



PRAARAS

JEE 2026

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Physics

COM and System of
particles

Lecture - 14

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Physics Wallah



Topics to be covered

A

COM JEE MAINS PYQ'S

B

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C

D





Jee Main

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PYQs

Question



The initial mass of a rocket is 1000 kg. Calculate at what rate the fuel should be burnt so that the rocket is given an acceleration of 20 ms^{-2} . The gases come out at a relative speed of 500 ms^{-1} with respect to the rocket:

[Use $g = 10 \text{ m/s}^2$]

$$F_{Th} = v_{rel} \frac{dm}{dt}$$

[26 Aug, 2021 (Shift-I)]

- 1 500 kgs^{-1}
- 2 10 kgs^{-1}
- 3 $6.0 \times 10^2 \text{ kg s}^{-1}$
- 4 60 kg s^{-1}



$$F_{Th} - mg = ma$$

$$(500)(\lambda) - 1000 \times 10 = 1000 \times 20$$

$$\lambda = \frac{30 \times 1000}{500} = 60 \text{ kg/s}$$

Ans : (4)



Question

$$20 + 5\sqrt{6} - 5\sqrt{2}$$

$$10\sqrt{2} + 5\sqrt{3} - 5$$

Two particles, of masses M and $2M$, moving as shown, with speeds of 10 m/s and 5 m/s collide elastically at the origin. After the collision, they move along the indicated directions with speeds v_1 and v_2 respectively. The value of v_1 and v_2 are nearly:

[10 April, 2019 (Shift-I)]

$$(2\sqrt{2} + 2\sqrt{6})v_1 = 40 + 10\sqrt{6} - 10\sqrt{2}$$

$$v_1 = \frac{10\sqrt{2} + 5\sqrt{3} - 5}{\sqrt{3} + 1}$$

$$\vec{P}_f = \vec{P}_i \rightarrow \text{x-dir}^n$$

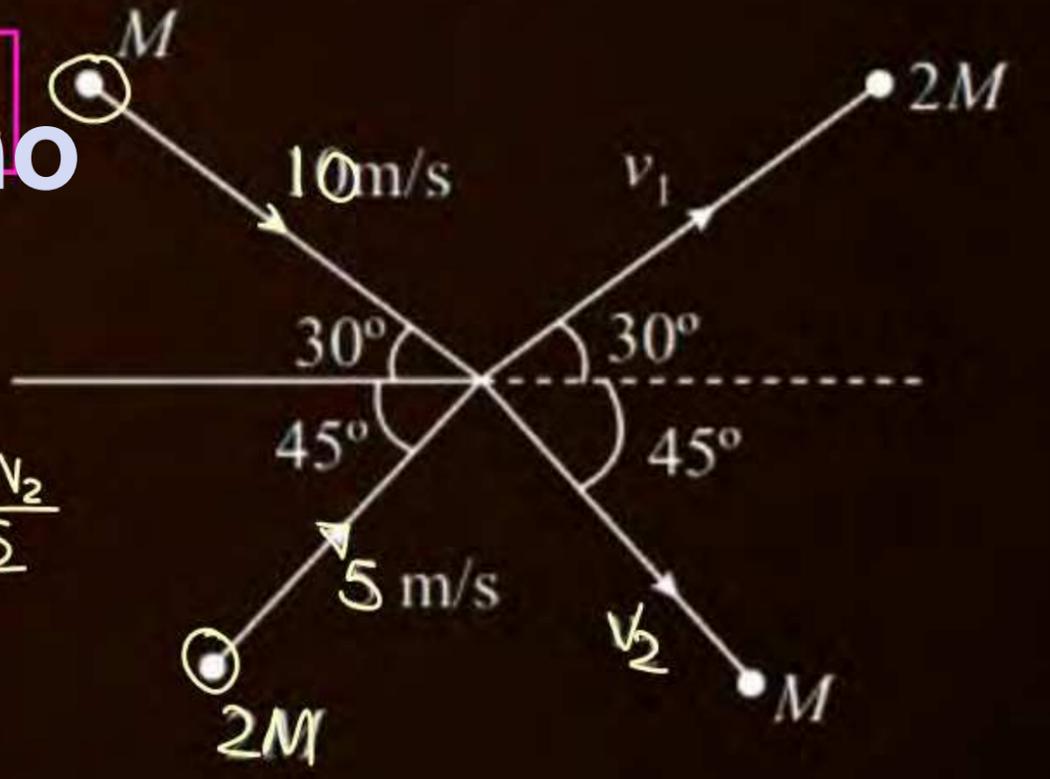
$$M(5\sqrt{3}) + 2M\left(\frac{5}{\sqrt{2}}\right) = 2M\left(\frac{\sqrt{3}v_1}{2}\right) + M\left(v_2 \cdot \frac{1}{\sqrt{2}}\right)$$

$$10\sqrt{6} + 20 = 2\sqrt{3}v_1 + 2v_2$$

y-dirⁿ

$$-M(5) + 2M\left(\frac{5}{\sqrt{2}}\right) = 2M\left(\frac{v_1}{2}\right) - \frac{Mv_2}{\sqrt{2}}$$

$$-10\sqrt{2} + 20 = 2\sqrt{2}v_1 - 2v_2$$



1 3.2 m/s and 6.3 m/s

2 3.2 m/s and 12.6 m/s

3 6.5 m/s and 6.3 m/s

4 6.5 m/s and 3.2 m/s

Ans : (1)

Question



Four particles A, B, C and D with masses $m_A = m$, $m_B = 2m$, $m_C = 3m$ and $m_D = 4m$ are at the corners of a square. They have accelerations of equal magnitude with directions as shown. The acceleration of the center of mass of the particles is:

[8 April, 2019 (Shift-I)]

$$\vec{a}_{cm} = \frac{m_1 \vec{a}_1 + m_2 \vec{a}_2 + \dots}{M}$$

$$\vec{a}_{cm} = \frac{m(-a\hat{i}) + 2m(a\hat{j}) + 3m(a\hat{i}) + 4m(-a\hat{j})}{10m}$$

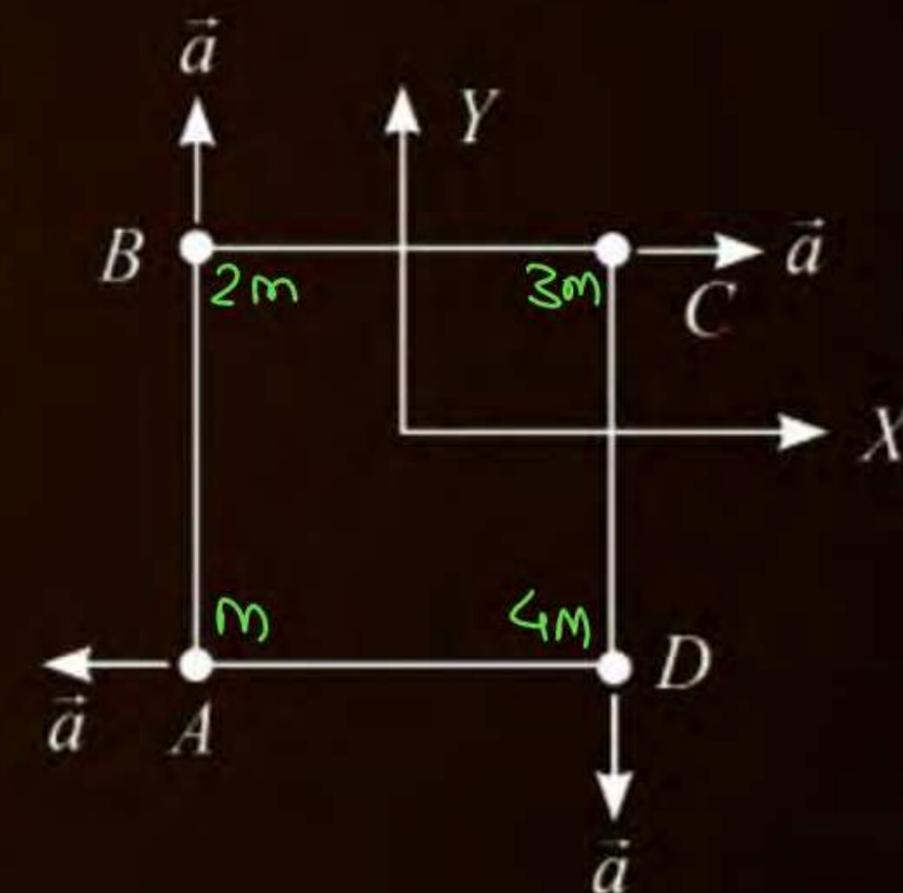
$$= \frac{2a\hat{i} - 2a\hat{j}}{10} = \frac{a(\hat{i} - \hat{j})}{5}$$

1 $\frac{a}{5}(\hat{i} - \hat{j})$

2 Zero

3 $\frac{a}{5}(\hat{i} - \hat{j})$

4 $a(\hat{i} + \hat{j})$



Ans : (3)

Question



A particle of mass m moving with velocity v collides with a stationary particle of mass $2m$. After collision, they stick together and continue to move together with velocity

[10 April, 2023 Shift-1)]



$$mv = 3mv_1 \Rightarrow \underline{v_1 = v/3}$$

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1 v

2 $\frac{v}{2}$

3 $\frac{v}{3}$

4 $\frac{v}{4}$

3
↑
Ans : (3)

Question



Velocity (v) and acceleration (a) in two systems of units 1 and 2 are related as $v_2 = \frac{n}{m^2} v_1$ and $a_2 = \frac{a_1}{mn}$ respectively. Here m and n are constants. The relations for distance and time in two system respectively are:

[28 June, 2022 (Shift-II)]

Unit and dimension

1 $\frac{n^3}{m^3} L_1 = L_2$ and $\frac{n^2}{m} T_1 = T_2$

2 $L_1 = \frac{n^4}{m^2} L_2$ and $T_1 = \frac{n^2}{m} T_2$

3 $L_1 = \frac{n^2}{m} L_2$ and $T_1 = \frac{n^4}{m^2} T_2$

4 $\frac{n^2}{m} L_1 = L_2$ and $\frac{n^4}{m^2} T_1 = T_2$

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Ans : (3)



Question

Two blocks of masses 10 kg and 30 kg are placed on the same straight line with coordinates (0, 0) and (x, 0) respectively. The block of 10 kg is moved on the same line through a distance of 6 cm towards the other block. The distance through which the block of 30 kg must be moved to keep the position of center of mass of the system unchanged is

[27 June, 2022 (Shift-I)]

- 1 4 cm towards the 10 kg block
- 2 2 cm away from the 10 kg block
- 3 2 cm towards the 10 kg block
- 4 4 cm away from the 10 kg block

$$S_{CM} = 0$$

$$m_1 \vec{s}_1 + m_2 \vec{s}_2 = 0$$

$$10(6\hat{i}) + 30(\vec{s}_2) = 0$$

$$\vec{s}_2 = -2\hat{i}$$



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Ans : (3)

Question



Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{i} - 2\hat{j} + \hat{k}$ respectively. The magnitude of position vector of center of mass of this system will be similar to the magnitude of vector:
[29 July, 2022 (Shift-I)]

$$\vec{r}_m = \frac{1(\hat{i} + 2\hat{j} + \hat{k}) + 3(-3\hat{i} - 2\hat{j} + \hat{k})}{4} = \frac{-8\hat{i} - 4\hat{j} + 4\hat{k}}{4}$$

1 $2\hat{i} - 2\hat{j} + \hat{k} \rightarrow \sqrt{9}$

2 $-3\hat{i} - 2\hat{j} + \hat{k} \rightarrow \sqrt{14}$

3 $-2\hat{i} + 2\hat{k} \rightarrow \sqrt{8}$

4 $-2\hat{i} - \hat{j} + \hat{k} \rightarrow \sqrt{6}$

ATDB.uno $\rightarrow \sqrt{2^2 + 1^2 + 1^2} = \sqrt{6}$

Ans : (4)

Question



A block moving horizontally on a smooth surface with a speed of 40 m/s splits into two parts with masses in the ratio of 1 : 2. If the smaller part moves at 60 m/s in the same direction, then the fractional change in kinetic energy is:

[31 Aug, 2021 (Shift-II)]

1 $2/3$

2 $1/3$

3 $1/4$

4 $1/8$

$$3m \rightarrow 40 \text{ m/s}$$

$$m \rightarrow 60 \text{ m/s}$$

$$2m \rightarrow v_1$$

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$$3m(40) = m(60) + 2mv_1$$

$$v_1 = \frac{120 - 60}{2} = \underline{30 \text{ m/s}}$$

$$k \cdot \xi_i = \frac{1}{2} (3m)(40)^2$$

$$= 2400m$$

$$k \cdot \xi_f = \frac{1}{2} m(60)^2 + \frac{1}{2} 2m(30)^2$$

$$= 1800m + 900m$$

$$= 2700m$$

$$\text{fractional change in k.e.} = \frac{k \cdot \xi_f - k \cdot \xi_i}{k \cdot \xi_i} = \frac{2700m - 2400m}{2400m}$$

$$= \frac{1}{8}$$

4
↑
Ans: ()

Question



A particle of mass m is moving with speed $2v$ collides with a mass $2m$ moving with speed v in the same direction. After collision, the first mass is stopped completely while the second one splits into two particles each of mass m , which move at angle 45° with respect to the original direction. The speed of each of the moving particle will be:

[9 April, 2019 (Shift-II)]

- 1 $v/(2\sqrt{2})$
- ~~2 $2\sqrt{2}v$~~
- 3 $\sqrt{2}v$
- 4 $v/\sqrt{2}$



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$\vec{p}_i = \vec{p}_f \rightarrow y \text{ dir}^n$ $0 = \frac{mv_1}{\sqrt{2}} - \frac{mv_2}{\sqrt{2}} \Rightarrow v_1 = v_2$



$m(2v) + 2mv = \frac{mv_1}{\sqrt{2}} + \frac{mv_1}{\sqrt{2}} = \frac{2mv}{\sqrt{2}} = \sqrt{2}mv$

$\Rightarrow v = \frac{4v}{\sqrt{2}} = 2\sqrt{2}v$

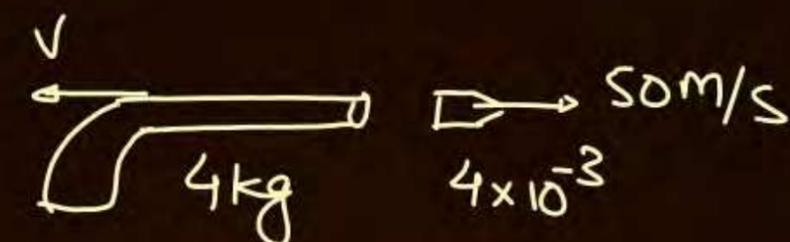
Ans : (2)

Question



A bullet of '4 g' mass is fired from a gun of mass 4 kg. If the bullet moves with the muzzle speed of 50 ms^{-1} , the impulse imparted to the gun velocity of recoil of gun are:

[22 July, 2021 (Shift-II)]



1 $0.4 \text{ kg ms}^{-1}, 0.1 \text{ ms}^{-1}$

2 $0.2 \text{ kg ms}^{-1}, 0.05 \text{ ms}^{-1}$

3 $0.4 \text{ kg ms}^{-1}, 0.05 \text{ ms}^{-1}$

4 $0.2 \text{ kg ms}^{-1}, 0.1 \text{ ms}^{-1}$

ATDB.uno $4v = 4 \times 10^{-3} \times 50 \Rightarrow v = 5 \times 10^{-2} = 0.05 \text{ m/s}$

Impulse $\rightarrow \Delta P = 4 \times 10^{-3} \times 50 = 0.2 \text{ kg m/s}$

Ans : (1)

Question

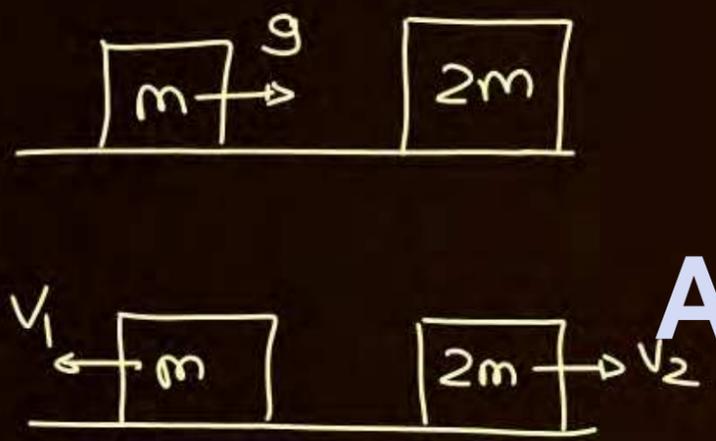


$e=1$

Three objects A, B and C are kept in a straight line on a frictionless horizontal surface. The masses of A, B and C are m , $2m$ and $2m$ respectively. A moves towards B with a speed of 9 m/s and makes an elastic collision with it. Thereafter B makes a completely inelastic collision with C. All motions occur along same straight line. The final speed of C is:

[27 July, 2021 (Shift-I)]

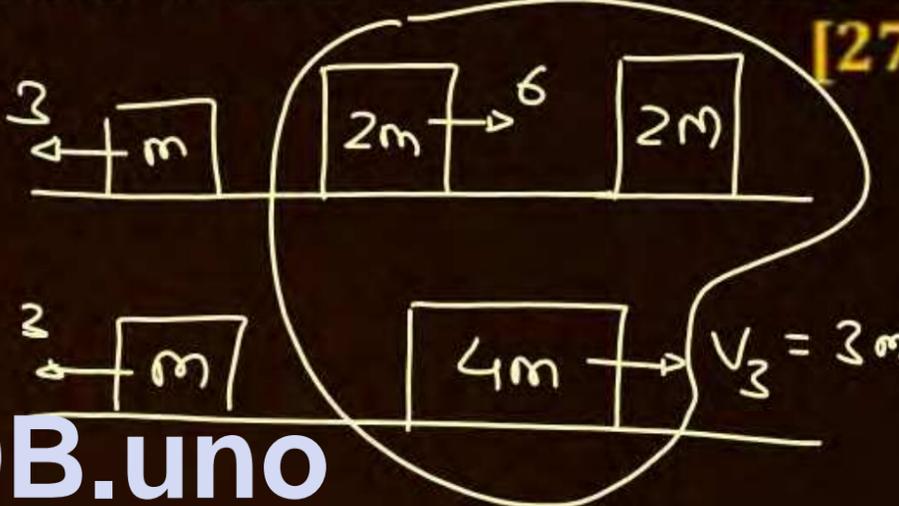
- 1 4 m/s
- 2 6 m/s
- 3 9 m/s
- 4 3 m/s



$$\rightarrow 2mv_2 - mv_1 = m(u) \Rightarrow 2v_2 - v_1 = u \quad \text{--- (i)}$$

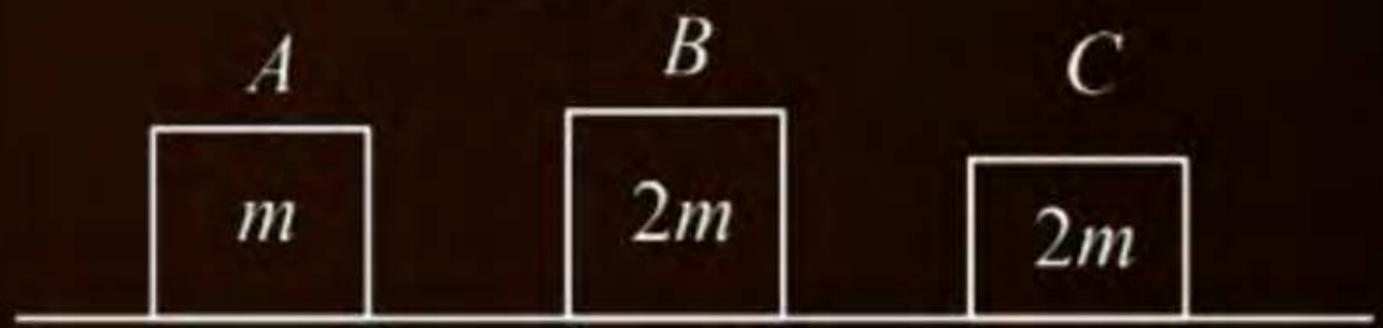
$$\rightarrow e = \frac{v_1 + v_2}{u} = 1 \Rightarrow v_2 + v_1 = u \quad \text{--- (ii)}$$

$$v_2 = 6\text{ m/s} \quad \& \quad v_1 = 3\text{ m/s}$$



$$2m(6) = 4m v_3$$

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Ans: (4)

Question



Two billiard balls of equal mass 30g strike a rigid wall with same speed of 108 kmph (as shown) but at different angles. If the balls get reflected with the same speed then the ratio of the magnitude of impulses imparted to ball 'a' and ball 'b' by the wall along 'X' direction is: **[25 July, 2021 (Shift-I)]**

$$\vec{J}_1 = \Delta \vec{p} = -mv\hat{i} - (mv\hat{i}) = -2mv\hat{i}$$

$$J_1 = 2mu$$

$$J_2 = \frac{2mu}{\sqrt{2}}$$

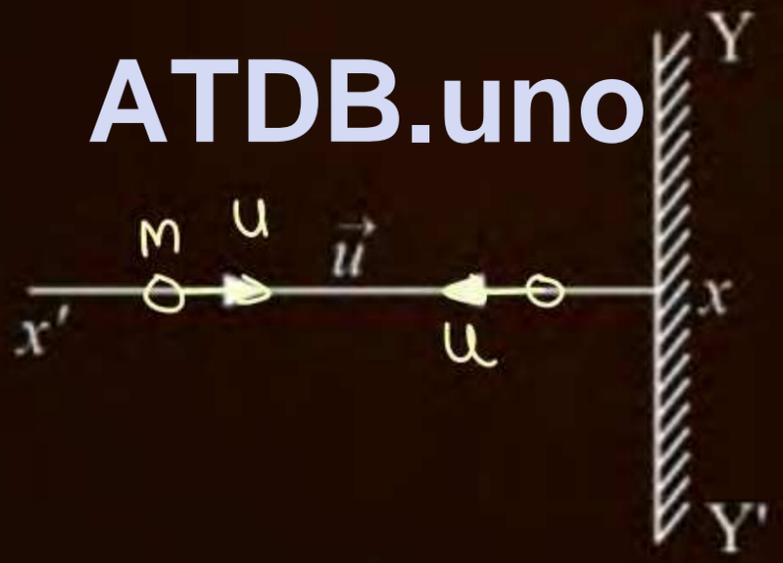
$$\frac{J_1}{J_2} = \frac{2mu}{\frac{2mu}{\sqrt{2}}} = \sqrt{2}$$

1 $\sqrt{2} : 1$

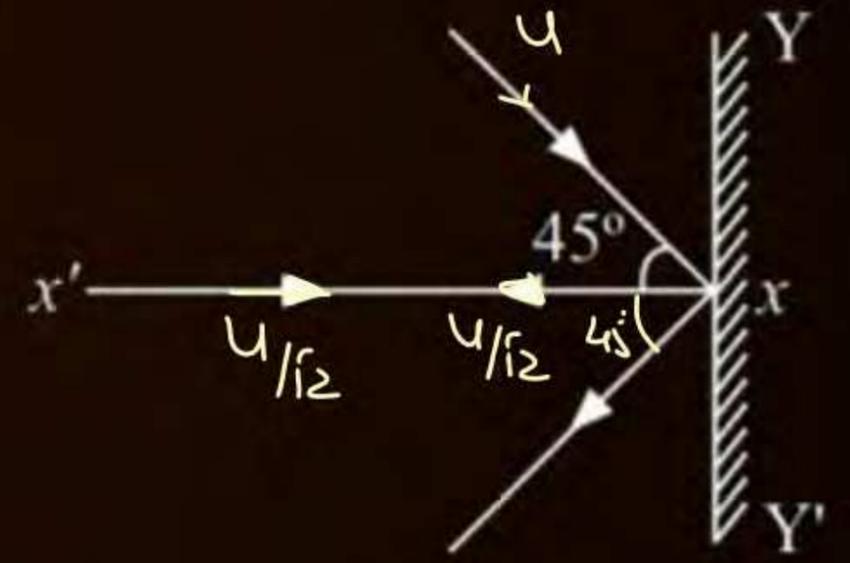
2 $1 : \sqrt{2}$

3 $1 : 1$

4 $2 : 1$



Ball(a)



Ball(b)

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Ans : (1)

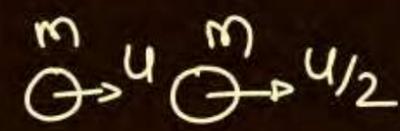
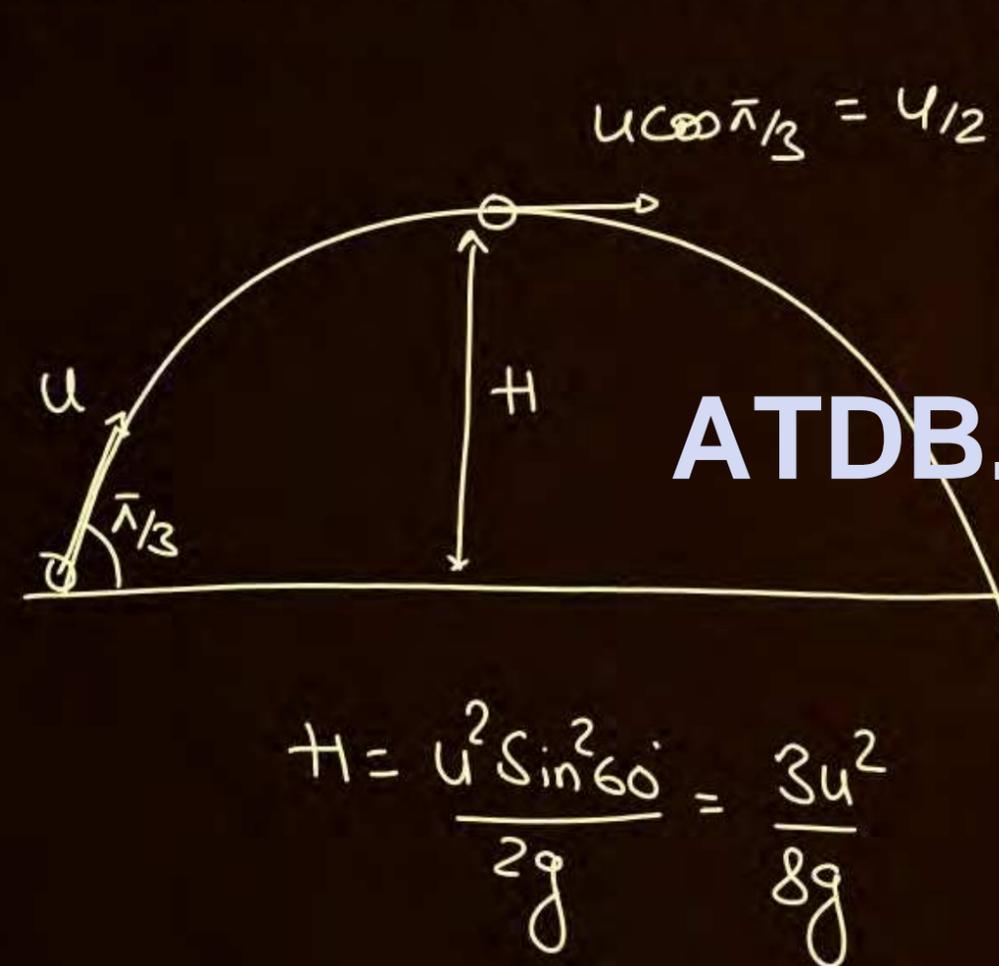
Question



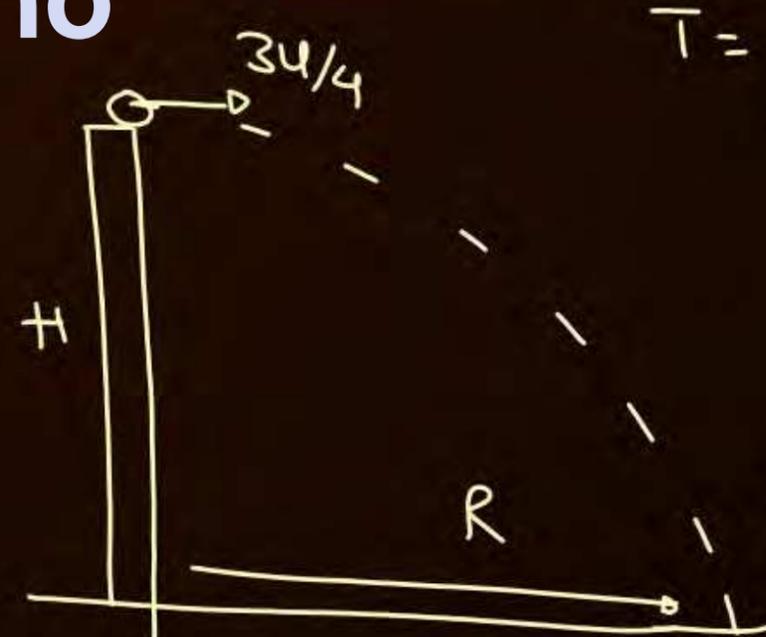
A particle of mass m is projected with a speed u from the ground at an angle $\theta = \pi/3$ w.r.t. horizontal (x -axis). When it has reached its maximum height, it collides completely inelastically with another particle of the same mass and velocity $u\hat{i}$. The horizontal distance covered by the combined mass before reaching the ground is:

[9 Jan, 2020 (Shift-II)]

- 1 $\frac{3\sqrt{3}u^2}{8g}$
- 2 $2\sqrt{2}\frac{u^2}{g}$
- 3 $\frac{5u^2}{8g}$
- 4 $\frac{3\sqrt{2}u^2}{4g}$



$$mu + \frac{mu}{2} = 2mv_1 \Rightarrow v_1 = \frac{3u}{4}$$



$$T = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2}{g} \cdot \frac{3u^2}{8g}}$$

$$T = \frac{\sqrt{3}u}{2g}$$

$$R = \left(\frac{3u}{4}\right) \left(\frac{\sqrt{3}u}{2g}\right) = \frac{3\sqrt{3}u^2}{8g}$$

Ans: (1)

Question



A particle of mass m is dropped from a height h above the ground. At the same time another particle of the same mass is thrown vertically upwards from the ground with a speed of $\sqrt{2gh}$. If they collide head-on completely inelastically, the time taken for the combined mass to reach the ground, in units of $\sqrt{\frac{h}{g}}$ is:

- 1 $\frac{1}{2}$
- 2 $\sqrt{\frac{1}{2}}$
- 3 $\sqrt{\frac{3}{4}}$
- 4 $\sqrt{\frac{3}{2}}$



$$\begin{aligned} \text{For particle 1: } -(h-h_1) &= -\frac{1}{2}gt^2 \Rightarrow h-h_1 = \frac{1}{2}gt^2 \\ \text{For particle 2: } h_1 &= \sqrt{2gh}t - \frac{1}{2}gt^2 \Rightarrow h_1 = \sqrt{2gh}t - \frac{1}{2}gt^2 \end{aligned} \quad \left. \begin{aligned} & \\ & \end{aligned} \right\} \begin{aligned} h &= \sqrt{2gh}t \\ t &= \sqrt{\frac{h}{2g}} \end{aligned}$$

[8 Jan, 2020 (Shift-II)]

$$h_1 = \sqrt{2gh} \sqrt{\frac{h}{2g}} - \frac{1}{2}g \left(\frac{h}{2g}\right)$$

$$h_1 = h - \frac{h}{4} = \frac{3h}{4}$$

$$v = u + at$$

$$v_1 = 0 - g \sqrt{\frac{h}{2g}} = -\sqrt{\frac{gh}{2}}$$

$$v_2 = \sqrt{2gh} - g \sqrt{\frac{h}{2g}} = \sqrt{\frac{gh}{2}}$$

Ans : (8)

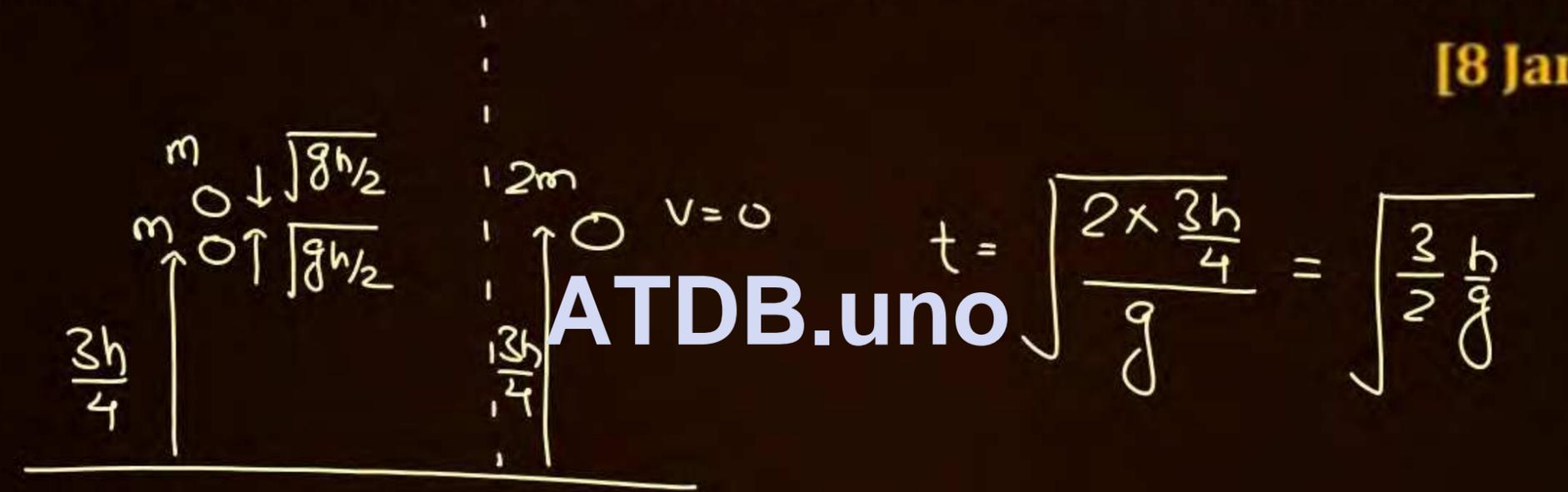
Question



A particle of mass m is dropped from a height h above the ground. At the same time another particle of the same mass is thrown vertically upwards from the ground with a speed of $\sqrt{2gh}$. If they collide head-on completely inelastically, the time taken for the combined mass to reach the ground, in units of $\sqrt{\frac{h}{g}}$ is:

[8 Jan, 2020 (Shift-II)]

- 1 $\frac{1}{2}$
- 2 $\sqrt{\frac{1}{2}}$
- 3 $\sqrt{\frac{3}{4}}$
- 4 $\sqrt{\frac{3}{2}}$



$$P_i = P_f \Rightarrow m\left(-\sqrt{\frac{gh}{2}}\right) + m\left(\sqrt{\frac{gh}{2}}\right) = 2mv_3$$

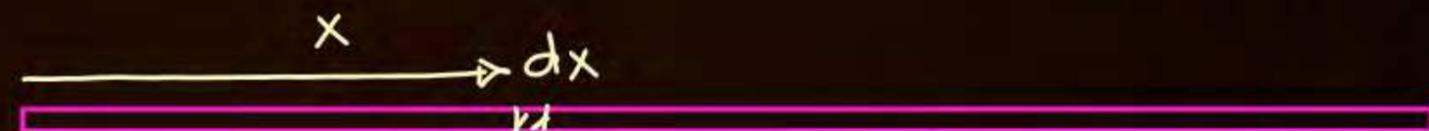
$$v_3 = 0$$

Ans : (4)

Question



The distance of center of mass from end A of a one dimensional rod (AB) having mass density $Q = Q_0 \left(1 - \frac{x^2}{L^2}\right)$ kg/m and length L (in meter) is $\frac{3L}{\alpha}$ m. The value of α is _____ . (where x is the distance from end A) **[28 July, 2022 (Shift-II)]**



$$x_{cm} = \frac{\int x dm}{\int dm} = \frac{\int_0^L x \left(Q_0 \left(1 - \frac{x^2}{L^2} \right) \right) dx}{\int_0^L Q_0 \left(1 - \frac{x^2}{L^2} \right) dx}$$

$$dm = \lambda dx = Q_0 \left(1 - \frac{x^2}{L^2} \right) dx$$

$$x_{cm} = \frac{\int_0^L \left(x - \frac{x^3}{L^2} \right) dx}{\int_0^L \left(1 - \frac{x^2}{L^2} \right) dx}$$

$$x_{cm} = \frac{\frac{L^2}{2} - \frac{L^4}{4L^2}}{L - \frac{L^3}{3L^2}} = \frac{\frac{L^2}{2} - \frac{L^2}{4}}{L - \frac{L}{3}} = \frac{\frac{L^2}{4}}{\frac{2L}{3}} = \frac{3L}{8}$$

8
↑
Ans : ()

Question



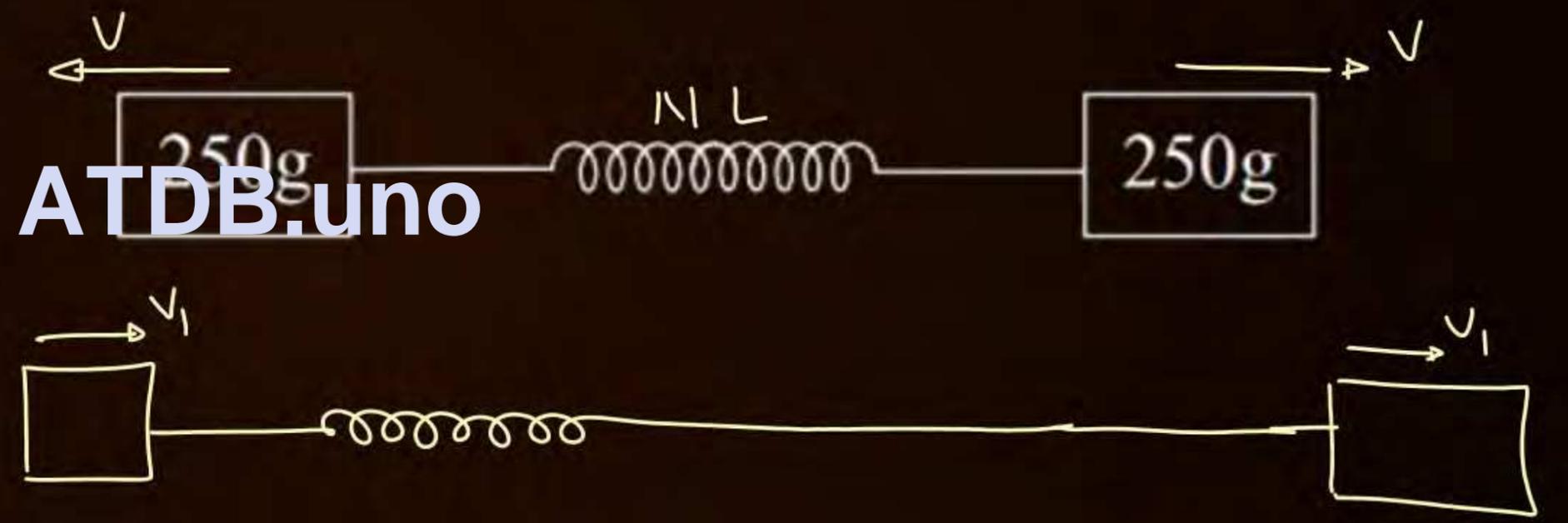
$$250 \text{ gm} = \frac{1}{4} \text{ kg}$$

As per the given figure, two blocks each of mass 250 g are connected to a spring of spring constant 2 Nm^{-1} . If both are given velocity v in opposite directions, then maximum elongation of the spring is:

[29 June, 2022 (Shift-I)]

- 1 $\frac{v}{2\sqrt{2}}$
- 2 $\frac{v}{2}$
- 3 $\frac{v}{4}$
- 4 $\frac{v}{\sqrt{2}}$

$P_f = P_i$
 $+\frac{1}{4}v_1 + \frac{1}{4}v_1 = -\frac{1}{4}v + \frac{1}{4}v$
 $\Rightarrow v_1 = 0$
 $k_1 + u_1 = k_2 + u_2$
 $\frac{1}{2} \cdot \frac{1}{4}v^2 + \frac{1}{2} \cdot \frac{1}{4}v^2 + 0 = 0 + \frac{1}{2} \cdot 2x^2$
 $\frac{v^2}{4} = x^2 \Rightarrow x = \frac{v}{2}$



Ans : (2)

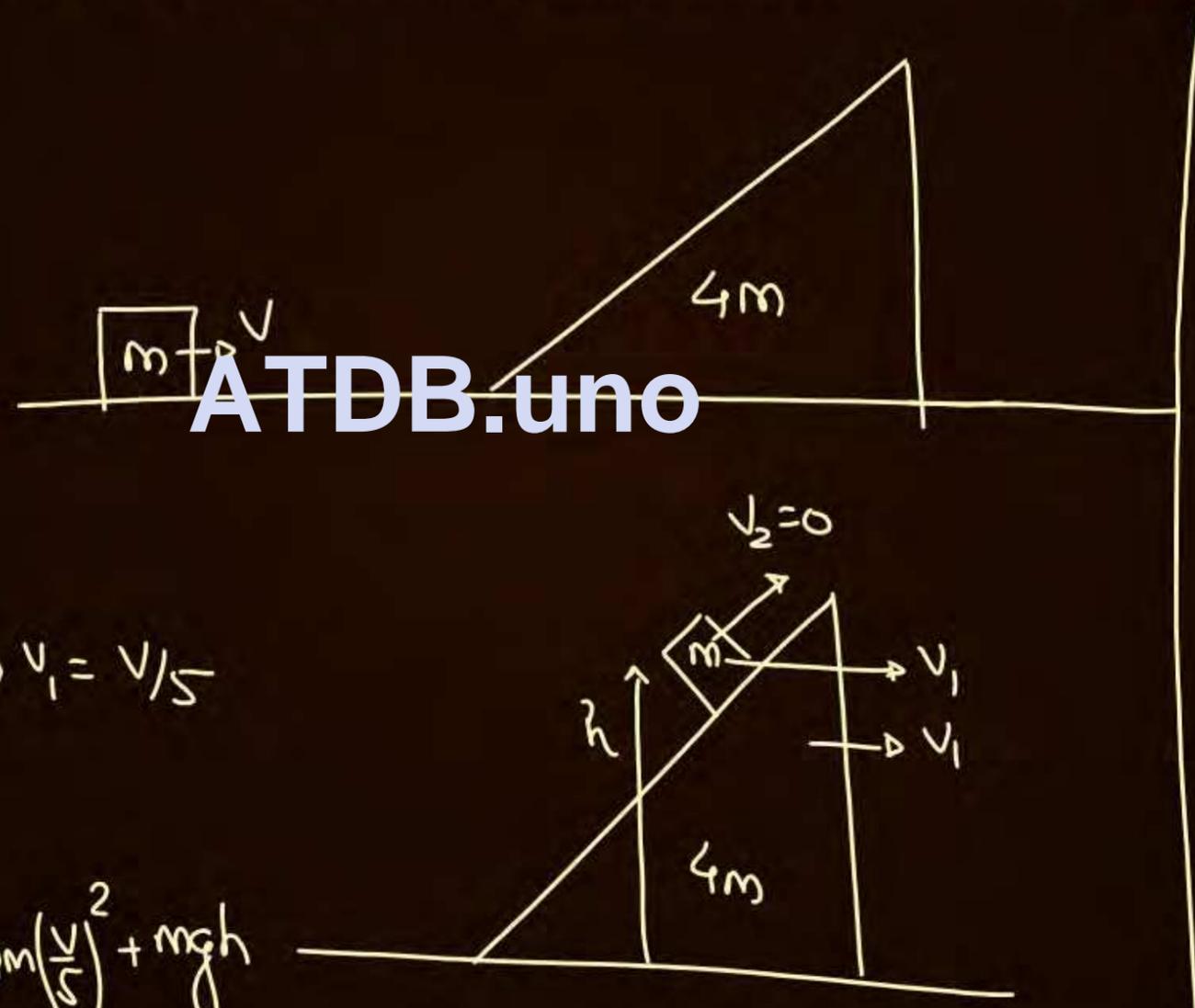
Question



A wedge of mass $M = 4m$ lies on a frictionless plane. A particle of mass m approaches the wedge with speed v . There is no friction between the particle and the plane or between the particle and the wedge. The maximum height climbed by the particle on the wedge is given by: **[29 April, 2019 (Shift-II)]**

- 1 $\frac{2v^2}{7g}$
- 2 $\frac{v^2}{g}$
- 3 $\frac{2v^2}{5g}$ ✓
- 4 $\frac{v^2}{2g}$

$\vec{P}_f = \vec{P}_i$
 $(P_f)_x = (P_i)_x$
 $mv_1 + 4mv_2 = mv \Rightarrow v_2 = v/5$
 $K_1 + U_1 = K_2 + U_2$
 $\frac{1}{2}mv^2 + 0 = \frac{1}{2}m\left(\frac{v}{5}\right)^2 + \frac{1}{2}4m\left(\frac{v}{5}\right)^2 + mgh$



$\frac{1}{2}mv^2 - \frac{1}{2}(5m)\left(\frac{v^2}{25}\right) = mgh$
 $h = \frac{2v^2}{5g}$

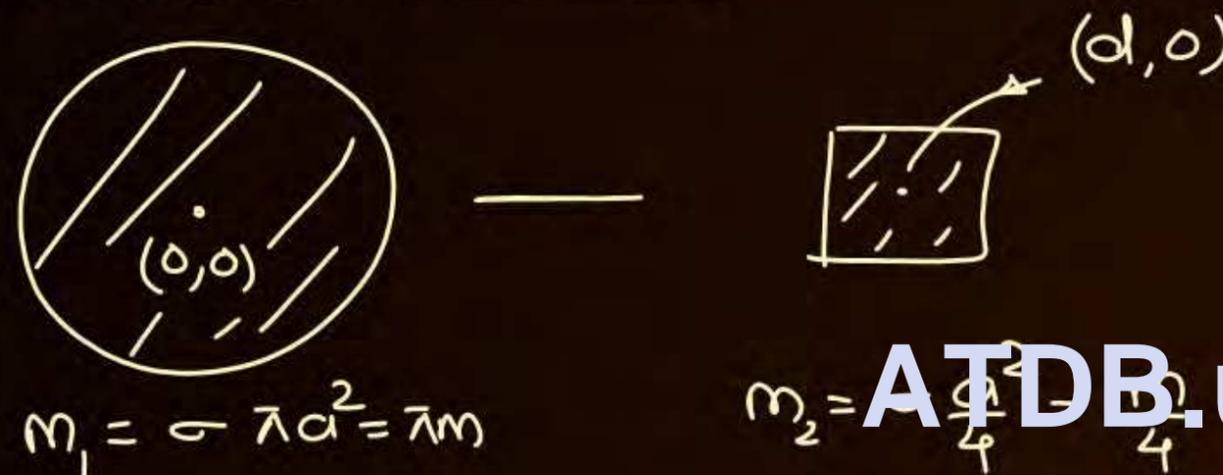
Ans : (3)

Question



A square shaped hole of side $l = \frac{a}{2}$ is carved out at a distance $d = \frac{a}{2}$ from the center 'O' of a uniform circular disk of radius a . If the distance of the center of mass of the remaining portion from O is $-\frac{a}{x}$, value of x (to the nearest integer) is _____.

[2 Sep, 2020 (Shift-II)]

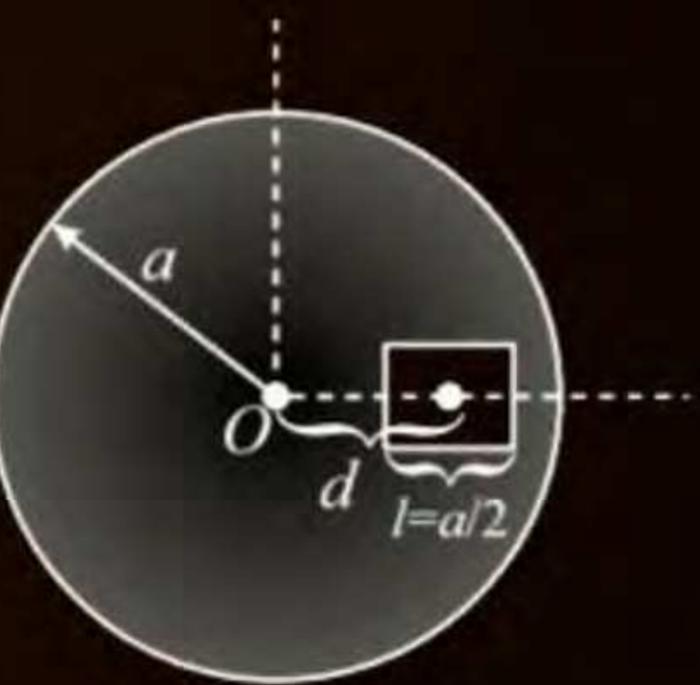


$$m_1 = \sigma \pi a^2 = \pi m$$

$$m_2 = \frac{\sigma l^2}{4} = \frac{\pi m}{4}$$

$$x_{cm} = \frac{\pi m(0) - \frac{\pi m}{4}(d)}{\pi m - \frac{\pi m}{4}} = \frac{-d}{(4\pi - 1)} = \frac{-a/2}{(4\pi - 1)} = \frac{-a}{2(4\pi - 1)}$$

$$= \frac{-a}{2(11.56)} \approx -\frac{a}{23}$$



Ans : (23)

Question



Three identical spheres each of mass M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to 3 m each. Taking point of intersection of mutually perpendicular sides as origin, the magnitude of position vector of center of mass of the system will be $\sqrt{x}\text{ m}$. The value of x is _____.

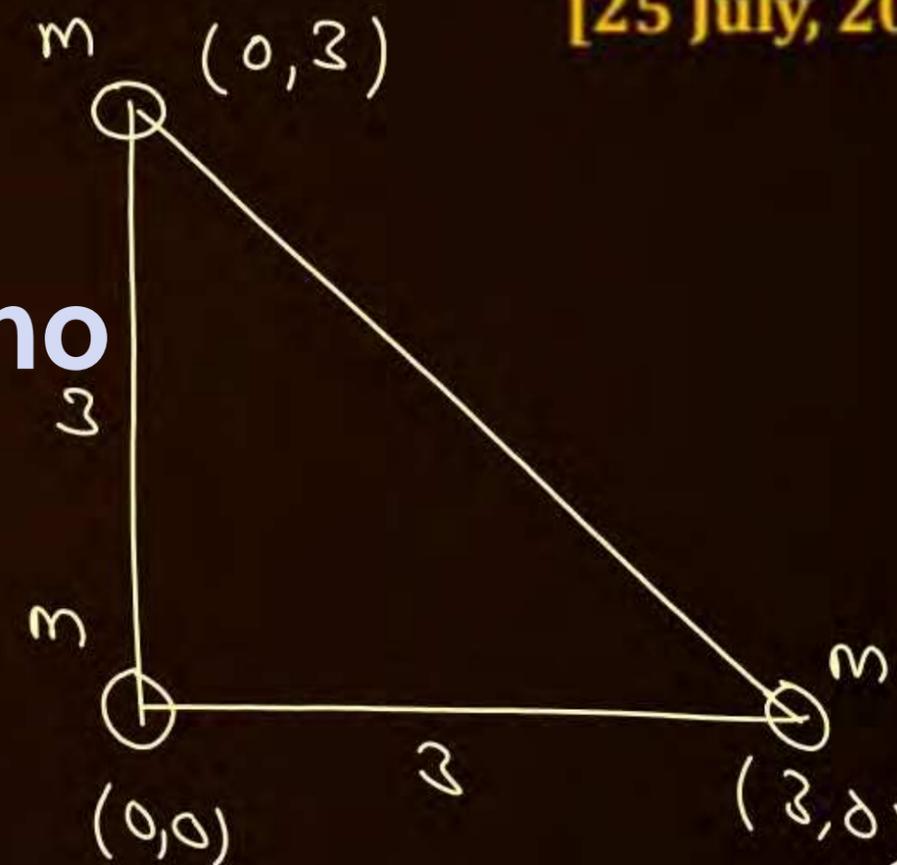
[25 July, 2022 (Shift-II)]

$$x_{cm} = \frac{m(0) + m(0) + m(3)}{3m} = 1$$

$$y_{cm} = \frac{m(0) + m(3) + m(0)}{3m} = 1$$

$$\sqrt{1^2 + 1^2} = \sqrt{2} = \sqrt{x}$$

$$x = 2$$



Ans : (2)

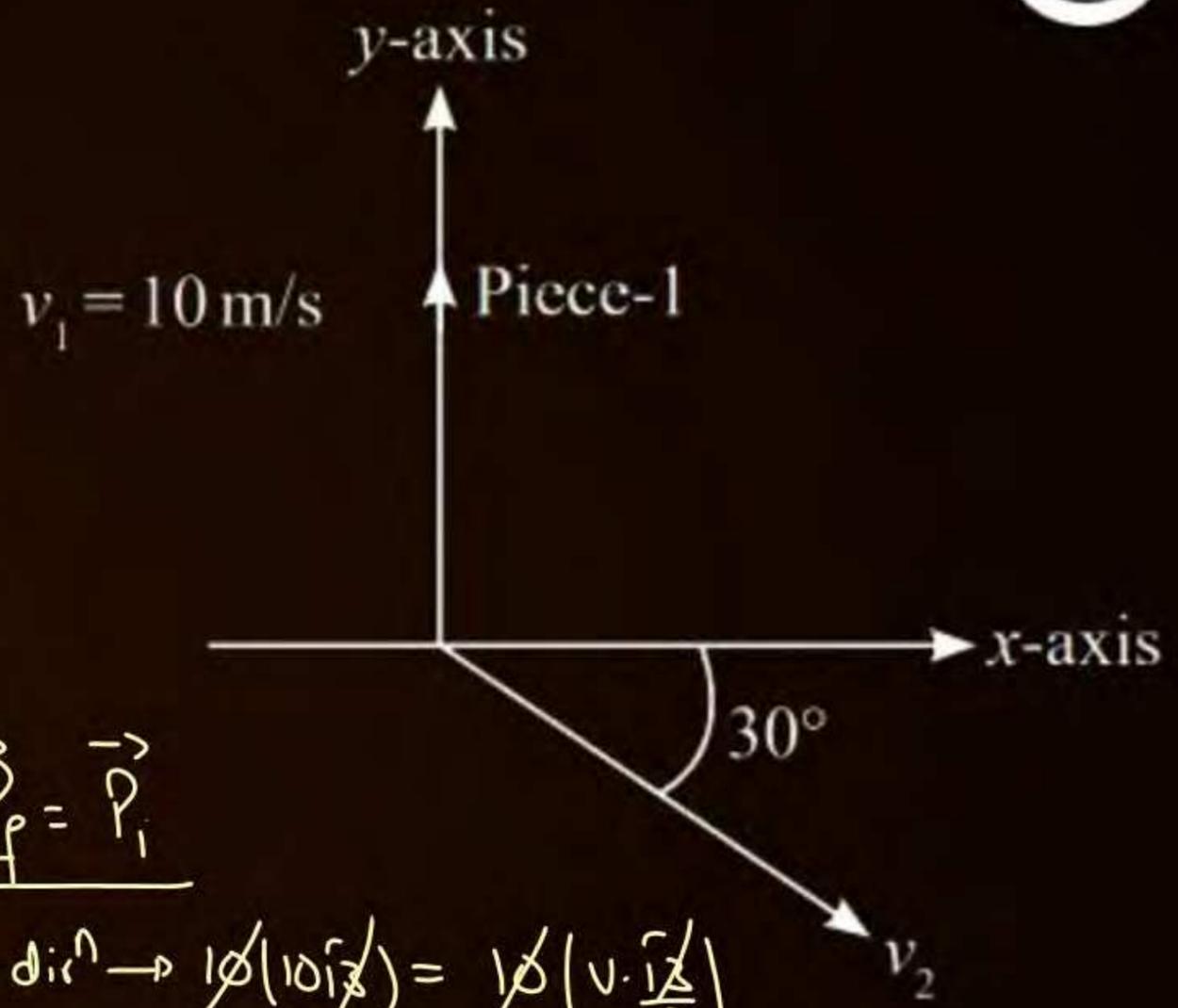
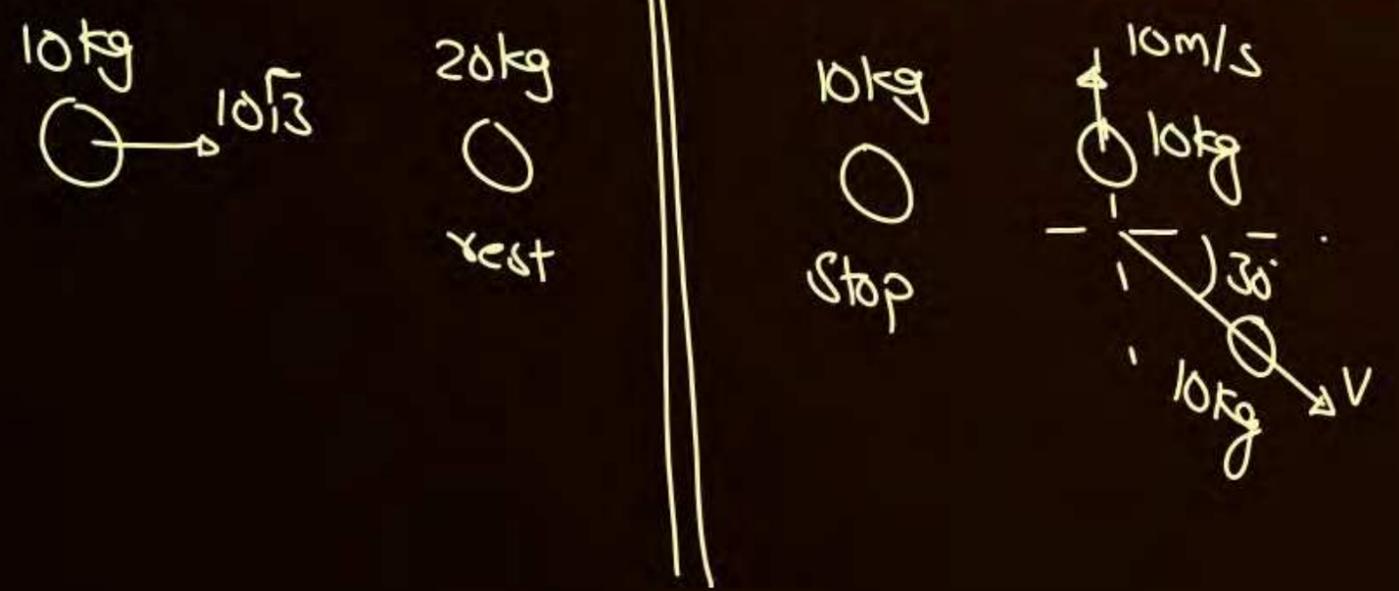


Question

A ball of mass 10kg, moving with a velocity $10\sqrt{3}$ m/s along the x-axis, hits another ball of mass 20kg which is at rest. After the collision, first ball comes to rest while second ball disintegrates into two equal pieces. One piece starts moving along y-axis with a speed of 10 m/s. The second piece starts moving at an angle of 30° with respect to the x-axis. The velocity of the ball moving at 30° with x-axis is x m/s. The configuration of pieces after collision is shown in the figure below.

The value of x to the nearest integer is _____.

[18 March, 2021 (Shift-I)]



$\vec{P}_f = \vec{P}_i$

X-dirⁿ $\rightarrow 10(10\sqrt{3}) = 10(v \cdot \frac{\sqrt{3}}{2})$
 $v = 20 \text{ m/s}$

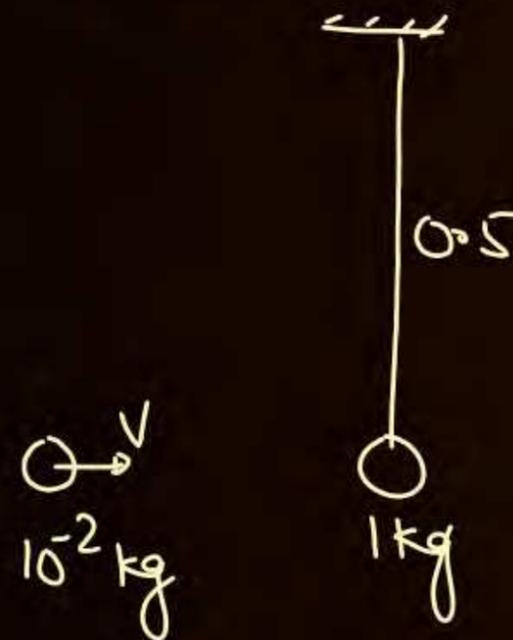
Y-dirⁿ $0 = 10(10) - 10(\frac{v}{2})$
 $\Rightarrow v = 20 \text{ m/s}$

Ans : (20)

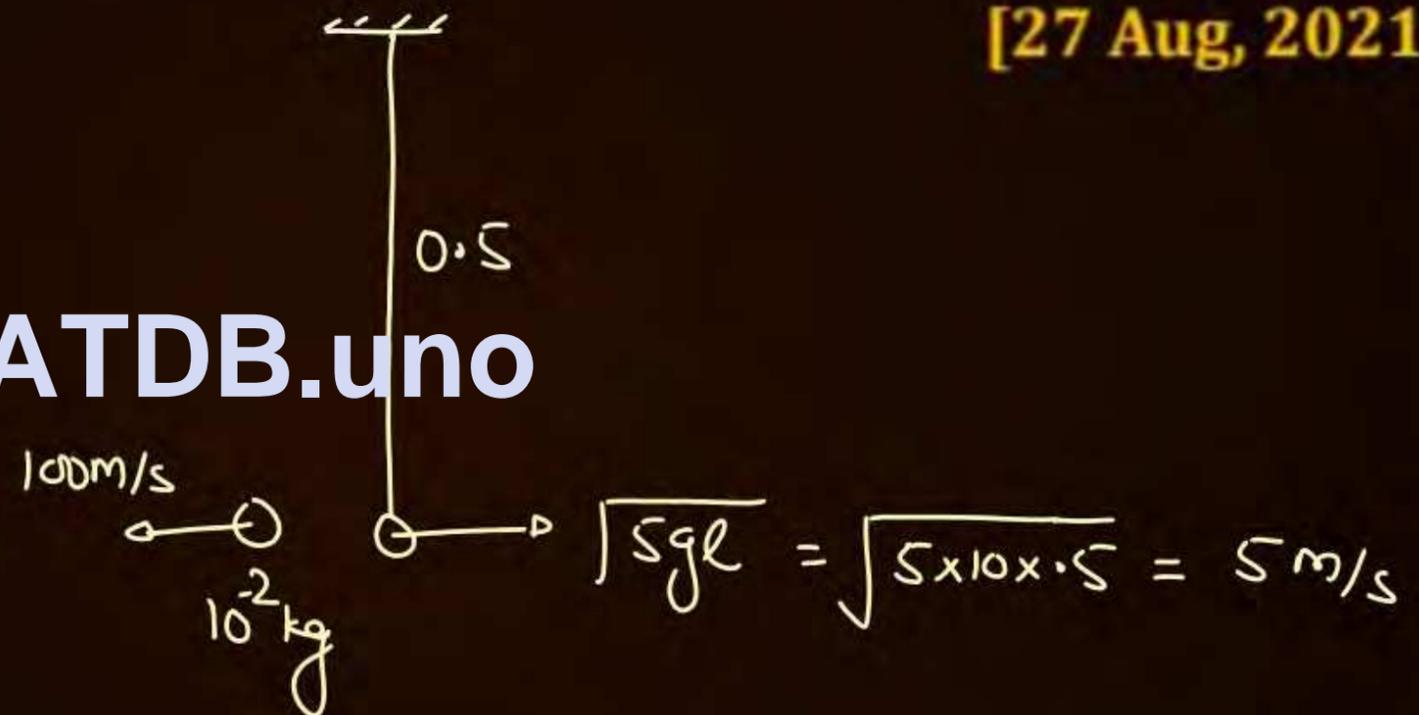
Question



A bullet of 10 g, moving with velocity v , collides head-on with the stationary bob of a pendulum and recoils with velocity 100 m/s. The length of the pendulum is 0.5 m and mass of the bob is 1 kg. The minimum value of $v = \underline{\hspace{2cm}}$ m/s so that the pendulum describes a circle. (Assume the string to be inextensible and $g = 10 \text{ m/s}^2$)



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[27 Aug, 2021 (Shift-II)]

$$\vec{p}_i = \vec{p}_f \Rightarrow (10^{-2})v = -10^{-2}(100) + 1(5)$$

$$v = -100 + 500 = \underline{400 \text{ m/s}}$$

Ans : (400)

Question



Consider a circular disc of radius 20 cm with center located at the origin. A circular hole of a radius 5 cm is cut from this disc in such a way that the edge of the hole touches the edge of the disc. The distance of center of mass of residual or remaining disc from the origin will be-

(January 2025) / 23-01-2025 / Morning Shift

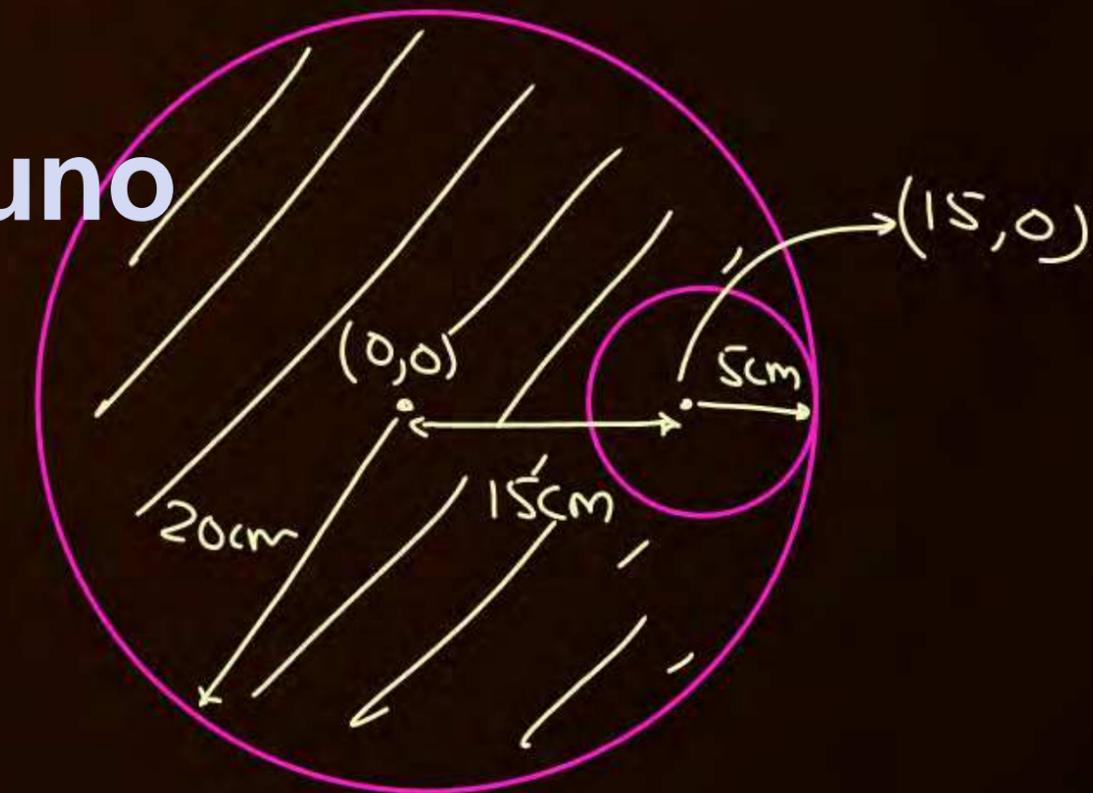
- 1 2.0 cm
- 2 0.5 cm
- 3 1.5 cm
- 4 1.0 cm



$$\sigma \pi (20)^2 = 16m$$

$$\sigma \pi (5)^2 = m$$

$$X_{cm} = \frac{16m(0) - m(15)}{16m - m} = \underline{\underline{-1 \text{ cm}}}$$



Ans. (4)

Question



The center of mass of a thin rectangular plate (fig - x) with sides of length a and b , whose mass per unit area (σ) varies as $\sigma = \frac{\sigma_0 x}{ab}$ (where σ_0 is a constant), would be _____

(January 2025)/28-01-2025/Morning Shift)

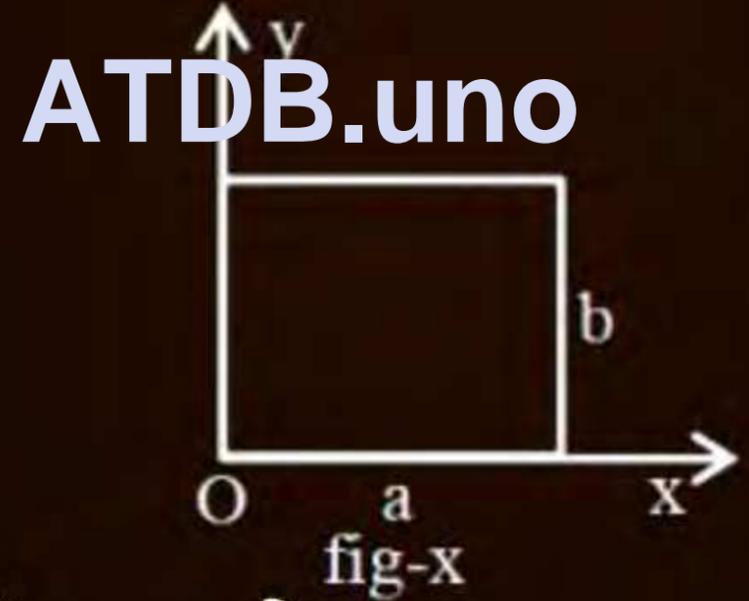
- 1 $\left(\frac{2}{3}a, \frac{b}{2}\right)$
- 2 $\left(\frac{2}{3}a, \frac{2}{3}b\right)$
- 3 $\left(\frac{a}{2}, \frac{b}{2}\right)$
- 4 $\left(\frac{1}{3}a, \frac{b}{2}\right)$

Handwritten solution for x_{cm} :

$$y_{cm} = b/2$$

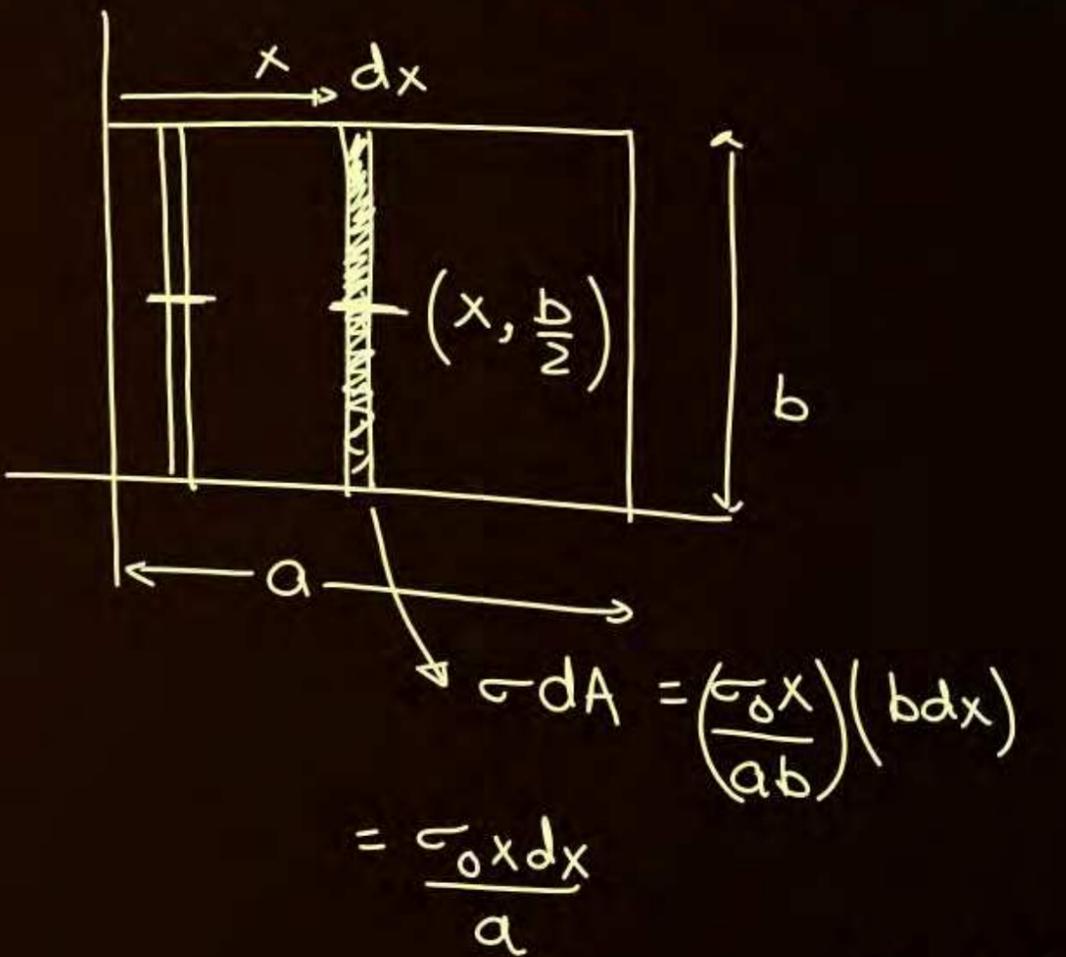
$$x_{cm} = \frac{\int x dm}{\int dm}$$

$$x_{cm} = \frac{\int_0^a x \left(\frac{\sigma_0 x dx}{a}\right)}{\int_0^a \frac{\sigma_0 x dx}{a}}$$



Handwritten calculation for x_{cm} :

$$\frac{a^3/3}{a^2/2} = \frac{2a}{3}$$



Ans : (1)

Question



As shown below, bob A of a pendulum having massless string of length 'R' is released from 60° to the vertical. It hits another bob B of half the mass that is at rest on a friction less table in the center. Assuming elastic collision, the magnitude of the velocity of bob A after the collision will be (take g as acceleration due to gravity)

(January 2025)/29-01-2025/Morning Shift)

1 $\frac{1}{3}\sqrt{Rg}$

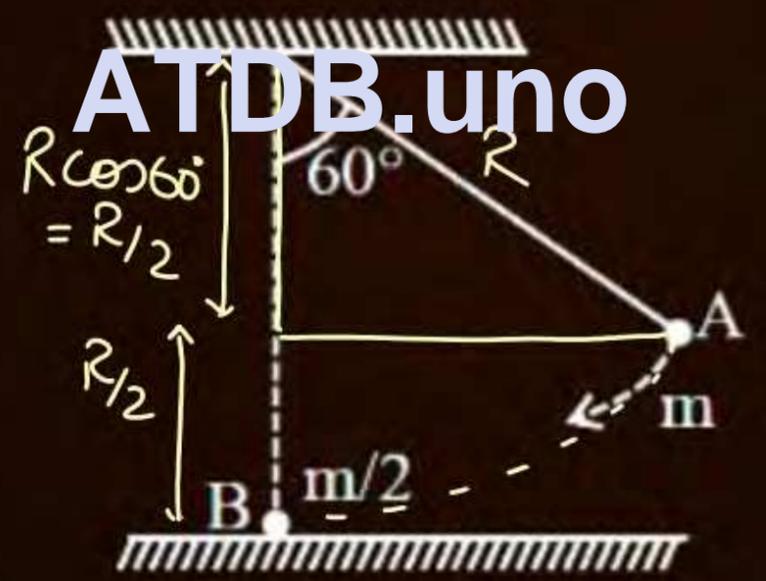
2 \sqrt{Rg}

3 $\frac{4}{3}\sqrt{Rg}$

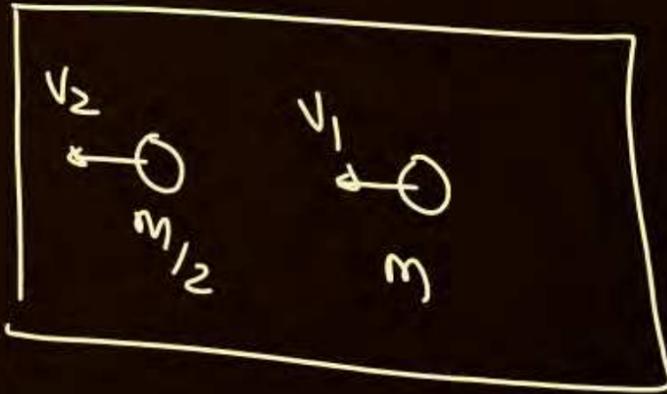
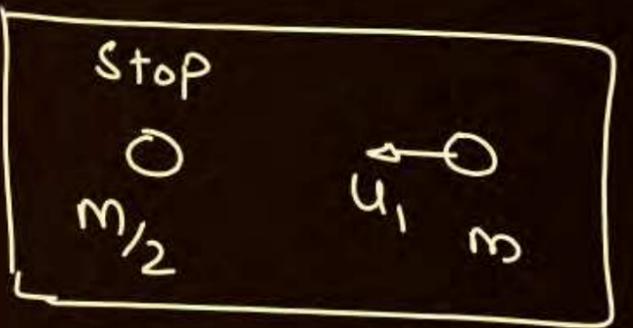
4 $\frac{2}{3}\sqrt{Rg}$

$P \rightarrow$
 $m\sqrt{gR} = \frac{m}{2}v_2 + mv_1$
 $2v_1 + v_2 = 2\sqrt{gR} \quad \text{--- (i)}$
 $e \rightarrow \frac{v_2 - v_1}{\sqrt{gR}} = 1$
 $v_2 - v_1 = \sqrt{gR}$

 $2v_1 + (\sqrt{gR} + v_1) = 2\sqrt{gR}$
 $3v_1 = \sqrt{gR}$
 $v_1 = \frac{1}{3}\sqrt{gR}$



$$u_1 = \sqrt{2g \cdot \frac{R}{2}} = \sqrt{gR}$$



Ans : (1)

Question



Assertion (A) : Three identical spheres of same mass undergo one dimensional motion as shown in figure with initial velocities $v_A = 5 \text{ m/s}$, $v_B = 2 \text{ m/s}$, $v_C = 4 \text{ m/s}$. If we wait sufficiently long for elastic collision to happen, then $v_A = 4 \text{ m/s}$, $v_B = 2 \text{ m/s}$, $v_C = 5 \text{ m/s}$ will be the final velocities.

✗



Reason (R) : In an elastic collision between identical masses, two objects exchange their velocities. ✓

(January 2025)/29-01-2025/Evening Shift)

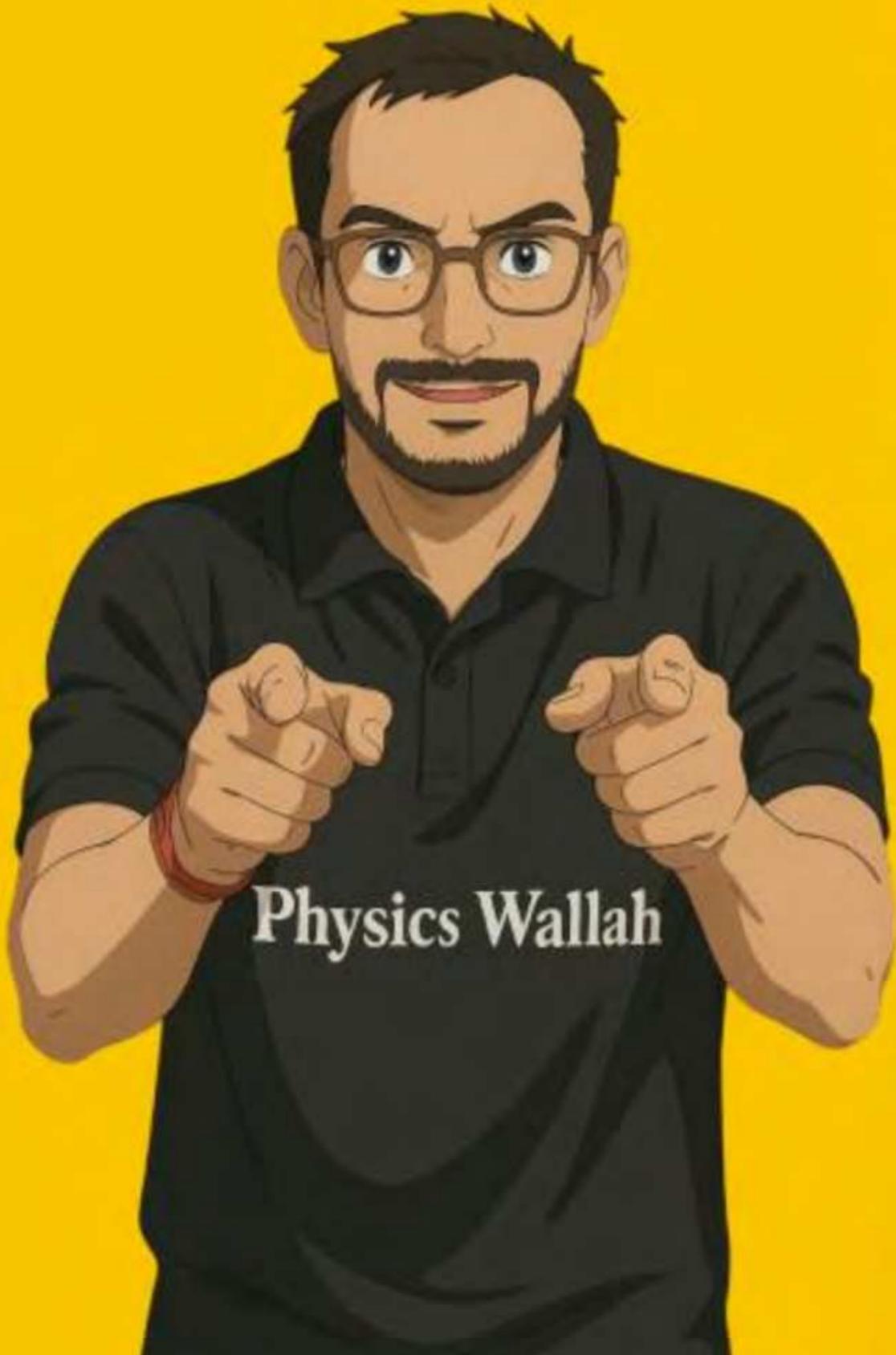




- 1 Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
- 2 (A) is true but (R) is false
- 3 Both (A) and (R) are true and (R) is the correct explanation of (A).
- 4 (A) is false but (R) is true

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Ans : (4)



THANK YOU
BAWWAL
BACCCHA
PARTY

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