Co-ordinate Geometry in 2-D

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Equations of Circle :–

① When centre $C(h, k)$ and radius 'r' is given, then, equation of circle is —

$$(x-h)^2 + (y-k)^2 = r^2 \longrightarrow ①$$

i) When centre is at origin,

$C(0,0)$

$$(x-0)^2 + (y-0)^2 = r^2$$

$$\Rightarrow x^2 + y^2 = r^2$$

ii) When ~~the~~ centre is at origin $C(0,0)$ and radius = 1 unit

$$(x-0)^2 + (y-0)^2 = 1^2$$

$$\Rightarrow x^2 + y^2 = 1$$ ⇒ It is known as unit circle.

2) **Standard form or General equation of a circle:**

*** $$x^2 + y^2 + 2gx + 2fy + c = 0 \longrightarrow ②$$

Here, Centre $= (-g, -f)$

*** Radius $= \sqrt{g^2 + f^2 - c}$

* Equation এ x^2 & y^2 থাকিলেই circle এর eqn হবে। (must be)

~~(i) When the centre at orio~~

i) If circle passes through the origin,

~~$x^2 + y^2 + 2gx$~~

$$x^2 + y^2 + 2gx + 2fy = 0$$

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ii) If centre lies on x-axis, then,

$$x^2+y^2+2gx+c=0$$

When centre lies on y-axis, then,

$$x^2+y^2+2fy+c=0$$

iii) If $g^2+f^2 > c$ (is greater than) c, then eqn (2), represent a circle with centre $C(-g,-f)$ and radius is real.

iv) If g^2+f^2 is less than c ($<$) than eqn (2) represent a circle with centre $C(-g,-f)$ and radius is imaginary and it is called virtual circle.

v) If g^2+f^2 is equal to c, then eqn (2) represent a circle with centre $C(-g,-f)$ and radius is equal to zero (0) i.e co-inside with the circle and it is called point circle.

(8) Find the eqn. of the circle with the centre $C(-2,1)$ and radius 3.

Soln: Given, $C(-2,1)$

$r=3$.

We know that,

$$(x-h)^2+(y-k)^2=r^2$$

$$\Rightarrow (x+2)^2+(y-1)^2=3^2$$

$$\Rightarrow x^2+2.x.2+4+y^2-2.1.y+1=9$$

$$\Rightarrow x^2+4x+4+y^2-2y+1=9$$

$\Rightarrow x^2 + y^2 + 4x - 2y + 5 = 4$

$\Rightarrow x^2 + y^2 + 4x - 2y = 9 - 5$

$\Rightarrow x^2 + y^2 + 4x - 2y = 4$

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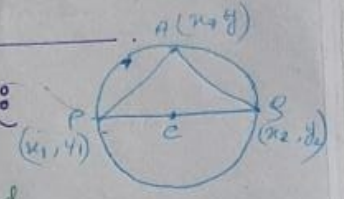
(3) Circle with given diameter :



When 2 ends points $P(x_1, y_1)$ and $Q(x_2, y_2)$ of diameter is given, then eqn is -

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0 \quad ****$$

(a) Find the equation of the circle of which the points $(5, -3)$ and $(1, -6)$ are the end points of a diameter.

Sol^n:

$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$

$\Rightarrow (x - 5)(x - 1) + (y + 3)(y + 6) = 0$

$\Rightarrow x^2 - x - 5x + 5 + y^2 + 6y + 3y + 18 = 0$

$\Rightarrow x^2 + y^2 - 6x + 5 + 9y + 18 = 0$

$\Rightarrow x^2 + y^2 + 9y - 6x + 23 = 0$ //