CO-ORDINATE GEOMETRY

Cartesian & Polar Co-ordinates

(1) **Basic Form:-**

Cartesian co-ordinate → (x, y)

Polar co-ordinate → (r, θ)

(2) $x = r\cos\theta,\ y = r\sin\theta$

& $r = \sqrt{x^2 + y^2},\ \theta = \tan^{-1}\frac{y}{x}$

(3) *Distance between* $P(x_1, y_1)$ & $Q(x_2, y_2)$ *is* $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

(4) $The\ co-ordinate\ of\ R\ which\ divides\ PQ\ internally\ (or, externally)\ in\ the\ ratio\ m{:}n\ is$

$\left(\frac{mx_2 \pm nx_1}{m \pm n}, \frac{my_2 \pm ny_1}{m \pm n}\right)$

(5) $The\ mid-point\ of\ P(x_1, y_1)\&\ Q(x_2, y_2)\ is\ \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

(6) $The\ centroid\ of\ \Delta ABC\ with\ vertices\ A(x_1, y_1), B(x_2, y_2)\ \&\ C(x_3, y_3)\ is\ \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

(7) $The\ area\ of\ \Delta ABC\ is$

$= \frac{1}{2}|y_1(x_2 - x_3) + y_2(x_3 - x_1) + y_3(x_1 - x_2)|\ unit^2$

$= \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|\ unit^2$

(8) $Three\ points\ A(x_1, y_1), B(x_2, y_2)\ \&\ C(x_3, y_3)\ will\ be\ collinear\ if$

$y_1(x_2 - x_3) + y_2(x_3 - x_1) + y_3(x_1 - x_2) = 0$

Straight Line

(1) $The\ gradient\ (or, slope)\ of\ a\ straight\ line\ in\ the\ direction\ of\ positive\ X-axis$ $with\ angle\ \theta\ is\ m = \tan\theta.$

(2) $The\ slope\ of\ a\ straight\ line\ joining\ the\ points\ A(x_1, y_1)\ \&\ B(x_2, y_2)\ is\ m = \frac{y_1 - y_2}{x_1 - x_2}$

(3) (i) $y = 0 \rightarrow equation\ of\ X-axis$

(ii) $y = b \rightarrow \parallel X-axis$

(iii) $x = 0 \rightarrow equation\ of\ Y-axis$

(iv) $x = a \rightarrow \parallel Y-axis$

(4) **Forms of straight line**

(i) $General\ form{:}\ ax + by + c = 0$ $\quad [a\ \&\ b\ must\ not\ be\ zero\ simultaneously]$

(ii) $Slope-intercept\ form{:}\ y = mx + c$

(iii) $Point-slope\ form{:}\ y - y_1 = m\,(x - x_1)$