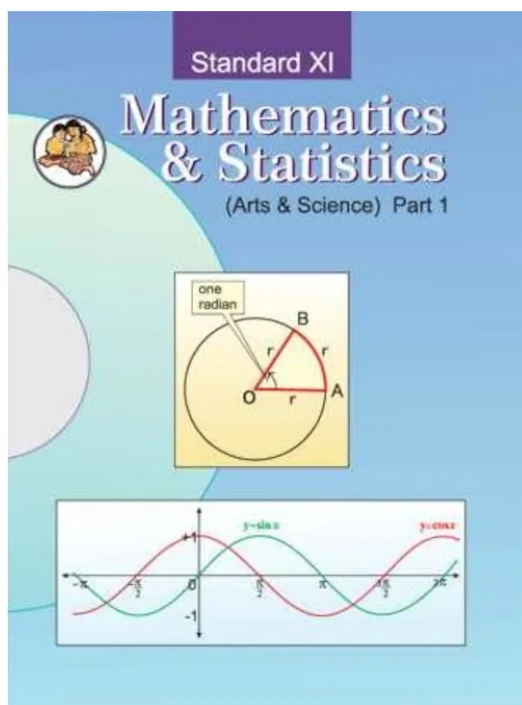


Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 6- Circle

Class 11 - Chapter 6 Circle



For any clarifications or questions you can write to info@indcareer.com

Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888, **Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>



Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 6- Circle

Class 11: Maths Chapter 6 solutions. Complete Class 11 Maths Chapter 6 Notes.

Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 6- Circle

Maharashtra Board 11th Maths Chapter 6, Class 11 Maths Chapter 6 solutions

Ex 6.1

Question 1.

Find the equation of a circle with

- (i) centre at origin and radius 4.
- (ii) centre at $(-3, -2)$ and radius 6.
- (iii) centre at $(2, -3)$ and radius 5.
- (iv) centre at $(-3, -3)$ passing through point $(-3, -6)$.

Solution:

(i) The equation of a circle with centre at origin and radius 'r' is given by

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

Here, $r = 4$

$\therefore$ The required equation of the circle is $x^2 + y^2 = 4^2$ i.e., $x^2 + y^2 = 16$.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

(ii) The equation of a circle with centre at (h, k) and radius 'r' is given by

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

Here, h = -3, k = -2 and r = 6

∴ The required equation of the circle is

$$[x - (-3)]^2 + [y - (-2)]^2 = 6^2$$

$$\Rightarrow (x + 3)^2 + (y + 2)^2 = 36$$

$$\Rightarrow x^2 + 6x + 9 + y^2 + 4y + 4 - 36 = 0$$

$$\Rightarrow x^2 + y^2 + 6x + 4y - 23 = 0$$

(iii) The equation of a circle with centre at (h, k) and radius 'r' is given by

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

Here, h = 2, k = -3 and r = 5

The required equation of the circle is

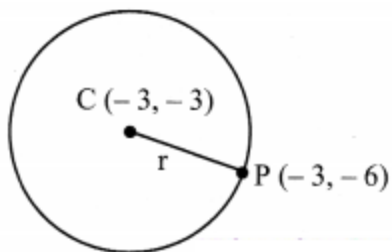
$$(x - 2)^2 + [y - (-3)]^2 = 5^2$$

$$\Rightarrow (x - 2)^2 + (y + 3)^2 = 25$$

$$\Rightarrow x^2 - 4x + 4 + y^2 + 6y + 9 - 25 = 0$$

$$\Rightarrow x^2 + y^2 - 4x + 6y - 12 = 0$$

(iv) Centre of the circle is C (-3, -3) and it passes through the point P (-3, -6).



By distance formula,

$$\begin{aligned}\text{Radius (r)} = CP &= \sqrt{[-3 - (-3)]^2 + [-6 - (-3)]^2} \\ &= \sqrt{(-3 + 3)^2 + (-6 + 3)^2} \\ &= \sqrt{0^2 + (-3)^2} \\ &= \sqrt{9} = 3\end{aligned}$$

The equation of a circle with centre at (h, k) and radius 'r' is given by

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

Here, h = -3, k = -3, r = 3

The required equation of the circle is

$$[x - (-3)]^2 + [y - (-3)]^2 = 3^2$$

$$\Rightarrow (x + 3)^2 + (y + 3)^2 = 9$$

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

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

Check:

If the point $(-3, -6)$ satisfies $x^2 + y^2 + 6x + 6y + 9 = 0$, then our answer is correct.

$$\text{L.H.S.} = x^2 + y^2 + 6x + 6y + 9$$

$$= (-3)^2 + (-6)^2 + 6(-3) - 6(-6) + 9$$

$$= 9 + 36 - 18 - 36 + 9$$

$$= 0$$

$$= \text{R.H.S.}$$

Thus, our answer is correct.

Question 2.

Find the centre and radius of the following circles:

(i) $x^2 + y^2 = 25$

(ii) $(x - 5)^2 + (y - 3)^2 = 20$

(iii) $\left(x - \frac{1}{2}\right)^2 + \left(y + \frac{1}{3}\right)^2 = \frac{1}{36}$

Solution:

(i) Given equation of the circle is

$$x^2 + y^2 = 25$$

$$\Rightarrow x^2 + y^2 = (5)^2$$

Comparing this equation with $x^2 + y^2 = r^2$, we get $r = 5$

Centre of the circle is $(0, 0)$ and radius of the circle is 5.

(ii) Given equation of the circle is

$$(x - 5)^2 + (y - 3)^2 = 20$$

$$\Rightarrow (x - 5)^2 + (y - 3)^2 = (\sqrt{20})^2$$

Comparing this equation with $(x - h)^2 + (y - k)^2 = r^2$, we get

$$h = 5, k = 3 \text{ and } r = \sqrt{20} = 2\sqrt{5}$$

Centre of the circle = $(h, k) = (5, 3)$

and radius of the circle = $2\sqrt{5}$.

(iii) Given the equation of the circle is

$$\left(x - \frac{1}{2}\right)^2 + \left(y + \frac{1}{3}\right)^2 = \frac{1}{36}$$

$$\left(x - \frac{1}{2}\right)^2 + \left(y - \left(-\frac{1}{3}\right)\right)^2 = \left(\frac{1}{6}\right)^2$$

Comparing this equation with $(x - h)^2 + (y - k)^2 = r^2$, we get

$$h = \frac{1}{2}, k = -\frac{1}{3} \text{ and } r = \frac{1}{6}$$

Centre of the circle = $(h, k) = \left(\frac{1}{2}, -\frac{1}{3}\right)$ and radius of the circle = $\frac{1}{6}$

Question 3.

Find the equation of the circle with centre

(i) at (a, b) and touching the Y-axis.

(ii) at $(-2, 3)$ and touching the X-axis.

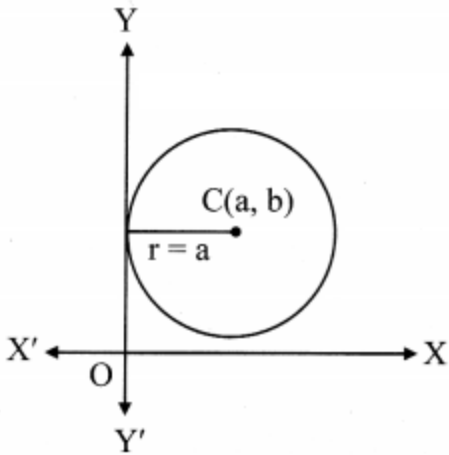
(iii) on the X-axis and passing through the origin having radius 4.

(iv) at $(3, 1)$ and touching the line $8x - 15y + 25 = 0$.

Solution:

Solution:

(i) Since the circle is touching the Y-axis, the radius of the circle is X-co-ordinate of the centre.



$$\therefore r = a$$

The equation of a circle with centre at (h, k) and radius r is given by

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

Here, $h = a$, $k = b$

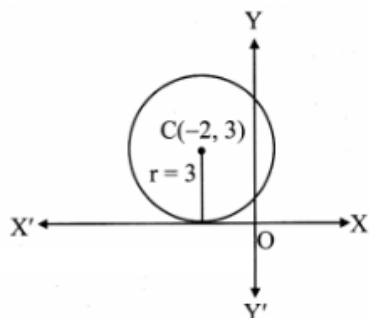
The required equation of the circle is

$$\Rightarrow (x - a)^2 + (y - b)^2 = a^2$$

$$\Rightarrow x^2 - 2ax + a^2 + y^2 - 2by + b^2 = a^2$$

$$\Rightarrow x^2 + y^2 - 2ax - 2by + b^2 = 0$$

(ii) Since the circle is touching the X-axis, the radius of the circle is the Y co-ordinate of the centre.



$$\therefore r = 3$$

The equation of a circle with centre at (h, k) and radius r is given by

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

Here, $h = -2$, $k = 3$

The required equation of the circle is

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

$$\Rightarrow x^2 + 4x + 4 + y^2 - 6y + 9 = 9$$

$$\Rightarrow x^2 + y^2 + 4x - 6y + 4 = 0$$

(iii) Let the co-ordinates of the centre of the required circle be $C(h, 0)$.

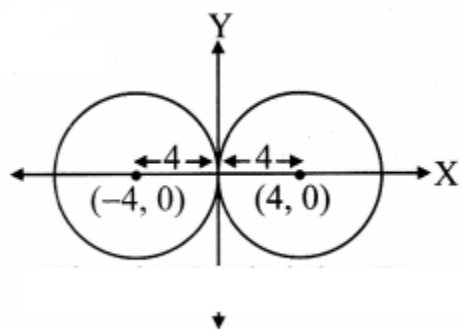
Since the circle passes through the origin i.e., $O(0, 0)$

$OC = \text{radius}$

$$\Rightarrow \sqrt{(h - 0)^2 + (0 - 0)^2} = 4$$

$$\Rightarrow h^2 = 16$$

$$\Rightarrow h = \pm 4$$



<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

the co-ordinates of the centre are $(4, 0)$ or $(-4, 0)$.

The equation of a circle with centre at (h, k) and radius r is given by

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

Here, $h = \pm 4$, $k = 0$, $r = 4$

The required equation of the circle is

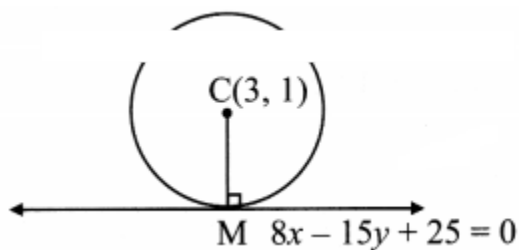
$$\Rightarrow (x - 4)^2 + (y - 0)^2 = 4^2 \text{ or } (x + 4)^2 + (y - 0)^2 = 4^2$$

$$\Rightarrow x^2 - 8x + 16 + y^2 = 16 \text{ or } x^2 + 8x + 16 + y^2 = 16$$

$$\Rightarrow x^2 + y^2 - 8x = 0 \text{ or } x^2 + y^2 + 8x = 0$$

(iv) Centre of the circle is $C(3, 1)$.

Let the circle touch the line $8x - 15y + 25 = 0$ at point M .



$CM = \text{radius } (r)$

$CM = \text{Length of perpendicular from centre } C(3, 1) \text{ on the line } 8x - 15y + 25 = 0$

$$\begin{aligned} &= \left| \frac{8(3) - 15(1) + 25}{\sqrt{8^2 + (-15)^2}} \right| \\ &= \left| \frac{24 - 15 + 25}{\sqrt{64 + 225}} \right| \\ &= \left| \frac{34}{\sqrt{289}} \right| \\ r &= \left| \frac{34}{17} \right| = 2 \end{aligned}$$

The equation of a circle with centre at (h, k) and radius r is given by

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

Here, h = 3, k = 1 and r = 2

The required equation of the circle is

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

$$\Rightarrow x^2 - 6x + 9 + y^2 - 2y + 1 = 4$$

$$\Rightarrow x^2 + y^2 - 6x - 2y + 10 - 4 = 0$$

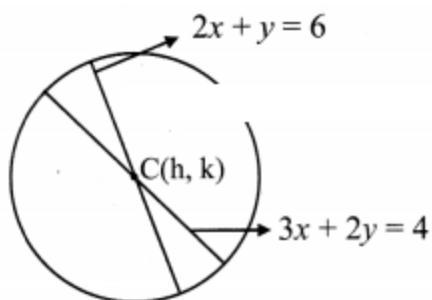
$$\Rightarrow x^2 + y^2 - 6x - 2y + 6 = 0$$

Question 4.

Find the equation of the circle, if the equations of two diameters are $2x + y = 6$ and $3x + 2y = 4$ and radius is 9.

Solution:

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>



Given equations of diameters are $2x + y = 6$ and $3x + 2y = 4$.

Let $C(h, k)$ be the centre of the required circle.

Since point of intersection of diameters is the centre of the circle,

$$x = h, y = k$$

Equations of diameters become

$$2h + k = 6 \dots\dots(i)$$

$$\text{and } 3h + 2k = 4 \dots\dots(ii)$$

By (ii) $- 2 \times (i)$, we get

$$-h = -8$$

$$\Rightarrow h = 8$$

Substituting $h = 8$ in (i), we get

$$2(8) + k = 6$$

$$\Rightarrow k = 6 - 16$$

$$\Rightarrow k = -10$$

Centre of the circle is $C(8, -10)$ and radius, $r = 9$

The equation of a circle with centre at (h, k) and radius r is given by

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

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

Here, $h = 8$, $k = -10$

The required equation of the circle is

$$\Rightarrow (x - 8)^2 + (y + 10)^2 = 9^2$$

$$\Rightarrow x^2 - 16x + 64 + y^2 + 20y + 100 = 81$$

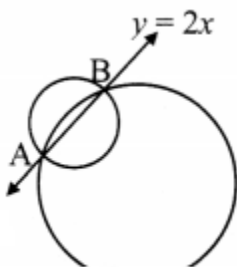
$$\Rightarrow x^2 + y^2 - 16x + 20y + 100 + 64 - 81 = 0$$

$$\Rightarrow x^2 + y^2 - 16x + 20y + 83 = 0$$

Question 5.

If $y = 2x$ is a chord of the circle $x^2 + y^2 - 10x = 0$, find the equation of the circle with this chord as diameter.

Solution:



$y = 2x$ is the chord of the given circle.

It satisfies the equation of a given circle.

Substituting $y = 2x$ in $x^2 + y^2 - 10x = 0$, we get

$$\Rightarrow x^2 + (2x)^2 - 10x = 0$$

$$\Rightarrow x^2 + 4x^2 - 10x = 0$$

$$\Rightarrow 5x^2 - 10x = 0$$

$$\Rightarrow 5x(x - 2) = 0$$

$$\Rightarrow x = 0 \text{ or } x = 2$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

When $x = 0$, $y = 2x = 2(0) = 0$

$\therefore A = (0, 0)$

When $x = 2$, $y = 2x = 2(2) = 4$

$\therefore B = (2, 4)$

End points of chord AB are A(0, 0) and B(2, 4).

Chord AB is the diameter of the required circle.

The equation of a circle having (x_1, y_1) and (x_2, y_2) as end points of diameter is given by

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

Here, $x_1 = 0$, $y_1 = 0$, $x_2 = 2$, $y_2 = 4$

The required equation of the circle is

$$\Rightarrow (x - 0)(x - 2) + (y - 0)(y - 4) = 0$$

$$\Rightarrow x^2 - 2x + y^2 - 4y = 0$$

$$\Rightarrow x^2 + y^2 - 2x - 4y = 0$$

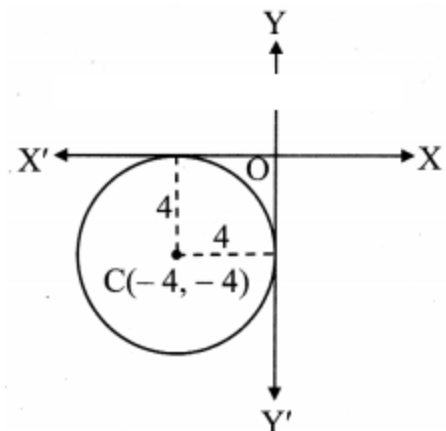
Question 6.

Find the equation of a circle with a radius of 4 units and touch both the co-ordinate axes having centre in the third quadrant. Solution:

The radius of the circle = 4 units

Since the circle touches both the co-ordinate axes and its centre is in the third quadrant,

the centre of the circle is C(-4, -4).



The equation of a circle with centre at (h, k) and radius r is given by $(x - h)^2 + (y - k)^2 = r^2$

Here, $h = -4$, $k = -4$, $r = 4$

the required equation of the circle is

$$\Rightarrow [x - (-4)]^2 + [y - (-4)]^2 = 4^2$$

$$\Rightarrow (x + 4)^2 + (y + 4)^2 = 16$$

$$\Rightarrow x^2 + 8x + 16 + y^2 + 8y + 16 - 16 = 0$$

$$\Rightarrow x^2 + y^2 + 8x + 8y + 16 = 0$$

Question 7.

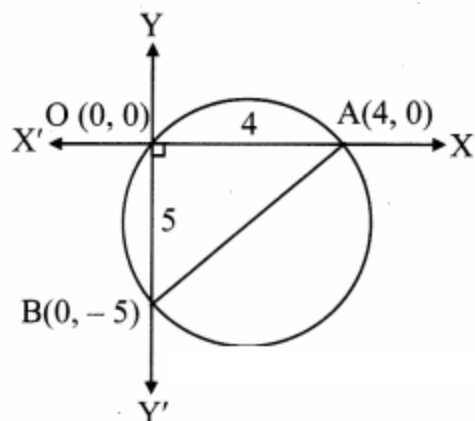
Find the equation of the circle passing through the origin and having intercepts 4 and -5 on the co-ordinate axes.

Solution:

Let the circle intersect X-axis at point A and intersect Y-axis at point B.

the co-ordinates of point A are $(4, 0)$ and the co-ordinates of point B are $(0, -5)$.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>



Since $\angle AOB$ is a right angle,

AB represents the diameter of the circle.

The equation of a circle having (x_1, y_1) and (x_2, y_2) as end points of diameter is given by

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

Here, $x_1 = 4, y_1 = 0, x_2 = 0, y_2 = -5$

The required equation of the circle is

$$\Rightarrow (x - 4)(x - 0) + (y - 0)[y - (-5)] = 0$$

$$\Rightarrow x(x - 4) + y(y + 5) = 0$$

$$\Rightarrow x^2 - 4x + y^2 + 5y = 0$$

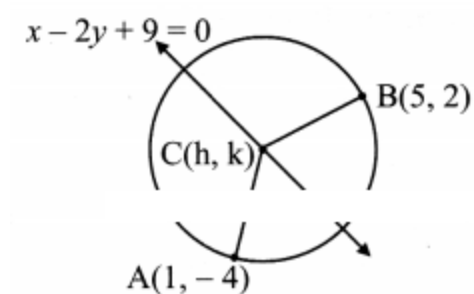
$$\Rightarrow x^2 + y^2 - 4x + 5y = 0$$

Question 8.

Find the equation of a circle passing through the points $(1, -4)$, $(5, 2)$ and having its centre on line $x - 2y + 9 = 0$.

Solution:

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>



Let $C(h, k)$ be the centre of the required circle which lies on the line $x - 2y + 9 = 0$.

Equation of line becomes

$$h - 2k + 9 = 0 \dots\dots(i)$$

Also, the required circle passes through points $A(1, -4)$ and $B(5, 2)$.

$$CA = CB = \text{radius}$$

$$CA = CB$$

By distance formula,

$$\sqrt{(h-1)^2 + [k - (-4)]^2} = \sqrt{(h-5)^2 + (k-2)^2}$$

Squaring both the sides, we get

$$\Rightarrow (h-1)^2 + (k+4)^2 = (h-5)^2 + (k-2)^2$$

$$\Rightarrow h^2 - 2h + 1 + k^2 + 8k + 16 = h^2 - 10h + 25 + k^2 - 4k + 4$$

$$\Rightarrow -2h + 8k + 17 = -10h - 4k + 29$$

$$\Rightarrow 8h + 12k - 12 = 0$$

$$\Rightarrow 2h + 3k - 3 = 0 \dots\dots(ii)$$

By (ii) - (i) $\times 2$, we get

$$7k = 21$$

$$\Rightarrow k = 3$$

Substituting $k = 3$ in (i), we get

$$h - 2(3) + 9 = 0$$

$$\Rightarrow h - 6 + 9 = 0$$

$$\Rightarrow h = -3$$

Centre of the circle is $C(-3, 3)$.

radius (r) = CA

$$= \sqrt{[1 - (-3)]^2 + (-4 - 3)^2}$$

$$= \sqrt{4^2 + (-7)^2}$$

$$= \sqrt{16 + 49}$$

$$= \sqrt{65}$$

The equation of a circle with centre at (h, k) and radius r is given by $(x - h)^2 + (y - k)^2 = r^2$

Here, $h = -3$, $k = 3$, $r = \sqrt{65}$

The required equation of the circle is

$$\Rightarrow [x - (-3)]^2 + (y - 3)^2 = (\sqrt{65})^2$$

$$\Rightarrow (x + 3)^2 + (y - 3)^2 = 65$$

$$\Rightarrow x^2 + 6x + 9 + y^2 - 6y + 9 - 65 = 0$$

$$\Rightarrow x^2 + y^2 + 6x - 6y - 47 = 0$$

Ex 6.2

Question 1.

Find the centre and radius of each of the following circles:

(i) $x^2 + y^2 - 2x + 4y - 4 = 0$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

(ii) $x^2 + y^2 - 6x - 8y - 24 = 0$

(iii) $4x^2 + 4y^2 - 24x - 8y - 24 = 0$

Solution:

(i) Given equation of the circle is $x^2 + y^2 - 2x + 4y - 4 = 0$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = -2, 2f = 4 \text{ and } c = -4$$

$$\Rightarrow g = -1, f = 2 \text{ and } c = -4$$

$$\text{Centre of the circle} = (-g, -f) = (1, -2)$$

and radius of the circle

$$\begin{aligned} &= \sqrt{g^2 + f^2 - c} \\ &= \sqrt{(-1)^2 + (2)^2 - (-4)} \\ &= \sqrt{1 + 4 + 4} \\ &= \sqrt{9} = 3 \end{aligned}$$

(ii) Given equation of the circle is $x^2 + y^2 - 6x - 8y - 24 = 0$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = -6, 2f = -8 \text{ and } c = -24$$

$$\Rightarrow g = -3, f = -4 \text{ and } c = -24$$

$$\text{Centre of the circle} = (-g, -f) = (3, 4)$$

and radius of the circle

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

$$\begin{aligned} &= \sqrt{g^2 + f^2 - c} \\ &= \sqrt{(-3)^2 + (-4)^2 - (-24)} \\ &= \sqrt{9+16+24} \\ &= \sqrt{49} = 7 \end{aligned}$$

(iii) Given equation of the circle is $4x^2 + 4y^2 - 24x - 8y - 24 = 0$

Dividing throughout by 4, we get $x^2 + y^2 - 6x - 2y - 6 = 0$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = -6, 2f = -2 \text{ and } c = -6$$

$$\Rightarrow g = -3, f = -1 \text{ and } c = -6$$

Centre of the circle = $(-g, -f) = (3, 1)$

and radius of the circle

$$\begin{aligned} &= \sqrt{g^2 + f^2 - c} \\ &= \sqrt{(-3)^2 + (-1)^2 - (-6)} \\ &= \sqrt{9+1+6} \\ &= \sqrt{16} = 4 \end{aligned}$$

Question 2.

Show that the equation $3x^2 + 3y^2 + 12x + 18y - 11 = 0$ represents a circle.

Solution:

Given equation is $3x^2 + 3y^2 + 12x + 18y - 11 = 0$

Dividing throughout by 3, we get

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

$$x^2 + y^2 + 4x + 6y - \frac{11}{3} = 0$$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = 4, 2f = 6, c = -\frac{11}{3}$$

$$\Rightarrow g = 2, f = 3, c = -\frac{11}{3}$$

$$\text{Now, } g^2 + f^2 - c = (2)^2 + (3)^2 - \left(-\frac{11}{3}\right)$$

$$= 4 + 9 + \frac{11}{3}$$

$$= \frac{50}{3} > 0$$

$\therefore$ The given equation represents a circle.

Question 3.

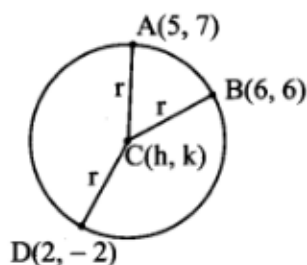
Find the equation of the circle passing through the points (5, 7), (6, 6), and (2, -2).

Solution:

Let $C(h, k)$ be the centre of the required circle.

Since the required circle passes through points A(5, 7), B(6, 6), and D(2, -2),

$CA = CB = CD = \text{radius}$



Consider, $CA = CD$

By distance formula,

By distance formula,

$$\sqrt{(h-5)^2 + (k-7)^2} = \sqrt{(h-2)^2 + [k - (-2)]^2}$$

Squaring both the sides, we get

$$\Rightarrow (h-5)^2 + (k-7)^2 = (h-2)^2 + (k+2)^2$$

$$\Rightarrow h^2 - 10h + 25 + k^2 - 14k + 49 = h^2 - 4h + 4 + k^2 + 4k + 4$$

$$\Rightarrow -10h - 14k + 74 = -4h + 4k + 8$$

$$\Rightarrow 6h + 18k - 66 = 0$$

$$\Rightarrow h + 3k - 11 = 0 \dots\dots(i)$$

Consider, $CB = CD$

By distance formula,

$$\sqrt{(h-6)^2 + (k-6)^2} = \sqrt{(h-2)^2 + [k - (-2)]^2}$$

Squaring both the sides, we get

$$\Rightarrow (h-6)^2 + (k-6)^2 = (h-2)^2 + (k+2)^2$$

$$\Rightarrow h^2 - 12h + 36 + k^2 - 12k + 36 = h^2 - 4h + 4 + k^2 + 4k + 4$$

$$\Rightarrow -12h - 12k + 72 = -4h + 4k + 8$$

$$\Rightarrow 8h + 16k - 64 = 0$$

$$\Rightarrow h + 2k - 8 = 0 \dots\dots(ii)$$

By (i) - (ii), we get $k = 3$

Substituting $k = 3$ in (i), we get

$$h + 3(3) - 11 = 0$$

$$\Rightarrow h + 9 - 11 = 0$$

$$\Rightarrow h = 2$$

Centre of the circle is $C(2, 3)$.

radius $(r) = CD$

$$= \sqrt{(2-2)^2 + (3+2)^2}$$

$$= \sqrt{0 + 5^2}$$

$$= \sqrt{25}$$

$$= 5$$

The equation of a circle with centre at (h, k) and radius r is given by $(x-h)^2 + (y-k)^2 = r^2$

Here, $h = 2, k = 3$

The required equation of the circle is

$$(x-2)^2 + (y-3)^2 = 5^2$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

$$\Rightarrow x^2 - 4x + 4 + y^2 - 6y + 9 = 25$$

$$\Rightarrow x^2 + y^2 - 4x - 6y + 4 + 9 - 25 = 0$$

$$\Rightarrow x^2 + y^2 - 4x - 6y - 12 = 0$$

Question 4.

Show that the points (3, -2), (1, 0), (-1, -2) and (1, -4) are concyclic.

Solution:

Let the equation of the circle passing through the points (3, -2), (1, 0) and (-1, -2) be

$$x^2 + y^2 + 2gx + 2fy + c = 0 \dots(i)$$

For point (3, -2),

Substituting $x = 3$ and $y = -2$ in (i), we get

$$9 + 4 + 6g - 4f + c = 0$$

$$\Rightarrow 6g - 4f + c = -13 \dots(ii)$$

For point (1, 0),

Substituting $x = 1$ and $y = 0$ in (i), we get

$$1 + 0 + 2g + 0 + c = 0$$

$$\Rightarrow 2g + c = -1 \dots(iii)$$

For point (-1, -2),

Substituting $x = -1$ and $y = -2$, we get

$$1 + 4 - 2g - 4f + c = 0$$

$$\Rightarrow 2g + 4f - c = 5 \dots(iv)$$

Adding (ii) and (iv), we get

$$8g = -8$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

$$\Rightarrow g = -1$$

Substituting $g = -1$ in (iii), we get

$$-2 + c = -1$$

$$\Rightarrow c = 1$$

Substituting $g = -1$ and $c = 1$ in (iv), we get

$$-2 + 4f - 1 = 5$$

$$\Rightarrow 4f = 8$$

$$\Rightarrow f = 2$$

Substituting $g = -1$, $f = 2$ and $c = 1$ in (i), we get

$$x^2 + y^2 - 2x + 4y + 1 = 0 \dots\dots\dots(v)$$

If $(1, -4)$ satisfies equation (v), the four points are concyclic.

Substituting $x = 1$, $y = -4$ in L.H.S of (v), we get

$$\text{L.H.S.} = (1)^2 + (-4)^2 - 2(1) + 4(-4) + 1$$

$$= 1 + 16 - 2 - 16 + 1$$

$$= 0$$

$$= \text{R.H.S.}$$

Point $(1, -4)$ satisfies equation (v).

$\therefore$ The given points are concyclic.

Ex 6.3

Question 1.

Write the parametric equations of the circles:

(i) $x^2 + y^2 = 9$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

(ii) $x^2 + y^2 + 2x - 4y - 4 = 0$

(iii) $(x - 3)^2 + (y + 4)^2 = 25$

Solution:

(i) Given equation of the circle is

$$x^2 + y^2 = 9$$

$$\Rightarrow x^2 + y^2 = 3^2$$

Comparing this equation with $x^2 + y^2 = r^2$, we get $r = 3$

The parametric equations of the circle in terms of θ are

$$x = r \cos \theta \text{ and } y = r \sin \theta$$

$$\Rightarrow x = 3 \cos \theta \text{ and } y = 3 \sin \theta$$

(ii) Given equation of the circle is

$$x^2 + y^2 + 2x - 4y - 4 = 0$$

$$\Rightarrow x^2 + 2x + y^2 - 4y - 4 = 0$$

$$\Rightarrow x^2 + 2x + 1 - 1 + y^2 - 4y + 4 - 4 - 4 = 0$$

$$\Rightarrow (x^2 + 2x + 1) + (y^2 - 4y + 4) - 9 = 0$$

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

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

Comparing this equation with $(x - h)^2 + (y - k)^2 = r^2$, we get

$$h = -1, k = 2 \text{ and } r = 3$$

The parametric equations of the circle in terms of θ are

$$x = h + r \cos \theta \text{ and } y = k + r \sin \theta$$

$$\Rightarrow x = -1 + 3 \cos \theta \text{ and } y = 2 + 3 \sin \theta$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

(iii) Given equation of the circle is

$$(x - 3)^2 + (y + 4)^2 = 25$$

$$\Rightarrow (x - 3)^2 + (y + 4)^2 = 5^2$$

Comparing this equation with $(x - h)^2 + (y - k)^2 = r^2$, we get

$$h = 3, k = -4 \text{ and } r = 5$$

The parametric equations of the circle in terms of θ are

$$x = h + r \cos \theta \text{ and } y = k + r \sin \theta$$

$$\Rightarrow x = 3 + 5 \cos \theta \text{ and } y = -4 + 5 \sin \theta$$

Question 2.

Find the parametric representation of the circle $3x^2 + 3y^2 - 4x + 6y - 4 = 0$.

Solution:

Given equation of the circle is $3x^2 + 3y^2 - 4x + 6y - 4 = 0$

Dividing throughout by 3, we get

$$x^2 + y^2 - \frac{4}{3}x + 2y - \frac{4}{3} = 0$$

$$x^2 - \frac{4}{3}x + y^2 + 2y - \frac{4}{3} = 0$$

$$x^2 - \frac{4}{3}x + \frac{4}{9} - \frac{4}{9} + y^2 + 2y + 1 - 1 - \frac{4}{3} = 0$$

$$\left(x^2 - \frac{4}{3}x + \frac{4}{9}\right) + (y^2 + 2y + 1) - \frac{25}{9} = 0$$

$$\left(x - \frac{2}{3}\right)^2 + (y + 1)^2 = \frac{25}{9}$$

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

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>

Comparing this equation with $(x - h)^2 + (y - k)^2 = r^2$, we get

$$h = \frac{2}{3}, k = -1 \text{ and } r = \frac{5}{3}$$

The parametric representation of the circle in terms of θ are

$$x = h + r \cos \theta \text{ and } y = k + r \sin \theta$$

$$\Rightarrow x = \frac{2}{3} + \frac{5}{3} \cos \theta \text{ and } y = -1 + \frac{5}{3} \sin \theta$$

Question 3.

Find the equation of a tangent to the circle $x^2 + y^2 - 3x + 2y = 0$ at the origin.

Solution:

$$\text{Given equation of the circle is } x^2 + y^2 - 3x + 2y = 0$$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = -3, 2f = 2, c = 0$$

$$\Rightarrow g = -\frac{3}{2}, f = 1, c = 0$$

The equation of a tangent to the circle

$$x^2 + y^2 + 2gx + 2fy + c = 0 \text{ at } (x_1, y_1) \text{ is } xx_1 + yy_1 + g(x + x_1) + f(y + y_1) + c = 0$$

The equation of the tangent at $(0, 0)$ is

$$x(0) + y(0) + \left(-\frac{3}{2}\right)(x + 0) + 1(y + 0) + 0 = 0$$

$$\Rightarrow -\frac{3}{2}x + y = 0$$

$$\Rightarrow 3x - 2y = 0$$

Question 4.

Show that the line $7x - 3y - 1 = 0$ touches the circle $x^2 + y^2 + 5x - 7y + 4 = 0$ at point $(1, 2)$.

Solution:

$$\text{Given equation of the circle is } x^2 + y^2 + 5x - 7y + 4 = 0$$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = 5, 2f = -7, c = 4$$

$$\Rightarrow g = \frac{5}{2}, f = \frac{-7}{2}, c = 4$$

The equation of a tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at (x_1, y_1) is

$$xx_1 + yy_1 + g(x + x_1) + f(y + y_1) + c = 0$$

The equation of the tangent at $(1, 2)$ is

$$x(1) + y(2) + \frac{5}{2}(x + 1) - \frac{7}{2}(y + 2) + 4 = 0$$

$$x + 2y + \frac{5}{2}x + \frac{5}{2} - \frac{7}{2}y - 7 + 4 = 0$$

$$\frac{7}{2}x - \frac{3}{2}y - \frac{1}{2} = 0$$

$7x - 3y - 1 = 0$, which is same as the given line.

The line $7x - 3y - 1 = 0$ touches the given circle at $(1, 2)$.

Question 5.

Find the equation of tangent to the circle $x^2 + y^2 - 4x + 3y + 2 = 0$ at the point $(4, -2)$.

Solution:

Given equation of the circle is $x^2 + y^2 - 4x + 3y + 2 = 0$

Comparing this equation with $x^2 + y^2 + 2gx + 2fy + c = 0$, we get

$$2g = -4, 2f = 3, c = 2$$

$$g = -2, f = \frac{3}{2}, c = 2$$

The equation of a tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at (x_1, y_1) is

$$xx_1 + yy_1 + g(x + x_1) + f(y + y_1) + c = 0$$

The equation of the tangent at $(4, -2)$ is

$$x(4) + y(-2) - 2(x + 4) + \frac{3}{2}(y - 2) + 2 = 0$$

$$\Rightarrow 4x - 2y - 2x - 8 + \frac{3}{2}y - 3 + 2 = 0$$

$$\Rightarrow 2x - \frac{1}{2}y - 9 = 0$$

$$\Rightarrow 4x - y - 18 = 0$$



Maharashtra Board Solutions

Class 11 Arts & Science Maths

(Part 1)

- Chapter 1- Angle and its Measurement
- Chapter 2- Trigonometry – I
- Chapter 3- Trigonometry – II
- Chapter 4- Determinants and Matrices
- Chapter 5- Straight Line
- Chapter 6- Circle
- Chapter 7- Conic Sections
- Chapter 8- Measures of Dispersion
- Chapter 9- Probability

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-p-art-1-chapter-6-circle/>

About About Maharashtra State Board (MSBSHSE)

The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-p-art-1-chapter-6-circle/>

FAQs

Where do I get the Maharashtra State Board Books PDF For free download?

You can download the Maharashtra State Board Books from the eBalbharti official website, i.e. cart.ebalbharati.in or from this article.

Add image

How to Download Maharashtra State Board Books?

Students can get the Maharashtra Books for primary, secondary, and senior secondary classes from here. You can view or download the Maharashtra State Board Books from this page or from the official website for free of cost. Students can follow the detailed steps below to visit the official website and download the e-books for all subjects or a specific subject in different mediums.

Step 1: Visit the official website ebalbharati.in

Step 2: On the top of the screen, select "Download PDF textbooks"

Step 3: From the "Classes" section, select your class.

Step 4: From "Medium", select the medium suitable to you.

Step 5: All Maharashtra board books for class 11th will now be displayed on the right side.

Step 6: Click on the "Download" option to download the PDF book.

Who developed the Maharashtra State board books?

As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-p-art-1-chapter-6-circle/>

About IndCareer

IndCareer.com is a leading developer of online career guidance resources for the Indian marketplace. Established in 2007, IndCareer.com is currently used by over thousands of institutions across India, including schools, employment agencies, libraries, colleges and universities.

IndCareer.com is designed to assist you in making the right career decision - a decision that meets your unique interests and personality.

For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

Website: <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-11-arts-science-maths-part-1-chapter-6-circle/>