

Triangle Ratio Quest

Use sine, cosine, and tangent to find missing measures.

HIGH SCHOOL • MA.912.T.1.8

MA.912.T.1.8 "Solve mathematical and real-world problems involving one-variable trigonometric ratios."

NAME _____

DATE _____

CHOOSE THE RIGHT RATIO

In a right triangle, $\sin(\theta) = \text{opposite/hypotenuse}$, $\cos(\theta) = \text{adjacent/hypotenuse}$, and $\tan(\theta) = \text{opposite/adjacent}$. Choose the ratio that includes the side you know and the side you need, then solve the equation for x .

WORKED EXAMPLE

In a right triangle, $\sin(\theta) = 5/13$ and the hypotenuse is 52. Find the opposite side, x .

1. $\sin(\theta) = \text{opposite/hypotenuse}$
2. $5/13 = x/52$
3. $x = 52(5/13)$
4. $x = 20$

Answer: 20

PRACTICE 6 problems

- 1** In a right triangle, the side opposite θ is 9 and the hypotenuse is 41. Find $\sin(\theta)$.

ANSWER _____

- 2** In a right triangle, the side adjacent to θ is 16 and the hypotenuse is 34. Find $\cos(\theta)$.

ANSWER _____

- 3** In a right triangle, the side opposite θ is 14 and the side adjacent to θ is 48. Find $\tan(\theta)$.

ANSWER _____

- 4** In a right triangle, $\tan(\theta) = 3/7$ and the side adjacent to θ is 35. Find the opposite side, x .

ANSWER _____

- 5** In a right triangle, $\cos(\theta) = 12/17$ and the hypotenuse is 51. Find the adjacent side, x .

ANSWER _____

- 6** In a right triangle, $\sin(\theta) = 4/9$ and the opposite side is 28. Find the hypotenuse, x .

ANSWER _____

APPLY IT Show your work

- 1** A skateboard ramp is 72 feet long. The ramp makes an angle θ with the level ground, and $\sin(\theta) = 3/8$. Find the vertical rise of the ramp, x .

WORK SPACE

ANSWER _____

- 2** A stage-light cable is 111 feet long and makes an angle θ with the theater floor. If $\cos(\theta) = 12/37$, find the horizontal distance from the cable's floor anchor to the point directly below the light, x .

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A right triangle has $\tan(\theta) = 8/15$ and a hypotenuse of 34. Find the opposite and adjacent side lengths. Explain how the ratio helps you find both lengths.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In a right triangle, the side opposite theta is 9 and the hypotenuse is 41. Find $\sin(\theta)$.	9/41
2	In a right triangle, the side adjacent to theta is 16 and the hypotenuse is 34. Find $\cos(\theta)$.	8/17
3	In a right triangle, the side opposite theta is 14 and the side adjacent to theta is 48. Find $\tan(\theta)$.	7/24
4	In a right triangle, $\tan(\theta) = 3/7$ and the side adjacent to theta is 35. Find the opposite side, x.	15
5	In a right triangle, $\cos(\theta) = 12/17$ and the hypotenuse is 51. Find the adjacent side, x.	36
6	In a right triangle, $\sin(\theta) = 4/9$ and the opposite side is 28. Find the hypotenuse, x.	63

PART 2 • APPLY IT

- 27 feet** Use $\sin(\theta) = \text{opposite/hypotenuse}$. Set $3/8 = x/72$, so $x = 27$ feet.
- 36 feet** Use $\cos(\theta) = \text{adjacent/hypotenuse}$. Set $12/37 = x/111$, so $x = 36$ feet.

CHALLENGE

Opposite side = 16 and adjacent side = 30. The ratio 8/15 matches an 8-15-17 right triangle, and $34 = 2(17)$, so multiply both legs by 2.

Accept equivalent unsimplified fractions for the ratio problems. For the challenge, accept any correct explanation that identifies a scale factor of 2 from the 8-15-17 triangle.