Circles as Conic Sections

Algebra & Geometry Worksheet · Grade 9–11

Name: _____ Date: _____

Learning Objectives

- Identify the center and radius of a circle from its standard equation
- Write the standard equation of a circle given its center and a point on the circle
- Convert the general form of a circle to standard form using completing the square

Problems

1. Identify the center and radius of the circle given by the equation below.

$$(x-3)^2+(y-5)^2=49$$

2. Identify the center and radius of the circle given by the equation below.

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

3. Write the standard equation of a circle with the center and radius given below.

$$\text{Center: } (2,\ -6),\quad r=3$$

4. Describe what value of r represents in the standard equation of a circle, then find the radius of the circle given below.

$$(x+2)^2+(y-7)^2=36$$

5. A circle has its center at the origin and passes through the point given below. Write the standard equation of the circle.

$$\text{Point on circle: } (0,5)$$

Scan to watch

6. Find the equation of the circle whose center and a point on the circle are given below.

Center: $(-3, 4)$, Point: $(1, 4)$

7. A circle has center at the point below and passes through the point shown. Find the standard equation of the circle.

Center: $(-5, 0)$, Point: $(-6, 4)$

8. Convert the general equation of the circle below to standard form, then state the center and radius.

$x^2 + y^2 - 6x + 4y - 3 = 0$

9. Convert the general equation of the circle below to standard form, then state the center and radius.

$x^2 + y^2 - 4x + 8y - 5 = 0$

10. Convert the general equation below to standard form, identify the center and radius, then list the four key points used to graph the circle.

$x^2 + y^2 + 10x - 2y + 1 = 0$

Scan to watch

Circles as Conic Sections — Answer Key

Algebra & Geometry Worksheet · Grade 9–11

Answer Key

1. Answer: Center: (3, 5), Radius: 7
- Compare with (x - h)^2 + (y - k)^2 = r^2
- h = 3, k = 5, so center = (3, 5)
- r^2 = 49, so r = 7

2. Answer: Center: (-4, 1), Radius: 5
- Rewrite as (x - (-4))^2 + (y - 1)^2 = 25
- h = -4, k = 1, so center = (-4, 1)
- r^2 = 25, so r = 5

3. Answer: (x - 2)^2 + (y + 6)^2 = 9
- Use the standard form (x - h)^2 + (y - k)^2 = r^2
- Substitute h = 2, k = -6, r = 3
- (x - 2)^2 + (y + 6)^2 = 9

4. Answer: r is the distance from the center to any point on the circle; r = 6
- r represents the fixed distance from the center (h, k) to any point on the circle
- r^2 = 36
- r = 6

5. Answer: x^2 + y^2 = 25
- Center is (0, 0), so h = 0, k = 0
- Substitute the point (0, 5) into (x - 0)^2 + (y - 0)^2 = r^2
- 0 + 25 = r^2, so r^2 = 25
- Equation: x^2 + y^2 = 25

6. Answer: (x + 3)^2 + (y - 4)^2 = 16
- Find r using the distance formula: r = sqrt((1-(-3))^2 + (4-4)^2)
- r = sqrt(16 + 0) = 4, so r^2 = 16
- Substitute h = -3, k = 4: (x + 3)^2 + (y - 4)^2 = 16

7. Answer: (x + 5)^2 + y^2 = 17
- Use (x - h)^2 + (y - k)^2 = r^2 with h = -5, k = 0
- Substitute the point (-6, 4): (-6 + 5)^2 + (4 - 0)^2 = r^2
- (-1)^2 + 4^2 = 1 + 16 = 17 = r^2
- Equation: (x + 5)^2 + y^2 = 17

8. Answer: (x - 3)^2 + (y + 2)^2 = 16; Center: (3, -2), Radius: 4
- Group and move constant: (x^2 - 6x) + (y^2 + 4y) = 3

Scan to watch

- Complete the square for x: take half of -6 = -3, square it = 9; add 9 to both sides
- Complete the square for y: take half of 4 = 2, square it = 4; add 4 to both sides
- (x - 3)^2 + (y + 2)^2 = 3 + 9 + 4 = 16
- Center: (3, -2), r = 4

9. Answer: (x - 2)^2 + (y + 4)^2 = 25; Center: (2, -4), Radius: 5

- Group and move constant: (x^2 - 4x) + (y^2 + 8y) = 5
- Complete the square for x: (half of -4)^2 = 4; add 4 to both sides
- Complete the square for y: (half of 8)^2 = 16; add 16 to both sides
- (x - 2)^2 + (y + 4)^2 = 5 + 4 + 16 = 25
- Center: (2, -4), r = 5

10. Answer: (x + 5)^2 + (y - 1)^2 = 25; Center: (-5, 1), Radius: 5; Key points: (-10, 1), (0, 1), (-5, 6), (-5, -4)

- Group and move constant: (x^2 + 10x) + (y^2 - 2y) = -1
- Complete the square for x: (half of 10)^2 = 25; add 25 to both sides
- Complete the square for y: (half of -2)^2 = 1; add 1 to both sides
- (x + 5)^2 + (y - 1)^2 = -1 + 25 + 1 = 25
- Center: (-5, 1), r = 5
- Key points: left (-10,1), right (0,1), up (-5,6), down (-5,-4)

Scan to watch