

Objective: Interpret and write the equation of a circle.

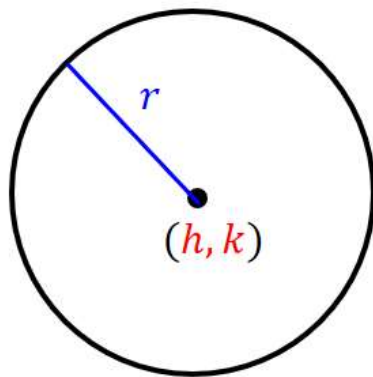
Concept

Equation of a Circle

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

OPP OPP

with center $C(h, k)$ and radius r units



A circle is defined as the set of points equidistant from a point called the center.

It is created using the coordinates of the center and the radius of the circle.

Objective: Interpret and write the equation of a circle.

Ex) State the center and exact radius of the circle.

$$(x + 6)^2 + (y - 8)^2 = 81 \quad r^2$$

opp opp
 $h = -6$ $k = 8$

① Center
 $(-6, 8)$

② radius = $r = \sqrt{81} = 9$ units



Objective: Interpret and write the equation of a circle.

Ex) State the center and exact radius of the circle.

$$x^2 + y^2 = 20$$

means: $(x-0)^2 + (y-0)^2 = 20$ r^2

$h=0$ $k=0$

Center: $(0, 0)$

radius = $r = \sqrt{20} = 2\sqrt{5}$ units

$\sqrt{4 \cdot 5}$



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Concept

Steps to Write the Equation of a Circle when the Radius Is Known

1. Identify the center, (h, k) and the radius, r .
2. Place the values of h , k and r into the circle equation:
$$(x - h)^2 + (y - k)^2 = r^2$$
3. Simplify where necessary.



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Ex) Write the equation of the circle with center $(5, -6)$ and radius of 4 units.

① $(x-h)^2 + (y-k)^2 = r^2$ ② $\begin{matrix} h & k \end{matrix}$ ③ $r = 4$

④ $(x-5)^2 + (y-(-6))^2 = 4^2$

⑤ simplify

$(x-5)^2 + (y+6)^2 = 16$



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Ex) Write the equation of the circle with center $(-4,0)$ and radius of $3\sqrt{6}$ units.

① $(x-h)^2 + (y-k)^2 = r^2$ ② $h = -4$
 $k = 0$ ③ $r = 3\sqrt{6}$

④ $(x - (-4))^2 + (y - 0)^2 = (3\sqrt{6})^2$

$3\sqrt{6} \cdot 3\sqrt{6}$
 $3^2 \cdot (\sqrt{6})^2 = 9 \cdot 6$
 $= 54$

⑤ simplify.

$$(x + 4)^2 + y^2 = 54$$

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Concept

Steps to Write the Equation of a Circle when the Radius Isn't Known

1. Identify the center, (h, k)
2. Place the values of h and k into the circle equation:
$$(x - h)^2 + (y - k)^2 = r^2$$
3. Identify another point on the circle, (x, y) .
4. Plug the values for x and y into the equation:
$$(x - h)^2 + (y - k)^2 = r^2$$
 and solve for the value of r^2 .
5. Write the final equation, simplifying where necessary.



Objective: Interpret and write the equation of a circle.

Ex) Write the equation of the circle whose center is $(2, -4)$ and point $P(3,0)$ is on the circle.

$$\textcircled{1} (x-h)^2 + (y-k)^2 = r^2$$

$$\textcircled{2} C(2, -4)$$

$h \quad k$

$$\textcircled{3} (x-2)^2 + (y-(-4))^2 = r^2$$

$$\textcircled{4} \text{ point } P(3,0)$$

$x \quad y$

$$(3-2)^2 + (0-(-4))^2 = r^2$$

$$1^2 + 4^2 = r^2$$

$$1 + 16 = r^2$$

$$17 = r^2$$

$$\textcircled{5} (x-2)^2 + (y+4)^2 = 17$$



Objective: Interpret and write the equation of a circle.

Ex) Write the equation of the circle whose graph is shown.

① $(x-h)^2 + (y-k)^2 = r^2$

② Center $(-3, 1)$
 h k

★ $(x - -3)^2 + (y - 1)^2 = r^2$

③ $P(1, 4)$
 x y

$(1 - -3)^2 + (4 - 1)^2 = r^2$
 4^2 3^2

$16 + 9 = r^2$

$25 = r^2$

④ $(x + 3)^2 + (y - 1)^2 = 25$

