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Circles in the Coordinate Plane

Unit 12 Lesson 5

CIRCLES IN THE COORDINATE PLANE

Students will be able to:

Identify the equation of the circle and draw the circle in the coordinate plane.

Key Vocabulary:

- Circle
- Center
- Radius
- General Form
- Center Radius Form
- Distance

Two Basic Equation of the Circle

CENTER RADIUS FORM: $(x-a)^2+(y-b)^2=r^2$

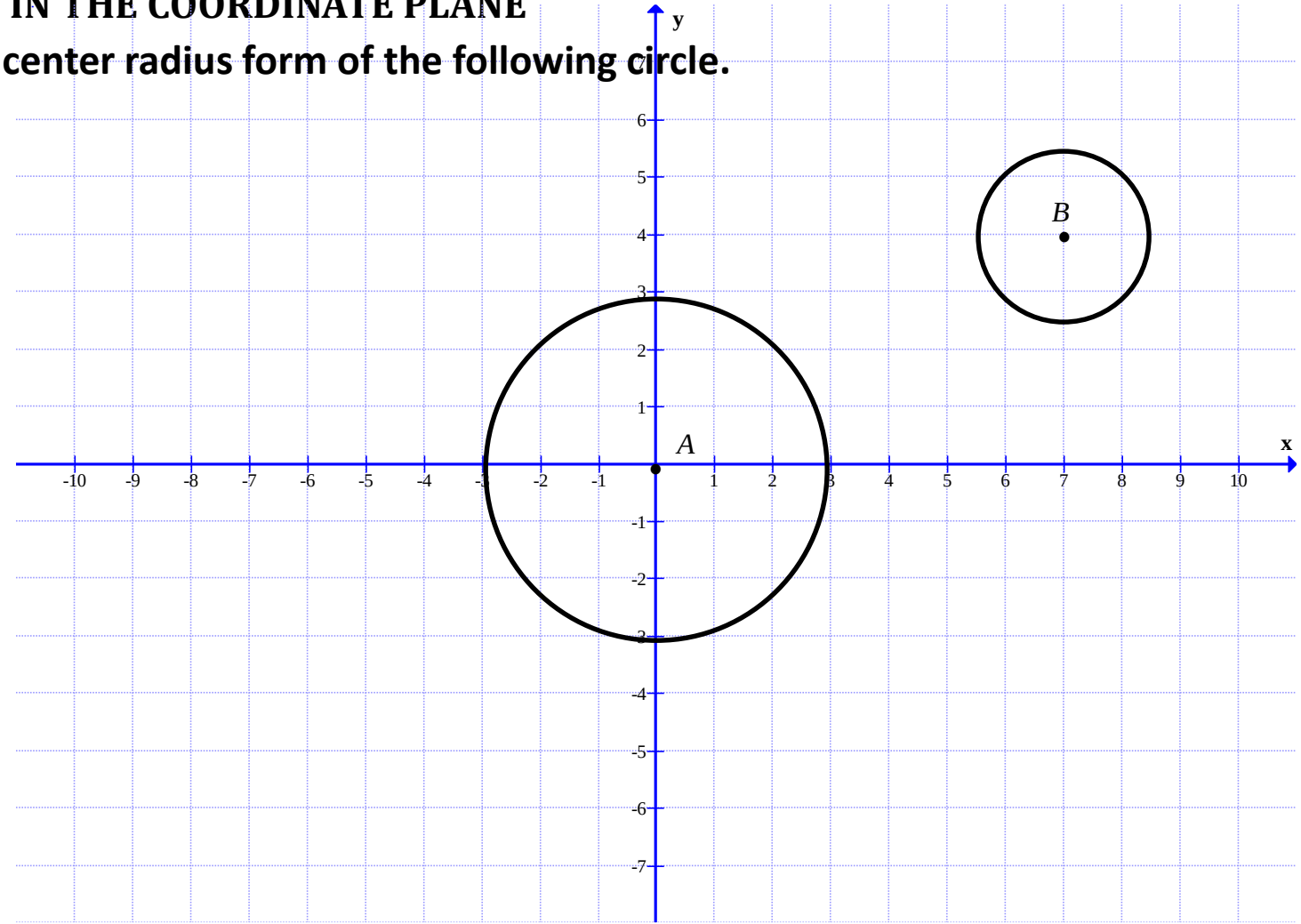
GENERAL FORM: $x^2+y^2+Ax+By+C=0$

Where: (a, b) are the coordinates of center of the circle; r is the radius; A, B, and C are constants

CENTER RADIUS AT THE ORIGIN: $x^2+y^2=r^2$

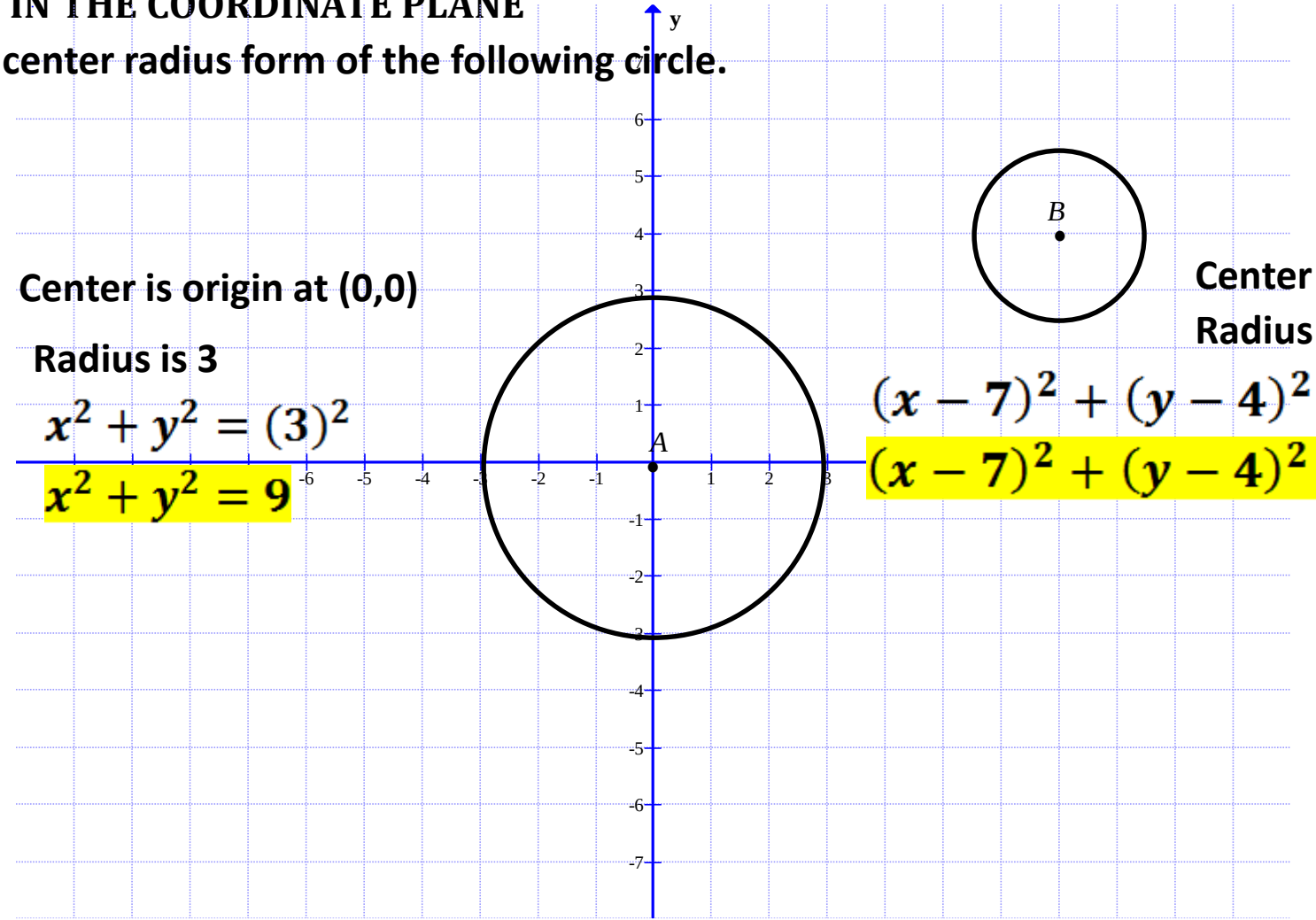
CIRCLES IN THE COORDINATE PLANE

Find the center radius form of the following circle.



CIRCLES IN THE COORDINATE PLANE

Find the center radius form of the following circle.



Center is origin at (0,0)

Radius is 3

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

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

Center at (7,4)

Radius is 1.5

$$(x-7)^2 + (y-4)^2 = (1.5)^2$$

$$(x-7)^2 + (y-4)^2 = 2.25$$

CIRCLES IN THE COORDINATE PLANE

Sample Problem 2: Find the equation of a circle given its center and radius.

3. Center at (0,0) radius is 4

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

$$x^2 + y^2 = 16$$

General Formula:

$$x^2 + y^2 - 16 = 0$$

4. Center at (5,2) radius is 5

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

$$(x-5)^2 + (y-2)^2 = 25$$

General Formula:

$$x^2 - 10x + 25 + y^2 - 4y + 4 = 25$$

$$x^2 + y^2 - 10x - 4y + 29 = 25$$

$$x^2 + y^2 - 10x - 4y + 4 = 0$$

CIRCLES IN THE COORDINATE PLANE

Sample Problem 3: Find the equation of a circle given one of its point and the center.

5. Center at (0,0) and point (3,2)

$$Radius = \sqrt{(3-0)^2 + (2-0)^2}$$

$$= \sqrt{13}$$

Equation:

$$x^2 + y^2 = \left(\sqrt{13}\right)^2$$

$$x^2 + y^2 = 13$$

General Equation:

$$x^2 + y^2 - 13 = 0$$

6. Center at (2,5) and point (2,8)

$$Radius = \sqrt{(2-2)^2 + (8-5)^2}$$

$$= \sqrt{9}$$

$$= 3$$

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

$$(x-2)^2 + (y-5)^2 = 9$$

General Equation:

$$x^2 - 4x + 4 + y^2 - 10y + 25 = 9$$

$$x^2 + y^2 - 4x + 10y + 29 = 9$$

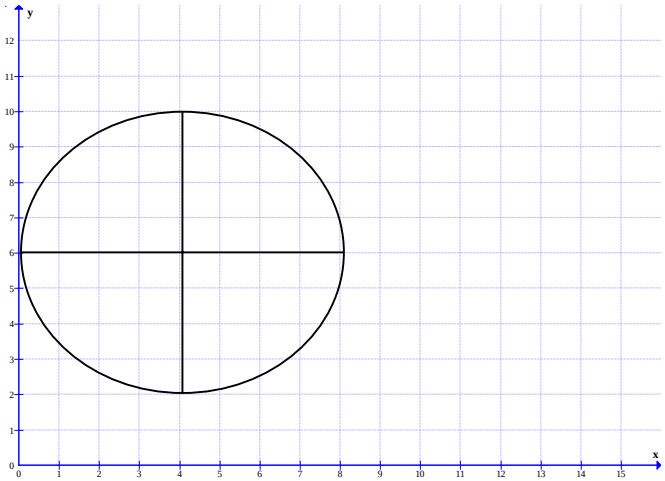
$$x^2 + y^2 - 4x + 10y + 20 = 0$$

CIRCLES IN THE COORDINATE PLANE

Sample Problem 4: given the equation of the circle graph the circle.

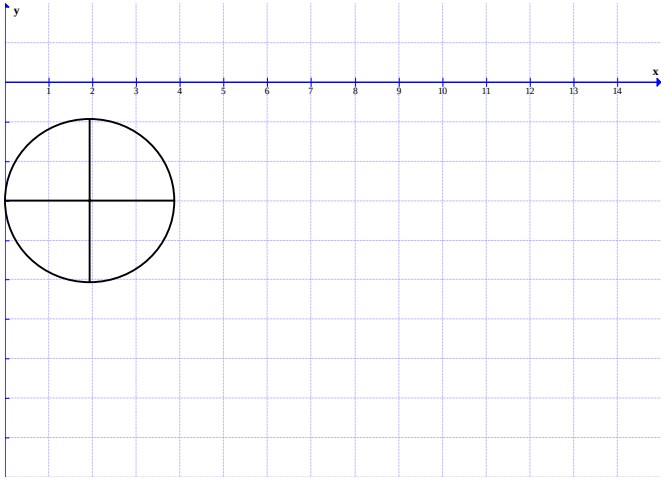
7. $(x-4)^2+(y-6)^2=16$

Center: (4,6) Radius: √16 = 4



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

Center: (2,-3) Radius: √4=2



Sample Problem 5: Changing general formula to center radius form.

$$x^2 + y^2 + 8x - 2y - 8 = 0$$

Solution:

$$x^2 + 8x + y^2 - 2y = 8$$

$$x^2 + 8x + \left(\frac{8}{2}\right)^2 + y^2 - 2y + \left(\frac{-2}{2}\right)^2 = 8 + \left(\frac{8}{2}\right)^2 + \left(\frac{-2}{2}\right)^2$$

$$(x+4)^2 + (y-1)^2 = 8 + 16 + 1$$

$$(x+4)^2 + (y-1)^2 = 25$$

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

Solution:

$$x^2 + 6x + y^2 - 2y = -2$$

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

$$(x+3)^2 + (y-1)^2 = -2 + 9 + 1$$

$$(x+3)^2 + (y-1)^2 = 8$$