Physicsaholics

DPP – 5 (Kinematics)

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Q 1. A projectile fired with initial velocity u at some angle θ has a range R. If the initial velocity be doubled at the same angle of projection, then the range will be:
(a) 2R (b) R/2
(c) R (d) 4R

Q 2. A ball is thrown with an initial velocity of 100m/s at an angle of 30^0 above the horizontal. How far from the throwing point will the ball attain its original level? $(g = 10\ m/s^2)$
(a) $50\sqrt{3}$ m (b) 486 m
(c) 866 m (d) 746 m

Q 3. The greatest height to which a man can throw a stone is h. The greatest distance to which he can throw it, will be?
(a) h/2 (b) h
(c) 2h (d) 3h

Q 4. The range of a projectile for a given initial velocity is maximum when the angle of projection is 45^0. The range will be minimum, if the angle of projection is:
(a) 90^0 (b) 180^0
(c) 60^0 (d) 75^0

Q 5. A stone is projected from the ground with velocity 25 m/s. Two seconds later, it just clears a wall 5 m high. The angle of projection of the stone is: $(g = 10\ m/s^2)$
(a) 30^0 (b) 45^0
(c) 50.2^0 (d) 60^0

Q 6. Galileo writes that for angles of projection of a projectile at angles $(45^0 + \theta)$ and $(45^0 - \theta)$, the horizontal ranges described by the projectile are in the ratio of: $(\theta < 45^0)$
(a) 2:1 (b) 1:2
(c) 1:1 (d) 2:3

Q 7. The equation of trajectory of a projectile is $y = 10x - \left(\frac{5}{9}\right)x^2$ If we assume g = 10 m/s^2, the range of projectile (in meters) is:
(a) 36 (b) 18

(c) 24 (d) 9

Q 8. A projectile can have the same range R for, two angles of projection at a given speed. If T_1 and T_2 be the times of flight in two cases, then find out relation between T_1, T_2 and R:

(a) $R = T_1 T_2 \frac{g}{2}$ (b) $R = T_1 T_2 \frac{2}{g}$

(c) $T_1 T_2 = \frac{R}{g}$ (d) $R = \frac{T_1 T_2}{g}$

Q 9. A body is projected with initial velocity of $(8\hat{\imath} + 6\hat{\jmath})\ m/s$. The horizontal range is? $(g = 9.8\ m/s^2)$

(a) $9.6\ m$ (b) $14\ m$

(c) $50\ m$ (d) $19.2\ m$

Q 10. If time of flight of a projectile is 10 seconds. Range is 500 m. The maximum height attained by it will be:

(a) $50\ m$ (b) $100\ m$

(c) $125\ m$ (d) $150\ m$

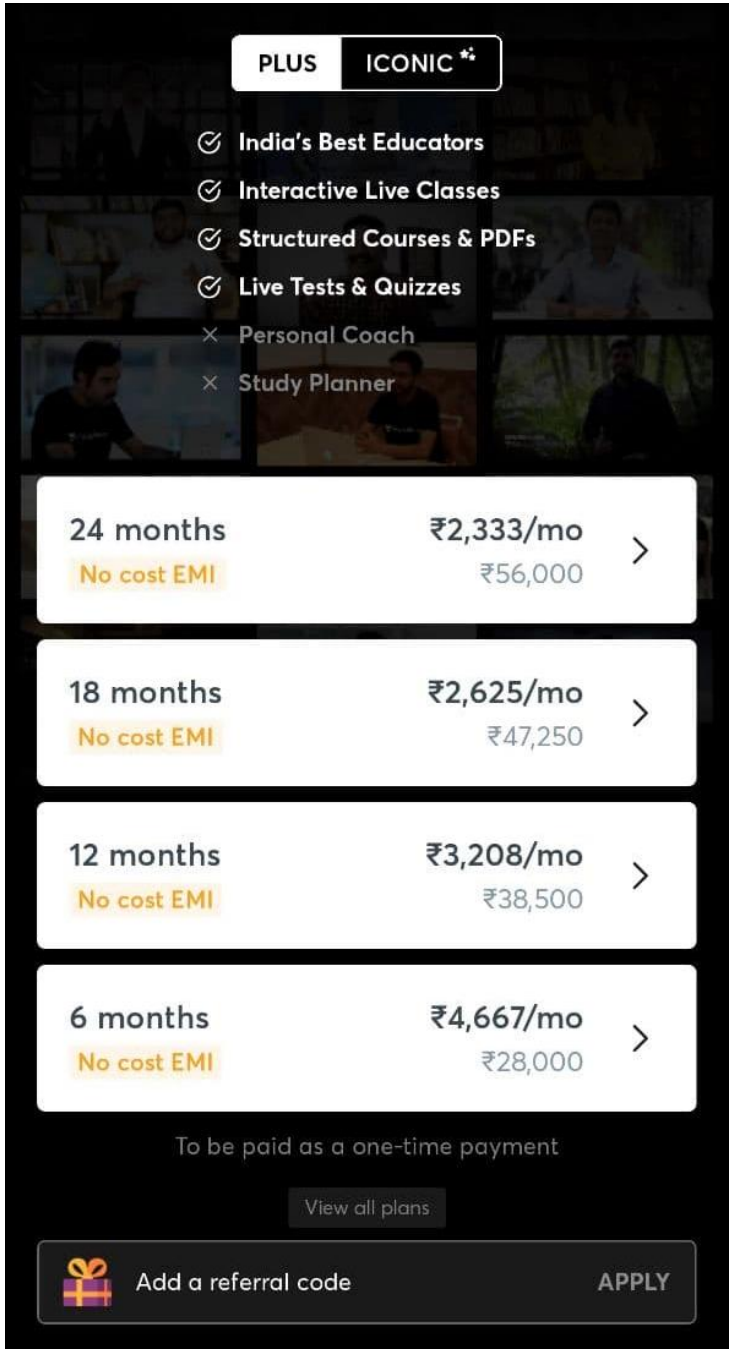
Q 11. An aeroplane is flying horizontally with a velocity of 600 km/h at a height of 1960 m. When it is vertically above of a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is:

(a) $1200\ m$ (b) $0.33\ km$

(c) $3.33\ km$ (d) $33\ km$

Answer Key

Q.1) d	**Q.2) c**	**Q.3) c**	**Q.4) a**	**Q.5) a**
Q.6) c	**Q.7) b**	**Q.8) a**	**Q.9) a**	**Q.10) c**
Q.11) c				



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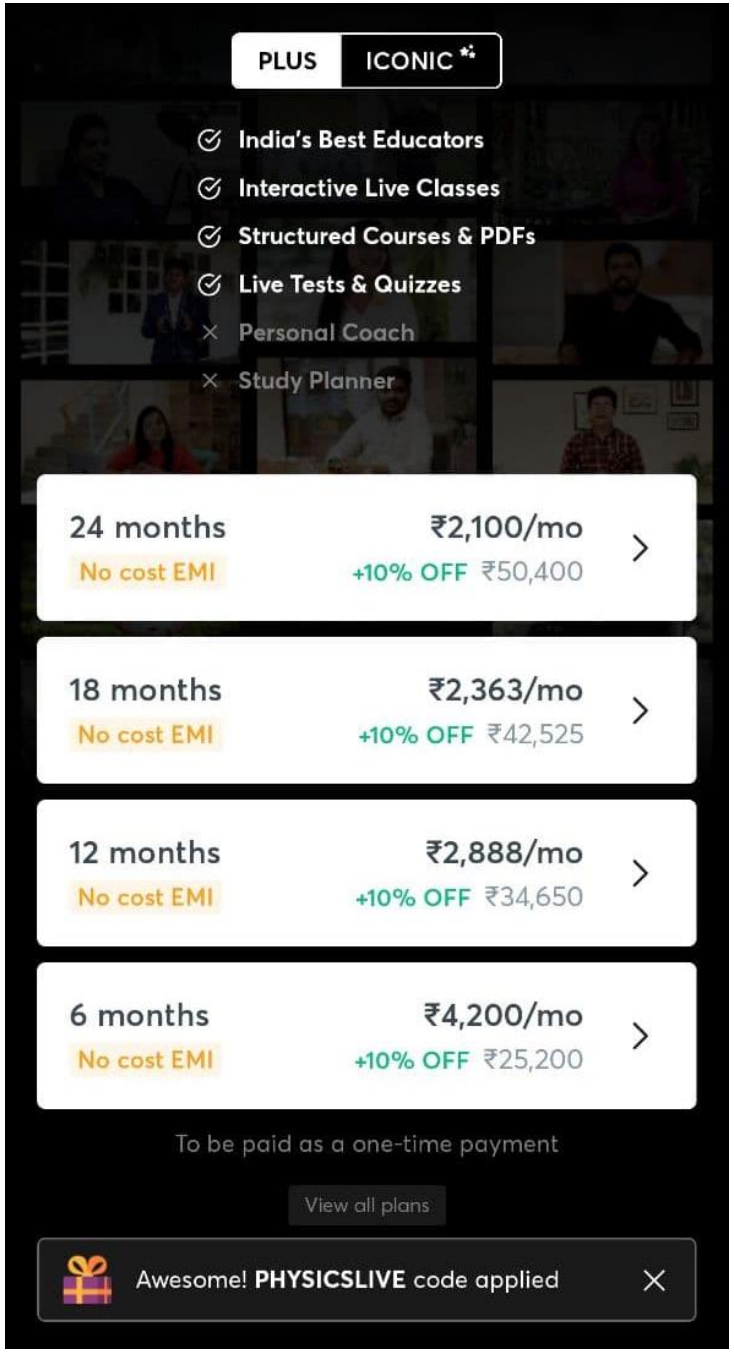


Written Solution

DPP-5 Projectile Motion

By Physicsaholics Team

SOLUTION : 1

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

$$R \propto u^2$$

If $u \to 2u$

$$\frac{R'}{R} = \frac{(2u)^2}{u^2} = 4$$

$$\boxed{R' = 4R}$$

ANS : d

SOLUTION : 2

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

$$= \frac{(100)^2 \times \sin(2 \times 30^\circ)}{10}$$

$$= 1000 \frac{\sqrt{3}}{2}$$

$$\boxed{R = 500\sqrt{3}\ m}$$

or

$$\boxed{R = 866\ m}$$

ANS : c

SOLUTION : 3

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

for max value of H

$\sin\theta = 1$

$\theta = 90^\circ$

so) $h = \frac{u^2}{2g}$

$$\boxed{u = \sqrt{2gh}}$$

for max Range :

$\theta = 45^\circ$

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

$$R = \frac{(2gh)(\sin 90^\circ)}{g}$$

$$\boxed{R = 2h}$$

ANS : c

SOLUTION : 4

Range; $R = u^2 \sin 2\theta$

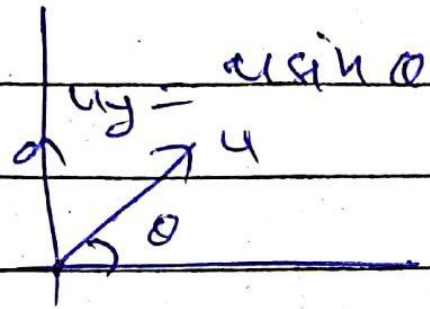
Minimum Range, $R = 0$

at $\theta = 90°$

(in vertically upward projection, Range is zero)

ANS : a

SOLUTION : 5



$$h = u_y t - \frac{1}{2} a_y t^2$$

$$5 = (25\sin\theta)\times 2 - \frac{1}{2}\times 10 \times (2)^2$$

$$5 = 50\sin\theta - 20$$

$$25 = 50\sin\theta$$

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

$$\boxed{\theta = 30^\circ}$$

ANS : a

SOLUTION : 6

$\theta_1 = 45^\circ + \theta$; $\theta_2 = 45^\circ - \theta$

$\theta_1 + \theta_2 = (45^\circ + \theta) + (45^\circ - \theta)$

$$\boxed{\theta_1 + \theta_2 = 90^\circ}$$

∴ Range will be same for both.

$$\boxed{\frac{R_1}{R_2} = \frac{1}{1}}$$

ANS : c

SOLUTION : 7

$$y = x\tan\theta\left(1 - \frac{x}{R}\right) \quad \text{---(1)}$$

$$y = 10x\left(1 - \frac{5}{9}\times\frac{1}{10}x\right)$$

$$y = 10x\left(1 - \frac{x}{18}\right) \quad \text{---(2)}$$

by comparing eq^{n} (1) & (2)

$$\boxed{R = 18\ m}$$

ANS : b

SOLUTION : 8

for same Range:

if $\theta_1 = \theta$

then $\theta_2 = 90 - \theta$

$$R = \frac{u^2 \sin 2\theta}{g} \quad - (1)$$

$$T_1 = \frac{2u \sin\theta}{g} \quad - (2)$$

$$T_2 = \frac{2u \sin(90-\theta)}{g} \quad - (3)$$

$$T_2 = \frac{2u \cos\theta}{g}$$

$$T_1 \cdot T_2 = \frac{4u^2 \sin\theta \cos\theta}{g^2}$$

$$T_1 T_2 = \frac{2u^2 \sin 2\theta}{g^2}$$

$$= \frac{2}{g}\left(\frac{u^2 \sin 2\theta}{g}\right)$$

$$T_1 T_2 = \frac{2}{g} R$$

$$\boxed{R = \frac{T_1 T_2 g}{2}}$$

ANS : a

SOLUTION : 9

$$\vec{V} = 8\hat{i} + 6\hat{j}$$

$$u_x = 8 \text{ m/s}$$

$$u_y = 6 \text{ m/s}$$

$$R = \frac{2u_x u_y}{g}$$

$$R = \frac{2(8)(6)}{9.8}$$

$$\boxed{R = 9.6 \text{ m}}$$

ANS : a

SOLUTION : 10

$$T = \frac{2u\sin\theta}{g} = 10$$

$$\Rightarrow u\sin\theta = \frac{10 \times 10}{2} = 50$$

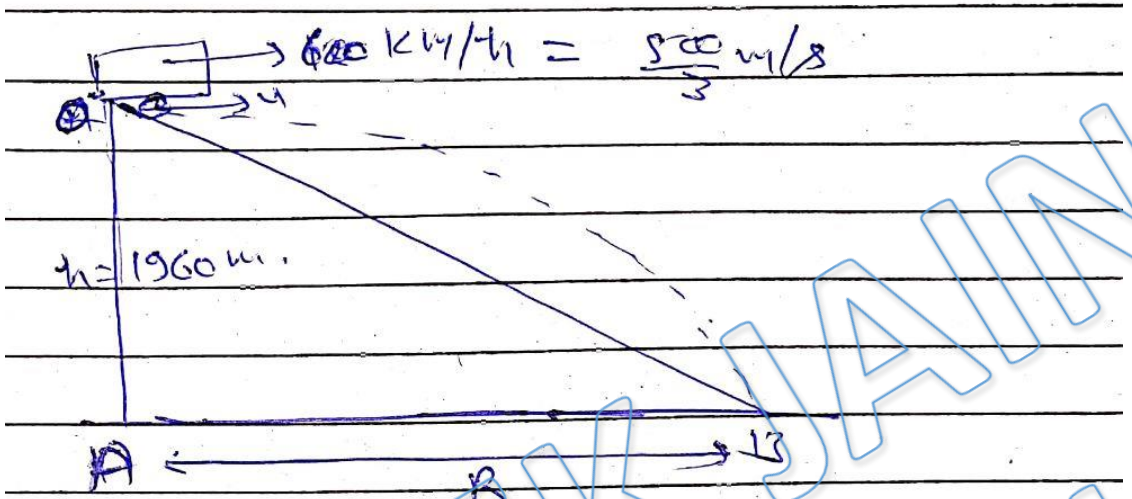
$$H_{max} = \frac{u^2\sin^2\theta}{2g}$$

$$= \frac{(50)^2}{2\times 10} = \frac{2500}{2\times 10}$$

$$\boxed{H_{max} = 125\ m}$$

ANS : c

SOLUTION : 11



$$T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 1960}{9.8}}$$

$$T = \sqrt{400}$$

$$T = 20 \text{ sec.}$$

$$AB = R = v \times T$$

$$= \frac{500}{3} \times 20 = \frac{10,000}{3} \text{ m}$$

$$AB = 3333.3 \text{ m.}$$

$$\boxed{AB = 3.33 \text{ km}}$$

ANS : c

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