



PHYSICS

BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

KINEMATICS

Wb Jee Workout Category 1 Single Option Correct Type 1 Mark

1. Let $\vec{A} = \frac{1}{\sqrt{2}}\cos\theta\hat{i} + \frac{1}{\sqrt{2}}\sin\theta\hat{j}$ be any vector.

What will be the unit vector \hat{n} in the direction of \vec{A} ?

A. $\cos\theta\hat{i} + \sin\theta\hat{j}$

B. $-\cos \theta \hat{i} - \sin \theta \hat{j}$

C. $\frac{1}{\sqrt{2}} (\cos \theta \hat{i} + \sin \theta \hat{j})$

D. $\frac{1}{\sqrt{2}} (\cos \theta \hat{i} - \sin \theta \hat{j})$

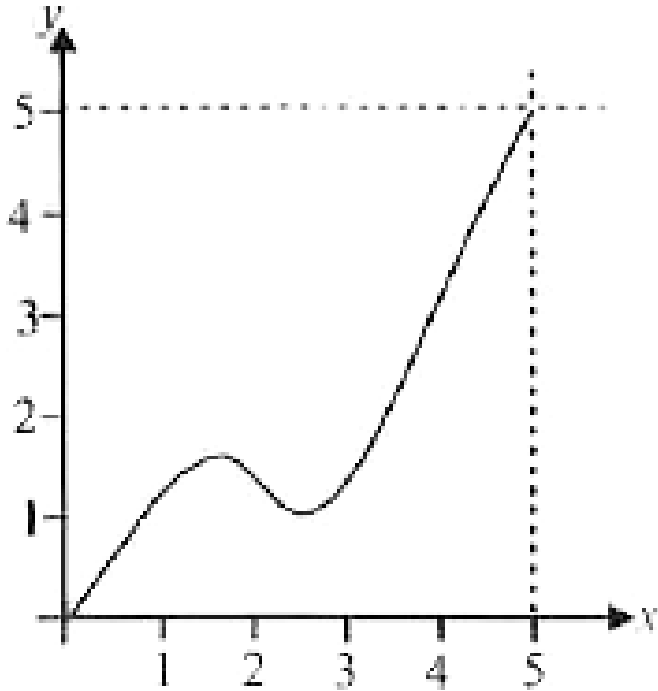
Answer: A



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2. A particle moves on a path as shown. The particle takes 10 seconds in going from starting point to the final point. What is the average velocity vector of the

particle ?



A. $0.5\hat{i} + \hat{j}$

B. $0.5\hat{i} + 2.5\hat{j}$

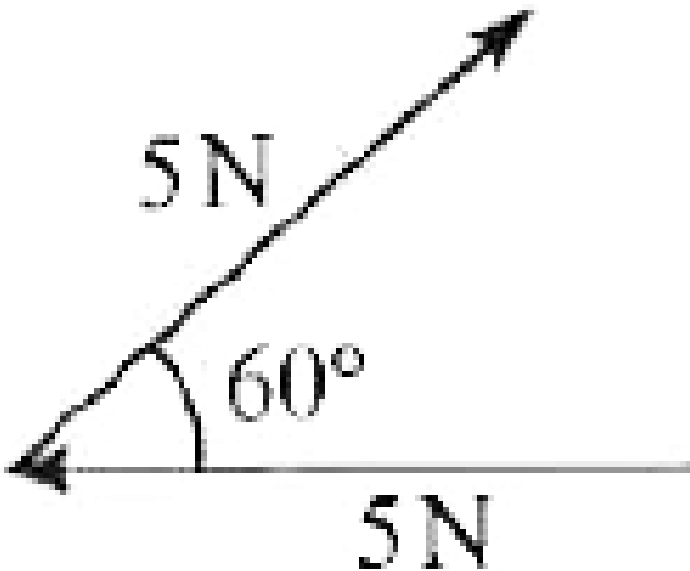
C. $0.5\hat{i} + 0.5\hat{j}$

D. None of these

Answer: C

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3. Two forces, each numerically equal to 5 N, are acting as shown in the figure. Then the resultant is



A. 2.5 N

B. 5 N

C. $5\sqrt{3}N$

D. 10 N

Answer: B



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4. The angle subtended by the vector

$\vec{A} = 4\hat{i} + 3\hat{j} + 12\hat{k}$ with the x-axis is

A. $\sin^{-1}\left(\frac{3}{13}\right)$

B. $\sin^{-1}\left(\frac{4}{13}\right)$

C. $\cos^{-1}\left(\frac{4}{13}\right)$

D. $\cos^{-1}\left(\frac{3}{13}\right)$

Answer: C



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5. If displacement $x = t^4$, then the ratio of acceleration and velocity of motion will be

A. $\frac{3}{t}$

B. $\frac{t}{3}$

C. $3t$

D. $\frac{4}{t}$

Answer: A



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6. For what angle between the two vectors, their resultant is maximum?

A. 180°

B. zero

C. 90°

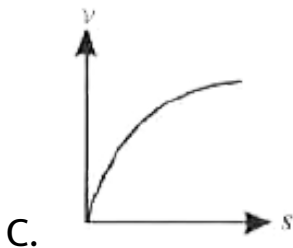
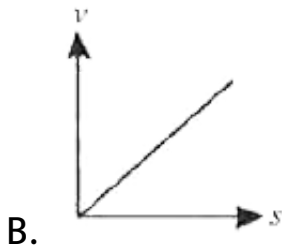
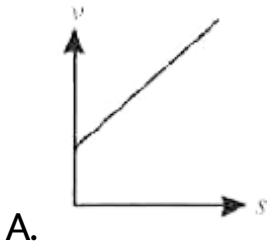
D. 45°

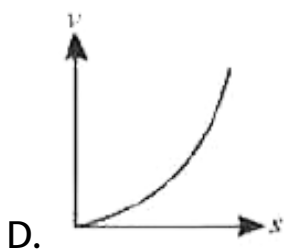
Answer: B



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7. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph





Answer: C

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8. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph

A. $\sqrt{\alpha^2 + \beta^2}$

B. $3t\sqrt{\alpha^2 + \beta^2}$

C. $3t^2 \sqrt{\alpha^2 \beta^2}$

D. $t^2 \sqrt{\alpha^2 + \beta^2}$

Answer: C



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9. If the vectors $\vec{a} = 2\hat{i} - 4\hat{j} - 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} + x\hat{k}$ are at the right angles to each other, then the value of x should be

A. 2

B. -2

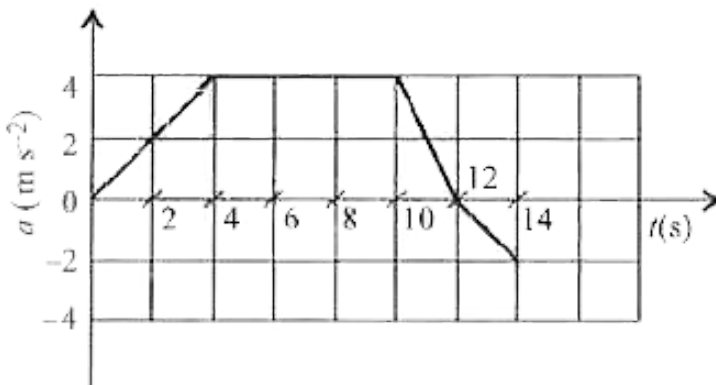
C. 1

D. -1

Answer: D

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10. A graph of acceleration versus time of a particle starting from rest at $t = 0$ is shown. The speed of the particle at $t = 14$ second is



A. $2ms^{-1}$

B. $34ms^{-1}$

C. $20ms^{-1}$

D. $42ms^{-1}$

Answer: D



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11. The distance travelled by an object along a straight line in time t is given by $s = 3 - 4t + 5t^2$, the initial velocity of the object is

A. 3 unit

B. -3 unit

C. 4 unit

D. -4 units

Answer: B



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12. A car travels 100 km east and then 100 km south. Finally, it comes back to the starting point by the shortest route. Throughout the journey, the speed is constant at 60 km/h. The average velocity for the whole of the journey is

A. 60 km/h

B. 90 km/h

C. 0 km/h

D. 180 km/h

Answer: C

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13. If \vec{P} and \vec{Q} denote the sides of parallelogram and its area is $\frac{1}{2}PQ$, then the angle between \vec{P} and \vec{Q} is

A. 0°

B. 30°

C. 45°

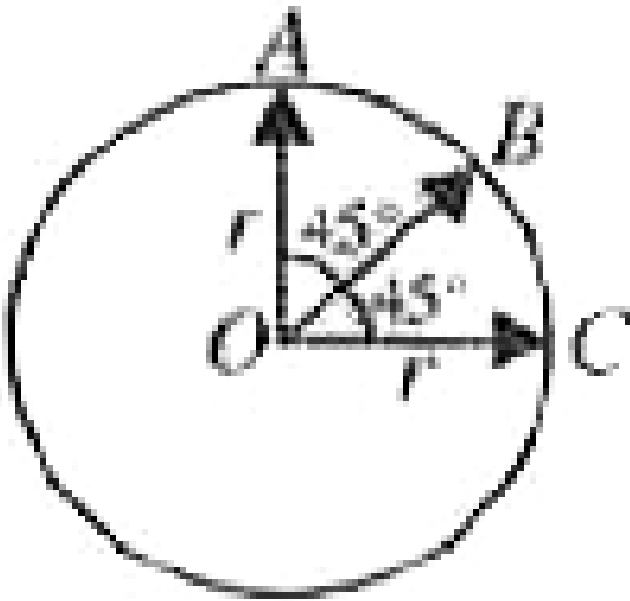
D. 60°

Answer: B



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14. The resultant of the three vectors \vec{OA} , \vec{OB} and \vec{OC} shown in figure is



A. r

B. $2r$

C. $r(1 + \sqrt{2})$

D. $r(\sqrt{2} - 1)$

Answer: C



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15. If a car covers $\frac{2}{3}$ of the total distance with speed ν_1 and $\frac{3}{5}$ distance with speed ν_2 , then average speed is

A. $\frac{1}{2} \sqrt{\nu_1 \nu_2}$

B. $\frac{\nu_1 + \nu_2}{2}$

C. $\frac{2\nu_1 \nu_2}{\nu_1 + \nu_2}$

D. $\frac{5\nu_1 \nu_2}{3\nu_1 + 2\nu_2}$

Answer: D



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16. Two balls are dropped from heights h and $2h$ respectively. The ratio of time taken by these balls to reach the earth is

A. $1 : \sqrt{2}$

B. $\sqrt{2} : 1$

C. $2 : 1$

D. $1 : 4$

Answer: A



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17. A lift ascends with a constant acceleration of 4ms^{-2} then with a constant velocity v and finally stops under a constant retardation of 4ms^{-2} . If the total height ascended be 20 m and the total time taken is 6 s then the time during which the lift was moving with a velocity v is

A. 2s

B. 3s

C. 4s

D. 5s

Answer: C



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18. Two boys are standing at the ends A and B of a ground where $AB = a$. The boy at B starts running in a direction perpendicular to AB with velocity v . The boy at A starts running simultaneously with velocity v_1 and catches the other in a time t , where t is

A. $\frac{a}{\sqrt{v^2 + v_1^2}}$

B. $\frac{a}{v + v_1}$

C. $\frac{a}{v - v_1}$

D. $\sqrt{\frac{a^2}{v^2 - v_1^2}}$

Answer: D



19. A train takes f s to perform a journey. It travels for $\frac{t}{n}$ s with uniform acceleration, then for $(n - 3)\frac{t}{n}$ with uniform speed v and finally it comes to rest with uniform retardation. The average of the speed of the train is

A. $(3n - 2)\frac{v}{2n}$

B. $(2n - 3)\frac{v}{2n}$

C. $(3n - 2)\frac{v}{3n}$

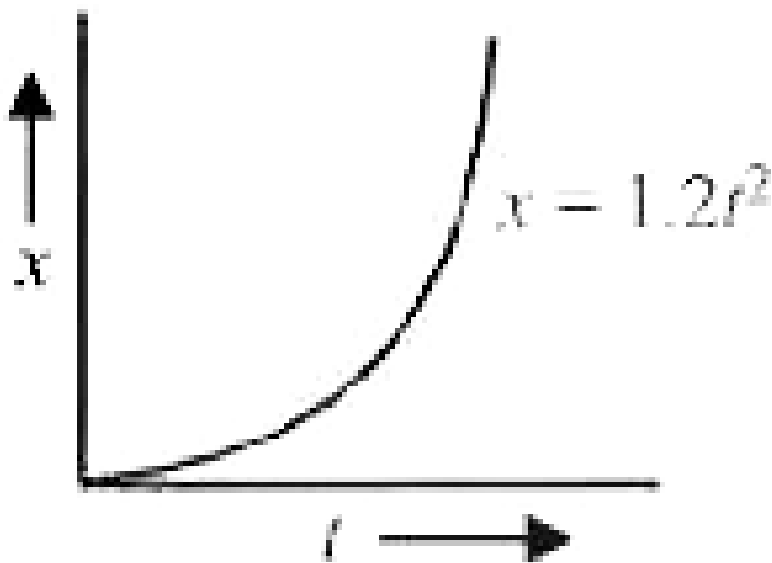
D. $(2n - 3)\frac{v}{3n}$

Answer: B



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20. Given figure shows the distance-time graph of the motion of a car. It follows from the graph that the car is



A. at rest

B. in uniform motion

C. in non-uniform acceleration

D. uniformly accelerated.

Answer: D



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21. Which of the following is a vector quantity?

A. Temperature

B. Magnetic Flux density

C. Magnetic field intensity

D. Time

Answer: C



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22. A car moving with a speed of 50 km/h, can be stopped by brakes after atleast 6 m. If the same car is moving at a speed of 100 km/h, the minimum stopping distance is

A. 12m

B. 18m

C. 24 m

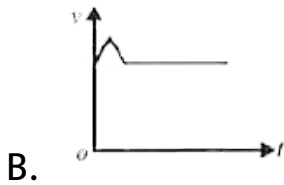
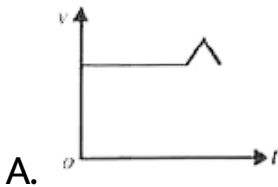
D. 6m

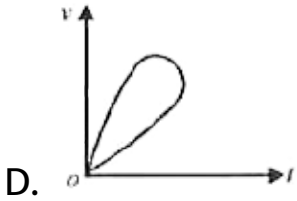
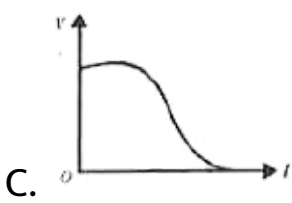
Answer: C



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23. Which of the following velocity-time graph is not possible?





Answer: D



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24. The component of a vector is

- A. always less than its magnitude
- B. always greater than its magnitude
- C. always equal to its magnitude

D. none of these

Answer: D



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25. The acceleration a of a body, starting from rest varies with time t following the equation $a = 3t + 4$. The velocity of the body at time $t = 2$ s will be

A. 10ms^{-1}

B. 18ms^{-1}

C. 14ms^{-1}

D. 26ms^{-1}

Answer: C



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26. A unit vector perpendicular to both the vectors

$2\hat{i} - 2\hat{j} + \hat{k}$ and $3\hat{i} + 4\hat{j} - 5\hat{k}$, is

A. $\frac{1}{\sqrt{410}} (6\hat{i} + 13\hat{j} + 14\hat{k})$

B. $\frac{1}{\sqrt{410}} (6\hat{i} + 13\hat{j} + 14\hat{k})$

C. $\frac{1}{\sqrt{401}} (6\hat{i} + 13\hat{j} + 14\hat{k})$

D. $\frac{1}{\sqrt{405}} (6\hat{i} + 13\hat{j} + 14\hat{k})$

Answer: B



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27. Two vectors are given by $\vec{A} = 3\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{B} = 3\hat{i} + 5\hat{j} - 2\hat{k}$. Find the third vector \vec{C} if $\vec{A} + 3\vec{B} - \vec{C} = 0$

A. $12\hat{i} + 14\hat{j} + 12\hat{k}$

B. $13\hat{i} + 17\hat{j} + 12\hat{k}$

C. $12\hat{i} + 16\hat{j} - 3\hat{k}$

D. $15\hat{i} + 13\hat{j} + 4\hat{k}$

Answer: C



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28. If the resultant of \vec{A} and \vec{B} makes angle α with \vec{A} and β with \vec{B} , then

A. $\alpha < \beta$ always

B. $\alpha < \beta$ if $A < B$

C. $\alpha < \beta$ if $A > B$

D. $\alpha < \beta$ if $A=B$

Answer: C



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29. A particle is travelling along a straight line OX. The distance r of the particle from O at a time t is given by

$x = 37 + 27t - t^3$, where t is time in seconds. The distance of the particle from O when it comes to rest is

A. 81 m

B. 91 m

C. 101 m

D. 111m

Answer: B



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30. A stone falls freely from rest and the total distance covered by it in the last second of its motion equals

the distance covered by it in the first three seconds of its motion. The stone remains in the air for

A. 6s

B. 5s

C. 7s

D. 4s

Answer: B



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**Wb Jee Workout Category 2 Single Option Correct Type 2
Marks**

1. If $\vec{a} + \vec{b} = \vec{c}$ and $a+b=c$, what is the angle between \vec{a} and \vec{b} ?

A. 90°

B. 180°

C. 120°

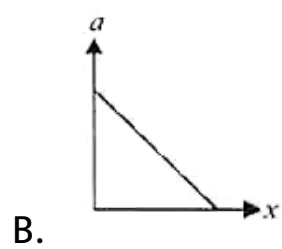
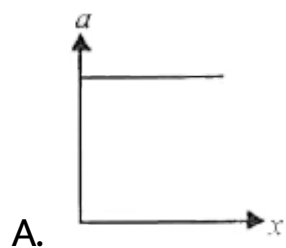
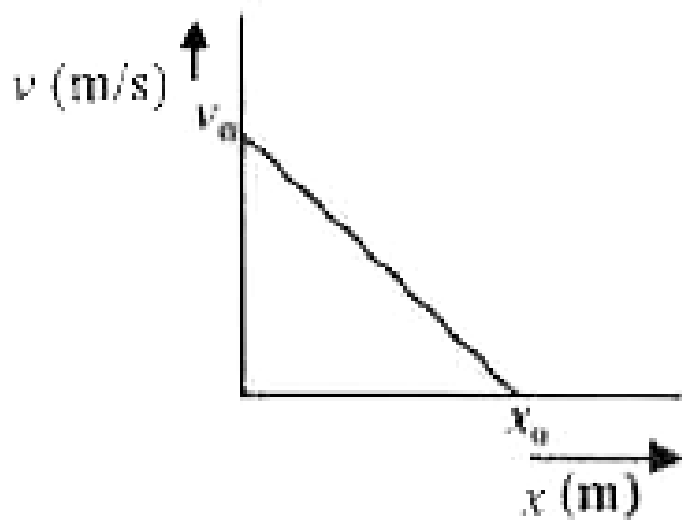
D. zero

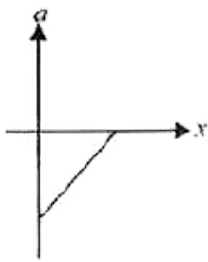
Answer: D



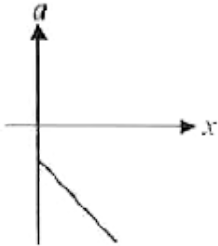
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2. What will be the a versus x graph for the following graph?





C.



D.

Answer: C

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3. Given $\vec{C} = \vec{A} \times \vec{B}$ and $\vec{D} = \vec{B} \times \vec{A}$ What is the angle between \vec{C} and \vec{D} ?

A. 30°

B. 60°

C. 90°

D. 180°

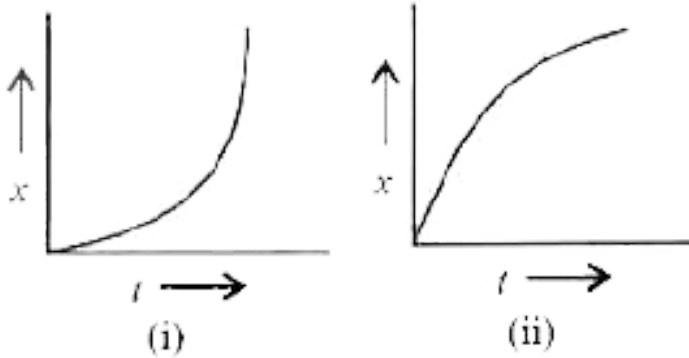
Answer: D



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4. Figure (i) and (ii) show the displacement-time graphs of two particles moving along the x-axis. We can say

that



- A. both the particles are having a uniformly retarded motion
- B. both the particles are having a uniformly accelerated motion
- C. Particle (1) is having a uniformly accelerated motion while particle (i) is having a uniformly retarded motion

D. Particle (i) is having a uniformly retarded motion while particle (ii) is having a uniformly accelerated motion

Answer: C



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5. 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. $v_0t + \frac{1}{3}bt^2$

B. $\nu_0 t + \frac{1}{3}bt^3$

C. $\nu_0 t + \frac{1}{6}bt^3$

D. $\nu_0 t + \frac{1}{2}bt^2$

Answer: C



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6. Two trains A and B each of length 400 m are moving on two parallel tracks in the same direction (with A ahead of B) with same speed 72 km/h. The driver of B decides to overtake A and accelerates by 1 m/s. If after 50s , B just brushes past A calculate the original distance between A and B .

A. 750 m

B. 1000m

C. 1250 m

D. 2250 m

Answer: C



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7. If a ball is thrown vertically upwards with speed u , the distance covered during the last t second of its ascent is

A. $\frac{1}{2}gt^2$

B. $ut - \frac{1}{2}gt^2$

C. $(u-gt)t$

D. ut

Answer: A



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8. If $\left| \vec{A} \times \vec{B} \right| = \sqrt{3} \vec{A} \cdot \vec{B}$, then the value of $\left| \vec{A} + \vec{B} \right|$

is

A. $(A^2 + B^2 + AB)^{1/2}$

B. $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}} \right)^{1/2}$

C. $A+B$

D. $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$

Answer: A



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9. If $\vec{A} = \vec{B} + \vec{C}$ and the magnitudes of \vec{A} , \vec{B} and \vec{C} are 5, 4 and 3 units respectively, the angle between \vec{A} and \vec{C} is :

A. $\cos^{-1}\left(\frac{3}{5}\right)$

B. $\cos^{-1}\left(\frac{4}{5}\right)$

C. $\frac{\pi}{2}$

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

Answer: A



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10. Given $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. The component of vector \vec{A} along vector \vec{B} is

A. $\frac{1}{\sqrt{2}}$

B. $\frac{3}{\sqrt{2}}$

C. $\frac{5}{\sqrt{2}}$

D. $\frac{7}{\sqrt{2}}$

Answer: C



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11. A particle is moving with velocity 5 m/s towards east and its velocity changes to 5 m/s north in 10 s, find the acceleration .

A. $\sqrt{2}$ North- West

B. $\frac{1}{\sqrt{2}}$ North - West

C. $\frac{1}{\sqrt{2}}$ North - East

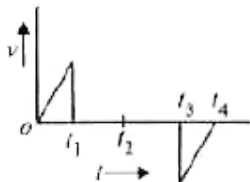
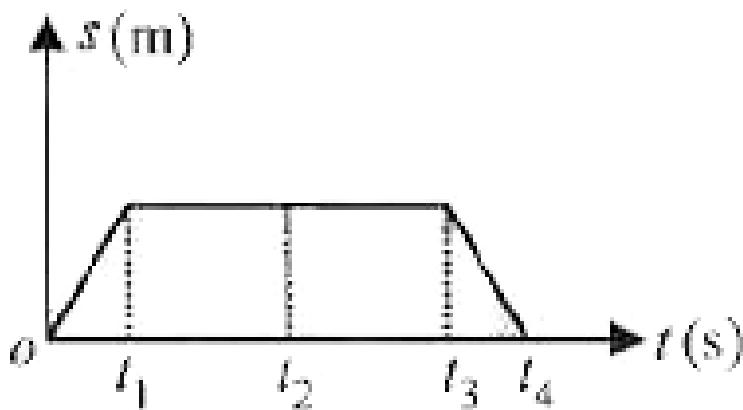
D. $\sqrt{2}$ North -East

Answer: B



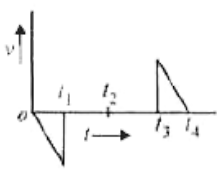
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12. The displacement time graph of a body is shown in figure. The velocity-time graph of the motion of the body will be

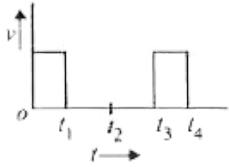


A.

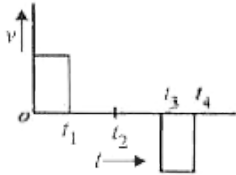
B.



C.



D.



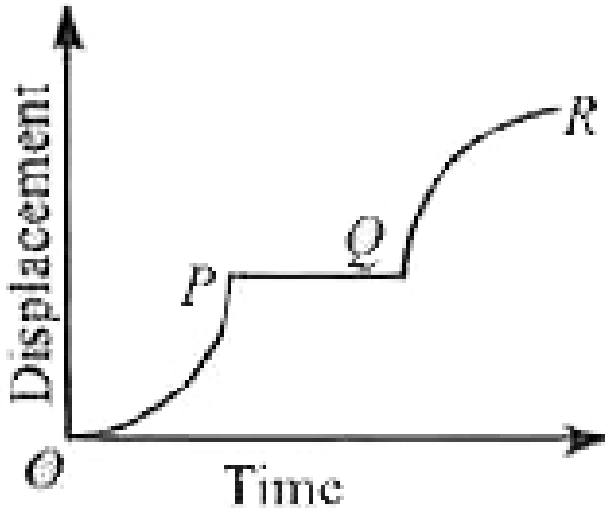
Answer: D



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13. The displacement time graph of a particle moving along a straight line is shown. The accelerations of the

particle during the regions OP, PQ and QR are



- A. OP PQ QR
- 0 +
- B. + 0 +
- C. + 0 -
- D. - 0 -

Answer: C



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14. The sum of magnitudes of two forces acting at a point is 16 and magnitude of their resultant is $8\sqrt{3}$. If the resultant is at 90° with the force of smaller magnitude, then their magnitudes are

A. 3,13

B. 2 , 14

C. 5 ,11

D. 4,12

Answer: B



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15. A ball is released from the top of a tower of height h metre. It takes T second to reach the ground. What is the position of the ball in $T/3$ second?

- A. $h/9$ metre from the ground
- B. $7h/9$ metre from the ground
- C. $8h/9$ metre from the ground
- D. $17h/18$ metre from the ground.

Answer: C



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**Wb Jee Workout Category 3 One Or More Than One
Option Correct Type 2 Marks**

1. Given two vectors $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. θ is the angle between \vec{A} and \vec{B} . Which of the following statements is/are correct?

A. $|\vec{A}| \cos \theta \left(\frac{\hat{i} + \hat{j}}{\sqrt{2}} \right)$ is the component of \vec{A} along \vec{B} .

B. $|\vec{A}| \sin \theta \left(\frac{\hat{i} - \hat{j}}{\sqrt{2}} \right)$ is the component of \vec{A} perpendicular to \vec{B} .

C. $|\vec{A}| \cos \theta \left(\frac{\hat{i} - \hat{j}}{\sqrt{2}} \right)$ is the component of \vec{A} along \vec{B} .

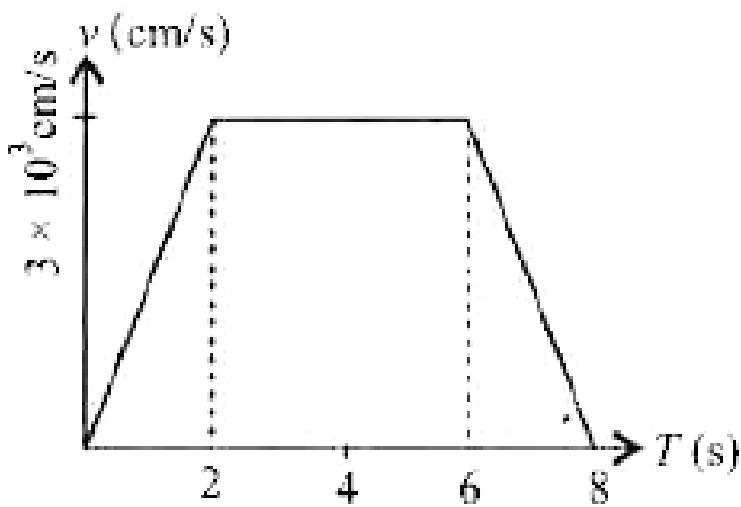
D. $|\vec{A}| \sin \theta \left(\frac{\hat{i} + \hat{j}}{\sqrt{2}} \right)$ is the component of \vec{A} perpendicular to \vec{B} .

Answer: A::B



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2. The velocity time graph of the motion of a car is given here.



A. The distance travelled by the car in the first six seconds is 150 m.

B. The deceleration of the car during the last two seconds are $-15 \frac{m}{s^2}$.

C. The distance travelled by the car in the first six second is 220 m.

D. The deceleration of the car during the last two

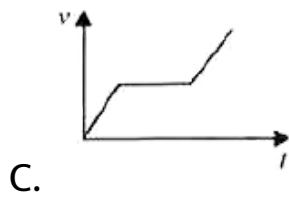
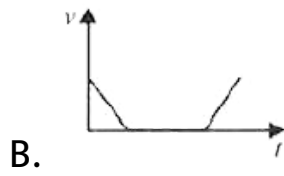
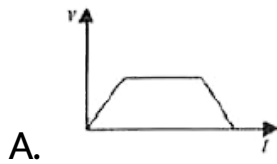
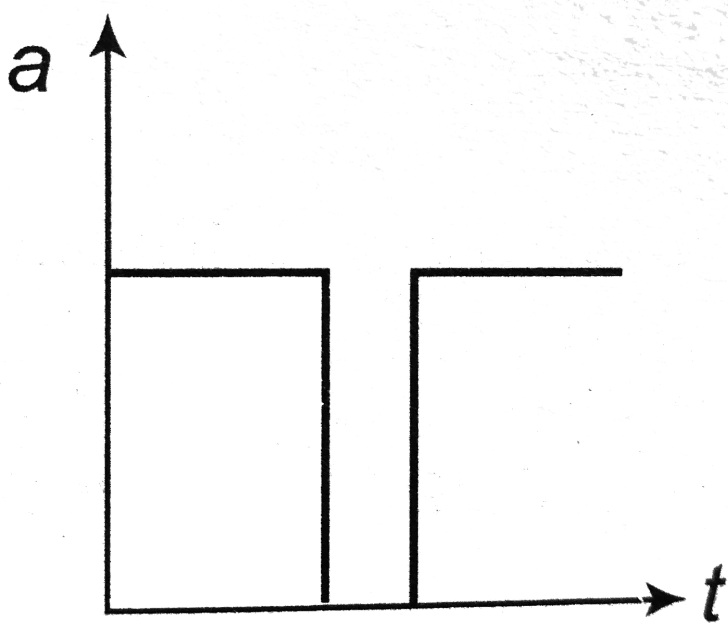
second is $-20 \frac{m}{s^2}$

Answer: A::B



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3. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is.





D.

Answer: C



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4. The resultant of three vectors 1, 2, and 3 units whose directions are those of the sides of an equilateral triangle is at what angle with respect to first vector?

- A. 30° with the first vector
- B. 15° with the first vector
- C. 100° with the first vector

D. 150° with the first vector

Answer: D



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5. The relation between time and displacement x is

$t = \alpha x^2 + \beta x$, where α and β are constants. (Take

$\alpha = 2m^{-2}s, \beta = 1m^{-1}s$)

A. The relation between velocity and acceleration is

$$-3/5v\alpha^2$$

B. At $x=2$ the velocity is $3/5 \text{ m s}^{-1}$

C. The relation between velocity and acceleration is

$$-2\alpha v^3.$$

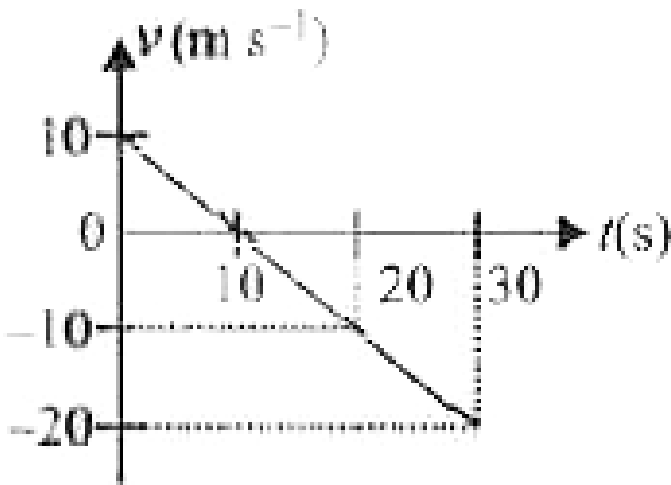
D. At $x=2$ the velocity is $\frac{1}{9}ms^{-1}$

Answer: C::D



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



- A. The particle has a constant acceleration.
- B. The particle has never turned around.
- C. The particle has zero displacement.
- D. The average speed in the interval 0 to 10 s is the same as the average speed in the interval 10s to 20 s.

Answer: A::D



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7. If $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + \hat{k}$ are two vectors, then the unit vector is

A. perpendicular to \vec{A} is $\frac{-\hat{j} + \hat{k}}{\sqrt{2}}$

B. parallel to \vec{A} is $\frac{2\hat{i} + \hat{j} + \hat{k}}{\sqrt{6}}$

C. perpendicular to \vec{B} is $\frac{-\hat{j} + \hat{k}}{\sqrt{2}}$

D. parallel to \vec{A} is $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$

Answer: A::B::C



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8. A bullet on penetrating 30 cm into its target loses its velocity by 50%. What additional distance will it penetrate into the target before it comes to rest?

A. 30 cm

B. 20 cm

C. 10 cm

D. 5 cm

Answer: C



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9. The resultant of vectors \vec{P} and \vec{Q} is \vec{R} . The resultant becomes $2\vec{R}$ when \vec{P} is either doubled or reversed in V its direction.

A. The value of P : Q is $\sqrt{3} : \sqrt{5}$

B. The value of P : Q is $\sqrt{3} : \sqrt{2}$

C. The relation between P and R is $P = \sqrt{\frac{3}{2}}R$

D. The relation between P and Q is $P = \frac{1}{\sqrt{3}}Q$.

Answer: B::C



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10. A particle of mass m moves on the x -axis as follows: It starts from rest at $x = 0$ from the point $x = 0$, and come to rest at $x = 1$ at the point $x = 1$. The velocity changes linearly with time. No other information is available about its motion at intermediate times $[0 < t < 1]$. If α denotes the instantaneous acceleration of the particle, then

- A. α cannot remain positive for all t in the interval 0 to 1
- B. $|\alpha|$ cannot exceed 2 at any point in its path
- C. $|\alpha|$ must be > 4 some point or points in its path

D. α must change sign during the motion, but no other assertion can be made with the given information.

Answer: A::C



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Wb Jee Previous Years Questions Category 1 Single Option Correct Type 1 Mark

1. Two vectors are given by $\vec{A} = \hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{B} = 3\hat{i} + 6\hat{j} + 2\hat{k}$. Another vector \vec{C} has the same

magnitude as \vec{B} but has the same direction as \vec{A} .

Then which of the following vectors represents \vec{C} ?

A. $\frac{7}{3}(\hat{i} + 2\hat{j} + 2\hat{k})$

B. $\frac{3}{7}(\hat{i} - 2\hat{j} + 2\hat{k})$

C. $\frac{7}{9}(\hat{i} + 2\hat{j} + 2\hat{k})$

D. $\frac{9}{7}(\hat{i} + 2\hat{j} + 2\hat{k})$

Answer: A



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2. A particle moves along x-axis and its displacement at any time is given by $x(t) = 2t^3 - 3t^2 + 4t$ in SI units.

The velocity of the particle when its acceleration is zero is

A. $2.5ms^{-1}$

B. $3.5ms^{-1}$

C. $4.5ms^{-1}$

D. $8.5ms^{-1}$

Answer: A



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3. Consider three vectors

$A = \hat{i} + \hat{j} - 2\hat{k}$, $B = \hat{i} - \hat{j} + \hat{k}$ and

$C = 2\hat{i} - 3\hat{j} + 4\hat{k}$. A vector X of the form $\alpha A + \beta B$ (α and β are numbers) is perpendicular to C . The ratio of α and β is

A. 1:1

B. 2:1

C. -1:1

D. 3:1

Answer: A



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4. A particle moves with constant acceleration along a straight line starting from rest. The percentage increase in its displacement during the 4th second compared to that in the 3rd second is

A. 33 %

B. 40 %

C. 66 %

D. 77 %

Answer: B



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5. Two particles A and B having different masses are projected from a tower with same speed. A is projected vertically upward and B vertically downward.

On reaching the ground

A. velocity of A is greater than that of B.

B. velocity of A is greater than that of B.

C. both A and B attain the same velocity.

D. the particle with the larger mass attains higher velocity.

Answer: C



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6. The vectors \vec{A} and \vec{B} are such that

$$|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|.$$

The angle between two vectors will be

A. 0°

B. 60°

C. 90°

D. 45°

Answer: C



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7. At a particular height, the velocity of an ascending body is \vec{u} . The velocity at the same height while the body falls freely is

A. $2\vec{u}$

B. $-\vec{u}$

C. \vec{u}

D. $-2\vec{u}$

Answer: B



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8. Three vectors

$$\vec{A} = a\hat{i} + \hat{j} + \hat{k}, \vec{B} = \hat{i} + b\hat{j} + \hat{k} \text{ and } \vec{C} = \hat{i} + \hat{j} + c\hat{k}$$

are mutually perpendicular (\hat{i} , \hat{j} and \hat{k} are unit vectors along X, Y, and Z axis respectively).

The respective values of a,b and c are

A. 0,0,0

B. $-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}$

C. 1, -1, 1

D. $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

Answer: B



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9. In a triangle ABC , the sides AB and AC are represented by the vectors $3\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$ respectively. Calculate the angle $\angle ABC$.

A. $\cos^{-1} \sqrt{\frac{5}{11}}$

B. $\cos^{-1} \sqrt{\frac{6}{11}}$

C. $\left(90^\circ - \cos^{-1} \sqrt{\frac{5}{11}} \right)$

D. $\left(180^\circ - \cos^{-1} \sqrt{\frac{5}{11}} \right)$

Answer: A



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Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type 2 Marks

1. A train moves from rest with acceleration α and in time t_1 covers a distance x . It then decelerates rest at constant retardation β for distance y in time t_2 . Then

A. $\frac{x}{y} = \frac{\beta}{\alpha}$

B. $\frac{\beta}{\alpha} = \frac{t_1}{t_2}$

C. $x=y$

D. $\frac{x}{y} = \frac{\beta t_1}{\alpha t_2}$

Answer: A::B



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