LESSON MAKER PRO

Circle Coordinates

Use reference angles to locate points on a circle.

HIGH SCHOOL · PC.T.1

PC.T.1 "Make sense of the unit circle and its relationship to the graphs of trigonometric functions. Draw and recognize angles in standard position using radian measure, and determine the quadrant of the terminal side..."

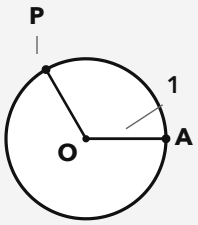
NAME _____ **DATE** _____

REFERENCE ANGLES

On the unit circle, a point at angle θ has coordinates (cos θ, sin θ). Find the positive coordinate values using the reference angle, then use the point's quadrant to choose the signs. Angles that differ by 2π end at the same point.

WORKED EXAMPLE

Find the exact coordinates of P for $\theta = 2\pi/3$.



1. The reference angle is π - 2π/3 = π/3.
2. For π/3, the coordinate values are 1/2 and √3/2.
3. P is in Quadrant II, so x is negative and y is positive.

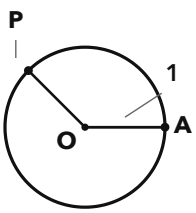
Answer: P = (-1/2, √3/2)

PRACTICE 6 problems

1 Find the exact coordinates of the unit-circle point at θ = π/6.

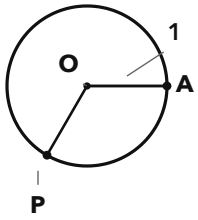
ANSWER _____

2 Find the exact coordinates of P for θ = 3π/4.



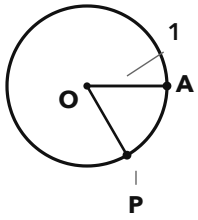
ANSWER _____

3 Find the exact coordinates of P for θ = 4π/3.



ANSWER _____

4 Find the exact coordinates of P for θ = 5π/3.



ANSWER _____

5 Find the exact coordinates of the unit-circle point at θ = 7π/6.

ANSWER _____

6 Find the exact coordinates of the unit-circle point at θ = 5π/4.

ANSWER _____

APPLY IT Show your work

1 In a video game, a character moves on a circular path of radius 1 game unit centered at (0, 0). The character starts at (1, 0) and travels counterclockwise through 5π/6 radians. What are the character's coordinates?

WORK SPACE

ANSWER _____

2 A Ferris wheel has a radius of 8 m and is centered at (0, 0). A seat starts at the rightmost point and travels counterclockwise through 7π/4 radians. What are the seat's coordinates relative to the center?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Starting at (1, 0) on the unit circle, rotate clockwise through 11π/6 radians to reach P. Find P and explain why its y-coordinate is positive even though the rotation is clockwise.

WORK SPACE AND ANSWER

Circle Coordinates

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the exact coordinates of the unit-circle point at θ = π/6.	**(√3/2, 1/2)**
2	Find the exact coordinates of P for θ = 3π/4.	**(-√2/2, √2/2)**
3	Find the exact coordinates of P for θ = 4π/3.	**(-1/2, -√3/2)**
4	Find the exact coordinates of P for θ = 5π/3.	**(1/2, -√3/2)**
5	Find the exact coordinates of the unit-circle point at θ = 7π/6.	**(-√3/2, -1/2)**
6	Find the exact coordinates of the unit-circle point at θ = 5π/4.	**(-√2/2, -√2/2)**

PART 2 · APPLY IT

1. **(-√3/2, 1/2) game units** The reference angle is π/6. The character is in Quadrant II, so only the x-coordinate is negative.
2. **(4√2, -4√2) m** At 7π/4, the unit-circle coordinates are (√2/2, -√2/2). Multiply each coordinate by the radius, 8 m.

CHALLENGE

P = (√3/2, 1/2). A clockwise rotation of 11π/6 ends at the same point as a counterclockwise rotation of π/6, which is in Quadrant I.

Accept equivalent exact forms, such as 1/√2 in place of √2/2. Coordinates in the Ferris wheel problem must be scaled by 8 and labeled in meters.