



- 1 Triangle ABC is a right-angled triangle with the right angle at B.
AB = 6 cm and BC = 8 cm.
Work out the length of AC.

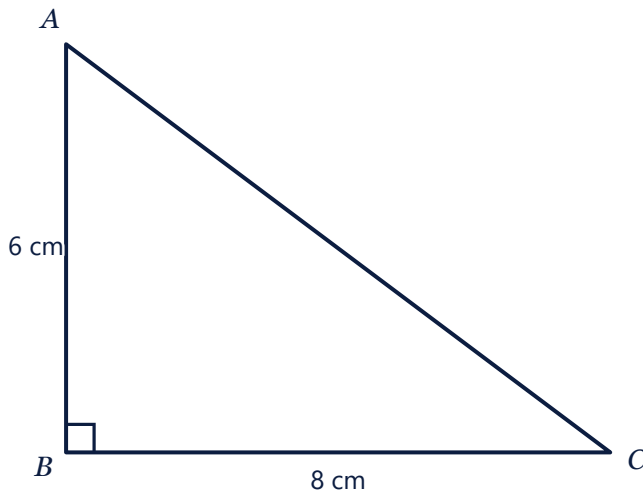


Diagram NOT accurately drawn

(2 marks)

The hypotenuse is the side opposite the right angle and is the longest side.

Pythagoras relates the areas of squares on the three sides: the two smaller areas add to the largest. It applies to right-angled triangles

AC is the hypotenuse, so use Pythagoras' theorem

$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 6^2 + 8^2 = 36 + 64 = 100$$

$$AC = \sqrt{100} = 10 \text{ cm}$$

10 cm

- 2 A right-angled triangle has shorter sides of length 5 cm and 12 cm.
Work out the length of the hypotenuse.

(2 marks)

$$c^2 = 5^2 + 12^2$$

$$c^2 = 25 + 144 = 169$$

$$c = \sqrt{169} = 13$$

13 cm

- 3 Triangle PQR is a right-angled triangle with the right angle at Q.
PQ = 7 cm and QR = 9 cm.
Work out the length of PR.
Give your answer correct to 1 decimal place.

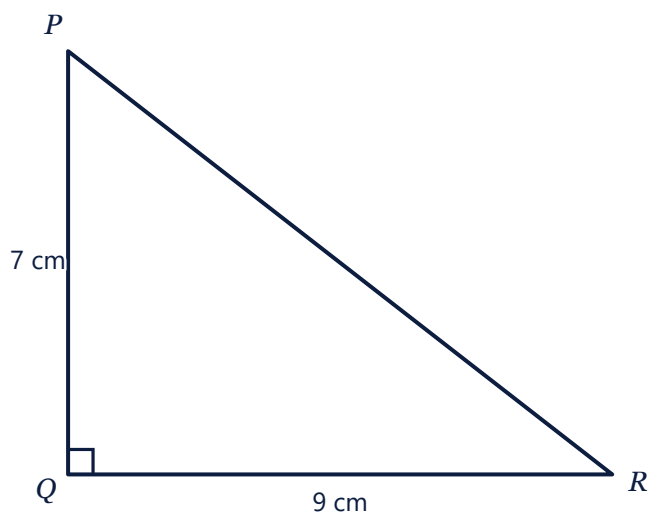


Diagram NOT accurately drawn

(2 marks)

PR is the hypotenuse, so $PR^2 = PQ^2 + QR^2$

$$PR^2 = 7^2 + 9^2 = 49 + 81 = 130$$

$$PR = \sqrt{130} = 11.401... = 11.4 \text{ cm (1 decimal place)}$$

11.4 cm

- 4 In triangle PQR, angle Q = 90° , PQ = 7 cm and QR = 9 cm.
Work out the length of PR. Give your answer correct to 3 significant figures.

(3 marks)

PR is the hypotenuse

$$PR^2 = 7^2 + 9^2$$

$$PR^2 = 49 + 81 = 130$$

$$PR = \sqrt{130} = 11.40$$

11.4 cm

- 5 A ship sails 24 km due north and then 10 km due east.
Work out the straight-line distance of the ship from its starting point.

(3 marks)

North and east make a right angle

$$d^2 = 24^2 + 10^2$$

$$d^2 = 576 + 100 = 676$$

$$d = \sqrt{676} = 26$$

26 km

- 6 Here are the side lengths of two triangles.

- a. Triangle A: 9 cm, 12 cm, 15 cm
b. Triangle B: 7 cm, 8 cm, 12 cm

Is each triangle right-angled? Show your working.

(4 marks)

a)

$$9^2 + 12^2 = 81 + 144 = 225$$

$$15^2 = 225$$

Equal, so A is right-angled

b)

$$7^2 + 8^2 = 49 + 64 = 113$$

$$12^2 = 144$$

Not equal, so B is not right-angled

- 7 A rectangular field is 60 m long and 45 m wide. Kyle walks from one corner to the opposite corner. He can walk along two sides of the field, or straight across the diagonal.
How much shorter is the diagonal route than walking along the two sides?

(3 marks)

$$\text{Two sides: } 60 + 45 = 105$$

$$d^2 = 60^2 + 45^2$$

$$d^2 = 3600 + 2025 = 5625$$

$$d = \sqrt{5625} = 75$$

$$105 - 75 = 30$$

30 m

8

A is the point with coordinates (2, 3).

B is the point with coordinates (10, 9).

Work out the length of AB.

(2 marks)

The horizontal distance from A to B is $10 - 2 = 8$

The vertical distance from A to B is $9 - 3 = 6$

$$AB^2 = 8^2 + 6^2 = 64 + 36 = 100, \text{ so } AB = \sqrt{100} = 10$$

10

9

A triangle has vertices A(2, 1), B(10, 1) and C(2, 7). M is the midpoint of AB and N is the midpoint of AC.

a. Write down the coordinates of M and of N.

b. Work out the length of MN.

(4 marks)

a)

$$M = \left(\frac{2 + 10}{2}, \frac{1 + 1}{2} \right) = (6, 1)$$

$$N = \left(\frac{2 + 2}{2}, \frac{1 + 7}{2} \right) = (2, 4)$$

b)

$$\text{Across} = 6 - 2 = 4$$

$$\text{Up} = 4 - 1 = 3$$

$$MN^2 = 4^2 + 3^2 = 25$$

$$MN = \sqrt{25} = 5$$

MN = 5

10

A rectangle is 9 cm long and 6 cm wide.

Work out the length of a diagonal of the rectangle.

Give your answer correct to 1 decimal place.

(2 marks)

The diagonal is the hypotenuse of a right-angled triangle with sides 9 cm and 6 cm

$$\text{diagonal}^2 = 9^2 + 6^2 = 81 + 36 = 117$$

$$\text{diagonal} = \sqrt{117} = 10.816... = 10.8 \text{ cm (1 decimal place)}$$

10.8 cm

11

A right-angled triangle has sides 6 cm, 8 cm and 10 cm (the hypotenuse). A semicircle is drawn outwards on each side, using that side as its diameter.

Show that the area of the semicircle on the hypotenuse is equal to the sum of the areas of the other two semicircles.

(4 marks)

$$\text{Semicircle area} = \frac{1}{2} \times \pi \times r^2, r = d \div 2$$

$$6 \text{ cm: } \frac{1}{2} \times \pi \times 3^2 = 4.5\pi$$

$$8 \text{ cm: } \frac{1}{2} \times \pi \times 4^2 = 8\pi$$

$$4.5\pi + 8\pi = 12.5\pi$$

$$10 \text{ cm: } \frac{1}{2} \times \pi \times 5^2 = 12.5\pi$$

$$12.5\pi = 12.5\pi, \text{ so they are equal}$$

12

A triangle has sides of length 10 cm, 24 cm and 26 cm.

Show that the triangle is a right-angled triangle.

(3 marks)

$$10^2 + 24^2 = 100 + 576 = 676$$

$$26^2 = 676$$

Since $10^2 + 24^2 = 26^2$, the sides satisfy Pythagoras' theorem, so the triangle is right-angled (the right angle is opposite the 26 cm side)

13

A square has sides of length 5 cm.

A circle is drawn through all four vertices of the square.

Calculate the circumference of the circle. Give your answer correct to 3 significant figures.

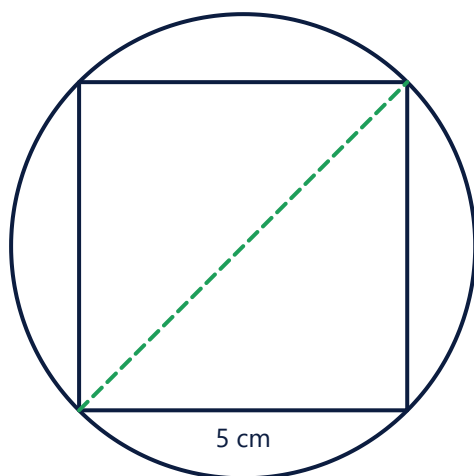


Diagram NOT accurately drawn

(4 marks)

The diameter of the circle is the diagonal of the square

By Pythagoras, $\text{diagonal}^2 = 5^2 + 5^2 = 50$, so $\text{diagonal} = \sqrt{50} = 7.0710... \text{ cm}$

Circumference = $\pi d = \pi \times 7.0710... = 22.214... = 22.2 \text{ cm}$ (3 sf)

22.2 cm

14

A rectangle measures 8 cm by 15 cm.

A circle is drawn that passes through all four vertices of the rectangle, so a diagonal of the rectangle is a diameter of the circle.

Work out the circumference of the circle.

Give your answer correct to 1 decimal place.

(4 marks)

$$\text{diagonal}^2 = 8^2 + 15^2 = 64 + 225 = 289$$

$\text{diagonal} = \sqrt{289} = 17 \text{ cm}$, so the diameter of the circle is 17 cm

$$\text{Circumference} = \pi \times d = \pi \times 17$$

$$\text{Circumference} = 53.407... = 53.4 \text{ cm (1 decimal place)}$$

53.4 cm