (b) 50 m, (c) 50 m

Question - 17



Figure shows the graph of the x -coordinate of a particle going along the X -axis as a function of time. Find (a) the average velocity during 0 to 10 s, (b) instantaneous velocity at 2, 5, 8 and 12s.



Ans : (a) 10 m/s, (b) 20 m/s, zero, 20 m/s, -20 m/s

Question – 18



A bullet going with speed 350 m/s enters a concrete wall and penetrates a distance of 5.0 cm before coming to rest. Find the deceleration.

Ans : (100 m, zero)

Question – 19



A particle starting from rest moves with constant acceleration. If it takes 5.0 s to reach the speed 18.0 km/h find (a) the average velocity during this period, and (b) the distance travelled by the particle during this period.

Ans : (a) 2.5 m/s, (b) 12.5 m

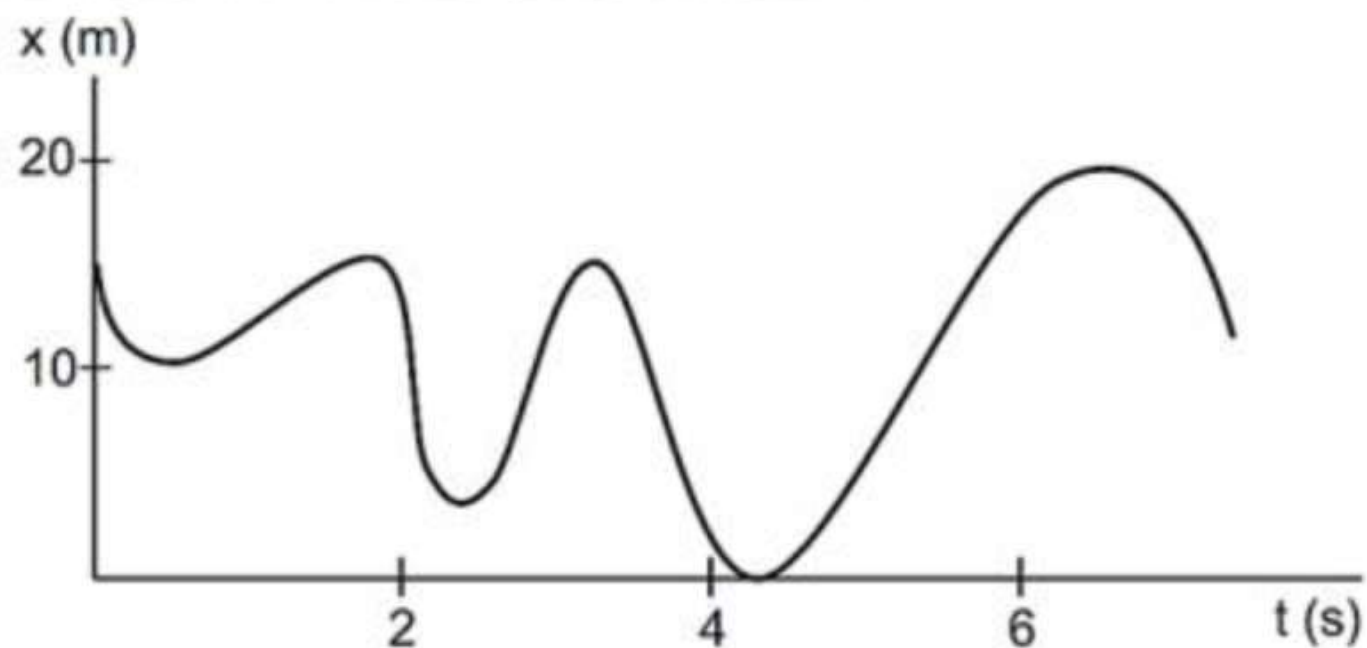
Question – 20



A driver takes 0.20 s to apply the brakes after he sees a need for it. This is called the reaction time of the driver. If he is driving a car at a speed of 54 km/h and the brakes cause a deceleration of 6.0 m/s^2 , find the distance travelled by the car after he sees the need to put the brakes on.

Ans : (22 m)

Figure shows the position of a particle moving on the X-axis as a function of time.



- (1) The particle has come to rest 6 times.
- (2) The maximum speed is at $t = 6$ s.
- (3) The velocity remains positive for $t = 0$ to $t = 6$ s.
- (4) The average velocity for the total period shown is negative

Question – 22



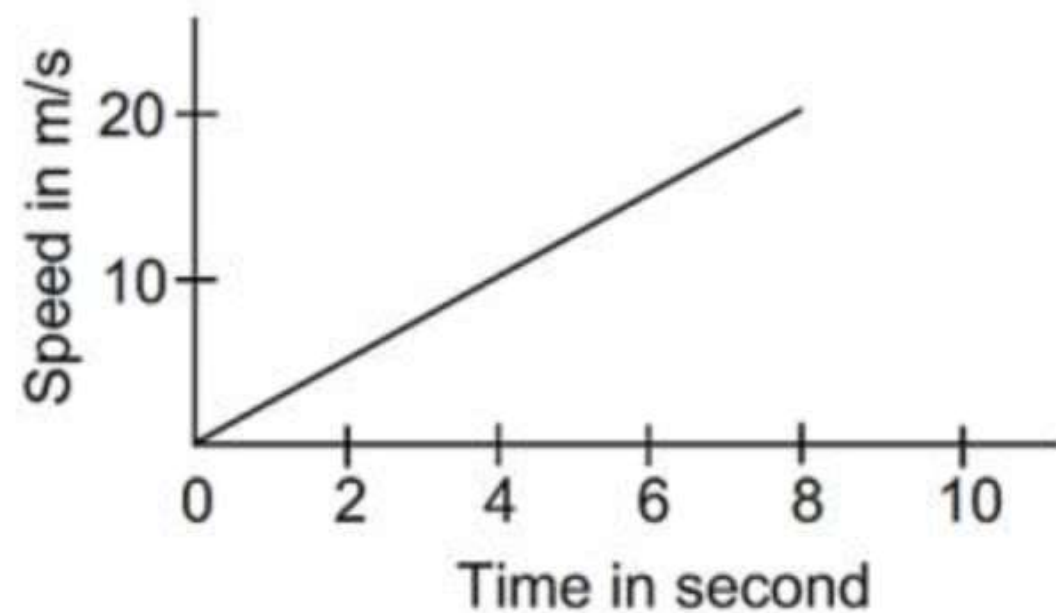
An athlete takes 2.0 s to reach his maximum speed of 18.0 km/h. What is the magnitude of his average acceleration?

Ans : (2.5 m/s²)

Question - 23



The speed of a car as a function of time is shown in figure. Find the distance travelled by the car in 8 seconds and its acceleration.

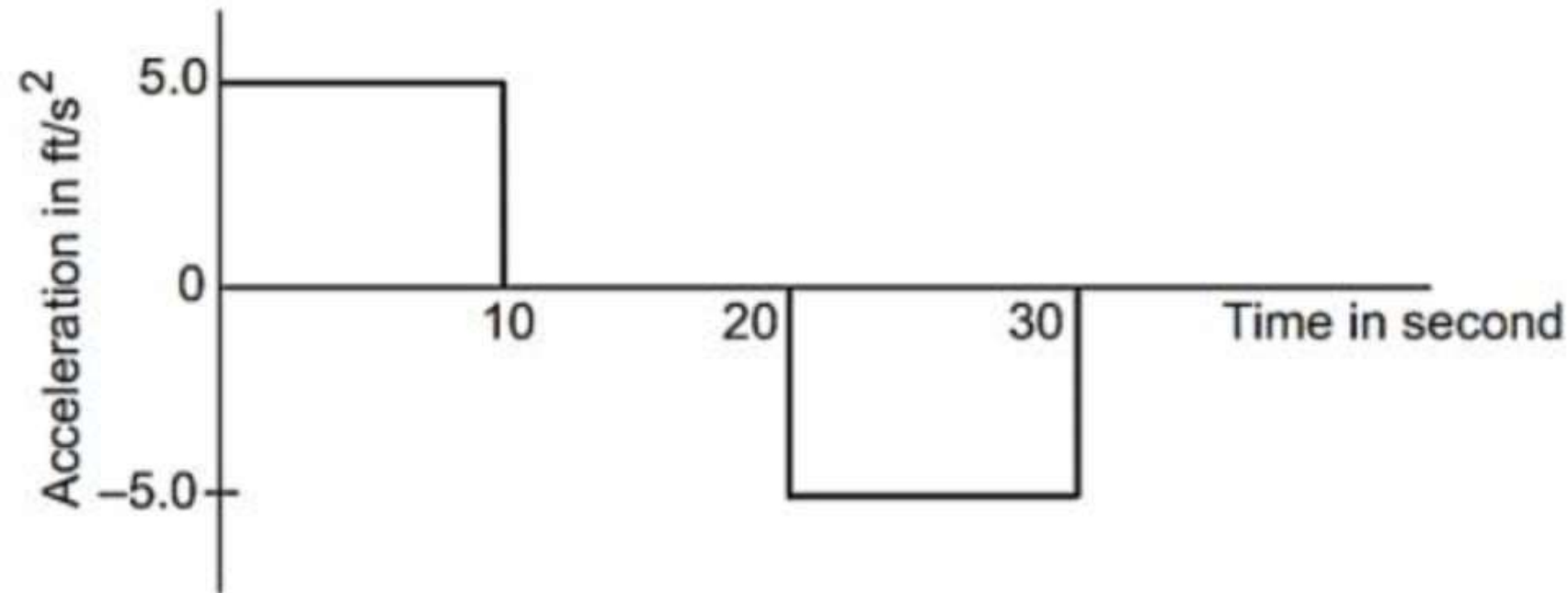


Ans : (80 m, 2.5 m/s^2)

Question - 24



The acceleration of a cart started at $t = 0$, varies with time as shown in figure. Find the distance travelled in 30 seconds and draw the position-time graph.



Ans : (1000 ft)

Question - 25



The velocity of a particle is zero at $t = 0$.

- (1) The acceleration at $t = 0$ must be zero.
- (2) The acceleration at $t = 0$ may be zero.
- (3) If the acceleration is zero from $t = 0$ to $t = 10$ s, the speed is also zero in this interval.
- (4) If the speed is zero from $t = 0$ to $t = 10$ s the acceleration is also zero in this interval.

Ans : (2, 3, 4)

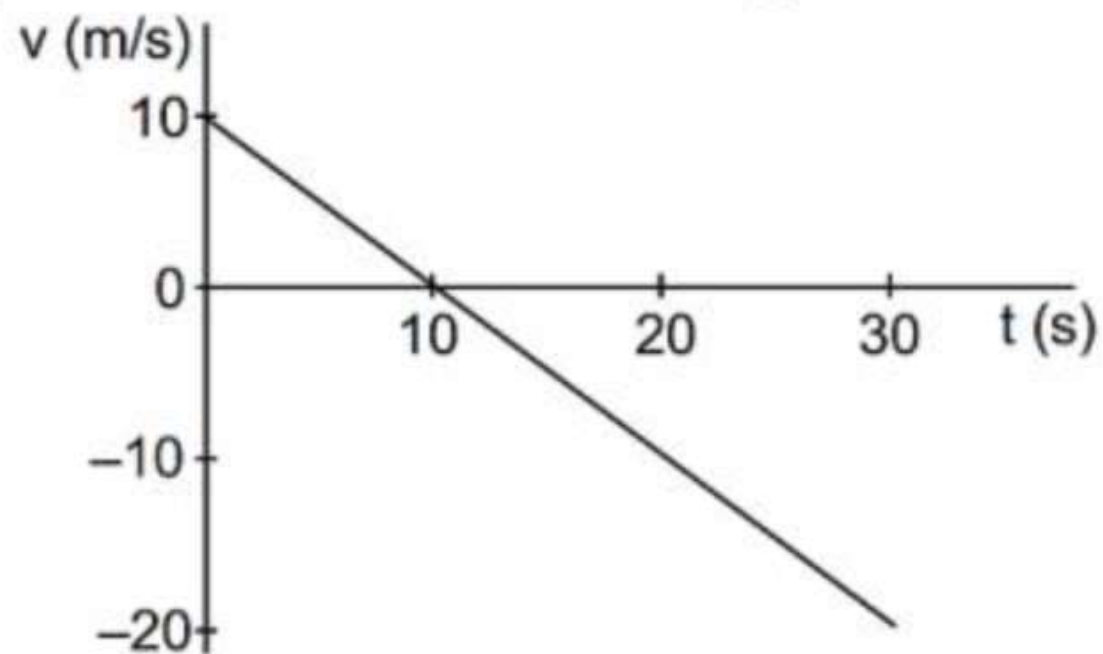
Mark the correct statements:

- (1) The magnitude of the velocity of a particle is equal to its speed.
- (2) The magnitude of average velocity in an interval is equal to its average speed in that interval.
- (3) It is possible to have a situation in which the speed of a particle is always zero but the average speed is not zero.
- (4) It is possible to have a situation in which the speed of the particle is never zero but the average speed in an interval is zero.

Question - 27



The velocity-time plot for a particle moving on a straight line is shown in the figure.



- (1) The particle has a constant acceleration.
- (2) The particle has never turned around.
- (3) The particle has zero displacement.
- (4) The average speed in the interval 0 to 10 s is the same as the average speed in the interval 10 s to 20 s.

Ans : (1, 4)

An object may have

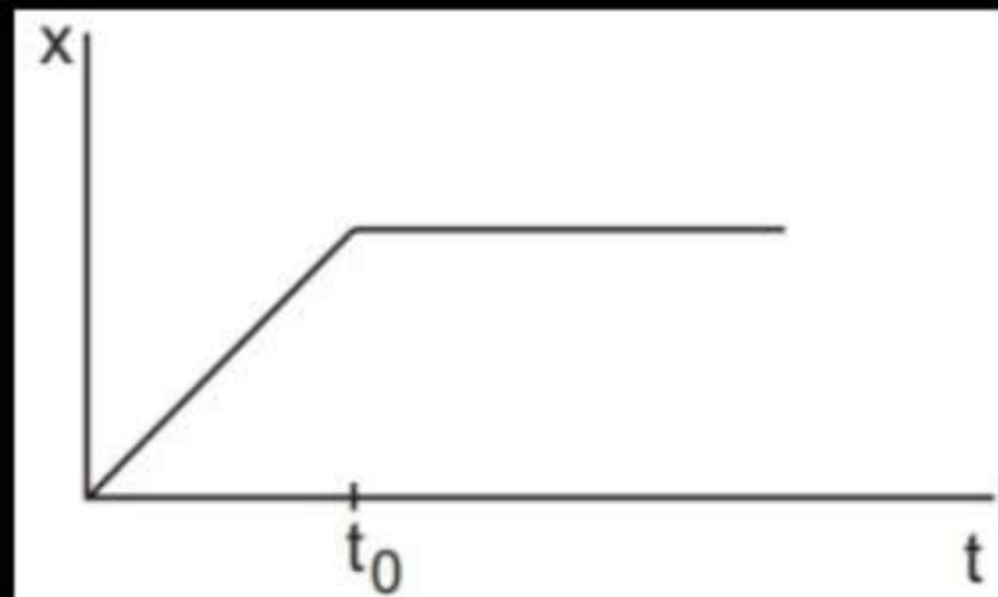
- (1) varying speed without having varying velocity
- (2) varying velocity without having varying speed
- (3) nonzero acceleration without having varying velocity
- (4) nonzero acceleration without having varying speed

Mark the correct statements for a particle going on a straight line:

- (1) If the velocity and acceleration have opposite sign, the object is slowing down.
- (2) If the position and velocity have opposite sign, the particle is moving towards the origin.
- (3) If the velocity is zero at an instant, the acceleration should also be zero at that instant.
- (4) If the velocity is zero for a time interval, the acceleration is zero at any instant within the time interval.

Figure shows the displacement-time graph of a particle moving on the X-axis.

- (1) the particle is continuously going in positive x direction.
- (2) the particle is at rest
- (3) the velocity increases up to a time t_0 , and then becomes constant
- (4) the particle moves at a constant velocity up to a time t_0 , and then stops.



A particle has a velocity u towards east at $t = 0$. Its acceleration is towards west and is constant. Let x_A and x_B be the magnitude of displacements in the first 10 seconds and the next 10 seconds.

- (1) $x_A < x_B$
- (2) $x_A = x_B$
- (3) $x_A > x_B$
- (4) the information is insufficient to decide the relation of x_A with x_B .

A person travelling on a straight line moves with a uniform velocity v_1 for some time and with uniform velocity v_2 for the next equal time. The average velocity v is given by:

$$(1) \quad v = \frac{v_1 + v_2}{2}$$

$$(2) \quad v = \sqrt{v_1 v_2}$$

$$(3) \quad \frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$$

$$(4) \quad \frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$$

A person travelling on a straight line moves with a uniform velocity v_1 for a distance x and with a uniform velocity v_2 for the next equal distance. The average velocity v is given by:

$$(1) \quad v = \frac{v_1 + v_2}{2}$$

$$(2) \quad v = \sqrt{v_1 v_2}$$

$$(3) \quad \frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$$

$$(4) \quad \frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$$

THANK
YOU