Right Triangle Trigonometry: SOHCAHTOA

Precalculus Worksheet · Grade 10-12 · numberbender.com

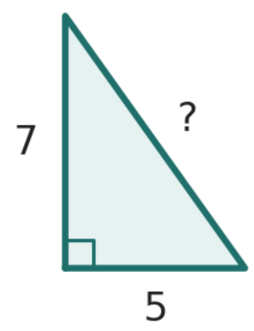
Name: ______________________________ Date: _______________ Score: / 10

Learning Objectives

- Identify the opposite, adjacent, and hypotenuse sides relative to a reference angle in a right triangle
- Compute the six trigonometric ratios (sine, cosine, tangent, cosecant, secant, cotangent) for an acute angle
- Rationalize fractions containing radicals when expressing trig ratios in simplest form

For each problem, identify the reference angle and the sides of the right triangle, then compute the requested trigonometric ratio in simplest rationalized form.

1. Find the length of the hypotenuse of the right triangle.

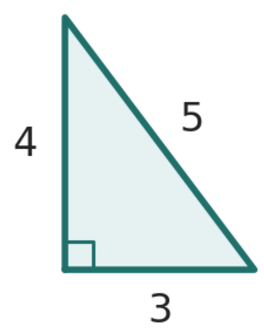


Answer: ________________________________

2. Find the length of the missing leg of the right triangle.

Answer: ________________________________

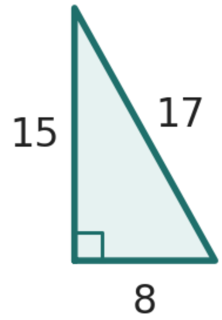
3. Using the right triangle with legs 3 and 4 and hypotenuse 5, find sin(θ) where θ is the angle at the bottom-left vertex (opposite the vertical leg).



$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$$

Answer: ________________________________

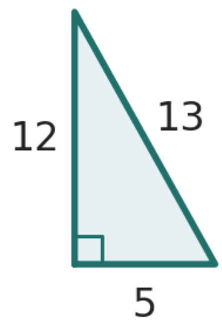
4. For the right triangle shown, find cos(θ) at the bottom-left reference angle.



$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

Answer: ____________________________________

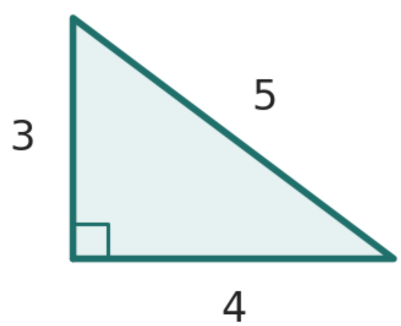
5. For the right triangle shown, find tan(θ) at the bottom-left reference angle.



$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

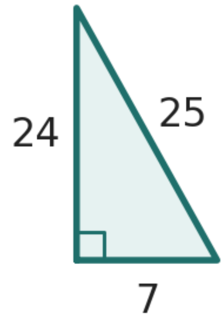
Answer: ____________________________________

6. Find the six trigonometric ratios for θ at the bottom-left reference angle of the triangle below. Report sin(θ) and csc(θ) only.



Answer: ____________________________________

7. For the right triangle below, find sec(θ) and cot(θ) at the bottom-left reference angle.



Answer: ______________________________

8. Rationalize the fraction so that no radical appears in the denominator.

$$\frac{1}{\sqrt{2}}$$

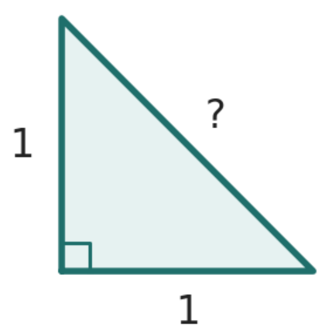
Answer: ______________________________

9. Rationalize the fraction so that no radical appears in the denominator.

$$\frac{3}{\sqrt{5}}$$

Answer: ______________________________

10. A right triangle has legs 1 and 1. Find sin(θ) and cos(θ) for the 45° reference angle, with all denominators rationalized.

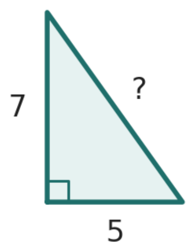


Answer: ______________________________

Remind students that 'opposite' and 'adjacent' are measured relative to the reference angle, while the hypotenuse is always the side opposite the right angle; encourage rationalizing all denominators.

Solutions

1. Find the length of the hypotenuse of the right triangle.



→ *Use the Pythagorean theorem: $a^2 + b^2 = c^2$.*
→ *Substitute the legs: $5^2 + 7^2 = c^2$, so $25 + 49 = c^2$.*
→ *Combine: $c^2 = 74$, therefore $c = \sqrt{74}$.*

Answer: $c = \sqrt{74}$

---

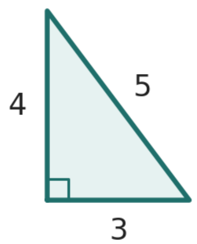
2. Find the length of the missing leg of the right triangle.

→ *Use the Pythagorean theorem with hypotenuse 13 and one leg 5.*
→ *Set up: $5^2 + b^2 = 13^2$, so $25 + b^2 = 169$.*
→ *Solve: $b^2 = 144$, therefore $b = 12$.*

Answer: $b = 12$

---

3. Using the right triangle with legs 3 and 4 and hypotenuse 5, find sin(θ) where θ is the angle at the bottom-left vertex (opposite the vertical leg).



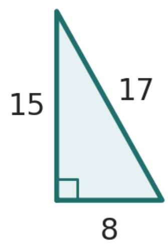
$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$$

→ *Identify the side opposite θ: the vertical leg of length 4.*
→ *Identify the hypotenuse: 5.*
→ *Apply SOH: sin(θ) = opposite ÷ hypotenuse = 4/5.*

Answer: $\sin(\theta) = \frac{4}{5}$

---

4. For the right triangle shown, find cos(θ) at the bottom-left reference angle.



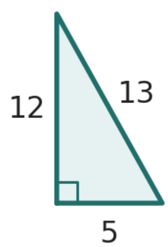
$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

→ *Identify the side adjacent to θ: the horizontal leg of length 8.*
→ *Identify the hypotenuse: 17.*
→ *Apply CAH: cos(θ) = adjacent ÷ hypotenuse = 8/17.*

Answer: $\cos(\theta) = \frac{8}{17}$

---

5. For the right triangle shown, find tan(θ) at the bottom-left reference angle.



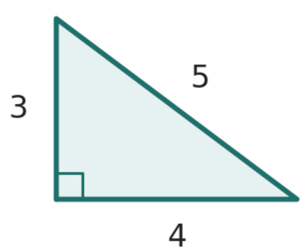
$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

→ *Identify the side opposite θ: the vertical leg of length 12.*
→ *Identify the side adjacent to θ: the horizontal leg of length 5.*
→ *Apply TOA: tan(θ) = opposite ÷ adjacent = 12/5.*

Answer: $\tan(\theta) = \frac{12}{5}$

---

6. Find the six trigonometric ratios for θ at the bottom-left reference angle of the triangle below. Report sin(θ) and csc(θ) only.

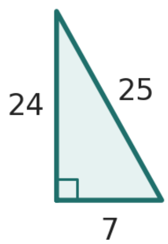


→ *The side opposite θ is the vertical leg of length 3; the hypotenuse is 5.*
→ *Apply SOH: sin(θ) = 3/5.*
→ *Cosecant is the reciprocal of sine: csc(θ) = 5/3.*

Answer: $\sin(\theta) = \frac{3}{5},\ \csc(\theta) = \frac{5}{3}$

---

7. For the right triangle below, find sec(θ) and cot(θ) at the bottom-left reference angle.



→ *Adjacent leg = 7, opposite leg = 24, hypotenuse = 25.*
→ *sec(θ) = hypotenuse ÷ adjacent = 25/7.*
→ *cot(θ) = adjacent ÷ opposite = 7/24.*

Answer: $\sec(\theta) = \frac{25}{7},\ \cot(\theta) = \frac{7}{24}$

---

8. Rationalize the fraction so that no radical appears in the denominator.

$\frac{1}{\sqrt{2}}$

→ *Multiply numerator and denominator by √2.*
→ *Numerator becomes 1·√2 = √2; denominator becomes √2·√2 = 2.*
→ *The rationalized form is √2/2.*

Answer: $\frac{\sqrt{2}}{2}$

---

9. Rationalize the fraction so that no radical appears in the denominator.

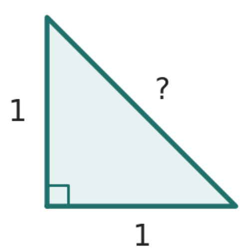
$\frac{3}{\sqrt{5}}$

→ *Multiply numerator and denominator by √5.*
→ *Numerator: 3·√5 = 3√5; denominator: √5·√5 = 5.*
→ *The rationalized form is 3√5 / 5.*

Answer: $\frac{3\sqrt{5}}{5}$

---

10. A right triangle has legs 1 and 1. Find sin(θ) and cos(θ) for the 45° reference angle, with all denominators rationalized.



→ *The hypotenuse is √(1² + 1²) = √2.*
→ *sin(θ) = opposite ÷ hypotenuse = 1/√2; cos(θ) = adjacent ÷ hypotenuse = 1/√2.*
→ *Rationalize each by multiplying by √2/√2 to get √2/2.*

Answer: $\sin(\theta) = \frac{\sqrt{2}}{2},\ \cos(\theta) = \frac{\sqrt{2}}{2}$