

Solving Right Triangles Using SOHCAHTOA

Trigonometry Worksheet · Grade 9–11

Name: _____

Date: _____

Learning Objectives

- Identify opposite, adjacent, and hypotenuse sides relative to a given angle
- Select the correct trig ratio (sine, cosine, or tangent) to find a missing side
- Solve for missing sides of right triangles given one side and one acute angle

Problems

1. A right triangle has an angle of 30° and the opposite side measures 5 units. Write the sine ratio equation to find the hypotenuse x .

$$\sin(30^\circ) = \frac{5}{x}$$

2. A right triangle has an angle of 45° and the adjacent side measures 8 units. Use cosine to find the hypotenuse x .

$$\cos(45^\circ) = \frac{8}{x}$$

3. A right triangle has an angle of 60° and the adjacent side measures 5 units. Use tangent to find the opposite side x .

$$\tan(60^\circ) = \frac{x}{5}$$

4. A right triangle has an angle of 30° and the hypotenuse measures 20 units. Find the opposite side x using the sine ratio.

$$\sin(30^\circ) = \frac{x}{20}$$

5. A right triangle has an angle of 45° and the hypotenuse measures 10 units. Find the adjacent side x using the cosine ratio.

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$$\cos(45^\circ) = \frac{x}{10}$$

6. A right triangle has an angle of 60° and the opposite side measures 9 units. Find the hypotenuse x using the sine ratio.

$$\sin(60^\circ) = \frac{9}{x}$$

7. A right triangle has an angle of 60° and the adjacent side measures 12 cm. Find both the opposite side x using tangent and the hypotenuse y using cosine.

$$\tan(60^\circ) = \frac{x}{12}, \quad \cos(60^\circ) = \frac{12}{y}$$

8. A right triangle has an angle of 30° and the adjacent side measures $7\sqrt{3}$ units. Find the opposite side x and the hypotenuse y .

$$\tan(30^\circ) = \frac{x}{7\sqrt{3}}, \quad \cos(30^\circ) = \frac{7\sqrt{3}}{y}$$

9. A right triangle has an angle of 45° and the opposite side measures $6\sqrt{2}$ units. Find the adjacent side x and verify the hypotenuse y using the Pythagorean theorem.

$$\tan(45^\circ) = \frac{6\sqrt{2}}{x}, \quad y = \sqrt{x^2 + (6\sqrt{2})^2}$$

10. A ramp makes a 30° angle with the ground. The vertical height of the ramp (opposite side) is 4.5 meters. Find the length of the ramp (hypotenuse x) and the horizontal distance (adjacent side y).

$$\sin(30^\circ) = \frac{4.5}{x}, \quad \cos(30^\circ) = \frac{y}{x}$$

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Solving Right Triangles Using SOHCAHTOA — Answer Key

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Answer Key

1. Answer: $x = 10$

- $\sin(30^\circ) = \text{opposite} / \text{hypotenuse} = 5 / x$
- $\sin(30^\circ) = 1/2$, so $1/2 = 5/x$
- Cross multiply: $x = 5 \times 2 = 10$

2. Answer: $x = 8\sqrt{2}$

- $\cos(45^\circ) = \text{adjacent} / \text{hypotenuse} = 8 / x$
- $\cos(45^\circ) = \sqrt{2}/2$, so $\sqrt{2}/2 = 8/x$
- Cross multiply: $x \cdot \sqrt{2} = 16$, so $x = 16/\sqrt{2} = 8\sqrt{2}$

3. Answer: $x = 5\sqrt{3}$

- $\tan(60^\circ) = \text{opposite} / \text{adjacent} = x / 5$
- $\tan(60^\circ) = \sqrt{3}$, so $\sqrt{3} = x / 5$
- Multiply both sides by 5: $x = 5\sqrt{3}$

4. Answer: $x = 10$

- $\sin(30^\circ) = \text{opposite} / \text{hypotenuse} = x / 20$
- $\sin(30^\circ) = 1/2$, so $1/2 = x / 20$
- $x = 20 \times (1/2) = 10$

5. Answer: $x = 5\sqrt{2}$

- $\cos(45^\circ) = \text{adjacent} / \text{hypotenuse} = x / 10$
- $\cos(45^\circ) = \sqrt{2}/2$, so $x = 10 \times (\sqrt{2}/2)$
- $x = 5\sqrt{2}$

6. Answer: $x = 6\sqrt{3}$

- $\sin(60^\circ) = \text{opposite} / \text{hypotenuse} = 9 / x$
- $\sin(60^\circ) = \sqrt{3}/2$, so $\sqrt{3}/2 = 9/x$
- Cross multiply: $x \cdot \sqrt{3} = 18$, so $x = 18/\sqrt{3} = 6\sqrt{3}$

7. Answer: $x = 12\sqrt{3}$ cm, $y = 24$ cm

- $\tan(60^\circ) = \sqrt{3}$, so $x = 12\sqrt{3}$
- $\cos(60^\circ) = 1/2$, so $1/2 = 12/y$
- $y = 12 \times 2 = 24$

8. Answer: $x = 7$, $y = 14$

- $\tan(30^\circ) = 1/\sqrt{3}$, so $x = 7\sqrt{3} \times (1/\sqrt{3}) = 7$

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- $\cos(30^\circ) = \sqrt{3}/2$, so $\sqrt{3}/2 = 7\sqrt{3}/y$
 - $y = 7\sqrt{3} \times 2/\sqrt{3} = 14$
-

9. Answer: $x = 6\sqrt{2}$, $y = 12$

- $\tan(45^\circ) = 1$, so $6\sqrt{2} / x = 1$, meaning $x = 6\sqrt{2}$
 - $y^2 = (6\sqrt{2})^2 + (6\sqrt{2})^2 = 72 + 72 = 144$
 - $y = \sqrt{144} = 12$
-

10. Answer: $x = 9$ m, $y = 4.5\sqrt{3} \approx 7.79$ m

- $\sin(30^\circ) = 1/2 = 4.5/x$, so $x = 4.5 \times 2 = 9$ m
 - $\cos(30^\circ) = \sqrt{3}/2 = y/9$, so $y = 9 \times (\sqrt{3}/2) = 4.5\sqrt{3}$
 - $4.5\sqrt{3} \approx 7.79$ m
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