Trigonometry: Word Problems with Right Triangles

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Name: _____ Date: _____ Score: / 10

DIRECTIONS *Draw and label a right triangle for each problem, then use SOHCAHTOA to solve. Show all work.*

1 Identify the correct trig ratio:

$\theta = 40°,\ \text{adjacent} = 10,\ \text{hypotenuse} = x$

Answer: _____

2 Identify the correct trig ratio:

$\theta = 55°,\ \text{opposite} = 7,\ \text{hypotenuse} = x$

Answer: _____

3 Solve for x (hypotenuse):

$$\cos 32° = \frac{15}{x}$$

Answer: _____

4 Solve for the missing side:

$\theta = 45°,\ \text{hypotenuse} = 20,\ \text{find opposite}$

Answer: _____

5 Solve for the adjacent side:

$\theta = 60°,\ \text{hypotenuse} = 30,\ \text{find adjacent}$

Answer: _____

6 Find the missing angle θ:

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

Answer: _____

7 Word problem — find the ladder length:

Answer: _____

8 Word problem — find the building height:

Answer: _____

9 Word problem — find the angle of depression:

Answer: _____

10 Multi-step: find perimeter of triangle:

Answer: _____

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Answer Key & Solutions

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TEACHER■NOTE *Remind students to identify the reference angle first, then label the sides as opposite, adjacent, and hypotenuse relative to that angle. Emphasize selecting the correct trig ratio (SOH, CAH, or TOA) based on which two sides are known or needed. Calculators should be set to degree mode throughout this worksheet.*

1 Identify the correct trig ratio:

$\theta = 40°,\ \text{adjacent} = 10,\ \text{hypotenuse} = x$

= $\cos 40° = \frac{10}{x}$

Since we know the adjacent side and the hypotenuse, we use CAH: cos θ = adjacent/hypotenuse. The correct equation is cos 40° = 10/x.

2 Identify the correct trig ratio:

$\theta = 55°,\ \text{opposite} = 7,\ \text{hypotenuse} = x$

= $\sin 55° = \frac{7}{x}$

Since we have the opposite side and hypotenuse, we use SOH: sin θ = opposite/hypotenuse. The equation is sin 55° = 7/x.

3 Solve for x (hypotenuse):

$\cos 32° = \frac{15}{x}$

= $x = \frac{15}{\cos 32°} \approx 17.68$

Cross-multiply to isolate x: x = 15 / cos 32°. Using a calculator, cos 32° ≈ 0.848, so x ≈ 17.68 units.

4 Solve for the missing side:

$\theta = 45°,\ \text{hypotenuse} = 20,\ \text{find opposite}$

= $x = 20 \cdot \sin 45° \approx 14.14$

Use SOH: sin 45° = opposite/20, so opposite = 20 · sin 45° ≈ 20 · 0.707 ≈ 14.14 units.

5 Solve for the adjacent side:

$\theta = 60°,\ \text{hypotenuse} = 30,\ \text{find adjacent}$

= $x = 30 \cdot \cos 60° = 15$

Use CAH: cos 60° = adjacent/30, so adjacent = 30 · cos 60° = 30 · 0.5 = 15 units.

6 Find the missing angle θ:

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

= $\theta = \tan^{-1}\left(\frac{8}{6}\right) \approx 53.13°$

Use the inverse tangent: θ = tan■¹(8/6) = tan■¹(1.333). A calculator gives θ ≈ 53.13°.

7 Word problem — find the ladder length:

= $x = \frac{5}{\cos 70°} \approx 14.62$ ft

The base (5 ft) is adjacent to the 70° angle and the ladder is the hypotenuse. Using CAH: cos 70° = 5/x, so x = 5/cos 70° ≈ 14.62 ft.

8 Word problem — find the building height:

= $h = 40 \cdot \tan 38° \approx 31.25$ ft

The 40 ft distance is adjacent and the height is opposite. Use TOA: tan 38° = h/40, so h = 40 · tan 38° ≈ 31.25 ft.

9 Word problem — find the angle of depression:

= $\theta = \tan^{-1}\left(\frac{80}{120}\right) \approx 33.69°$

The opposite side is 80 m (height) and adjacent is 120 m (distance). Use TOA: θ = tan■¹(80/120) ≈ 33.69°.

10 Multi-step: find perimeter of triangle:

= $\text{adj} \approx 22.07,\ \text{opp} \approx 11.74,\ P \approx 58.81$

Adjacent = 25 · cos 28° ≈ 22.07; Opposite = 25 · sin 28° ≈ 11.74. Perimeter = 25 + 22.07 + 11.74 ≈ 58.81 units.

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