

Tips and Tricks to use circle equation quickly:

Lots of questions are asked in JEE Exams, that ask to find center and radius of a circle. If one knows some formulas then it becomes quick and can save a lot of time. Here are some of the standard forms worth remembering:

**Center Radius Form:**

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

Centre (h, k), Radius = r

**General Form:**

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

Where (-g, -f) centre

$$r^2 = g^2 + f^2 - c$$

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

→ Here important results are of center and radius formula.

**Parametric Form:**

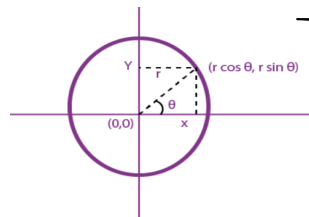
$$\text{Equation of circle} = x^2 + y^2 = r^2$$

$$X = r \cos \theta$$

$$Y = r \sin \theta$$

Squaring both side

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



→ When parametric form is mentioned in que, try to start with this diagram.

**Bonus:**

If in question, there is an assumption about a circle; it is a best practice to start with simplest circle. That is standard equation of circle. Most of the time a result that is claimed to be true in an option, ought to hold for simplest circle also. This way one can check particular option quickly and save time. One can practice this method in other concepts as well.

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

centre (0, 0) and Radius (r)

→ Standard Circle Equation

Illustration 1: Find the centre and the radius of the circle

$$3x^2 + 3y^2 - 8x - 10y + 3 = 0.$$

→ General form formulas are used to solve this one.

Solution:

$$\text{We rewrite the given equation as } x^2 + y^2 - \frac{8}{3}x - \frac{10}{3}y + 1 = 0$$

$$\Rightarrow g = -\frac{4}{3}, f = -\frac{5}{3}, c = 1.$$

Hence the centre is  $(\frac{4}{3}, \frac{5}{3})$  and the radius is

$$\sqrt{\frac{16}{9} + \frac{25}{9} - 1} = \sqrt{\frac{32}{9}} = \frac{4\sqrt{2}}{3}.$$