LESSON MAKER PRO

Circle Coordinates

Use unit-circle points to find trig values.

HIGH SCHOOL · MT.PLUS.ALG.TRIG.1

MT.PLUS.ALG.TRIG.1 "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 Defining the tangent, cotangent..."

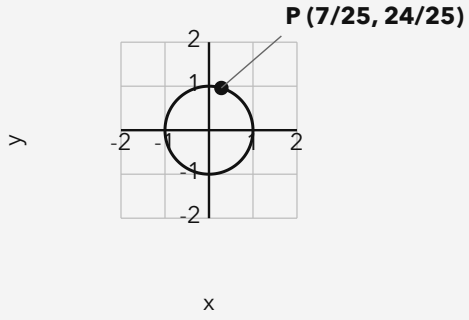
NAME _____ DATE _____

FROM POINTS TO FUNCTIONS

For any real angle t, start at (1, 0) on the unit circle. Rotate counterclockwise for positive t or clockwise for negative t. If the endpoint is (x, y), then cos t = x, sin t = y, tan t = y/x, cot t = x/y, sec t = 1/x, and csc t = 1/y. A function is undefined when its denominator is zero.

WORKED EXAMPLE

At P on the unit circle, find cos t and csc t.

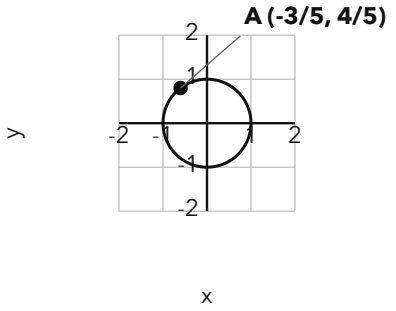


1. P has coordinates (7/25, 24/25).
2. cos t = x = 7/25.
3. csc t = 1/y = 1/(24/25) = 25/24.

Answer: cos t = 7/25; csc t = 25/24

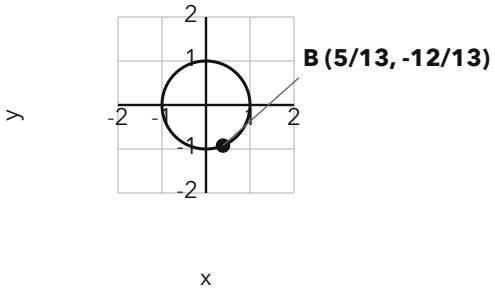
PRACTICE 6 problems

1 At A on the unit circle, find sin t and sec t.



ANSWER _____

2 At B on the unit circle, find tan t and cot t.



ANSWER _____

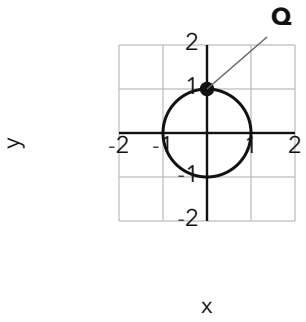
3 If sin t = -15/17 and cos t = -8/17, find sec t.

ANSWER _____

4 If sin t = 3/5 and cos t = -4/5, find cot t.

ANSWER _____

5 At Q on the unit circle, which of tan t, cot t, sec t, and csc t are undefined?



ANSWER _____

6 Starting at (1, 0), rotate through t = -5π/2. Find sin t and csc t.

ANSWER _____

APPLY IT Show your work

1 A video game stores the direction a player faces as a point (-12/13, 5/13) on a unit circle. Find tan t and sec t for the player's heading t.

WORK SPACE

ANSWER _____

2 A Ferris wheel app shows a rider's position relative to the wheel's center as (8/17, -15/17) on a unit circle. Find sin t and csc t for the rider's position.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Angles t and u end at the same point on the unit circle. If $t = -\pi/3$ and $0 \le u < 2\pi$, find u, tan u, and sec u.

WORK SPACE AND ANSWER

ANSWER KEY

Circle Coordinates

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	At A on the unit circle, find sin t and sec t.	**sin t = 4/5; sec t = -5/3**
2	At B on the unit circle, find tan t and cot t.	**tan t = -12/5; cot t = -5/12**
3	If sin t = -15/17 and cos t = -8/17, find sec t.	**-17/8**
4	If sin t = 3/5 and cos t = -4/5, find cot t.	**-4/3**
5	At Q on the unit circle, which of tan t, cot t, sec t, and csc t are undefined?	**tan t and sec t**
6	Starting at (1, 0), rotate through t = -5π/2. Find sin t and csc t.	**sin t = -1; csc t = -1**

PART 2 · APPLY IT

1. **tan t = -5/12; sec t = -13/12** Use x = -12/13 and y = 5/13. Then tan t = y/x = -5/12 and sec t = 1/x = -13/12.
2. **sin t = -15/17; csc t = -17/15** The y-coordinate gives sin t = -15/17. Its reciprocal is csc t = -17/15.

CHALLENGE

u = 5π/3; tan u = -sqrt(3); sec u = 2

Accept equivalent exact forms. At Q, tan t and sec t are undefined because the x-coordinate is zero.