Your notes

GCSE Maths: revision notes

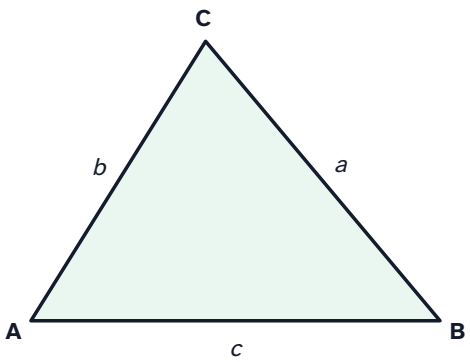
Sine and cosine rules

Contents

1. Labelling
2. The sine rule
3. The cosine rule
4. Area of a triangle
5. Worked examples
6. Key terms
7. Quick questions
8. What to do next

Labelling

- Label the sides a, b and c, and the angles opposite them A, B and C. Side a is opposite angle A.
- These rules work in any triangle, not just right-angled ones.



The sine rule

- $a/\sin A = b/\sin B = c/\sin C$. Use it when you know a side and the angle opposite it.
- If A = 40°, B = 65° and a = 8 cm, then b = 8 × sin 65° ÷ sin 40° = 11.3 cm.
- To find an angle, flip it: $\sin A/a = \sin B/b$.

The cosine rule

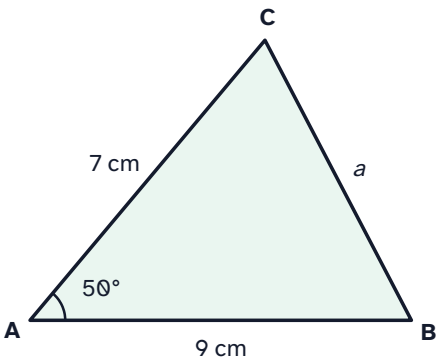
- $a^2 = b^2 + c^2 - 2bc \cos A$. Use it when you know two sides and the angle between them, or all three sides.
- If b = 7 cm, c = 9 cm and A = 50°, then $a^2 = 49 + 81 - 126 \times \cos 50° = 49.01$, so a = 7.0 cm.
- To find an angle: $\cos A = (b^2 + c^2 - a^2) \div 2bc$.

Area of a triangle

- Area = ½ab sin C, using two sides and the angle between them.
- Sides of 6 cm and 10 cm with an angle of 30° between them: area = ½ × 6 × 10 × sin 30° = 15 cm².

Worked examples

In triangle ABC, b = 7 cm, c = 9 cm and angle A = 50°. Find a to 1 decimal place.



You have two sides and the angle between them, so use the cosine rule. **$a^2 = b^2 + c^2 - 2bc \cos A$**

Put the numbers in. **$a^2 = 49 + 81 - 2 \times 7 \times 9 \times \cos 50°$**

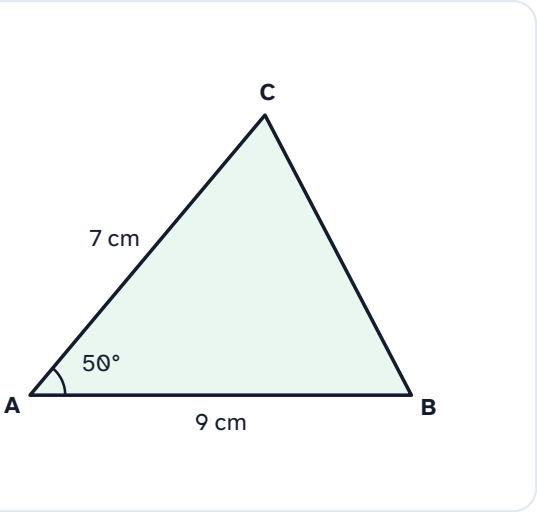
Work it out. **$a^2 = 130 - 80.991... = 49.008...$**

Square root. **$a = 7.0006...$**

Answer: a = 7.0 cm

Your notes

Find the area of the same triangle (b = 7 cm, c = 9 cm, A = 50°) to 1 decimal place.



Use area = ½bc sin A with the two sides and the angle between them. **½ × 7 × 9 × sin 50°**

Work it out. **31.5 × 0.76604… = 24.130…**

Answer: 24.1 cm²

Key terms

Sine rule	a/sin A = b/sin B = c/sin C.
Cosine rule	$a^2 = b^2 + c^2 - 2bc \cos A$.
Included angle	The angle between two given sides.
Opposite side	The side facing an angle; side a is opposite angle A.
Area formula	Area = ½ab sin C, for any triangle.

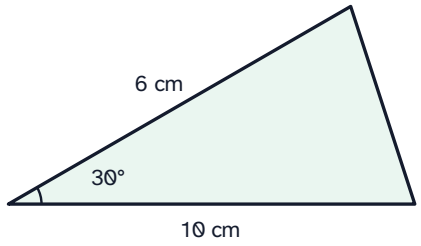
Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

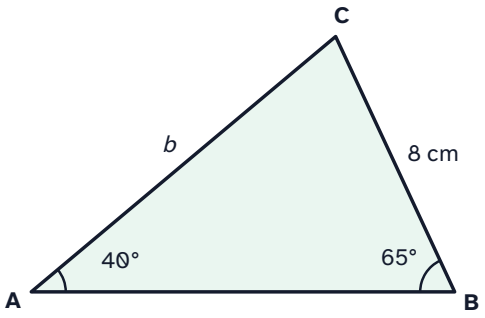
1. When should you use the sine rule?
2. When should you use the cosine rule to find a side?
3. Which is the cosine rule?
4. Which is the sine rule?

Your notes

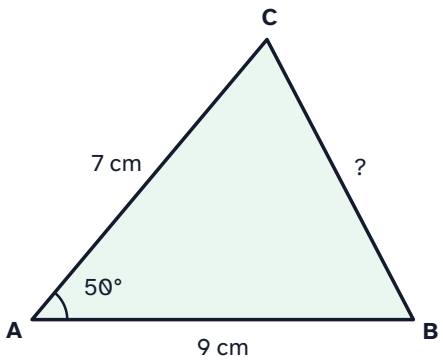
5. What is the area of a triangle with sides of 6 cm and 10 cm and an angle of 30° between them?



6. What is the formula for the area of a triangle using an angle?
7. A = 40°, B = 65° and a = 8 cm. What is b, to 1 d.p.?



8. b = 7 cm, c = 9 cm and A = 50°. What is a, to 1 d.p.?



Answers

1. When you know a side and the angle opposite it
2. When you know two sides and the angle between them
3. $a^2 = b^2 + c^2 - 2bc \cos A$
4. $a/\sin A = b/\sin B$
5. 15 cm^2

Your notes

6. ½ab sin C
7. 11.3 cm
8. 7.0 cm

What to do next

Practise 12 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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