LESSON MAKER PRO

Triangle Ratio Quest

Use special triangles and side ratios to find missing lengths.

HIGH SCHOOL · MT.CORE.GEOM.MEAS.3

MT.CORE.GEOM.MEAS.3 "Use similarity to explore and define the sine ratio, cosine ratio, and tangent ratio in terms of right triangles by: Deriving and applying the trigonometric ratios in special right triangles..."

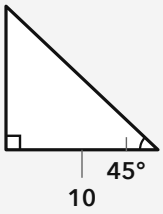
NAME _____ DATE _____

RATIOS THAT STAY THE SAME

For an acute angle in a right triangle, sine is opposite/hypotenuse, cosine is adjacent/hypotenuse, and tangent is opposite/adjacent. Right triangles with the same acute angle are similar, so these ratios stay the same. The side ratios are 1:sqrt3:2 in a 30°-60°-90° triangle and 1:1:sqrt2 in a 45°-45°-90° triangle.

WORKED EXAMPLE

Find the hypotenuse and the sine of the marked angle.

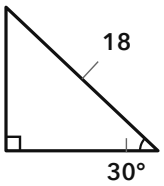


1. The acute angles are equal, so both legs are 10.
2. By the Pythagorean Theorem, the hypotenuse is sqrt(10^2 + 10^2) = 10sqrt2.
3. sin 45° = 10/(10sqrt2) = sqrt2/2.

Answer: Hypotenuse = 10sqrt2; sin 45° = sqrt2/2.

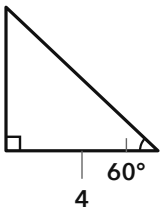
PRACTICE 6 problems

1 Find the leg opposite the marked angle.



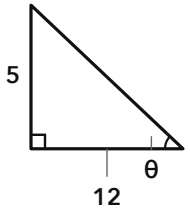
ANSWER _____

2 Find the hypotenuse.



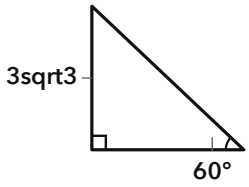
ANSWER _____

3 Find sin θ and cos θ.



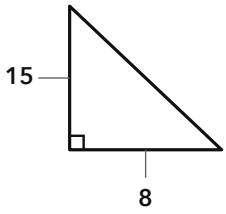
ANSWER _____

4 Find the leg adjacent to the marked angle.



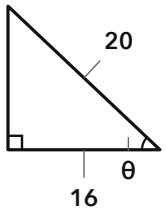
ANSWER _____

5 Find the hypotenuse.



ANSWER _____

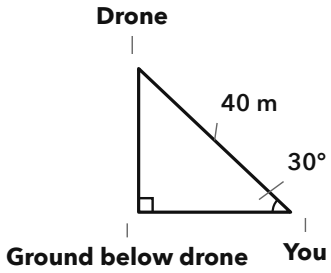
6 Find tan θ.



ANSWER _____

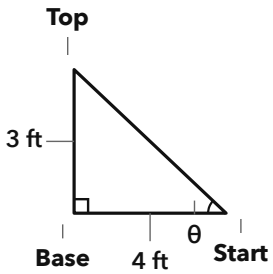
APPLY IT Show your work

1 You are filming a drone. The diagram shows your line of sight to it. How high is the drone above the ground?



ANSWER _____

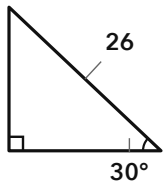
2 A skateboard ramp has the dimensions shown. Find the ramp's length and tan θ, where θ is the angle the ramp makes with the ground.



ANSWER _____

CHALLENGE One step up

Find the perimeter of the triangle. Explain why a 30°-60°-90° side ratio can be used.



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the leg opposite the marked angle.	**9**
2	Find the hypotenuse.	**8**
3	Find sin θ and cos θ.	**sin θ = 5/13; cos θ = 12/13**
4	Find the leg adjacent to the marked angle.	**3**
5	Find the hypotenuse.	**17**
6	Find tan θ.	**3/4**

PART 2 · APPLY IT

1. **20 m** The height is opposite the 30° angle. Its length is half the 40 m hypotenuse.
2. **Ramp length = 5 ft; tan θ = 3/4** The Pythagorean Theorem gives a ramp length of sqrt(4^2 + 3^2) = 5 ft. For θ, the opposite leg is 3 ft and the adjacent leg is 4 ft.

CHALLENGE

39 + 13sqrt3. The missing legs are 13 and 13sqrt3. Every right triangle with a 30° angle is similar to a 30°-60°-90° triangle, so its sides have the ratio 1:sqrt3:2.

Accept equivalent exact radical forms. In the challenge, accept an explanation based on AA similarity or on the remaining acute angle being 60°.