4. MOTION IN A PLANE

IMP DEFINITIONS & FORMULAS

1. Scalar: A physical quantity which has only magnitude but no direction, is called a scalar.
Ex : Length, Mass, Time, Distance.

2.1 Vector: A physical quantity which has both magnitude and direction and obeys law of vector addition is called a vector.
Ex: Displacement, Velocity, Force,.....

2.2 Unit Vector: A vector of magnitude 'one unit' is called a unit vector.

2.3 Null Vector: A vector of 'zero magnitude' and arbitrary direction is called a zero vector.

2.4 Position Vector: The position vector of a point P is the vector from the origin 'O' to the the point P . It is denoted by $\overline{OP}$.

3.0 Parallelogram law of vectors:
"If two vectors act as two adjacent sides of a parallelogram drawn from a point then their resultant is the diagonal passing through the same point".

3.1. $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ **3.2.** $\alpha = \text{Tan}^{-1}\left(\frac{Q\sin\theta}{P + Q\cos\theta}\right)$

3.3. If $\vec{R} = a\vec{j} + b\vec{j} + c\vec{k}$ then $|\vec{R}| = \sqrt{a^2 + b^2 + c^2}$

4.0 Equations of motion for **a Projectile** with angle of projection θ and initial velocity u.

4.1. Horizontal component $u_x = u\cos\theta$;
Vertical component $u_y = u\sin\theta$.

4.2. Time of ascent $t = \frac{u\sin\theta}{g}$ = Time of descent

4.3. Time of flight $T = 2t = \frac{2u\sin\theta}{g}$

4.4. Maxi. height $h_{max} = \frac{u^2\sin^2\theta}{2g}$

4.5. Range $R = \frac{u^2\sin2\theta}{g}$; **4.6.** $R_{max} = \frac{u^2}{g}(\because \theta = 45^\circ)$

5. Angular displacement (θ) : It is the angle described by the radius vector at the centre, in a given interval of time.
SI unit : radian.; **D.F :** $[M^0L^0T^0]$

6. Angular velocity (ω) : The rate of angular displacement is called Angular velocity.
Formula: $\omega = \theta/t$
SI unit : rad s^{-1}.; **D.F:** $[M^0L^0T^{-1}]$

7. Angular acceleration (α): The rate of angular velocity is called Angular acceleration.
SI unit : rad s^{-2}; **D.F:** $[M^0L^0T^{-2}]$

BULLET MASTER'S PHYSI BEATS!

MOTION IN A PLANE[1 VSAQ+1SAQ]

Motion in a Plane అంటే మీకు ఠకీమని గుర్తుకురావాల్సింది **Sixer in a Ground!**

దాని నుండి **Projectile** ⇒ Parabola. ఆ వెంటనే **Maximum height** Formula $h_{max} = \frac{u^2\sin^2\theta}{2g}$, **Range** Formula $R = \frac{u^2\sin2\theta}{g}$ అలాగే బంతి గాలిలో ఎంతసేపు ఉందో తెలిపే సూత్రం $T = \frac{2u\sin\theta}{g}$

☺ **Universal Boss Gayle బదా Sixers లంబా లంబా దూరం కొడుతున్నాడంటే బహుశ Gayle కి కూడా మీలాగే θ=45° తెలుసనుకుంటా!**

ఆ తర్వాత **Parallelogram Law** and **Resultant vector** $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

అసలు వీటన్నింటికంటే ముందు **IPE Point View** లో Most Important Concept
Vectors, Types and Resolution of a Vector.

Motion in a Plane అంటే

☺ Don't go for other meaning that "Plane లో Motion ఎంట్రా బాబూ" ☺