

Right Triangle Ratios

Use sine, cosine, and tangent to connect sides of a right triangle.

HIGH SCHOOL • HSG-SRT.C

CCSS.Math.Content.HSG-SRT.C "Define trigonometric ratios and solve problems involving right triangles"

NAME _____

DATE _____

CHOOSE THE RIGHT RATIO

For an acute angle in a right triangle, $\sin \theta = \text{opposite/hypotenuse}$, $\cos \theta = \text{adjacent/hypotenuse}$, and $\tan \theta = \text{opposite/adjacent}$. First name the sides relative to θ , then choose the ratio that connects the information you know to what you need.

WORKED EXAMPLE

In a right triangle, the side opposite θ is 8, the adjacent side is 15, and the hypotenuse is 17. Find $\tan \theta$.

1. Relative to θ , opposite = 8 and adjacent = 15.
2. Use $\tan \theta = \text{opposite/adjacent}$.
3. $\tan \theta = 8/15$.

Answer: $\tan \theta = 8/15$

PRACTICE 6 problems

- 1** In a right triangle, the side opposite θ is 6 and the hypotenuse is 10. Find $\sin \theta$.

ANSWER _____

- 2** In a right triangle, the side adjacent to θ is 12 and the hypotenuse is 13. Find $\cos \theta$.

ANSWER _____

- 3** In a right triangle, the side opposite θ is 5 and the adjacent side is 12. Find $\tan \theta$.

ANSWER _____

- 4** In a right triangle, $\sin \theta = 3/5$ and the hypotenuse is 20. Find the length x of the side opposite θ .

ANSWER _____

- 5** In a right triangle, $\tan \theta = 7/24$ and the side adjacent to θ is 24. Find the length x of the side opposite θ .

ANSWER _____

- 6** In a right triangle, the side opposite θ is 18 and the adjacent side is x . If $\tan \theta = 3/4$, find x .

ANSWER _____

APPLY IT Show your work

- 1** A student crew uses a 10-foot support cable from the ground to the top of a 6-foot outdoor event screen. What is the sine of the angle the cable makes with the ground?

WORK SPACE

ANSWER _____

- 2** A camera drone rises 7 meters while moving 24 meters horizontally from its starting point. What is $\tan \theta$, where θ is the drone's angle above the horizontal, and how far is the drone from its starting point?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A right triangle has hypotenuse 35, and $\tan \theta = 3/4$. Find $\sin \theta$ and $\cos \theta$. Explain how the tangent ratio helps you determine both values without a calculator.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In a right triangle, the side opposite θ is 6 and the hypotenuse is 10. Find $\sin \theta$.	$\sin \theta = 3/5$
2	In a right triangle, the side adjacent to θ is 12 and the hypotenuse is 13. Find $\cos \theta$.	$\cos \theta = 12/13$
3	In a right triangle, the side opposite θ is 5 and the adjacent side is 12. Find $\tan \theta$.	$\tan \theta = 5/12$
4	In a right triangle, $\sin \theta = 3/5$ and the hypotenuse is 20. Find the length x of the side opposite θ .	$x = 12$
5	In a right triangle, $\tan \theta = 7/24$ and the side adjacent to θ is 24. Find the length x of the side opposite θ .	$x = 7$
6	In a right triangle, the side opposite θ is 18 and the adjacent side is x . If $\tan \theta = 3/4$, find x .	$x = 24$

PART 2 • APPLY IT

- $\sin \theta = 3/5$** The screen height is opposite the ground angle, and the cable is the hypotenuse. Use $\sin \theta = 6/10 = 3/5$.
- $\tan \theta = 7/24$; distance = 25 m** Use $\tan \theta = \text{opposite/adjacent} = 7/24$. The vertical and horizontal distances form a 7-24-25 right triangle, so the direct distance is 25 m.

CHALLENGE

$\sin \theta = 3/5$ and $\cos \theta = 4/5$. Since $\tan \theta = 3/4$, the legs are in a 3:4 ratio. A 3-4-5 triangle scaled by 7 has legs 21 and 28 with hypotenuse 35, so $\sin \theta = 21/35 = 3/5$ and $\cos \theta = 28/35 = 4/5$.

Accept equivalent unsimplified fractions when they match the correct ratio. For the challenge, require reasoning that connects the 3:4 leg ratio to the 3-4-5 triangle or an equivalent Pythagorean Theorem argument.