LESSON MAKER PRO

Circle Coordinates

Turn diameter endpoints into a circle equation.

HIGH SCHOOL · GDA.AF.C.6.a

GDA.AF.C.6.a "Given the endpoints of the diameter of a circle, use the midpoint formula to find its center and then use the Pythagorean Theorem to find its equation."

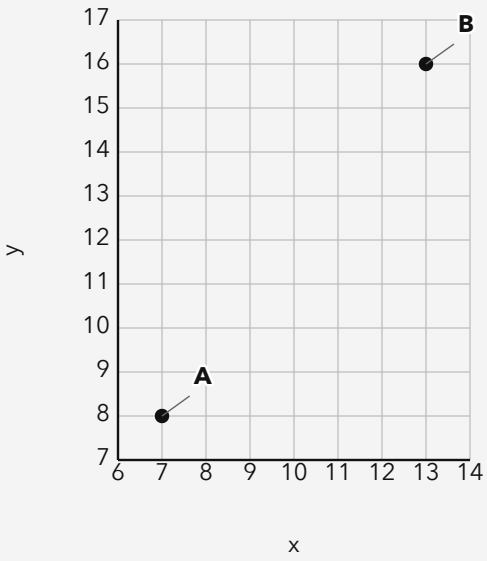
NAME _____ DATE _____

FROM DIAMETER TO EQUATION

The center is the midpoint of a diameter. Average the endpoints' x-coordinates and y-coordinates to find the center (h, k). Then use the horizontal and vertical distances from the center to one endpoint in the Pythagorean Theorem to find r^2, and write $(x - h)^2 + (y - k)^2 = r^2$.

WORKED EXAMPLE

Use the plotted endpoints of the diameter to write the circle's equation.

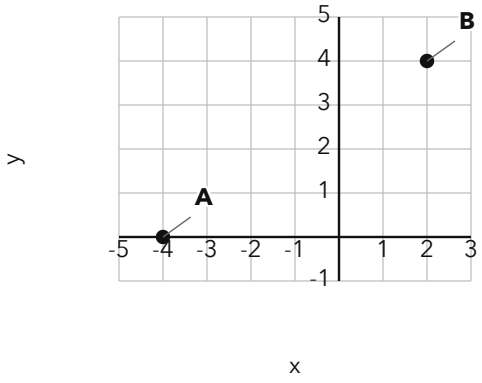


1. Find the center: ((7 + 13)/2, (8 + 16)/2) = (10, 12).
2. Find r^2: $(13 - 10)^2 + (16 - 12)^2 = 9 + 16 = 25$.
3. Substitute h = 10, k = 12, and $r^2 = 25$.

Answer: $(x - 10)^2 + (y - 12)^2 = 25$

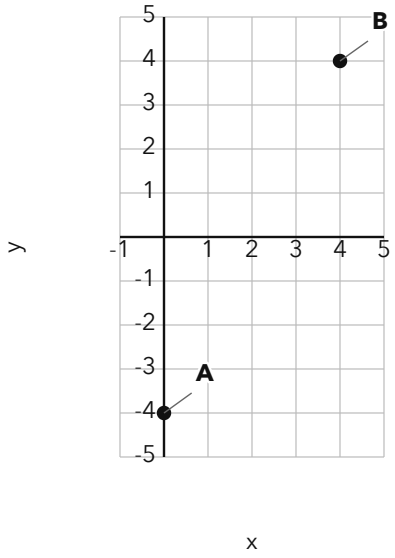
PRACTICE 6 problems

1 The plotted points are endpoints of a diameter. Write the circle's equation.



ANSWER _____

2 The plotted points are endpoints of a diameter. Write the circle's equation.



ANSWER _____

3 A diameter has endpoints (-6, 2) and (2, 2). Write the circle's equation.

ANSWER _____

4 A diameter has endpoints (1, -6) and (5, 0). Write the circle's equation.

ANSWER _____

5 A diameter has endpoints (-5, -1) and (1, 5). Write the circle's equation.

ANSWER _____

6 A diameter has endpoints (-4, 6) and (4, -4). Write the circle's equation.

ANSWER _____

APPLY IT Show your work

1 A game map shows a circular safe zone. Two opposite points on its boundary are (-8, 0) and (0, 4), in map units. Write the equation of the safe zone's boundary.

WORK SPACE

ANSWER _____

2 At a school festival, two opposite points on the edge of a circular concert area are (-3, -4) and (1, 6), measured in meters from a marked origin. Write the equation of the area's boundary.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A diameter has endpoints (-6, -2) and (4, 4). Write the circle's equation. Then decide whether (2, 6) is on the circle, and explain using substitution.

WORK SPACE AND ANSWER

ANSWER KEY

Circle Coordinates

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The plotted points are endpoints of a diameter. Write the circle's equation.	$(x + 1)^2 + (y - 2)^2 = 13$
2	The plotted points are endpoints of a diameter. Write the circle's equation.	$(x - 2)^2 + y^2 = 20$
3	A diameter has endpoints (-6, 2) and (2, 2). Write the circle's equation.	$(x + 2)^2 + (y - 2)^2 = 16$
4	A diameter has endpoints (1, -6) and (5, 0). Write the circle's equation.	$(x - 3)^2 + (y + 3)^2 = 13$
5	A diameter has endpoints (-5, -1) and (1, 5). Write the circle's equation.	$(x + 2)^2 + (y - 2)^2 = 18$
6	A diameter has endpoints (-4, 6) and (4, -4). Write the circle's equation.	$x^2 + (y - 1)^2 = 41$

PART 2 · APPLY IT

1. **$(x + 4)^2 + (y - 2)^2 = 20$** The midpoint is (-4, 2). The squared distance from the center to either endpoint is $4^2 + 2^2 = 20$.
2. **$(x + 1)^2 + (y - 1)^2 = 29$** The midpoint is (-1, 1). The squared distance from the center to either endpoint is $2^2 + 5^2 = 29$.

CHALLENGE

The center is (-1, 1), and $r^2 = 5^2 + 3^2 = 34$, so the equation is $(x + 1)^2 + (y - 1)^2 = 34$. The point (2, 6) is on the circle because $(2 + 1)^2 + (6 - 1)^2 = 9 + 25 = 34$.

Accept equivalent circle equations with unsimplified but correct squared terms. For the challenge, the substitution must show that (2, 6) satisfies the equation.