LESSON MAKER PRO

Unit Circle Moves

Use coordinates to find exact trigonometric values.

HIGH SCHOOL · MA.912.T.2

MA.912.T.2 "Extend trigonometric functions to the unit circle."

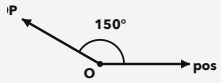
NAME _____ DATE _____

COORDINATES ON THE CIRCLE

For an angle θ in standard position, its terminal point on the unit circle is (cos θ, sin θ). The x-coordinate is cos θ, the y-coordinate is sin θ, and tan θ = sin θ / cos θ when cos θ is not 0.

WORKED EXAMPLE

The terminal side OP shown is on a unit circle. Find sin θ, cos θ, and tan θ.

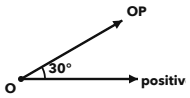


1. The reference angle is 30°.
2. At 150°, the unit-circle point is (-sqrt(3)/2, 1/2).
3. sin θ = 1/2 and cos θ = -sqrt(3)/2.
4. tan θ = (1/2) / (-sqrt(3)/2) = -sqrt(3)/3.

Answer: sin θ = 1/2, cos θ = -sqrt(3)/2, tan θ = -sqrt(3)/3

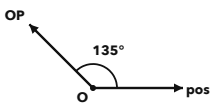
PRACTICE 6 problems

1 In the unit-circle angle shown, find cos θ and sin θ, in that order.



ANSWER _____

2 For the terminal point P of the unit-circle angle shown, write P = (x, y).



ANSWER _____

3 Find tan(210°).

ANSWER _____

4 Find cos(300°).

ANSWER _____

5 A point on the unit circle is (-1/2, -sqrt(3)/2). Name the angle θ, where 0° ≤ θ < 360°.

ANSWER _____

6 Find sin(3pi/2).

ANSWER _____

APPLY IT Show your work

1 A game developer uses a unit direction vector to show where a character moves. The character moves at an angle of 315° from the positive x-axis. What are the horizontal and vertical components of the direction vector?

WORK SPACE

ANSWER _____

2 A coding club animates a dot on the unit circle with x = cos θ and y = sin θ. At one frame, θ = 5pi/6. What coordinates should the program use?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Suppose sin θ = 3/5 and θ is in Quadrant II. Without finding θ, determine cos(θ + pi) and sin(θ + pi). Explain using the unit circle.

WORK SPACE AND ANSWER

ANSWER KEY

Unit Circle Moves

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In the unit-circle angle shown, find cos θ and sin θ, in that order.	**cos θ = sqrt(3)/2, sin θ = 1/2**
2	For the terminal point P of the unit-circle angle shown, write P = (x, y).	**P = (-sqrt(2)/2, sqrt(2)/2)**
3	Find tan(210°).	**sqrt(3)/3**
4	Find cos(300°).	**1/2**
5	A point on the unit circle is (-1/2, -sqrt(3)/2). Name the angle θ, where 0° ≤ θ < 360°.	**θ = 240°**
6	Find sin(3pi/2).	**-1**

PART 2 · APPLY IT

1. **(sqrt(2)/2, -sqrt(2)/2)** On the unit circle, the direction vector is (cos 315°, sin 315°). The reference angle is 45° and the angle is in Quadrant IV.
2. **(-sqrt(3)/2, 1/2)** 5pi/6 is 150°, which has reference angle pi/6 in Quadrant II. The x-coordinate is negative and the y-coordinate is positive.

CHALLENGE

cos(θ + pi) = 4/5 and sin(θ + pi) = -3/5. Since θ is in Quadrant II, cos θ = -4/5. Adding pi moves the terminal point to the opposite point, so both coordinates change signs.

Accept equivalent exact forms, including tan(210°) = 1/sqrt(3). For coordinate answers, require the coordinates in the stated order.