LESSON MAKER PRO

Locate the Point

Move between polar and Cartesian coordinates.

HIGH SCHOOL · G.GPE.C.8

G.GPE.C.8 "Understand the relationship between polar coordinates and Cartesian coordinates."

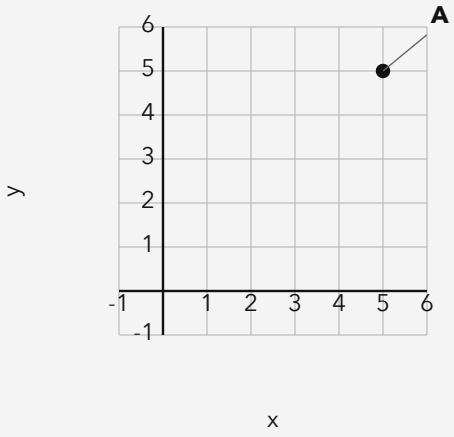
NAME _____ DATE _____

TWO WAYS TO LOCATE

In polar coordinates (r, θ), r is the distance from the origin, and θ is measured counterclockwise from the positive x-axis. To find Cartesian coordinates, use x = r cos θ and y = r sin θ. To convert back, find r = sqrt(x^2 + y^2), then use the point's quadrant to choose θ.

WORKED EXAMPLE

Point A has polar coordinates (5sqrt(2), 45°). Find its Cartesian coordinates.



1. x = r cos θ = 5sqrt(2) · sqrt(2)/2 = 5.
2. y = r sin θ = 5sqrt(2) · sqrt(2)/2 = 5.

Answer: (5, 5)

PRACTICE 4 problems

1 Find the Cartesian coordinates of (6, 60°).

ANSWER _____

2 Find the Cartesian coordinates of (6, 120°).

ANSWER _____

3 Find the polar coordinates of (0, -7). Use 0° ≤ θ < 360°.

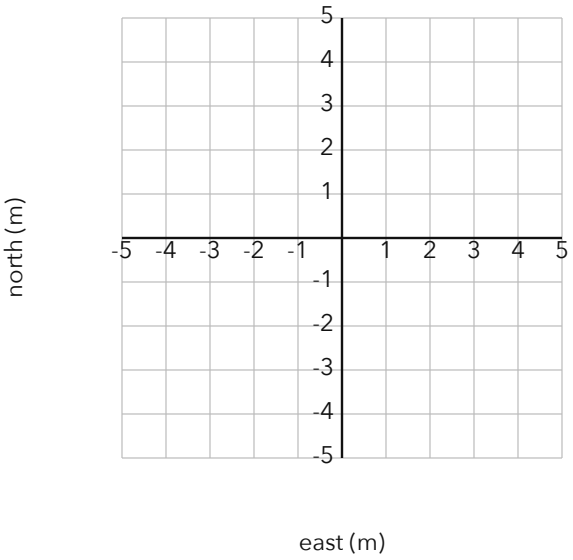
ANSWER _____

4 Find the polar coordinates of (-4, 0). Use 0° ≤ θ < 360°.

ANSWER _____

APPLY IT Show your work

1 At a drone show, a drone is 4 m from its launch pad at 150° counterclockwise from east. Give its position as (east, north) coordinates.



ANSWER _____

2 In a game, your character is 9 m west and 9 m south of the spawn point. Give its polar coordinates, measuring the angle counterclockwise from east.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Point P is at (-3sqrt(3), -3). Find its polar coordinates with $0° \le \theta < 360°$. Explain how you chose the angle.

WORK SPACE AND ANSWER

ANSWER KEY

Locate the Point

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the Cartesian coordinates of (6, 60°).	**(3, 3sqrt(3))**
2	Find the Cartesian coordinates of (6, 120°).	**(-3, 3sqrt(3))**
3	Find the polar coordinates of (0, -7). Use $0° \le \theta < 360°$.	**(7, 270°)**
4	Find the polar coordinates of (-4, 0). Use $0° \le \theta < 360°$.	**(4, 180°)**

PART 2 · APPLY IT

1. **(-2sqrt(3), 2) m** Use $x = 4 \cos 150° = -2\sqrt{3}$ and $y = 4 \sin 150° = 2$.
2. **(9sqrt(2) m, 225°)** The distance is $\sqrt{9^2 + 9^2} = 9\sqrt{2}$ m. The character is southwest, so the angle is 225°.

CHALLENGE

(6, 210°). The distance is sqrt(27 + 9) = 6. The reference angle is 30°, and P is in Quadrant III, so θ = 180° + 30° = 210°.

Accept equivalent exact notation for square roots. For polar answers, check that the radius is positive and the angle is in the requested range.