

1 The diagram shows a square and an isosceles triangle.

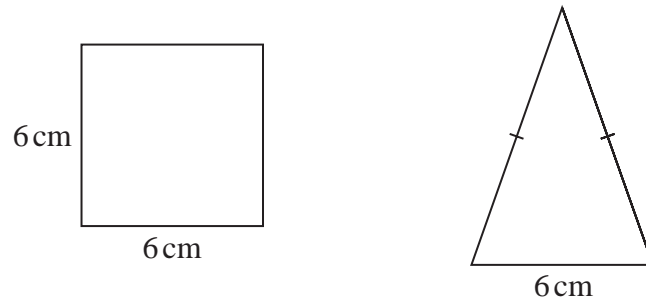


Diagram **NOT** accurately drawn

The square has sides of length 6 cm.

The base of the isosceles triangle is 6 cm.

The perimeter of the square is equal to the perimeter of the isosceles triangle.

The shaded shape is made by putting three of the isosceles triangles around the square as shown in the diagram below.

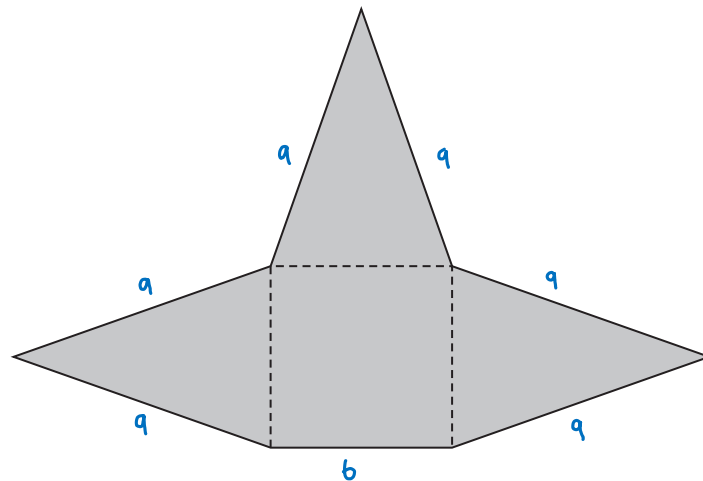
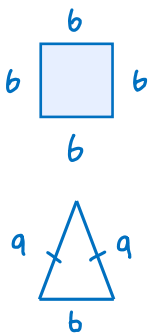


Diagram **NOT** accurately drawn

Work out the perimeter of the shaded shape.
Show your working clearly.



$$\text{Perimeter of square} = 4 \times b = 24 \text{ cm} \quad (1)$$

perimeter of square = perimeter of triangle

$$\text{Long side of triangle} = \frac{24 - b}{2} = 9 \quad (1)$$

$$\begin{aligned} \text{Perimeter of shaded shape} &= (6 \times 9) + b \quad (1) \\ &= 60 \text{ cm} \end{aligned}$$

(see diagram)

60 (1)

..... cm

(Total for Question 1 is 4 marks)

2 Markus makes a steel framework.

The framework is in the shape of the right-angled triangle ABC shown in the diagram.

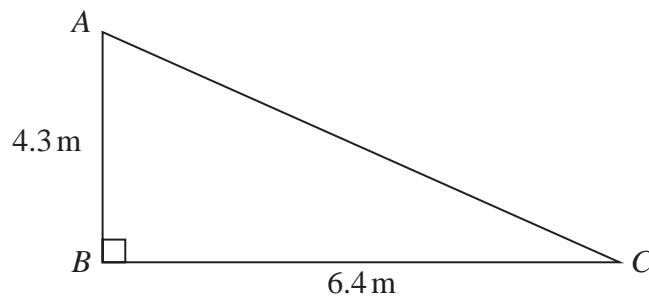


Diagram **NOT**
accurately drawn

The steel that Markus uses costs \$22 per metre.

The steel can **only** be bought in a length that is a whole number of metres.

Work out the total cost of the steel that Markus buys in order to make the framework.

Finding length AC using Pythagoras' Theorem :

$$AC = \sqrt{4.3^2 + 6.4^2} \quad (1)$$

$$= 7.71 \text{ m} \quad (1)$$

Finding total length of framework :

$$7.71 \text{ m} + 4.3 \text{ m} + 6.4 \text{ m} = 18.4 \text{ m}$$

\therefore Since steel can only be bought in whole number of metres,
round up 18.4 m to 19 m.

↖ cannot round down to 18 m. Not
enough for total framework.

$$\text{Total cost of steel} : 19 \times \$22 \quad (1)$$

$$= \$418 \quad (1)$$

\$..... **418**

(Total for Question 2 is 4 marks)

3 Here is a rectangle.

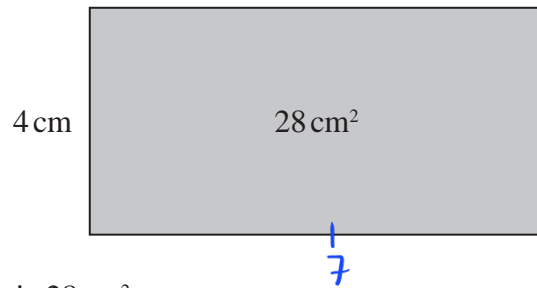


Diagram **NOT** accurately drawn

The area of the rectangle is 28 cm^2

Three of these rectangles are used to make the shape below.

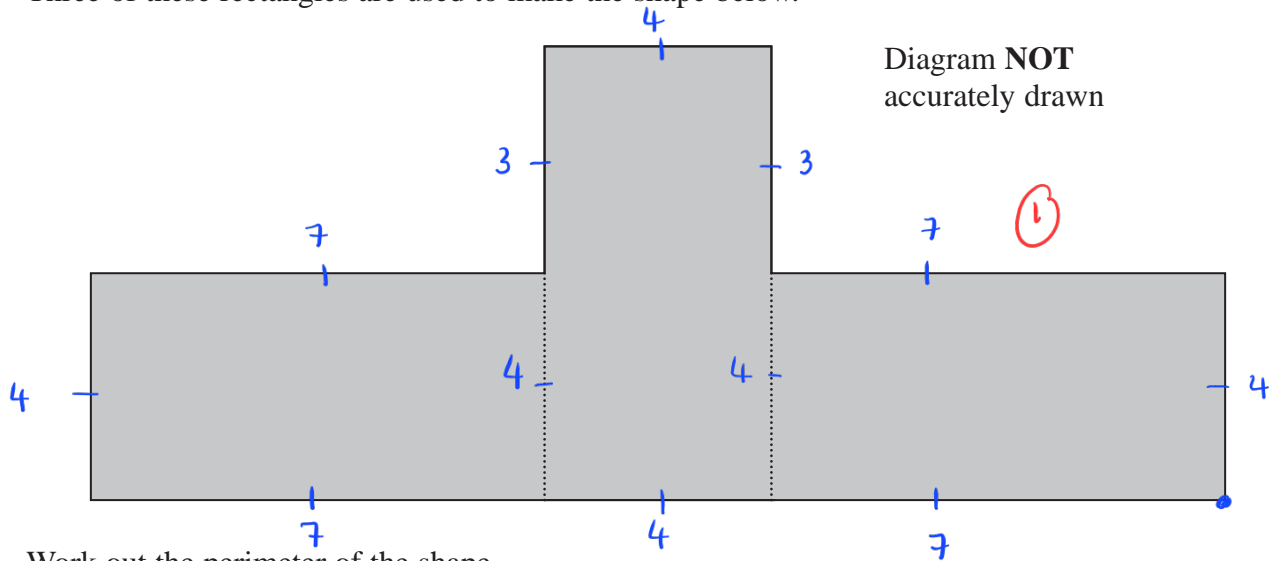


Diagram **NOT** accurately drawn

Work out the perimeter of the shape.

$$\begin{aligned} \text{Area} &= \text{length} \times \text{height} \\ 28 &= \text{length} \times 4 \\ \text{length} &= 28 / 4 = 7 \quad (1) \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &: 4 + 7 + 3 + 4 + 3 + 7 + 4 + 7 + 4 + 7 \quad (1) \\ &= 50 \end{aligned}$$

50 (1) cm

(Total for Question 3 is 4 marks)

- 4 The diagram shows a regular hexagon, $ABCDEF$, and an isosceles triangle, GHI .

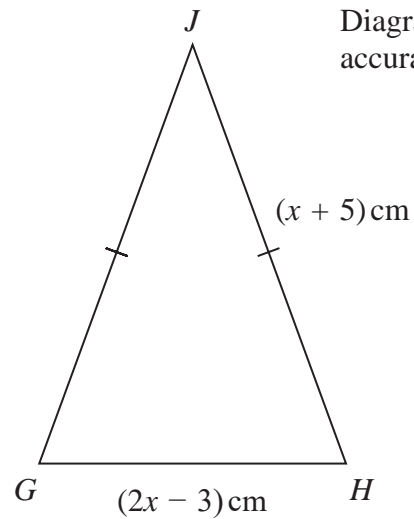
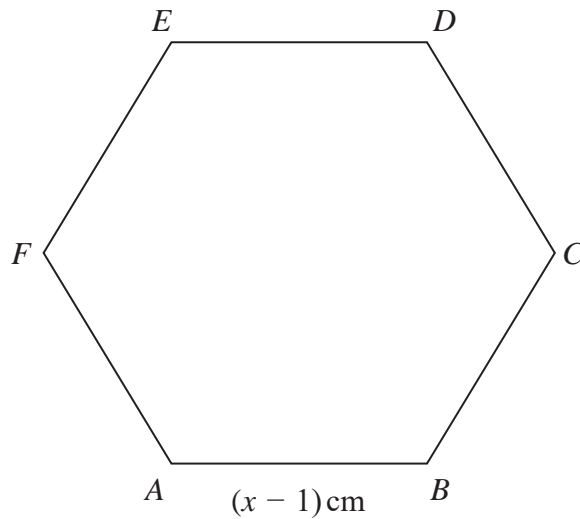


Diagram **NOT**
accurately drawn

The perimeter of the hexagon is equal to the perimeter of the triangle.

Find the length of each side of the hexagon.

Show clear algebraic working.

Perimeter of hexagon = Perimeter of triangle

$$6(x-1) = (2x-3) + 2(x+5)$$

$$\textcircled{1} 6x - 6 = 2x - 3 + 2x + 10$$

$$\textcircled{1} 6x - 6 = 4x + 7 \textcircled{1}$$

$$6x - 4x = 7 + 6 \textcircled{1}$$

$$2x = 13$$

$$x = \frac{13}{2}$$

$$= 6.5$$

$$\text{Side of hexagon} = 6.5 - 1$$

$$= 5.5 \text{ cm } \textcircled{1}$$

5.5

..... cm

(Total for Question 4 is 5 marks)

- 5 Here is a rectangle made from 12 square tiles.

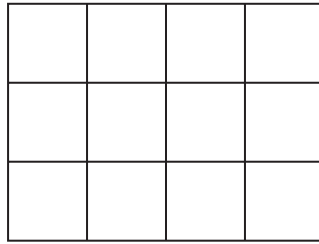


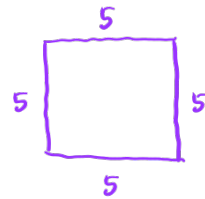
Diagram **NOT**
accurately drawn

The perimeter of each tile is 20 cm.

Work out the area of the rectangle.

Perimeter of each tile = 20 cm

Each tile has 4 sides.



$$\frac{20}{4} = 5 \text{ cm} \quad (1)$$

$$\begin{aligned} \text{Area of 1 tile} &= 5 \times 5 \\ &= 25 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of 12 tiles} &= 25 \text{ cm}^2 \times 12 \quad (1) \\ &= 300 \text{ cm}^2 \quad (1) \end{aligned}$$

$$\text{.....} \quad 300 \quad \text{cm}^2$$

(Total for Question 5 is 3 marks)

- 6 The diagram shows a shaded shape $ABCD$ made from a semicircle ABC and a right-angled triangle ACD .

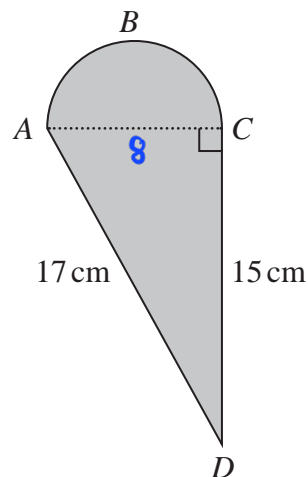


Diagram NOT
accurately drawn

AC is the diameter of the semicircle ABC .

Work out the perimeter of the shaded shape.
Give your answer correct to 3 significant figures.

By using Pythagoras' Theorem :

$$\begin{aligned} AC^2 &= AD^2 - CD^2 \\ AC^2 &= 17^2 - 15^2 \quad (1) \\ AC &= \sqrt{64} \\ &= 8 \text{ cm} \quad (1) \end{aligned}$$

$$\text{Length } ABC = \frac{\pi \times 8}{2} = 4\pi \quad (1)$$

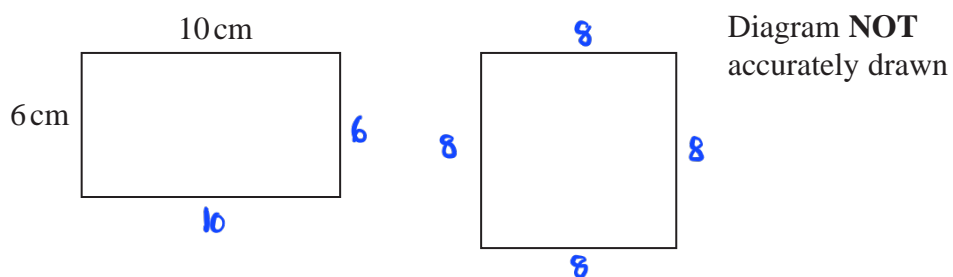
$$\begin{aligned} \text{Perimeter of shaded shape} &: 4\pi + 15 + 17 \quad (1) \\ &= 44.6 \text{ cm} \quad (1) \end{aligned}$$

44.6

..... cm

(Total for Question 6 is 5 marks)

- 7 The diagram shows a rectangle and a square.



The perimeter of the rectangle is equal to the perimeter of the square.
The area of the rectangle is less than the area of the square.

Work out by how much the area of the rectangle is less than the area of the square.

Rectangle

$$\begin{aligned}\text{Perimeter} &= 10 + 10 + 6 + 6 \\ &= 32 \text{ cm} \quad (1)\end{aligned}$$

$$\begin{aligned}\text{Area} &= 10 \times 6 \\ &= 60 \text{ cm}^2 \quad (1)\end{aligned}$$

Square

$$\text{Perimeter} = 32 \text{ cm} \quad (\text{each side } 8 \text{ cm})$$

$$\begin{aligned}\text{Area} &= 8 \times 8 \\ &= 64 \text{ cm}^2 \quad (1)\end{aligned}$$

$$\text{Difference} : 64 - 60 = 4 \text{ cm}^2 \quad (1) \quad \dots\dots\dots 4 \text{ cm}^2$$

(Total for Question 7 is 4 marks)

8 Here is isosceles triangle ABC .

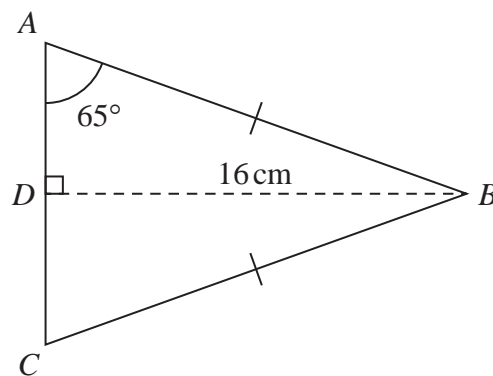


Diagram **NOT**
accurately drawn

D is the midpoint of AC and $DB = 16$ cm.

Angle $DAB = 65^\circ$

Work out the perimeter of triangle ABC .
Give your answer correct to one decimal place.

$$AD = \frac{16}{\tan 65^\circ} \quad (1)$$

$$= 7.4609 \dots \text{ cm}$$

$$AB = \frac{16}{\sin 65^\circ}$$

$$= 17.654 \dots \text{ cm} \quad (1)$$

$$\text{Perimeter} = 2(17.654 \dots) + 2(7.4609 \dots) \quad (1)$$

$$= 50.2 \text{ cm (1dp)} \quad (1)$$

50.2 cm

(Total for Question 8 is 4 marks)

9 The diagram shows a right-angled triangle.

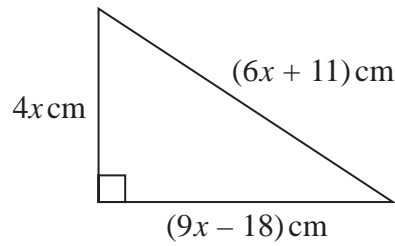


Diagram **NOT**
accurately drawn

The perimeter of the triangle is 126 cm.

Work out the area of the triangle.

$$\begin{aligned}\text{Perimeter} &= 4x + 6x + 11 + 9x - 18 \\ &= 19x - 7\end{aligned}$$

$$126 = 19x - 7 \quad (1)$$

$$126 + 7 = 19x$$

$$133 = 19x$$

$$x = 7 \quad (1)$$

$$\begin{aligned}\text{Length of triangle} &= 9(7) - 18 \\ &= 45 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Height of triangle} &= 4 \times 7 \\ &= 28 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Area of triangle} &= \frac{1}{2} \times 28 \times 45 \quad (1) \\ &= 630 \text{ cm}^2\end{aligned}$$

$$630 \quad (1) \text{ cm}^2$$

(Total for Question 9 is 4 marks)

- 10 The diagram shows a shape $ABCDEFG$ made from a square $ABDF$ and three identical isosceles triangles BCD , DEF and FGA .

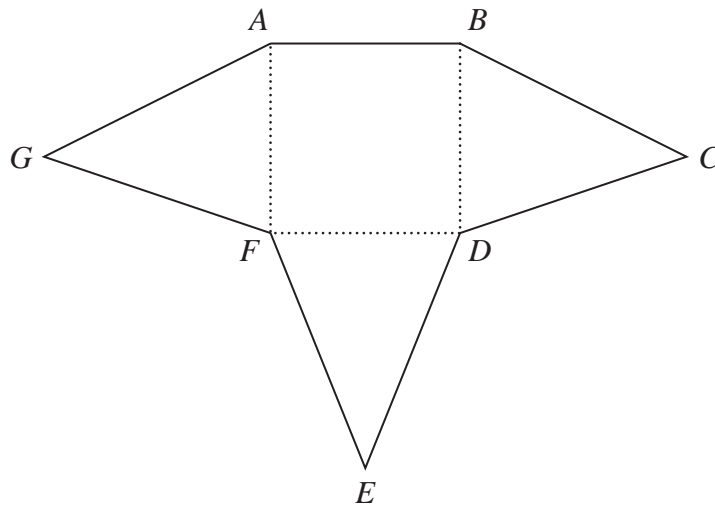


Diagram **NOT**
accurately drawn

The perimeter of the square $ABDF$ is 48 cm.
The perimeter of each isosceles triangle is 30 cm.
Work out the perimeter of the shape $ABCDEFG$.

$$\text{length } AB : \frac{48}{4} = 12 \text{ cm} \quad (1)$$

$$\text{length } AG : \frac{30 - 12}{2} = 9 \text{ cm} \quad (1)$$

$$\text{Perimeter} : (6 \times 9) + 12$$

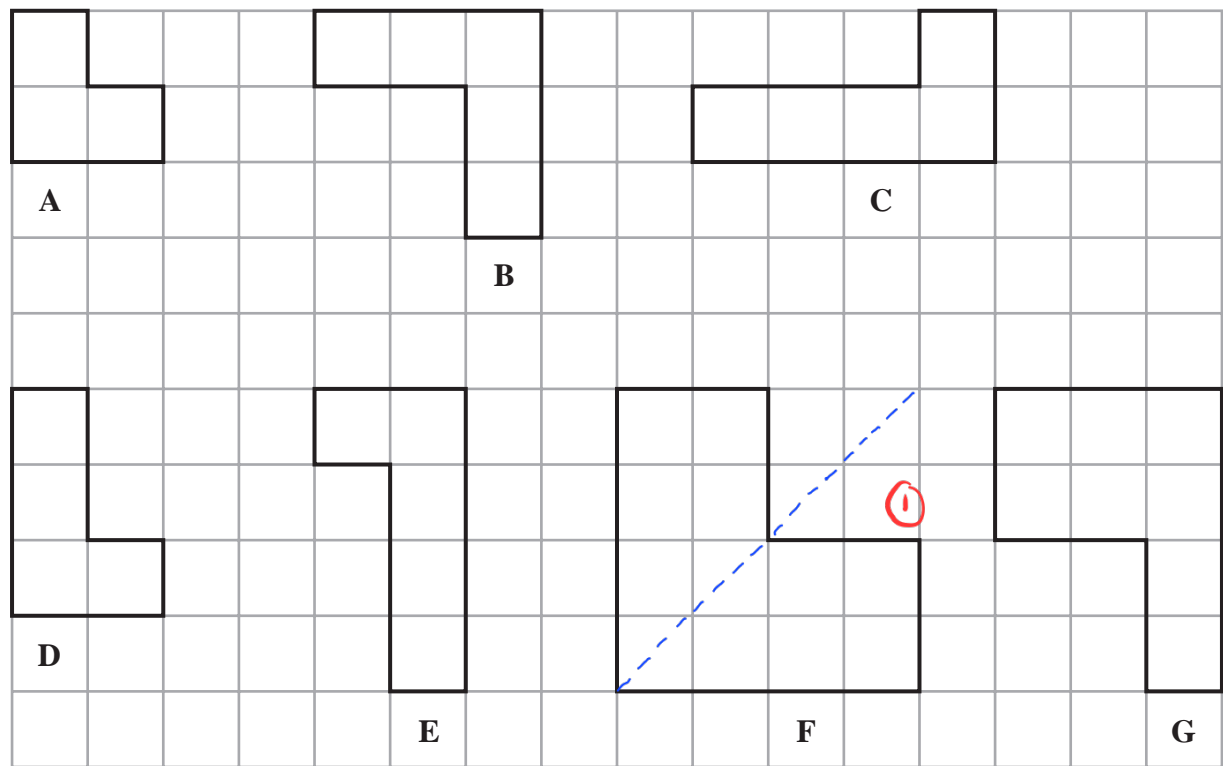
$$: 54 + 12 \quad (1)$$

$$: 66 \text{ cm} \quad (1)$$

..... 66 cm

(Total for Question 10 is 4 marks)

11 Here are seven shapes on a centimetre grid.



(d) Work out the perimeter of shape **B**.

12 1 cm
(1)

- 12 The shaded shape is made using three identical right-angled triangles and a square.

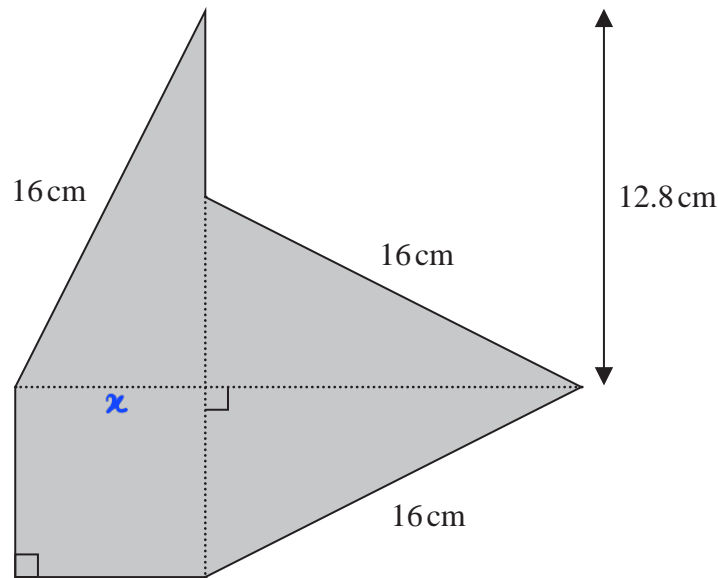


Diagram **NOT**
accurately drawn

Work out the perimeter of the shaded shape.

$$x^2 = 16^2 - 12.8^2$$

$$= 92.16 \quad (1)$$

$$x = \sqrt{92.16} \quad (1)$$

$$= 9.6$$

$$\text{Perimeter} = 16 + 9.6 + 9.6 + 16 + 16 + (12.8 - 9.6) \quad (1)$$

$$= 70.4 \quad (1)$$

70.4

..... cm

(Total for Question 12 is 4 marks)

13 Here is a square.



Diagram **NOT**
accurately drawn

The perimeter of the square is 24 cm.

The shaded rectangle below is made from 4 of these squares.

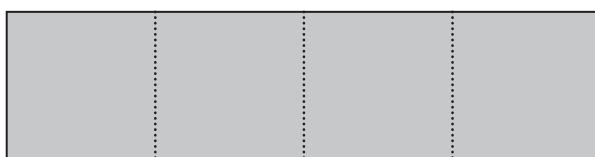


Diagram **NOT**
accurately drawn

Work out the perimeter of the shaded rectangle.

$$\frac{24}{4} = 6 \quad (1)$$

$$\begin{aligned} \text{Perimeter} &= 6 \times 10 \quad (1) \\ &= 60 \quad (1) \end{aligned}$$

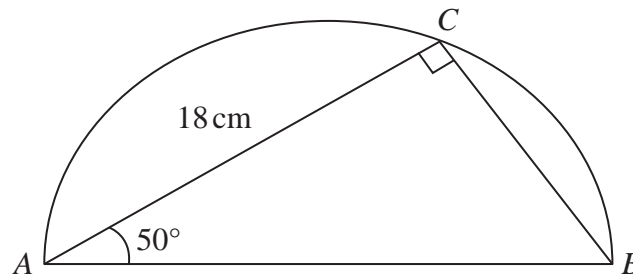
60

..... cm

(Total for Question 13 is 3 marks)

14 The diagram shows a triangle ABC inside a semicircle.

Diagram **NOT**
accurately drawn



A , B and C are points on the semicircle.

AB is the diameter of the semicircle.

Angle $ACB = 90^\circ$

Angle $BAC = 50^\circ$

$AC = 18 \text{ cm}$

Work out the perimeter of the semicircle.

Give your answer correct to 2 significant figures.

$$\cos 50^\circ = \frac{18}{AB} \quad (1)$$

$$AB = \frac{18}{\cos 50^\circ} \quad (1)$$

$$= 28.0030 \dots$$

$$\frac{1}{2} \times \pi \times 28.0030 \dots = 43.9 \dots \quad (1)$$

$$28.0030 \dots + 43.9 \dots \quad (1)$$

$$= 71.9900 \dots$$

$$\approx 72 \quad (1)$$

72

..... cm

(Total for Question 14 is 5 marks)

15 The diagram shows rectangle $ABCD$

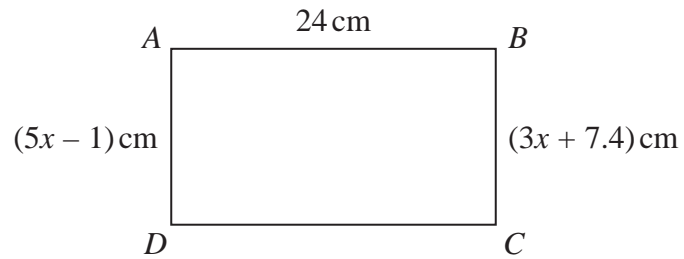


Diagram **NOT**
accurately drawn

Work out the perimeter of the rectangle.
Show your working clearly.

$$5x - 1 = 3x + 7.4 \quad (1)$$

$$2x = 8.4$$

$$x = 4.2 \quad (1)$$

$$\text{Perimeter} = 24 + 24 + 5(4.2) - 1 + 3(4.2) + 7.4 \quad (1)$$

$$= 24 + 24 + 20 + 20$$

$$= 88 \quad (1)$$

88

..... cm

(Total for Question 15 is 4 marks)

16 The diagram shows an isosceles triangle, with base length 24 cm.

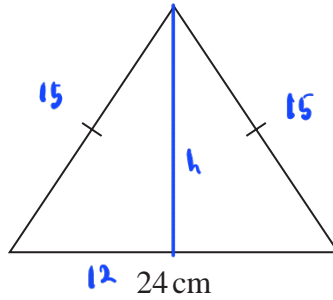


Diagram **NOT**
accurately drawn

The perimeter of the triangle is 54 cm.

Work out the area of the triangle.

$$2x + 24 = 54$$

$$x = 15 \quad (1)$$

$$h^2 = 15^2 - 12^2 \quad (1)$$

$$h = \sqrt{81} \quad (1)$$

$$= 9$$

$$\text{Area} = \frac{1}{2} \times 9 \times 24 \quad (1)$$

$$= 108 \quad (1)$$

108

..... cm²

(Total for Question 16 is 5 marks)

- 17 The diagram shows a shape made up of three semicircles, enclosing a right-angled triangle.

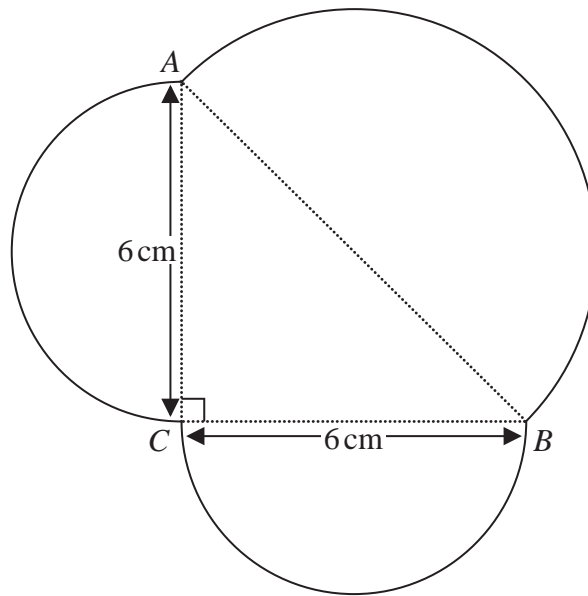


Diagram **NOT**
accurately drawn

AB , BC and CA are each the diameter of a semicircle.

$$BC = CA = 6 \text{ cm.}$$

Work out the perimeter of the shape.

Give your answer correct to one decimal place.

$$AB^2 = 6^2 + 6^2$$

$$AB^2 = 72 \quad (1)$$

$$AB = \sqrt{72} = 8.48 \dots \quad (1)$$

$$\text{Perimeter} = \frac{1}{2} \times \pi \times 6 + \frac{1}{2} \times \pi \times 6 + \frac{1}{2} \times \pi \times 8.48 \dots \quad (1)$$

$$= 3\pi + 3\pi + 4.24\pi \quad (1)$$

$$= 10.24\pi$$

$$= 32.17 \dots$$

$$\approx 32.2 \text{ (1 d.p.)}$$

(1)

32.2

..... cm

(Total for Question 17 is 5 marks)

- 18 The diagram shows a rectangle measuring 10 cm by 3 cm.

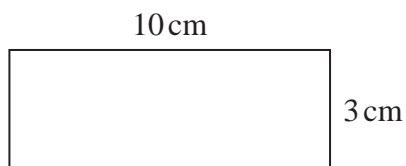
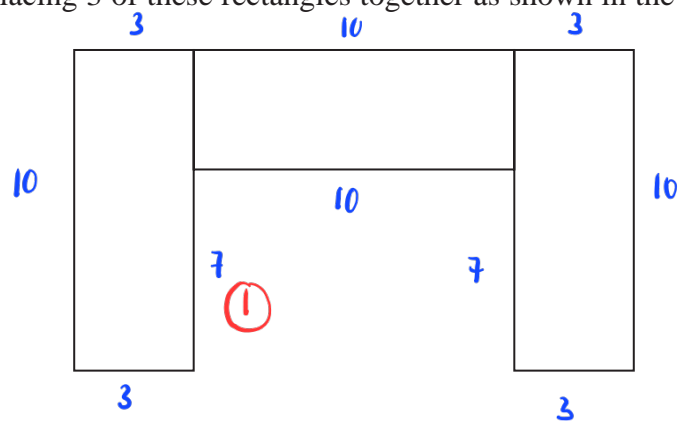


Diagram **NOT**
accurately drawn

A shape is made by placing 3 of these rectangles together as shown in the diagram.



Work out the perimeter of the shape.

$$\begin{aligned} \text{Perimeter} &= 10 + 3 + 7 + 10 + 7 + 3 + 10 + 3 + 10 + 3 \quad \textcircled{1} \\ &= 66 \quad \textcircled{1} \end{aligned}$$

66

..... cm

(Total for Question 18 is 3 marks)

- 19 The diagram shows a shaded shape $AEB CD$ made by removing triangle AEB from rectangle $ABCD$

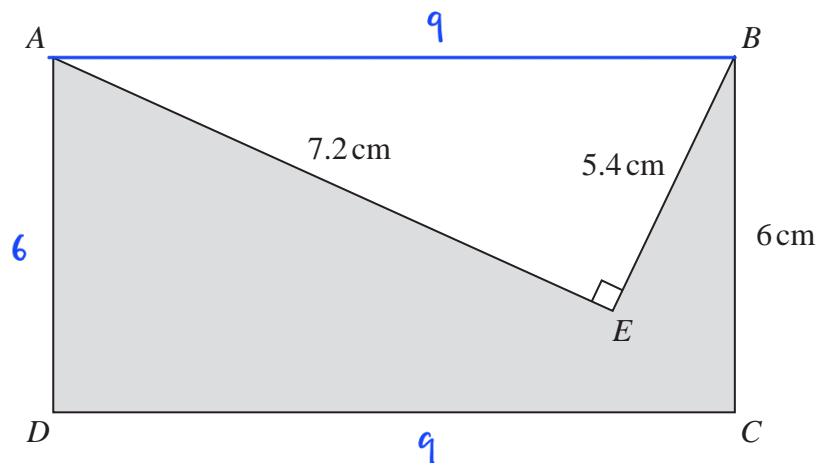


Diagram **NOT**
accurately drawn

$$AE = 7.2 \text{ cm} \quad BE = 5.4 \text{ cm} \quad BC = 6 \text{ cm} \quad \text{angle } AEB = 90^\circ$$

Work out the perimeter of the shaded shape.

$$\begin{aligned} AB^2 &= 7.2^2 + 5.4^2 \\ &= 81 \quad (1) \\ AB &= \sqrt{81} = 9 \quad (1) \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= 6 + 7.2 + 5.4 + 6 + 9 \quad (1) \\ &= 33.6 \quad (1) \end{aligned}$$

33.6 cm

(Total for Question 19 is 4 marks)