LESSON MAKER PRO

Unit Circle Moves

Find all six trig values from an angle.

HIGH SCHOOL · MA.912.T.2.5

MA.912.T.2.5 "Given angles measured in radians or degrees, calculate the values of the six basic trigonometric functions using the unit circle, trigonometric identities or technology."

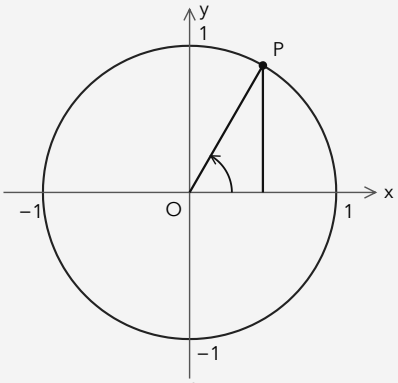
NAME _____ DATE _____

COORDINATES TELL THE VALUES

On a radius-1 circle P=(x,y), cosθ=x and sinθ=y. tanθ=y/x and secθ=1/x require x≠0. cotθ=x/y and cscθ=1/y require y≠0. A zero denominator makes that function undefined. Use reference triangles and quadrant signs or permitted technology.

WORKED EXAMPLE

Use the angle shown to find all six trigonometric functions.



60°; radius = 1

1. The terminal point is (1/2, sqrt(3)/2).
2. sin θ = sqrt(3)/2 and cos θ = 1/2.
3. tan θ = (sqrt(3)/2)/(1/2) = sqrt(3).
4. Use reciprocals for csc, sec, and cot.

Answer: sin θ = sqrt(3)/2, cos θ = 1/2, tan θ = sqrt(3), csc θ = 2sqrt(3)/3, sec θ = 2, cot θ = sqrt(3)/3

PRACTICE 4 problems

1 Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 135°.

ANSWER _____

2 Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 7π/6.

ANSWER _____

3 Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = -π/4.

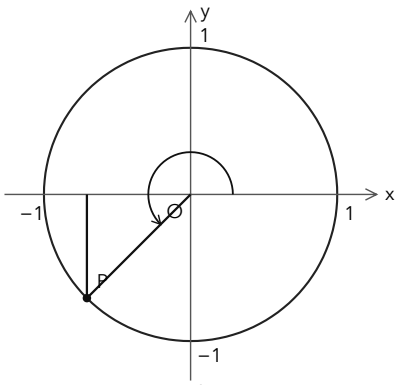
ANSWER _____

4 Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 2π/3.

ANSWER _____

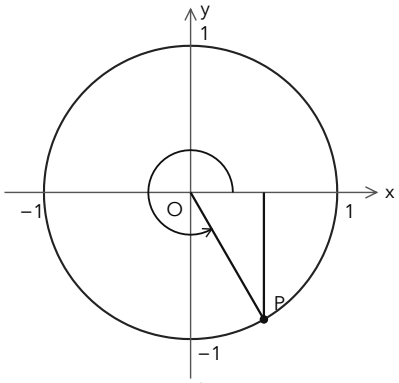
APPLY IT Show your work

1 A game designer programs a circular joystick. Its direction uses the standard-position angle shown. Find all six trigonometric functions for the direction.



225°; radius = 1

2 A video editor rotates a sticker by the standard-position angle shown. Find all six trigonometric functions for the rotation.



300°; radius = 1

CHALLENGE One step up

For θ = 17π/4, find all six trigonometric functions. Explain how you reduced the angle before using the unit circle. Also state which functions are undefined at θ=0 and at θ=π/2, using coordinate denominators.

ANSWER KEY

Unit Circle Moves

HIGH SCHOOL · MA.912.T.2.5

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 135°.	**sin θ = sqrt(2)/2, cos θ = -sqrt(2)/2, tan θ = -1, csc θ = sqrt(2), sec θ = -sqrt(2), cot θ = -1**
2	Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 7π/6.	**sin θ = -1/2, cos θ = -sqrt(3)/2, tan θ = sqrt(3)/3, csc θ = -2, sec θ = -2sqrt(3)/3, cot θ = sqrt(3)**
3	Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = -π/4.	**sin θ = -sqrt(2)/2, cos θ = sqrt(2)/2, tan θ = -1, csc θ = -sqrt(2), sec θ = sqrt(2), cot θ = -1**
4	Find sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ for θ = 2π/3.	**sin θ = sqrt(3)/2, cos θ = -1/2, tan θ = -sqrt(3), csc θ = 2sqrt(3)/3, sec θ = -2, cot θ = -sqrt(3)/3**

PART 2 · APPLY IT

1. **sin θ = -sqrt(2)/2, cos θ = -sqrt(2)/2, tan θ = 1, csc θ = -sqrt(2), sec θ = -sqrt(2), cot θ = 1** The angle is in Quadrant III with a 45° reference angle. Both sine and cosine are negative, so tangent is positive.
2. **sin θ = -sqrt(3)/2, cos θ = 1/2, tan θ = -sqrt(3), csc θ = -2sqrt(3)/3, sec θ = 2, cot θ = -sqrt(3)/3** The angle is in Quadrant IV with a 60° reference angle. Use the Quadrant IV signs, then take reciprocals.

CHALLENGE

17π/4 - 4π = π/4. sin θ = sqrt(2)/2, cos θ = sqrt(2)/2, tan θ = 1, csc θ = sqrt(2), sec θ = sqrt(2), cot θ = 1. At0: csc and cot undefined; atπ/2: tan and sec undefined. Sine and cosine are always defined.

Accept equivalent exact forms, including rationalized or nonrationalized reciprocal values. Students may list the six functions in any order if each value is correctly matched.