Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- sine rule: $\dfrac{b}{\sin 65^\circ} = \dfrac{9}{\sin 40^\circ}$
- $b = \dfrac{9 \sin 65^\circ}{\sin 40^\circ}$

$$= 12.689\ldots = \mathbf{12.7}\text{ cm}$$

2.2

- cosine rule, since the angle lies between the two known sides
- $r^2 = 7^2 + 9^2 - 2(7)(9)\cos 52^\circ = 130 - 126\cos 52^\circ$
- $r^2 = 52.43\ldots$

$$r = \mathbf{7.24}\text{ cm}$$

- take the square root at the very end, never of the separate terms

2.3

- area $= \frac{1}{2} \times 10 \times 14 \times \sin 38^\circ$

$$= 43.096\ldots = \mathbf{43.1}\text{ cm}^2$$

2.4

- cosine rule for an angle: $\cos\theta = \dfrac{a^2 + b^2 - c^2}{2ab}$, with $c = 7$ opposite the angle
- $\cos\theta = \dfrac{5^2 + 8^2 - 7^2}{2 \times 5 \times 8} = \dfrac{40}{80} = 0.5$

$$\theta = \mathbf{60}^\circ$$

2.5

- area $= \frac{1}{2}ab\sin C$: $30 = \frac{1}{2} \times 8 \times 10 \times \sin C$, so $\sin C = 0.75$

$$C = \mathbf{48.6}^\circ$$

3.1

(a)

- the angle is between the two known sides, so use the cosine rule
- $AC^2 = 8^2 + 11^2 - 2(8)(11)\cos 73^\circ = 185 - 176\cos 73^\circ$
- $AC^2 = 133.54\ldots$

$$AC = \mathbf{11.6}\text{ cm}$$

(b)

- area $= \frac{1}{2} \times 8 \times 11 \times \sin 73^\circ$

$$= 42.077\ldots = \mathbf{42.1}\text{ cm}^2$$

3.2

- sine rule: $\dfrac{\sin Y}{9.4} = \dfrac{\sin 35^\circ}{6.2}$
- $\sin Y = \dfrac{9.4 \sin 35^\circ}{6.2} = 0.8696\ldots$

$$Y = \mathbf{60.4}^\circ$$

- the obtuse solution $180 - 60.4 = 119.6^\circ$ also has this sine; the question asked for the acute value

3.3

- the longer diagonal is opposite the 120° angle: $d^2 = a^2 + b^2 - 2ab\cos C$
- $d^2 = 6^2 + 9^2 - 2 \times 6 \times 9 \times \cos 120^\circ = 117 + 54 = 171$

$$d = \sqrt{171} = 13.07\ldots = \mathbf{13.1}\text{ cm}$$

3.4

(a)

- at B the bearing back to A is $040^\circ + 180^\circ = 220^\circ$, so angle $ABC = 220^\circ - 160^\circ = 60^\circ$

(b)

- cosine rule: $AC^2 = AB^2 + BC^2 - 2 \times AB \times BC \times \cos B$
- $AC^2 = 12^2 + 15^2 - 2 \times 12 \times 15 \times \cos 60^\circ = 369 - 180 = 189$

$$AC = \sqrt{189} = 13.74\ldots = \mathbf{13.7}\text{ km}$$

3.5

(a)

- BC is opposite angle A, and AB is opposite angle C; sine rule: $\dfrac{BC}{\sin A} = \dfrac{AB}{\sin C}$
- $BC = \dfrac{10 \sin 50^\circ}{\sin 70^\circ}$

$$BC = 8.152\ldots = \mathbf{8.15}\text{ cm}$$

(b)

- angle $B = 180^\circ - 50^\circ - 70^\circ = 60^\circ$, the angle between AB and BC
- area $= \frac{1}{2} \times AB \times BC \times \sin B = \frac{1}{2} \times 10 \times 8.152 \times \sin 60^\circ = 35.29\ldots = \mathbf{35.3}\text{ cm}^2$