



Prayas JEE (2025)

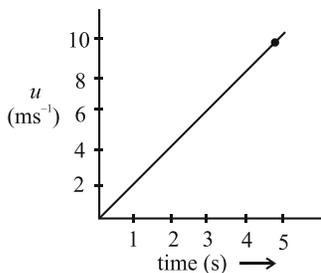
Motion In A Plane

PYQ

1. A particle is moving along the x -axis with its coordinate with $x(t)$ the time ' t ' given by $x(t) = 10 + 8t - 3t^2$. Another particle is moving the y -axis with its coordinate as a function of time given by $y(t) = 5 - 8t^3$. At $t = 1$ s, the speed of the second particle as measured in the frame of the first particle is given as \sqrt{v} . Then v (in m/s) is _____.
(JEE Main 2020)
2. A particle moves such that its position vector $\vec{r}(t) = \cos\omega t\hat{i} + \sin\omega t\hat{j}$ where ω is a constant and t is time. Then which of the following statements is true for the velocity $\vec{v}(t)$ and acceleration $\vec{a}(t)$ of the particle:
(JEE Main 2020)
- \vec{v} is perpendicular to \vec{r} and \vec{a} is directed towards the origin
 - \vec{v} and \vec{a} both are parallel to \vec{r}
 - \vec{v} and \vec{a} both are perpendicular to \vec{r}
 - \vec{v} is perpendicular to \vec{r} and \vec{a} is directed away from the origin.
- 3.
4. The distance x covered by a particle in one dimensional motion varies with time t as $x^2 = at^2 + 2bt + c$. If the acceleration of the particle depends on x as x^{-n} , where n is an integer, the value of n is _____.
(JEE Main 2020)
5. A particle starts from the origin at $t = 0$ with an initial velocity of $3.0\hat{i}$ m/s and moves in the $x - y$ plane with a constant acceleration $(6.0\hat{i} + 4.0\hat{j})$ m/s². The x -coordinate of the particle at the instant when its y -coordinate is 32 m is D meters. The value of D is:-
(JEE Main 2020)
- 50
 - 32
 - 60
 - 40
- 6.
7. Starting from the origin at time $t = 0$, with initial velocity $5\hat{j}$ ms⁻¹, a particle moves in the $x - y$ plane
- with a constant acceleration of $(10\hat{i} + 4\hat{j})$ ms⁻². At time t , its coordinates are $(20\text{m}, y_0)$. The values of t and y_0 , are respectively:
(JEE Main 2020)
- 4 s and 52 m
 - 2 s and 24 m
 - 2 s and 18 m
 - 5 s and 25 m
8. A Tennis ball is released from a height h and after freely falling on a wooden floor it rebounds and reaches height $\frac{h}{2}$. The velocity versus height of the ball during its motion may be represented graphically by:
(JEE Main 2020)
- -
 -
 -
9. A small ball of mass is thrown upward with velocity u from the ground. The ball experiences a resistive force mkv^2 where v is its speed. The maximum height attained by the ball is:
(JEE Main 2020)
- $\frac{1}{2k} \tan^{-1} \frac{ku^2}{g}$
 - $\frac{1}{2k} \ln \left(1 + \frac{ku^2}{g} \right)$
 - $\frac{1}{k} \tan^{-1} \frac{ku^2}{2g}$
 - $\frac{1}{k} \ln \left(1 + \frac{ku^2}{2g} \right)$
10. The speed versus time graph for a particle is shown in the figure. The distance travelled (in m) by the



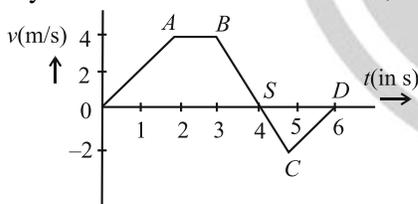
particle during the time interval $t = 0$ to $t = 5$ s will be _____.
(JEE Main 2020)



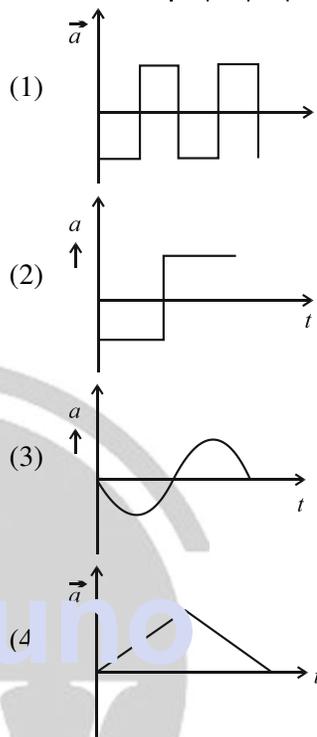
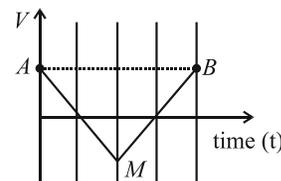
11. A helicopter raises from rest on the ground vertically upwards with a constant acceleration g . A food packet is dropped from the helicopter when it is at a height h . The time taken by the packet to reach the ground is close to [g is the acceleration due to gravity]:
(JEE Main 2020)

(1) $t = \sqrt{\frac{2h}{3g}}$ (2) $t = 1.8\sqrt{\frac{h}{g}}$
 (3) $t = 3.4\sqrt{\left(\frac{h}{g}\right)}$ (4) $t = \frac{2}{3}\sqrt{\left(\frac{h}{g}\right)}$

12. The velocity (v) and time (t) graph of a body in a straight line motion is shown in the figure. The point S is at 4.333 seconds. The total distance covered by the body in 6s is:
(JEE Main 2020)



- (1) 12 m (2) 49/4 m
 (3) 11 m (4) 37/3 m
13. When a car is at rest, its driver sees rain drops falling on it vertically. When driving the car with speed v , he sees that rain drops are coming at an angle 60° from the horizontal. On further increasing the speed of the car to $(1 + \beta)v$, this angle changes to 45° . The value of β is close to:
(JEE Main 2020)
- (1) 0.41 (2) 0.50
 (3) 0.37 (4) 0.73
14. If the velocity-time graph has the shape AMB , what would be the shape of the corresponding acceleration-time graph?
(JEE Main 2021)



15. A particle is projected with velocity v_0 along x -axis. A damping force is acting on the particle which is proportional to the square of the distance from the origin i.e., $ma = -\alpha x^2$. The distance at which the particle stops:
(JEE Main 2021)

(1) $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{2}}$ (2) $\left(\frac{2v_0}{3\alpha}\right)^{\frac{1}{3}}$
 (3) $\left(\frac{2v_0^2}{3\alpha}\right)^{\frac{1}{2}}$ (4) $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{3}}$

16. An engine of a train, moving with uniform acceleration, passes the signal-post with velocity u and the last compartment with velocity v . The velocity with which middle point of the train passes the signal post is:
(JEE Main 2021)

(1) $\sqrt{\frac{v^2 + u^2}{2}}$ (2) $\frac{v - u}{2}$
 (3) $\frac{u + v}{2}$ (4) $\sqrt{\frac{v^2 - u^2}{2}}$



17. A stone is dropped from the top of a building. When it crosses a point 5 m below the top, another stone starts to fall from a point 25 m below the top. Both stones reach the bottom of building simultaneously. The height of the building is: (JEE Main 2021)
- (1) 35 m (2) 45 m
 (3) 50 m (4) 25 m

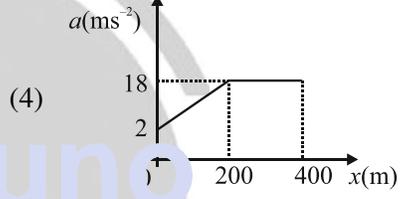
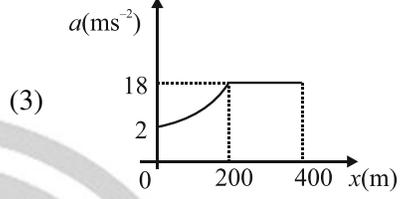
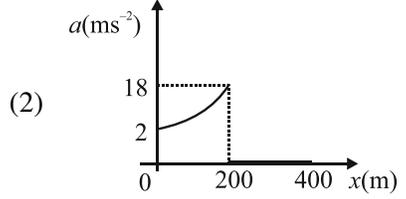
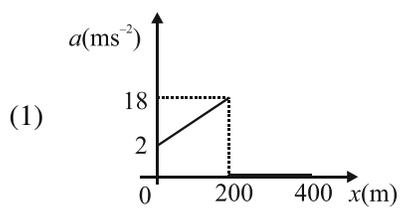
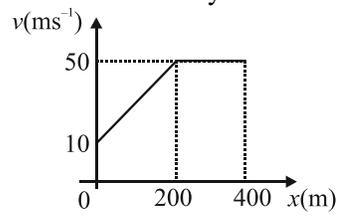
18. The trajectory of a projectile in a vertical plane is $y = \alpha x - \beta x^2$, where α and β are constants and x & y are respectively the horizontal and vertical distances of the projectile from the point of projection. The angle of projection θ and the maximum height attained H are respectively given by: (JEE Main 2021)

- (1) $\tan^{-1} \alpha, \frac{\alpha^2}{4\beta}$ (2) $\tan^{-1} \beta, \frac{\alpha^2}{2\beta}$
 (2) $\tan^{-1} \alpha, \frac{4\alpha^2}{\beta}$ (3) $\tan^{-1} \left(\frac{\alpha}{\beta} \right), \frac{\alpha}{\beta}$

19. A scooter accelerates from rest for time t_1 at constant rate a_1 and then retards at constant rate a_2 for time t_2 and comes to rest. The correct value of $\frac{t_1}{t_2}$ will be _____. (JEE Main 2021)

- (1) $\frac{a_1 + a_2}{a_2}$ (2) $\frac{a_2}{a_1}$
 (3) $\frac{a_1}{a_2}$ (4) $\frac{a_1 + a_2}{a_1}$

20. The velocity-displacement graph describing the motion of a bicycle is shown in the figure. The acceleration-displacement graph of the bicycle's motion is best described by: (JEE Main 2021)



21. A mosquito is moving with a velocity $\vec{v} = -0.5t^2\hat{i} + 3t\hat{j} + 9\hat{k}$ m/s and accelerating in uniform conditions. What will be the direction of mosquito after 2 s? (JEE Main 2021)

- (1) $\tan^{-1} \left(\frac{2}{3} \right)$ from x -axis
 (2) $\tan^{-1} \left(\frac{2}{3} \right)$ from y -axis
 (3) $\tan^{-1} \left(\frac{5}{2} \right)$ from y -axis
 (4) $\tan^{-1} \left(\frac{5}{2} \right)$ from x -axis

22. A swimmer can swim with velocity of 12 km/h in still water. Water flowing in a river has velocity 6 km/h. The direction with respect to the direction of flow of river water he should swim in order to reach the point on the other bank just opposite to his starting point is _____°. (Round off to the Nearest Integer) (find the angle in degree) (JEE Main 2021)

23. A car accelerates from rest at a constant rate a for some time after which it decelerates at a constant rate



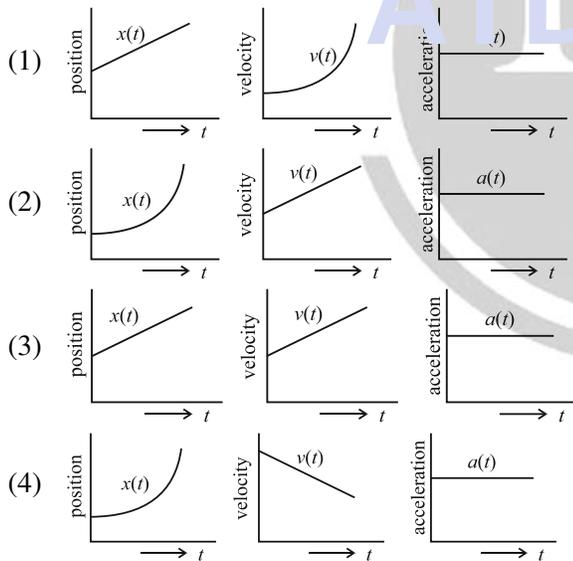
b to come to rest. If the total time elapsed is t seconds, the total distance travelled is: (JEE Main 2021)

- (1) $\frac{4\alpha\beta}{(\alpha+\beta)}t^2$ (2) $\frac{2\alpha\beta}{(\alpha+\beta)}t^2$
 (3) $\frac{\alpha\beta}{2(\alpha+\beta)}t^2$ (4) $\frac{\alpha\beta}{4(\alpha+\beta)}t^2$

24. The velocity of a particle is $v = v_0 + gt + Ft^2$. Its position is $x = 0$ at $t = 0$; then its displacement after time ($t = 1$) is: (JEE Main 2021)

- (1) $v_0 + g + F$ (2) $V_0 + \frac{g}{2} + \frac{F}{3}$
 (3) $V_0 + \frac{g}{2} + F$ (4) $v_0 + 2g + 3F$

25. The position, velocity and acceleration of a particle moving with a constant acceleration can be represented by: (JEE Main 2021)

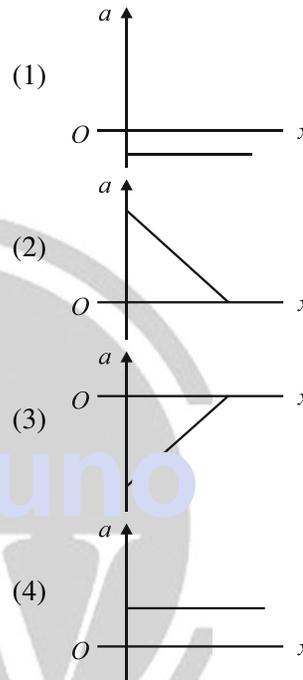
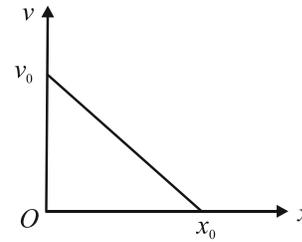


26. A person is swimming with a speed of 10 m/s at an angle of 120° with the flow and reaches to a point directly opposite on the other side of the river. The speed of the flow is ' x ' m/s. The value of ' x ' to the nearest integer is _____. (JEE Main 2021)

27. The velocity-displacement graph of a particle is shown in the figure. The acceleration-displacement

graph of the same particle is represented by:

(JEE Main 2021)



28. A butterfly is flying with a velocity $4\sqrt{2}$ m/s in North-East direction. Wind is slowly blowing at 1 m/s from North to South. The resultant displacement of the butterfly in 3 seconds is:

(JEE Main 2021)

- (1) 3 m (2) 20 m
 (3) $12\sqrt{2}$ m (4) 15 m

29. A boy reaches the airport and finds that the escalator is not working. He walks up the stationary escalator in time t_1 . If he remains stationary on a moving escalator then the escalator takes him up in time t_2 . The time taken by him to walk up on the moving escalator will be: (JEE Main 2021)

- (1) $\frac{t_1 t_2}{t_2 - t_1}$ (2) $\frac{t_1 + t_2}{2}$



(3) $\frac{t_1 t_2}{t_2 + t_1}$ (4) $t_2 - t_1$

30. Water droplets are coming from an open tap at a particular rate. The spacing between a droplet observed at 4th second after its fall to the next droplet is 34.3m. At what rate the droplets are coming from the tap? (Take $g = 9.8 \text{ m/s}^2$) (JEE Main 2021)

- (1) 3 drops/2 seconds
 (2) 2 drops/second
 (3) 1 drop/second
 (4) 1 drop/7 seconds

31.

32. A force $\vec{F} = (40\hat{i} + 10\hat{j}) \text{ N}$ acts on a body of mass 5 kg. If the body starts from rest, its position vector \vec{r} at time $t = 10 \text{ s}$, will be: (JEE Main 2021)

- (1) $(100\hat{i} + 400\hat{j}) \text{ m}$
 (2) $(100\hat{i} + 100\hat{j}) \text{ m}$
 (3) $(400\hat{i} + 100\hat{j}) \text{ m}$
 (4) $(400\hat{i} + 400\hat{j}) \text{ m}$

33. A balloon was moving upwards with a uniform velocity of 10 m/s. An object of finite mass is dropped from the balloon when it was at a height of 75 m from the ground level. The height of the balloon from the ground when object strikes the ground was around: (takes the value of g as 10 m/s^2) (JEE Main 2021)

- (1) 300 m (2) 200 m
 (3) 125 m (4) 250 m

34. The instantaneous velocity of a particle moving in a straight line is given as $v = \alpha t + \beta t^2$, where α and β are constants. The distance travelled by the particle between 1s and 2s is: (JEE Main 2021)

- (1) $3\alpha + 7\beta$ (2) $\frac{3}{2}\alpha + \frac{7}{3}\beta$
 (3) $\frac{\alpha}{2} + \frac{\beta}{3}$ (4) $\frac{3}{2}\alpha + \frac{7}{2}\beta$

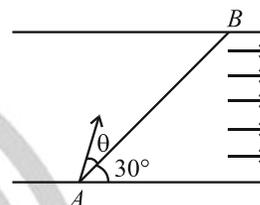
35. A ball is thrown up with a certain velocity so that it reaches a height 'h'. Find the ratio of the two different

times of the ball reaching $\frac{h}{3}$ in both the directions.

(JEE Main 2021)

- (1) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ (2) $\frac{1}{3}$
 (3) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ (4) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

36. A swimmer wants to cross a river from point A to point B. Line AB makes an angle of 30° with the flow of river. Magnitude of velocity of the swimmer is same as that of the river. The angle θ with the line AB should be _____°, so that the swimmer reaches point B. (JEE Main 2021)



37. Two spherical balls having equal masses with radius of 5 cm each are thrown upwards along the same vertical direction at an interval of 3 s with the same initial velocity of 35 m/s, then these balls collide at a height of _____m. (Take $g = 10 \text{ m/s}^2$) (JEE Main 2021)

38. A bomb is dropped by fighter plane flying horizontally. To an observer sitting in the plane, the trajectory of the bomb is a: (JEE Main 2021)

- (1) hyperbola
 (2) parabola in the direction of motion of plane
 (3) straight line vertically down the plane
 (4) parabola in a direction opposite to the motion of plane

39. If the velocity of a body related to displacement x is given by $v = \sqrt{5000 + 24x} \text{ m/s}$, then the acceleration of the body is m/s^2 . (JEE Main 2021)

40. Water drops are falling from a nozzle of a shower onto the floor, from a height of 9.8 m. The drops fall at a regular interval of time. When the first drop strikes the floor, at that instant, the third drop begins to fall. Locate the position of second drop from the floor when the first drop strikes the floor.



(JEE Main 2021)

- (1) 4.18 m (2) 2.94 m
(3) 2.45 m (4) 7.35 m

41. A player kicks a football with an initial speed of 25 ms^{-1} at an angle of 45° from the ground. What are the maximum height and the time taken by the football to reach at the highest point during motion? (Take $g = 10 \text{ ms}^{-2}$)

(JEE Main 2021)

- (1) $h_{\text{max}} = 10 \text{ m}$ $T = 2.5 \text{ s}$
(2) $h_{\text{max}} = 15.625 \text{ m}$ $T = 3.54 \text{ s}$
(3) $h_{\text{max}} = 15.625 \text{ m}$ $T = 1.77 \text{ s}$
(4) $h_{\text{max}} = 3.54 \text{ m}$ $T = 0.125 \text{ s}$

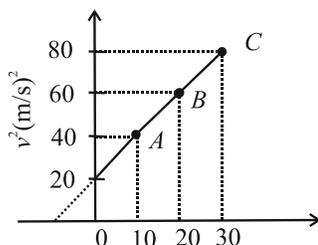
42. A helicopter is flying horizontally with a speed ' v ' at an altitude ' h ' has to drop a food packet for a man on the ground. What is the distance of helicopter from the man when the food packet is dropped?

(JEE Main 2021)

- (1) $\sqrt{\frac{2ghv^2 + 1}{h^2}}$ (2) $\sqrt{2ghv^2 + u^2}$
(3) $\sqrt{\frac{2v^2h}{g} + h^2}$ (4) $\sqrt{\frac{2gh}{v^2} + h^2}$

43. A particle is moving with constant acceleration ' a '. Following graph shows v^2 versus x (displacement) plot. The acceleration of the particle is _____ m/s^2 .

(JEE Main 2021)



44. The ranges and heights for two projectiles projected with the same initial velocity at angles 42° and 48° with the horizontal are R_1, R_2 and H_1, H_2 respectively. Choose the correct option:

(JEE Main 2021)

- (1) $R_1 > R_2$ and $H_1 = H_2$
(2) $R_1 = R_2$ and $H_1 < H_2$
(3) $R_1 < R_2$ and $H_1 < H_2$
(4) $R_1 = R_2$ and $H_1 = H_2$

45. From the top of a tower, a ball is thrown vertically upward which reaches the ground in 6 s. A second ball thrown vertically downward from the same position with the same speed reaches the ground in 1.5 s. A third ball released, from the rest from the same location, will reach the ground in _____ s.

(JEE Main 2022)

46. An object of mass 5 kg is thrown vertically upwards from the ground. The air resistance produces a constant retarding force of 10N throughout the motion. The ratio of time of ascent to the time of descent will be equal to:

(JEE Main 2022)

- (1) 1 : 1 (2) $\sqrt{2} : \sqrt{3}$
(3) $\sqrt{3} : \sqrt{2}$ (3) 2 : 3

47. Two buses P and Q start from a point at the same time and move in a straight line and their positions are represented by $X_{P(t)} = \alpha t + \beta t^2$ and $X_{Q(t)} = ft - t^2$.

At what time, both the buses have same velocity?

(JEE Main 2022)

- (1) $\frac{\alpha - f}{1 + \beta}$ (2) $\frac{\alpha + f}{2(\beta - 1)}$
(3) $\frac{\alpha + f}{2(1 + \beta)}$ (4) $\frac{f - \alpha}{2(1 + \beta)}$

48. A person is standing in an elevator. In which situation, he experiences weight loss? (JEE Main 2022)

- (1) When the elevator moves upward with constant acceleration
(2) When the elevator moves downward with constant acceleration
(3) When the elevator moves upward with uniform velocity
(4) When the elevator moves downward with uniform velocity

49. An object is thrown vertically upwards. At its maximum height, which of the following quantity becomes zero? (JEE Main - 2022)

- (1) Momentum (2) Potential energy
(3) Acceleration (4) Force

50. A ball of mass 0.5 kg is dropped from the height of 10 m. The height, at which the magnitude of velocity becomes equal to the magnitude of acceleration due to gravity, is _____ m. (Use $g = 10 \text{ m/s}^2$)



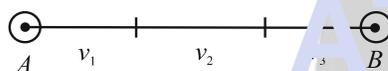
(JEE Main - 2022)

51. A ball is projected vertically upward with an initial velocity of 50 ms^{-1} at $t = 0 \text{ s}$. At $t = 2 \text{ s}$, another ball is projected vertically upward with same velocity. At $t = s$, second ball will meet the first ball ($g = 10 \text{ ms}^{-2}$)
(JEE Main - 2022)

52. A man of 60 kg is running on the road and suddenly jumps into a stationary trolley car of mass 120 kg . Then, the trolley car starts moving with velocity 2 ms^{-1} . The velocity of the running man was ms^{-1} . When he jumps into the car. (JEE Main - 2022)

53.

54. A car covers AB distance with first one-third at velocity $v_1 \text{ ms}^{-1}$, second one-third at $v_2 \text{ ms}^{-1}$ and last one-third at $v_3 \text{ ms}^{-1}$. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11 \text{ ms}^{-1}$ then the average velocity of the car is ms^{-1} . (JEE Main - 2022)



55. Two balls A and B are placed at the top of 180 m tall tower. Ball A is released from the top at $t = 0 \text{ s}$. Ball B is thrown vertically down with an initial velocity ' u ', at $t = 2 \text{ s}$. After a certain time both balls meet 100 m above the ground. Find the value of ' u ' in ms^{-1} . [use $g = 10 \text{ ms}^{-2}$]: (JEE Main - 2022)
(1) 10 (2) 15
(3) 20 (4) 30

56. A small toy starts moving from the position of rest under a constant acceleration. If it travels a distance of 10 m in $t \text{ s}$, the distance travelled by the toy in the next $t \text{ s}$ will be: (JEE Main - 2022)
(1) 10 m (2) 20 m
(3) 30 m (4) 40 m

57.

58. A body is projected from the ground at an angle of 45° with the horizontal. Its velocity after 2 s is 20 ms^{-1} . The maximum height reached by the body during its motion is m . (use $g = 10 \text{ ms}^{-2}$) (JEE Main - 2022)

59. Given below are two statements. One is labelled as Assertion A and the other is labelled as Reason R .

Assertion A: two identical balls A and B thrown with same velocity ' u ' at two different angles with horizontal attained the same range R . If A and B reached the maximum height h_1 and h_2 respectively, then $R = 4\sqrt{h_1 h_2}$

Reason R: Product of said height.

$$h_1 h_2 = \left(\frac{u^2 \sin^2 \theta}{2g} \right) \cdot \left(\frac{u^2 \cos^2 \theta}{2g} \right)$$

Choose the correct answer: (JEE Main - 2022)

- (1) Both A and R are true and R is the correct explanation of A
- (2) Both A and R true but R is NOT the correct explanation of A
- (3) A is true but R is false
- (4) A is false but R is true

60. A fighter jet is flying horizontally at a certain altitude with a speed of 200 ms^{-1} . When it passes directly overhead an anti-aircraft gun, bullet is fired from the gun, at an angle θ with the horizontal, to hit the jet, if the bullet speed is 400 m/s , the value of θ will be $^\circ$. (JEE Main - 2022)

61. A projectile is launched at an angle ' α ' with the horizontal with a velocity 20 ms^{-1} . After 10 s , its inclination with horizontal is ' β '. The value of $\tan \beta$ will be: ($g = 10 \text{ ms}^{-2}$) (JEE Main - 2022)
(1) $\tan \alpha + 5 \sec \alpha$
(2) $\tan \alpha - 5 \sec \alpha$
(3) $2 \tan \alpha - 5 \sec \alpha$
(4) $2 \tan \alpha + 5 \sec \alpha$

62. A girl standing on road holds her umbrella at 45° with the vertical to keep the rain away. If she starts running without umbrella with a speed of $15\sqrt{2} \text{ kmh}^{-1}$, the rain drops hit her head vertically. The speed of rain drops with respect to the moving girl is: (JEE Main - 2022)

- (1) 30 kmh^{-1} (2) $\frac{25}{\sqrt{2}} \text{ kmh}^{-1}$
- (3) $\frac{30}{\sqrt{2}} \text{ kmh}^{-1}$ (4) 25 kmh^{-1}

63. Motion of particle in $x - y$ plane is described by a set of following equations $x = 4 \sin\left(\frac{\pi}{2} - \omega t\right) \text{ m}$ and $y = 4 \sin(\omega t) \text{ m}$. The path of particle will be _____ . (JEE Main - 2022)

- (1) Circular (2) Helical
- (3) parabolic (4) elliptical



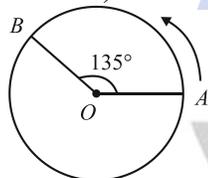
64. A ball spun with angular acceleration $\alpha = 6t^2 - 2t$ where t is in second and α is in rads^{-2} and angular position of 4 rad. The most appropriate for the angular position of the ball is: (JEE Main - 2022)

- (1) $\frac{3}{2}t^4 - t^2 + 10t$
- (2) $\frac{t^4}{2} - \frac{t^3}{3} + 10t + 4$
- (3) $\frac{2t^4}{36} - \frac{t^3}{6} + 10t + 12$
- (4) $2t^4 - \frac{t^3}{2} + 5t + 4$

65. A person can throw a ball upto a maximum range of 100 m. How high above the ground he can throw the same ball? (JEE Main - 2022)

- (1) 25 m
- (2) 50 m
- (3) 100 m
- (4) 200 m

66. A person moved from A to B on a circular path as shown in figure. If the distance travelled by him is 60 m, then the magnitude of displacement would be (Given $\cos 135^\circ = -0.7$) (JEE Main - 2022)



- (1) 42 m
- (2) 47 m
- (3) 17 m
- (4) 40 m

67. A car is moving with speed of 150 km/h and after applying the brake it will move 27 m before it stops. If the same car is moving with a speed of one third the reported speed then it will stop after travelling m distance. (JEE Main - 2022)

68. A particle is moving in a straight line such that its velocity is increasing at 5 ms^{-1} per meter. The acceleration of the particle is ms^{-2} at a point where its velocity is 20 ms^{-1} . (JEE Main - 2022)

69. Two projectiles are thrown with same initial velocity making an angle of 45° and 30° with the horizontal respectively. The ratio of their range respectively will be _____. (JEE Main - 2022)

- (1) $1 : \sqrt{2}$
- (2) $\sqrt{2} : 1$
- (3) $2 : \sqrt{3}$
- (4) $\sqrt{3} : 2$

70. A ball is thrown vertically upwards with a velocity of 19.6 ms^{-1} from the top of a tower. The ball strikes the

ground after 6 s. The height from the ground up to which the ball can rise will be $\left(\frac{k}{5}\right) \text{ m}$. The value of k is _____. (use $g = 9.8 \text{ m/s}^2$) (JEE Main - 2022)

71. A ball is thrown up vertically with a certain velocity so that, it reaches a maximum height h . Find the ratio of the times in which it is at height $\frac{h}{3}$ while going up and coming down respectively. (JEE Main - 2022)

- (1) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$
- (2) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$
- (3) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
- (4) $\frac{1}{3}$

72. A juggler throws balls vertically upwards with same initial velocity in air. When the first ball reaches its highest position, he throws the next ball. Assuming the juggler throws n balls per second, the maximum height the balls can reach is (JEE Main - 2022)

- (1) $g/2n$
- (2) g/n
- (3) $2gn$
- (4) $g/2n^2$

73. A ball reaches a height h . If t_1 and t_2 be the time required to complete first half second half of the distance respectively. Then, choose the correct relation between t_1 and t_2 . (JEE Main - 2022)

- (1) $t_1 = (\sqrt{2})t_2$
- (2) $t_1 = (\sqrt{2}-1)t_2$
- (3) $t_2 = (\sqrt{2}+1)t_1$
- (4) $t_2 = (\sqrt{2}-1)t_1$

74. A ball is projected from the ground with a speed 15 ms^{-1} at an angle θ with horizontal so that its range and maximum height are equal, then 'tan θ ' will be equal to _____. (JEE Main - 2022)

- (1) $\frac{1}{4}$
- (2) $\frac{1}{2}$
- (3) 2
- (4) 4

75. Two projective thrown at 30° and 45° with the horizontal respectively, reach the maximum height in same time. The ratio of their initial velocities is _____. (JEE Main - 2022)

- (1) $1 : \sqrt{2}$
- (2) 2 : 1
- (3) $\sqrt{2} : 1$
- (4) 1 : 2



76. If the initial velocity in horizontal direction of a projectile is unit vector \hat{i} and the equation of trajectory is $y = 5x(1 - x)$. The y component vector of the initial velocity is _____ \hat{j} .

(Take $g = 10 \text{ m/s}^2$) (JEE Main - 2022)

77. A ball of mass m is thrown vertically upward. Another ball of mass $2m$ thrown an angle θ with the vertical. Both the balls stay in air for the same period of time. The ratio of the height attained by the two balls respectively is $\frac{1}{x}$. The value of x is _____.

(JEE Main - 2022)

78. A body of mass 10 kg is projected at an angle of 45° with the horizontal. The trajectory of the body is observed to pass through a point $(20, 10)$. If T is the time of flight, then the momentum vector, at time $t = \frac{T}{\sqrt{2}}$, is _____. (Take $g = 10 \text{ m/s}^2$).

(JEE Main - 2022)

- (1) $100\hat{i} + (100\sqrt{2} - 200)\hat{j}$
 (2) $100\sqrt{2}\hat{i} + (100 - 200\sqrt{2})\hat{j}$
 (3) $100\hat{i} + (100 - 200\sqrt{2})\hat{j}$
 (4) $100\sqrt{2}\hat{i} + (100\sqrt{2} - 200)\hat{j}$

79. A NCC parade is going at a uniform speed of 9 km/h under a mango tree on which a monkey is sitting at a height of 19.6 m . At any particular instant, the monkey drops a mango. A cadet will receive the mango whose distance from the tree at time of drop is : (Given $g = 9.8 \text{ m/s}^2$)

(JEE Main - 2022)

- (1) 5 m (2) 10 m
 (3) 19.8 m (4) 24.5 m

80. At time $t = 0$ a particle starts travelling from a height $7 \hat{z} \text{ cm}$ in a plane keeping z coordinate constant. At any instant of time it's a position along the x and y direction are defined as $3t$ and $5t^3$ respectively. At $t = 1 \text{ s}$ acceleration of the particle will be _____.

(JEE Main - 2022)

- (1) $-30y$ (2) $30y$
 (3) $3x + 15y$ (4) $3x + 15y + 7 \hat{z}$

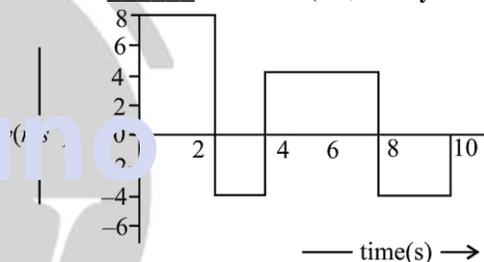
81. A ball is projected with kinetic energy E , at an angle of 60° to the horizontal. The kinetic energy of this ball at the highest point of its flight will become:

(JEE Main - 2022)

- (1) zero (2) $\frac{E}{2}$
 (3) $\frac{E}{4}$ (4) E

82. An object is projected in the air with initial velocity u at an angle θ . The projectile motion is such that the horizontal range R , is maximum. Another object is projected in the air with a horizontal range half of the range of first object. The initial velocity of the angle of projection, at which the second object is projected, will be _____ degree.
 (Mark the smallest angle possible) (JEE Main - 2022)

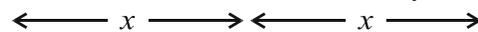
83. The velocity time graph of a body moving in a straight line is shown in figure. The ratio of displacement to distance travelled by the body in time 0 to 10 s is _____. (24 January 2023 - Shift 2)



- (1) $1 : 1$ (2) $1 : 4$
 (3) $1 : 2$ (4) $1 : 3$

84. A car travels a distance of ' x ' with speed v_1 and then same distance ' x ' with speed v_2 in the same direction. The average speed of the car is:

(25 January 2023 - Shift 2)



- (1) $\frac{v_1 v_2}{2(v_1 + v_2)}$
 (2) $\frac{v_1 + v_2}{2}$
 (3) $\frac{2x}{v_1 + v_2}$
 (4) $\frac{2v_1 v_2}{v_1 + v_2}$

85. The distance travelled by a particle is related to time t as $x = 4t^2$. The velocity of the particle at $t = 5 \text{ s}$ is.

(25 January 2023 - Shift 2)

- (1) 40 ms^{-1} (2) 25 ms^{-1}
 (3) 20 ms^{-1} (4) 8 ms^{-1}



86. A tennis ball is dropped on to the floor from a height of 9.8 m. It rebounds to a height 5.0 m. Ball comes in contact with the floor for 0.2 s. The average acceleration during contact is _____ ms^{-2} .
[Given $g = 10 \text{ ms}^{-2}$] (29 January 2023 - Shift 1)

87. A horse rider covers half the distance with 5 m/s speed. The remaining part of the distance was travelled with speed 10 m/s for half the time and with speed 15 m/s for other half of the time. The mean speed of the rider averaged over the whole time of motion is $x/7$ m/s. The value of x is:
(30 January 2023 - Shift 1)

88. An object is allowed to fall from a height R above the earth, where R is the radius of earth. Its velocity when it strikes the earth's surface, ignoring air resistance, will be: (30 January 2023 - Shift 2)

(1) $2\sqrt{gR}$ (2) \sqrt{gR}

(3) $\sqrt{\frac{gR}{2}}$ (4) $\sqrt{2gR}$

89. A vehicle travels 4 km with speed of 3 km/h and another 4 km with speed of 5 km/h, then its average speed is: (30 January 2023 - Shift 2)

(1) 4.25 km/h (2) 3.50 km/h
(3) 4.00 km/h (4) 3.75 km/h

90. A body is moving with constant speed, in a circle of radius 10 m. The body completes one revolution in 4 s. At the end of 3rd second, the displacement of body (in m) from its starting point is:
(31 January 2023 - Shift 2)

(1) 30 (2) 15π
(3) 5π (4) $10\sqrt{2}$

91. An object moves with speed v_1 , v_2 and v_3 along a line segment AB , BC and CD respectively as shown in figure. Where $AB = BC$ and $AD = 3AB$, then average speed of the object will be: (01 February 2023 - Shift 1)



(1) $\frac{(v_1 + v_2 + v_3)}{3}$

(2) $\frac{v_1 v_2 v_3}{3(v_1 v_2 + v_2 v_3 + v_3 v_1)}$

(3) $\frac{3v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$

(4) $\frac{(v_1 + v_2 + v_3)}{3v_1 v_2 v_3}$

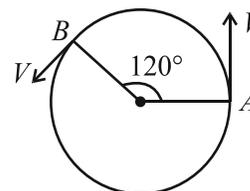
92. For a train engine moving with speed of 20 ms^{-1} . the driver must apply brakes at a distance of 500 m before the station for the train to come to rest at the station. If the brakes were applied at half of this distance, the train engine would cross the station with speed $\sqrt{x} \text{ ms}^{-1}$. The value of x is _____.
(Assuming same retardation is produced by brakes)
(01 February 2023 - Shift 2)

93. A particle of mass 10 g moves in a straight line with retardation $2x$, where x is the displacement in SI units. Its loss of kinetic energy for above displacement is $\left(\frac{10}{x}\right)^{-n}$ J. The value of n will be _____.
(06 April 2023 - Shift 1)

94. A particle starts with an initial velocity of 10.0 ms^{-1} along x -direction and accelerates uniformly at the rate of 2.0 ms^{-2} . The time taken by the particle to reach the velocity of 60.0 ms^{-1} is _____.
(06 April 2023 - Shift 2)

(1) 25 s (2) 3 s
(3) 6 s (4) 30 s

95. As shown in the figure, a particle is moving with constant speed $\pi \text{ ms}^{-1}$. Considering its motion from A to B , the magnitude of the average velocity is:
(06 April 2023 - Shift 2)



(1) $\sqrt{3} \text{ ms}^{-1}$ (2) $\pi \text{ ms}^{-1}$
(3) $1.5\sqrt{3} \text{ ms}^{-1}$ (4) $2\sqrt{3} \text{ ms}^{-1}$

96. Given below are two statements:
Statement I: Area under velocity-time graph gives the distance travelled by the body in a given time.
Statement II: Area under acceleration-time graph is equal to the change in velocity in the given time.
In the light of given statements, choose the correct answer from the options given below.

(08 April 2023 - Shift 2)

(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false



- (3) Statement I is correct but Statement II is false
- (4) Statement I is incorrect but Statement II is true

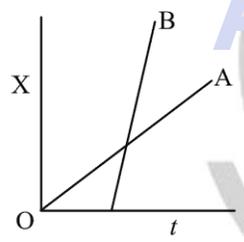
97. A ball is thrown vertically upward with an initial velocity of 150 ms^{-1} . The ratio of velocity after 3 s and 5 s is $\frac{x+1}{x}$. The value of x is _____.

- [take, $g = 10 \text{ ms}^{-2}$] (12 April 2023 - Shift 1)
- (1) 10
 - (2) -5
 - (3) 6
 - (4) 5

98. The position-time graphs for two students A and B returning from the school to their homes are shown in figure.

- (A) A lives closer to the school
- (B) B lives closer to the school
- (C) A takes lesser time to reach home
- (D) A travels faster than B
- (E) B travels faster than A

Choose the correct answer from the options given below:

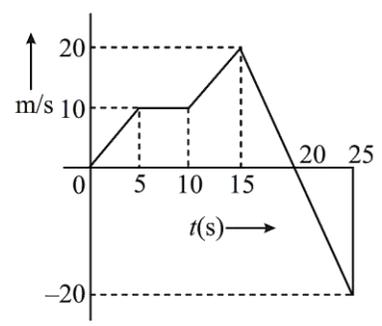


- (1) (A), (C) and (D) only
- (2) (A), (C) and (E) only
- (3) (B) and (E) only
- (4) (A) and (E) only

99. A person travels x distance with velocity v_1 and then x distance with velocity v_2 in the same direction. The average velocity of the person is v , then the relation between v , v_1 and v_2 will be _____.

- (10 April 2023 - Shift 2)
- (1) $v = \frac{v_1 + v_2}{2}$
 - (2) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$
 - (3) $v = v_1 + v_2$
 - (4) $\frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$

100. Form the $v - t$ graph shown, the ratio of distance to displacement in 25 s of motion is: (11 April 2023 - Shift 1)



- (1) 1
- (2) 1/2
- (3) 5/3
- (4) 3/5

101. Given below are two statements:
Statement I: A truck and a car moving with same kinetic energy are brought to rest by applying breaks which provide equal retarding forces. Both come to rest in equal distance.
Statement II: A car moving towards east takes a turn and moves towards north, the speed remains unchanged. The acceleration of the car is zero.

In the light of given statements, choose the most appropriate answer from the options given below (12 April 2023 - Shift 1)

- (1) Statement I is correct but statement II is incorrect
- (2) Statement I is incorrect but statement II is correct
- (3) Both statement I and Statement II are correct
- (4) Both statement I and statement II are incorrect

102. The distance travelled by an object in time t is given by $s = (2.5)t^2$. The instantaneous speed of the object at $t = 5$ s will be: (13 April 2023 - Shift 2)

- (1) 25 ms^{-1}
- (2) 5 ms^{-1}
- (3) 62.5 ms^{-1}
- (4) 12.5 ms^{-1}

104. A passenger sitting in a train A moving at 90 km h^{-1} observes another train B moving in the opposite direction for 8 s. If the velocity of the train B is 54 km h^{-1} , then length of train B is: (13 April 2023 - Shift 2)

- (1) 120 m
- (2) 320 m
- (3) 80 m
- (4) 200 m

105. The position of a particle related to time is given by $x = (5t^2 - 4t + 5)\text{m}$. The magnitude of velocity of the particle at $t = 2$ s will be: (15 April 2023 - Shift 1)

- (1) 0.6 ms^{-1}
- (2) 14 ms^{-1}
- (3) 10 ms^{-1}
- (4) 16 ms^{-1}



106. The maximum vertical height to which a man can throw a ball is 136 m. The maximum horizontal distance upto which he can throw the same ball is.
(24 January 2023 – Shift 1)

(1) 192 m (2) 136 m
(3) 272 m (4) 68 m

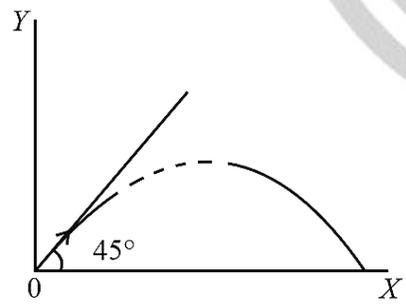
107. Two objects are projected with same velocity 'u' however at different angles α and β with the horizontal. If $\alpha + \beta = 90^\circ$, the ratio of horizontal range of the first object to the 2nd object will be:
(25 January 2023 – Shift 2)

(1) 4 : 1 (2) 2 : 1
(3) 1 : 2 (4) 1 : 1

108. A stone is projected at angle 30° to the horizontal. The ratio of kinetic energy of the stone at point of projection to its kinetic energy at the highest point of flight will be:
(29 January 2023 – Shift 1)

(1) 1 : 2 (2) 1 : 4
(3) 4 : 1 (4) 4 : 3

109. A particle of mass 100 g is projected at time $t = 0$ with a speed 20 ms^{-1} at an angle 45° to the horizontal as given in the figure. The magnitude of the angular momentum of the particle about the starting point at time $t = 2\text{s}$ is found to be $\sqrt{K} \text{ kgm}^2/\text{s}$. The value of K is _____. (Take $g = 10 \text{ ms}^{-2}$)
(29 January 2023 – Shift 2)



110. The initial speed of a projectile fired from ground is u . At the highest point during its motion, the speed of projectile is $\frac{\sqrt{3}}{2} u$. The time of flight of the projectile is:
(31 January 2023 – Shift 1)

(1) $u/2g$ (2) u/g
(3) $2u/g$ (4) $\sqrt{3} u/g$

111. The speed of a swimmer is 4 km h^{-1} in still water. If the swimmer makes his strokes normal to the flow of river of width 1 km, he reaches a point 750 m down the stream on the opposite bank. The speed of the river water is _____ km h^{-1} .
(31 January 2023 – Shift 1)

112. Two bodies are projected from ground with same speeds 40 ms^{-1} at two different angles with respect to horizontal. The bodies were found to have same range. If one of the body was projected at an angle of 60° , with horizontal then sum of the maximum heights, attained by the two projectiles, is _____ m. (Given $g = 10 \text{ ms}^{-2}$)
(31 January 2023 – Shift 2)

113. A child stands on the edge of the cliff 10 m above the ground and throws a stone horizontally with an initial speed of 5 ms^{-1} . Neglecting the air resistance, the speed with which the stone hits the ground will be _____ ms^{-1} . (given $g = 10 \text{ ms}^{-2}$).
(01 February 2023 – Shift 1)

(1) 10 (2) 15
(3) 30 (4) 25

114. A particle is moving with constant speed in a circular path. When the particle turns by an angle 90° , the ratio of instantaneous velocity to its average velocity is $\pi : x\sqrt{2}$. The value of x will be _____.
(06 April 2023 – Shift 1)

(1) 2 (2) 5
(3) 1 (4) 7

115. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: When a body is projected at an angle 45° , its range is maximum.
Reason R: For maximum range, the value of $\sin 2\theta$ should be equal to one.
In the light of the above statements, choose the correct answer from the options given below:
(06 April 2023 – Shift 1)

(1) A is false but R is true
(2) A is true but R is false
(3) Both A and R are correct and R is the correct explanation of A
(4) Both A and R are correct but R is NOT the correct explanation of A



- 116.** A child of mass 5 kg is going round a merry-go-round that makes 1 rotation in 3.14 s. The radius of the merry-go-round is 2 m. The centrifugal force on the child will be _____. (06 April 2023 – Shift 2)
- (1) 80 N (2) 40 N
(3) 100 N (4) 50 N
- 117.** Two projectiles *A* and *B* are thrown with initial velocities of 40 ms^{-1} and 60 ms^{-1} at angles 30° and 60° with the horizontal respectively. The ratio of their ranges respectively is _____. ($g = 10 \text{ ms}^{-2}$) (08 April 2023 – Shift 1)
- (1) 4 : 9 (2) 2 : $\sqrt{3}$
(3) $\sqrt{3} : 2$ (4) 1 : 1
- 118.** The trajectory of projectile, projected from the ground is given by $y = x - \frac{x^2}{20}$. Where *x* and *y* are measured in meter. The maximum height attained by the projectile will be: (08 April 2023 – Shift 2)
- (1) 200 m (2) 10 m
(3) 5 m (4) $10\sqrt{2}$ m
- 119.** The range of the projectile projected at an angle of 15° with horizontal is 50 m. If the projectile is projected with same velocity at an angle of 45° with horizontal, then its range will be. (10 April 2023 – Shift 1)
- (1) 100 m (2) $100\sqrt{2}$ m
(3) $50\sqrt{2}$ m (4) 50 m
- 120.** Two projectiles are projected at 30° and 60° with the horizontal with the same speed. The ratio of the maximum height attained by the two projectiles respectively is: (10 April 2023 – Shift 2)
- (1) $\sqrt{3} : 1$ (2) 1 : $\sqrt{3}$
(3) 2 : $\sqrt{3}$ (4) 1 : 3
- 121.** A projectile fired at 30° to the ground is observed to be at same height at time 3 s and 5 s after projection, during its flight. The speed of projection of the projectile is _____ ms^{-1} . (Given $g = 10 \text{ m s}^{-2}$) (11 April 2023 – Shift 1)
- 122.** A projectile is projected at 30° from horizontal with initial velocity 40 ms^{-1} . The velocity of the projectile at $t = 2$ s from the start will be: (11 April 2023 – Shift 2)
- (1) $40\sqrt{3} \text{ ms}^{-1}$ (2) Zero
(3) 20 ms^{-1} (4) $20\sqrt{3} \text{ ms}^{-1}$
- 123.**
- 124.** A vehicle of mass 200 kg is moving along a levelled curved road of radius 70 m with angular velocity of 0.2 rads^{-1} . The centripetal force acting on the vehicle is: (13 April 2023 – Shift 2)
- (1) 560 N (2) 2800 N
(3) 2240 N (4) 14 N
- 125.** A particle is moving in one dimension (along *x*-axis) under the action of a variable force. It's initial position was 16 m right of origin. The variation of its position (*x*) with time (*t*) is given as $x = -3t^3 + 18t^2 + 16t$, where *x* is in meter (*t*) in s. The velocity of the particle when its acceleration becomes zero is _____ m/s. (01 Feb. 2024 - Shift 1)
- 126.** Train *A* is moving along two parallel rail tracks towards north with speed 72 km/h and train *B* is moving towards south with speed 108 km/h. Velocity of train *B* with respect to *A* and velocity of ground with respect to *B* are (in ms^{-1}): (01 Feb. 2024 - Shift 2)
- (1) –30 and 50 (2) –50 and –30
(3) –50 and 30 (4) 50 and –30
- 127.** A particle initially at rest starts moving from reference point. $x = 0$ along *x*-axis, with velocity *v* that varies as $v = 4\sqrt{x} \text{ m/s}$. The acceleration of the particle is _____ ms^{-2} . (01 Feb. 2024 - Shift 2)
- 128.** A particle starts from origin at $t = 0$ with a velocity $5\hat{i} \text{ m/s}$ and moves in *x* – *y* plane under action of a force which produces a constant acceleration of $(3\hat{i} + 2\hat{j}) \text{ m/s}^2$. If the *x*-coordinate of the particle at that instant is 84 m, then the speed of the particle at this time is $\sqrt{\alpha} \text{ m/s}$. The value of α is _____. (27 Jan. 2024 - Shift 1)



129. A bullet is fired into a fixed target loses one third of its velocity after travelling 4 cm. It penetrates further $D \times 10^{-3}$ m before coming to rest. The value of D is:
(27 Jan. 2024 - Shift 2)

(1) 2 (2) 5
(3) 3 (4) 32

130. A body falling under gravity covers two points A and B separated by 80 m in 2 s. The distance of upper point A from the starting point is _____ m.
(use $g = 10 \text{ ms}^{-2}$) (27 Jan. 2024 - Shift 2)

131.

132. A particle is moving in a straight line. The variation of position ' x ' as a function of time ' t ' is given as $x = (t^3 - 6t^2 + 20t + 15)$ m. The velocity of the body when its acceleration becomes zero is:
(29 Jan. 2024 - Shift 2)

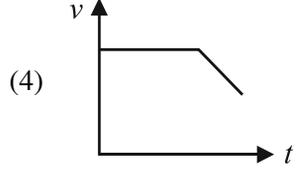
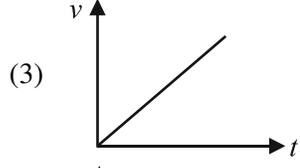
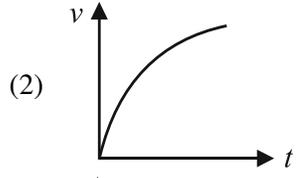
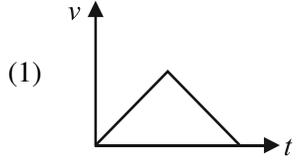
(1) 4 m/s (2) 8 m/s
(3) 10 m/s (4) 6 m/s

133. A particle is moving in a circle of radius 5 cm in such a way that at any instant the normal and tangential components of its acceleration are equal. If its speed at $t = 0$ is 4 m/s, the time taken to complete the first revolution will be $\frac{1}{\alpha} [1 - e^{-2\pi}]$ s, where $\alpha =$ _____ .
(29 Jan. 2024 - Shift 2)

134. The displacement and the increase in the velocity of a moving particle in the time interval of t to $(t + 1)$ s are 125 m and 50 m/s, respectively. The distance travelled by the particle in $(t + 2)^{\text{th}}$ s is _____ m.
(30 Jan. 2024 - Shift 1)

135.

136. A small steel ball is dropped into a long cylinder containing glycerine. Which one of the following is the correct representation of the velocity time graph for the transit of the ball? (31 Jan. 2024 - Shift 1)



137.

138. If the radius of curvature of the path of two particles of same mass are in the ratio 3 : 4, then in order to have constant centripetal force, their velocities will be in the ratio of: (29 Jan. 2024 - Shift 1)

(1) $\sqrt{3} : 1$ (2) 1 : $\sqrt{3}$
(3) $\sqrt{3} : 1$ (4) 2 : $\sqrt{3}$

139. A ball rolls off the top of a stairway with horizontal velocity u . The steps are 0.1 m high and 0.1 m wide. The minimum velocity u with which that ball just hits the step 5 of the stairway will be \sqrt{x} ms^{-1} where $x =$ _____ [use $g = 10 \text{ m/s}^2$]. (29 Jan. 2024 - Shift 1)

140. A particle of mass m projected with a velocity ' u ' making an angle of 30° with the horizontal. The magnitude of angular momentum of the projectile about the point of projection when the particle is at its maximum height h is: (30 Jan. 2024 - Shift 1)

(1) $\frac{\sqrt{3}}{16} \frac{mu^3}{g}$ (2) $\frac{\sqrt{3}}{2} \frac{mu^2}{g}$
(3) $\frac{mu^3}{\sqrt{2}g}$ (4) Zero

141. Projectiles A and B are thrown at angles of 45° and 60° with vertical respectively from top of a 400 m high tower. If their ranges and times of flight are same, the ratio of their speeds of projection $v_A : v_B$ is: (30 Jan. 2024 - Shift 2)



(1) $1 : \sqrt{3}$

(2) $\sqrt{2} : 1$

(3) $1 : 2$

(4) $1 : 1$





Answer Key

1. (580)	22. (12)	43. (1)	64. (2)	85. (1)	106. (3)	127. (8)
2. (1)	23. (3)	44. (2)	65. (2)	86. (120)	107. (4)	128. (673)
3.	24. (2)	45. (3)	66. (2)	87. (50)	108. (4)	129. (4)
4. (3)	25. (2)	46. (2)	67. (3)	88. (2)	109. (800)	130. (45)
5. (3)	26. (5)	47. (4)	68. (100)	89. (4)	110. (2)	131.
6.	27. (3)	48. (2)	69. (3)	90. (4)	111. (3)	132. (2)
7. (3)	28. (4)	49. (1)	70. (392)	91. (3)	112. (80)	133. (8)
8. (3)	29. (3)	50. (5)	71. (2)	92. (200)	113. (2)	134. (175)
9. (2)	30. (3)	51. (6)	72. (4)	93. (2)	114. (1)	135.
10. (20)	31.	52. (6)	73. (4)	94. (1)	115. (3)	136. (2)
11. (3)	32. (3)	53.	74. (4)	95. (3)	116. (2)	137.
12. (4)	33. (3)	54. (18)	75. (3)	96. (4)	117. (1)	138. (1)
13. (4)	34. (2)	55. (4)	76. (5)	97. (4)	118. (3)	139. (2)
14. (2)	35. (3)	56. (3)	77. (1)	98. (4)	119. (1)	140. (1)
15. (4)	36. (30)	57.	78. (4)	99. (4)	120. (4)	141. (4)
16. (1)	37. (50)	58. (20)	79. (1)	100. (3)	121. (80)	
17. (2)	38. (3)	59. (1)	80. (2)	101. (1)	122. (4)	
18. (1)	39. (12)	60. (60)	81. (2)	102.	123.	
19. (2)	40. (4)	61. (2)	82. (2)	103. (1)	124. (1)	
20. (1)	41. (3)	62. (2)	83. (2)	104. (2)	125. (52)	
21. (2)	42. (3)	63. (1)	84. (4)	105. (4)	126. (3)	



PW Web/App - <https://smart.link/7wwosivoicgd4>

Library- <https://smart.link/sdfez8ejd80if>