Solving Missing Sides of a Triangle Using SOH CAH TOA

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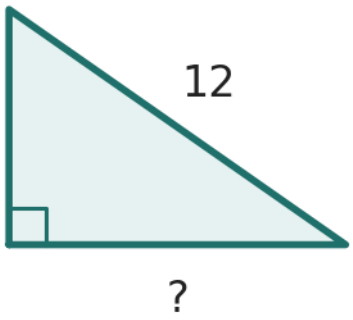
Name: _____ Date: _____ Score: / 10

Learning Objectives

- Apply the SOH CAH TOA mnemonic to identify the correct trigonometric ratio for a given right triangle
- Solve for missing sides of right triangles using sine, cosine, and tangent ratios
- Evaluate trigonometric functions of angles greater than 360 degrees using coterminal angles

Use SOH CAH TOA to find the missing side(s) of each right triangle, rounding to two decimal places where needed.

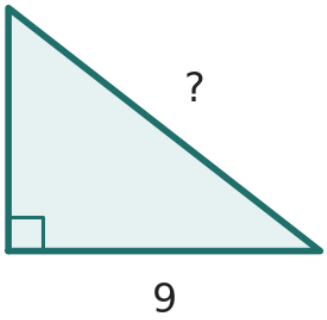
1. Find the missing side x of the right triangle where the 35° angle has an opposite side of x and a hypotenuse of 12.



$$\sin(35^\circ) = \frac{x}{12}$$

Answer: _____

2. Find the length of the hypotenuse c of a right triangle where the 40° angle has an adjacent side of 9.

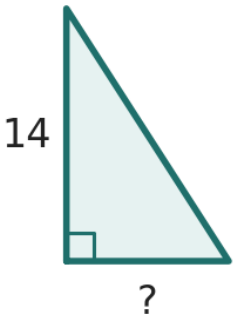


$$\cos(40^\circ) = \frac{9}{c}$$

Answer: _____

Scan to watch

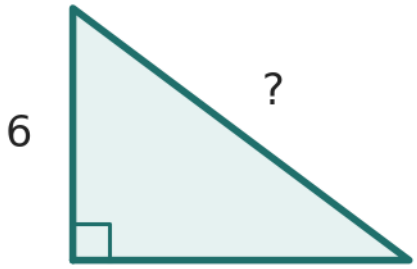
3. Find the missing leg y of the right triangle where the 55° angle has an opposite leg of 14 and an adjacent leg of y.



$\tan(55^\circ) = \frac{14}{y}$

Answer: _____

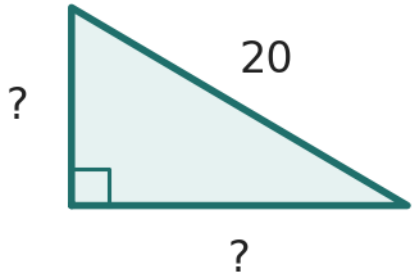
4. A right triangle has a 25° angle. The side opposite this angle measures 6. Find the hypotenuse.



$\sin(25^\circ) = \frac{6}{c}$

Answer: _____

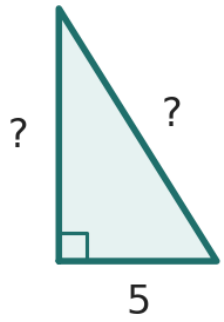
5. Find both missing sides of a right triangle with a 30° angle and a hypotenuse of 20 (opposite leg a and adjacent leg b).



$a = 20\sin(30^\circ),\ b = 20\cos(30^\circ)$

Answer: _____

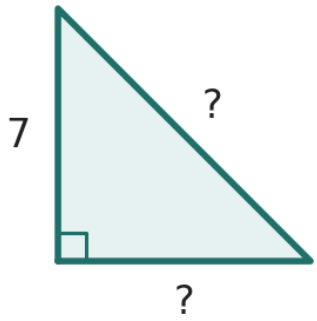
6. Find both missing sides of a right triangle with a 60° angle and an adjacent leg of 5 (opposite leg a and hypotenuse c).



$\tan(60^\circ) = \frac{a}{5},\ \cos(60^\circ) = \frac{5}{c}$

Answer: _____

7. A right triangle has a 45° angle with the opposite leg measuring 7. Find the adjacent leg and the hypotenuse.



$\tan(45^\circ) = \frac{7}{b},\ \sin(45^\circ) = \frac{7}{c}$

Answer: _____

8. Find the exact value of tan(780°) by using coterminal angles.

$\tan(780^\circ)$

Answer: _____

9. Find the exact value of sin(750°) using coterminal angles.

$\sin(750^\circ)$

Answer: _____

10. Find the exact value of cos(900°) using coterminal angles.

$\cos(900^\circ)$

Answer: _____

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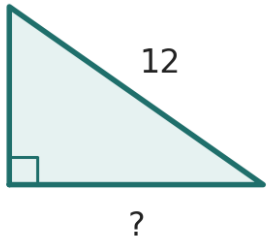
ANSWER KEY & SOLUTIONS

Encourage students to label the opposite, adjacent, and hypotenuse relative to the given angle before choosing a trig ratio.

Solutions

1. Find the missing side x of the right triangle where the 35° angle has an opposite side of x and a hypotenuse of 12.

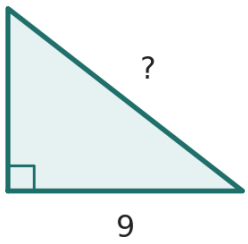


$$\sin(35^\circ) = \frac{x}{12}$$

→ *Identify the opposite side (x) and the hypotenuse (12) relative to the 35° angle*
→ *Since opposite and hypotenuse are involved, use sine: sin(35°) = x/12*
→ *Multiply both sides by 12 to isolate x: x = 12 · sin(35°)*
→ *Compute sin(35°) ≈ 0.5736, then x ≈ 12 · 0.5736 ≈ 6.88*

Answer: $x \approx 6.88$

2. Find the length of the hypotenuse c of a right triangle where the 40° angle has an adjacent side of 9.



$$\cos(40^\circ) = \frac{9}{c}$$

→ *Identify the adjacent side (9) and the hypotenuse (c) relative to the 40° angle*
→ *Since adjacent and hypotenuse are involved, use cosine: cos(40°) = 9/c*
→ *Solve for c by multiplying both sides by c and dividing by cos(40°): c = 9 / cos(40°)*
→ *Compute cos(40°) ≈ 0.7660, then c ≈ 9 / 0.7660 ≈ 11.75*

Answer: $c \approx 11.75$

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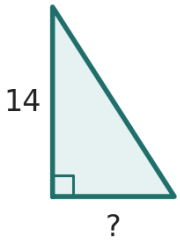
3. Find the missing leg y of the right triangle where the 55° angle has an opposite leg of 14 and an adjacent leg of y.



$$\tan(55^\circ) = \frac{14}{y}$$

→ *Identify the opposite side (14) and the adjacent side (y) relative to the 55° angle*
→ *Since opposite and adjacent are involved, use tangent: tan(55°) = 14/y*
→ *Multiply both sides by y and divide by tan(55°): y = 14 / tan(55°)*
→ *Compute tan(55°) ≈ 1.4281, then y ≈ 14 / 1.4281 ≈ 9.80*

Answer: $y \approx 9.80$

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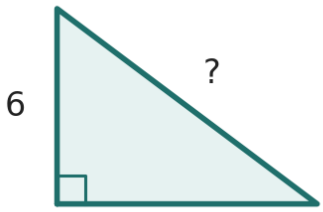
4. A right triangle has a 25° angle. The side opposite this angle measures 6. Find the hypotenuse.



$$\sin(25^\circ) = \frac{6}{c}$$

→ *The opposite side is 6 and the hypotenuse is unknown, so use sine*
→ *Set up the equation sin(25°) = 6/c*
→ *Solve for c: c = 6 / sin(25°)*
→ *Compute sin(25°) ≈ 0.4226, then c ≈ 6 / 0.4226 ≈ 14.20*

Answer: $c \approx 14.20$

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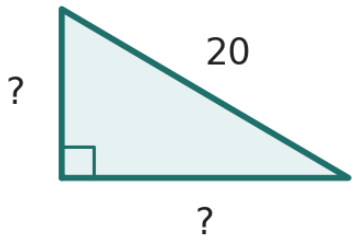
5. Find both missing sides of a right triangle with a 30° angle and a hypotenuse of 20 (opposite leg a and adjacent leg b).



$$a = 20\sin(30^\circ),\ b = 20\cos(30^\circ)$$

→ *Use sine to find the opposite leg: a = 20 · sin(30°) = 20 · 0.5 = 10*
→ *Use cosine to find the adjacent leg: b = 20 · cos(30°)*
→ *Compute cos(30°) ≈ 0.8660, so b ≈ 20 · 0.8660 ≈ 17.32*

Answer: $a = 10,\ b \approx 17.32$

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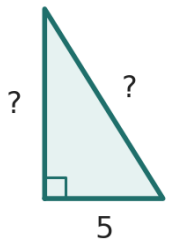
6. Find both missing sides of a right triangle with a 60° angle and an adjacent leg of 5 (opposite leg a and hypotenuse c).



$\tan(60^\circ) = \frac{a}{5},\ \cos(60^\circ) = \frac{5}{c}$

→ *Use tangent to find the opposite leg: a = 5 · tan(60°) ≈ 5 · 1.7321 ≈ 8.66*
→ *Use cosine to find the hypotenuse: c = 5 / cos(60°) = 5 / 0.5 = 10*

Answer: $a \approx 8.66,\ c = 10$

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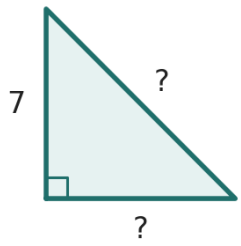
7. A right triangle has a 45° angle with the opposite leg measuring 7. Find the adjacent leg and the hypotenuse.



$\tan(45^\circ) = \frac{7}{b},\ \sin(45^\circ) = \frac{7}{c}$

→ *Use tangent to find the adjacent leg: b = 7 / tan(45°) = 7 / 1 = 7*
→ *Use sine to find the hypotenuse: c = 7 / sin(45°)*
→ *Compute sin(45°) ≈ 0.7071, then c ≈ 7 / 0.7071 ≈ 9.90*

Answer: $b = 7,\ c \approx 9.90$

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8. Find the exact value of tan(780°) by using coterminal angles.

$\tan(780^\circ)$

→ *Subtract multiples of 360° to find a coterminal angle: 780° – 360° = 420°, then 420° – 360° = 60°*
→ *So tan(780°) = tan(60°)*
→ *From the unit circle, tan(60°) = √3 ≈ 1.7321*

Answer: $\sqrt{3}$

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9. Find the exact value of sin(750°) using coterminal angles.

$\sin(750^\circ)$

→ *Subtract 360° repeatedly: 750° – 360° = 390°, then 390° – 360° = 30°*
→ *So sin(750°) = sin(30°)*
→ *From the unit circle, sin(30°) = 1/2*

Answer: $\frac{1}{2}$

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10. Find the exact value of cos(900°) using coterminal angles.

$\cos(900^\circ)$

→ *Subtract 360° repeatedly: 900° – 360° = 540°, then 540° – 360° = 180°*
→ *So cos(900°) = cos(180°)*
→ *From the unit circle, cos(180°) = –1*

Answer: -1