

Area of a triangle

To find the area of any triangle you need the length of two sides and the size of the angle between them.

Formula. This formula is given on the National 5 Mathematics exam paper.

Area of a Triangle:

$$A = \frac{1}{2}ab \sin C$$

Important: in the formula, a and b mean the lengths, and C means the angle. It is possible that you may be given a diagram where different letters are used. You have to ignore these letters and relabel the two sides a and b (order does not matter) and the angle in between them as C .

Example

Find the area of this triangle. Round your answer to 3 significant figures.

Solution

a and b are the lengths, so we use $a = 8$, $b = 12$

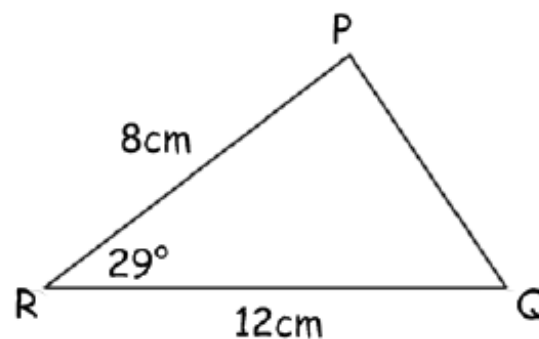
C is the angle between the lengths, so $C = 29^\circ$

$$A = \frac{1}{2}ab \sin C$$

$$A = 8 \times 12 \times \sin 29^\circ \div 2$$

$$A = 23.27086177...$$

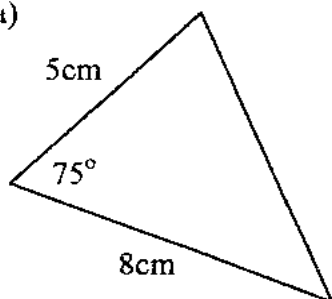
$$A = 23.3 \text{ cm}^2 \text{ (3 s.f.)}$$



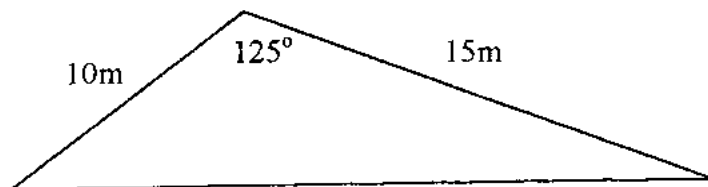
Exercise 1

1. Use trigonometry to calculate the area of each triangle below.

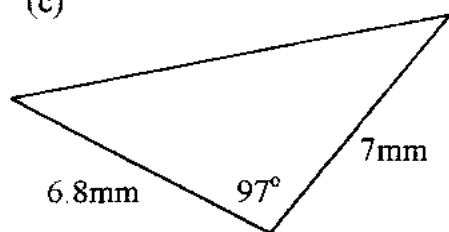
(a)



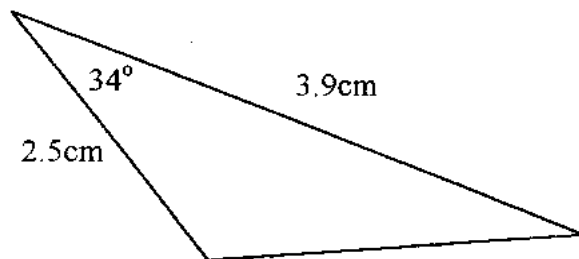
(b)



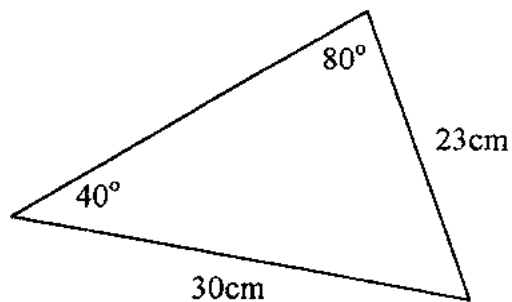
(c)



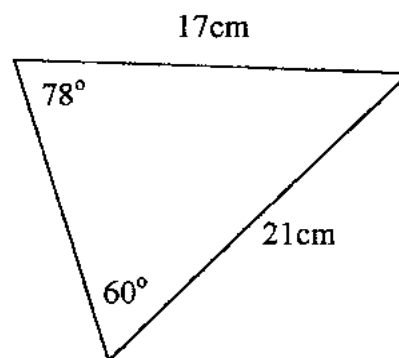
(d)



(e)

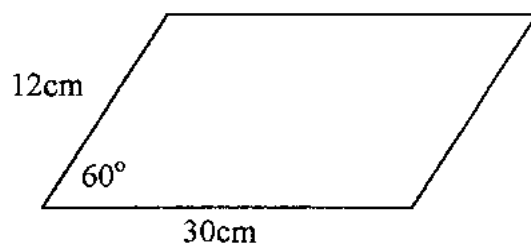


(f)

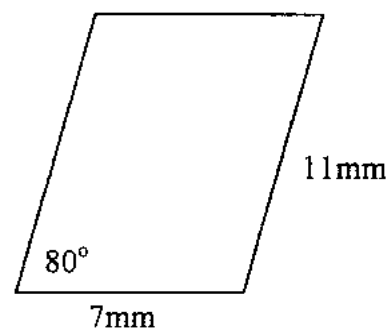


2. Calculate the area of each parallelogram below.

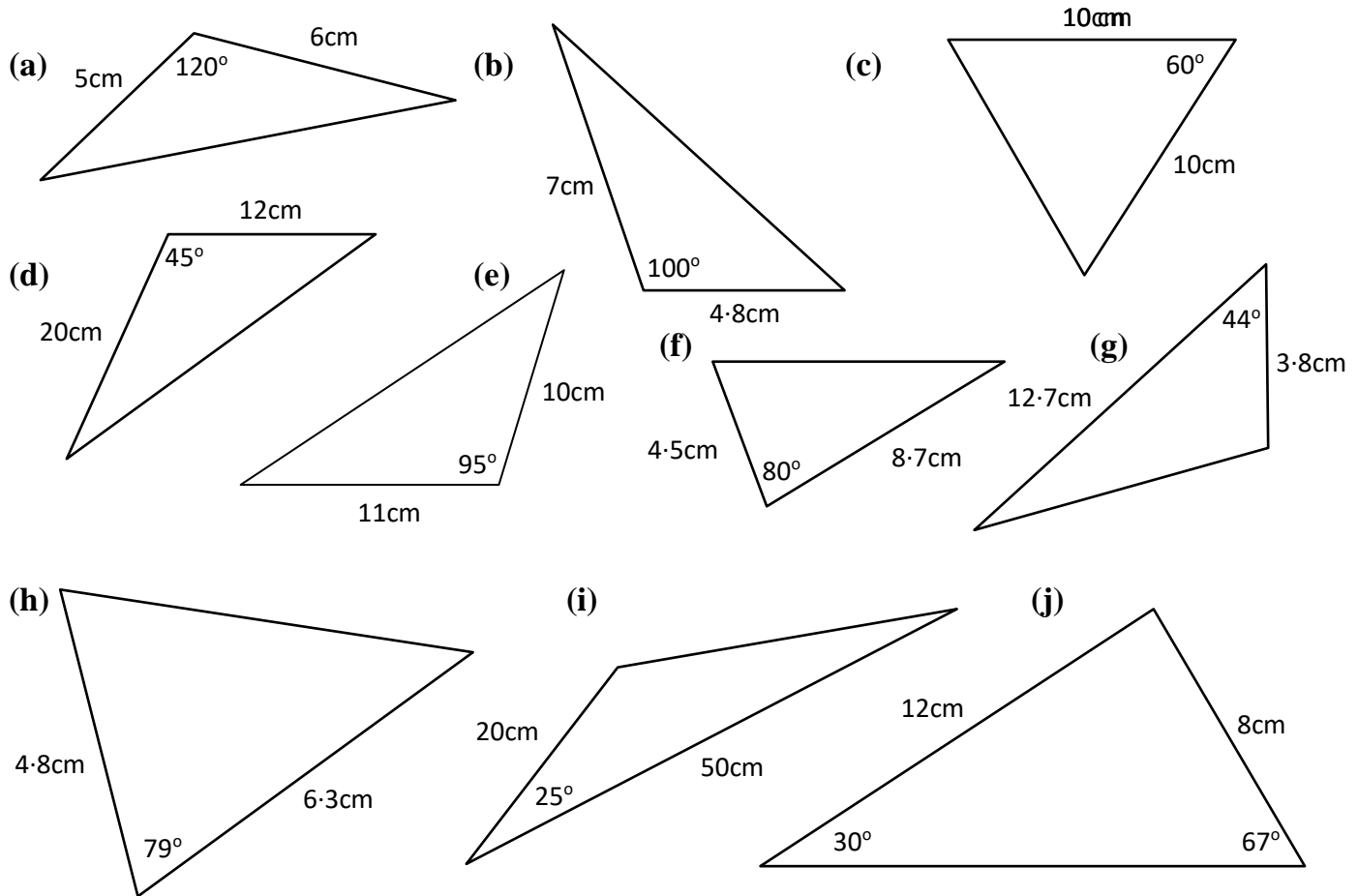
(a)



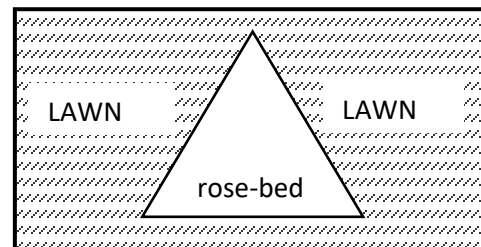
(b)



3. Find the area of the following triangles :

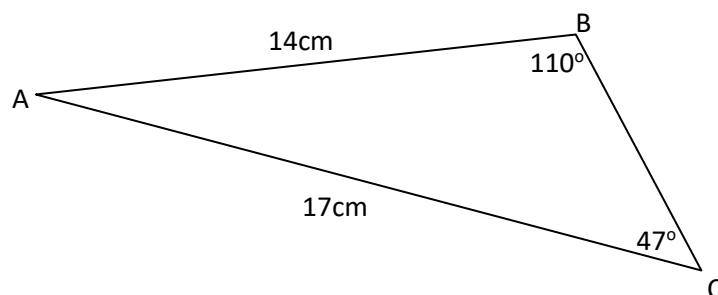


4. Mr. Fields is planting a rose-bed in his garden.
It is to be in the shape of an **equilateral** triangle of side 2m.

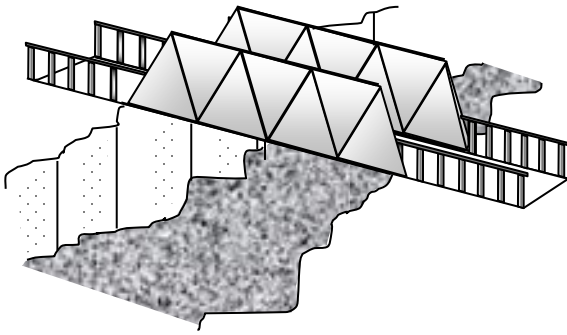


What area of lawn will he need to remove to plant his rose-bed?

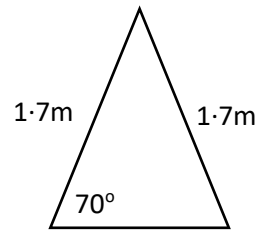
5. Calculate the area of triangle ABC where $AB = 14\text{cm}$, $AC = 17\text{cm}$, $\angle ABC = 110^\circ$ and $\angle BCA = 47^\circ$.



6. For safety reasons the sides of a footbridge are to be covered with triangular panels.

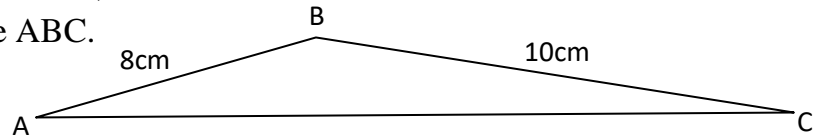


Each panel is an isosceles triangle as shown.

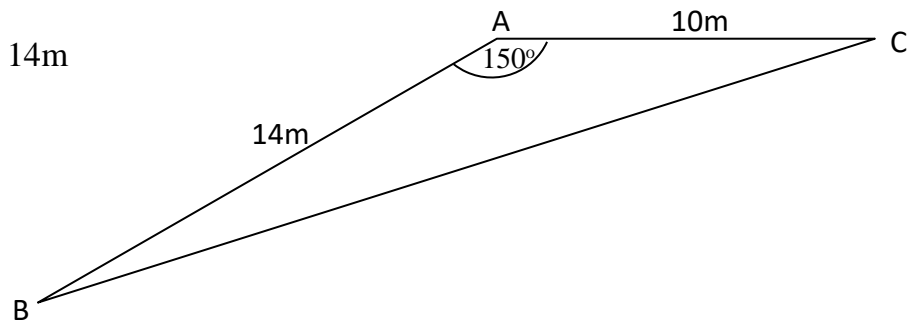


- a) Find the area of each panel.
- b) If there are 7 panels on each side of the bridge, find the total area of material required to cover the bridge.

7. Given that the area of this triangle is 20cm^2 , calculate the size of the **obtuse** angle ABC.

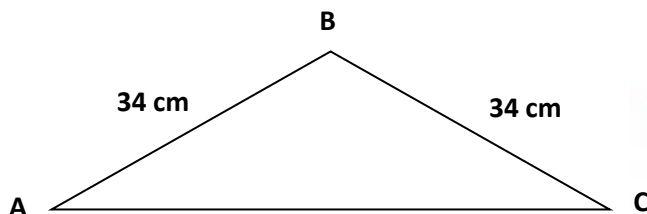


8. In triangle ABC, $AB = 14\text{m}$
and $AC = 10\text{m}$.
Angle $BAC = 150^\circ$.



Given that $\sin 150^\circ = 0.5$, calculate the area of triangle ABC.

9. The area of a triangular flag is 429.5cm^2 .
Calculate the size of the obtuse angle ABC.



10. Calculate the area of the triangle with sides measuring 12 cm, 14 cm and 20 cm.

Answers

Exercise 1

- 1.** **a)** 19.3cm^2 **(b)** 61.4m^2 **(c)** 23.6mm^2
 d) 2.7cm^2 **(e)** 298.8cm^2 **(f)** 119.4cm
- 2.** **a)** 311.8cm^2 **(b)** 75.8cm^2
- 3.** **a)** 13 cm^2 **(b)** 16.5 cm^2 **(c)** 43.3 cm^2 **(d)** 84.9 cm^2
 e) 54.8 cm^2 **(f)** 19.3 cm^2 **(g)** 16.8 cm^2 **(h)** 14.8 cm^2
 i) 211.3 cm^2 **(j)** 47.6 cm^2
- 4.** 1.7 m^2
- 5.** 46.5cm^2
- 6.** **a)** 0.93 m^2 **(b)** 13 m^2
- 7.** 150°
- 8.** 35m^2
- 9.** 132°
- 10.** 82.6cm^2