LESSON MAKER PRO

Unit Circle Sprint

Exact trig values from special triangles

HIGH SCHOOL · MA.912.T.2.3

MA.912.T.2.3 "Determine the values of the six basic trigonometric functions for 0, π/6, π/3 and π/4 and their multiples using special triangles."

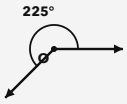
NAME _____ DATE _____

SPECIAL TRIANGLE VALUES

On the unit circle, cos θ is the x-coordinate and sin θ is the y-coordinate. Use a 30-60-90 or 45-45-90 special triangle to find the absolute values, then use the quadrant to choose signs. Tan θ equals sin θ/cos θ, and csc θ, sec θ, and cot θ are reciprocals of sin θ, cos θ, and tan θ.

WORKED EXAMPLE

For the angle θ shown, find sec θ.

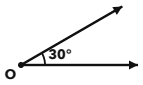


1. 225° = 5π/4, so the reference angle is π/4.
2. A 45-45-90 triangle gives |cos θ| = sqrt(2)/2.
3. The angle is in Quadrant III, so cos θ = -sqrt(2)/2.
4. sec θ = 1/cos θ = -sqrt(2).

Answer: -sqrt(2)

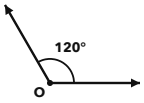
PRACTICE 6 problems

1 For the angle θ shown, find sin θ.



ANSWER _____

2 For the angle θ shown, find cos θ.



ANSWER _____

3 Find tan(π/3).

ANSWER _____

4 Find csc(7π/6).

ANSWER _____

5 Find sec(0).

ANSWER _____

6 Find cot(5π/3).

ANSWER _____

APPLY IT Show your work

1 A student launches a model rocket at an angle of 60° above level ground. At one moment, the rocket is 18 m from the launch point along its straight flight path. Assuming the flight path is straight, what is the rocket's height above the launch point? Give an exact answer.

WORK SPACE

ANSWER _____

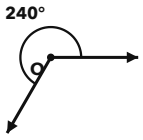
2 For a concert video, a camera is 12 m horizontally from the base of a stage. The camera points up at a performer at an angle of elevation of 30°. How much higher than the camera is the performer? Give an exact answer.

WORK SPACE

ANSWER _____

CHALLENGE One step up

For the angle θ shown, determine sin θ, cos θ, tan θ, csc θ, sec θ, and cot θ. Explain how the reference angle and quadrant determine your signs.



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For the angle θ shown, find sin θ.	**1/2**
2	For the angle θ shown, find cos θ.	**-1/2**
3	Find tan(π/3).	**sqrt(3)**
4	Find csc(7π/6).	**-2**
5	Find sec(0).	**1**
6	Find cot(5π/3).	**-sqrt(3)/3**

PART 2 · APPLY IT

1. **9sqrt(3) m** Use sin 60° = height/18. The height is 18(sqrt(3)/2) = 9sqrt(3) m.
2. **4sqrt(3) m** Use tan 30° = height/12. The height is 12(sqrt(3)/3) = 4sqrt(3) m.

CHALLENGE

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 reference angle is π/3, and Quadrant III makes sine and cosine negative while tangent is positive.

Accept equivalent rationalized or unrationalized reciprocal forms, such as -2/sqrt(3) for -2sqrt(3)/3. Require exact values, not decimal approximations.