LESSON MAKER PRO

Circle Coordinates

Find a circle's center, radius, and equation.

HIGH SCHOOL · G.C.1.2

G.C.1.2 "Use the distance and midpoint formula, where appropriate, to recognize and write the radius r, center (h, k), and standard form of the equation of a circle $(x - h)^2 + (y - k)^2 = r^2$ with and without graphs."

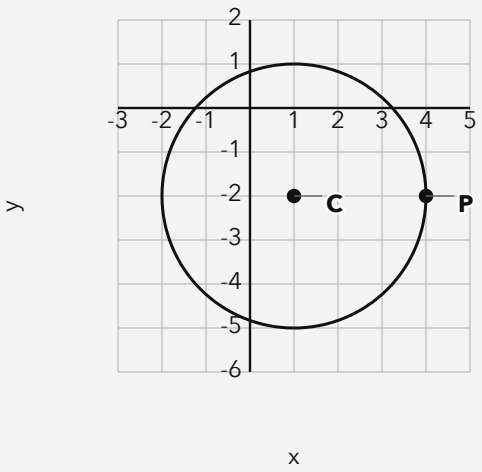
NAME _____ DATE _____

THE CIRCLE RULE

A circle with center (h, k) and radius r has equation $(x - h)^2 + (y - k)^2 = r^2$. Use the distance from the center to a point on the circle to find r. If you know the endpoints of a diameter, find their midpoint first to locate the center.

WORKED EXAMPLE

Write the equation of the circle shown. C is the center, and P is on the circle.

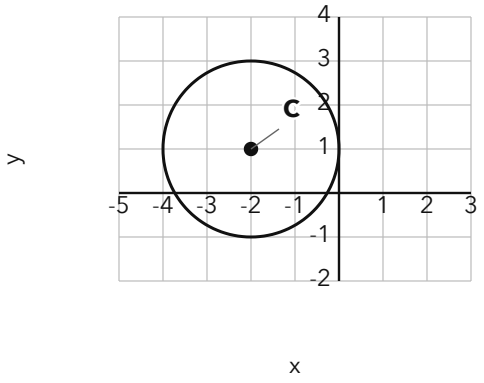


1. Read the center from C: (1, -2).
2. C and P have the same y-coordinate, so r = 4 - 1 = 3.
3. Substitute h = 1, k = -2, and $r^2 = 9$ into the circle rule.

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

PRACTICE 6 problems

1 Write the equation of the circle shown. C is the center.



ANSWER _____

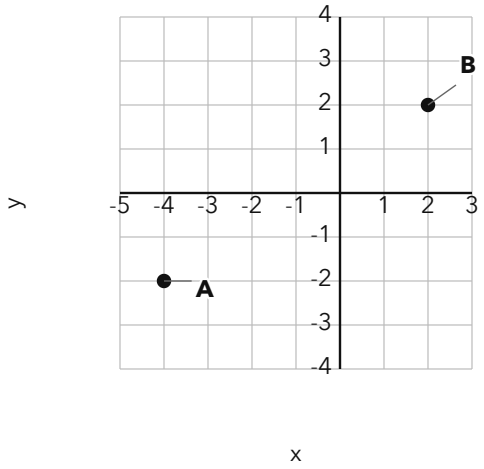
2 Give the center and radius of $(x - 3)^2 + (y + 2)^2 = 49$.

ANSWER _____

3 A circle has center (4, -1) and passes through (4, 3). Write its equation.

ANSWER _____

4 A and B on the grid are endpoints of a diameter. Write the circle's equation.



ANSWER _____

5 A circle has center (-3, -4) and passes through (0, 0). Write its equation.

ANSWER _____

6 Give the center and exact radius of $(x + 1)^2 + (y - 3)^2 = 10$.

ANSWER _____

APPLY IT Show your work

1 A livestream app shows a circular viewing zone on a coordinate map measured in kilometers. Its center is (-4, 3), and a viewer at (-4, -3) is on the boundary. Write the equation of the zone's boundary.

WORK SPACE

ANSWER _____

2 In a video game, two beacons at (-6, 1) and (2, 7) mark opposite ends of a circular capture zone. Coordinates are measured in game units. Write the equation of the zone's boundary.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Rewrite $x^2 + y^2 - 4x + 6y - 12 = 0$ in standard form. Give its center and radius. Show how you complete the squares.

WORK SPACE AND ANSWER

ANSWER KEY

Circle Coordinates

HIGH SCHOOL · G.C.1.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write the equation of the circle shown. C is the center.	**$(x + 2)^2 + (y - 1)^2 = 4$**
2	Give the center and radius of $(x - 3)^2 + (y + 2)^2 = 49$.	**Center: (3, -2); radius: 7**
3	A circle has center (4, -1) and passes through (4, 3). Write its equation.	**$(x - 4)^2 + (y + 1)^2 = 16$**
4	A and B on the grid are endpoints of a diameter. Write the circle's equation.	**$(x + 1)^2 + y^2 = 13$**
5	A circle has center (-3, -4) and passes through (0, 0). Write its equation.	**$(x + 3)^2 + (y + 4)^2 = 25$**
6	Give the center and exact radius of $(x + 1)^2 + (y - 3)^2 = 10$.	**Center: (-1, 3); radius: $\sqrt{10}$**

PART 2 · APPLY IT

1. **$(x + 4)^2 + (y - 3)^2 = 36$** The center and boundary point have the same x-coordinate, so the radius is 6. Substitute the center and $r^2 = 36$ into standard form.
2. **$(x + 2)^2 + (y - 4)^2 = 25$** The midpoint of the beacons is (-2, 4). Its distance to either beacon is $\sqrt{(4^2 + 3^2)} = 5$, so $r^2 = 25$.

CHALLENGE

$x^2 - 4x + y^2 + 6y = 12$; add 4 and 9 to both sides to get $(x - 2)^2 + (y + 3)^2 = 25$. Center: (2, -3); radius: 5.

Accept reordered squared terms and equivalent expressions such as $(x - 0)^2$ in place of x^2. For problem 4, the radius is $\sqrt{13}$, but the equation uses $r^2 = 13$.