Exercise - I (Conceptual Questions) Build Up Your Understanding

DISTANCE & DISPLACEMENT

1. If displacement of a particle is zero, the distance covered :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

PML001

2. If the distance covered is zero, the displacement :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

PML002

3. The location of a particle is changed. What can we say about the displacement and distance covered by the particle :
(1) Both cannot be zero
(2) One of the two may be zero
(3) Both must be zero
(4) If one is positive, the other is negative and vice-versa

PML003

4. The numerical ratio of distance to the displacement covered is always :–
(1) less than one
(2) equal to one
(3) equal to or less than one
(4) equal to or greater than one

PML004

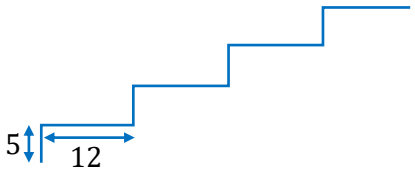
5. Milkha Singh can cover one round of a circular park in 40 second, After 1 minute and 40 second, he will cover a distance and displacement respectively
(R = Radius of circle):-
(1) Zero, Zero (2) $4\pi R$, R
(3) $5\pi R$, 2R (4) $6\pi R$, 2R

PML005

6. A hall has the dimensions 10 m × 10 m × 10 m. A fly starting at one corner ends up at a diagonally opposite corner. The magnitude of its displacement is nearly
(1) $5\sqrt{3}$ m (2) $10\sqrt{3}$ m
(3) $20\sqrt{3}$ m (4) $30\sqrt{3}$ m

PML006

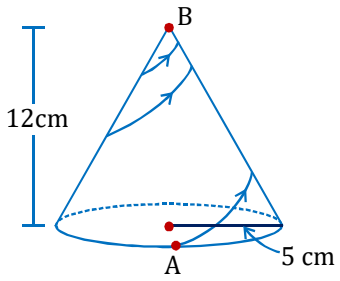
7. An ant is scramping on the stairs as shown in the figure. There are '4' stairs and each stair has width of 12 cm and height of 5 cm. The distance travelled by the ant to scramp the stairs is :-



(1) 52 cm (2) 68 cm
(3) 48 cm (4) 20 cm

PML007

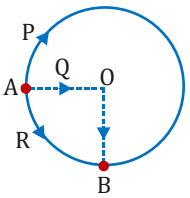
8. An insect starts climbing a conical birthday hat of radius 5 cm at base. It starts from point A and reaches point B, taking spiral path on the hat. Find out its displacement if height is 12 cm:-



(1) 12 cm (2) 8 cm
(3) 13 cm (4) 25 cm

PML008

9. Three particles P, Q and R are situated at point A on the circular path of radius 10 m. All three particles move along different paths and reach point B as shown in figure. Then the ratio of distance traversed by particles P and R is :



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

PML009

10. A body moves along the curved path of a semi circle. Calculate the ratio of distance to displacement:
(1) 11 : 7 (2) 7 : 11
(3) 11 : $\sqrt{2} \times 7$ (4) 7 : $11\sqrt{2}$
PML010

11. Distance travelled by the tip of minute hand of length 10 cm in 100 sec is
(1) $\frac{\pi}{180}$m (2) $\frac{\pi}{360}$m
(3) $\frac{\pi}{1200}$m (4) $\frac{3\pi}{2160}$m
PML011

12. If a particle moves from point P(2, 3, 5) to point Q(3, 4, 5). Its displacement vector be :-
(1) $\hat{i} + \hat{j} + 10\hat{k}$ (2) $\hat{i} + \hat{j} + 5\hat{k}$
(3) $\hat{i} + \hat{j}$ (4) $2\hat{i} + 4\hat{j} + 6\hat{k}$
PML012

13. A man walks 30 m towards north, then 20 m towards east and the last $30\sqrt{2}$ m towards south-east. The displacement from origin is :
(1) 10 m towards west
(2) 50 m towards east
(3) $60\sqrt{2}$ m towards north west
(4) $60\sqrt{2}$ m towards east north
PML013

14. A person walks 80 m east, then turns right through angle 143° walks further 50 m and stops. His position relative to the starting point is
(1) 50 m, 53° east of south
(2) 50 m, 53° south of east
(3) 30 m, 37° south of east
(4) 30 m, 53° south of east
PML014

15. A drunkard is walking along a straight road. He takes 5 steps forward and 3 steps backward, followed by 5 steps forward and 3 steps backward and so on. Each step is one meter long and takes one second. There is a pit on the road 13 meters away from the starting point. The drunkard will fall into the pit after :
(1) 29 s (2) 21 s (3) 37s (4) 31 s
PML015

SPEED & VELOCITY, AVERAGE SPEED & AVERAGE VELOCITY

16. A train covers the first half of the distance between two stations with a speed of 30 km/h and the other half with 70 km/h. Then its average speed is :
(1) 50 km/h (2) 48 km/h
(3) 42 km/h (4) 100 km/h
PML016

17. Select the correct statements from the following.
S1. Average velocity is path length divided by time interval.
S2. In general, average speed $\geq$ |average velocity|
S3. A particle moving in a given direction with a non-zero velocity can have zero speed.
S4. The magnitude of average velocity is the average speed.
(1) S_1 (2) S_2 (3) S_3 (4) S_4
PML017

18. The magnitude of average velocity is equal to the average speed when a particle moves :
(1) on a curved path
(2) in the same direction
(3) with constant acceleration
(4) with constant retardation
PML018

19. A man walks for some time 't' with velocity (v) due east. Then he walks for same time 't' with velocity (v) due north. The average speed of the man is :
(1) 2v (2) $\sqrt{2}$v (3) v (4) $\frac{v}{\sqrt{2}}$
PML019

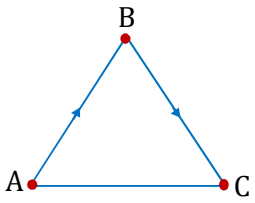
20. A car travels a distance d on a straight road in two hours and then returns to the starting point in next three hours. Its average speed and average velocity is :
(1) $\frac{d}{5}$, 0 (2) $\frac{2d}{5}$, 0
(3) $\frac{5d}{6}$, $\frac{d}{5}$ (4) none of these
PML020

21. A particle moves in the east direction with 15 m/sec for 2 sec then northwards with 5 m/s for 8 sec. Average velocity of the particle is :–

(1) 1 m/s (2) 5 m/s
(3) 7 m/s (4) 10 m/s

PML021

22. A man walks on an equilateral triangle along path ABC with constant speed then the ratio of average speed and magnitude of average velocity for A to C :-



(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) None

PML022

23. A car runs at constant speed on a circular track of radius 10 m taking 6.28s on each lap (i.e. round). The average speed and average velocity for half lap is :

(1) Velocity $20/\pi$ m/s, speed 10 m/s
(2) Velocity zero, speed 10 m/s
(3) Velocity zero, speed zero
(4) Velocity 10 m/s, speed zero

PML023

24. A particle moves in straight line in same direction for 20 sec. with velocity 3 m/s and then moves with velocity 4 m/s for another 20 sec. and finally moves with velocity 5 m/s for next 20 sec. What is the average velocity of the particle?

(1) 3 m/s (2) 4 m/s
(3) 5 m/s (4) Zero

PML024

25. An object travels 10 km at a speed of 100 m/s and another 10 km at 50 m/s. The average speed over the whole distance is :-

(1) 75 m/s (2) 55 m/s
(3) 66.7 m/s (4) 33.3 m/s

PML025

26. A body has speed V, 2V and 3V in first 1/3 part of total travelled distance S, second 1/3 part of S and third 1/3 part of S respectively. Its average speed will be :-

(1) V (2) 2V (3) $\frac{18}{11}$V (4) $\frac{11}{18}$V

PML026

27. A body covers one-third of the time with a velocity v_1 the second one-third of the time with a velocity v_2, and the last one-third of the time with a velocity v_3. The average velocity is :

(1) $\frac{v_1+v_2+v_3}{3}$ (2) $\frac{3v_1v_2v_3}{v_1v_2+v_2v_3+v_3v_1}$

(3) $\frac{v_1v_2+v_2v_3+v_3v_1}{3}$ (4) $\frac{v_1v_2v_3}{3}$

PML027

28. If a car cover $2/5^{th}$ of total distance with v_1 speed and $3/5^{th}$ distance with v_2 speed then the average speed is :-

(1) $\frac{1}{2}\sqrt{v_1v_2}$ (2) $\frac{v_1+v_2}{2}$

(3) $\frac{2v_1+v_2}{v_1+v_2}$ (4) $\frac{5v_1v_2}{3v_1+2v_2}$

PML028

29. A particle moving in a straight line covers half the distance with speed of 10 m/s. The other half of the distance is covered in two equal time intervals with speed of 4.5 m/s and 7.5 m/s respectively. The average speed of the particle during this motion is :

(1) 8.0 m/s (2) 12.0 m/s
(3) 10.0 m/s (4) 7.5 m/s

PML029

30. A point object traverses half the distance with velocity v_0. The remaining part of the distance is covered with velocity v_1 for the half time and with velocity v_2 for the rest half. The average velocity of the object for the whole journey is

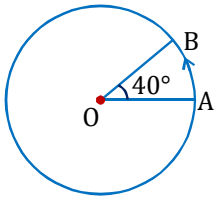
(1) $2v_1(v_0 + v_2) / (v_0 + 2v_1 + 2v_2)$
(2) $2v(v_0 + v_1) / (v_0 + v_1 + v_2)$
(3) $2v_0(v_1 + v_2) / (v_1 + v_2 + 2v_0)$
(4) $2v_2(v_0 + v_1) / (v_1 + 2v_2 + v_0)$

PML030

31. A scooter going due east at 10 ms^{-1} turns in right side through an angle of 90°. If the speed of the scooter remains unchanged in taking this turn, the change in the velocity of the scooter is :-
(1) 20.0 ms^{-1} in south-west direction
(2) Zero
(3) 10.0 ms^{-1} in south-east direction
(4) 14.14 ms^{-1} in south-west direction

PML031

32. A person is moving in a circle of radius r with constant speed V. The change in velocity in moving from A to B is



(1) 2V cos 40° (2) 2V sin 40°
(3) 2V cos 20° (4) 2V sin 20°

PML032

33. An insect crawls a distance of 4m along north in 10 s and then a distance of 3m along east in 5 s. The average velocity of the insect is :-
(1) $\frac{7}{15}$ m / s (2) $\frac{1}{5}$ m / s
(3) $\frac{1}{3}$ m / s (4) $\frac{4}{5}$ m / s

PML033

ACCELERATION, AVERAGE ACCELERATION & APPLICATION OF CALCULUS

34. The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The velocity at time t of the particle will be equal to zero, where t is equal to :
(1) $\frac{2a}{3b}$ (2) $\frac{a}{b}$ (3) $\frac{a}{3b}$ (4) $\frac{a}{2b}$

PML034

35. If x denotes displacement in time t and x = a sint, then acceleration is :
(1) a cos t (2) – a cos t
(3) a sin t (4) –a sin t

PML035

36. The motion of a particle is described by the equation $x = a + bt^2$ where a = 15 cm and b = 3 cm/sec^2. Its acceleration at time 3 sec will be :-
(1) 36 cm/sec^2 (2) 18 cm/sec^2
(3) 6 cm/sec^2 (4) 32 cm/sec^2

PML036

37. Equation of displacement for a particle is $s = 3t^3 + 7t^2 + 14t + 8$ m. Its acceleration at time t = 2 sec is :-
(1) 10 m/s^2 (2) 16 m/s^2
(3) 25 m/s^2 (4) 50 m/s^2

PML037

38. A body is moving according to the equation $x = at^2 + bt - c$. Then its instantaneous speed is given by :–
(1) a + 2b + 3ct (2) $a + 2bt - 3ct^2$
(3) 2b – 6ct (4) 2at + b

PML038

39. The relation $t = \sqrt{x} + 3$ describes the position of a particle where x is in meters and t is in seconds. The acceleration of particle is :–
(1) 2 m/s^2 (2) 4 m/s^2
(3) 5 m/s^2 (4) zero

PML039

40. The displacement of a particle is given by $y = a + bt + ct^3$. The initial velocity and acceleration are respectively :
(1) b, 0 (2) –b, 2c
(3) b, 2c (4) 2c, – 4d

PML040

41. Equation of a particle moving along the x axis is $x = u(t - 2) + a(t - 2)^2$
(1) the initial velocity of the particle is u
(2) the acceleration of the particle is a
(3) the acceleration of the particle is 2a
(4) at t = 2 particle is not at origin

PML041

42. If for a particle position $x \propto t$ then :–
(1) velocity is constant
(2) acceleration is non zero
(3) acceleration is variable
(4) None of these

PML042

43. The velocity of a body depends on time according to the equation = 20 + 0.1t. The body has :
(1) uniform acceleration
(2) uniform retardation
(3) non-uniform acceleration
(4) zero acceleration

PML043

44. Which of the following relations representing velocity of a particle describes motion with constant acceleration ?
(1) $v = 6 - 7t$ (2) $v = 3t^2 + 5t^3 + 7$
(3) $v = 9t^2 + 8$ (4) $v = 4t^{-2} + 3t^{-1}$

PML044

45. Which of the following equations represents the motion of a body moving with constant finite velocity? in these equations, y denotes the displacement in time t and p, q and r are arbitary constants :
(1) $y = (p + qt)^2 (r + pt)$
(2) $y = p + tqr$
(3) $y = (p + t) (q + t) (r + 1)$
(4) $y = (p + qt)rt$

PML045

46. The displacement of a particle starting from rest (at t=0) is given by $s = 6t^2 - t^3$
The time when the particle will attain zero acceleration is :
(1) 2s (2) 8s (3) 12s (4) 16s

PML046

47. The displacement of a particle varies with time according to the relation $x = \frac{k}{b}[1 - e^{-bt}]$.
Then the velocity of the particle is :
(1) $k(e^{-bt})$ (2) $\frac{k}{b^2 e^{-bt}}$
(3) kbe^{-bt} (4) None of these

PML047

48. A particle moves along a straight line such that its displacement at any time t is given by $s = t^3 - 6t^2 + 3t + 4$ metres. The displacement when the acceleration is zero is :
(1) 3 m (2) –12 (3) 42 m (4) –6 m

PML048

49. Displacement x of a particle is related to time t as $x = at + bt^2 - ct^3$ where a, b and c are constants. The velocity of the particle when its acceleration is zero is given by :-
(1) $a + \frac{b^2}{c}$ (2) $a + \frac{b^2}{2c}$
(3) $a + \frac{b^2}{3c}$ (4) $a + \frac{b^2}{4c}$

PML049

50. A particle moves along the curve $y = \frac{x^2}{2}$. Here x varies with time as $x = \frac{t^2}{2}$. Where x and y are measured in metre and t in second. At t = 2s, the velocity of the particle (in ms^{-1}) is :
(1) $2\hat{i} - 4\hat{j}$ (2) $2\hat{i} + 4\hat{j}$
(3) $4\hat{i} + 2\hat{j}$ (4) $4\hat{i} - 2\hat{j}$

PML050

51. The velocity-time relation of an electron starting from rest is given by u = kt, where $k = 2\ m/s^2$. The distance traversed in 4 sec is :
(1) 9m (2) 16 m (3) 27 m (4) 36 m

PML051

52. The initial velocity of a particle is u (at t = 0) and the acceleration is given by $f = at^2$. Which of the following relations is valid?
(1) $v = u + at^2$ (2) $v = u + \frac{at^2}{2}$
(3) $v = u + \frac{at^3}{3}$ (4) v = u + at

PML052

53. A particle is moving with a velocity of 10m/s towards east. After 20 s its velocity changes to 10m/s towards north. Its average acceleration is:-
(1) zero
(2) $\sqrt{2}\ m/s^2$ towards N-W
(3) $\frac{1}{\sqrt{2}}\ m/s^2$ towards N-E
(4) $\frac{1}{\sqrt{2}}\ m/s^2$ towards N-W

PML053

54. Starting from rest, the acceleration of a particle is $a = 2(t - 1) m/s^2$. The velocity of the particle at t = 5 s is :-

(1) 15 m/s (2) 25 m/s
(3) 5 m/s (4) None of these

PML054

55. If the velocity of a particle is $(10 + 2t^2)$ m/s, then the average acceleration of the particle between 2s and 5s is :-

(1) $2m/s^2$ (2) $4m/s^2$
(3) $12m/s^2$ (4) $14m/s^2$

PML055

56. If velocity of a particle is given by $v = (3t^2 + 2)m/s$, then average velocity in the interval $0 \le t \le 2$sec:-

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

PML056

57. A particle located at x = 0 at time t = 0, starts moving along the positive x–direction with a velocity 'v' which varies as $v = \alpha\sqrt{x}$, then velocity of particle varies with time as : (α is a constant)

(1) $v \propto t$ (2) $v \propto t^2$
(3) $v \propto \sqrt{t}$ (4) v = constant

PML057

58. If the velocity of a particle is given by $v = (180 - 16x)^{1/2}$ m/s, then its acceleration will be:-

(1) Zero (2) $8 m/s^2$
(3) $-8 m/s^2$ (4) $4 m/s^2$

PML058

59. The acceleration of a particle moving in a straight line varies with its displacement as a = 2S + 1. Velocity of the particle is zero at zero displacement. The relation between velocity and displacement is :-

(1) v = S(S + 1) (2) $v = \sqrt{2S(S+1)}$
(3) $v = \sqrt{S(S+1)}$ (4) None of these

PML059

60. The position vector of a particle is given as $\vec{r} = \left(t^2 - 4t + 6\right)\hat{i} + \left(t^2\right)\hat{j}$. The time after which the velocity vector and acceleration vector becomes perpendicular to each other is equal to:-

(1) 1 sec. (2) 2 sec.
(3) 1.5 sec. (4) 5 sec.

PML060

61. At any instant of time acceleration and velocity of a particle are given by $\vec{a} = \hat{i} + \hat{j}$ & $\vec{v} = 6\hat{i} + 8\hat{j}$, then rate of change of speed (component of acceleration along velocity) at the same instant will be:-

(1) $\frac{(3\hat{i} + 4\hat{j})}{25}$ (2) $\frac{6\hat{i} + 8\hat{j}}{25}$
(3) $\frac{7}{25}(3\hat{i} + 8\hat{j})$ (4) $\frac{7}{25}(3\hat{i} + 4\hat{j})$

PML061

CONSTANT ACCELERATION MOTION, FREE FALL

62. If a body starts from rest, the time in which it covers a particular displacement with uniform acceleration is :

(1) inversely proportional to the square root of the displacement
(2) inversely proportional to the displacement
(3) directly proportional to the displacement
(4) directly proportional to the square root of the displacement

PML062

63. A body at rest is imparted motion to move in a straight line. It is then obstructed by an opposite force, then:

(1) the body may necessarily change direction
(2) the body is sure to slow down
(3) the body will necessarily continue to move in the same direction at the same speed
(4) none of the above.

PML063

64. If a car at rest accelerates uniformly to a speed of 144 km/h in 40 seconds, it covers a distance of :

(1) 200 m (2) 800 m
(3) 1440 m (4) 2980 m

PML064

65. If a car at rest accelerates uniformly and attains a speed of 54 km/h in 10s, then it covers a distance of

(1) 75 m (2) 100 m

(3) 200 m (4) 400 m

PML065

66. If a train travelling at 72 km/h is to be brought to rest in a distance of 100 m, then its retardation should be :

(1) 20 m/s^2 (2) 2 m/s^2

(3) 10 m/s^2 (4) 1 m/s^2

PML066

67. Initially a body is at rest. If its acceleration is $5ms^{-2}$ then the distance travelled in the 5^{th} second is :–

(1) 86.6 m (2) 87.5 m

(3) 88 m (4) 22.5 m

PML067

68. A car starts from rest travelling with constant acceleration. If distance covered by it in 10^{th} second of its journey is 19m, what will be the acceleration of car?

(1) 4 m/s^2 (2) 3 m/s^2

(3) 2 m/s^2 (4) 1 m/s^2

PML068

69. A car starts from rest and moves with constant acceleration. The ratio of the distance covered in the n^{th} second to that covered in n seconds is :-

(1) $\frac{2}{n^2}-\frac{1}{n}$ (2) $\frac{2}{n^2}+\frac{1}{n}$

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

PML069

70. A body starts from rest. What is the ratio of the distance travelled by the body during the 4th and 5th second?

(1) $\frac{7}{5}$ (2) $\frac{5}{7}$

(3) $\frac{7}{9}$ (4) $\frac{3}{7}$

PML070

71. A car moving with a velocity of 10 m/s can be stopped by the application of a constant force F in a distance of 20m. If the velocity of the car is 40 m/s. It can be stopped by this force in :

(1) $\frac{20}{3}$ m (2) 320 m

(3) 60 m (4) 180 m

PML071

72. A car moving with a speed of 40 km/h can be stopped by applying brakes after at least 2m. If the same car is moving with a speed of 120 km/h., what is the minimum stopping distance?

(1) 2 m (2) 4 m (3) 6 m (4) 18 m

PML072

73. The velocity acquired by a body moving with uniform acceleration is 30 m/s in 2 seconds and 50 m/s in 4 seconds. The initial velocity is :

(1) zero (2) 2 m/s

(3) 4 m/s (4) 10 m/s

PML073

74. A body starts from rest and with a uniform acceleration of 5 ms^{-2} for 5 seconds. During the next 10 seconds it moves with uniform velocity. The total distance travelled by the body is :–

(1) 100 m (2) 312.5 m

(3) 500 m (4) 625 m

PML074

75. The velocity of a particle moving with constant acceleration at an instant t_0 is 10 m/s. After 5 seconds of that instant the velocity of the particle is 20m/s. The velocity at 2 second before t_0 is :

(1) 8 m/s (2) 4 m/s

(3) 6 m/s (4) 7 m/s

PML075

76. A bullet moving with a velocity of 200 cm/s penetrates a wooden block and comes to rest after traversing 4 cm inside it. What velocity is needed for travelling distance of 9 cm in same block :-

(1) 100 cm/s (2) 136.2 cm/s

(3) 300 cm/s (4) 250 cm/s

PML076

77. Which of the following four statements is true?
(1) A body can have zero velocity and still be accelerated
(2) A body can have a constant velocity and still have a varying speed
(3) A body cannot have a constant speed if it has a varying velocity
(4) The direction of the velocity of a body cannot change when its acceleration is constant.

PML077

78. If an iron ball and a wooden ball of same radii are released from a height h in vacuum then time taken by both of them to reach ground will be :
(1) unequal (2) exactly equal
(3) roughly equal (4) zero

PML078

79. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point 'O' along three different frictionless paths. The speeds of the three objects on reaching the ground, will be in the ratio of :–
(1) $m_1 : m_2 : m_3$ (2) $m_1 : 2m_2 : 3m_3$
(3) 1 : 1 : 1 (4) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

PML079

80. A body dropped from a tower reaches the ground in 5s. The height of the tower is about :
(1) 80 m (2) 125 m (3) 160 m (4) 40 m

PML080

81. A stone falls freely such that the distance covered by it in the last second of its motion is equal to the distance covered by it in the first 3 seconds. It remained in air for :–
(1) 2 s (2) 3 s (3) 5 s (4) 6 s

PML081

82. A body dropped from the top of a tower covers 5x distance in the last second of its fall. The time of fall is if x is the distance covered in first second of its fall-
(1) 2 sec (2) 4 sec.
(3) 3 sec. (4) $\left(\frac{50}{7}\right)$ sec

PML082

83. An object is dropped vertically down on earth. The change in its speed after falling through a distance 2d from its highest point is
(1) mgd (2) $\sqrt{2gd}$
(3) $2\sqrt{gd}$ (4) $2\sqrt{\frac{mg}{d}}$

PML083

84. A bullet enters in a thick wooden wall with speed u. If the bullet penetrates a distance 's' into the wood then retardation of the bullet is :
(1) $\frac{u^2}{s}$ (2) $\frac{u^2}{2s}$
(3) $\frac{u^2}{4s}$ (4) $\frac{2u^2}{s}$

PML084

85. A body dropped from the top of a tower covers a distance 9x in the last second of its journey, where x is the distance covered in first second. How much time does it take to reach the ground?
(1) 3s (2) 4s (3) 5s (4) 6s

PML085

86. A stone is dropped into a well in which the level of water is h below the top of the well. If v is velocity of sound, the time T after which the splash is heard is given by.
(1) $T = \frac{2h}{v}$ (2) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$
(3) $T = \sqrt{\frac{2h}{v}} + \frac{h}{g}$ (4) $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

PML086

87. A body is released from the top of a tower of height H metres. It takes t time to reach the ground. Where is the body $\frac{t}{3}$ time after the release :
(1) At $\frac{H}{2}$ metres from ground
(2) At $\frac{H}{4}$ metres from ground
(3) At $\frac{8H}{9}$ metres from the ground
(4) At $\frac{H}{9}$ metres from the ground

PML087

88. A body falling from height 'h' takes t_1 time to reach the ground. The time taken to cover the first $\left(\frac{1}{4}\right)^{th}$ of the height is :

(1) $t_2 = \frac{t_1}{\sqrt{2}}$ (2) $t_1 = \frac{t_2}{\sqrt{2}}$

(3) $t_2 = \frac{t_1}{2}$ (4) None of these

PML088

89. A stone is dropped from a certain height which can reach the ground in 5 seconds. It is stopped after 3 seconds of its fall and is again released. The total time taken by the stone to reach the ground will be :

(1) 6 s (2) 6.5 s (3) 7 s (4) 7.5 s

PML089

90. A body released from a height falls freely towards earth. Another body is released from the same point exactly two second later. The separation between them two seconds after the release of the second body is :–

(1) 9.8 m (2) 49 m

(3) 58.8 m (4) 19.6 m

PML090

91. Two balls are dropped from different heights at different instants. Second ball is dropped 2 seconds after the first ball. If both balls reach the ground simultaneously after 5 seconds of dropping the first ball, then the difference between the initial heights of the two balls will be: ($g=9.8 m/s^2$)

(1) 58.8 m (2) 78.4 m (3) 98.0 m (4) 117.6 m

PML091

92. A body is released from the top of a tower of height H m. After 2sec it is stopped and then instantaneously released. What will be its height from ground after next 2sec :-

(1) (H–5) m (2) (H–10) m

(3) (H–20)m (4) (H-40) m

PML092

93. The ratio of the distances traversed, in successive intervals of time by a body falling from rest, are

(1) 1 : 3 : 5 : 7 : 9 : .....

(2) 2 : 4 : 6 : 8 : 10 : .....

(3) 1 : 4 : 7 : 10 : 13 : .....

(4) None of these

PML093

94. A particle is dropped from a certain height. The time taken by it to fall through successive distances of 1 km each will be :

(1) all equal, being equal to $\sqrt{\frac{2}{g}}$ second.

(2) in the ratio of the square roots of the integers 1: $\sqrt{2} : \sqrt{3}$

(3) in the ratio of the difference in the square roots of the integers, i.e., $\sqrt{1},,(\sqrt{2}-\sqrt{1}),(\sqrt{3}-\sqrt{2}),(\sqrt{4}-\sqrt{3})$ .....

(4) in the ratio of the reciprocals of the square roots of the integers, ie., $\frac{1}{\sqrt{1}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{3}}$.....

PML094

95. Drops of water fall from the roof of a building 27m high at regular intervals of time. When the first drop reaches the ground, at the same instant fourth drop begins to fall. What are the distances of the second and third drops from the roof?

(1) 6 m and 12 m (2) 6 m and 3 m

(3) 12 m and 3 m (4) 8 m and 2 m

PML095

96. Water drops fall at regular intervals from a tap 6 m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant?

(1) 1.25 m (2) 2.50 m

(3) 3.75 m (4) 4.5 m

PML096

97. Four marbles are dropped from the top of a tower one after the other with an interval of one second. The first one reaches the ground after 4 seconds. When the first one reaches the ground the distances between the first and second, the second and third and the third and forth will be respectively :-

(1) 35 m, 25 m and 15 m

(2) 30 m, 20 m and 10 m

(3) 20 m, 10 m and 5 m

(4) 40 m, 30 m and 20 m

PML097

98. A particle is thrown vertically upward. Its velocity at half of the maximum height is 10m/s. The maximum height attained by it is ($g=10\ ms^{-2}$) :–
(1) 8m (2) 20m (3) 10m (4) 16m
PML098

99. A ball is thrown upward with a velocity of 50 m/s. It will reach the ground after :–
(1) 10 s (2) 20 s (3) 5 s (4) 40 s
PML099

100. Two bodies are thrown vertically upwards with their initial speeds in the ratio 2 : 3. The ratio of the maximum heights reached by them and the ratio of time taken by them to return back to the ground respectively are :-
(1) 4 : 9 and 2 : 3 (2) 2 : 3 and $\sqrt{2}:\sqrt{3}$
(3) $\sqrt{2}:\sqrt{3}$ and 4 : 9 (4) $\sqrt{2}:\sqrt{3}$ and 2 : 3
PML100

101. A particle is thrown from the ground upward with velocity 40 m/s. Calculate maximum height:-
(1) 40 m (2) 80 m (3) 160 m (4) 8 m
PML101

102. If a ball is thrown vertically upwards with 40 m/s. its velocity after three seconds will be :
(1) 10 m/s (2) 20 m/s
(3) 30 m/s (4) 40 m/s
PML102

103. When a ball is thrown vertically up with velocity v_0, it reaches a maximum height 'h'. If one wishes to double the maximum height then the ball should be thrown with velocity –
(1) $\sqrt{2}\,v_0$ (2) $3v_0$
(3) $9v_0$ (4) $3/2v_0$
PML103

104. With what speed should a body be thrown upwards so that the distances traversed in 7th second and 8th second are equal?
(1) 58.4 m/s (2) 49 m/s
(3) $\sqrt{98}$ m/s (4) 68.6 m/s
PML104

105. If a ball is thrown vertically upwards with speed u, the distance covered during the last 't' seconds of its ascent is :–
(1) ut (2) $\frac{1}{2}gt^2$
(3) $ut - \frac{1}{2}gt^2$ (4) $(u + gt)t$
PML105

106. A body thrown vertically upwards with an initial velocity u reaches maximum height in 6 seconds. The ratio of the distance travelled by the body in the first second and the seventh second is :-
(1) 1 : 1 (2) 11 : 1 (3) 1 : 2 (4) 5 : 3
PML106

107. A ball is thrown vertically upwards with velocity 600 m/s. Calculate distance travelled in last 2 sec of its upward motion :-
(1) 20 m (2) 30 m (3) 10 m (4) 25 m
PML107

108. A body is projected vertically up at t = 0 with a velocity of 98 m/s. Another body is projected from the same point with same velocity after 4 seconds. Both bodies will meet at t =
(1) 6 s (2) 8 s (3) 10 s (4) 12 s
PML108

109. A ball is thrown vertically upwards. The ball was observed at a height h twice with a time interval Δt. The initial velocity of the ball is
(1) $\sqrt{8gh+(g\Delta t)^2}$ (2) $\sqrt{2gh+\left(\frac{g\Delta t}{2}\right)^2}$
(3) $\sqrt{8gh+(2g\Delta t)^2}$ (4) $\sqrt{2gh}$
PML109

110. A ball is thrown vertically upwards. Assuming the air resistance to be constant and considerable :–
(1) the time of ascent $\geq$ the time of descent
(2) the time of ascent < the time of descent
(3) the time of ascent > the time of descent
(4) the time of ascent = the time of descent
PML110

111. A particle is thrown up vertically with a speed 'v_1', in air. It takes time t_1 in upward journey and t_2 ($> t_1$) in the downward journey and returns to the starting point with a speed v_2.Then:
(1) $v_1 = v_2$
(2) $v_1 < v_2$
(3) $v_1 > v_2$
(4) Data is insufficient
PML111

112. A particle is thrown upwards from ground. It experiences a constant resistance force which produces a retardation of 2 m/s². The ratio of time of ascent to the time of descent is ($g = 10\ m/s^2$):-

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

PML112

113. A stone is thrown straight upward with a speed of 20 m/sec from a tower 200 m high. The speed with which it strikes the ground is approximately ($g = 9.8\ m/s^2$)

(1) 60 m/sec (2) 65 m/sec
(3) 70 m/sec (4) 75 m/sec

PML113

114. A balloon is at a height of 81 m and is ascending upwards with a velocity of 12 m/s. A body of 2 kg weight is dropped from it. If $g = 10\ m/s^2$, the body will reach the surface of the earth in:-

(1) 1.5 s (2) 4.025 s
(3) 5.4 s (4) 6.75 s

PML114

115. A ball is thrown vertically upwards from the top of a tower with velocity 4.9 ms^{-1}. It strikes the pond near the base of the tower after 3 seconds. The height of the tower is :-

(1) 73.5 m (2) 44.1 m
(3) 29.4 m (4) None of these

PML115

116. A stone is thrown upwards with a speed 'u' from the top of the tower reaches the ground with a velocity '3u'. The height of the tower is:-

(1) $\frac{3u^2}{g}$ (2) $\frac{4u^2}{g}$ (3) $\frac{6u^2}{g}$ (4) $\frac{9u^2}{g}$

PML116

117. A body dropped from a height h, strikes the ground with velocity 3 m/s. Another body of same mass is thrown downward from the height h with an initial velocity of 4 m/s. Find the final velocity with which it strikes the ground

(1) 3 m/s (2) 4 m/s
(3) 5 m/s (4) 12 m/s

PML117

118. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically) with same speed. If V_A and V_B are their respective velocities on reaching the ground then :-

(1) $V_B > V_A$ (2) $V_A = V_B$
(3) $V_A > V_B$ (4) None of these

PML118

119. A stone falls from a balloon that is descending at a uniform rate of 10 ms^{-1}. The displacement of the stone from the point of release after 10 seconds is : ($g = 10\ m/s^2$)

(1) 490 m (2) 510 m
(3) 600 m (4) 725 m

PML119

120. A parachutist after bailing out falls 50 m without friction. When parachute opens, it decelerates at 2 m/s². He reaches the ground with a speed of 3 m/s. At what approximate height, did he bail out?

(1) 293 m (2) 111 m
(3) 91 m (4) 182 m

PML120

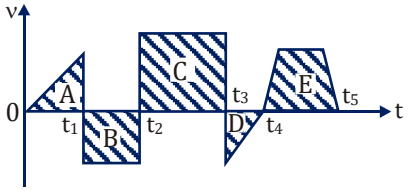
121. A rocket is fired vertically from the ground. It moves upwards with a constant acceleration 20 m/s² for 30 sec after which the fuel is finished. After what time from the instant of firing the rocket will attain the maximum height? (Take $g = 10\ m/s^2$)

(1) 90 s (2) 45 s (3) 60 s (4) 75 s

PML121

GRAPHICAL ANALYSIS

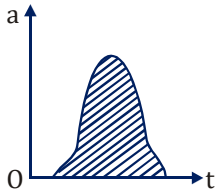
122. The velocity-time graph of an object is shown. The distance during the interval 0 to t_4 is :-



(1) Area A + Area B +Area C +Area D +Area E
(2) Area A + Area C – Area B – Area D
(3) Area A + Area B + Area C + Area D
(4) Area A + Area C + Area E –Area B +Area D

PML122

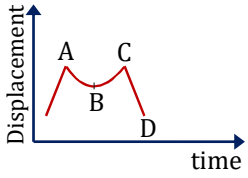
123. Figure below shows the acceleration-time graph of a one dimensional motion. Which of the following characteristics of the particle is represented by the shaded area?



(1) change in velocity
(2) change in position
(3) change in momentum
(4) velocity

PML123

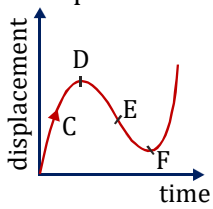
124. Fig. shows the displacement of a particle moving along x-axis as a function of time. The velocity of the particle is zero at :-



(1) A (2) B (3) C (4) D

PML124

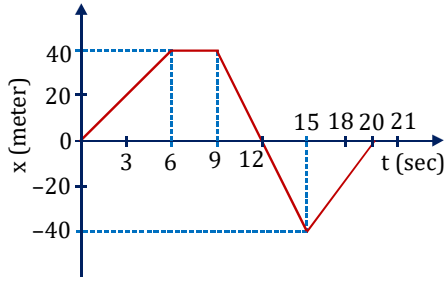
125. The displacement-time graph of a moving particle is shown. The instantaneous velocity of the particle is positive at the point :



(1) D (2) F (3) C (4) E

PML125

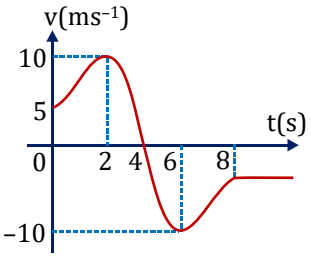
126. A person walks along an east-west street and a graph of his displacement from home is shown in figure. His average speed for the whole time interval is



(1) 0 (2) 23 m/s
(3) 8 m/s (4) None of these

PML126

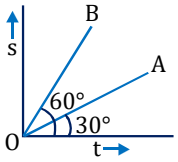
127. A particle is moving in a straight line y=3x. Its velocity time graph is shown in figure. Its speed is minimum at t =.....



(1) 2s (2) 4s (3) 6s (4) 8s

PML127

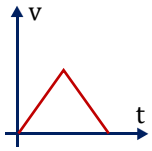
128. The displacement–time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. The ratio of velocity of particle A & B ($V_A : V_B$) is :-

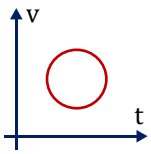


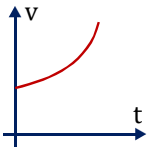
(1) 1 : 2 (2) 1 : $\sqrt{3}$ (3) $\sqrt{3}$: 1 (4) 1 : 3

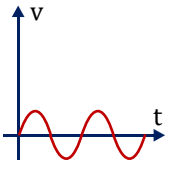
PML128

129. Which one of the following curves do not represent motion in one dimension :-

(1) 

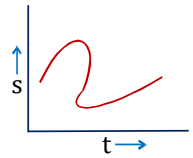
(2) 

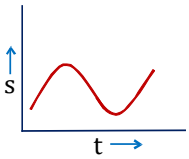
(3) 

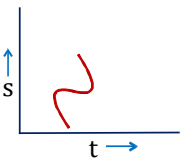
(4) 

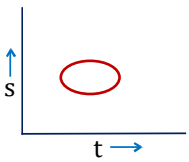
PML129

130. Which of the following displacement–time graphs shows a realistic situation for a body in motion ?

(1) 

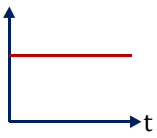
(2) 

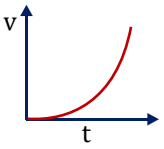
(3) 

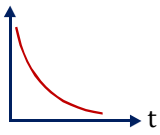
(4) 

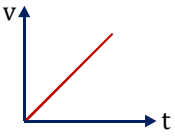
PML130

131. Which of the following velocity-time graphs represent uniformly accelerated motion ?

(1) 

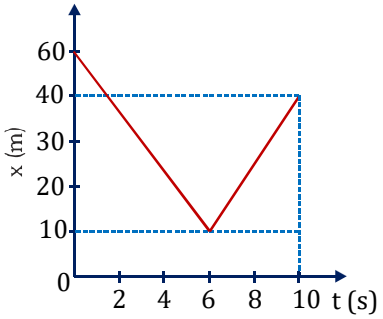
(2) 

(3) 

(4) 

PML131

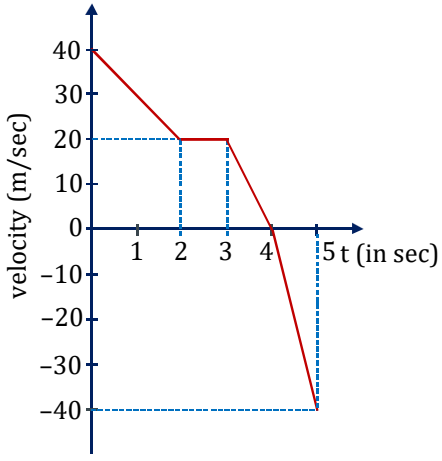
132. The fig. shows the position time graph of a particle moving on a straight line path. What is the magnitude of average speed of the particle over 10 seconds ?



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

PML132

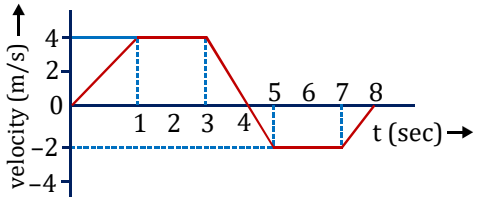
133. From the following velocity time graph of a body the distance travelled by the body and its displacement during 5 seconds in metres will be :



(1) 75, 75 (2) 110, 70
(3) 110, 110 (4) 110, 40

PML133

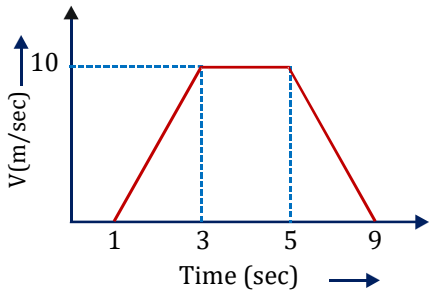
134. The v-t graph of linear motion of a particle starts its motion from origin is shown in adjoining figure. The distance of particle from origin after 8 sec. is :-



(1) 18 meters (2) 16 meters
(3) 8 meters (4) 6 meters

PML134

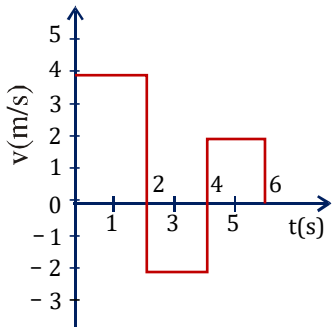
135. A particle moves according to given velocity–time graph. Then the ratio of distance travelled in last 4 seconds and 9 seconds is :-



(1) $\frac{1}{4}$ (2) $\frac{2}{5}$ (3) $\frac{1}{8}$ (4) $\frac{4}{11}$

PML135

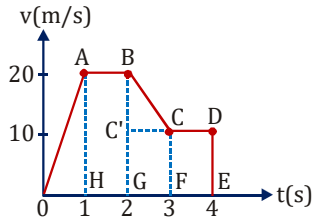
136. The velocity-time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 s are, respectively :-



(1) 8 m, 16 m (2) 16 m, 8 m
(3) 16 m, 16 m (4) 8 m, 8m

PML136

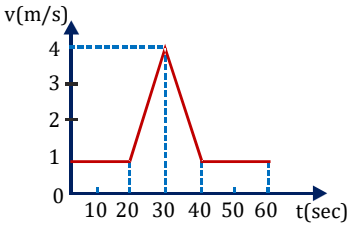
137. The variation of velocity of a particle moving along a straight line is illustrated in the figure. The distance transversed by the particle in 3 seconds is



(1) 60 m (2) 45 m (3) 55 m (4) 30 m

PML137

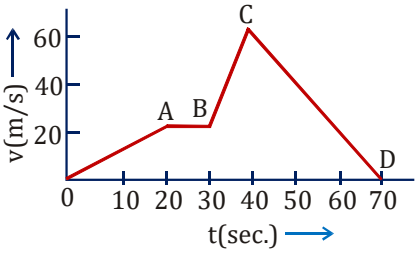
138. Velocity-time (v-t) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is zero acceleration is:–



(1) 60 m (2) 50 m (3) 30 m (4) 40 m

PML138

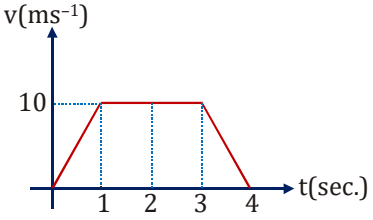
139. The velocity versus time curve of a moving particle is as shown in the following figure. The maximum acceleration is



(1) 1 m sec^{-2} (2) 2 m sec^{-2}
(3) 3 m sec^{-2} (4) 4 m sec^{-2}

PML139

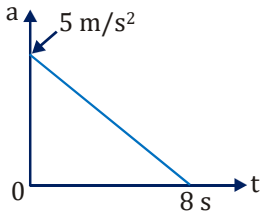
140. Find the average acceleration of the block from time t=2 sec to t=4 sec.



(1) 5 m/s^2 (2) 10 m/s^2
(3) –5 m/s^2 (4) –10 m/s^2

PML140

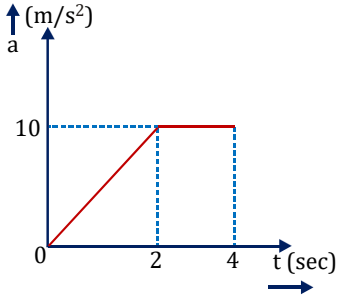
141. A particle starts from rest. Its acceleration at time t = 0 is 5 m/s^2 which varies with time as shown in the figure. The maximum speed of the particle will be :



(1) 7.5 m/s (2) 15 m/s
(3) 20 m/s (4) 37.5 m/s

PML141

142. A particle starts from rest, its acceleration-time graph is shown in figure.

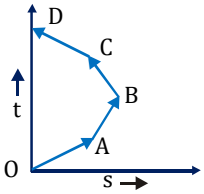


Find out velocity at t = 4 sec

(1) 20 m/s (2) 30 m/s
(3) 40 m/s (4) None of these

PML142

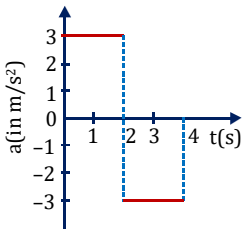
143. Which of the following options is correct for the object having a straight line motion represented by the following graph :-

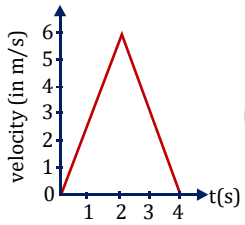


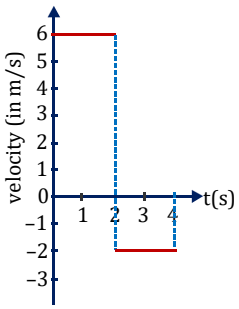
(1) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.
(2) Velocity of the object increases uniformly
(3) Average velocity is zero
(4) The graph shown is impossible

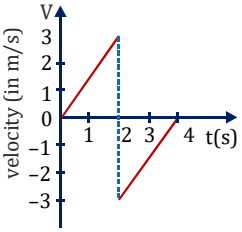
PML143

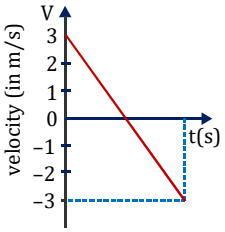
144. For the motion of a particle acceleration-time graph is shown in figure. The velocity time curve for the duration of 0 – 4 seconds is :



(1)


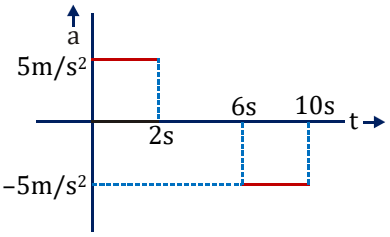
(2)


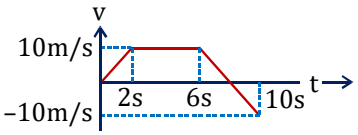
(3)


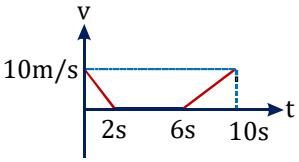
(4)


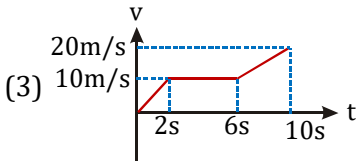
PML144

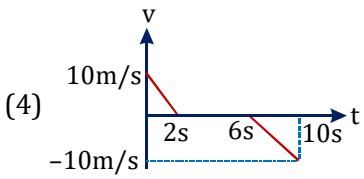
145. Acceleration-time graph of a body initially at rest is shown. The corresponding velocity-time graph of the same body is :-



(1)


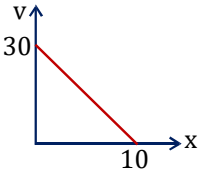
(2)


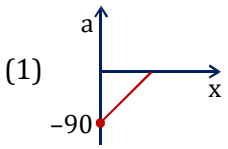
(3)


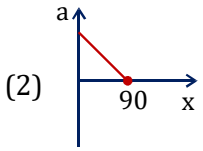
(4)


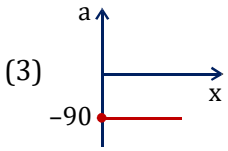
PML145

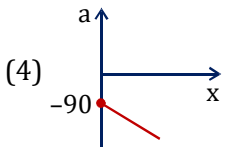
146. The given graph shows the variation of velocity with displacement. Which one of the graph given below correctly represents the variation of acceleration with displacement :-



(1)


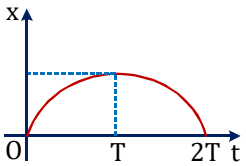
(2)


(3)


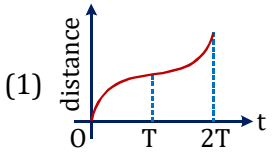
(4)


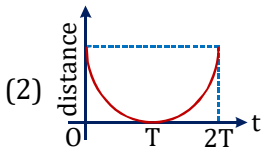
PML146

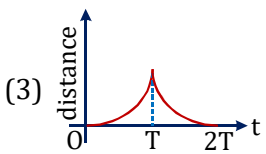
147. The x – t graph of a particle moving along a straight line is shown in figure.

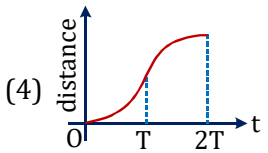


The distance-time graph of the particle is correctly shown by :

(1)


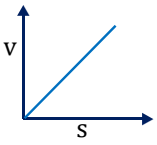
(2)


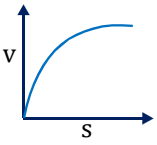
(3)


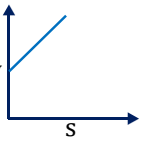
(4)


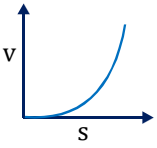
PML147

148. A particle starts from rest and move with constant acceleration. Its velocity-displacement curve is :

(1) 

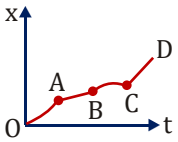
(2) 

(3) 

(4) 

PML148

149. The graph between the displacement x and time t for a particle moving in a straight line is shown in figure. During the interval OA, AB, BC and CD, the acceleration of the particle is :



	OA	AB	BC	CD
(1)	+	0	+	+
(2)	–	0	+	0
(3)	+	0	–	0
(4)	–	0	–	0

PML149

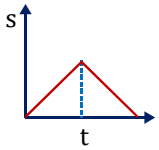
150. Acceleration-time curve for a body projected vertically upwards is a/an :–

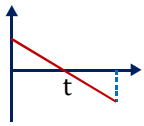
(1) Parabola (2) Ellipse

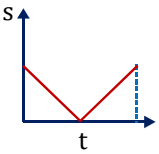
(3) Hyperbola (4) Straight line

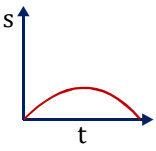
PML150

151. A body is projected vertically upward from the surface of the earth, its displacement-time graph is :

(1) 

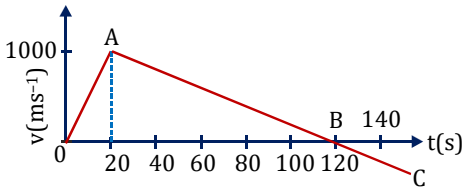
(2) 

(3) 

(4) 

PML151

152. A rocket is launched upward from the earth's surface whose velocity time graphs shown in figure. Then maximum height attained by the rocket is:



(1) 1 km (2) 10 km

(3) 100 km (4) 60 km

PML152

153. In above Q. no. 152, height covered by the rocket before retardation is :

(1) 1 km (2) 10 km

(3) 20 km (4) 60 km

PML153

154. In above Q. no. 152, mean velocity of rocket during the time it took to attain the maximum height :

(1) 100 m/s (2) 50 m/s

(3) 500 m/s (4) 25/3 m/s

PML154

155. In above Q. no. 152, the retardation of rocket is:

(1) 50 m/s^2 (2) 100 m/s^2

(3) 500 m/s^2 (4) 10 m/s^2

PML155

156. In above Q. no. 152, the acceleration of rocket is :

(1) 50 m/s^2 (2) 100 m/s^2

(3) 10 m/s^2 (4) 1000 m/s^2

PML156

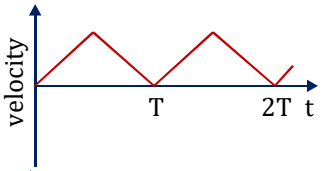
157. In above Q. no. 152, the rocket goes up and comes down on the following parts respectively :

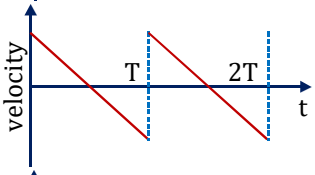
(1) OA and AB (2) AB and BC

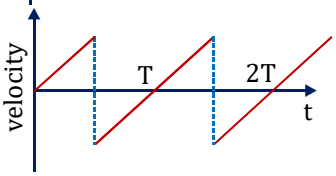
(3) OA and ABC (4) OAB and BC

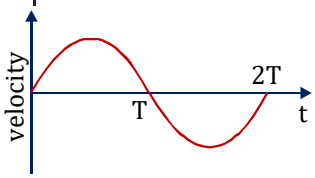
PML157

158. A ball is dropped from the certain height on the surface of glass. It collides elastically and comes back to its initial position. If this process it repeated then the velocity time graph is :
(Take downward direction as positive)

(1) 

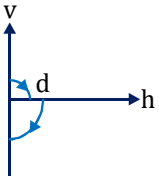
(2) 

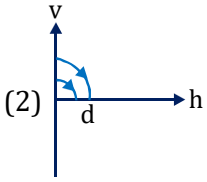
(3) 

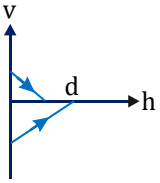
(4) 

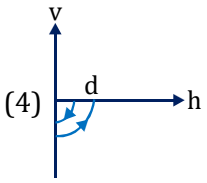
PML158

159. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height d/2. Neglecting subsequent motion and air resistance, The graph according to which its velocity V varies with the height h above the ground is :-

(1) 

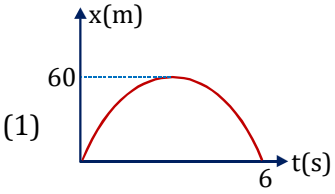
(2) 

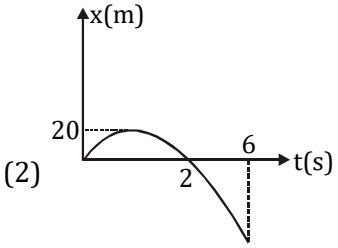
(3) 

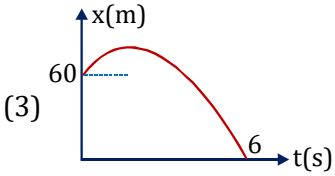
(4) 

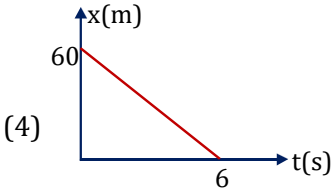
PML159

160. A stone is thrown upwards from top of a tower 60 m high at a speed of 20 m/s. The correct position-time graph for the time interval in which it reaches ground, is (g = 10 m/s^2 & take origin at the base of the tower) :-

(1) 

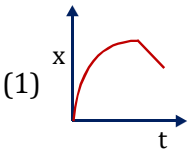
(2) 

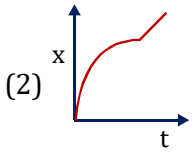
(3) 

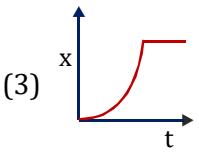
(4) 

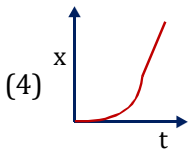
PML160

161. A car starts from rest and accelerates uniformly by for 4 seconds and then moves with uniform velocity which of the x-t graph represent the motion of the car ?

(1) 

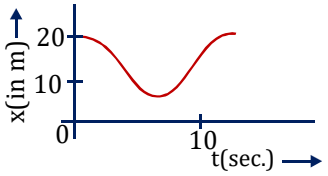
(2) 

(3) 

(4) 

PML161

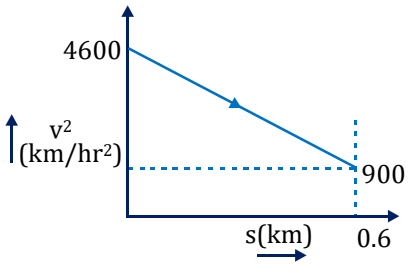
162. Figure shows x-t graph of a particle. Find the time t such that the average velocity of the particle during the period 0 to t is zero



(1) 6 sec. (2) 8 sec.
(3) 10 sec. (4) 12 sec.

PML162

163. Graph between the square of the velocity (v) of a particle and the distance (s) moved is shown in figure. The acceleration of the particle in kilometers per hour square is :



(1) 2250 (2) 3084
(3) – 2250 (4) – 3084

PML163

164. A train takes 4 min. to go between stations 2.25 km apart starting and finishing at rest. The acceleration is uniform for the first 40 sec and the deceleration is uniform for the last 20 sec. Assuming the velocity to be constant for the remaining time, then maximum speed of the train is :-

(1) 75 m/sec (2) 18.75 m/sec
(3) 37.5 m/sec (4) 10.7 m/sec

PML164

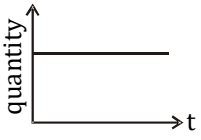
165. A car accelerates from rest at a constant rate of 2 m/s² for some time. Then, it retards at a constant rate of 4 m/s² and comes to rest. If it remains in motion for 3 seconds, then the maximum speed attained by the car is :

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

PML165

GROUND TO GROUND PROJECTION

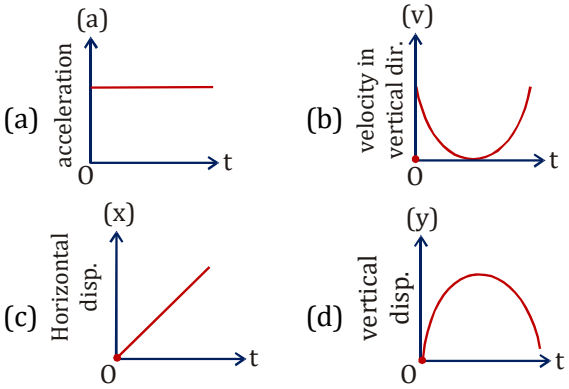
166. In the graph shown in fig. time is plotted along x-axis. Which quantity associated with a projectile motion is plotted along the y-axis ?



(1) kinetic energy (2) momentum
(3) horizontal velocity (4) none of the above

PML166

167. For ground to ground projection following curves are given :-



Find incorrect one.

(1) a (2) b (3) c (4) d

PML167

168. If air resistance is not considered in projectile motion, the horizontal motion takes place with

(1) constant velocity
(2) constant acceleration
(3) constant retardation
(4) variable velocity

PML168

169. In a projectile motion, the velocity :-

(1) is always perpendicular to the acceleration
(2) is never perpendicular to the acceleration
(3) is perpendicular to the acceleration for one instant only
(4) is perpendicular to the acceleration for two instants

PML169

170. In projectile motion, the modulus of rate of change of velocity–

(1) is constant
(2) first increases then decreases
(3) first decreases then increases
(4) None of the above

PML170

171. Which of the following quantities remains constant during projectile motion?

(A) Average velocity between two points.
(B) Average speed between two points
(C) $\frac{d\vec{v}}{dt}$
(D) $\frac{d^2}{dt^2}(\vec{v})$

(1) only A (2) only C
(3) A and C (4) C and D

PML171

172. A bomb is fired from a cannon with a velocity of 1000 m/s making an angle of 30° with the horizontal. What is the time taken by the bomb to reach at the highest point-

(1) 11 sec (2) 23 sec

(3) 38 sec (4) 50 sec

PML172

173. If time of flight of a projectile is 10 seconds. Range is 500 meters. The maximum height attained by it will be :-

(1) 125 m (2) 50 m

(3) 100 m (4) 150 m

PML173

174. A body is thrown with a velocity of 19.6 m/s making an angle of 30^0 with the horizontal. It will hit the ground after a time :–

(1) 3 s (2) 2 s (3) 1.5 s (4) 1 s

PML174

175. If a projectile is fired at an angle θ to the vertical with velocity u, then maximum height attained is given by :

(1) $\frac{u^2\cos\theta}{2g}$ (2) $\frac{u^2\sin^2\theta}{2g}$

(3) $\frac{u^2\sin^2\theta}{g}$ (4) $\frac{u^2\cos^2\theta}{2g}$

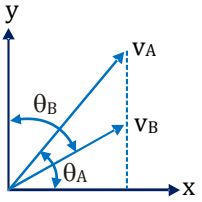
PML175

176. At the uppermost point of a projectile its velocity and acceleration are at an angle of :–

(1) 180° (2) 90° (3) 60° (4)45°

PML176

177. Two projectiles are projected with velocity v_A, v_B at angles θ_A (from horizontal) and θ_B (from vertical) as shown in the figure below, such that $v_A > v_B$ but having same horizontal component of velocity. Which of the following can not be correct ?



(1) $T_A > T_B$ (2) $H_A > H_B$

(3) $R_A > R_B$ (4) $R_B > R_A$

PML177

178. A player throws a ball that reaches to the another player in 4s. If the height of each player is 1.5m, the maximum height attained by the ball from the ground level is :

(1) 19.6 m (2) 21.1 m

(3) 23.6 m (4) 25.1 m

PML178

179. A body of mass m is thrown upwards at an angle θ with the horizontal with speed v. While rising up the magnitude of the velocity after t seconds will be:

(1) $\sqrt{(v\cos\theta)^2+(v\sin\theta)^2}$

(2) $\sqrt{(v\cos\theta-v\sin\theta)^2-gt}$

(3) $\sqrt{v^2+g^2t^2-(2v\sin\theta)gt}$

(4) $\sqrt{v^2+g^2t^2-(2v\cos\theta)gt}$

PML179

180. A particle is fired with velocity u making θ angle with the horizontal. What is the magnitude of change in velocity when it returns to the ground.

(1) u cos θ (2) u

(3) 2u sin θ (4) (u cosθ – u)

PML180

181. In the above, the change in speed is :

(1) u cos θ (2) 0

(3) u sin θ (4) (u cosθ – u)

PML181

182. The angle which the velocity vector of a projectile, will make with the vertical after time t of its being thrown with a velocity v at an angle θ to the horizontal, is :

(1) θ

(2) $\tan^{-1}\left(\frac{\theta}{t}\right)$

(3) $\tan^{-1}\left(\frac{v\cos\theta}{v\sin\theta-gt}\right)$

(4) $\tan^{-1}\left(\frac{v\sin\theta-gt}{v\cos\theta}\right)$

PML182

183. At a height 0.4 m from the ground, the velocity of a projectile in vector form is: $\vec{v}=(6\hat{i}+2\hat{j})\,m/s$. The angle of projection from horizontal is (g = 10 m/s²) :-

(1) 45° (2) 60°

(3) 30° (4) $\tan^{-1}(3/4)$

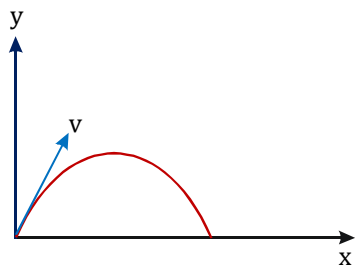
PML183

184. In case of a projectile fired at an angle 60° to the horizontal with velocity u, the horizontal range is:

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

PML184

185. If the instantaneous velocity of a particle projected as shown in figure is given by $\vec{v}=a\hat{i}+(b-ct)\hat{j}$ where a, b and c are positive constants, the range on the horizontal plane will be :



(1) 2ab/c (2) ab/c

(3) ac/b (4) a/2bc

PML185

186. A projectile is thrown from a point in a horizontal plane such that its horizontal and vertical velocity components are 9.8 m/s and 4.9 m/s respectively. Its horizontal range is :

(1) 4.9 m (2) 9.8 m

(3) 19.6 m (4) 39.2 m

PML186

187. A projectile is projected with initial velocity $(5\hat{i}+12\hat{j})$ m/s. If g = 10 ms^{-2}, then horizontal range is :

(1) 4.8 metre (2) 9.6 metre

(3) 19.2 metre (4) 12 metre

PML187

188. A shell is fired vertically upwards with a velocity v_1 from the deck of a ship moving with a speed v_2. A person on the shore observes the motion of the shell as a parabola. Its horizontal range is given by :

(1) $\frac{2v_1^2v_2}{g}$ (2) $\frac{2v_1v_2^2}{g}$

(3) $\frac{2v_1v_2}{g}$ (4) $\frac{2v_1^2v_2^2}{g}$

PML188

189. The range of a projectile when fired at 60° to the horizontal is 0.5 km. What will be its range when fired at 45° with the same speed ?

(1) 0.5 km (2) $\frac{1.0}{\sqrt{3}}$ km

(3) 1.5 km (4) 2.0 km

PML189

190. The speed of a projectile at its maximum height is $\frac{1}{2}$ times of its initial speed 'u' of projection. Its range on the horizontal plane is :

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

PML190

191. A bullet is fired from a cannon with velocity 500 m/s. If the angle of projection is 15° and g = 10m/s². Then the range is :-

(1) 25×10^3 m (2) 12.5×10^3 m

(3) 50×10^2 m (4) 25×10^2 m

PML191

192. For a given angle of projection if the initial velocity is tripled the range of the projectile becomes :-

(1) 9 times (2) one-fourth

(3) two times (4) four times

PML192

193. A ball is thrown at an angle θ to the vertical and the range is maximum. The value of tanθ is :

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

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

PML193

194. The maximum horizontal range of a gun is 25 km. If g = 10 m/s², the muzzle velocity of the shell must be :–

(1) 1600 m/s (2) 500 m/s

(3) $200\sqrt{2}$ m/s (4) $160\sqrt{10}$ m/s

PML194

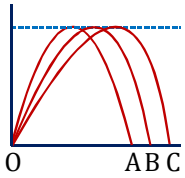
195. A grasshopper can jump maximum distance 1.6 m. It spends negligible time on the ground. How far can it go in 10 seconds :-

(1) $5\sqrt{2}$m (2) $10\sqrt{2}$m

(3) $20\sqrt{2}$m (4) $40\sqrt{2}$m

PML195

196. Three projectiles A, B and C are thrown from the same point in the same plane. Their trajectories are shown in the figure. Which of the following statement is incorrect?



(1) The time of flight is the same for all the three

(2) The launch speed is same for all the three

(3) The horizontal velocity component is largest for particle C

(4) The maximum height is same for all the three

PML196

197. A projectile is thrown with an initial velocity of $\vec{v}=a\hat{i}+b\hat{j}$. If range of the projectile is four times the maximum height attained by it then :

(1) a = 2 b (2) b = a

(3) b = 2a (4) b = 4a

PML197

198. Two projectiles are fired from the same point with the same speeds at angles of projection 60° and 30° respectively. Which one of the following is true ?

(1) Their horizontal ranges will be the same

(2) Their maximum heights will be the same

(3) Their landing velocities will be the same

(4) Their times of flight will be the same

PML198

199. Three particles A, B and C are projected from the same point with the same initial speeds making angles 30°, 45° and 60° respectively with the horizontal. Which of the following statements are correct ?

(1) A, B and C have unequal ranges

(2) Ranges of A and C are equal and less than that of B

(3) Ranges of A and C are equal and greater than that of B

(4) A, B and C have equal ranges

PML199

200. A number of bullets are fired in all possible directions with the same initial velocity u. The maximum area of ground covered by bullets is :–

(1) $\pi\left(\frac{2u^2}{g}\right)^2$ (2) $3\pi\left(\frac{u}{g}\right)^2$

(3) $5\pi\left(\frac{u}{2g}\right)^2$ (4) $\pi\left(\frac{u^2}{g}\right)^2$

PML200

201. Four bodies P, Q, R and S are projected with equal speed having angles of projection 15°, 30°, 45° and 60° with the horizontal respectively. The body having shortest range is :-

(1) P (2) Q (3) R (4) S

PMP001

202. A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance up to which the boy can throw the same stone will be :

(1) $20\sqrt{2}$m (2) 10 m (3) $10\sqrt{2}$m (4) 20 m

PMP002

203. A cricketer can throw a ball to a maximum horizontal distance of 100m. How much high above the ground can the cricketer throw the same ball :-

(1) 200m (2) 400m

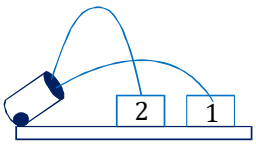
(3) 100m (4) 50m

PMP003

204. The maximum range of a projectile fired with some initial velocity is found to be 2000 m. The maximum height (H) reached by this projectile is:
(1) 250 metre (2) 500 metre
(3) 1000 metre (4) 2000 metre
PMP004

205. The cannon was set by mistake at 30° instead of 20° with the horizontal and was fired to hit the enemy target. The cannon-shell will now fall at :
(1) The enemy target
(2) Before the enemy target
(3) Beyond the enemy target
(4) May fall at any place
PMP005

206. Two similar cannon simultaneously fires two identical cannon balls at target 1 and 2 as shown in the figure. If the cannon balls have identical initial speeds, which of the following statements is true?



(1) Target 2 is hit before target 1
(2) Target 1 is hit before target 2
(3) Both are hit at the same time
(4) information is insufficient
PMP006

207. If R is the horizontal range of a particle projected at an angle 53° from horizontal, then the greatest height attained by it is :
(1) $\frac{R}{3}$ (2) 2R (3) $\frac{R}{2}$ (4) $\frac{R}{4}$
PMP007

208. A projectile can have the same range R for two angles of projection. If h_1 and h_2 be the maximum height in the two cases, then :–
(1) $h_1h_2 \propto R^2$ (2) $h_1h_2 \propto R$
(3) $h_1h_2 \propto \frac{1}{R}$ (4) $h_1h_2 \propto \frac{1}{R^2}$
PMP008

209. A body is thrown with some velocity from the ground. Maximum height attained when it is thrown at 37° to the horizontal is 90 m. What is the height attained when it is thrown at 53° to the horizontal?
(1) 90 m (2) 45 m
(3) 120 m (4) 160 m
PMP009

210. Two stones are projected with the same speed but making different angles with the horizontal. Their ranges are equal. If the angle of projection of one is $\frac{\pi}{6}$ and its maximum height is y_1, then the maximum height of the other will be :
(1) $3y_1$ (2) $2y_1$ (3) $\frac{y_1}{2}$ (4) $\frac{y_1}{3}$
PMP010

211. A ball is thrown at different angles with the same speed u and from the same point; it has the same range in both the cases. If y_1 and y_2 be the heights attained in the two cases, then $y_1 + y_2 = \ldots$:
(1) $\frac{u^2}{g}$ (2) $\frac{2u^2}{g}$ (3) $\frac{u^2}{2g}$ (4) $\frac{u^2}{4g}$
PMP011

212. A body is projected at such an angle that the horizontal range is four times the greatest height. The angle of projection is :–
(1) 25° (2) 33° (3) 45° (4) 53°
PMP012

213. The horizontal range of a projectile is $4\sqrt{3}$ times of its maximum height. Its angle of projection from horizontal will be:
(1) 45° (2) 60° (3) 90° (4) 30°
PMP013

214. A projectile have range double as compare to its maximum height attained. The angle of projection from horizontal is–
(1) $\tan^{-1}(2)$ (2) $\tan^{-1}(4)$
(3) $\tan^{-1}(3)$ (4) $\tan^{-1}(5)$
PMP014

215. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times its initial speed. If the range of the projectile is 'P' times the maximum height attained by it, then P equals to -

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

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

PMP015

216. A ball is projected to attain the maximum range. If the height attained is H, the range is

(1) H (2) 2H (3) 4H (4) H/2

PMP016

217. The equation of a projectile is $y = x - \frac{gx^2}{2}$. The angle of projection is :

(1) 30° (2) 60°

(3) 45° (4) none

PMP017

218. The equation of a projectile is $y = 4x - \frac{x^2}{4}$. The horizontal range is :

(1) 16 m (2) 8 m

(3) 64 m (4) 12.8 m

PMP018

219. A particle is projected at an angle of 45° from horizontal, 6m away from the foot of a wall, just touches the top of the wall and falls on the ground on the opposite side at a distance 3m from it. The height of wall is :

(1) 2m (2) $\frac{4}{3}$m (3) $\frac{8}{3}$m (4) $\frac{3}{4}$m

PMP019

220. A stone is projected from the ground with velocity 50 m/s at an angle of 30° from horizontal. It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground ($g = 10m/sec^2$)

(1) 90.2 m (2) 89.6 m

(3) 86.6 m (4) 70.2 m

PMP020

221. A shell fired from the ground is just able to cross the top of a wall 90m away and 45 m high moving horizontally. The direction of projection of the shell from horizontal will be :-

(1) 25° (2) 30° (3) 60° (4) 45°

PMP021

222. An arrow is shot into the air. Its range is 100 metres and its time of flight is 5 s. If the value of g is assumed to be 10 m/s^2, then the horizontal component of the velocity of arrow is:

(1) 40 m/s (2) 20 m/s

(3) 31.25 m/s (4) 12.5 m/s

PMP022

223. In the Q. 222, the maximum height attained by the arrow is :

(1) 25 m (2) 20 m/s

(3) 31.25 m (4) 12.5 m

PMP023

224. In the Q. 222, the vertical component of the projection velocity is :

(1) 25 m/s (2) 40 m/s

(3) 12.5 m/s (4) 31.25 m/s

PMP024

225. In the Q. 222, the angle of projection with the horizontal is :

(1) $\tan^{-1}\left(\frac{4}{5}\right)$ (2) $\tan^{-1}\left(\frac{5}{4}\right)$

(3) $\tan^{-1}\left(\frac{5}{8}\right)$ (4) $\tan^{-1}\left(\frac{8}{5}\right)$

PMP025

226. A projectile is thrown into space so as to have the maximum possible horizontal range equal to 200m. Taking the point of projection as the origin, the coordinates of the point where the velocity of the projectile is minimum are:

(1) (200, 100) m (2) (50, 200) m

(3) (100, 50) m (4) (50, 100) m

PMP026

227. If the range of a gun which fires a shell with muzzle speed v, is R, then the angle of elevation of the gun is :

(1) $\cos^{-1}\left(\frac{v^2}{Rg}\right)$ (2) $\cos^{-1}\left(\frac{Rg}{v^2}\right)$

(3) $\frac{1}{2}\sin^{-1}\left(\frac{v^2}{Rg}\right)$ (4) $\frac{1}{2}\sin^{-1}\left(\frac{Rg}{v^2}\right)$

PMP027

228. Two balls A and B are thrown with speeds u and u/2 respectively. Both the balls cover the same horizontal distance before returning to the plane of projection. If the angle of projection of ball B is 30° with the horizontal, then the angle of projection of A is :

(1) $\sin^{-1}\left(\frac{1}{8}\right)$ (2) $\frac{1}{2}\sin^{-1}\left(\frac{\sqrt{3}}{8}\right)$

(3) $\frac{1}{3}\sin^{-1}\left(\frac{1}{8}\right)$ (4) $\frac{1}{4}\sin^{-1}\left(\frac{1}{8}\right)$

PMP028

229. Two balls are projected from the same point on the ground simultaneously. First ball is projected vertically upwards and the second ball at an angle of projection 60° from the horizontal. Both the balls reach the ground simultaneously. The ratio of their velocities of projection are :

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

PMP029

230. A body is projected at an angle θ with horizontal, another body is projected with the same speed at an angle θ with the vertical then the ratio of the maximum height is :-

(1) 1 : 1 (2) $\tan^2\theta$: 1

(3) 1 : cotθ (4) none of these

PMP030

231. A ball is thrown from a point on earth surface with a speed v at an angle of projection θ from horizontal. From the same point and at the same instant a person starts running with a constant speed $\frac{v}{2}$ to catch the ball. The angle of projection of the ball from horizontal is :-

(1) 60° (2) 30° (3) 90° (4) 45°

PMP031

232. For a projectile the ratio of maximum height reached to the square of flight time is (g=10 m/s²):-

(1) 5 : 4 (2) 5 : 2 (3) 5 : 1 (4) 10 : 1

PMP032

233. At what angle to the horizontal should a ball be thrown so that its range R is related to the time of flight T as $R = 5\sqrt{3}T^2$? Take g = 10 ms^{-2} :

(1) 30° (2) 45° (3) 60° (4) 90°

PMP033

234. A ball whose kinetic energy is E, is thrown at an angle of 60° to the horizontal. Its kinetic energy at the highest point of its flight will be :–

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

PMP034

235. A cricket ball is hit at an angle of 30° with the vertical with kinetic energy K. The kinetic energy of the ball at the highest point of the path is :-

(1) Zero (2) K/4 (3) K/2 (4) 3K/4

PMP035

236. A ball is projected vertically upwards with a certain speed. Another ball of the same mass is projected at an angle 30° to the vertical with the same initial speed. The ratio of their potential energies at highest points of their journey, will be

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

PMP036

237. A particle is projected with a velocity u making an angle θ with the horizontal. At any instant, its velocity v is at right angle to its initial velocity u; then v is:

(1) u cos θ (2) u tan θ

(3) u cot θ (4) u sec θ

PMP037

238. A force $\vec{F} = (6t^2\hat{i} + 4t\hat{j})$N acts on a particle of mass 1 kg. What will be velocity of the particle at t = 3 second if at t = 0, the particle was at rest :-

(1) $(54\hat{i} + 12\hat{j})$ m/s (2) $(54\hat{i} + 18\hat{j})$ m/s

(3) $(12\hat{i} + 6\hat{j})$ m/s (4) none

PMP038

PROJECTION FROM A HEIGHT

239. A stone is projected horizontally with a speed 10 m/s from a 80 m high building. The distance of the target on the ground from the foot of the building is :- (g = 10 m/s²)

(1) 80 m (2) 40 m (3) 20 m (4) 10 m

PMP039

240. An aeroplane moving horizontally with a speed of 90 km/h drops a food packet while flying at a height of 490 m. The horizontal range of the packet is :

(1) 180 m (2) 250 m

(3) 500 m (4) 670 m

PMP040

241. A stuntman plans to run along a roof top and then horizontally off it to land on the roof of next building. The roof of the next building is 19.6 metres below the first one and 6.2 metres away from it. What should be his minimum roof top speed in m/s, so that he can successfully make the jump ?

(1) 3.1 (2) 4.0 (3) 4.9 (4) 6.2

PMP041

242. Two stones are projected horizontally from the same height with speeds 100 m/s and 40 m/s. The ratio of their horizontal range is

(1) 1 : 1 (2) 5 : 2 (3) 2 : 5 (4) 3 : 4

PMP042

243. A body is thrown horizontally with a velocity 20 m/s from the top of a tower of height 20 m. It strikes the level ground through the foot of the tower at a distance x from the tower. The value of x is :-

(1) 20 m (2) 10 m (3) 40 m (4) 30 m

PMP043

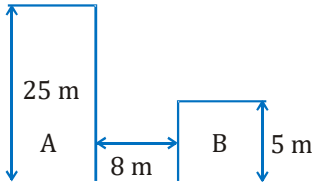
244. A bomber is flying horizontally with a constant speed of 150 m/s at a height of 19.6 m. The pilot has to drop a bomb at the enemy target. At what horizontal distance from the target should he release the bomb?

(1) 0 m (2) 300 m

(3) 600 m (4) 1000 m

PMP044

245. A boy wants to jump from building A to building B. Height of building A is 25 m and that of building B is 5m. Distance between buildings is 8m. Assume that the boy jumps horizontally, then calculate minimum velocity with which he has to jump to land safely on building B.

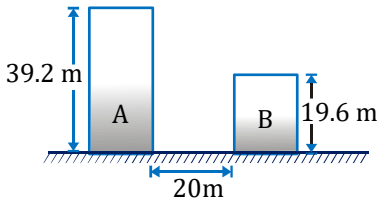


(1) 6 m/s (2) 8 m/s

(3) 4 m/s (4) 2 m/s

PMP045

246. A boy wants to jump from building A to building B. Height of building A is 39.2 m and building B is 19.6m. Distance between buildings is 20 m. Assuming boy jumps horizontally, then calculate minimum velocity with which boy has to jump to land safely on building B :-



(1) 10 m/s (2) 20 m/s

(3) 9.8 m/s (4) 19.6 m/s

PMP046

247. Two buildings are separated by 30 m. By what speed a ball is projected horizontally from a window at height 150 m in one building so as to enter in the window at height 27.5 m in the other building.

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

PMP047

248. Two bodies of masses 100 kg and 50 kg are projected horizontally from same height with speeds 40 m/s and 20 m/s, simultaneously. The ratio of time taken by both the bodies to reach the ground is :-

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

PMP048

249. A ball is thrown horizontally from a height of 90 m with a speed of 4.5 m/s then find the time when it is at the height of 45 m from the ground:

(1) $3\sqrt{2}$ sec (2) 10 sec (3) 9 sec (4) 3 sec

PMP049

250. When a particle is thrown horizontally with speed u from top of tower, the displacement of the projectile at any time t is given by :

(1) $\sqrt{u^2t^2+g^2t^2}$ (2) $\sqrt{u^2t^2+\frac{1}{4}g^2t^4}$

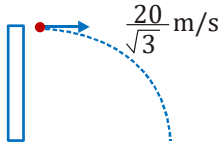
(3) $\sqrt{u^2+g^2t^2}$ (4) $\sqrt{u^2-g^2t^2}$

PMP050

251. A plane is flying horizontally at $98\sqrt{3}$ m/s and releases an object which reaches the ground in 10 s. The angle made by it with horizontal while hitting the ground is :
(1) 55° (2) 45° (3) 60° (4) 30°
PMP051

252. From the top of a tower 78.4 m high, a ball is thrown horizontally. If the line joining the point of projection to the point where it hits the ground makes an angle of 45° with the horizontal, then the initial velocity of the ball is :
(1) 9.8 m/s (2) 4.9 m/s
(3) 19.6 m/s (4) 2.8 m/s
PMP052

253. A particle is projected horizontally with a speed of $\frac{20}{\sqrt{3}}$ m/s, from some height at t = 0. At what time will its velocity make 30° angle with the initial velocity



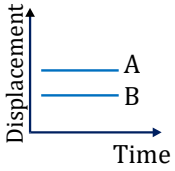
(1) 1 sec (2) 2 sec
(3) 1.5 sec (4) 2/3 sec
PMP053

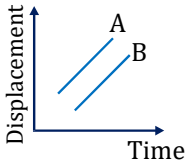
254. In the above question what will be the displacement of the particle in x-direction when its velocity makes 30° angle with the initial velocity
(1) $\frac{20}{\sqrt{3}}$ m (2) $\frac{40}{3\sqrt{3}}$ m
(3) $\frac{50}{\sqrt{3}}$ m (4) $\frac{10}{\sqrt{3}}$ m
PMP054

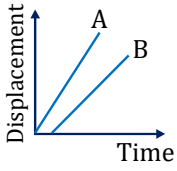
255. A ball is projected upwards from the top of a tower with a velocity of 50 m/s making an angle of 30^0 with the horizontal. The height of the tower is 70m. After how much time from the instant of throwing, will the ball reach the ground?
(1) 2 s (2) 5 s (3) 7 s (4) 9 s
PMP055

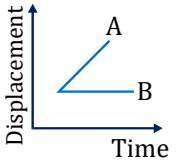
RELATIVE MOTION IN ONE DIMENSION

256. Which one of the following represents the displacement-time graph of two objects A and B moving with zero relative speed :-

(1) 

(2) 

(3) 

(4) 

PMP056

257. A monkey is climbing up a tree at a speed of 3 m/s. A dog runs towards the tree with a speed of 4 m/s. What is the relative speed of the dog as seen by the monkey ?
(1) > 7 m/s
(2) Between 5 m/s and 7 m/s
(3) 5 m/s
(4) < 5 m/s
PMP057

258. A train is moving towards east and a car is along north, both with same speed. The observed direction of car to the passenger in the train is:-
(1) East-north direction
(2) West-north direction
(3) South-east direction
(4) None of these
PMP058

259. Two car A & B start from rest (from the same point) in same direction with acceleration 8 m/s^2 & 4 m/s^2 respectively then acceleration of car B in frame of A(Take direction of motion of car is positive) :-
(1) 4 m/s^2 (2) –4 m/s^2
(3) 12 m/s^2 (4) None of these
PMP059

260. A motorcycle is moving with a velocity of 80 km/h and a car is moving with a velocity of 65 km/h in the opposite direction. What is the relative velocity of the motorcycle with respect to the car ?
(1) 15 km/h (2) 20 km/h
(3) 25 km/h (4) 145 km/h
PMP060

261. Two cars A and B start moving from the same point with same speed v = 5 km/minute. Car A moves towards south and car B is moving towards west. What is the relative velocity of B with respect to A ?
(1) $5\sqrt{2}$ km/min towards South-East
(2) $5\sqrt{2}$ km/min towards North-West
(3) $5\sqrt{2}$ km/min towards South-West
(4) $5\sqrt{2}$ km/min towards North-East

PMP061

262. A train is moving towards East with a speed 20 m/s. A person is running on the roof of the train with a speed 3 m/s in the direction of motion of train. Velocity of the person as seen by an observer on ground will be :
(1) 23 m/s towards East
(2) 17 m/s towards East
(3) 23 m/s towards West
(4) 17 m/s towards West

PMP062

263. A jet air plane travelling with a speed of 500 km/h ejects its products of combustion with a speed of 1600 km/h relative to the jet plane. The speed of the latter with respect to an observer on the ground is :–
(1) 1600 km/h (2) 2100 km/h
(3) 1100 km/h (4) 500 km/h

PMP063

264. A train moves in north direction with a speed of 54 km/h. A monkey is running on the roof of the train, against its motion with a velocity of 36 km/h. with respect to train. The velocity of monkey as observed by a man standing on the ground is:
(1) 5 m/s due north
(2) 25 m/s due south
(3) 10 m/s due south
(4) 10 m/s due north

PMP064

265. A lift is moving upwards with acceleration a. A man in the lift drops a ball within the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively :
(1) g, g (2) g – a, g – a
(3) g + a, g (4) a, g

PMP065

266. A stone is thrown upwards and it rises to a height of 200 m. The relative velocity of the stone with respect to the earth will be minimum at :–
(1) Height of 100 m (2) Height of 150 m
(3) Highest point (4) The ground

PMP066

267. A 100 m long train crosses a man travelling at 5 km/h, in opposite direction in 6 seconds, then the velocity of train is :–
(1) 40 km/h (2) 55 km/h
(3) 20 km/h (4) 45 km/h

PMP067

268. A 300 metres long train is moving due north with a speed of 20 m/s. A small bird is flying due south a little above the train with 5 m/s speed The time taken by the bird to cross the train is **:-**
(1) 6 s (2) 7 s (3) 9 s (4) 12 s

PMP068

269. Two trains each 100 m long, are travelling in opposite directions with respective velocities 35 m/s and 15 m/s. The time of crossing is :–
(1) 2 s (2) 4 s
(3) $2\sqrt{3}$ s (4) $4\sqrt{3}$ s

PMP069

270. A train 200 m long crosses a bridge 300 m long. It enters the bridge with a speed of 30 ms^{-1} and leaves it with a speed of 50 ms^{-1}. What is the time taken to cross the bridge ?
(1) 2.5s (2) 7.5s
(3) 12.5s (4) 15.0s

PMP070

271. Two cars get closer by 8 m in every second while travelling in the opposite directions. They get closer by 0.8 m in every second while travelling in the same direction. What are the speeds of the two cars?
(1) 4 ms^{-1} and 4.4 ms^{-1}
(2) 4.4 ms^{-1} and 3.6 ms^{-1}
(3) 4 ms^{-1} and 3.6 ms^{-1}
(4) 4 ms^{-1} and 3 ms^{-1}

PMP071

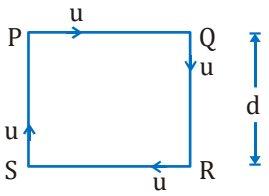
272. Velocity of a swimmer in still water is 5 m/s. If he takes 10 sec to swim upstream a distance of 30 m, then the speed of river is :-
(1) 3 m/s (2) 5 m/s
(3) 10 m/s (4) 2 m/s

PMP072

273. Two cars are moving in the same direction with the same speed of 60 km/h. They are separated by 10 km. What is the speed of a car moving in the opposite direction if it meets the two cars at an interval of 5 minute?
(1) 45 km/h (2) 60 km/h
(3) 105 km/h (4) None

PMP073

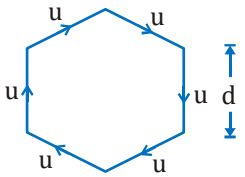
274. Four persons P, Q, R and S of same mass travel with same speed u along a square of side 'd' such that each one always faces the other. After what time will they meet each other?



(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$ (3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

PMP074

275. Six persons of same mass travel with same speed u along a regular hexagon of side 'd' such that each one always faces the other. After how much time will they meet each other ?



(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$ (3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

PMP075

276. A person walks up a stalled escalator in 45 sec. He is carried in 60s, when standing on the same escalator which is now moving. The time he would take to walk up the moving escalator will be :–
(1) 27 s (2) 72 s
(3) 18 s (4) 25.71 s

PMP076

277. A bus starts from rest moving with an acceleration of $2m/s^2$. A cyclist, 96 m behind the bus starts simultaneously towards the bus at 20 m/s. After what time will he be able to overtake the bus :–
(1) 8 s (2) 10 s (3) 12 s (4) 1 s

PMP077

278. A boat takes 2 hours to go 10 km and come back in still water lake. The time taken for going 10 km upstream and coming back with water velocity of 5 km/h is :
(1) 140 min (2) 150 min
(3) 160 min (4) 170 min

PMP078

279. A river 2 km wide flows at the rate of 2km/h. A boatman who can row a boat at a speed of 6 km/h in still water, goes a distance of 2 km upstream and then comes back. The time taken by him to complete his journey is
(1) 60 min (2) 45 min
(3) 80 min (4) 90 min

PMP079

280. Two bodies are held separated by 9.8 m vertically one above the other. They are released simultaneously to fall freely under gravity. After 2 s the relative distance between them is :-
(1) 4.9 m (2) 19.6 m
(3) 9.8 m (4) 39.2m

PMP080

281. Two balls are thrown simultaneously, (A) vertically upwards with a speed of 20 m/s from the ground and (B) vertically downwards from a height of 80 m with the same speed and along the same line of motion. At which point will the balls collide? (take $g = 10\ m/s^2$)
(1) 15 m above from the ground
(2) 15 m below from the top of the tower
(3) 20 m above from the ground
(4) 20 m below from the top of the tower

PMP081

282. While sitting on a tree branch 20m above the ground, you drop a walnut. When the walnut has fallen 5m, you throws a second walnut straight down. What initial speed must you give the second walnut if they are both to reach the ground at the same time?
($g=10ms^{-2}$)
(1) 5 ms^{-1} (2) 10 ms^{-1}
(3) 15 ms^{-1} (4) None of these

PMP082

283. A body A is thrown up vertically from the ground with velocity v_0 and another body B is simultaneously dropped from a height H. They meet at a height $\frac{H}{2}$ if v_0 is equal to

(1) $\sqrt{2gH}$ (2) $\sqrt{gH}$
(3) $\frac{1}{2}\sqrt{gH}$ (4) $\sqrt{\frac{2g}{H}}$

PMP083

284. An elevator is accelerating upward at a rate of 6 ft/sec^2 when a bolt from its ceiling falls to the floor of the lift (Distance = 19 feet). The time (in seconds) taken by the falling bolt to hit the floor is (take g = 32 ft/ sec^2)
(1) $\sqrt{2}$ (2) 1
(3) $2\sqrt{2}$ (4) $\frac{1}{2\sqrt{2}}$

PMP084

RELATIVE MOTION IN TWO DIMENSION

285. A boat is sent across a river with a velocity of 8km/hr. If the resultant velocity of boat is 10 km/hr, then velocity of the river is
(1) 10 km/hr (2) 8 km/hr
(3) 6 km/hr (4) 4 km/hr

PMP085

286. A bird is flying towards south with a velocity 40km/h and a train is moving with a velocity 40 km/h towards east. What is the velocity of the bird w.r.t. an observer in the train ?
(1) $40\sqrt{2}$ km/h. N-E (2) $40\sqrt{2}$ km/h. S-E
(3) $40\sqrt{2}$ km/h. S-W (4) $40\sqrt{2}$ km/h. N-W

PMP086

287. A bird is flying with a speed of 40 km/h in the north direction. A train is moving with a speed of 30 km/h in the west direction. A passenger sitting in the train will see the bird moving with velocity :
(1) 50 km/hr, 53° North of east
(2) 50 km/hr, 37° North of east
(3) 50 km/hr, 53° East of north
(4) 50 km/hr in North East direction

PMP087

288. A boat is sailing with a velocity $(3\hat{i}+4\hat{j})$ with respect to ground and water in river is flowing with a velocity $(-6\hat{i}-8\hat{j})$. Relative velocity of the boat with respect to water is :
(1) $8\hat{j}$ (2) $9\hat{i}+12\hat{j}$
(3) $6\hat{i}+8\hat{j}$ (4) $-6\hat{i}-8\hat{j}$

PMP088

289. Let $\vec{r}_1(t)=3t\hat{i}+4t^2\hat{j}$ and $\vec{r}_2(t)=4t^2\hat{i}+3t\hat{j}$ represent the positions of particles 1 and 2, respectively as functions of time t; $\vec{r}_1(t)$ and $\vec{r}_2(t)$ are in metres and t is in seconds. The relative speed of the two particles at the instant t = 2 sec, will be
(1) 1 m/s (2) $13\sqrt{2}$ m/s
(3) $5\sqrt{2}$ m/s (4) $7\sqrt{2}$ m/s

PMP089

290. Rain is falling vertically with a speed of 3 m/s. If a man is running with the same speed then the velocity of rain w.r.t. man is :-
(1) 3 m/s (2) 6 m/s
(3) 4.2 m/s (4) 0 m/s

PMP090

291. A man is walking on a road with a velocity of 5km/h. When suddenly it starts raining, velocity of rain is 10km/h in vertically downward direction, relative velocity of the rain with respect to man is :
(1) $\sqrt{13}$ km/hr (2) $\sqrt{7}$ km/hr
(3) $\sqrt{109}$ km/hr (4) $5\sqrt{5}$ km/hr

PMP091

292. If the rain is falling vertically downwards with velocity 20 m/s and if a bike is going with velocity 30 m/s. Calculate at what angle from the vertical a man on the bike must incline his umbrella so that he can save himself from rain :-

(1) $\tan^{-1}\left(\frac{2}{3}\right)$ (2) $\tan^{-1}\left(\frac{3}{2}\right)$

(3) $\tan^{-1}(1)$ (4) $\tan^{-1}\left(\frac{6}{5}\right)$

PMP092

293. If rain is falling at some angle from vertical and has horizontal velocity 2 m/s in east direction. With what velocity a man must move on the horizontal surface so that rain will appear vertical to him :-

(1) 4 m/s in east direction

(2) 2 m/s in east direction

(3) 2 m/s in west direction

(4) 2 m/s in a circular path

PMP093

294. A boy is running on a levelled road with velocity (u) with a long hollow tube in his hand. Water is falling vertically downwards with velocity (v). At what angle to the vertical, should he incline the tube so that the water drops enters without touching its side :

(1) $\tan^{-1}\left(\frac{v}{u}\right)$ (2) $\sin^{-1}\left(\frac{v}{u}\right)$

(3) $\tan^{-1}\left(\frac{u}{v}\right)$ (4) $\cos^{-1}\left(\frac{v}{u}\right)$

PMP094

295. A river is flowing at the rate of 8 km/h. A swimmer swims across the river with a velocity of 10 km/h w.r.t. water. The resultant velocity of the man will be in (km/h):-

(1) $\sqrt{117}$ (2) $\sqrt{340}$

(3) $\sqrt{164}$ (4) $3\sqrt{40}$

PMP095

296. A river is flowing from W to E with a speed of 5 m/min. A man can swim in still water with a velocity 10 m/min. In which direction should the man swim so as to take the shortest possible path to go to the north :-

(1) 30° with downstream

(2) 60° with downstream

(3) 120° with downstream

(4) South

PMP096

297. A river 4.0 miles wide is flowing at the rate of 2 miles/hr. The minimum time taken by a boat to cross the river with a speed v = 2 miles/hr (in still water) is approximately

(1) 1 hr and 0 minute

(2) 2 hr

(3) 1 hr and 12 minutes

(4) 2 hr and 25 minutes

PMP097

298. A river flows from east to west with a speed of 5m/min. A man on south bank of river, capable of swimming at the rate of 10 m/min in still water, wants to swim across the river in shortest time; he should swim :

(1) due north

(2) due north-east

(3) due north-east with double the speed of river

(4) none of the above

PMP098

299. A boat-man can row a boat to make it move with a speed of 10 km/h in still water. River flows steadily at the rate of 6 km/h. and the width of the river is 4 km. If the boat man cross the river along the minimum distance of approach then time elapsed in rowing the boat will be :

(1) $\frac{2\sqrt{3}}{5}$ h (2) $\frac{2}{5\sqrt{3}}$ h

(3) $\frac{3\sqrt{2}}{5}$ h (4) $\frac{1}{2}$ h

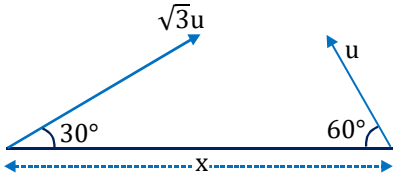
PMP099

300. A man wishes to swim across a river 0.5 km wide. If he can swim at the rate of $\sqrt{2}$ km/h in still water and the river flows at the rate of 1 km/h. The angle made by the direction (w.r.t. the flow of the river) along which he should swim so as to reach a point exactly opposite his starting point, should be :

(1) 60° (2) 120° (3) 135° (4) 90°

PMP100

301. Two particles are separated by a horizontal distance x as shown in figure. They are projected as shown in figure with different initial speeds. The time after which the horizontal distance between them becomes zero is :



(1) $\frac{x}{u}$

(2) $\frac{u}{2x}$

(3) $\frac{x}{2u}$

(4) none of these

PMP101

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	1	1	4	3	2	2	3	2	1	1	3	2	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	2	2	3	2	2	2	1	2	3	3	1	4	4	3
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	4	4	3	1	4	3	4	4	1	1	3	1	1	1	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	1	4	3	2	2	3	4	1	4	1	1	3	2	1
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	4	4	2	2	1	2	4	3	3	3	2	4	4	2	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	3	1	2	3	2	3	3	3	2	3	2	3	3	3	3
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	2	4	1	3	3	4	1	3	1	1	2	1	1	4	2
Question	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	2	1	4	2	2	3	2	2	3	3	2	3	2	3	1
Question	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Answer	1	3	1	2	3	3	2	4	2	2	4	4	2	4	2
Question	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Answer	1	2	4	4	3	3	2	3	1	1	1	1	2	3	4
Question	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Answer	4	4	2	3	4	1	4	3	1	3	4	4	4	4	3
Question	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Answer	3	2	1	3	1	4	4	1	2	4	2	4	2	3	3
Question	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Answer	2	3	3	2	1	2	4	3	2	1	2	1	1	2	3
Question	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
Answer	2	2	1	2	4	1	4	4	2	3	2	1	1	4	1
Question	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
Answer	3	3	4	1	3	3	3	1	1	3	4	2	3	1	2
Question	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
Answer	3	4	2	3	2	1	1	1	1	2	1	3	2	2	2
Question	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
Answer	1	2	3	2	3	1	2	1	4	2	4	3	4	2	3
Question	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
Answer	2	3	2	2	4	2	1	3	1	3	3	2	4	2	3
Question	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
Answer	2	4	2	1	3	4	1	3	2	3	3	3	2	2	3
Question	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
Answer	3	1	2	2	3	4	2	2	3	3	3	2	1	4	3
Question	301														
Answer	3														

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2014

1. A projectile is fired from the surface of the earth with a velocity of 5 m/s and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m/s at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in m/s^2) is: (given g = 9.8 m/s^2)

(1) 3.5 (2) 5.9

(3) 16.3 (4) 110.8

PMP130

2. A particle is moving such that its position coordinates (x, y) are

(2m, 3m) at time t = 0

(6m, 7m) at time t = 2 s and

(13m, 14m) at time t = 5s.

Average velocity vector ($\vec{V}_{av}$) from t = 0 to t = 5 s is

(1) $\frac{1}{5}\left(13\hat{i}+14\hat{j}\right)$ (2) $\frac{7}{3}\left(\hat{i}+\hat{j}\right)$

(3) $2\left(\hat{i}+\hat{j}\right)$ (4) $\frac{11}{5}\left(\hat{i}+\hat{j}\right)$

PMP131

AIPMT 2015

3. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$v(x) = \beta x^{-2n}$

where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x, is given by :

(1) $-2n\beta^2x^{-4n-1}$ (2) $-2\beta^2x^{-2n+1}$

(3) $-2n\beta^2e^{-4n+1}$ (4) $-2n\beta^2x^{-2n-1}$

PMP132

4. A ship A is moving Westwards with a speed of 10 km/h and a ship B 100 km South of A, is moving Northwards with a speed of 10 km/h. The time after which the distance between them becomes shortest, is :-

(1) 5 h (2) $5\sqrt{2}$ h

(3) $10\sqrt{2}$ h (4) 0 h

PMP133

Re-AIPMT 2015

5. Two particles A and B, move with constant velocities $\vec{v}_1$ and $\vec{v}_2$. At the initial moment their position vectors are $\vec{r}_1$ and $\vec{r}_2$ respectively. The condition for particle A and B for their collision is:-

(1) $\vec{r}_1-\vec{r}_2=\vec{v}_1-\vec{v}_2$ (2) $\frac{\vec{r}_1-\vec{r}_2}{|\vec{r}_1-\vec{r}_2|}=\frac{\vec{v}_2-\vec{v}_1}{|\vec{v}_2-\vec{v}_1|}$

(3) $\vec{r}_1\cdot\vec{v}_1=\vec{r}_2\cdot\vec{v}_2$ (4) $\vec{r}_1\times\vec{v}_1=\vec{r}_2\times\vec{v}_2$

PMP134

NEET-I 2016

6. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is :-

(1) $\frac{3}{2}A+4B$ (2) 3A+7B

(3) $\frac{3}{2}A+\frac{7}{3}B$ (4) $\frac{A}{2}+\frac{B}{3}$

PMP135

NEET-II 2016

7. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

(1) $\frac{a+f}{2(1+b)}$ (2) $\frac{f-a}{2(1+b)}$

(3) $\frac{a-f}{1+b}$ (4) $\frac{a+f}{2(b-1)}$

PMP136

NEET(UG) 2017

8. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be

(1) $\frac{t_1t_2}{t_2-t_1}$ (2) $\frac{t_1t_2}{t_2+t_1}$

(3) $t_1 - t_2$ (4) $\frac{t_1+t_2}{2}$

PMP137

9. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at t = 2s is :-

(1) 5 m/s² (2) – 4 m/s²
(3) – 8 m/s² (4) 0

PMP138

NEET(UG) 2019

10. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :

(1) 30° west (2) 0°
(3) 60° west (4) 45° west

PMP139

11. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object the shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be

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

PMP140

NEET(UG) 2019 (Odisha)

12. A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time t_1 if the elevator is at rest and in time t_2 if the elevator is moving uniformly. Then :-

(1) $t_1 < t_2$ or $t_1 > t_2$ depending upon whether the lift is going up or down
(2) $t_1 < t_2$
(3) $t_1 > t_2$
(4) $t_1 = t_2$

PMP141

13. Two bullets are fired horizontally and simultaneously towards each other from roof tops of two buildings 100 m apart and of same height of 200m with the same velocity of 25 m/s. When and where will the two bullets collide. (g =10 m/s²)

(1) after 2s at a height 180 m
(2) after 2s at a height of 20 m
(3) after 4s at a height of 120 m
(4) they will not collide

PMP142

14. A person travelling in a straight line moves with a constant velocity v_1 for certain distance 'x' and with a constant velocity v_2 for next equal distance. The average velocity v is given by the relation

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

(3) $\frac{v}{2}=\frac{v_1+v_2}{2}$ (4) $v=\sqrt{v_1v_2}$

PMP143

NEET(UG) 2020

15. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is :

(g = 10 m/s²)

(1) 300 m (2) 360 m
(3) 340 m (4) 320 m

PMP144

NEET(UG) 2020 (Covid-19)

16. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window?

(g = 10 m/s²)

(1) 15.5 m/s (2) 14.5 m/s
(3) 4.5 m/s (4) 20 m/s

PMP145

NEET(UG) 2021

17. A small block slides down on a smooth inclined plane, starting from rest at time t = 0. Let S_n be the distance travelled by the block in the interval t = n – 1 to t = n. Then, the ratio $\frac{S_n}{S_{n+1}}$ is :

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

PMP146

18. A car starts from rest and accelerates at 5 m/s². At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s ? (Take g = 10 m/s²)

(1) 20 m/s, 5 m/s² (2) 20 m/s, 0

(3) $20\sqrt{2}$ m/s, 0 (4) $20\sqrt{2}$ m/s, 10 m/s²

PMP147

19. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution.

If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals 4R. The angle of projection, θ, is then given by :

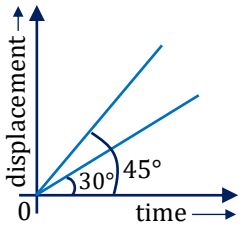
(1) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$ (2) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$

(3) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$ (4) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$

PMP148

NEET(UG) 2022

20. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



(1) 1 : 1 (2) 1 : 2

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

PMP149

21. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :

(1) 1 : 4 : 9 : 16 (2) 1 : 3 : 5 : 7

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

PMP150

22. A ball is projected with a velocity, 10 ms⁻¹, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

(1) $5\sqrt{3}$ ms⁻¹ (2) 5 ms⁻¹

(3) 10 ms⁻¹ (4) Zero

PMP151

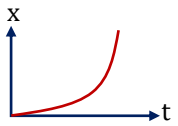
RE-NEET(UG) 2022

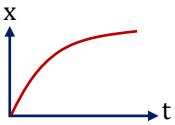
23. A cricket ball is thrown by a player at a speed of 20 m/s in a direction 30° above the horizontal. The maximum height attained by the ball during its motion is : (g = 10 m/s²)

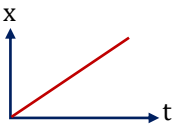
(1) 5 m (2) 10 m (3) 20 m (4) 25 m

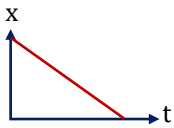
PMP152

24. The position-time (x – t) graph for positive acceleration is :

(1) 

(2) 

(3) 

(4) 

PMP153

NEET(UG) 2023

25. A bullet is fired from a gun at the speed of 280 ms⁻¹ in the direction 30° above the horizontal. The maximum height attained by the bullet is $\left(g = 9.8 ms^{-2}, \sin 30° = 0.5\right)$:-

(1) 2000 m (2) 1000 m

(3) 3000 m (4) 2800 m

PMP172

26. A vehicle travels half the distance with speed υ and the remaining distance with speed 2υ. Its average speed is :

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

(3) $\frac{3\upsilon}{4}$ (4) $\frac{\upsilon}{3}$

PMP173

27. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity 4 ms^{-1}. The ball strikes the water surface after 4s. The height of bridge above water surface is (Take g = 10 m s^{-2})

(1) 60 m (2) 64 m
(3) 68 m (4) 56 m

PMP174

28. A bullet from a gun is fired on a rectangular wooden block with velocity *u*. When bullet travels 24 cm through the block along its length horizontally, velocity of bullet becomes $\frac{u}{3}$. Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is :

(1) 24 cm (2) 28 cm
(3) 30 cm (4) 27 cm

PMP175

RE-NEET(UG) 2023

29. The position of a particle is given by

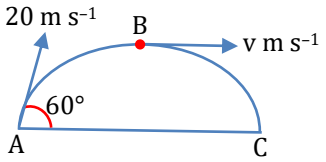
$\vec{r}(t)=4t\,\hat{i}+2t^2\,\hat{j}+5\,\hat{k}$

where t is in seconds and r in metre. Find the magnitude and direction of velocity v(t), at t = 1s, with respect to x-axis

(1) $4\sqrt{2}$ ms^{-1}, 45° (2) $4\sqrt{2}$ ms^{-1}, 60°
(3) $3\sqrt{2}$ ms^{-1}, 30° (4) $3\sqrt{2}$ ms^{-1}, 45°

PMP176

30. A ball is projected from point A with velocity 20 m s^{-1} at an angle 60° to the horizontal direction. At the highest point B of the path (as shown in figure), the velocity v m s^{-1} of the ball will be:

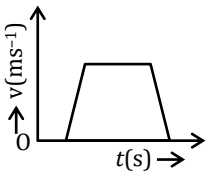


(1) 20 (2) $10\sqrt{3}$ (3) Zero (4) 10

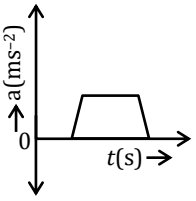
PMP177

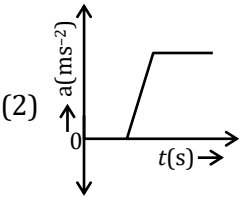
NEET(UG) 2024

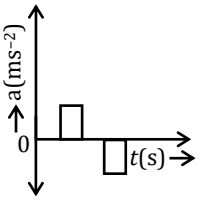
31. The velocity (v) – time (t) plot of the motion of a body is shown below :

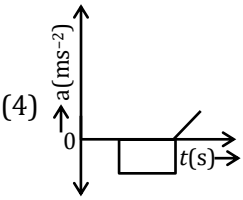


The acceleration (a) – time (t) graph that best suits this motion is :

(1) 

(2) 

(3) 

(4) 

PMP178

RE-NEET(UG) 2024

32. A particle is moving along x-axis with its position (x) varying with time (t) as $x = \alpha t^4 + \beta t^2 + \gamma t + \delta$. The ratio of its initial velocity to its initial acceleration, respectively is :

(1) $2\alpha : \delta$ (2) $\gamma : 2\delta$
(3) $4\alpha : \beta$ (4) $\gamma : 2\beta$

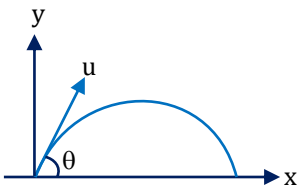
PMP179

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	4	1	1	2	3	2	2	2	1	3	4	1	2	1
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	2	2	4	4	3	2	1	1	1	2	2	2	4	1	4
Question	31	32													
Answer	3	4													

Exercise – III (Analytical Questions) Master Your Understanding

1. For ground to ground projectile motion with initial velocity u at angle θ from horizontal.



(A)	Change in speed from initial to final point	(i)	u–ucosθ
(B)	Magnitude of change in velocity from initial to final point	(ii)	usinθ
(C)	Change in speed from initial to top	(iii)	2usinθ
(D)	Magnitude of change in velocity from initial to top	(iv)	zero

Options :-

(1) (A)–(i), (B)–(ii), (C)–(iii), (D)–(iv)
(2) (A)–(iv), (B)–(ii), (C)–(i), (D)–(iii)
(3) (A)–(iv), (B)–(iii), (C)–(i), (D)–(ii)
(4) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)

PMP154

2. For initial velocity $(\vec{v}_i) = 3\hat{i} - 4\hat{j}$ and final velocity $(\vec{v}_f) = 3\hat{i} + 4\hat{j}$:-

(A) $|\Delta\vec{v}|$ (i) $8\hat{j}$
(B) $\Delta|\vec{v}|$ (ii) $6\hat{i}$
(C) $\vec{v}_f - \vec{v}_i$ (iii) 0
(D) $\vec{v}_f + \vec{v}_i$ (iv) 8

(1) (A)–(iii), (B)–(iv), (C)–(ii), (D)–(i)
(2) (A)–(iii), (B)–(iv), (C)–(i), (D)–(ii)
(3) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)
(4) (A)–(iv), (B)–(iii), (C)–(i), (D)–(ii)

PMP155

3. A particle is projected vertically upward from ground with initial velocity u such that it clears the top of a pole of height h after time t_1 in its path. It takes further time t_2 to reach the ground.

(A) u (i) $\frac{(t_1+t_2)^2}{8}g$
(B) h (ii) $(t_1 + t_2)$
(C) Time of flight (iii) $\frac{1}{2}g(t_1 + t_2)$
(D) Maximum height (iv) $\frac{1}{2}gt_1t_2$

(1) (A)–(ii), (B)–(i), (C)–(iii), (D)–(iv)
(2) (A)–(i), (B)–(ii), (C)–(iii), (D)–(iv)
(3) (A)–(iii), (B)–(iv), (C)–(ii), (D)–(i)
(4) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)

PMP156

4. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Horizontal component of velocity is constant in projectile motion under gravity.

Reason (R) : Two projectiles having same horizontal range must have the same time of flight.

In the light of the above statements, choose the most appropriate answer from the options given below:

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

PMP158

5. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : A particle with constant acceleration always moves along a straight line.

Reason (R) : A particle with constant acceleration will not change direction of motion.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) Both **(A)** and **(R)** are false.

PMP159

6. An object may have-

(A) varying speed without having varying velocity

(B) varying velocity without having varying speed

(C) non-zero acceleration without having varying velocity

(D) non-zero acceleration without having varying speed

(1) Only B is correct

(2) Only D is correct

(3) Both B and D are correct

(4) All are correct

PMP160

7. The velocity of a particle is zero at t = 0, then -

(A) the acceleration at t = 0 must be zero

(B) the acceleration at t = 0 may be zero

(C) if the acceleration is zero from t = 0 to t = 10 s, speed is also zero in this interval

(D) if the speed is zero from t = 0 to t = 10 sec, the acceleration is also zero in the interval

(1) (A), (C) and (D) are correct

(2) (B), (C) and (D) are correct

(3) (A) and (D) are correct

(4) (B) and (C) are correct

PMP161

8. Instantaneous velocity of a particle -

(A) depends on instantaneous position

(B) depends on instantaneous speed

(C) independent of instantaneous position

(D) independent of instantaneous speed

(1) Both (A) & (B) are correct

(2) Both (C) & (D) are correct

(3) Both (A) & (D) are correct

(4) Both (B) & (C) are correct

PMP163

9. If the velocity of a body is constant -

(A) |Velocity| = speed

(B) |Average velocity| = speed

(C) Velocity = average velocity

(D) Speed = average speed

(1) Only (A) is correct

(2) (A) and (B) are correct

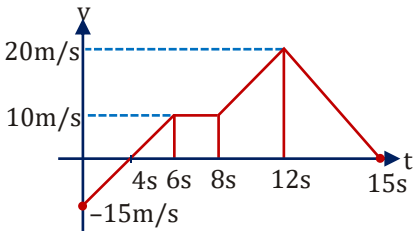
(3) (C) and (D) are correct

(4) All are correct

PMP165

Paragraph for Question Nos. 10 to 12

A moving particle is acted upon by three forces at different times to bring it to rest. Its velocity versus time graph is given below



10. The average speed for the first 6 s is

(1) zero (2) $\frac{5}{3}$ ms^{-1}

(3) $\frac{10}{3}$ ms^{-1} (4) $\frac{20}{3}$ ms^{-1}

PMP168

11. The average velocity for the first 12s is

(1) zero (2) 5 m/s

(3) $\frac{10}{3}$ m/s (4) 10 m/s

PMP169

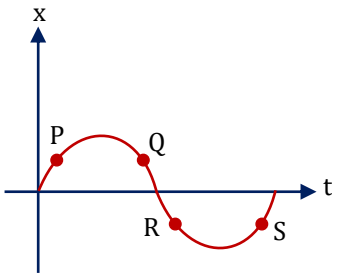
12. The average acceleration from t = 5s to t = 15s is

(1) zero (2) –0.5 m/s^2

(3) +0.5 m/s^2 (4) 1 m/s^2

PMP170

13. A car is moving along a straight line. It's displacement (x) - time(t) graph is shown in column II. Match the entries in column I with points on graph.



Column I	Column II
(A) x → negative, v → positive, a → positive	(P) P
(B) x → positive, v → negative, a→ negative	(Q) Q
(C) x → negative, v → negative, a→ positive	(R) R
(D) x → positive, v → positive, a → negative	(S) S

Options :-
(1) A → S, B → Q, C → R, D → P
(2) A → P, B → R, C → Q, D → S
(3) A → S, B → R, C → Q, D → P
(4) A → S, B → Q, C → R, D → S

PMP171

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer	3	4	3	3	4	3	2	4	4	4	2	2	1

Important Notes