1 The diagram shows a regular hexagon, *ABCDEF*, and an isosceles triangle, *GHJ*.

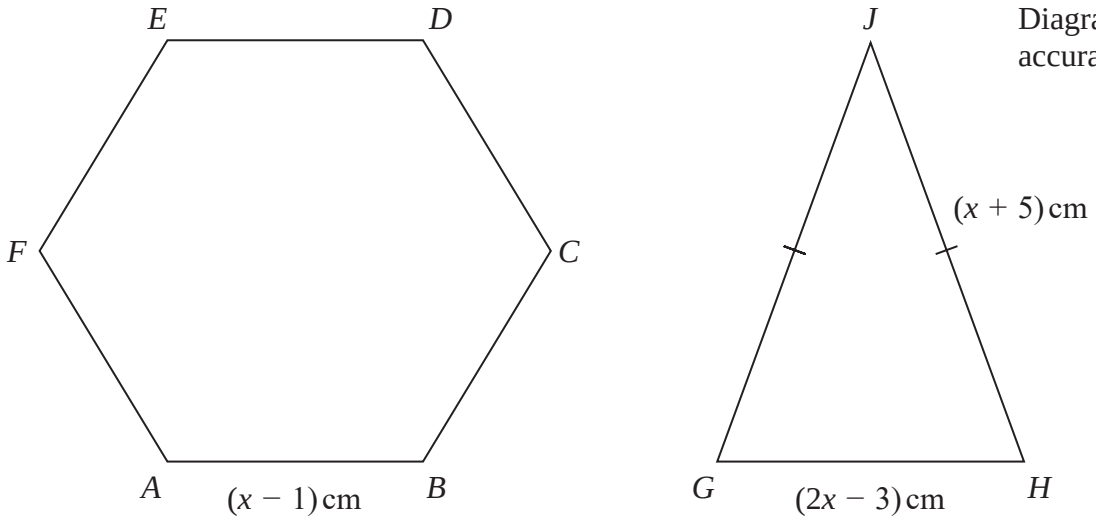

Diagram **NOT** accurately drawn

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

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

(1) $6x - 6 = 2x - 3 + 2x + 10$

(1) $6x - 6 = 4x + 7$ (1)

$6x - 4x = 7 + 6$ (1)

$2x = 13$

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

$= 6.5$

Side of hexagon $= 6.5 - 1$

$= 5.5$ cm (1)

5.5 ..... cm

(Total for Question 1 is 5 marks)

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

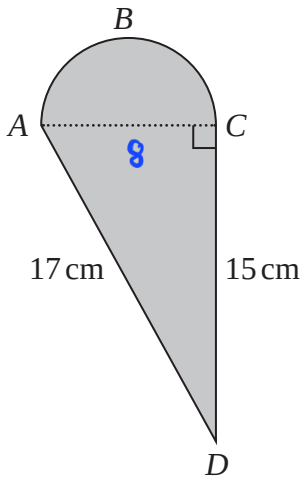

Diagram **NOT** accurately drawn

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:

$AC^2 = AD^2 - CD^2$

$AC^2 = 17^2 - 15^2$ (1)

$AC = \sqrt{64}$

$= 8$ cm (1)

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

Perimeter of shaded shape: $4\pi + 15 + 17$ (1)

$= 44.6$ cm (1)

44.6 cm

(Total for Question 2 is 5 marks)

3

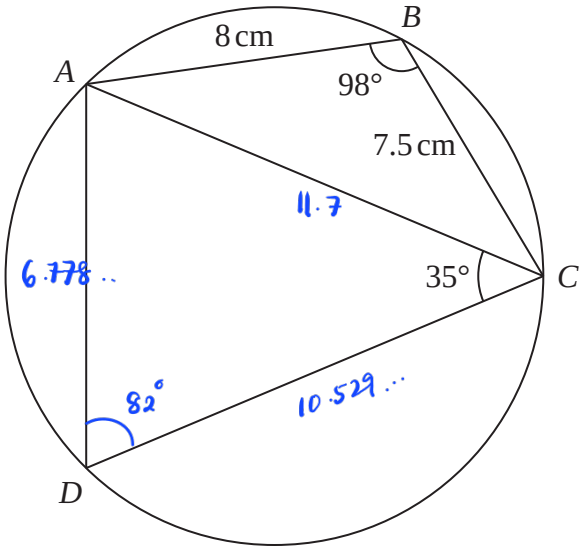

Diagram **NOT** accurately drawn

ABCD is a quadrilateral where *A*, *B*, *C* and *D* are points on a circle.

AB = 8 cm
BC = 7.5 cm
Angle *ABC* = 98°
Angle *ACD* = 35°

Work out the perimeter of quadrilateral *ABCD*.
Give your answer correct to one decimal place.

angle ADC = $180^\circ - 98^\circ$
= 82° (1)

By using cosine rule :

$AC^2 = 8^2 + 7.5^2 - 2(8)(7.5)\cos 98^\circ$
$AC^2 = 136.95\ldots$ (1)
$AC = 11.702\ldots$ (1)

By using sine rule :

$$\frac{AD}{\sin 35^\circ} = \frac{11.702\ldots}{\sin 82^\circ}$$

$$AD = \frac{11.702\ldots}{\sin 82^\circ} \times \sin 35^\circ$$
$= 6.778\ldots$ (1)

angle DAC = $180^\circ - 82^\circ - 35^\circ$

= 63°

By using sine rule :

$$\frac{DC}{\sin 63^\circ} = \frac{6.778\ldots}{\sin 35^\circ}$$

$$DC = \frac{6.778\ldots}{\sin 35^\circ} \times \sin 63^\circ$$

= 10.529.... (1)

Perimeter of ABCD = 8 + 7.5 + 10.529... + 6.778...

= 32.8 cm (1)

32.8 ..... cm

(Total for Question 3 is 6 marks)

4 A circle centre *O* has radius 9 cm.

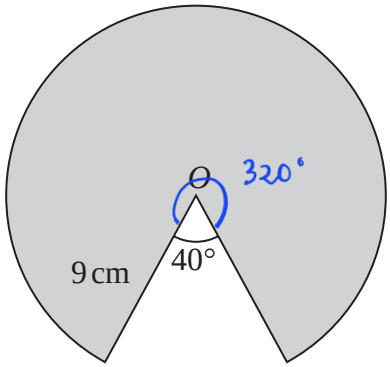

Diagram **NOT** accurately drawn

Calculate the perimeter of the shaded sector of the circle.
Give your answer correct to 3 significant figures.

(1) $\frac{320^\circ}{360^\circ} \times 2\pi(9) = 16\pi$ (1)

Circumference $2\pi r$

Perimeter $= 16\pi + 9 + 9$ (1)

$= 68.265\ldots$

$= 68.3$ (3sf)

68.3 (1) ..... cm

(Total for Question 4 is 4 marks)

5 Here is isosceles triangle *ABC*.

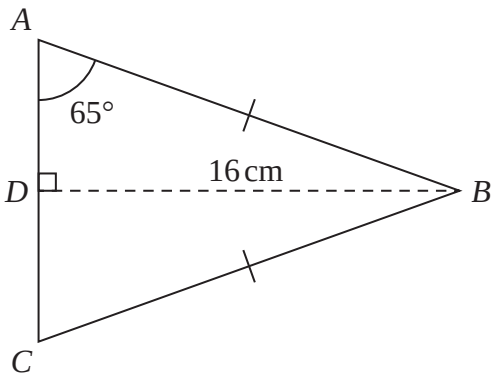

Diagram **NOT** accurately drawn

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

Angle *DAB* = 65°

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

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

$= 7.4609\ldots$ cm

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

$= 17.654\ldots$ cm (1)

Perimeter $= 2(17.654\ldots) + 2(7.4609\ldots)$ (1)

$= 50.2$ cm (1dp) (1)

50.2 cm

(Total for Question 5 is 4 marks)

6 A rectangle *ABCD* is to be drawn on a centimetre grid such that

A has coordinates (–4, –2)
B has coordinates (1, 10)
C has coordinates (19, *a*)
D has coordinates (*b*, *c*)

(b) Calculate the perimeter, in centimetres, of rectangle *ABCD*.

$AB = \sqrt{(1-(-4))^2+(10-(-2))^2}$

$= \sqrt{5^2+12^2}$

$= 13$ (1)

$BC = \sqrt{(19-1)^2+(2.5-10)^2}$

$= 19.5$ (1)

Perimeter $= 2(13)+2(19.5)$

$= 65$ cm (1)

65 ..... cm

(3)

(Total for Question 6 is 3 marks)

7 The diagram shows a sector AOB of a circle with centre O

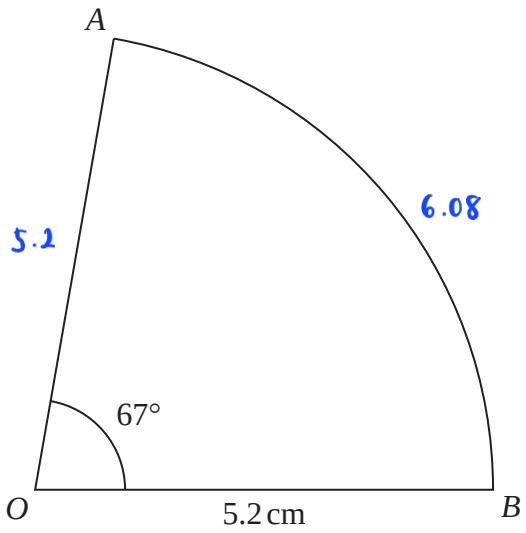

Diagram **NOT** accurately drawn

Angle $AOB = 67°$
$OA = OB = 5.2$ cm

Calculate the perimeter of the sector.
Give your answer correct to 3 significant figures.

Circumference of the whole circle:

$2 \times \pi \times 5.2 = \frac{52}{5}\pi$ (1)

Arc length of the sector AOB:

$\frac{67}{360} \times \frac{52}{5}\pi = 6.08$ cm (1)

Perimeter of the sector AOB:

$5.2 + 5.2 + 6.08 = 16.48$ (1)

$= 16.5$ (3 s.f.)

16.5 ..... cm

(Total for Question 7 is 3 marks)

8 Markus makes a steel framework.
The framework is in the shape of the right-angled triangle *ABC* shown in the diagram.

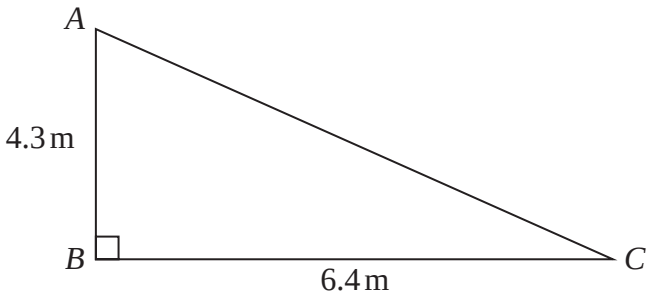

Diagram **NOT** accurately drawn

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 :

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

$= 7.71$ m (1)

Finding total length of framework :

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

∴ 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.

Total cost of steel : $19 \times \$22$ (1)

$= \$418$ (1)

$ 418

(Total for Question 8 is 4 marks)

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

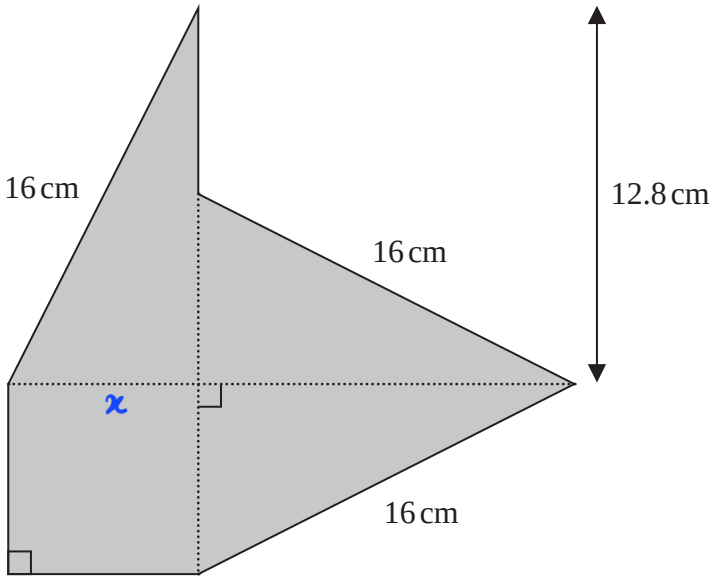

Diagram **NOT** accurately drawn

Work out the perimeter of the shaded shape.

$x^2 = 16^2 - 12.8^2$ (1)

$= 92.16$

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

$= 9.6$

Perimeter $= 16 + 9.6 + 9.6 + 16 + 16 + (12.8 - 9.6)$ (1)

$= 70.4$ (1)

70.4 ..... cm

(Total for Question 9 is 4 marks)

10

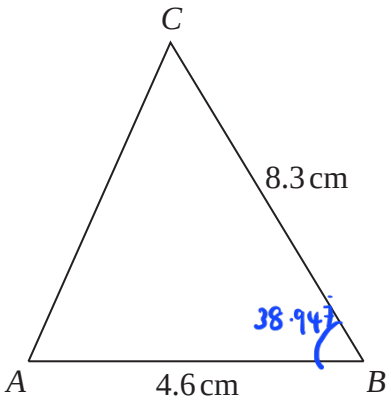

Diagram **NOT** accurately drawn

AB = 4.6 cm *BC* = 8.3 cm angle *ABC* is acute

The area of triangle *ABC* is 12 cm²

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

$12 = \frac{1}{2} \times 8.3 \times 4.6 \times \sin ABC$ (1)

$ABC = \sin^{-1} \frac{12}{\frac{1}{2} \times 8.3 \times 4.6}$ (1)

$= 38.947\ldots$

$AC^2 = 4.6^2 \times 8.3^2 - 2(4.6)(8.3) \cos 38.947$ (1)

$AC^2 = 30.6627\ldots$

$AC = \sqrt{30.6627\ldots}$ (1)

$= 18.4$ (1)

18.4 ..... cm

(Total for Question 10 is 5 marks)

11 *A*, *B* and *C* are points on a circle, centre *O*

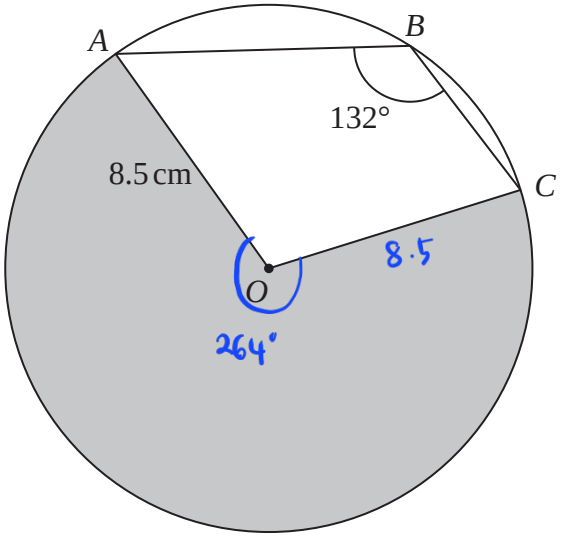

Diagram **NOT** accurately drawn

The radius of the circle is 8.5 cm
Angle *ABC* = 132°

Work out the perimeter of the shaded sector *AOC*
Give your answer correct to 3 significant figures.

$\angle AOC = 132° \times 2 = 264°$ (1)

$\frac{264}{360} \times 2 \times \pi \times 8.5 = 39.1\ldots$ (1)

Perimeter : $39.1\ldots + 8.5 + 8.5$

$= 56.2$ (1)

56.2 ..... cm

(Total for Question 11 is 3 marks)

12 The diagram shows rectangle *ABCD*

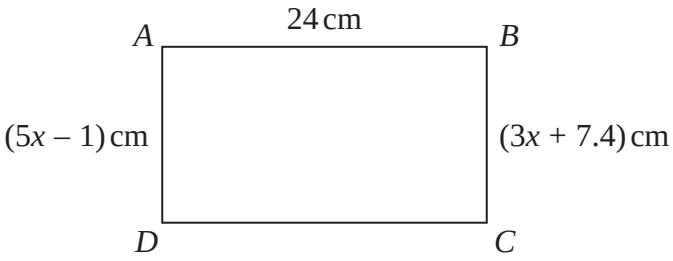

Diagram **NOT** accurately drawn

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

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

$2x = 8.4$

$x = 4.2$ (1)

Perimeter $= 24 + 24 + 5(4.2) - 1 + 3(4.2) + 7.4$ (1)

$= 24 + 24 + 20 + 20$

$= 88$ (1)

88 ..... cm

(Total for Question 12 is 4 marks)

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

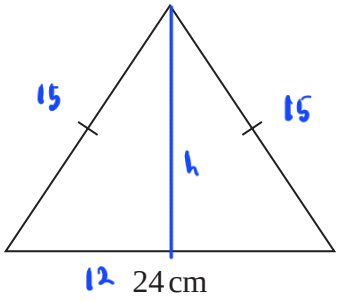

Diagram **NOT** accurately drawn

The perimeter of the triangle is 54 cm.

Work out the area of the triangle.

$2x + 24 = 54$

$x = 15$ (1)

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

$h = \sqrt{81}$

$= 9$ (1)

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

$= 108$ (1)

108 ..... cm^2

(Total for Question 13 is 5 marks)

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

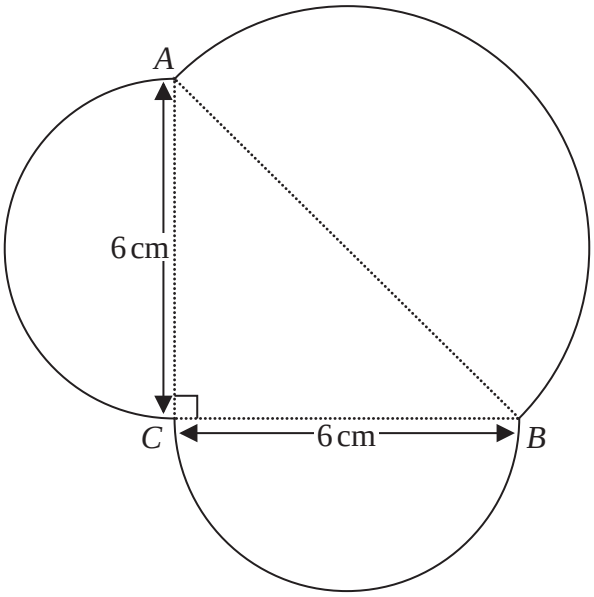

Diagram **NOT** accurately drawn

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

BC = *CA* = 6 cm.

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

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

$AB^2 = 72$ (1)

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

(1)

Perimeter $= \frac{1}{2} \times \pi \times 6 + \frac{1}{2} \times \pi \times 6 + \frac{1}{2} \times \pi \times 8.48\ldots$

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

$= 10.24\pi$

$= 32.17\ldots$

≈ 32.2 (1 d.p.)

(1)

32.2 ..... cm

(Total for Question 14 is 5 marks)

15 The diagram shows a shaded shape *AEBCD* made by removing triangle *AEB* from rectangle *ABCD*

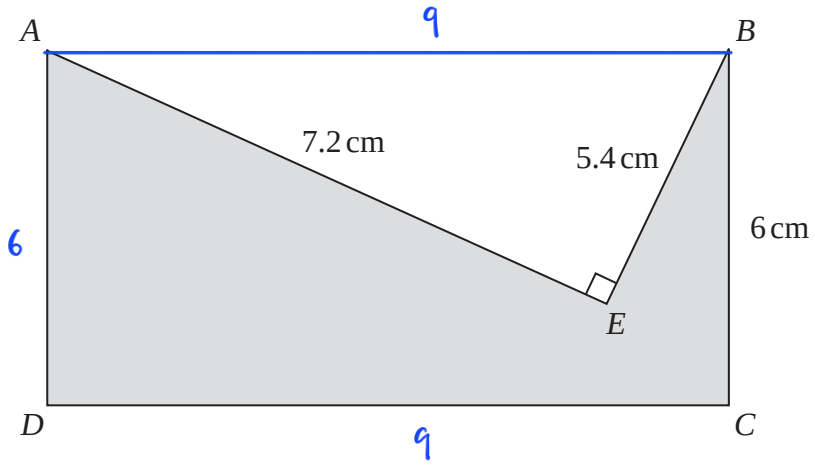

Diagram **NOT** accurately drawn

AE = 7.2 cm *BE* = 5.4 cm *BC* = 6 cm angle *AEB* = 90°

Work out the perimeter of the shaded shape.

$AB^2 = 7.2^2 + 5.4^2$ (1)

$= 81$

$AB = \sqrt{81} = 9$ (1)

Perimeter $= 6 + 7.2 + 5.4 + 6 + 9$ (1)

$= 33.6$ (1)

33.6 ..... cm

(Total for Question 15 is 4 marks)