



- 1 In triangle ABC, AB = 6 cm, AC = 9 cm and angle BAC = 40° .

Work out the area of the triangle. Give your answer correct to 3 significant figures.

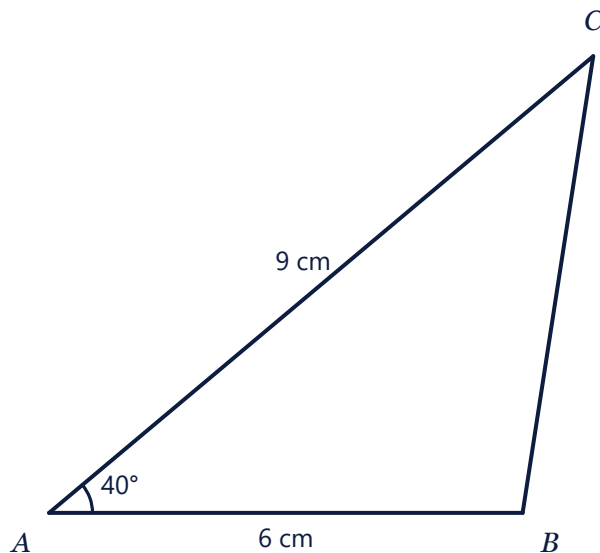


Diagram NOT accurately drawn

(2 marks)

Area is half $\times$ base $\times$ perpendicular height. If the sides around the given angle are a and b , the height relative to base a is $b \sin(\text{angle})$, so area = half $\times a \times b \times \sin(\text{angle})$. Use your calculator in degree mode

Area = $\frac{1}{2} ab \sin C$ with the two sides that enclose the given angle

$$\text{Area} = \frac{1}{2} \times 6 \times 9 \times \sin 40^\circ$$

$$\text{Area} = 27 \times 0.64279... = 17.355..$$

$$\text{Area} = 17.4 \text{ cm}^2 \text{ (3 sf)}$$

$$\boxed{17.4 \text{ cm}^2}$$

2

In triangle PQR, PQ = 8 cm, PR = 11 cm and angle QPR = 52° .

Calculate the area of the triangle. Give your answer correct to 3 significant figures.

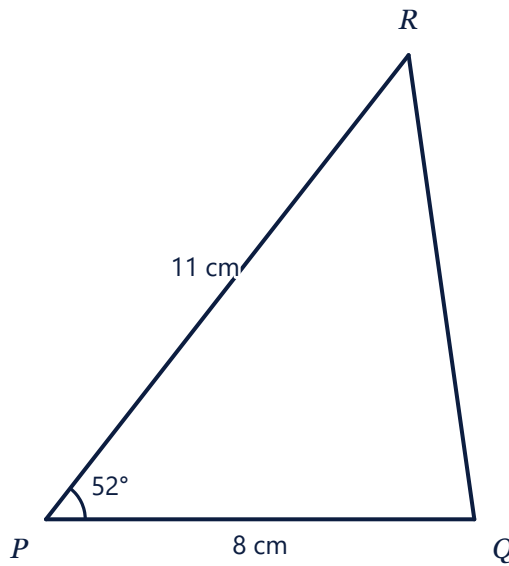


Diagram NOT accurately drawn

(2 marks)

Area is $\frac{1}{2} \times \text{base} \times \text{perpendicular height}$. If the sides around the given angle are a and b , the height relative to base a is $b \sin(\text{angle})$, so area = $\frac{1}{2} \times a \times b \times \sin(\text{angle})$. Use your calculator in degree mode

$$\text{Area} = \frac{1}{2} \times 8 \times 11 \times \sin 52^\circ$$

$$\text{Area} = 44 \times 0.78801... = 34.672..$$

$$\text{Area} = 34.7 \text{ cm}^2 \text{ (3 s.f.)}$$

$$\boxed{34.7 \text{ cm}^2}$$

3

ABCD is a parallelogram. AB = 12 cm, AD = 7.5 cm and angle DAB = 65° .

Calculate the area of the parallelogram. Give your answer correct to 3 significant figures.

(2 marks)

Parallelogram = 2 identical triangles

$$\text{Area} = 2 \times \frac{1}{2} \times 12 \times 7.5 \times \sin 65^\circ$$

$$\text{Area} = 12 \times 7.5 \times \sin 65^\circ$$

$$\text{Area} = 81.568...$$

$$\boxed{81.6 \text{ cm}^2}$$

4

In triangle DEF, DE = 9.4 cm, DF = 12.6 cm and angle EDF = 105° .

Calculate the area of the triangle. Give your answer correct to 3 significant figures.

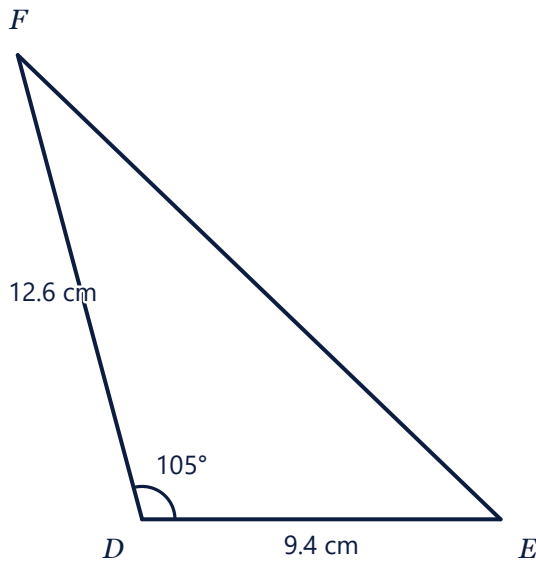


Diagram NOT accurately drawn

(2 marks)

Area is half $\times$ base $\times$ perpendicular height. If the sides around the given angle are a and b , the height relative to base a is $b \sin(\text{angle})$, so area = half $\times a \times b \times \sin(\text{angle})$. Use your calculator in degree mode

The formula $\text{Area} = \frac{1}{2}ab \sin C$ also works for obtuse angles

$$\text{Area} = \frac{1}{2} \times 9.4 \times 12.6 \times \sin 105^\circ$$

$$\text{Area} = 59.22 \times 0.96592... = 57.202..$$

$$\text{Area} = 57.2 \text{ cm}^2 \text{ (3 sf)}$$

57.2 cm^2

5

In triangle ABC, $AB = 9$ cm and $AC = 8$ cm.

The area of the triangle is 30 cm^2 .

Angle BAC is acute.

Work out the size of angle BAC. Give your answer correct to 1 decimal place.

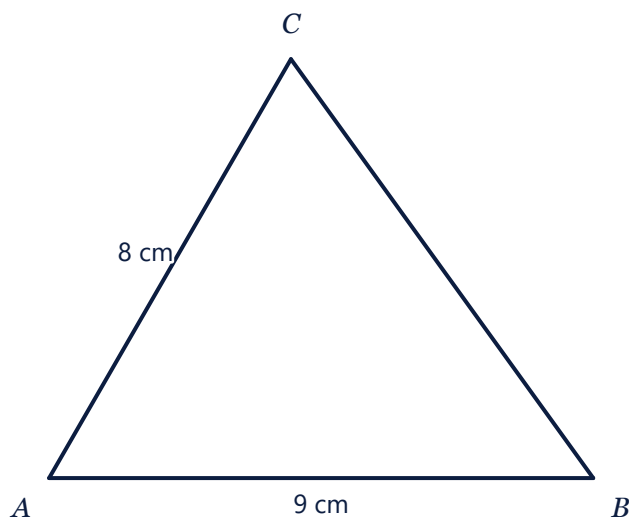


Diagram NOT accurately drawn

(3 marks)

$$\text{Area} = \frac{1}{2} \times 9 \times 8 \times \sin A = 36 \sin A$$

$$36 \sin A = 30, \text{ so } \sin A = \frac{30}{36} = 0.8333\ldots$$

$$A = \sin^{-1}(0.8333\ldots) = 56.442\ldots^\circ$$

$$\text{Angle BAC} = 56.4^\circ \text{ (1 dp)}$$

$$\boxed{56.4^\circ}$$

6 In triangle PQR, PQ = 10 cm and PR = 12 cm.

The area of the triangle is 45 cm^2 .

Angle QPR is obtuse.

Work out the size of angle QPR. Give your answer correct to 1 decimal place.

(3 marks)

$$45 = \frac{1}{2} \times 10 \times 12 \times \sin P$$

$$45 = 60 \sin P$$

$$\sin P = \frac{45}{60} = 0.75$$

$$\sin^{-1} 0.75 = 48.59...^\circ \text{ (acute)}$$

P is obtuse, so use $180^\circ - \text{acute angle}$

$$P = 180^\circ - 48.59...^\circ$$

$$\boxed{131.4^\circ}$$

7 In triangle XYZ, XY = 10 cm and angle YXZ = 35° .

The area of the triangle is 42 cm^2 .

Work out the length of XZ. Give your answer correct to 3 significant figures.

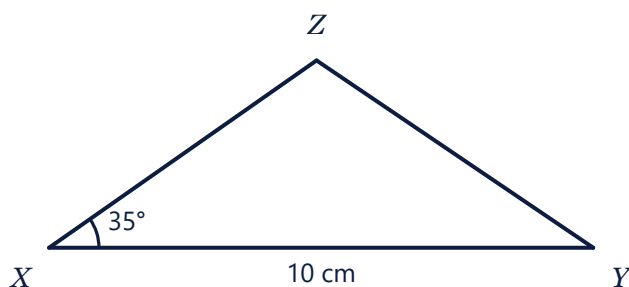


Diagram NOT accurately drawn

(3 marks)

$$\text{Area} = \frac{1}{2} \times 10 \times XZ \times \sin 35^\circ = 42$$

$$XZ = 84 \div (10 \times \sin 35^\circ) = 84 \div 5.7357..$$

$$XZ = 14.644..$$

$$XZ = 14.6 \text{ cm (3 sf)}$$

$$\boxed{14.6 \text{ cm}}$$

8

In triangle ABC, AB = 8 cm, BC = 12 cm and AC = 15 cm.

- Work out the size of angle ABC. Give your answer correct to 1 decimal place.
- Work out the area of the triangle. Give your answer correct to 3 significant figures.

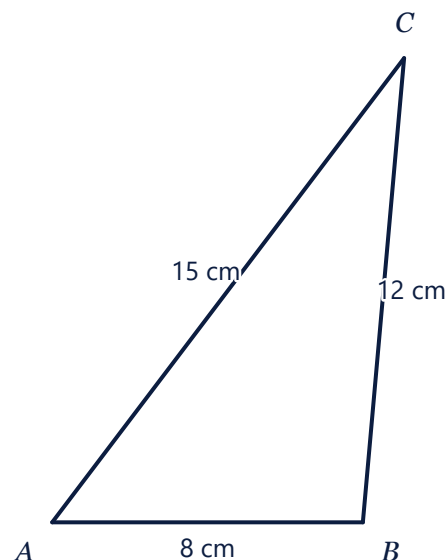


Diagram NOT accurately drawn

(5 marks)

a) Angle ABC is opposite AC. Cosine rule

$$\cos B = \frac{AB^2 + BC^2 - AC^2}{2 \times AB \times BC}$$

$$\cos B = \frac{64 + 144 - 225}{2 \times 8 \times 12} = -\frac{17}{192} = -0.08854..$$

$$B = \cos^{-1}(-0.08854...) = 95.079...^{\circ} = 95.1^{\circ} \text{ (1 dp)}$$

$$\text{b) Area} = \frac{1}{2} \times AB \times BC \times \sin B = \frac{1}{2} \times 8 \times 12 \times \sin 95.079...^{\circ}$$

$$\text{Area} = 48 \times 0.99607... = 47.811... = 47.8 \text{ cm}^2 \text{ (3 sf)}$$

9

A rectangle measures 9 cm by 4 cm.

A triangle has two sides of length 10 cm and 12 cm, with an acute angle of x° between them.

The area of the triangle is equal to the area of the rectangle.

Work out the value of x . Give your answer correct to 1 decimal place.

(4 marks)

$$\text{Area of the rectangle} = 9 \times 4 = 36 \text{ cm}^2$$

$$\text{Area of the triangle} = \frac{1}{2} \times 10 \times 12 \times \sin x^\circ = 60 \sin x^\circ$$

$$60 \sin x^\circ = 36, \text{ so } \sin x^\circ = 0.6$$

$$x = \sin^{-1}(0.6) = 36.869..$$

$$x = 36.9 \text{ (1 dp)}$$

36.9

10

A and B are points on a circle with centre O.

The circumference of the circle is 40 cm.

Angle AOB = 68° .

Calculate the area of triangle AOB. Give your answer correct to 3 significant figures.

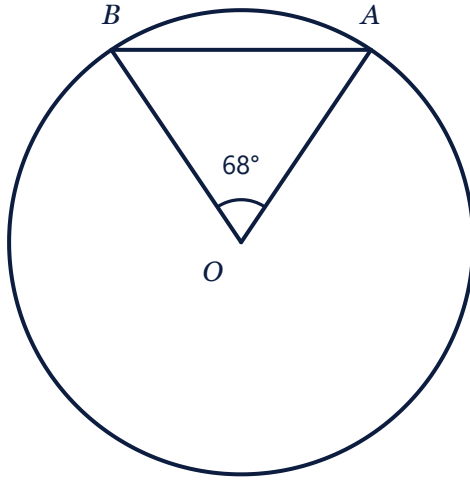


Diagram NOT accurately drawn

(4 marks)

$$\text{Circumference} = 2\pi r, \text{ so } r = 40 \div (2\pi) = 6.3661..$$

$$OA = OB = r, \text{ so Area} = \frac{1}{2} \times r \times r \times \sin 68^\circ$$

$$\text{Area} = \frac{1}{2} \times 6.3661...^2 \times 0.92718... = 18.788..$$

$$\text{Area} = 18.8 \text{ cm}^2 \text{ (3 sf)}$$

$$\boxed{18.8 \text{ cm}^2}$$

11

A and B are points on a circle with centre O and radius 10 cm. Angle AOB = 80° .

The chord AB cuts off a segment of the circle (the region between the chord AB and the minor arc AB).

Work out the area of this segment. Give your answer correct to 3 significant figures.

(4 marks)

Segment = sector - triangle

$$\text{Sector} = \frac{80}{360} \times \pi \times 10^2$$

$$\text{Sector} = 69.81\dots$$

$$\text{Triangle} = \frac{1}{2} \times 10 \times 10 \times \sin 80^\circ$$

$$\text{Triangle} = 49.24\dots$$

$$\text{Segment} = 69.81\dots - 49.24\dots$$

$$\boxed{20.6 \text{ cm}^2}$$

12

ABCDE is a regular pentagon with sides of length 9 cm.

Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

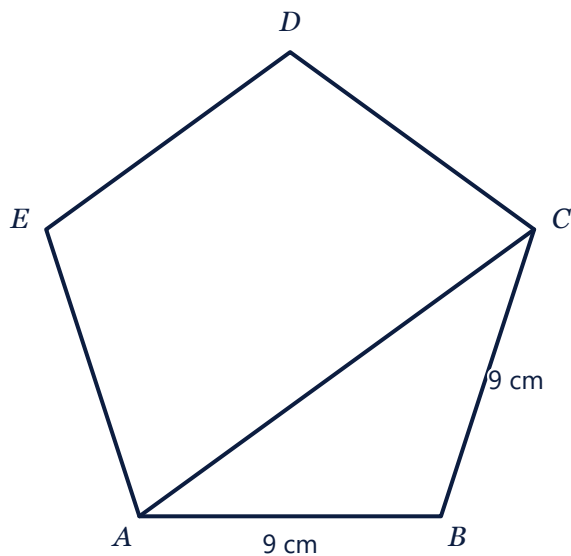


Diagram NOT accurately drawn

(4 marks)

Interior angle of a regular pentagon = $(5 - 2) \times 180^\circ \div 5 = 108^\circ$

In triangle ABC, $AB = BC = 9 \text{ cm}$ and angle $ABC = 108^\circ$

$$\text{Area} = \frac{1}{2} \times 9 \times 9 \times \sin 108^\circ$$

$$\text{Area} = 40.5 \times 0.95105... = 38.517..$$

$$\text{Area} = 38.5 \text{ cm}^2 \text{ (3 s.f.)}$$

38.5 cm^2

13

In triangle ABC, AB = 16 cm, angle BAC = 54° and angle ABC = 71° .

Work out the area of the triangle. Give your answer correct to 3 significant figures.

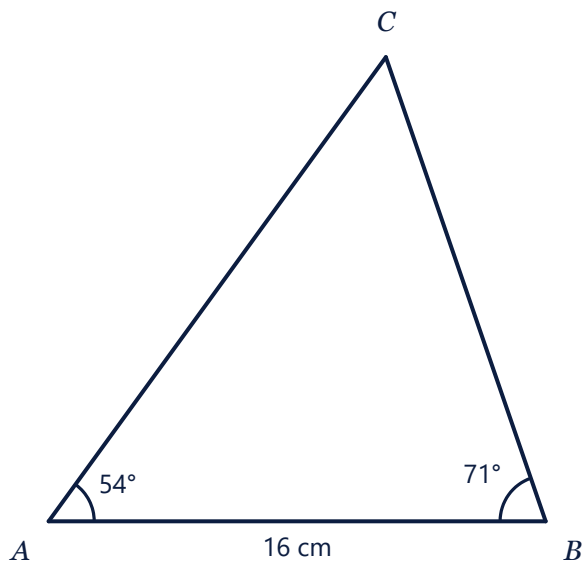


Diagram NOT accurately drawn

(5 marks)

$$\text{Angle } ACB = 180^\circ - 54^\circ - 71^\circ = 55^\circ$$

Use the sine rule to find BC

$$\frac{BC}{\sin A} = \frac{AB}{\sin C}$$

$$BC = 16 \times \sin 54^\circ \div \sin 55^\circ = 15.802..$$

$$\text{Area} = \frac{1}{2} \times AB \times BC \times \sin B = \frac{1}{2} \times 16 \times 15.802... \times \sin 71^\circ$$

$$\text{Area} = 119.52... = 120 \text{ cm}^2 \text{ (3 sf)}$$

$$\boxed{120 \text{ cm}^2}$$

14

ABCD is a quadrilateral. The diagonal BD splits it into two triangles.

In triangle ABD, AB = 9 cm, BD = 13 cm and angle ABD = 42° .

In triangle BCD, BC = 11 cm and angle DBC = 51° .

Work out the area of the quadrilateral ABCD. Give your answer correct to 3 significant figures.

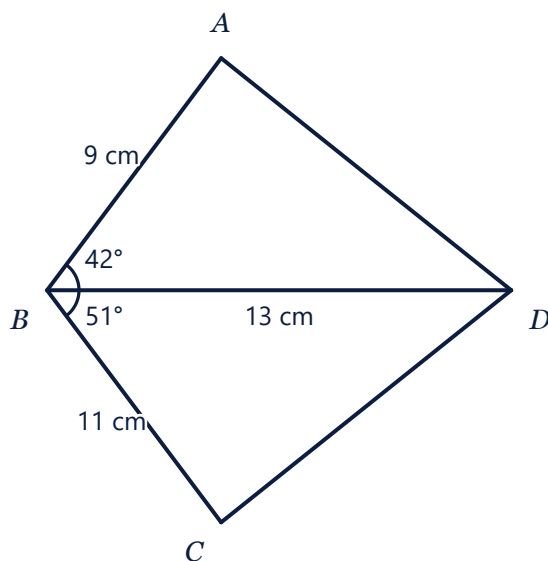


Diagram NOT accurately drawn

(5 marks)

$$\text{Area of triangle ABD} = \frac{1}{2} \times 9 \times 13 \times \sin 42^\circ = 39.144..$$

$$\text{Area of triangle BCD} = \frac{1}{2} \times 11 \times 13 \times \sin 51^\circ = 55.565..$$

$$\text{Total area} = 39.144... + 55.565... = 94.710..$$

$$\text{Area of ABCD} = 94.7 \text{ cm}^2 \text{ (3 sf)}$$

$$\boxed{94.7 \text{ cm}^2}$$