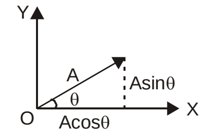
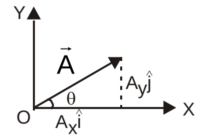
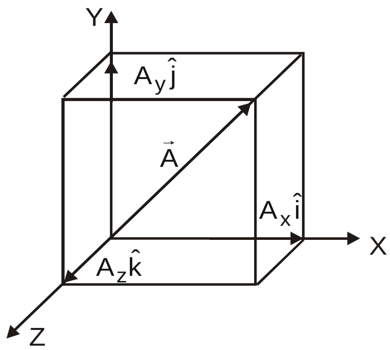
1. **Resolution of a vector in two dimensions** : If $\vec{A}$ is a vector making an angle θ with x–axis, then X–component = $A\cos\theta$, Y–component = $A\sin\theta$.



2. If $\hat{i}$ and $\hat{j}$ are unit vectors along X and Y axes, any vector lying in XOY plane can be represented as $\vec{A} = A_x\hat{i} + A_y\hat{j}$;



3. $|\vec{A}| = A = \sqrt{A_x^2 + A_y^2}$; $\tan\theta = \dfrac{A_y}{A_x}$
4. The component of a vector can have a magnitude greater than that of the vector itself.
5. The rectangular component cannot have magnitude greater than that of the vector itself.
6. If a number of vectors $\vec{A}, \vec{B}, \vec{C}, \vec{D}$,..... acting at a point are resolved along X–direction as A_x, B_x, C_x, D_x, … along Y–direction as A_y, B_y, C_y, D_y….. and if $\vec{R}$ is the resultant of all the vectors, then the components of $\vec{R}$ along X–direction and Y–direction are given by $R_x = A_x + B_x + C_x + D_x + \ldots$ and $R_y = A_y + B_y + C_y + D_y + \ldots$ respectively, and $R = \sqrt{R_x^2 + R_y^2}$; $\tan\theta = \dfrac{R_y}{R_x}$ where θ is the angle made by the resultant with X–direction.
7. If $\hat{i}, \hat{j}$ and $\hat{k}$ are unit vectors along X, Y and Z–axes, any vector in 3 dimensional space can be expressed as $\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$; $|\vec{A}| = A = \sqrt{A_x^2 + A_y^2 + A_z^2}$ Here A_x, A_y, A_z are the components of $\vec{A}$ and $\vec{B}$ are scalars. $\vec{A}$ is body diagonal of the cube.



8. If α, β and γ are the angles made by $\vec{A}$ with X–axis, Y–axis and Z–axis respectively, then
$\cos\alpha = \dfrac{A_x}{A}$; $\cos\beta = \dfrac{A_y}{A}$; $\cos\gamma = \dfrac{A_z}{A}$ and
$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$
$\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$
9. If $\cos\alpha = l$, $\cos\beta = m$ and $\cos\gamma = n$, then l, m, n are called direction cosines of the vector.
$l^2 + m^2 + n^2 = 1$.
10. If vectors $\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$ and $\vec{B} = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$ are parallel, then $\dfrac{A_x}{B_x} = \dfrac{A_y}{B_y} = \dfrac{A_z}{B_z}$
and $\vec{A} = K\vec{B}$ where K is a scalar.
11. The vector $\hat{i} + \hat{j} + \hat{k}$ is equally inclined to the coordinate axes at an angle of 54.74°.
12. The position vector of a point P(x,y,z) is given by $\overrightarrow{OP} = x\hat{i} + y\hat{j} + z\hat{k}$ and $|\overrightarrow{OP}| = \sqrt{x^2 + y^2 + z^2}$
13. The vector having initial point $P(x_1, y_1, z_1)$ and final point $Q(x_2, y_2, z_2)$ is given by
$\overrightarrow{PQ} = (x_2 - x_1)\hat{i} + (y_2 - y_1)\hat{j} + (z_2 - z_1)\hat{k}$.