

# Triangle Ratio Quest

Use right-triangle ratios to find missing values.

HIGH SCHOOL • MA.912.T.1

**MA.912.T.1** "Define and use trigonometric ratios, identities or functions to solve problems."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## RIGHT-TRIANGLE RATIOS

For an acute angle  $\theta$  in a right triangle,  $\sin(\theta) = \text{opposite/hypotenuse}$ ,  $\cos(\theta) = \text{adjacent/hypotenuse}$ , and  $\tan(\theta) = \text{opposite/adjacent}$ . Identify the sides relative to  $\theta$ , substitute their lengths, and simplify the fraction when possible.

## WORKED EXAMPLE

In a right triangle,  $\theta$  has an opposite side of 8 and a hypotenuse of 17. Find  $\sin(\theta)$ .

1. Use  $\sin(\theta) = \text{opposite/hypotenuse}$ .
2. Substitute:  $\sin(\theta) = 8/17$ .

**Answer: 8/17**

## PRACTICE 6 problems

- 1** In a right triangle, the side opposite  $\theta$  is 7 and the hypotenuse is 25. Find  $\sin(\theta)$ .

**ANSWER** \_\_\_\_\_

- 2** In a right triangle, the side adjacent to  $\theta$  is 9 and the hypotenuse is 41. Find  $\cos(\theta)$ .

**ANSWER** \_\_\_\_\_

- 3** In a right triangle, the side opposite  $\theta$  is 20 and the side adjacent to  $\theta$  is 21. Find  $\tan(\theta)$ .

**ANSWER** \_\_\_\_\_

- 4** If  $\sin(\theta) = 3/5$  and the hypotenuse is 30, find the length of the side opposite  $\theta$ .

**ANSWER** \_\_\_\_\_

- 5** If  $\cos(\theta) = 12/13$  and the hypotenuse is 26, find the length of the side adjacent to  $\theta$ .

**ANSWER** \_\_\_\_\_

- 6** A right triangle has legs of 14 and 48. For the acute angle  $\theta$  opposite the leg of 14, find  $\tan(\theta)$ .

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** At a concert, a lighting cable makes an angle  $\theta$  with the ground. The cable rises 27 feet to a light, and  $\tan(\theta) = 3/4$ . How far is the ground anchor from the point directly below the light?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** During a basketball game, a student films from an upper seat. The line of sight to the court is 65 feet, and  $\cos(\theta) = 12/13$ , where  $\theta$  is the angle between the line of sight and the horizontal. How far horizontally is the student from the point on the court directly below?

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A right triangle has  $\tan(\theta) = 7/24$  and a hypotenuse of 75. Find the opposite side, the adjacent side,  $\sin(\theta)$ , and  $\cos(\theta)$ .

\_\_\_\_\_  
\_\_\_\_\_

## PART 1 • PRACTICE

| # | PROBLEM                                                                                                         | ANSWER       |
|---|-----------------------------------------------------------------------------------------------------------------|--------------|
| 1 | In a right triangle, the side opposite theta is 7 and the hypotenuse is 25. Find $\sin(\theta)$ .               | <b>7/25</b>  |
| 2 | In a right triangle, the side adjacent to theta is 9 and the hypotenuse is 41. Find $\cos(\theta)$ .            | <b>9/41</b>  |
| 3 | In a right triangle, the side opposite theta is 20 and the side adjacent to theta is 21. Find $\tan(\theta)$ .  | <b>20/21</b> |
| 4 | If $\sin(\theta) = 3/5$ and the hypotenuse is 30, find the length of the side opposite theta.                   | <b>18</b>    |
| 5 | If $\cos(\theta) = 12/13$ and the hypotenuse is 26, find the length of the side adjacent to theta.              | <b>24</b>    |
| 6 | A right triangle has legs of 14 and 48. For the acute angle theta opposite the leg of 14, find $\tan(\theta)$ . | <b>7/24</b>  |

## PART 2 • APPLY IT

- 36 feet** Use  $\tan(\theta) = \text{rise/run}$ . Set  $27/x = 3/4$ , so  $x = 36$  feet.
- 60 feet** Use  $\cos(\theta) = \text{horizontal distance/line of sight}$ . The horizontal distance is  $(12/13)(65) = 60$  feet.

## CHALLENGE

**Opposite side: 21; adjacent side: 72;  $\sin(\theta) = 7/25$ ;  $\cos(\theta) = 24/25$**

Accept equivalent ratios, but require fractions to be simplified. For the challenge, accept the four results in any clear order.