Cosine rule

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Two sides are 8 m and 11 m and their included angle is 50°. Find the third side to one decimal place. [2 marks]

$c^2 = 8^2 + 11^2 - 2 \times 8 \times 11 \cos 50^\circ$.

Take the positive square root.

Answer: 8.5 m

2. Find the angle opposite 13 in a triangle with sides 9, 10 and 13. Round to one decimal place. [2 marks]

$\cos C = \frac{81 + 100 - 169}{2 \times 9 \times 10}$.

$C = \cos^{-1}\left(\frac{12}{180}\right)$.

Answer: 86.2°

3. Sides of 12 cm and 17 cm enclose 40°. Find the opposite side to one decimal place. [2 marks]

$c^2 = 144 + 289 - 408 \cos 40^\circ$.

Take the positive square root.

Answer: 11.0 cm

4. Use cosine rule to show that sides 8, 15 and 17 form a right triangle. [3 marks]

$\cos C = \frac{64 + 225 - 289}{2 \times 8 \times 15} = 0.$

Thus $C = 90^\circ$.

Answer: The angle opposite 17 is 90°.

5. Could sides 4 cm, 5 cm and 12 cm form a triangle? Explain before calculating an angle. [3 marks]

$4 + 5 = 9 < 12.$

The two shorter sides cannot close a triangle around the longest side.

Answer: No.

6. For $a = 6$, $b = 9$, $C = 110^\circ$, a student adds $2ab\cos C$ instead of subtracting it. Correct the rule and find c. [3 marks]

Cosine rule subtracts $2ab\cos C$.

$\cos 110^\circ$ is negative, so subtracting this term increases c^2.

Answer: $c^2 = 117 - 108\cos 110^\circ$; $c \approx 12.4\,\text{units}$.