

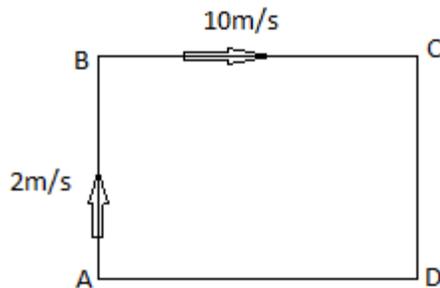
1 year IIT-JEE

Consolidated:

Mains:

MCO with single option:

Easy:



1. Two men standing at corners A and B of a square ABCD of side 8 m start moving along the track with constant speeds 2 m/s and 10 m/s respectively. Find the time when they meet for the first time.

- a) 2 sec b) 3 sec c) 1 sec *d) 6 sec

2. A ball A is thrown vertically upwards with a speed u . Another ball B is instantaneously dropped from rest from a height h . At time t the relative velocity of A w.r.t B is

- a) u *b) $u - 2gt$ c) $\sqrt{u^2 - 2gh}$ d) $u - gt$

3. A particle is projected upwards. If t_1 and t_2 are the times at which it is at a height h from the ground while ascending and descending respectively, h is

- a) gt_1t_2 *b) $\frac{gt_1t_2}{2}$ c) $2gt_1t_2$ d) $4gt_1t_2$

Moderate:

4. A stone is tied to the end of the string of 1 m length and whirled in a horizontal circle with a constant speed. If the stone makes 22 revolutions in 44 sec, what is centripetal acceleration?

- *a) $\pi^2 m s^{-2}$ towards the center along the radius b) $\pi^2 m s^{-2}$ away from the center along the radius

c) $\pi^2 m s^{-2}$ along the tangent

d) $\frac{\pi^2}{4} m s^{-2}$ towards the center along the radius

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

*a) 1 sec

b) 2 sec

c) 1.5 sec

d) not possible

6. A particle has an initial velocity of $3\hat{i} + 4\hat{j}$ m/s and a constant acceleration of $4\hat{i} - 3\hat{j}$ S.I units, the speed of the particle after one sec will be

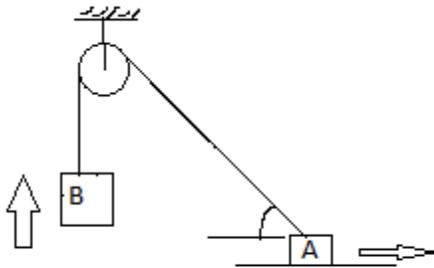
a) 0

b) 10 m/s

*c) $5\sqrt{2}$ m/s

d) 25 m/s

Difficult:



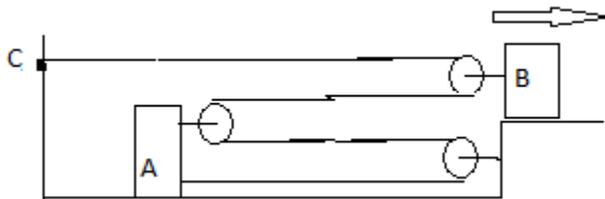
7. Two blocks A and B are connected as shown. If the speeds of A and B as marked are v_1 and v_2 respectively, the angle that the string makes with the horizontal at A is θ , find the relation between the two velocities.

a) $v_1 = v_2 \cos \theta$

*b) $v_2 = v_1 \cos \theta$

c) $v_1^2 + v_2^2 = 1$

d) $v_2 = v_1 \tan \theta$



8. One end of a mass less inextensible string is connected to the wall at C and the other end is connected to block A after passing through three mass less and frictionless pulleys, one connected to B, the other to A and the third to the wall respectively. If B has a speed towards the direction marked 300 mm/sec, find the speed of A.

a) 300 mm/sec

*b) 200 mm/sec

c) 450 mm/sec

d) 100 mm/sec

Advanced:

Passage: 1

Here are 4 descriptions for the velocity of a hockey puck in the x-y plane, all in m/s

A: $v_x = (-3t^2 + 4t - 2)$ and $v_y = 6t - 4$

B: $v_x = -3$ and $v_y = -5t^2 + 6$

C: $\vec{v} = 2t^2\hat{i} - (4t + 3)\hat{j}$

D: $\vec{v} = -2t\hat{i} + 3\hat{j}$

1. The x component of the acceleration in ms^{-2} in the above descriptions at $t = 1$ sec is respectively

- a) (-2, 0, 4,-2) b) (-2,-10, 4,-4) c) (-2,-5, 0, 4) d) (-2, 6,-4, 0)

2. The y component of the acceleration in ms^{-2} in the above descriptions at $t = 1$ sec is respectively

- a) (0, -4, -10, 6) b) (0, 4, 10, 6) c) (6, -10, -4, 0) d) (-2, 0, 4,-2)

3. In description D the units of coefficients -2 and 3 are respectively

- a) ms^{-1} & ms^{-2} b) ms^{-2} & ms^{-1} c) ms^{-1} & ms^{-1} d) ms^{-2} & ms^{-2}

Passage: 2

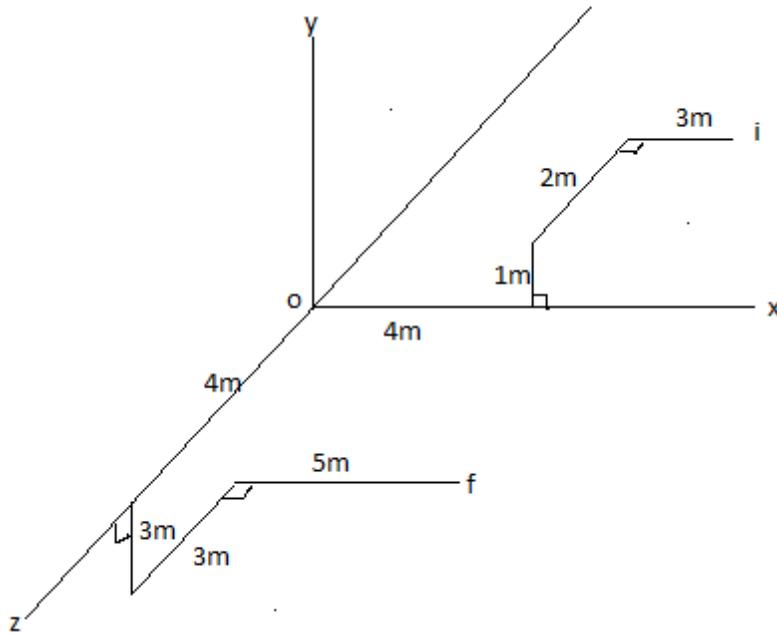


Figure shows the initial position i and final position f of a particle. All the lines drawn are parallel to the respective axis and the distances marked are also along them.

1. The initial position vector is

- *a) $7\hat{i} + \hat{j} - 2\hat{k}$ b) $-7\hat{i} - \hat{j} + 2\hat{k}$ c) $-3\hat{i} - \hat{j} + 2\hat{k}$ d) $4\hat{i}$

2. The final position vector is

- a) $-5\hat{i} + 3\hat{j} - 4\hat{k}$ b) $-5\hat{i} + 3\hat{j} - 3\hat{k}$ *c) $5\hat{i} - 3\hat{j} + \hat{k}$ d) $3\hat{k}$

3. The x component of the particles displacement is

- a) 2m *b) -2m c) -5m d) -12m