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ANSWER BOOK

Triangles and the sine and cosine rules

Trigonometry · Year 12–13

7 questions · 20 marks

NAVY EDITION

SECTION A · Warm-up

A1 The known opposite pair is a and A, so the sine rule gives b = 10 sin 80°/sin 35° = 17.2 cm. The bigger angle faces the bigger side, which the answer respects: a built-in sanity check. [2]

A2 Area = ½ × 8 × 11 × sin 30° = 44 × ½ = 22 cm^2. The angle in the formula must be the one squeezed between the two sides used. [2]

SECTION B · Standard

B1 Cosine rule: a^2 = 36 + 81 − 2 × 6 × 9 × cos 40° = 117 − 82.73… = 34.27…, so a = 5.85 cm. Keeping a^2 exact until the final square root avoids rounding damage. [3]

B2 The largest angle faces the 7 cm side. Rearranged cosine rule: cos A = (25 + 36 − 49)/(2 × 5 × 6) = 12/60 = 0.2, so A = 78.5°. A positive cosine means the angle is acute: even the biggest angle of this triangle is under 90°. [3]

B3 B = 180° − 50° − 60° = 70°. With the opposite pair a and A: b = 12 sin 70°/sin 50° = 14.7 cm and c = 12 sin 60°/sin 50° = 13.6 cm. The largest side, b, faces the largest angle, B, as it must. [4]

SECTION C · Stretch

C1 Sine rule: sin B = 9 sin 40°/7 = 0.8264…, so B = 55.7° or its supplement 124.3°. Both must be tested against the angle sum: 40° + 124.3° = 164.3° < 180°, so the obtuse option also leaves room for C. Two triangles exist: sine cannot tell an angle from its supplement, and only the angle sum can referee. [3]

C2 Cosine rule with cos 60° = ½: a^2 = 16 + 36 − 48 × ½ = 28, so a = √28 = 2√7 cm. Area = ½ × 4 × 6 × sin 60° = 12 × √3/2 = 6√3 cm^2. The 60° angle is what makes exact work possible: its sine and cosine are both on the exact-value list. [3]