Co-ordinate Geometry

Father of Co-ordinate Geometry : Rene Descartes

Locus :

1) If (x,y) = (a,b) then
   X-coordinate = a
   Y-coordinate = b

2) Equation of Circle having Centre C(h,k) ,Radius r and point on Circumference P(x,y) is

   r = $\sqrt{(x-h)^2+(y-k)^2}$

3) Distance d between two points i.e $A(x_1,y_1)$ and $B(x_2,y_2)$ is

   AB = d = $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

Section Formula :

The coordinates of the point P(x,y) which devides the line segment joining the points $A(x_1,y_1)$ and $B(x_2,y_2)$ in the ratio $m_1:m_2$ are

4) Internally :

$$(x,y) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2} , \frac{m_1y_2+m_2y_1}{m_1+m_2} \right)$$

This is known as Section formula.

5) Externally :

$$(x,y) = \left(\frac{m_1 x_2 - m_2 x_1}{m_1 - m_2} , \frac{m_1 y_2 - m_2 y_1}{m_1 - m_2} \right)$$

6) If ratio is 1:1 then

$$(x,y) = \left(\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right)$$

This is known as Mid-Point Formula.

Equation of Straight Line :

7) Equation of line Parallel to X-axis is y=b.

8) Equation of line Parallel to Y-axis is x=a.
Where a and b are distance covered in unit.

Slope Intercept Form :

9) Slope (m) =tan θ here, θ --> angle with +ve X-axis.

10) Slope (m) = $\frac{y_2 - y_1}{x_2 - x_1}$

11) Equation of straight line where 'm' is the slope and 'c' is the y-intercept is y=mx+c

12) Equation of straight line where 'a' is the x-intercept and 'b' is the y-intercept is $\frac{x}{a} + \frac{y}{b} = 1$

13) Equation of a line having perpendicular distance from a point to the line is 'p' and 'α' is the angle made by the perpendicular line with positive X-axis is $x\cos\alpha + y\sin\alpha = p$

In a equation $ax+by+c = 0$

14) Slope (m) = $\frac{-a}{b}$

15) X-intercept (A) = $\frac{-c}{a}$

16) Y-intercept (B) = $\frac{-c}{b}$

##Conversion in Normal Form

17) $x\cos\alpha + y\sin\alpha - p = \frac{\pm(ax+by+c)}{\sqrt{a^2+b^2}}$

18) Cos α = $\frac{a}{\pm\sqrt{a^2+b^2}}$

19) Sin α = $\frac{b}{\pm\sqrt{a^2+b^2}}$

20) p = $\frac{c}{\pm\sqrt{a^2+b^2}}$

21) Equation of a line having slope 'm' and passes through a point $A(x_1,y_1)$ is $y-y_1 = m(x-x_1)$

22) Equation of a line passes through the points $A(x_1,y_1)$ and $B(x_2,y_2)$ is $y-y_1 = \frac{y_2-y_1}{x_2-x_1}(x-x_1)$

Perpendicular Distance from a Point to a Line :

23) Distance d from a point $A(x_1,y_1)$ to a line $ax+by+c=0$ is

$$d = \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}} \right|$$

Area of Triangle and Quadrilateral using co-ordinates :

24) $A(x_1,y_1)$, $B(x_2,y_2)$ and $C(x_3,y_3)$ are the three vertices of a Triangle ABC then, Area of Triangle is

$$= \frac{1}{2}\left|x_1y_2 - x_2y_1 + x_2y_3 - x_3y_2 + x_3y_1 - x_1y_3\right|$$

25) $A(x_1,y_1)$, $B(x_2,y_2)$ and $C(x_3,y_3)$ are the three vertices of a Triangle ABC then, Area of Triangle is

$$= \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$$

26) $A(x_1,y_1)$, $B(x_2,y_2)$, $C(x_3,y_3)$ and $D(x_4,y_4)$ are the four vertices of a Quadrilateral ABCD then, Area of Quadrilateral is

$$= \frac{1}{2}\left|x_1y_2 - x_2y_1 + x_2y_3 - x_3y_2 + x_3y_4 - x_4y_3 + x_4y_1 - y_4x_1\right|$$

27) $A(x_1,y_1)$, $B(x_2,y_2)$, $C(x_3,y_3)$ and $D(x_4,y_4)$ are the four vertices of a Quadrilateral ABCD then, Area of Quadrilateral is

$$= \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$$

28) Condition of Collinear :

Points $A(x_1,y_1)$, $B(x_2,y_2)$ and $C(x_3,y_3)$ are collinear if and only if Area of ABC = 0

Thank You!!!