LESSON MAKER PRO

Circle Boundary Check

Use distance to decide where a point lies.

HIGH SCHOOL · GDA.GM.H.30

GDA.GM.H.30 "Develop and use precise definitions of figures such as angle, circle, perpendicular lines, parallel lines, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc."

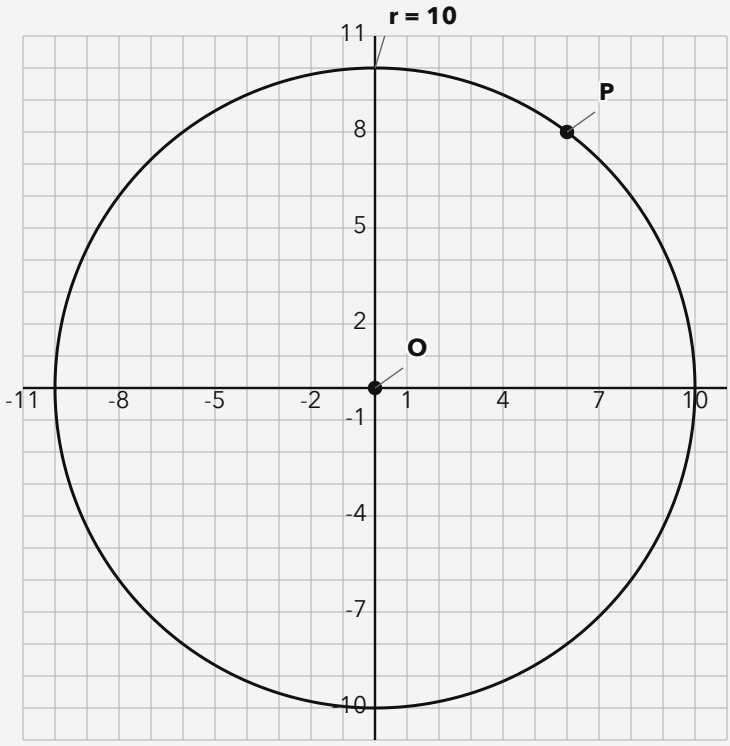
NAME _____ DATE _____

DISTANCE DEFINES A CIRCLE

A circle is the set of all points a fixed distance, called the radius, from its center. On a coordinate grid, square the horizontal and vertical distances from the center, then add them. If the sum equals the radius squared, the point is on the circle. A smaller sum means inside, and a larger sum means outside.

WORKED EXAMPLE

Is point P on the circle shown?

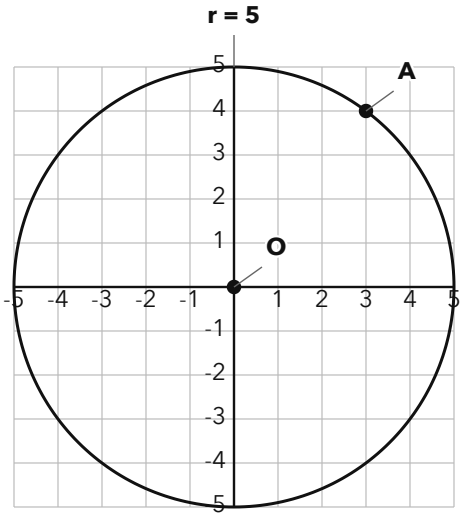


1. From O to P, the horizontal distance is 6 and the vertical distance is 8.
2. Add their squares: $6^2 + 8^2 = 36 + 64 = 100$.
3. The radius squared is $10^2 = 100$, so the distances match.

Answer: Yes, P is on the circle.

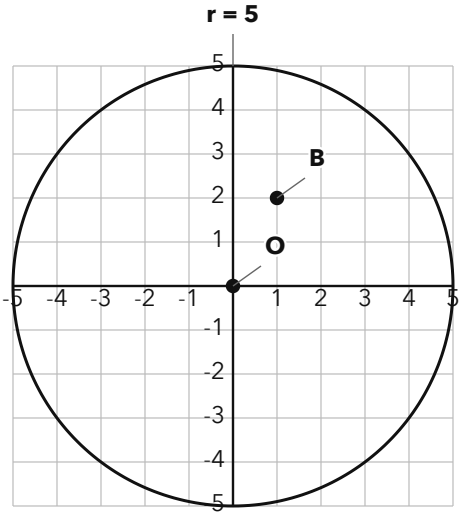
PRACTICE 6 problems

1 Is point A on the circle? Show the sum of the squared distances.



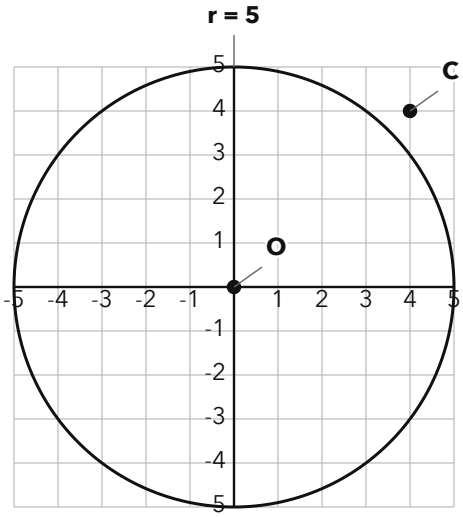
ANSWER _____

2 Is point B inside, on, or outside the circle?



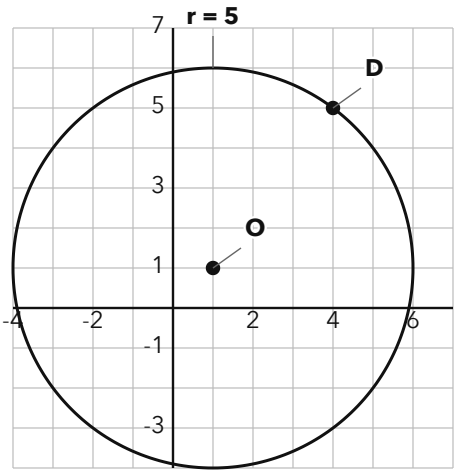
ANSWER _____

3 Is point C inside, on, or outside the circle?



ANSWER _____

4 Is point D on the circle? Show the sum of the squared distances from O.



ANSWER _____

5 A circle has center (-2, 1) and radius 7. Is point (-2, -4) inside, on, or outside it?

ANSWER _____

6 A circle has center (0, 0) and radius 13. Point (x, 12) is on the circle, and x is positive. Find x.

ANSWER _____

APPLY IT Show your work

1 At an outdoor concert, a speaker covers a circular area with a radius of 13 meters. A fan is 5 meters east and 12 meters north of the speaker. Is the fan on the edge of the coverage area?

WORK SPACE

ANSWER _____

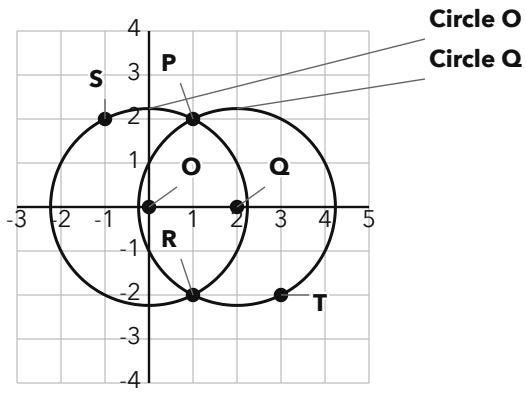
2 In a video game, a circular safe zone has a radius of 7 map units. A player is 5 units right and 5 units up from its center. Is the player inside, on, or outside the safe zone?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Both circles have radius sqrt(5). Which two plotted points lie on both circles? Explain using squared distances to both centers.



WORK SPACE AND ANSWER

ANSWER KEY

Circle Boundary Check

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Is point A on the circle? Show the sum of the squared distances.	**Yes. $3^2 + 4^2 = 25 = 5^2$.**
2	Is point B inside, on, or outside the circle?	**Inside**
3	Is point C inside, on, or outside the circle?	**Outside**
4	Is point D on the circle? Show the sum of the squared distances from O.	**Yes. $3^2 + 4^2 = 25 = 5^2$.**
5	A circle has center (-2, 1) and radius 7. Is point (-2, -4) inside, on, or outside it?	**Inside**
6	A circle has center (0, 0) and radius 13. Point (x, 12) is on the circle, and x is positive. Find x.	**x = 5**

PART 2 · APPLY IT

1. **Yes, the fan is on the edge.** The fan's squared distance from the speaker is $5^2 + 12^2 = 169$, which equals 13^2.
2. **Outside the safe zone.** The player's squared distance from the center is $5^2 + 5^2 = 50$, which is greater than $7^2 = 49$.

CHALLENGE

P and R. Each is 1 unit horizontally and 2 units vertically from O, so each has squared distance $1^2 + 2^2 = 5$. Each is also 1 unit horizontally and 2 units vertically from Q, giving the same squared distance of 5. Both distances equal the radius squared.

Accept equivalent calculations that compare squared distance with radius squared. In the challenge, the points are P and R; S and T lie on only one circle each.