LESSON MAKER PRO

Trig Sign Detective

Use the identity and the quadrant to find missing ratios.

HIGH SCHOOL · HSF-TF.C.8

CCSS.Math.Content.HSF-TF.C.8 "Prove the Pythagorean identity sin 2 (θ) + cos 2 (θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle."

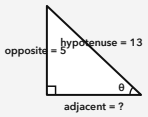
NAME _____ DATE _____

THE IDENTITY LINK

A point on the unit circle has coordinates (cos(θ), sin(θ)). Since $x^2 + y^2 = 1$, $\sin^2(\theta) + \cos^2(\theta) = 1$. Use the quadrant to choose the correct positive or negative sign.

WORKED EXAMPLE

Use the right triangle to find cos(θ).



1. sin(θ) = 5/13.
2. $\sin^2(\theta) + \cos^2(\theta) = 1$.
3. $\cos^2(\theta) = 1 - 25/169 = 144/169$.
4. θ is acute, so cos(θ) = 12/13.

Answer: cos(θ) = 12/13

PRACTICE 4 problems

1 If sin(θ) = 8/17 and θ is in Quadrant II, find cos(θ).

ANSWER _____

2 If cos(θ) = -7/25 and θ is in Quadrant III, find sin(θ).

ANSWER _____

3 If tan(θ) = -7/24 and θ is in Quadrant IV, find sin(θ).

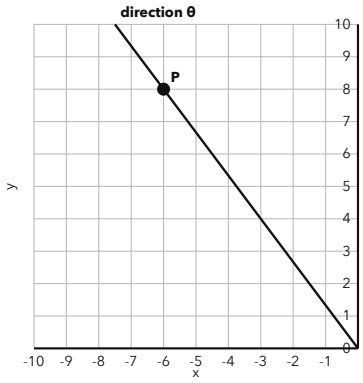
ANSWER _____

4 If cos(θ) = 9/41 and θ is in Quadrant I, find tan(θ).

ANSWER _____

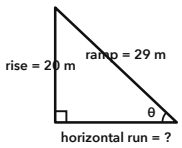
APPLY IT Show your work

1 A student is coding a game. The grid shows the avatar's location P after moving from the origin in direction θ. Find cos(θ).



ANSWER _____

2 At a skate park, the ramp makes angle θ shown in the figure. Find cos(θ).



ANSWER _____

CHALLENGE One step up

tan(θ) = -9/40 and sin(θ) > 0. Identify the quadrant, then find sin(θ) and cos(θ). Explain how you chose the signs.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	If sin(θ) = 8/17 and θ is in Quadrant II, find cos(θ).	**-15/17**
2	If cos(θ) = -7/25 and θ is in Quadrant III, find sin(θ).	**-24/25**
3	If tan(θ) = -7/24 and θ is in Quadrant IV, find sin(θ).	**-7/25**
4	If cos(θ) = 9/41 and θ is in Quadrant I, find tan(θ).	**40/9**

PART 2 · APPLY IT

1. **cos(θ) = -3/5** The distance from the origin to P is sqrt(6^2 + 8^2) = 10. Use x/r = -6/10.
2. **cos(θ) = 21/29** Use the identity or the Pythagorean theorem to find the horizontal run, 21 m. Then use adjacent/hypotenuse.

CHALLENGE

Quadrant II; sin(θ) = 9/41 and cos(θ) = -40/41. Tangent is negative, so the ratios have opposite signs, and positive sine makes cosine negative.

Accept equivalent fractions. Require the correct sign based on the stated quadrant or condition.