

Area of Triangle Sine

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

Name _____ Class _____ Date _____

1. Worked example

Find the area of a triangle with sides 7 cm and 9 cm and an included angle of 40° .

Step 1 · Substitute

$$\frac{1}{2} \times 7 \times 9 \times \sin 40^\circ$$

Step 2 · Evaluate

$$31.5 \times 0.6427... = 20.24...$$

Answer: 20.2 cm^2 (3 s.f.)

Check: Height = $9 \sin 40^\circ = 5.79$, and $\frac{1}{2} \times 7 \times 5.79 = 20.2$ ✓

2. Now try one with the steps

A triangle has sides 8 cm and 10 cm and area 30 cm^2 . Find the included angle, given that it is acute.

Step 1 · $30 = \frac{1}{2} \times 8 \times 10 \times \sin C$

Step 2 · Rearrange

Step 3 · Inverse sine

Answer:

3. Practice

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

- 1.** Find the area of a triangle with sides 5 cm and 6 cm and an included angle of 30° . [2]

- 2.** Find the area of a triangle with sides 10 cm and 12 cm and an included angle of 90° . [1]

- 3.** Find the area of a triangle with sides 8 cm and 11 cm and an included angle of 55° , to 1 decimal place. [2]

4. Find the area of a triangle with sides 4.5 cm and 7.2 cm and an included angle of 120° , to 1 decimal place. [2]

5. Find the exact area of an equilateral triangle with side 9 cm. [2]

6. A parallelogram has sides 6 cm and 10 cm with an angle of 50° between them. Find its area, to 1 decimal place. [2]

7. A triangle has sides 5 cm and 10 cm and area 20 cm^2 . Find the included angle, given that it is acute, to 1 decimal place. [3]

8. A triangle has area 24 cm^2 , one side 8 cm, and an angle of 30° between that side and side x . Find x , in cm. [3]

9. In question 7, what other angle (obtuse) would give the same area? Give it to 1 decimal place. [1]

10. Find the exact area of a regular hexagon with side 4 cm. [3]

11. Find the area of the segment of a circle of radius 8 cm cut off by a chord that subtends 90° at the centre, to 1 decimal place. [3]

12. Find the area of the segment of a circle of radius 6 cm cut off by a chord that subtends 120° at the centre, to 1 decimal place. [3]

13. A triangle has sides 7 cm and 8 cm, an acute included angle x and area 14 cm^2 . Find x . [2]

14. In triangle ABC, $AB = 12 \text{ cm}$, $AC = 15 \text{ cm}$ and the area is 45 cm^2 . Angle A is obtuse. Find angle A. [3]

15. A triangle has sides 5 cm, 6 cm and 7 cm. Use the cosine rule and then $\frac{1}{2}ab \sin C$ to find its area, to 1 decimal place. [4]

4. Before you hand it in

Area of a triangle with sides 7 and 9 and the angle opposite the 9 equal to 40° : $\frac{1}{2} \times 7 \times 9 \times \sin 40^\circ$

C must be the INCLUDED angle. If it is not, find the included angle first (often with the sine rule or angle sum).

Area = $7 \times 9 \times \sin 40^\circ$

It is half of base $\times$ height: $\frac{1}{2}ab \sin C$.

$\sin C = 0.5$, so $C = 30^\circ$ (when the diagram shows an obtuse angle)

$\sin 150^\circ = \sin 30^\circ$ too. Check the diagram or wording: an obtuse angle means $C = 150^\circ$.

Segment area = sector area

A segment is the sector MINUS the triangle formed by the two radii and the chord.