Formula Sheet

Straight Line.

- **Shift of origin:-**

  $x = X+h$, $y = Y+k$ i.e. $X = h-x$, $Y = y-k$

- **Slope of Line:-**

  1) X-axis $\longrightarrow$ $m = \tan 0° = 0$ Y-axis $\longrightarrow$ $m = \tan 90° = \infty$

  2) $m_1, m_2 \rightarrow$ parallel line then $m_1 = m_2$

  3) $m_1, m_2 \rightarrow$ perpendicular Line then $m_1 \cdot m_2 = -1$.

  4) Slope of Line passing through points $(x_1, y_1)(x_2 y_2)$ is

  $$\frac{Y_2 - Y_1}{X_2 - X_1}, \quad x_1 \neq x_2.$$

- **Equation of straight Line in Standard form:-**

	Form	Description	Equation
i)	Standard	Eqn of X-axis	$y = 0$
		Eqn of Y-axis	$x = 0$
		Parallel to X-axis	$y = \pm b$
		Parallel to Y-axis	$x = \pm a$
ii)	Slope-point	Point (X_1, Y_1), Slope $= m$	$Y - Y_1 = m(X - X_1)$
iii)	Two-point	Two point (X_1, Y_1), (X_2, Y_2)	$\frac{Y - Y_1}{Y_1 - Y_2} = \frac{X - X_1}{X_1 - X_2}$
iv)	Slope intercept	Slope $= m$ intercept c on Y-axis	$Y = mx + c$
v)	Double intercept	Non-zero intercept a and b on X and Y-axis	$\frac{x}{a} + \frac{y}{b} = 1$.
vi)	Normal.	Length of $\perp^{er}$ from origin $= P$. angle α with X-axis	$x\cos\alpha + y\sin\alpha = p$
vii)	Parametric.	Pass through (x_1, y_1), angle θ +ve X-axis	$\frac{x - x_1}{\cos\theta} = \frac{Y - Y_1}{\sin\theta} = r$

- Property:- General eqn: $ax+by+c=0$

1) Slope: $\frac{-a}{b}$ 2) x-intercept: $x=\frac{-c}{a}$

3) y-intercept: $y=\frac{-c}{b}$

- Two intersecting lines:-

$$\tan\theta = \left|\frac{m_1-m_2}{1+m_1m_2}\right|$$

- Centroid formula:-

$$\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$

- Concurrent Lines:-

$a_1x+b_1y+c_1=0$
$a_2x+b_2y+c_2=0$
$a_3x+b_3y+c_3=0$

then $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$

- Length of perpendicular:-

1] Dist. from point to Line - $p=\left|\frac{a_1x+b_1y+c}{\sqrt{a^2+b^2}}\right|$

2] Dist. bet^n parallel line - $\left|\frac{c_1-c_2}{\sqrt{a^2+b^2}}\right|$

- Distance formula:- $d(PQ)=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

- Section formula:-

1) Internal division: $P=\left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right)$

2) Midpoint formula: $P=\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

3) External division: $P=\left(\frac{mx_2-nx_1}{m-n}, \frac{my_2-ny_1}{m-n}\right)$