Sine Cosine Rule

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

In triangle ABC, angle A = 35°, angle B = 85° and b = 12 cm. Find a.

Step 1 · A matching pair (B and b) → sine rule

$a/\sin 35° = 12/\sin 85°$

Step 2 · Rearrange

$a = 12 \sin 35° \div \sin 85° = 6.909…$

Answer: 6.91 cm

Check: a is opposite the smaller angle, so it is shorter than b ✓

2. Now try one with the steps

a = 9 cm, b = 5 cm and the angle between them C = 70°. Find c.

Step 1 · Two sides and the included angle → cosine rule

Step 2 · Evaluate

Step 3 · Square root

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. When should you use the cosine rule instead of the sine rule? [1]

2. In triangle ABC, A = 40°, B = 60° and a = 8 cm. Find b, to 3 significant figures. [3]

3. Two sides of a triangle are 5 cm and 7 cm with an included angle of 60°. Find the third side, to 2 decimal places. [3]

4. A triangle has sides 6 cm, 8 cm and 9 cm. Find its largest angle, to 1 decimal place. [3]

5. In triangle PQR, p = 10, q = 7 and P = 80°. Find Q, to 1 decimal place. [3]

6. In triangle ABC, A = 50°, C = 70° and c = 12 cm. Find a, to 2 decimal places. [3]

7. Two sides are 7 cm and 10 cm with an included angle of 120°. Find the third side, to 1 decimal place. [3]

8. A triangle has sides 4 cm, 5 cm and 6 cm. Find its smallest angle, to 1 decimal place. [3]

9. In triangle ABC, a = 8 cm, b = 11 cm and A = 40°. Find the acute value of B, to 1 decimal place. [3]

10. For question 9, give the other possible (obtuse) value of B, to 1 decimal place. [1]

11. A ship sails 12 km on a bearing of 040° and then 9 km on a bearing of 100°. The angle between the two legs at the turn is 120°. How far is it from its start, to 2 decimal places? [4]

12. A triangle has sides 13 cm, 14 cm and 15 cm. Find the angle opposite the 14 cm side, to 1 decimal place. [3]

13. In triangle ABC, A = 30°, a = 5 cm and b = 8 cm. How many different triangles are possible? [2]

14. In triangle PQR, PQ = 9 cm, QR = 12 cm and angle PQR = 48°. Find PR, to 2 decimal places. [3]

15. A parallelogram has sides 6 cm and 10 cm, with an angle of 70° between them. Find the length of the longer diagonal, to 1 decimal place. [4]

4. Before you hand it in

Using the sine rule with two sides and the included angle

Two sides and the angle BETWEEN them → cosine rule for the third side.

$c^2 = 49 + 100 - 140 \cos 120°$ worked out as $149 - 70$

$-140 \times (-0.5) = +70$, so $c^2 = 219$. Obtuse angles make the third side LONGER.

Working out $(b^2 + c^2 - 2bc) \cos A$

Only the 2bc term is multiplied by cos A. Type it^2 + c^2 – 2 × b × c × cos(A).

Taking only the acute answer from sin B = 0.8 when an obtuse angle also fits

sin(180° − B) = sin B. Check whether 180° − B also leaves room for angle A.