***Problem* 1.** A man goes $10m$ towards North, then $20m$ towards east then displacement is

(a) $22.5m$ (b) $25m$ (c) $25.5m$ (d) $30m$

***Problem* 2.** A body moves over one fourth of a circular arc in a circle of radius r. The magnitude of distance travelled and displacement will be respectively

(a) $\frac{\pi}{2}r, r\sqrt{2}$ (b) $\frac{\pi r}{4}, r$ (c) $\pi r, \sqrt{r}$ (d) $\pi r, r$

***Problem* 3.** The displacement of the point of the wheel initially in contact with the ground, when the wheel roles forward half a revolution will be (radius of the wheel is R)

(a) $\frac{R}{\pi + 4}$ (b) $R\sqrt{\pi^2 + 4}$ (c) $\frac{2\pi}{R}$ (d) πR

***Problem* 4.** If a car covers $2/5^{th}$ of the total distance with v_1 speed and $3/5^{th}$ distance with v_2 then average speed is

(a) $\frac{1}{2}\sqrt{v_1 v_2}$ (b) $\frac{v_1 + v_2}{2}$ (c) $\frac{2v_1 v_2}{v_1 + v_2}$ (d) $\frac{5v_1 v_2}{3v_1 + 2v_2}$

***Problem* 5.** A car accelerated from initial position and then returned at initial point, then

(a) Velocity is zero but speed increases (b) Speed is zero but velocity increases (c) Both speed and velocity increase (d) Both speed and velocity decrease

***Problem* 6.** A man walks on a straight road from his home to a market 2.5 *km* away with a speed of 5 *km/h*. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 *km/h*. The average speed of the man over the interval of time 0 to 40 *min*. is equal to

(a) 5 *km/h* (b) $\frac{25}{4}$ *km/h* (c) $\frac{30}{4}$ *km/h* (d) $\frac{45}{8}$ *km/h*

***Problem* 7.** The relation $3t - \sqrt{3x} + 6$ describes the displacement of a particle in one direction where x is in *metres* and t in sec. The displacement, when velocity is zero, is

(a) 24 *metres* (b) 12 *metres* (c) 5 *metres* (d) Zero

***Problem* 8.** The motion of a particle is described by the equation $x = a + bt^2$ where $a = 15\ cm$ and $b = 3\ cm$. Its instantaneous velocity at time 3 *sec* will be

(a) 36 *cm/sec* (b) 18 *cm/sec* (c) 16 *cm/sec* (d) 32 *cm/sec*

***Problem* 9.** A train has a speed of 60 *km/h* for the first one hour and 40 *km/h* for the next half hour. Its average speed in *km/h* is (a) 50 (b) 53.33 (c) 48 (d) 70

***Problem* 10.** A person completes half of its his journey with speed v_1 and rest half with speed v_2. The average speed of the person is

(a) $v = \frac{v_1 + v_2}{2}$ (b) $v = \frac{2 v_1 v_2}{v_1 + v_2}$ (c) $v = \frac{v_1 v_2}{v_1 + v_2}$ $)(= v\, d\, \sqrt{v_2 v_1 v}$

***Problem* 11.** A car moving on a straight road covers one third of the distance with 20 *km/hr* and the rest with 60 *km/hr*. The average speed is

(a) 40 *km/hr* (b) 80 *km/hr* (c) $46\frac{2}{3}$ *km /hr* (d) 36 *km/hr*

***Problem* 12.** The displacement of a particle, moving in a straight line, is given by $s = 2t^2 + 2t + 4$ where s is in *metres* and t in seconds. The acceleration of the particle is

(a) 2 m/s^2 (b) 4 m/s^2 (c) 6 m/s^2 (d) 8 m/s^2

***Problem* 13.** The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to

(a) $\frac{a}{b}$ (b) $\frac{2a}{3b}$ (c) $\frac{a}{3b}$ (d) Zero

***Problem* 14.** The displacement of the particle is given by $y = a + bt + ct^2 - dt^4$. The initial velocity and acceleration are respectively

(a) $b, -4d$ (b) $-b, 2c$ (c) $b, 2c$ (d) $2c, -4d$

***Problem* 15.** The relation between time t and distance x is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is (v is the velocity)

(a) $2\alpha v^3$ (b) $2\beta v^3$ (c) $2\alpha\beta v^3$ (d) $2\beta^2 v^3$

***Problem* 16.** If displacement of a particle is directly proportional to the square of time. Then particle is moving with

(a) Uniform acceleration (b) Variable acceleration
(c) Uniform velocity (d) Variable acceleration but uniform velocity

***Problem* 17.** A particle is moving eastwards with velocity of 5 *m/s*. In 10 *sec* the velocity changes to 5 *m/s* northwards. The average acceleration in this time is

(a) Zero (b) $\frac{1}{\sqrt{2}}$ m/s^2 toward north-west

(c) $\frac{1}{\sqrt{2}}$ m/s^2 toward north-east (d) $\frac{1}{2}$ m/s^2 toward north-west

***Problem* 18.** A body starts from the origin and moves along the x-axis such that velocity at any instant is given by $(4t^3 - 2t)$, where t is in second and velocity is in *m/s*. What is the acceleration of the particle, when it is 2*m* from the origin?

(a) 28 m/s^2 (b) 22 m/s^2 (c) 12 m/s^2 (d) 10 m/s^2

***Problem* 19.** A body of mass 10 *kg* is moving with a constant velocity of 10 *m/s*. When a constant force acts for 4 *sec* on it, it moves with a velocity 2 *m/sec* in the opposite direction. The acceleration produced in it is

(a) 3 m/s^2 (b) -3 m/s^2 (c) 0.3 m/s^2 (d) -0.3 m/s^2

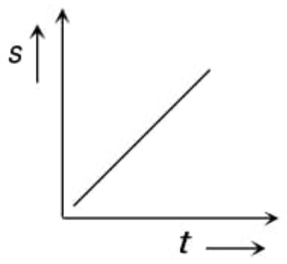
***Problem* 20.** The position of a particle moving along the x-axis at certain times is given below :

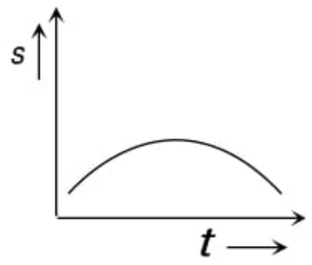
t (*s*)	0	1	2	3
x (*m*)	-2	0	6	16

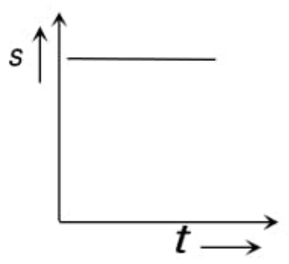
Which of the following describes the motion correctly

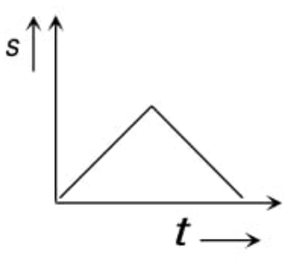
(a) Uniform, accelerated (b) Uniform, decelerated
(c) Non-uniform, accelerated (d) (d) There is not enough data for generalisation

***Problem* 21.** Which of the following graph represents uniform motion

(a) 

(b) 

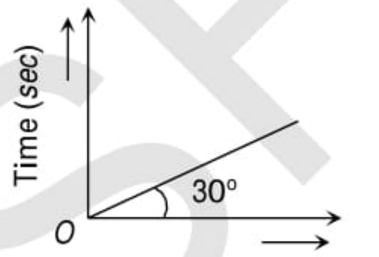
(c) 

(d) 

***Problem* 22.** The displacement-time graph for two particles A and B are straight lines inclined at angles of 30^o and 60^o with the time axis. The ratio of velocities of $v_A : v_B$ is

(a) $1 : 2$ (b) $1 : \sqrt{3}$ (c) $\sqrt{3} : 1$ (d) $1 : 3$

***Problem* 23.** From the following displacement time graph find out the velocity of a moving body



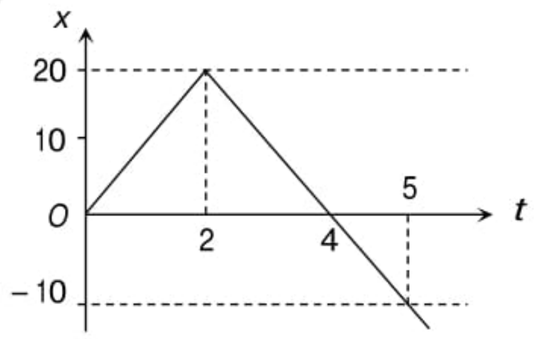
(a) $\frac{1}{\sqrt{3}}$ m/s

(b) 3 m/s

(c) $\sqrt{3}$ m/s

(d) $\frac{1}{3}$

***Problem* 24.** The diagram shows the displacement-time graph for a particle moving in a straight line. The average velocity for the interval $t = 0, t = 5$ is



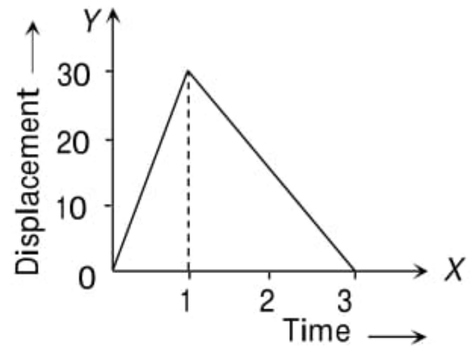
(a) 0

(b) $6\ ms^{-1}$

(c) $-2\ ms^{-1}$

(d) $2\ ms^{-1}$

***Problem* 25.** Figure shows the displacement time graph of a body. What is the ratio of the speed in the first second and that in the next two seconds



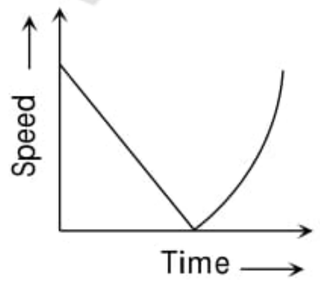
(a) 1 : 2

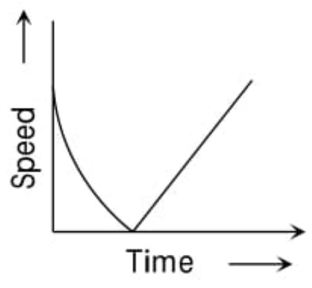
(b) 1 : 3

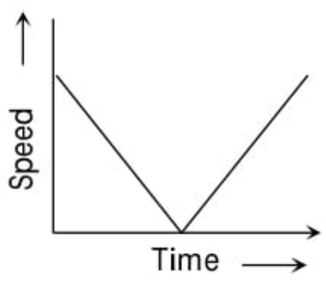
(c) 3 : 1

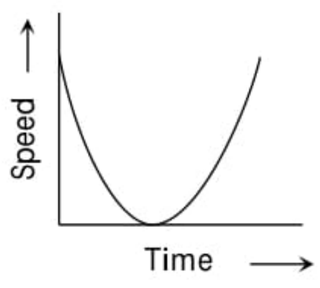
(d) 2 : 1

***Problem* 26.** A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its flight if the air resistance is not ignored

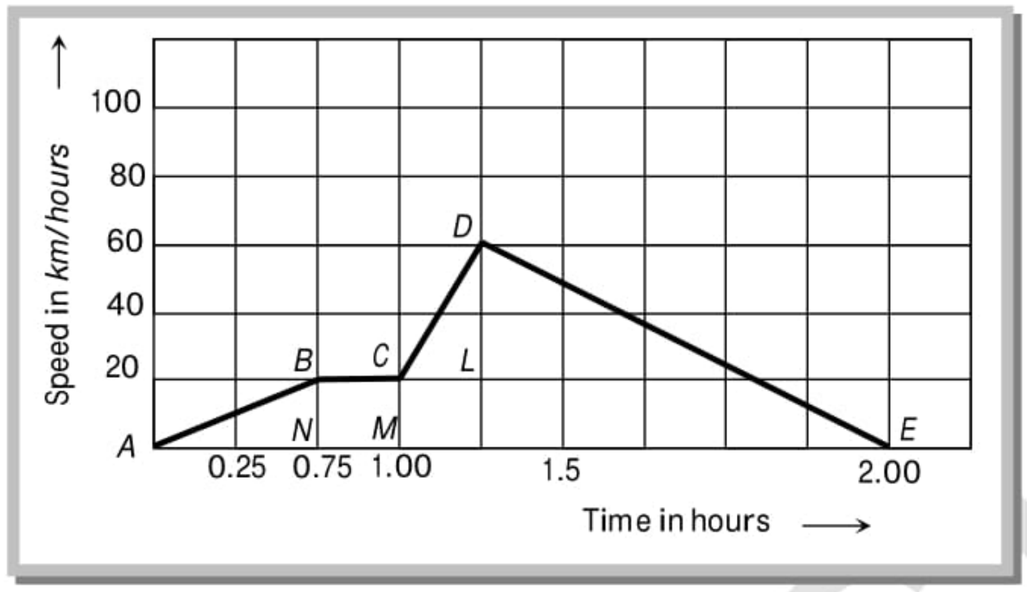
(a) 

(b) 

(c) 

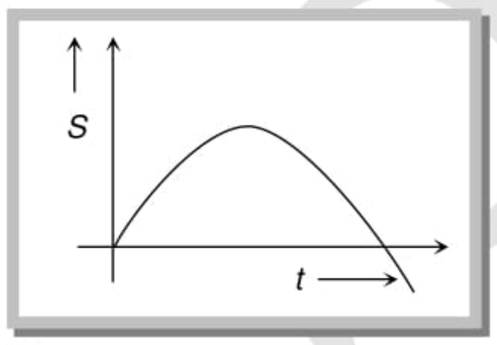
(d) 

***Problem* 27.** A train moves from one station to another in 2 hours time. Its speed-time graph during this motion is shown in the figure. The maximum acceleration during the journey is

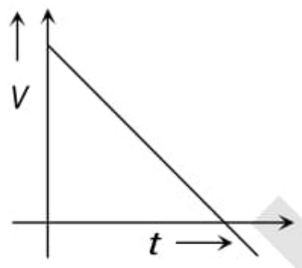


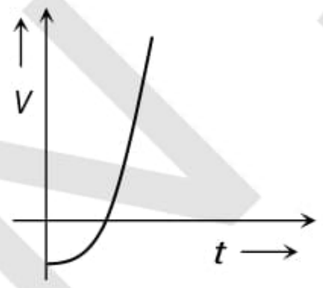
(a) 140 $km\ h^{-2}$ (b) 160 $km\ h^{-2}$ (c) 100 $km\ h^{-2}$ (d) 120 $km\ h^{-2}$

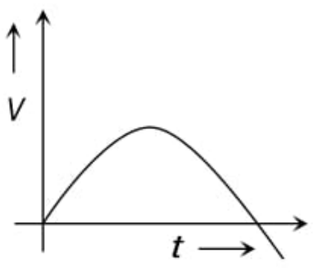
***Problem* 28.** The graph of displacement *v/s* time is

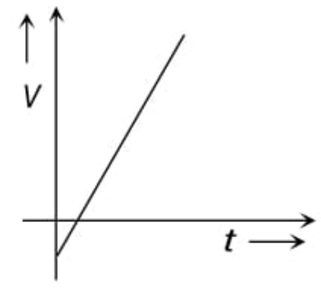


Its corresponding velocity-time graph will be

(a) 

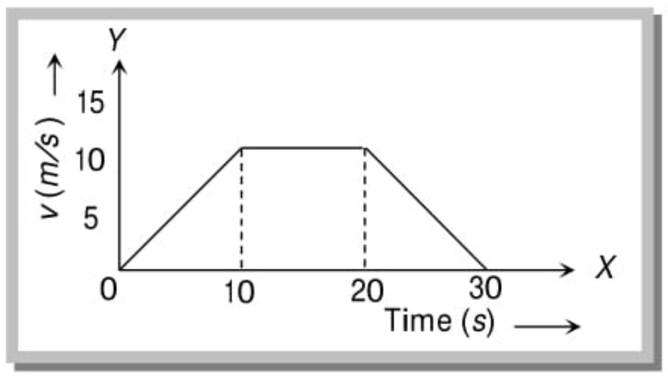
(b) 

(c) 

(d) 

***Problem* 29.** In the following graph, distance travelled by the body in *metres* is

(a) 200
(b) 250
(c) 300
(d) 400



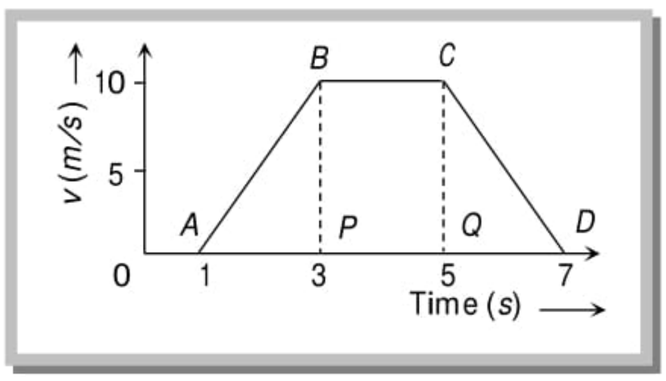
***Problem* 30.** For the velocity-time graph shown in figure below the distance covered by the body in last two seconds of its motion is what fraction of the total distance covered by it in all the seven seconds

(a) $\frac{1}{2}$

(b) $\frac{1}{4}$

(c) $\frac{1}{3}$

(d) $\frac{2}{3}$



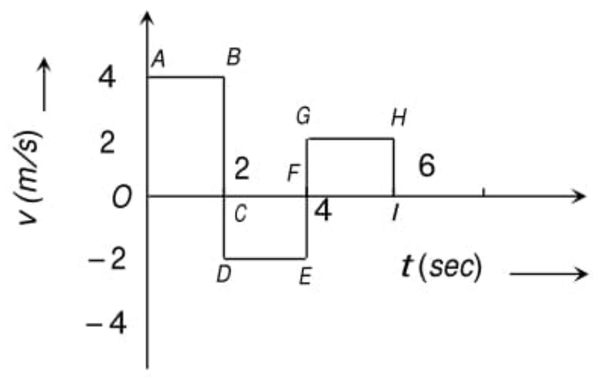
***Problem* 31.** The velocity time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 *sec* are respectively

(a) $8\,m, 16\,m$

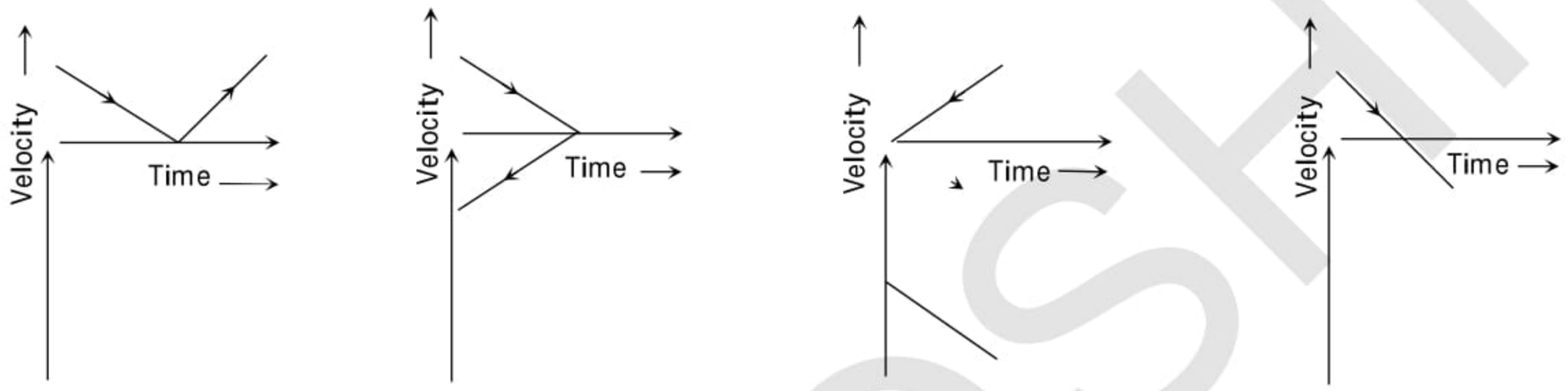
(b) $16\,m, 8\,m$

(c) $16\,m, 16\,m$

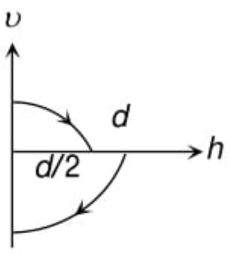
(d) $8\,m, 8\,m$

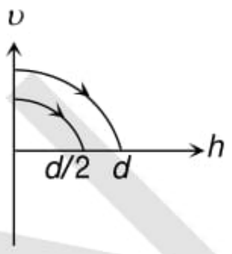


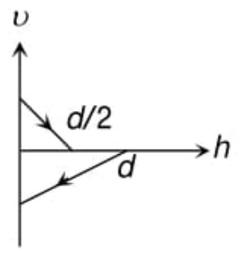
***Problem* 32.** A ball is thrown vertically upward which of the following graph represents velocity time graph of the ball during its flight (air resistance is neglected)

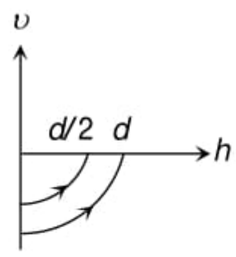


***Problem* 33.** A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height $\frac{d}{2}$. Neglecting subsequent motion and air resistance, its velocity υ varies with the height h above the ground as.

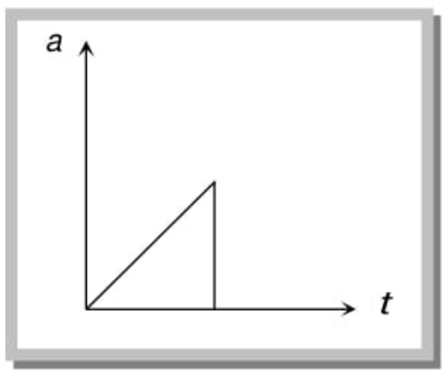
(a) 

(b) 

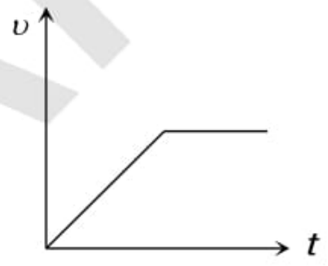
(c) 

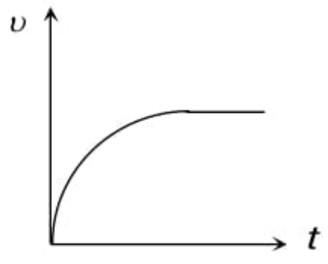
(d) 

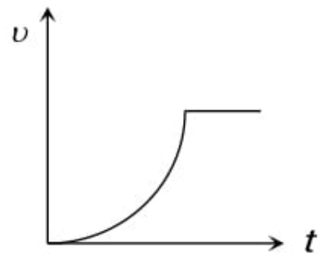
***Problem* 34.** The acceleration-time graph of a body is shown below –

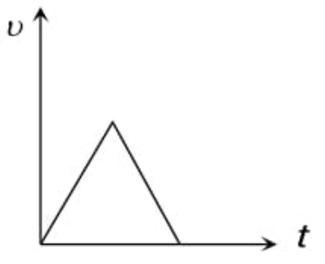


The most probable velocity-time graph of the body is

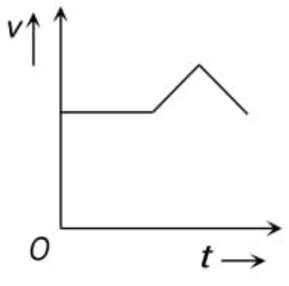
(a) 

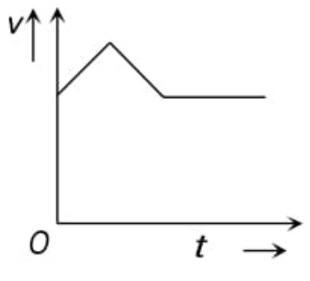
(b) 

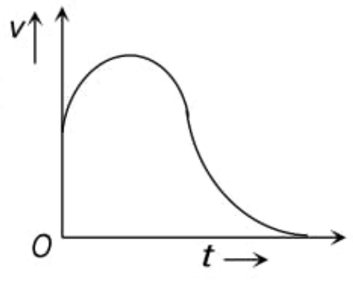
(c) 

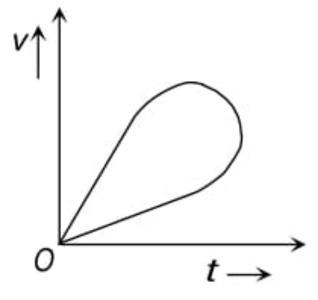
(d) 

***Problem* 35.** Which of the following velocity time graphs is not possible

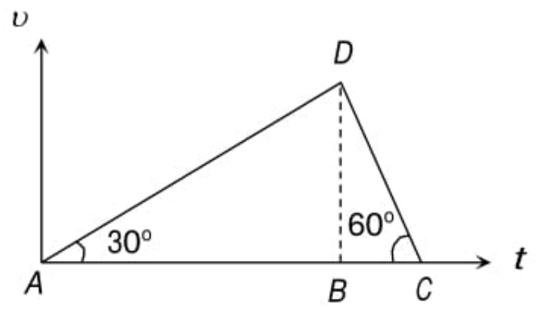
(a) 

(b) 

(c) 

(d) 

***Problem* 36.** For a certain body, the velocity-time graph is shown in the figure. The ratio of applied forces for intervals AB and BC is



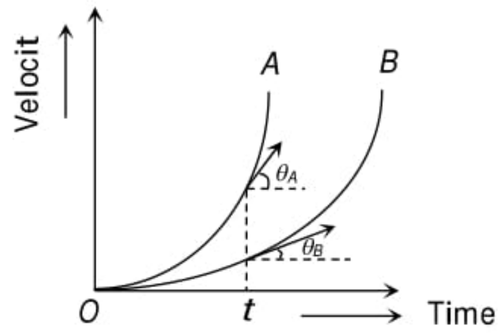
(a) $+\frac{1}{2}$

(b) $-\frac{1}{2}$

(c) $+\frac{1}{3}$

(d) $-\frac{1}{3}$

***Problem* 37.** Velocity-time graphs of two cars which start from rest at the same time, are shown in the figure. Graph shows, that



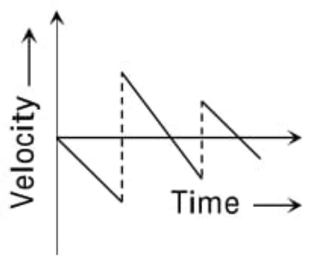
(a) Initial velocity of A is greater than the initial velocity of B

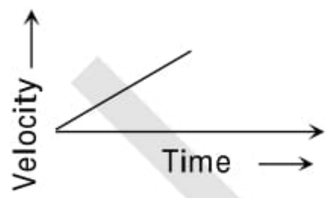
(b) Acceleration in A is increasing at lesser rate than in B

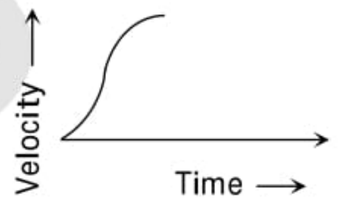
(c) Acceleration in A is greater than in B

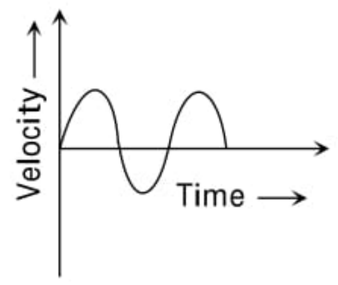
(d) Acceleration in B is greater than in A

***Problem* 38.** Which one of the following graphs represent the velocity of a steel ball which fall from a height on to a marble floor? (Here υ represents the velocity of the particle and t the time)

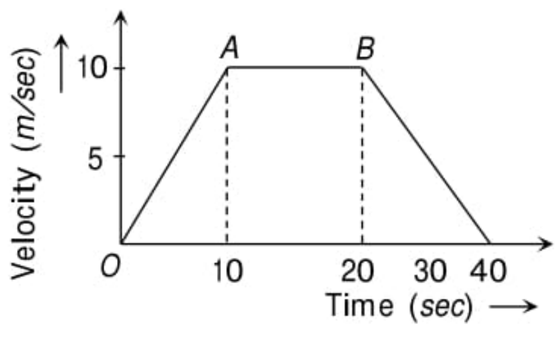
(a) 

(b) 

(c) 

(d) 

***Problem* 39.** The adjoining curve represents the velocity-time graph of a particle, its acceleration values along OA, AB and BC in *metre/sec*^{2} are respectively



(a) 1, 0, – 0.5

(b) 1, 0, 0.5

(c) 1, 1, 0.5

(d) 1, 0.5, 0

***Problem* 40.** A body A moves with a uniform acceleration a and zero initial velocity. Another body B, starts from the same point moves in the same direction with a constant velocity v. The two bodies meet after a time t. The value of t is

(a) $\frac{2v}{a}$ (b) $\frac{v}{a}$ (c) $\frac{v}{2a}$ (d) $\sqrt{\frac{v}{2a}}$

***Problem* 41.** A student is standing at a distance of 50metres from the bus. As soon as the bus starts its motion with an acceleration of $1 ms^{-2}$, the student starts running towards the bus with a uniform velocity u. Assuming the motion to be along a straight road, the minimum value of u, so that the students is able to catch the bus is

(a) $5\ ms^{-1}$ (b) $8\ ms^{-1}$ (c) $10\ ms^{-1}$ (d) $12\ ms^{-1}$

***Problem* 42.** A car, moving with a speed of 50 km/*hr*, can be stopped by brakes after at least $6m$. If the same car is moving at a speed of 100 *km/hr*, the minimum stopping distance is

(a) $6m$ (b) $12m$ (c) $18m$ (d) $24m$

***Problem* 43.** The velocity of a bullet is reduced from $200 m/s$ to $100 m/s$ while travelling through a wooden block of thickness $10 cm$. The retardation, assuming it to be uniform, will be

(a) $10 \times 10^4\ m/s^2$ (b) $12 \times 10^4\ m/s^2$ (c) $13.5 \times 10^4\ m/s^2$ (d) $15 \times 10^4\ m/s^2$

***Problem* 44.** A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5th second, after the start of A, then the ratio $a_1 : a_2$ is equal to

(a) 5 : 9 (b) 5 : 7 (c) 9 : 5 (d) 9 : 7

***Problem* 45.** The average velocity of a body moving with uniform acceleration travelling a distance of 3.06 m is 0.34 ms^{-1}. If the change in velocity of the body is $0.18 ms^{-1}$ during this time, its uniform acceleration is

(a) 0.01 ms^{-2} (b) 0.02 ms^{-2} (c) 0.03 ms^{-2} (d) 0.04 ms^{-2}

***Problem* 46.** A particle travels $10m$ in first 5 *sec* and $10^2 m$ in next 3 *sec*. Assuming constant acceleration what is the distance travelled in next 2 *sec*

(a) 8.3 m (b) 9.3 m (c) 10.3 m (d) None of above

***Problem* 47.** A body travels for 15 *sec* starting from rest with constant acceleration. If it travels distances S_1, S_2 and S_3 in the first five seconds, second five seconds and next five seconds respectively the relation between S_1, S_2 and S_3 is

(a) $S_1 = S_2 = S_3$ (b) $5S_1 = 3S_2 = S_3$ (c) $S_1 = \frac{1}{3}S_2 = \frac{1}{5}S_3$ (d) $S_1 = \frac{1}{5}S_2 = \frac{1}{3}S_3$

***Problem* 48.** If a body having initial velocity zero is moving with uniform acceleration $8\ m/\sec^2$, the distance travelled by it in fifth second will be

(a) 36 *metres* (b) 40 *metres* (c) 100 *metres* (d) Zero

***Problem* 49.** The engine of a car produces acceleration $4 m/sec^2$ in the car, if this car pulls another car of same mass, what will be the acceleration produced

(a) $8\ m/s^2$ (b) $2\ m/s^2$ (c) $4\ m/s^2$ (d) $\frac{1}{2} m/s^2$

***Problem* 50.** A body starts from rest. What is the ratio of the distance travelled by the body during the 4^{th} and 3^{rd} second.

(a) 7/5 (b) 5/7 (c) 7/3 (d) 3/7

***Problem* 51.** If a body is thrown up with the velocity of 15 m/s then maximum height attained by the body is ($g = 10\ m/s^2$)

(a) 11.25 m (b) 16.2 m (c) 24.5 m (d) 7.62 m

***Problem* 52.** A body falls from rest in the gravitational field of the earth. The distance travelled in the fifth second of its motion is ($g = 10 m/s^2$)

(a) $25m$ (b) $45m$ (c) $90m$ (d) $125m$

***Problem* 53.** If a ball is thrown vertically upwards with speed u, the distance covered during the last t seconds of its ascent is

(a) $\frac{1}{2}gt^2$ (b) $ut - \frac{1}{2}gt^2$ (c) $(u - gt)t$ (d) ut

***Problem* 54.** A man throws balls with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time (Given $g = 9.8 m/s^2$)

(a) At least 0.8 m/s (b) Any speed less than 19.6 m/s

(c) Only with speed 19.6 m/s (d) More than 19.6 m/s

***Problem* 55.** A man drops a ball downside from the roof of a tower of height 400 *meters*. At the same time another ball is thrown upside with a velocity 50 *meter/sec*. from the surface of the tower, then they will meet at which height from the surface of the tower

(a) 100 *meters* (b) 320 *meters* (c) 80 *meters* (d) 240 *meters*

***Problem* 56.** A very large number of balls are thrown vertically upwards in quick succession in such a way that the next ball is thrown when the previous one is at the maximum height. If the maximum height is $5m$, the number of ball thrown per minute is (take $g = 10\,ms^{-2}$)

(a) 120 (b) 80 (c) 60 (d) 40

***Problem* 57.** A particle is thrown vertically upwards. If its velocity at half of the maximum height is 10 *m/s*, then maximum height attained by it is (Take $g = 10$ m/s^2)

(a) 8 m (b) 10 m (c) 12 m (d) 16 m

***Problem* 58.** A stone is shot 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

(a) 60 *m/sec* (b) 65 *m/sec* (c) 70 *m/sec* (d) 75 *m/sec*

***Problem* 59.** A body freely falling from the rest has a velocity 'v' after it falls through a height 'h'. The distance it has to fall down for its velocity to become double, is

(a) $2h$ (b) $4h$ (c) $6h$ (d) $8h$

***Problem* 60.** A body sliding on a smooth inclined plane requires 4 *seconds* to reach the bottom starting from rest at the top. How much time does it take to cover one-fourth distance starting from rest at the top

(a) 1 s (b) 2 s (c) 4 s (d) 16 s

***Problem* 61.** A stone dropped from a building of height h and it reaches after t seconds on earth. From the same building if two stones are thrown (one upwards and other downwards) with the same velocity u and they reach the earth surface after t_1 and t_2 seconds respectively, then

(a) $t = t_1 - t_2$ (b) $t = \frac{t_1 + t_2}{2}$ (c) $t = \sqrt{t_1 t_2}$ (d) $t = t_1^2\, t_2^2$

***Problem* 62.** By which velocity a ball be projected vertically downward so that the distance covered by it in 5th second is twice the distance it covers in its 6th second ($g = 10\,m/s^2$)

(a) $58.8\,m/s$ (b) $49\,m/s$ (c) $65\,m/s$ (d) $19.6\,m/s$

***Problem* 63.** Water drops fall at regular intervals from a tap which is 5 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

(a) 2.50 m (b) 3.75 m (c) 4.00 m (d) 1.25 m

***Problem* 64.** 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

(a) 1.5 s (b) 4.025 s (c) 5.4 s (d) 6.75 s

***Problem* 65.** A particle is dropped under gravity from rest from a height $h(g = 9.8\,m/s^2)$ and it travels a distance $9h/25$ in the last second, the height h is

(a) 100 m (b) 122.5 m (c) 145 m (d) 167.5 m

***Problem* 66.** A stone thrown upward with a speed u from the top of the tower reaches the ground with a velocity $3u$. The height of the tower is

(a) $3u^2/g$ (b) $4u^2/g$ (c) $6u^2/g$ (d) $9u^2/g$

***Problem* 67.** A stone dropped from the top of the tower touches the ground in 4 *sec*. The height of the tower is about

(a) 80 m (b) 40 m (c) 20 m (d) 160 m

***Problem* 68.** A body is released from a great height and falls freely towards the earth. Another body is released from the same height exactly one second later. The separation between the two bodies, two seconds after the release of the second body is

(a) 4.9 m (b) 9.8 m (c) 19.6 m (d) 24.5 m

***Problem* 69.** An electron starting from rest has a velocity that increases linearly with the time that is $v = kt$, where $k = 2m/\sec^2$. The distance travelled in the first 3 *seconds* will be

(b) 16 m (c) 27 m (d) 36 m

***Problem* 70.** The acceleration of a particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_0. The distance travelled by the particle in time t will be

(a) $v_0 t + \frac{1}{3}bt^2$ (b) $v_0 t + \frac{1}{3}bt^3$ (c) $v_0 t + \frac{1}{6}bt^3$ (d) $v_0 t + \frac{1}{2}bt^2$

***Problem* 71.** The motion of a particle is described by the equation $u = at$. The distance travelled by the particle in the first 4 seconds

(a) $4a$ (b) $12a$ (c) $6a$ (d) $8a$