
DAY 35
MCA CET 2025
MATHS
straight line
CIRCLE
KEEP LEARNING
MCA
VISION ACADEMY
YOUR CAREER GUIDE
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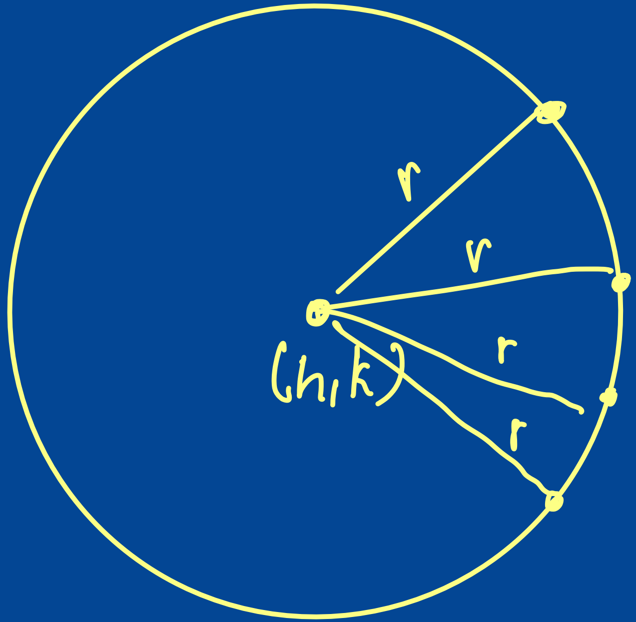
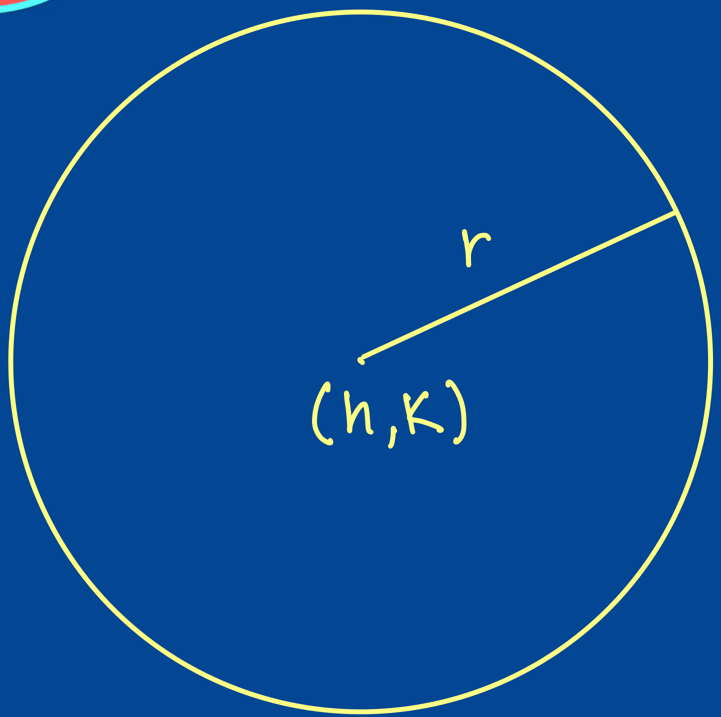
FREE CRASH COURSE

WHAT IS A CIRCLE?

A circle is defined as the locus of all such points that remain constant from a given fixed point (C) which is known as center.



EQUATION OF CIRCLE



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

$h \to 0$, $k \to 0$

What will happen if origin is center?

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

General Equation of Circle.

Second Degree General Equation:

$$ax^2 + by^2 + 2hxy + 2gx + 2fy + c = 0$$

It represents circle if —

(i) $a = b$

(ii) $h = 0$

$\therefore$ Eqn. becomes $\Rightarrow$ $x^2 + y^2 + 2gx + 2fy + c = 0$

$\therefore$ Center $= (-g, -f)$ Radius $= \sqrt{g^2 + f^2 - c}$

The co-ordinates of the centre and the radius of the circle $x^2 + y^2 + 4x - 6y - 36 = 0$ are respectively, given by

(a) (-4, 6) and 6

(b) (4, - 6) and 7

(c) (2, - 3) and 6

(d) (-2, 3) and 7

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

$-6y = 2fy$

$f = -3$

Center $(-g, -f)$

$= (-2, +3)$

$r = \sqrt{g^2 + f^2 - c} = \sqrt{4 + 9 + 36}$

$= \sqrt{49} = 7$

Point (1, 2) relative to the circle $x^2 + y^2 + 4x - 2y - 4 = 0$ is a/an

(a) exterior point

(b) interior point but not centre

(c) boundary point

(d) centre

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

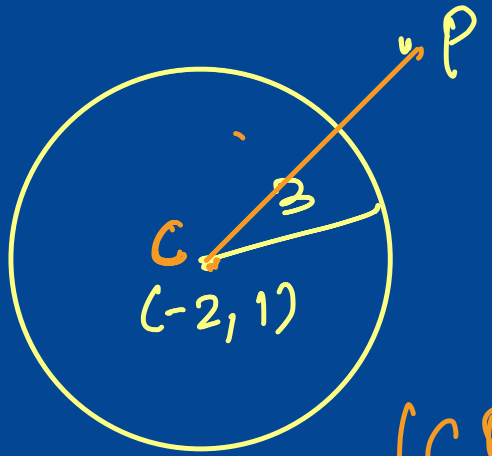
$g = 2 \quad f = -1$

center = $(-2, +1)$

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

$= \sqrt{4 + 1 + 4}$

$= \sqrt{9} = 3$



$\sqrt{(-2-1)^2 + (1-2)^2}$

$\sqrt{9+1}$

$= \sqrt{10}$

$CP < r$

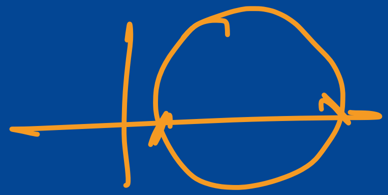
$CP = r$

$CP > r$

$CP = 0$

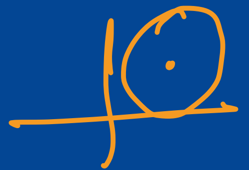
$$x^2+y^2+2gx+2fy+c=0$$

Important Notes:



If $g^2 > c \Rightarrow$ circle will cut x-axis at 2 distinct real points

If $g^2 = c \Rightarrow$ circle will touch x-axis at a point



If $g^2 < c \Rightarrow$ circle will neither touch nor cut the x-axis.

Important Notes:

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

If $g^2 + f^2 - c$ (radius)^2

- > 0 radius will be real and real circle is possible
- $= 0$ radius is zero and circle is a point
- < 0 radius is imaginary no real circle possible

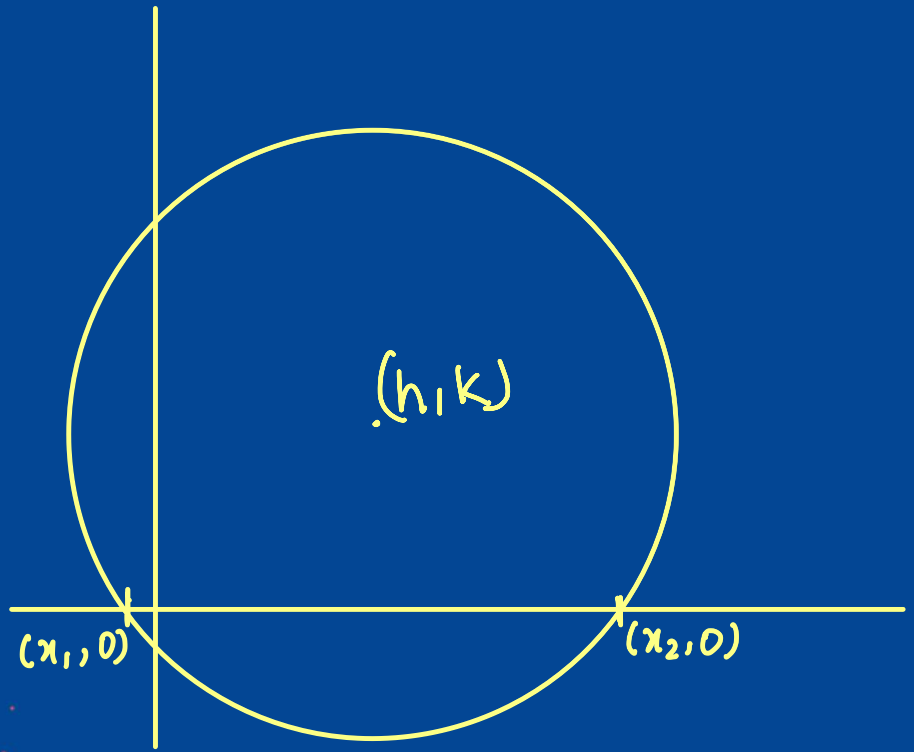
Important Points:

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

($c \to 0$)

if $c=0$ $\therefore$ circle passes through origin.

Intercepts made by circle on x-axis



Equation of circle

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

To get the intercept points on x-axis, substitute $y=0$ and solve the quadratic.

Note: You can also do same for general form

The circle $x^2 + y^2 - 3x - 4y + 2 = 0$ cuts X-axis at

(a) (2, 0), (-3, 0)

(b) (3, 0), (4, 0)

(c) (1, 0), (-1, 0)

(d) (1, 0), (2, 0)

$y = 0$

$x^2 - 3x + 2 = 0$

$x^2 - 2x - x + 2 = 0$

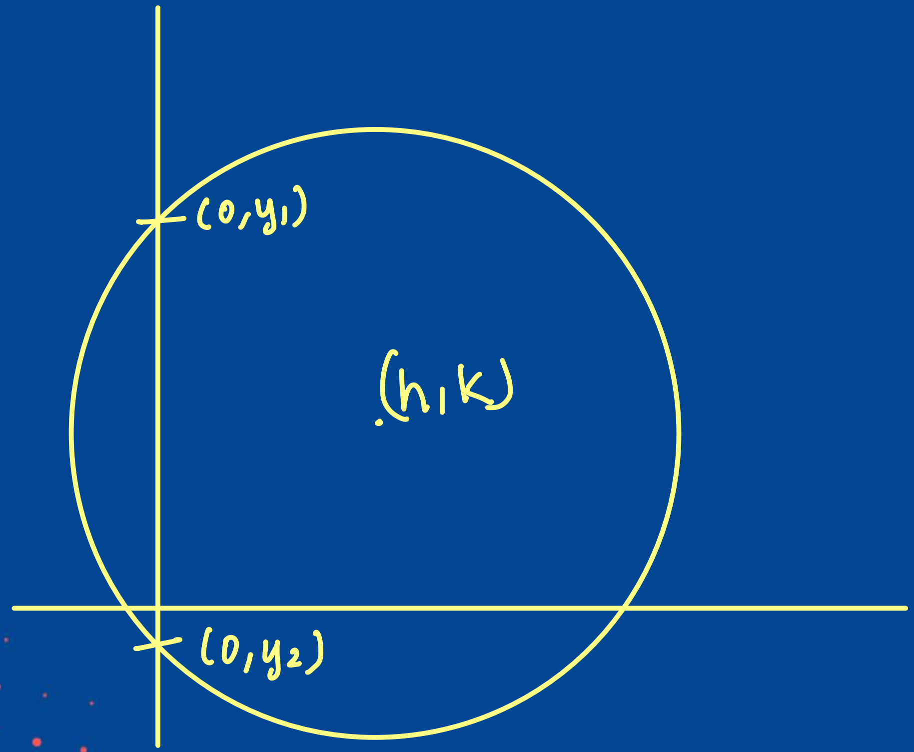
$x(x-2) - 1(x-2) = 0$

$(x-1)(x-2) = 0$

$x_1 = 1$ | $x_2 = 2$

(1, 0) (2, 0)

Intercepts made by circle on y-axis



Equation of circle

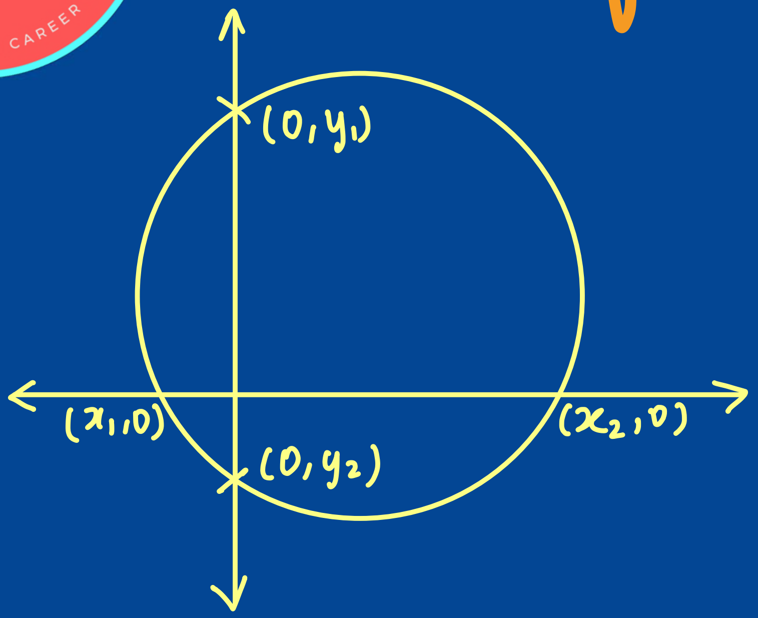
$$(x-h)^2 + (y-k)^2 = r^2$$

To get the intercept points on y-axis, substitute $x = 0$ and solve the quadratic.

Note: You can also do same for general form

SHORTCUT:

Distance between intercepts for general form of circle.



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

center $= (-g, -f)$

⇑ x

x-axis intercept distance $= x_2 - x_1 = 2\sqrt{g^2 - c}$

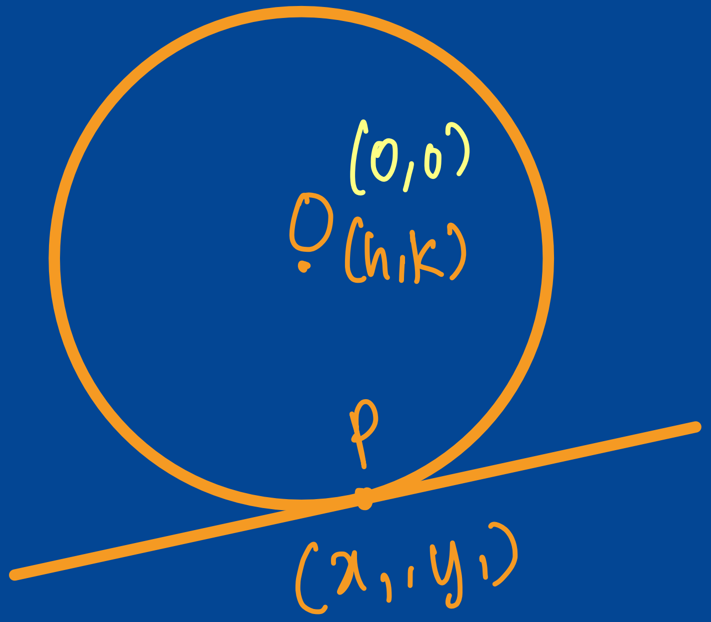
y-axis intercept distance $= y_2 - y_1 = 2\sqrt{f^2 - c}$

EQUATION OF A TANGENT AT A POINT ON CIRCLE:

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

→ general =

$T_N \Rightarrow x \cdot x_1 + y \cdot y_1 = r^2$ → Radius of circle.



Equation of tangent for general form of circle

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

$T_N : \Rightarrow x \cdot x_1 + y \cdot y_1 + g \cdot (x + x_1) + f(y + y_1) + c = 0$

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

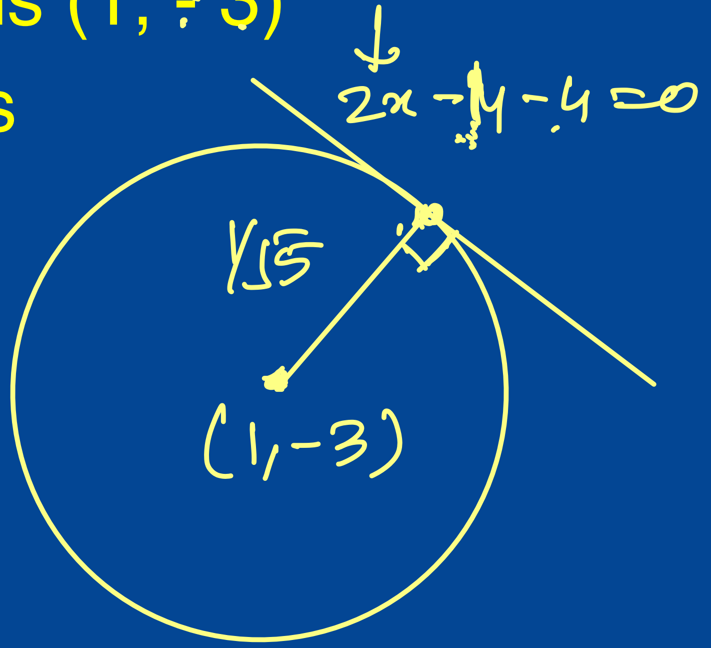
The equation of the circle whose centre is (1, - 3) and which touches the line 2x - y - 4=0 is

(a) $5x^2+5y^2-10x+30y+49=0$

(6) $5x^2+5y^2+10x-30y+49=0$

(c) $5x^2+5y^2-10x+30y-49=0$

(d) None of the above

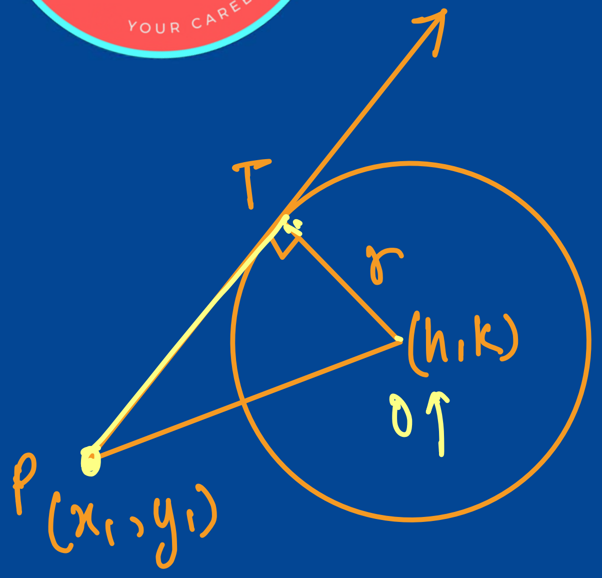


$$(x-1)^2+(y+3)^2=\left(\frac{1}{\sqrt{5}}\right)^2$$

$$x^2-2x+1+y^2+6y+9=\frac{1}{5}$$

$$5x^2+5y^2-10x+30y+49=0$$

Length of T^{N} from a point to the circle



$$PT = \sqrt{(x_1 - h)^2 + (y_1 - k)^2 - r^2}$$

The lines $5x - 12y - 5 = 0$ and $10x - 24y + 3 = 0$ are tangents to the same circle. What is the diameter of the circle?

(a) 1 unit

(b) 8 unit

(c) 5 unit

(d) 1/2 unit

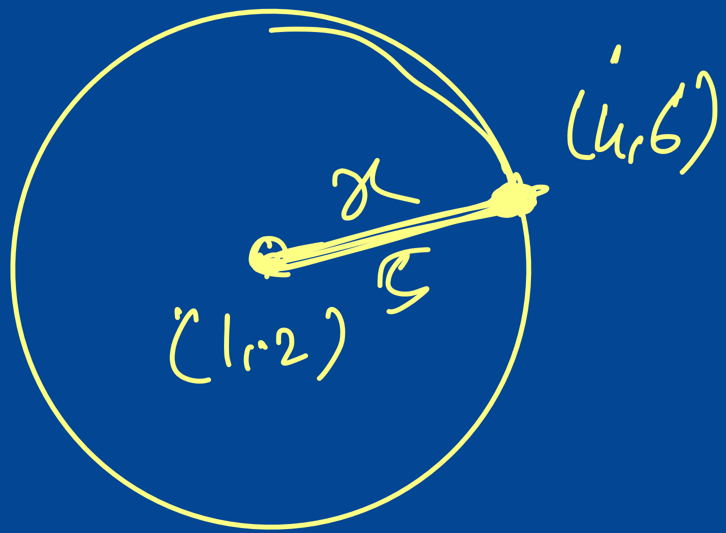
The area of the circle whose centre is at (1, 2) and which passes through the point (4, 6) is

(a) 5π

(b) 10π

(c) 25π

(d) None of these



$$\pi r^2 = \pi \cdot 25$$

$$\sqrt{3^2 + 4^2} = \sqrt{9+16}$$

$$= \sqrt{25} = 5$$

The radius of any circle touching the lines $3x - 4y + 5 = 0$ and $6x - 8y - 9 = 0$ is

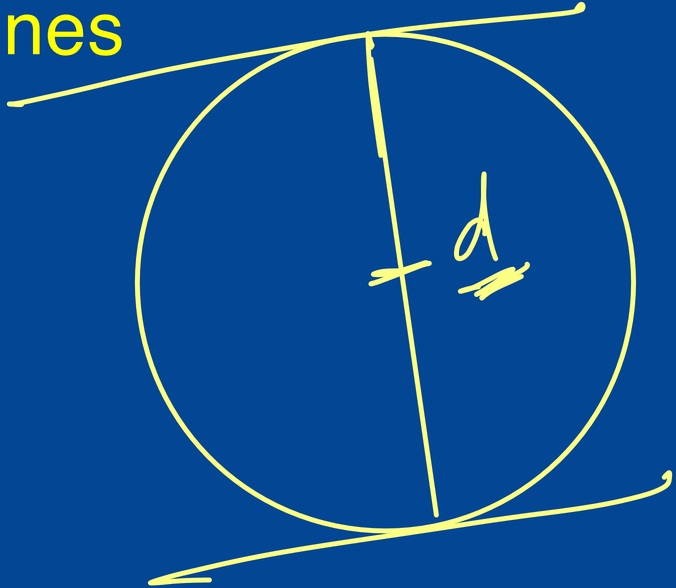
(a) 1.9

(b) 0.95

(c) 2.9

(d) 1.45

$$3x - 4y - 9/2 = 0$$



$$\left|\frac{c_1 - c_2}{\sqrt{a^2+b^2}}\right| = \left|\frac{5+9/2}{\sqrt{25}}\right| = \left|\frac{\frac{19}{2}}{5}\right| = \left|\frac{19}{10}\right| = \frac{1.9}{2}$$

$$= 0.95$$

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