# Year 9 trigonometry worksheet

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Name: _____ Date: _____

**Question 1**

A right-angled triangle has sides 5, 12 and 13. For the angle θ, the opposite side is 5 and the adjacent side is 12.

(a) Find sin θ.

(b) Find cos θ.

(c) Find tan θ.

Answer: _____

**Question 2**

A right-angled triangle has an acute angle of 35°. The hypotenuse is 12 cm. Find the side opposite the 35° angle, correct to two decimal places.

Answer: _____

**Question 3**

In a right-angled triangle, the side opposite a 32° angle is 8 cm. Find the length of the hypotenuse, x cm, correct to 2 decimal places.

Answer: _____

**Question 4**

A loading ramp rises 1.4 m vertically over a horizontal distance of 5 m. Find the angle the ramp makes with the horizontal, correct to the nearest degree.

Answer: _____

**Question 5**

A 6.5 m ladder leans against a vertical wall. The base of the ladder is on horizontal ground and sits 2.5 m from the base of the wall. A safety rule says the angle the ladder makes with the ground must be between 70° and 80°. Use trigonometry to find the angle the ladder makes with the ground, correct to one decimal place, and state whether the ladder is positioned safely.

Answer: _____

**Question 6**

Write each compass bearing as a true bearing.

(a) N40°E (b) S25°E (c) S60°W (d) N15°W

Answer: _____

**Question 7**

Use a calculator to evaluate each of the following, correct to 4 decimal places.

(a) sin 27°

(b) cos 64°

(c) tan 71°

Answer: _____

**Question 8**

In a right-angled triangle, an acute angle measures 52°. The side adjacent to that angle is 9 m. Find the length of the side opposite the 52° angle, correct to two decimal places.

Answer: _____

**Question 9**

In a right-angled triangle, the side adjacent to a 55° angle is 15 m. Find the length of the hypotenuse, x m, correct to 2 decimal places.

Answer: _____

**Question 10**

A ramp rises 1.8 m vertically over a horizontal distance of 4.5 m. Find the angle the ramp makes with the horizontal, correct to 2 decimal places. Give your answer in degrees.

Answer: _____

# Year 9 trigonometry: answers and worked solutions

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**Question 1**

**Key idea:** SOH CAH TOA: sin = O/H, cos = A/H, tan = O/A.

1. The hypotenuse is 13, the longest side. 2. sin θ = 5/13 3. cos θ = 12/13 4. tan θ = 5/12

**Answer:** (a) 5/13 (b) 12/13 (c) 5/12

**Question 2**

**Key idea:** Identify the sides relative to the given angle, then choose the ratio that links those two sides.

1. The known side is the hypotenuse (12 cm). The unknown side is opposite the 35° angle. Use sine: sinθ = opposite/hypotenuse 2. Substitute the known values: sin 35° = x/12 3. Solve for x: x = 12 × sin 35° 4. Calculate: x = 12 × 0.5736 ≈ 6.88  cm

**Answer:** The opposite side is approximately 6.88 cm.

**Question 3**

**Key idea:** When the unknown is in the denominator, write the ratio, multiply both sides by x, then divide by the trigonometric value.

1. sin 32° = 8/x 2. x sin 32° = 8 3. x = (8)/(sin 32°) = 15.096… ≈ 15.10

**Answer:** x = 15.10

**Question 4**

**Key idea:** The vertical rise is opposite the unknown angle and the horizontal distance is adjacent to it, so use inverse tangent.

1. Write the tangent ratio: tanθ = opposite/adjacent = (1.4)/(5) 2. Simplify: tanθ = 0.28 3. Apply inverse tangent: θ = $\tan^{-1}(0.28)$ 4. Calculate: θ ≈ 15.64° ≈ 16°

**Answer:** The ramp makes an angle of approximately 16° with the horizontal.

**Question 5**

**Key idea:** The ladder, wall and ground form a right-angled triangle. Use the cosine ratio, since the adjacent side (ground distance) and hypotenuse (ladder) are known, to find the angle at the base.

1. Identify the sides relative to the angle at the ground: adjacent = 2.5 m, hypotenuse = 6.5 m. 2. Write the cosine ratio:\ $\cos(\theta) = (2.5)/(6.5)$ 3. Solve for θ:\ $\theta = \cos^{-1}!((2.5)/(6.5)) \approx$

$\cos^{-1}(0.3846) \approx 67.4°$ 4. Compare with the safe range of 70° to 80°: 67.4° < 70°, so th e ladder is outside the safe range.

**Answer:** The ladder makes an angle of approximately 67.4° with the ground, which is not safe.

**Question 6**

**Key idea:** A true bearing is measured clockwise from north and written with three digits. East is 090°, south is 180° and west is 270°.

1. (a) 40° clockwise from north: 040°T 2. (b) 25° from south towards east is anticlockwise from south: 180 - 25 = 155, so 155°T 3. (c) 60° from south towards west: 180 + 60 = 240, so 240°T 4. (d) 15° from north towards west: 360 - 15 = 345, so 345°T

**Answer:** (a) 040°T (b) 155°T (c) 240°T (d) 345°T

**Question 7**

**Key idea:** Make sure the calculator is in degree mode.

1. sin 27° = 0.453990… 2. cos 64° = 0.438371… 3. tan 71° = 2.904211…

**Answer:** (a) 0.4540 (b) 0.4384 (c) 2.9042

**Question 8**

**Key idea:** When the opposite and adjacent sides are involved, use tangent.

1. Write the tangent ratio: $\tan\theta$ = opposite/adjacent 2. Substitute the known values: $\tan 52° = x/9$ 3. Solve for x: $x = 9 \times \tan 52°$ 4. Calculate: $x = 9 \times 1.2799 \approx 11.52$ m

**Answer:** The opposite side is approximately 11.52 m.

**Question 9**

**Key idea:** Adjacent and hypotenuse are linked by cosine. The unknown hypotenuse is in the denominator.

1. $\cos 55° = 15/x$ 2. $x = (15)/(\cos 55°) = 26.151… \approx 26.15$

**Answer:** x = 26.15

**Question 10**

**Key idea:** When you know the opposite and adjacent sides, use $\tan\theta$ = opposite/adjacent, then apply $\tan^{-1}$ to find the angle.

1. Label the sides: opposite = 1.8 m, adjacent = 4.5 m. 2. Write the ratio: $\tan\theta = (1.8)/(4.5)$ 3. Simplify: $\tan\theta = 0.4$ 4. Apply the inverse tangent: $\theta = \tan^{-1}(0.4)$ 5. Evaluate: $\theta \approx 21.80°$

**Answer:** 21.80°