Sine rule, cosine rule and area: 10 practice questions

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Name: _____ Date: _____

Attempt all questions and show your working. In every triangle ABC, side a is opposite angle A, side b is opposite angle B and side c is opposite angle C. Unless a question says otherwise, give lengths and areas correct to two decimal places and angles correct to two decimal places. Suggested time: 15 to 20 minutes.

Section A: Consolidating (Questions 1-4)

Question 1

In triangle ABC, A = 40°, B = 60° and a = 10 cm.

(a) Find C.

(b) Use the sine rule to find b.

Question 2

In triangle ABC, b = 5 cm, c = 8 cm and A = 60°. Use the cosine rule to find the exact value of a.

Question 3

Find the area of a triangle with two sides of 10 cm and 12 cm and an included angle of 30°.

Question 4

A triangle has sides 3 cm, 5 cm and 7 cm. Find the size of its largest angle.

Section B: Standard (Questions 5-10)

Question 5

In triangle ABC, a = 8 cm, b = 12 cm and A = 30°. Find the two possible values of B.

Question 6

In triangle ABC, A = 30° and c = 10 cm. For each value of a below, state whether there are no triangles, exactly one triangle or two triangles. Give a reason.

(a) a = 4 cm

(b) a = 5 cm

(c) a = 7 cm

(d) a = 12 cm

Question 7

In triangle ABC, the perpendicular from C meets side AB at D, with A and B both acute.

(a) Write the height CD in terms of b and A, and also in terms of a and B.

(b) Hence show that (a)/(sin A) = (b)/(sin B).

(c) Show that the area of the triangle is ½bc sin A.

Question 8

A yacht sails 12 km from a marina on a bearing of 050°, then turns and sails 20 km on a bearing of 170°.

(a) Show that the angle at the turning point, between the two legs of the trip, is 60°.

(b) Find the yacht's distance from the marina.

Question 9

A triangular paddock has two sides of 120 m and 150 m, with an angle of 75° between them.

(a) Find the area of the paddock in square metres, correct to the nearest square metre.

(b) Convert your answer to hectares, correct to two decimal places (1 ha = 10,000 m²).

Question 10

A triangle has sides 7 cm, 8 cm and 13 cm.

(a) Show that the largest angle is exactly 120°.

(b) Find the other two angles.

Sine rule, cosine rule and area: answers

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Question 1

Answer: (a) 80° (b) 13.47 cm ((10 sin 60°)/(sin 40°))

Question 2

Answer: 7 cm ($a^2 = 25 + 64 - 2 \times 5 \times 8 \times ½ = 49$)

Question 3

Answer: 30 cm^2 (½ × 10 × 12 × sin 30°)

Question 4

Answer: 120° ($\cos \theta = (9 + 25 - 49)/(30) = -½$)

Question 5

Answer: B = 48.59° or B = 131.41° ($\sin B = (12 \sin 30°)/(8) = 0.75$)

Question 6

Answer: The height from B is c sin A = 5 cm. (a) None (4 < 5, a is too short to reach) (b) Exactly one (right-angled triangle, a equals the height) (c) Two (5 < 7 < 10) (d) Exactly one (12 ≥ 10, so the obtuse case is impossible)

Question 7

Answer: (a) CD = b sin A and CD = a sin B (b) b sin A = a sin B, divide both sides by sin A sin B (c) Area = ½ × AB × CD = ½ c × b sin A = ½bc sin A

Question 8

Answer: (a) The bearing back to the marina from the turning point is 230°, and 230° - 170° = 60° (b) 17.44 km (√(144 + 400 - 480 cos 60°) = √(304))

Question 9

Answer: (a) 8693 m^2 (½ × 120 × 150 × sin 75°) (b) 0.87 ha

Question 10

Answer: (a) $\cos \theta = (49 + 64 - 169)/(2 \times 7 \times 8) = -56/112 = -½$, so θ = 120° (b) 27.80° (opposite the 7 cm side) and 32.20° (opposite the 8 cm side)