LESSON MAKER PRO

Circle Coordinates

Find sine and cosine from points and turns on the unit circle.

HIGH SCHOOL · MT.PLUS.ALG.TRIG.1.a

MT.PLUS.ALG.TRIG.1.a "Understand how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers by: Defining the sine and cosine functions in terms of the unit circle, and"

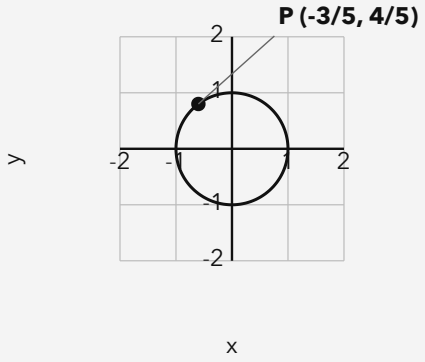
NAME _____ DATE _____

THE UNIT CIRCLE RULE

The unit circle is centered at (0, 0), and every point on it satisfies $x^2 + y^2 = 1$. The point where an angle t ends has coordinates (cos t, sin t). Angles start on the positive x-axis, with positive turns counterclockwise and negative turns clockwise.

WORKED EXAMPLE

The marked point is where angle t ends on the unit circle. Find sin t and cos t.

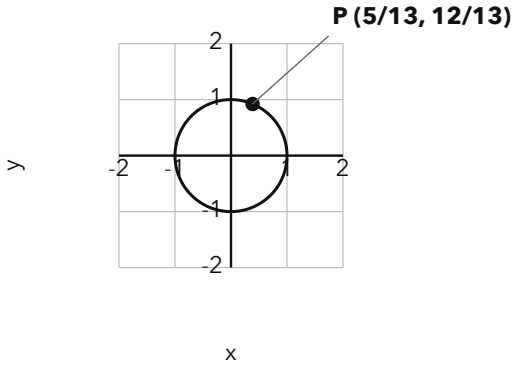


1. Read the marked point: P = (-3/5, 4/5).
2. Sine is the y-coordinate, so sin t = 4/5.
3. Cosine is the x-coordinate, so cos t = -3/5.

Answer: sin t = 4/5; cos t = -3/5

PRACTICE 6 problems

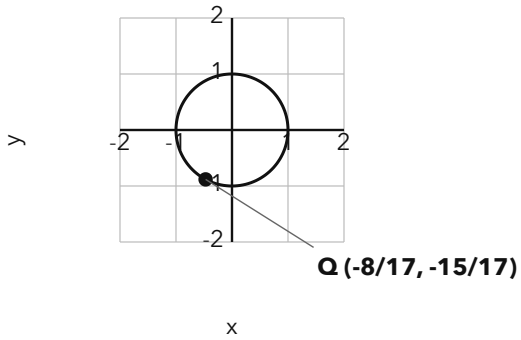
1 The marked point is where angle t ends on the unit circle. Find sin t and cos t.



ANSWER _____

_____

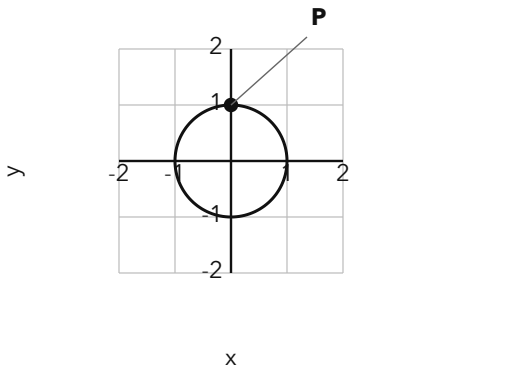
2 The marked point is where angle t ends on the unit circle. Find sin t and cos t.



ANSWER _____

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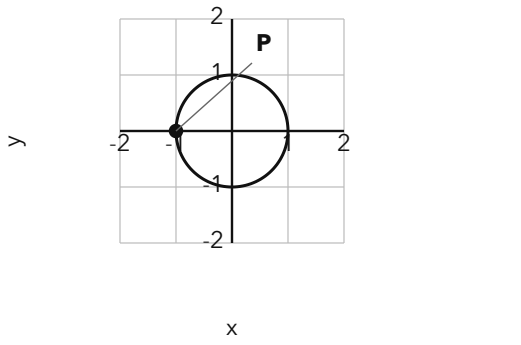
3 The dot marks where t = 5pi/2 ends. Find sin t and cos t.



ANSWER _____

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4 The dot marks where t = -pi ends. Find sin t and cos t.



ANSWER _____

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5 An angle t ends in quadrant IV, and sin t = -7/25. Find cos t.

ANSWER _____

6 An angle t ends in quadrant II, and cos t = -20/29. Find sin t.

ANSWER _____

APPLY IT Show your work

1 An LED is 6 cm from the center of a DJ turntable. It starts directly to the right of the center and rotates counterclockwise through 7pi/2 radians. What is its position relative to the center, as an ordered pair in centimeters?

WORK SPACE

ANSWER _____

2 A camera on a rotating arm is 8 cm from its pivot. It starts directly to the right of the pivot and rotates clockwise through 3pi radians. What is the camera's position relative to the pivot, as an ordered pair in centimeters?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Explain in two sentences why sin(t + 2pi) = sin t and cos(t + 2pi) = cos t for every real number t. Use the unit circle in your explanation.

WORK SPACE AND ANSWER

ANSWER KEY # Circle Coordinates

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The marked point is where angle t ends on the unit circle. Find sin t and cos t.	**sin t = 12/13; cos t = 5/13**
2	The marked point is where angle t ends on the unit circle. Find sin t and cos t.	**sin t = -15/17; cos t = -8/17**
3	The dot marks where t = 5pi/2 ends. Find sin t and cos t.	**sin t = 1; cos t = 0**
4	The dot marks where t = -pi ends. Find sin t and cos t.	**sin t = 0; cos t = -1**
5	An angle t ends in quadrant IV, and sin t = -7/25. Find cos t.	**24/25**
6	An angle t ends in quadrant II, and cos t = -20/29. Find sin t.	**21/29**

PART 2 · APPLY IT

1. **(0, -6) cm** The angle 7pi/2 ends at the bottom of the unit circle, where (cos t, sin t) = (0, -1). Multiply each coordinate by the 6 cm radius.
2. **(-8, 0) cm** A clockwise turn of 3pi radians ends on the left, where (cos t, sin t) = (-1, 0). Multiply each coordinate by the 8 cm radius.

CHALLENGE

Adding 2pi makes one full turn around the unit circle, so t and t + 2pi have the same terminal point. Sine and cosine are that point's y- and x-coordinates, so both values stay the same.

For problems 5 and 6, students can use $x^2 + y^2 = 1$ and the quadrant to choose the correct sign. Accept ordered pairs with units written after the pair or on each coordinate.