

Acute Triangle Trigonometry Review

Answer key Final answers only. Try first, then check.

CORE SKILLS

- K1** a) $b \approx 14.4$ cm
b) $QR \approx 11.9$ cm (using $\angle R = 69^\circ$)
c) $x \approx 20.5$ m
- K2** a) $\angle B \approx 47.3^\circ$
b) $\angle C \approx 68.7^\circ$
c) $c \approx 11.4$ cm
- K3** a) $f \approx 8.1$ cm
b) $x \approx 12.7$ cm
c) $z = 15$ (the term $2xy \cos 90^\circ$ is 0)
- K4** a) $\angle C \approx 83.3^\circ$
b) $\angle A \approx 44.0^\circ$
c) $\cos C = \frac{1}{5}$
- K5** a) 1: AAS, sine law. 2: SAS, cosine law. 3: SSS, cosine law. 4: SSA, sine law (a and $\angle A$ are a side with its opposite angle).
b) $c \approx 7.7$ cm
c) $\angle B \approx 51.5^\circ$

REAL WORLD

- A1** a) $\angle TPQ = 70^\circ$
b) $TQ \approx 13.8$ km; bearing $\approx 258^\circ$ (Q lies on a bearing of about 078° from T)
c) It is wrong: after legs of 14 km and 9 km the boat is at most $14 + 9 = 23$ km from the harbour. The cosine law would need $\cos \theta = \frac{14^2 + 9^2 - 25^2}{2(14)(9)} \approx -1.38$, and no angle has that cosine.
- A2** a) ≈ 198.7 m²
b) ≈ 22.9 m; about \$332.70
c) No: the area is $\frac{1}{2}(18)(25) \sin \theta = 225 \sin \theta$, and $\sin \theta \leq 1$, so the largest possible area is 225 m² (at 90°). $\sin \theta = \frac{250}{225} \approx 1.11$ has no solution.
- A3** a) $10 \sin 60^\circ \approx 8.7$ km
b) $12^2 = x^2 + 10^2 - 2(10)(x) \cos 60^\circ$, so $x^2 - 10x - 44 = 0$; $x = 5 \pm \sqrt{69}$, so $x \approx 13.3$ or $x \approx -3.3$
c) $x \approx 13.3$ km. The other solution, -3.3 , is a point 3.3 km west of J , where there is no highway. Signal from J to about 13.3 km: $0 \leq x \leq 13.3$.

THINK IT THROUGH

- T1** a) The sum of two sides is greater than the third: $c + 7 > 9$, so $c > 2$ cm.
b) The student subtracted $130 - 126$ before multiplying by $\cos 52^\circ$. $c^2 = 130 - 126 \cos 52^\circ \approx 52.43$, so $c \approx 7.2$ cm.
c) Only for $C = 90^\circ$, where $\cos C = 0$. For $C = 52^\circ$, $\cos C > 0$, so the positive amount $2ab \cos C$ is subtracted: $c^2 < a^2 + b^2$, so $c < 11.4$ cm.
- T2** a) e.g. angles $35^\circ, 70^\circ, 75^\circ$: $\frac{\sin 70^\circ}{\sin 35^\circ} \approx 1.64$, not 2. Sides are proportional to the sines of the opposite angles, not to the angles.
b) Any $b > \frac{6}{\sin 40^\circ} \approx 9.3$ cm, e.g. $b = 10$ cm: $\sin B = \frac{10 \sin 40^\circ}{6} \approx 1.07$, and no angle has a sine greater than 1.
c) e.g. 5, 7, 8: $5^2 + 8^2 - 2(5)(8) \cos 60^\circ = 89 - 40 = 49 = 7^2$, so the angle opposite 7 is 60° (another: 8, 13, 15).

BOSS LEVEL

Boss a) $BC = 7$; area $= 10\sqrt{3} \approx 17.3$

b) $AD = \frac{40\sqrt{3}}{13} \approx 5.33$

c) $BD = \frac{56}{13} \approx 4.31$, $DC = \frac{35}{13} \approx 2.69$; no ($BD : DC = 8 : 5 \neq AB : AC$)

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