Solving Right Triangles with SOH CAH TOA

Trigonometry Worksheet · Grade 9-11 · numberbender.com

Name: _____ Date: _____ Score: / 10

Learning Objectives

- Find the six trigonometric ratios given an angle in standard position
- Find the six trigonometric ratios given one ratio (such as cotangent)
- Use SOH CAH TOA to find missing sides and angles of right triangles

Solve each problem below using SOH CAH TOA and the definitions of the six trigonometric ratios, rounding angle measures to the nearest tenth of a degree when needed.

1. Find the value of sine, cosine, and tangent given \theta = \dfrac{7\pi}{3}.

$\theta = \frac{7\pi}{3}$

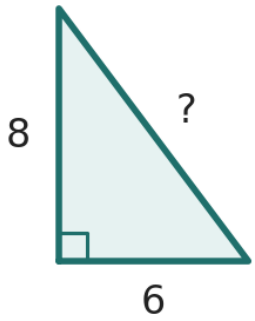
Answer: _____

2. Find the values of cosecant, secant, and cotangent given \theta = \dfrac{7\pi}{3}.

$\theta = \frac{7\pi}{3}$

Answer: _____

3. Given \cot\theta = \dfrac{6}{8} with \theta in the first quadrant, find \sin\theta and \cos\theta.



$\cot\theta = \frac{6}{8}$

Answer: _____

4. Given \cot\theta = \dfrac{6}{8} with \theta in the first quadrant, find \tan\theta, \sec\theta, and \csc\theta.

$\cot\theta = \frac{6}{8}$

Answer: _____

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5. Solve for \theta to the nearest tenth of a degree if \cot\theta = \dfrac{8}{10}.

$$\cot\theta = \frac{8}{10}$$

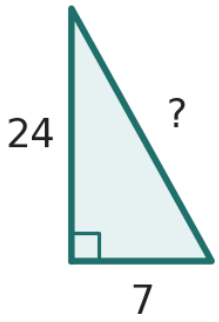
Answer: _____

6. Solve for \theta to the nearest tenth of a degree if \sin\theta = \dfrac{3}{5}.

$$\sin\theta = \frac{3}{5}$$

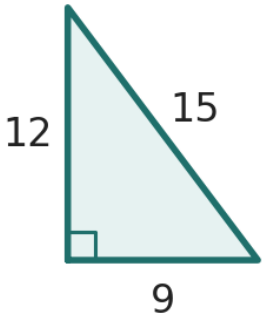
Answer: _____

7. Find the missing hypotenuse of the right triangle shown.



Answer: _____

8. Find the measure of angle \theta (opposite the vertical leg) to the nearest tenth of a degree.

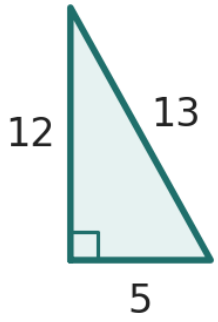


Answer: _____

9. Find the missing leg of the right triangle shown using the Pythagorean theorem.

Answer: _____

10. Find angle \theta (the angle adjacent to the side of length 5) to the nearest tenth of a degree.



Answer: _____

Encourage students to sketch a reference triangle in the appropriate quadrant before computing the six trig ratios.

Solutions

1. Find the value of sine, cosine, and tangent given \theta = \dfrac{7\pi}{3}.

$\theta = \frac{7\pi}{3}$

→ *Subtract 2π to find the coterminal angle: 7π/3 – 6π/3 = π/3 (which is 60°).*
→ *On the unit circle at π/3, the point is (1/2, √3/2), so sin = √3/2 and cos = 1/2.*
→ *Compute tan = sin/cos = (√3/2) ÷ (1/2) = √3.*

Answer: $\sin\theta = \frac{\sqrt{3}}{2},\ \cos\theta = \frac{1}{2},\ \tan\theta = \sqrt{3}$

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2. Find the values of cosecant, secant, and cotangent given \theta = \dfrac{7\pi}{3}.

$\theta = \frac{7\pi}{3}$

→ *Use the coterminal angle π/3 where sin = √3/2 and cos = 1/2.*
→ *Take reciprocals: csc = 1/sin = 2/√3 = 2√3/3, sec = 1/cos = 2.*
→ *Compute cot = cos/sin = (1/2)/(√3/2) = 1/√3 = √3/3.*

Answer: $\csc\theta = \frac{2\sqrt{3}}{3},\ \sec\theta = 2,\ \cot\theta = \frac{\sqrt{3}}{3}$

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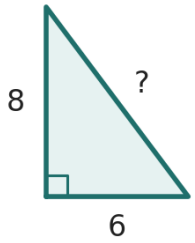
3. Given \cot\theta = \dfrac{6}{8} with \theta in the first quadrant, find \sin\theta and \cos\theta.



$\cot\theta = \frac{6}{8}$

→ *Since cot = adjacent/opposite, set adjacent = 6 and opposite = 8.*
→ *Find the hypotenuse by the Pythagorean theorem: √(6² + 8²) = √100 = 10.*
→ *Therefore sin = opposite/hyp = 8/10 and cos = adjacent/hyp = 6/10.*

Answer: $\sin\theta = \frac{8}{10},\ \cos\theta = \frac{6}{10}$

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4. Given \cot\theta = \dfrac{6}{8} with \theta in the first quadrant, find \tan\theta, \sec\theta, and \csc\theta.

$\cot\theta = \frac{6}{8}$

→ *Use the reference triangle with opposite = 8, adjacent = 6, hypotenuse = 10.*
→ *Tangent is the reciprocal of cotangent: tan = 8/6.*
→ *Secant = hyp/adj = 10/6 and cosecant = hyp/opp = 10/8.*

Answer: $\tan\theta = \frac{8}{6},\ \sec\theta = \frac{10}{6},\ \csc\theta = \frac{10}{8}$

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5. Solve for \theta to the nearest tenth of a degree if \cot\theta = \dfrac{8}{10}.

$\cot\theta = \frac{8}{10}$

→ *Rewrite cot θ = 8/10 as tan θ = 10/8 = 1.25.*
→ *Take the inverse tangent: θ = tan■¹(1.25).*
→ *Using a calculator, θ ≈ 51.3°.*

Answer: $\theta \approx 51.3^\circ$

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6. Solve for \theta to the nearest tenth of a degree if \sin\theta = \dfrac{3}{5}.

$\sin\theta = \frac{3}{5}$

→ *Apply the inverse sine: θ = sin■¹(3/5) = sin■¹(0.6).*
→ *Compute with a calculator to get θ ≈ 36.87°.*
→ *Round to the nearest tenth: θ ≈ 36.9°.*

Answer: $\theta \approx 36.9^\circ$

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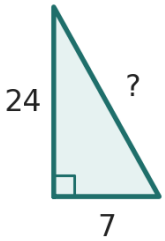
7. Find the missing hypotenuse of the right triangle shown.



→ *Identify the legs of the right triangle: a = 7 and b = 24.*
→ *Apply the Pythagorean theorem: c² = 7² + 24² = 49 + 576 = 625.*
→ *Take the square root: c = √625 = 25.*

Answer: $c = 25$

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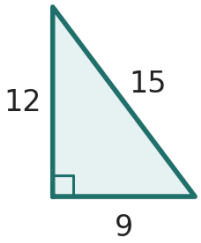
8. Find the measure of angle \theta (opposite the vertical leg) to the nearest tenth of a degree.



→ *Identify the sides: the side opposite θ is 12 and the side adjacent to θ is 9.*
→ *Use SOH CAH TOA: tan θ = opposite/adjacent = 12/9.*
→ *Take the inverse tangent: θ = tan■¹(12/9) ≈ 53.1°.*

Answer: $\theta \approx 53.1^\circ$

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9. Find the missing leg of the right triangle shown using the Pythagorean theorem.

→ *Label the known sides: one leg a = 8 and the hypotenuse c = 17.*
→ *Apply the Pythagorean theorem: $b^2 = c^2 - a^2 = 17^2 - 8^2 = 289 - 64 = 225$.*
→ *Take the square root: $b = \sqrt{225} = 15$.*

Answer: $b = 15$

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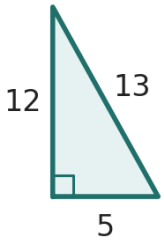
10. Find angle \theta (the angle adjacent to the side of length 5) to the nearest tenth of a degree.



→ *Identify the sides relative to θ: adjacent = 5 and hypotenuse = 13.*
→ *Use SOH CAH TOA: cos θ = adjacent/hypotenuse = 5/13.*
→ *Take the inverse cosine: θ = cos■¹(5/13) ≈ 67.4°.*

Answer: $\theta \approx 67.4^\circ$