Year 10A trigonometry worksheet

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Name: _____ Date: _____

Question 1

In triangle PQR, angle Q = 90°. The side opposite angle θ at P is QR = 5 cm, the side adjacent to θ is PQ = 12 cm and the hypotenuse is PR = 13 cm.

Write, as fractions:

(a) cos θ

(b) tan θ

Answer: _____

Question 2

Use a calculator. In a right-angled triangle, the side opposite angle θ is 7 cm and the hypotenuse is 12 cm. Find θ, correct to one decimal place.

Answer: _____

Question 3

A lifeguard sits in a tower 8 m above the ground and looks down at a swimmer on the beach. The swimmer is 15 m from the base of the tower along flat ground. Find the angle of depression from the lifeguard to the swimmer, correct to one decimal place.

Answer: _____

Question 4

A ship sails 40 km due east, then turns and sails 30 km due north. Find the bearing of the ship from its starting point, correct to the nearest degree.

Answer: _____

Question 5

A rectangular prism has length 8 m, width 6 m and height 5 m. Find the angle that the space diagonal makes with the base of the prism, correct to one decimal place.

Answer: _____

Question 6

In triangle ABC, angle A = 47°, angle B = 63°, and side a = 14 cm. Find side b, correct to one decimal place.

Answer: _____

Question 7

In triangle PQR, p = 9 cm, q = 11 cm, and r = 7 cm. Find angle R, correct to the nearest degree.

Answer: _____

Question 8

Two fences meet at a corner post. One fence is 23 m long and the other is 18 m long. The angle between the fences at the corner post is 74°. A third fence is to be built to join the far ends of the two fences, enclosing a triangular paddock. Find the area of the triangular paddock, correct to the nearest square metre, and the length of the third fence, correct to the nearest metre.

Answer: _____

Question 9

Use the unit circle to find the exact value of:

(a) cos 180°

(b) sin 270°

(c) cos 300°

Answer: _____

Question 10

For the graph of y = 4sin x:

(a) State the amplitude.

(b) State the period, in degrees.

(c) State the minimum value of y.

Answer: _____

Year 10A trigonometry: answers and worked solutions

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Question 1

Key idea: cos θ = adjacent/hypotenuse and tan θ = opposite/adjacent.

1. cos θ = 12/13 2. tan θ = 5/12

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

Question 2

Key idea: Opposite and hypotenuse are known, so use sine, then the inverse sine function.

1. sinθ = 7/12 2. θ = $\sin^{-1}(7/12)$ = 35.685…° ≈ 35.7°

Answer: θ ≈ 35.7°

Question 3

Key idea: The angle of depression equals the angle inside the right-angled triangle at the top (alternate angles with the horizontal). Use the tangent ratio because you have the opposite side (8 m) and the adjacent side (15 m).

1. Label the triangle: opposite = 8 m, adjacent = 15 m. 2. Write the trig equation:\ $\tan(\theta) = 8/15$ 3. Solve for θ:\ $\theta = \tan^{-1}!(8/15)$ 4. Calculate:\ θ ≈ 28.1°

Answer: The angle of depression is approximately 28.1°.

Question 4

Key idea: Draw the right-angled triangle formed by the two legs of the journey. The bearing is measured clockwise from north at the starting point, so find the angle the direct path makes with north, then convert to a three-figure bearing.

1. Identify the right-angled triangle: the eastward leg is 40 km (opposite the required angle from north) and the northward leg is 30 km (adjacent to the required angle from north). 2. Find the angle east of north:\ $\tan(\theta) = 40/30$ 3. Solve:\ $\theta = \tan^{-1}!(40/30) \approx 53°$ 4 . Convert to a three-figure bearing (clockwise from north):\ Bearing = 053°

Answer: The bearing of the ship from its starting point is 053°.

Question 5

Key idea: First find the diagonal of the base, then use trigonometry in the vertical right-angled triangle formed by that base diagonal and the space diagonal.

1. Find the base diagonal b using Pythagoras' theorem:\ $b = \sqrt{(8^2 + 6^2)} = \sqrt{(64 + 36)} = \sqrt{(100)} = 10$ m 2. The space diagonal, the base diagonal and the height form a right-angled triangle. The side opposite the required angle θ is the height (5 m) and the side adjacent is the base diagonal (10 m). 3. Apply the tangent ratio:\ $\tan\theta = 5/10 = 0.5$ 4. Solve for θ:\ $\theta = \tan^{-1}(0.5) \approx 26.6°$

Answer: The space diagonal makes an angle of approximately 26.6° with the base.

Question 6

Key idea: When two angles and one opposite side are known, use the sine rule $(a)/(\sin A) = (b)/(\sin B)$.

1. Write the sine rule with the known values:\ $(14)/(\sin 47°) = (b)/(\sin 63°)$ 2. Solve for b:\ $b = (14 \times \sin 63°)/(\sin 47°)$ 3. Evaluate:\ $b = (14 \times 0.8910)/(0.7314) \approx (12.474)/(0.7314) \approx 17.1$ cm

Answer: $b \approx 17.1$ cm

Question 7

Key idea: When all three sides are known, use the cosine rule in the form $\cos R = (p^2 + q^2 - r^2)/(2pq)$.

1. Substitute the known values:\ $\cos R = (9^2 + 11^2 - 7^2)/(2 \times 9 \times 11)$ 2. Simplify the numerator and denominator:\ $\cos R = (81 + 121 - 49)/(198) = 153/198$ 3. Divide:\ $\cos R \approx 0.7727$ 4. Find angle R:\ $R = \cos^{-1}(0.7727) \approx 39.4° \approx 39°$

Answer: $R \approx 39°$

Question 8

Key idea: Use the area formula Area = ½absin C when two sides and the included angle are known, then use the cosine rule to find the third side.

1. Label the two known sides a = 23 m, b = 18 m, and the included angle C = 74°. 2. Calculate the area:\ $\text{Area} = ½ \times 23 \times 18 \times \sin 74° = ½ \times 23 \times 18 \times 0.9613 \approx 199 \approx 199$ m² 3. Apply the cosine rule to find the third side c:\ $c^2 = 23^2 + 18^2 - 2 \times 23 \times 18 \times \cos 74° = 529 + 324 - 828 \times 0.2756 = 853 - 228.2 = 624.8$ 4. Take the square root:\ $c = \sqrt{(624.8)} \approx 25$ m

Answer: Area ≈ 199 m², third fence ≈ 25 m

Question 9

Key idea: The point at angle θ on the unit circle is (cos θ, sin θ); use reference angles for non-axis angles.

1. At 180° the point is (-1, 0), so cos 180° = -1 2. At 270° the point is (0, -1), so sin 270° = -1 3. 300° is in the fourth quadrant with reference angle 60°, and cosine is positive there, so cos 300° = cos 60° = ½

Answer: (a) -1 (b) -1 (c) ½

Question 10

Key idea: For y = asin x, the amplitude is |a| and the period is still 360°.

1. Amplitude = 4 2. Period = 360° (the x is not multiplied by anything) 3. The graph goes from -4 to 4, so the minimum is -4

Answer: (a) 4 (b) 360° (c) -4