LESSON MAKER PRO

Circle Coordinates

Use right triangles to write circle equations.

HIGH SCHOOL · MT.CORE.GEOM.MEAS.2

MT.CORE.GEOM.MEAS.2 "Derive the equation of a circle of a given center and radius using the Pythagorean Theorem."

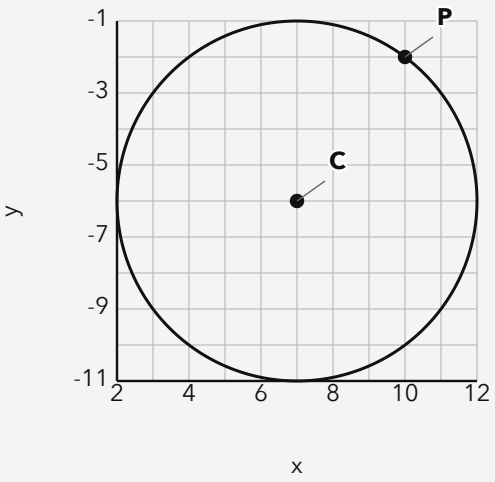
NAME _____ DATE _____

FROM RADIUS TO EQUATION

For a circle centered at (h,k), the horizontal and vertical changes from its center to any point (x,y) on the circle form a right triangle. The radius r is the hypotenuse, so the Pythagorean Theorem gives $(x-h)^2 + (y-k)^2 = r^2$.

WORKED EXAMPLE

Use the plotted center C and point P on the circle to derive its equation.

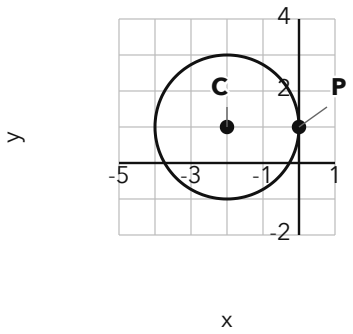


1. C = (7,-6) and P = (10,-2).
2. Horizontal change = 10-7 = 3; vertical change = -2-(-6) = 4.
3. By the Pythagorean Theorem, $r^2 = 3^2 + 4^2 = 25$.
4. Use the center and r^2: $(x-7)^2 + (y+6)^2 = 25$.

Answer: $(x-7)^2 + (y+6)^2 = 25$

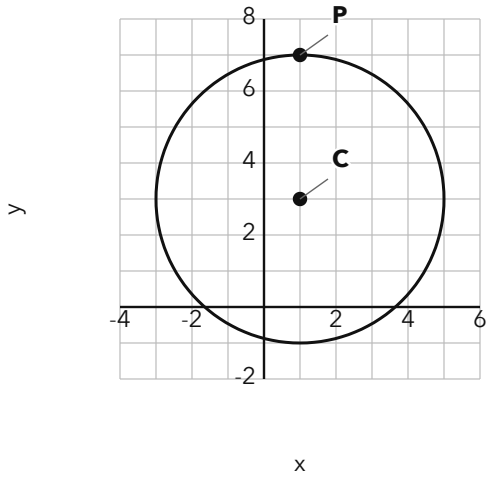
PRACTICE 6 problems

1 Use the plotted center C and point P on the circle to write its equation.



ANSWER _____

2 Use the plotted center C and point P on the circle to write its equation.



ANSWER _____

3 Write the equation of a circle centered at (0,0) with radius 6.

ANSWER _____

4 Write the equation of a circle centered at (-3,-4) with radius 1.

ANSWER _____

5 Write the equation of a circle centered at (4,-2) with radius 3.

ANSWER _____

6 A circle is centered at (-1,-2) and passes through (1,1). Write its equation and show how you found r^2.

ANSWER _____

APPLY IT Show your work

1 A Wi-Fi router is at (3,-1) on a map measured in meters. Its signal reaches 8 meters in every direction. Write the equation of the circle marking the edge of its coverage.

WORK SPACE

ANSWER _____

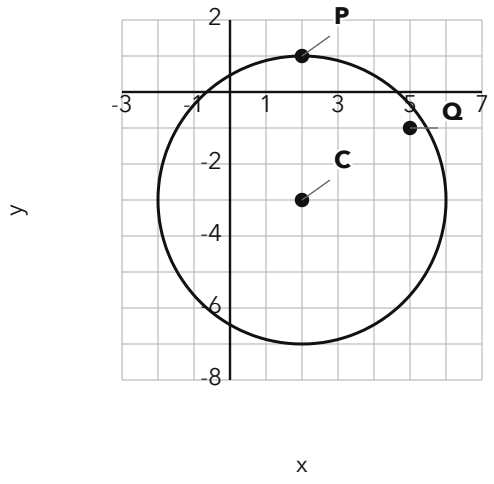
2 In an augmented reality game, a circular safe zone is centered at (-3,2) on a meter grid. Its boundary passes through (-2,4). Write the equation of the boundary.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Use the grid to write the circle's equation. Does Q lie on the circle? Explain with a sum of squares.



WORK SPACE AND ANSWER

Circle Coordinates

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the plotted center C and point P on the circle to write its equation.	**$(x+2)^2 + (y-1)^2 = 4$**
2	Use the plotted center C and point P on the circle to write its equation.	**$(x-1)^2 + (y-3)^2 = 16$**
3	Write the equation of a circle centered at (0,0) with radius 6.	**$x^2 + y^2 = 36$**
4	Write the equation of a circle centered at (-3,-4) with radius 1.	**$(x+3)^2 + (y+4)^2 = 1$**
5	Write the equation of a circle centered at (4,-2) with radius 3.	**$(x-4)^2 + (y+2)^2 = 9$**
6	A circle is centered at (-1,-2) and passes through (1,1). Write its equation and show how you found r^2.	**$r^2 = 2^2 + 3^2 = 13$; $(x+1)^2 + (y+2)^2 = 13$**

PART 2 · APPLY IT

1. **$(x-3)^2 + (y+1)^2 = 64$** The router is the center, and the signal range is the radius. Square 8 to get 64.
2. **$(x+3)^2 + (y-2)^2 = 5$** The horizontal change is 1 and the vertical change is 2, so $r^2 = 1^2 + 2^2 = 5$.

CHALLENGE

$(x-2)^2 + (y+3)^2 = 16$. Q does not lie on the circle because $(5-2)^2 + (-1+3)^2 = 9 + 4 = 13$, not 16.

Accept algebraically equivalent expanded equations. In the challenge, Q is inside the circle because its sum of squares is less than 16.