GGSRDN
Educational Services Private Limited
NEET, JEE(Mains/Advanced)
जहां से सोचो वहा से परे है।

Class : 11th Physics
Chapter- 4 : Motion in a plane

Unit Vector

It has magnitude as one or unity

$$\hat{A} = \frac{\vec{A}}{|\vec{A}|}$$

Negative Vector

Vectors having same magnitude but opposite direction

eg. $\vec{A}$ is a negative of $\vec{B}$

If, $\vec{A} = -\vec{B}$

Acceleration vector

$$\vec{a} = a_x\hat{i} + a_y\hat{j};\ a_x = dv_x/dt \ \&\ a_y = dv_y/dt$$

$$|\vec{a}| = \sqrt{a_x^2 + a_y^2}$$

Position of displacement vector

Position vector , $\vec{r} = x\hat{i} + y\hat{j}$

Displacement vector , $\Delta\vec{r} = \Delta x\hat{i} + \Delta y\hat{j}$

Vectors Types

Equal Vectors

Vectors having same direction and magnitude

Co-initial vector

Vectors having common starting point.

Zero or Null vector

It has zero magnitude and orbitary direction

Additional vector

Law of Triangle | Law of Parallelogram

$\vec{R} = \vec{P} + \vec{Q}$

Motion in a plane

Velocity vector

$$\vec{v} = v_x\hat{i} + v_y\hat{j},$$

$$\text{magnitude } |\vec{v}| = \sqrt{v_x^2 + v_y^2}$$

Substraction of two vectors

$$\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$$

Multiplication of a vector by a real number

$$\lambda \times \vec{A} = \lambda\vec{A}$$

Motion in a plane

Relative velocity

$$\vec{V}_{AB} = \vec{V}_A - \vec{V}_B$$

$$\vec{V}_{BA} = \vec{V}_B - \vec{V}_A$$

and

$$\vec{V}_{AB} = -\vec{V}_{BA}$$

$$|\vec{V}_{AB}| = |\vec{V}_{BA}|$$

Motion of Body under 2 dimensional frame.

$$\text{Total time of flight, } T_f = \frac{2u\sin\theta}{g}$$

$$\text{Maximum height, } H_{max} = \frac{u^2\sin^2\theta}{2g}$$

$$\text{Horizontal range, } R = \frac{u^2\sin 2\theta}{g}$$

Projectile motion

Motion of an object that is in flight after being thrown or projected.

Uniform circular motion

When an object follows a circular path at a constant speed , the motion of the object is called uniform circular motion.

Angular velocity ,ω= θ/t Angular acceleration,α=Δω/Δt eg- merry go around.

Equation of path of projectile

$$y = x\tan\theta - \frac{g}{2u^2\cos^2\theta}x^2$$

Components of velocity (in velocity)

$u_x = u\cos\theta, u_y = u\sin\theta$

Components of acceleration

at any instant

$a_x = 0, a_y = g$

Position after time t

$x = (u\cos\theta)t;$

$y = (u\sin\theta)\,t - \frac{1}{2}gt^2$

Centripetal Acceleration

A body in a circular motion acted upon by an acceleration directed towards center of the circular motion.

$$a_c = v^2/r = r\omega^2 = 4\pi^2 rv^2$$