YAKEEN NEET 2.0

2026

Motion in a plane

Physics | Assignment Solution 02

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Question

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

[NEET 2023]

(1) 3000 m

(2) 2800 m

(3) 2000 m

(4) 1000 m ✓

$u = 280\ m/s$

$\theta = 30°$

$H = \frac{u_y^2}{2g} = \frac{u^2\sin^2\theta}{2g}$

$H = \frac{280\times\cancel{280}^{14}\left(\frac{1}{2}\right)^2}{\cancel{2}\times\cancel{10}}$

$= \frac{\cancel{280}^{1400}\times 14}{\cancel{4}_{2}} =$

Question

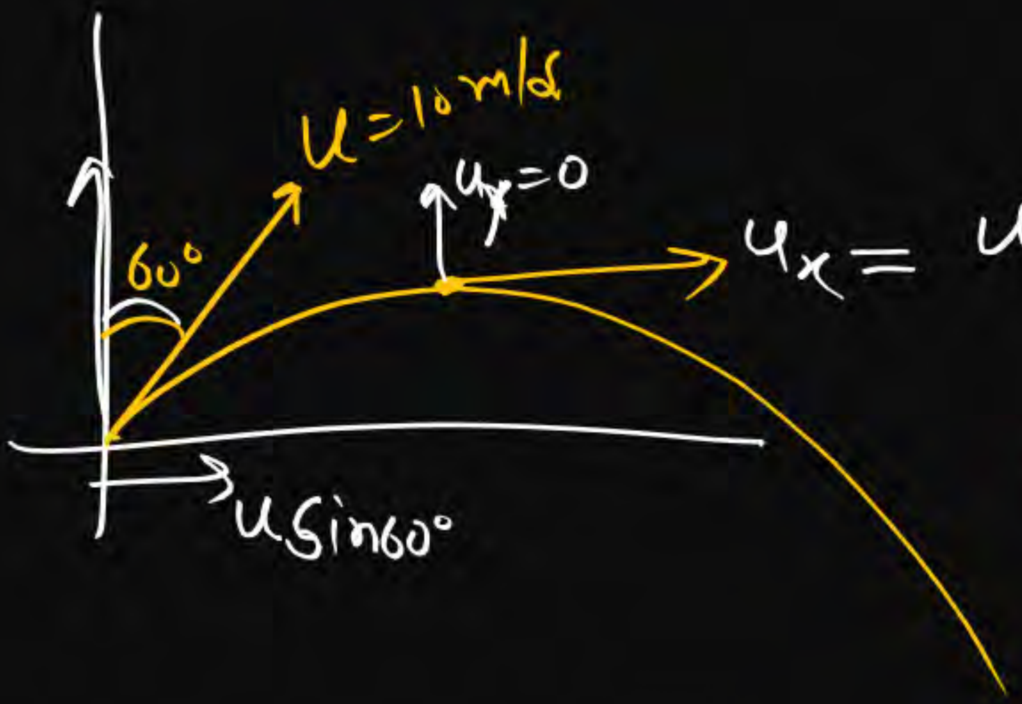
A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be: **[NEET 2022]**

(1) 10 ms^{-1}

(2) Zero

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

(4) 5 ms^{-1}



$u_x = u\sin 60^\circ = \frac{\cancel{10}^{\,5} \times \sqrt{3}}{\cancel{2}}$

$a_x = 0$

Question

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: [NEET 2021]

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

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

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

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

$u = \frac{2\pi R}{T}$ — (1)

$H = 4R = \frac{u^2 \sin^2\theta}{2g}$

$\cancel{4R} = \frac{\cancel{4}\pi^2 R^{\cancel{2}} \sin^2\theta}{T^2\, 2g}$

$\frac{2gT^2}{R\pi^2} = \sin^2\theta$

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

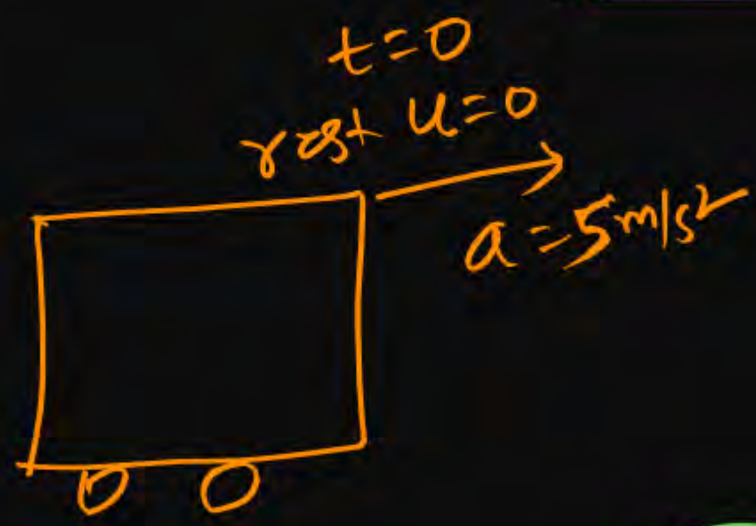
$\theta = \sin^{-1}\left(\frac{2gT^2}{R\pi^2}\right)^{1/2}$ Ans

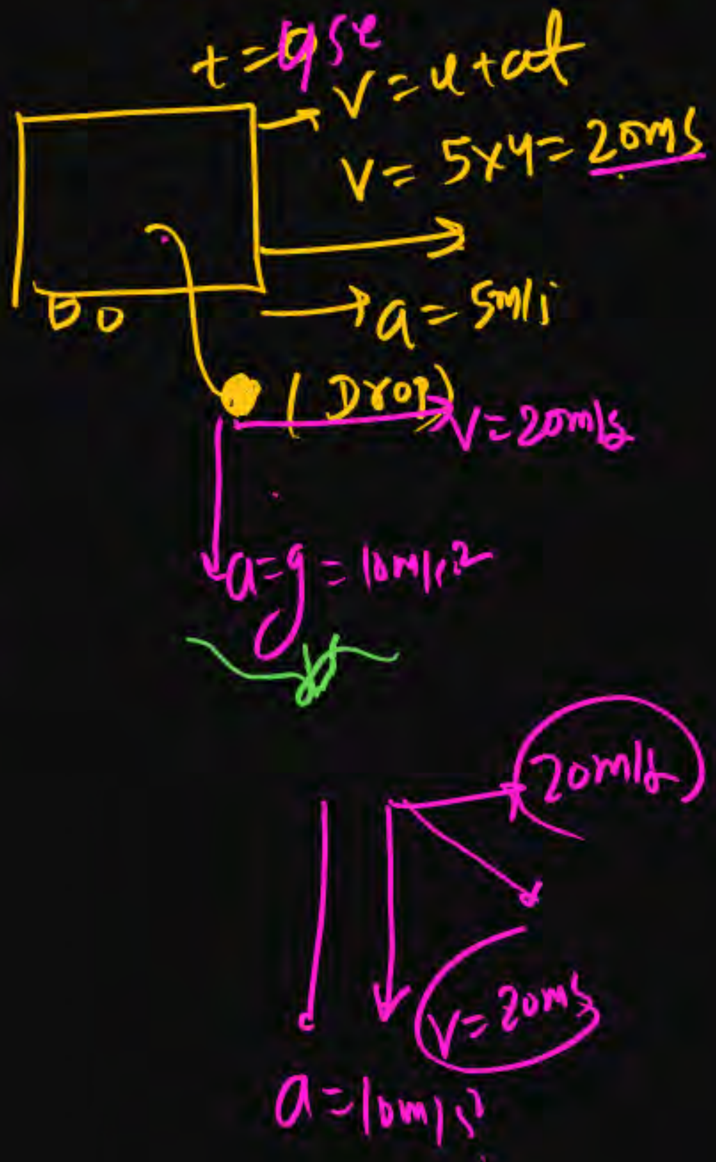
Question

A car starts from rest and accelerates at $5\ \mathrm{m/s^2}$. At $t = 4\mathrm{s}$, 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 $t = 6\mathrm{s}$?

[NEET 2021]

1. $20\ \mathrm{m/s}, 0$
2. $20\sqrt{2}\ \mathrm{m/s}, 0$
3. $20\sqrt{2}\ \mathrm{m/s}, 10\ \mathrm{m/s^2}$ R
4. $20\ \mathrm{m/s}, 5\ \mathrm{m/s^2}$





Question

A projectile is fired from the surface of the earth with a velocity of 5 ms^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} 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 ms^{-2}) is: (given $g = 9.8$ ms^{-2}) [NEET 2014]

(1) 3.5

(2) 5.9

(3) 16.3

(4) 110.8

Ans

$u_e = 5$ m/s $\qquad u_p = 3$ m/s

$\theta = \theta$

$$R = \frac{u_e^2 \cancel{\sin 2\theta}}{g_e} = \frac{u_p^2 \cancel{\sin 2\theta}}{g_p}$$

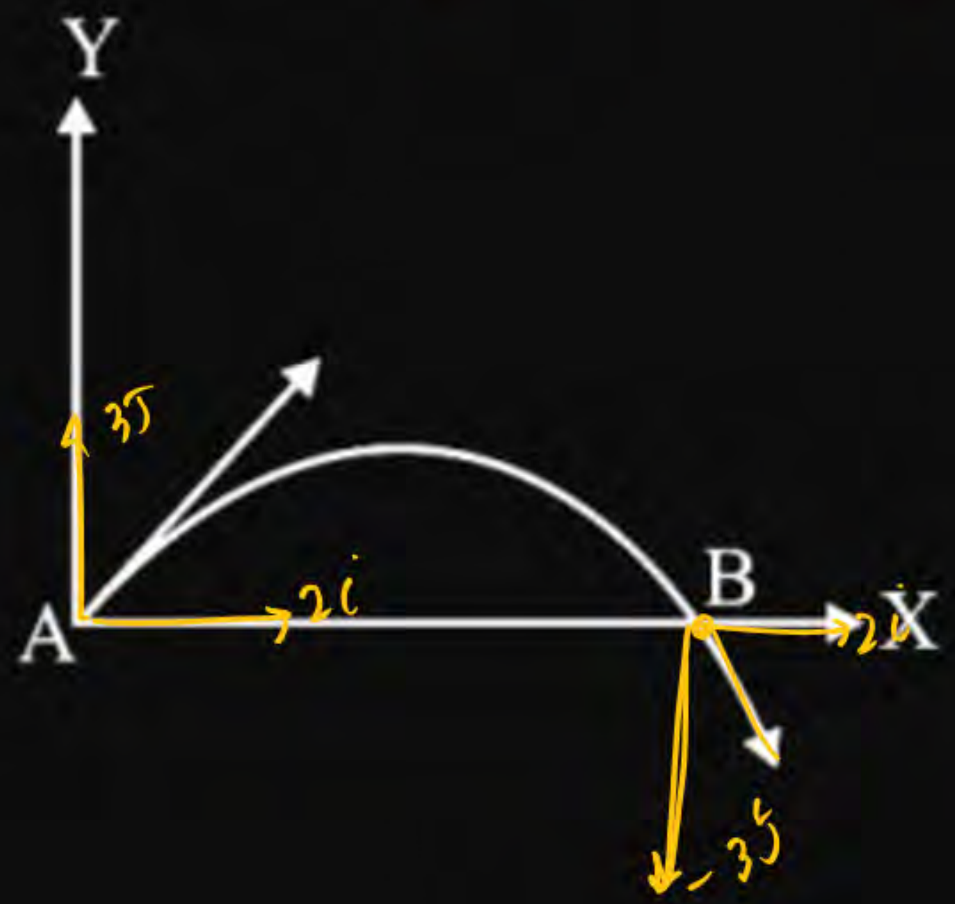
$$\frac{25}{10} = \frac{9}{g_p}$$

$$g_p = \frac{90}{25} = 3.6$$

Question

The velocity of a projectile at the initial point A $(2\hat{\imath} + 3\hat{\jmath})$ m/s. Its velocity (in m/s) at point B is:

[NEET 2013]



(1) $2\hat{\imath} + 3\hat{\jmath}$

(2) $-2\hat{\imath} - 3\hat{\jmath}$

(3) $-2\hat{\imath} + 3\hat{\jmath}$

(4) $2\hat{\imath} - 3\hat{\jmath}$

Question

The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is: [2012 Pre]

1. $\theta = \tan^{-1}\left(\frac{1}{4}\right)$
2. $\theta = \tan^{-1}(4)$
3. $\theta = \tan^{-1}(2)$
4. $\theta = 45^\circ$

$\cancel{\frac{H}{R}} = \frac{\tan\theta}{4}$

$\tan\theta = 4$

$\theta = \tan^{-1}(4)$

Question

A missile is fired for maximum range with an initial velocity of 20 m/s. If $g = 10\ \text{m/s}^2$, the range of the missile is: [2011 Pre]

$\theta = 45^\circ$

$$R_{max} = \frac{u^2 \sin(2\times 45^\circ)}{g} = \frac{u^2}{g} = \frac{20\times 20}{10}$$

1. 40 m ✓
2. 50 m
3. 60 m
4. 20 m

Question

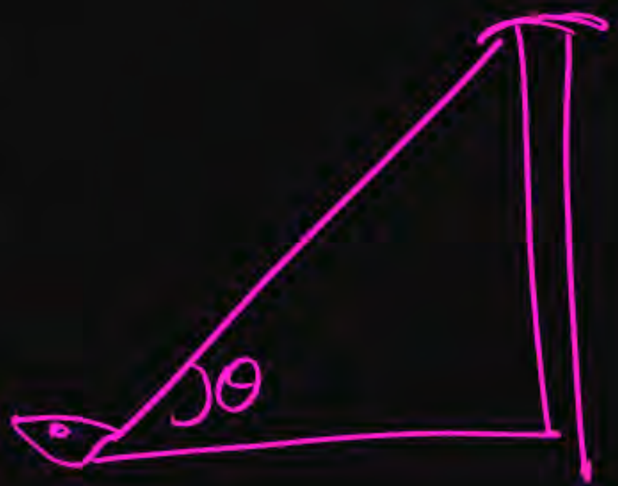
A projectile is fired at an angle of $45°$ with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection, is: **[2011 Mains]**

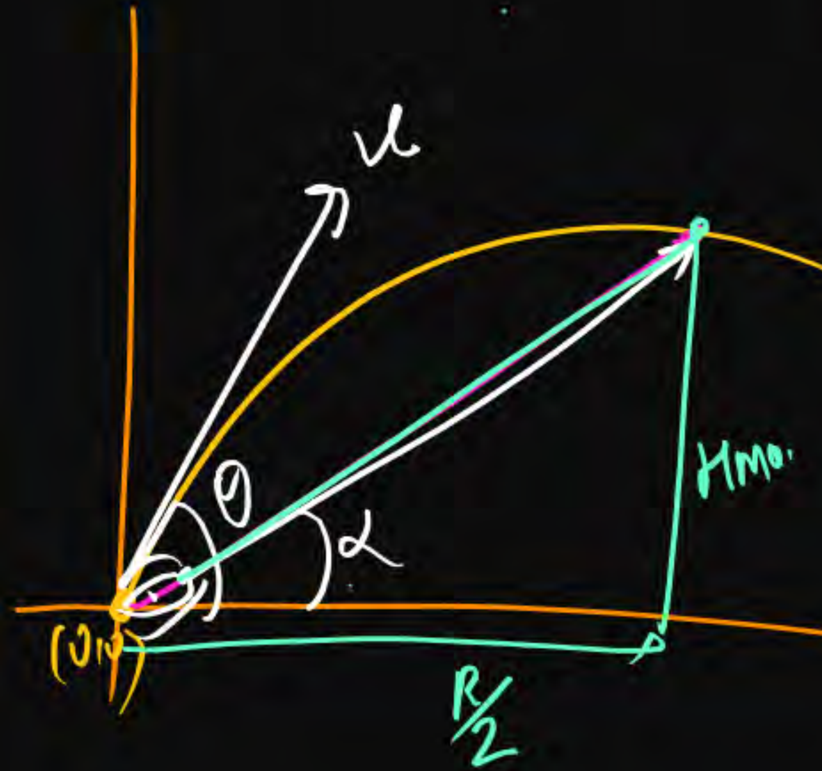
(1) $60°$

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

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

(4) $45°$





$\tan\alpha = \frac{2H_{max}}{R} = \frac{2 \cancel{R}\tan\theta}{\cancel{R} \times 4}$

$\tan\alpha = \frac{\tan\theta}{2}$

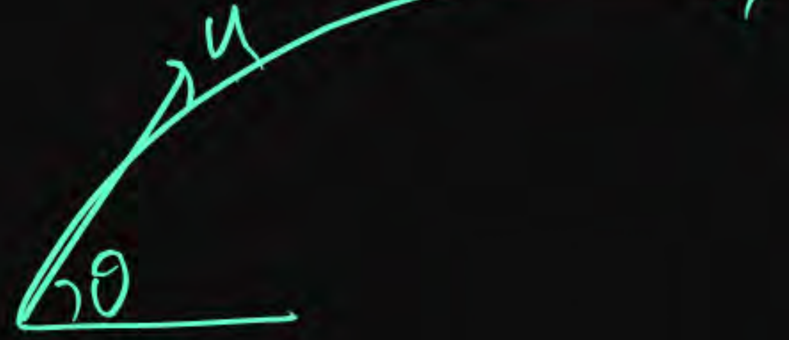
$= \frac{\tan 45°}{2}$

$\boxed{\tan\alpha = \frac{1}{2}}$

Question

The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is: **[2010 Mains]**

1. $60°$
2. $15°$
3. $30°$
4. $45°$



$\cancel{u}\cos\theta = \frac{\cancel{u}}{2}$

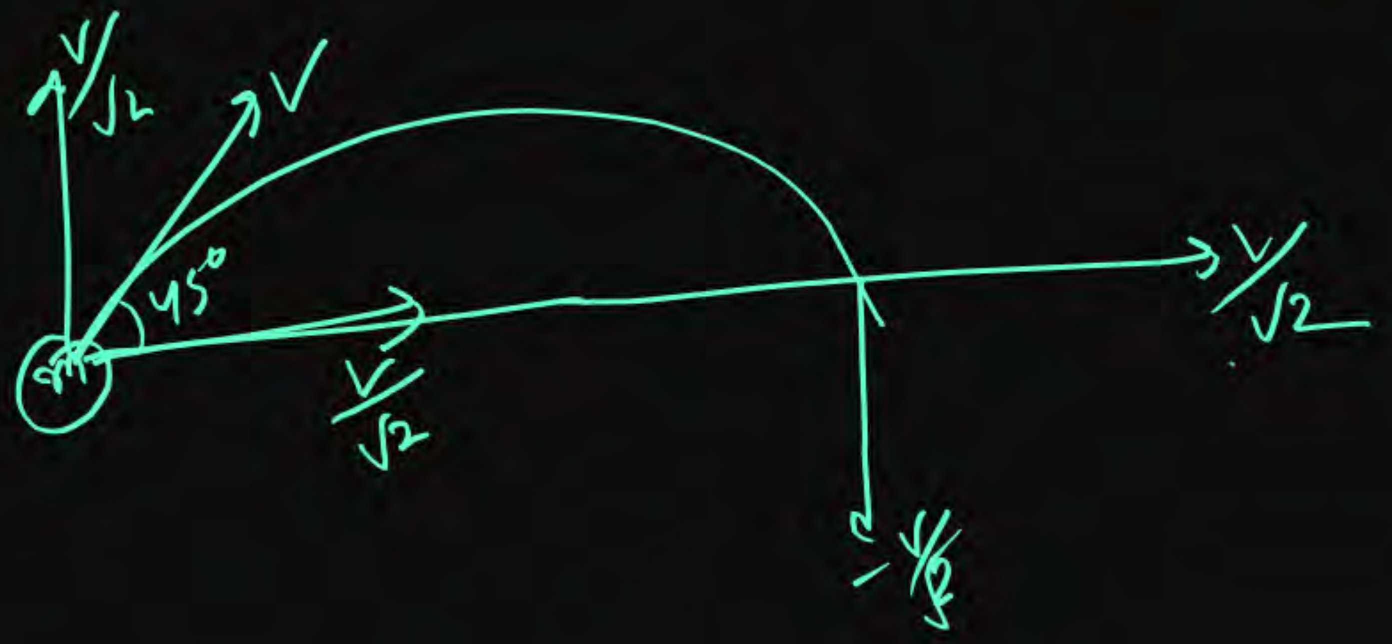
$\cos\theta = \frac{1}{2}$

$\theta = 60°$

Question

A particle of mass m is projected with velocity v making an angle of 45° with the horizontal. When the particle lands on the level ground the magnitude of the change in its momentum will be [NEET 2008]

1. $\sqrt{2}\, mv$
2. Zero
3. $2mv$
4. $\frac{mv}{\sqrt{2}}$



$$\Delta P = m(v_f - v_i)$$

$$= m\left[\cancel{\frac{v}{\sqrt2}\hat{i}} - \frac{v}{\sqrt2}\hat{j} - \left(\cancel{\frac{v}{\sqrt2}\hat{i}} + \frac{v}{\sqrt2}\hat{j}\right)\right]$$

$$= m \cdot \cancel{2}^{\sqrt2} \frac{v}{\cancel{\sqrt2}}$$

$$= \sqrt2\, mv$$

Question

For angles of projection of a projectile at angles $\overset{\alpha}{(45^\circ - \theta)}$ and $\overset{\beta}{(45^\circ + \theta)}$, the horizontal ranges described by the projectile are in the ratio of: [NEET 2006]

$\alpha + \beta = 90$

1. 1 : 1
2. 2 : 3
3. 1 : 2
4. 3 : 2

Question

Particle (A) is dropped from a height and another particle (B) is projected in horizontal direction with speed of 5 m/s from the same height, then correct statement is:

[NEET 2002]

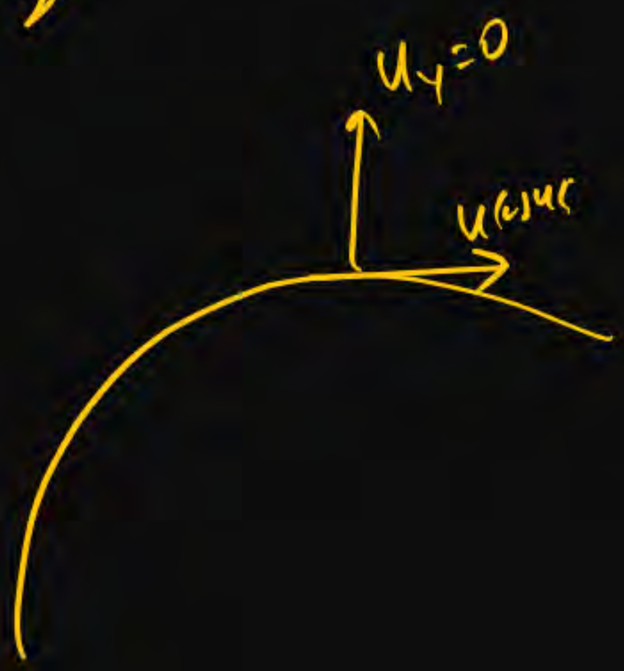
1. Particle (A) will reach at ground first with respect to particle (B)
2. Particle (B) will reach at ground first with respect to particle (A)
3. Both particles will reach at ground simultaneously
4. Both particles will reach at ground with same speed.

Question

A particle is projected making angle 45° with horizontal having kinetic energy K. The kinetic energy at highest point will be: **[NEET 2001]**

1. $\frac{K}{\sqrt{2}}$
2. $\frac{K}{2}$
3. $2K$
4. K

$K.E = \frac{1}{2} m u^2 = K$



$K.E = \frac{1}{2} m (u \cos 45)^2$

$= \frac{1}{2} m u^2 \left(\frac{1}{\sqrt{2}}\right)^2$

$= \left(\frac{1}{2} m u^2\right) \frac{1}{2}$

$= \frac{K}{2}$

Question

Two projectiles of same mass and with same velocity are thrown at an angle $\overset{\alpha}{60^\circ}$ and $\underset{\beta}{30^\circ}$ with the horizontal, then which quantity will remain same: [NEET 2000]

1. Time of flight
2. Horizontal range of projectile
3. Max height acquired
4. All of them

Question

Two particles separated at a horizontal distance x as shown in figure they projected at the same line as shown in figure with different initial speeds. The time after which the horizontal distance between them become zero: [NEET 1999]

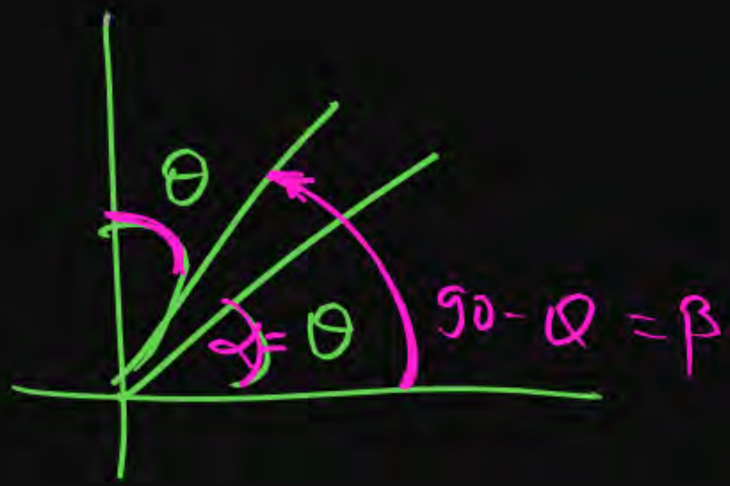
1. $\frac{x}{u}$
2. $\frac{u}{2x}$
3. $\frac{2u}{x}$
4. None of these

diagram missing

Question

Two particles are projected with same initial velocity one makes angle θ with horizontal while other makes an angle θ with vertical. If their common range is R then product of their time of flight is direction proportional to: **[NEET 1999]**

1. R
2. R^2
3. $1/R$
4. R^0



$$t_1 \cdot t_2 = \frac{2u\sin\theta}{g} \times \frac{2u\sin(90-\theta)}{g}$$

$$= \frac{4u^2 \sin\theta \times \cos\theta}{g^2}$$

$$\boxed{t_1 t_2 \propto R}$$

Question

If a body A of mass M is thrown with velocity v at an angle of $30°$ to the horizontal and another body B of the same mass is thrown with the same speed at an angle of $60°$ to the horizontal, the ratio of horizontal range of A to B will be: [NEET 1992, 90]

(1) $1 : 3$

(2) $1 : 1$

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

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

Question

bullet

Actual vel

The maximum range of a gun of horizontal terrain is 16 km. If $g = 10\ ms^{-2}$, then muzzle velocity of a shell must be: [NEET 1990]

1. $160\ ms^{-1}$
2. $200\sqrt{3}\ ms^{-1}$
3. $400\ ms^{-1}$ ✓
4. $800\ ms^{-1}$

$R = 16 \times 10^3\ m$

$R = \frac{u^2 \sin 2\theta}{g}$

$16 \times 10^3 = \frac{u^2}{10}$

$u = \sqrt{16 \times 10^4} = 4 \times 10^2$

$=$

THANK YOU