1   Markus makes a steel framework.
The framework is in the shape of the <mark>right-angled triangle</mark> *ABC* shown in the diagram.
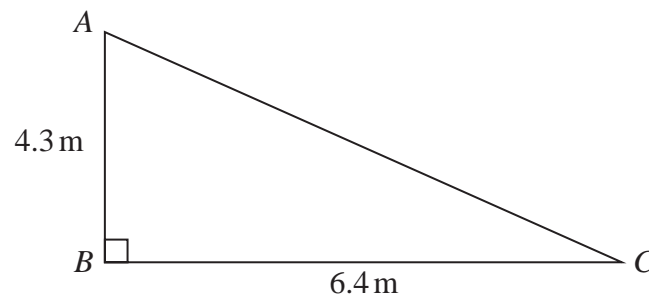

Diagram **NOT**
accurately drawn

The steel that Markus uses costs \$22 per metre.
The steel can **only** be bought in a length that is a <mark>whole number of metres.</mark>

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 :

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

∴ 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 × \$22 ①

$$= \$418 \quad ①$$

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

(Total for Question 1 is 4 marks)

2   The diagram shows an isosceles triangle.

Diagram **NOT** accurately drawn

8.5 cm   8.5 cm

7.5

4 cm   8 cm   4 cm

Work out the area of the triangle.

By using Pythagoras' theorem :

$$h = \sqrt{8.5^2 - 4^2}$$

$$= \sqrt{56.25} \ ①$$

$$= 7.5 \ cm \ ①$$

8.5   h

4
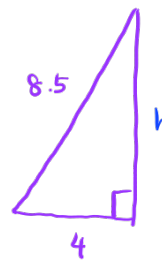
Area of triangle : $\frac{1}{2}$ × base × height

$$= \frac{1}{2} \times 8 \ cm \times 7.5 \ cm \ ①$$

$$= 30 \ cm^2 \ ①$$

30
....cm²

(Total for Question 2 is 4 marks)

3 The diagram shows two right-angled triangles, *DEF* and *EFG*.

Diagram **NOT** accurately drawn

$$\cos 40° = \frac{a}{h}$$

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

$$EF = 12 \cos 40° \;①$$
$$= 9.1925 \text{ cm} \;①$$

$$\angle GFE = 180° - 90° - 28°$$
$$= 62°$$

$$\tan 62° = \frac{EG}{9.1925} \;①$$

$$EG = 9.1925 \times \tan 62°$$
$$= 17.3 \;(3sf)$$

17·3 ① .... cm

(Total for Question 3 is 4 marks)

4   The diagram shows a rectangle and a diagonal of the rectangle.
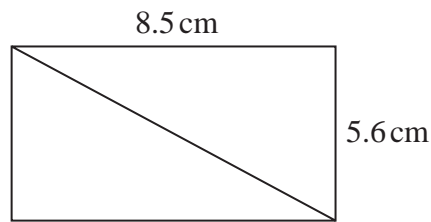
8.5 cm

5.6 cm
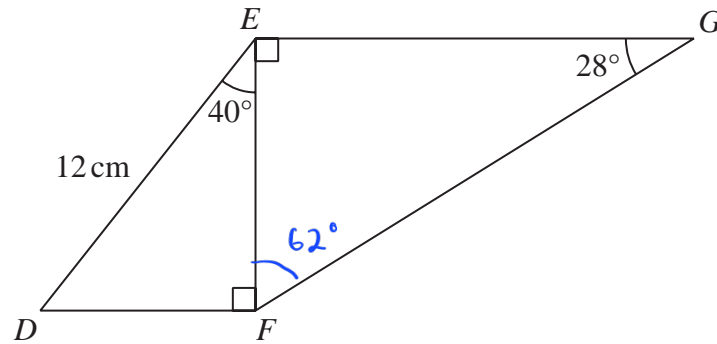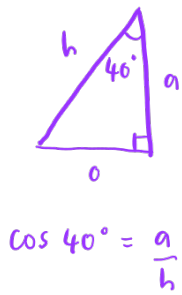
Diagram **NOT** accurately drawn

Work out the length of the diagonal of the rectangle.
Give your answer correct to 1 decimal place.

Using Pythagoras' theorem :

$$\text{diagonal} = \sqrt{8.5^2 + 5.6^2} \quad ①$$
$$= \sqrt{103.61} \quad ①$$
$$= 10.2 \quad ①$$

10.2 .... cm

(Total for Question 4 is 3 marks)

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

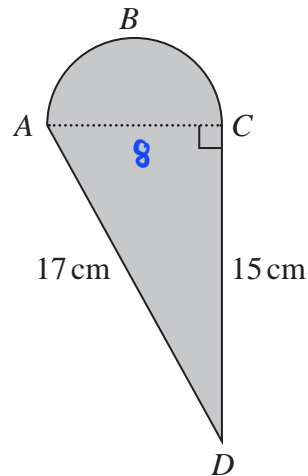*B*

A ⋯⋯⋯⋯⋯ *C*

8

17 cm   15 cm

D

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:

$$AC^2 = AD^2 - CD^2$$
$$AC^2 = 17^2 - 15^2 \quad ①$$
$$AC = \sqrt{64}$$
$$= 8 \text{ cm} \quad ①$$

Length ABC $= \dfrac{\pi \times 8}{2} = 4\pi \quad ①$

Perimeter of shaded shape: $4\pi + 15 + 17 \quad ①$
$$= 44.6 \text{ cm} \quad ①$$

44.6
⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯ cm

(Total for Question 5 is 5 marks)
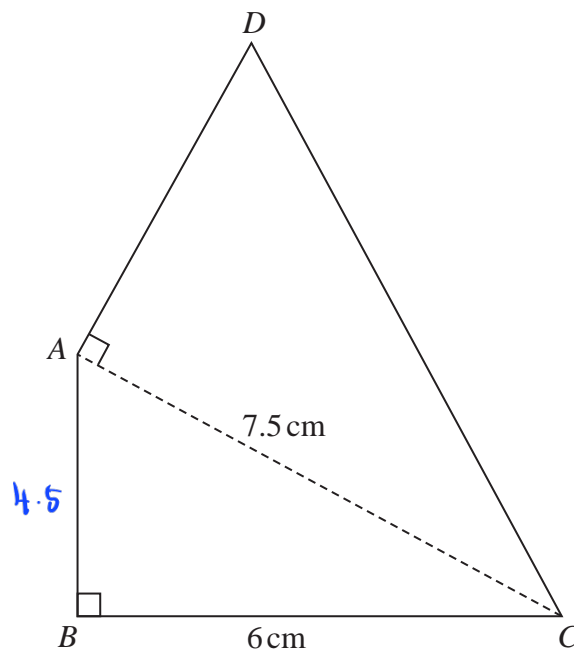
6 The diagram shows a quadrilateral *ABCD*

Diagram **NOT**
accurately drawn

D

A

7.5 cm

4.5

B   6 cm   *C*

In the diagram, *ABC* and *DAC* are right-angled triangles.

$BC = 6$ cm $AC = 7.5$ cm

The area of quadrilateral *ABCD* is 31.5 cm^2

Work out the length of *AD*

By using Pythagoras' theorem :

length AB = $\sqrt{7.5^2 - 6^2}$ ①

= 4.5 cm ①

Area of triangle ABC : $\frac{1}{2} \times 6 \times 4.5 = 13.5$ cm^2 ①

Area of triangle ADC : $31.5 - 13.5 = 18$ cm^2 ①

$\frac{1}{2} \times$ AD $\times 7.5 = 18$

AD $= \dfrac{18}{7.5} \times 2$ ①

$= 4.8$ cm ①

4.8

.... cm

(Total for Question 6 is 6 marks)

7 Here is a parallelogram *PQRS*, in which angle *SPQ* is acute.

Diagram **NOT** accurately drawn

3.8 cm

S

R

h

y

P *x* 6.1 cm *Q*
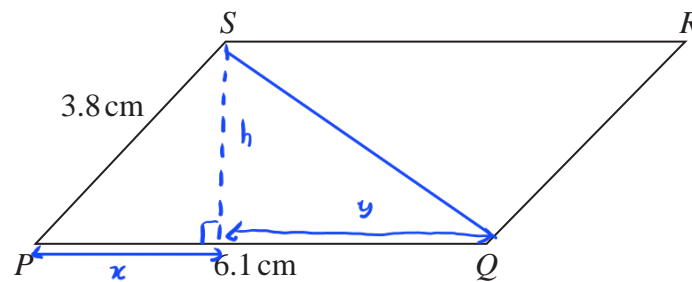
$PQ = 6.1\,\text{cm}$ $PS = 3.8\,\text{cm}$

Area of parallelogram = base × height

The area of the parallelogram is $18\,\text{cm}^2$

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

Area of parallelogram = $18 = 6.1 \times h$
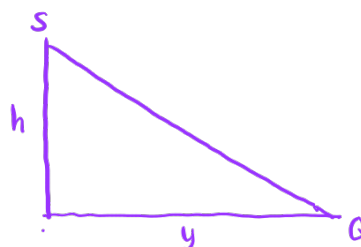
$$h = \frac{18}{6.1} = 2.95\ldots \; \textcircled{1}$$

Finding length x by Pythagoras' theorem :

$$x = \sqrt{3.8^2 - 2.95^2\ldots}$$

$$= 2.394\ldots \; \textcircled{1}$$

length $y = 6.1 - 2.394$

$$= 3.7057\ldots \; \textcircled{1}$$

Finding length QS :

S

h

y

Q

$$QS = \sqrt{h^2 + y^2}$$

$$= \sqrt{(2.95)^2 + (3.7057\ldots)^2} \; \textcircled{1}$$

$$= 4.74 \; \textcircled{1}$$

4.74
.... cm

(Total for Question 7 is 5 marks)

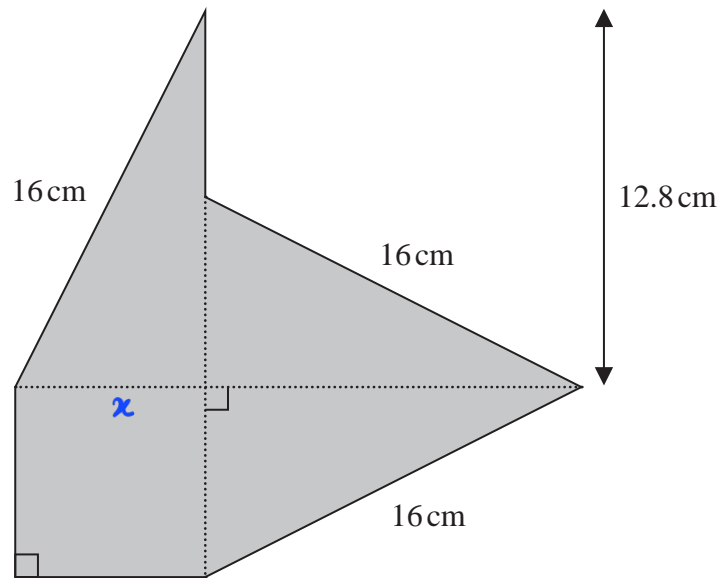**8** The shaded shape is made using three identical right-angled triangles and a square.

Diagram **NOT** accurately drawn

16 cm

16 cm

12.8 cm

x

16 cm

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 8 is 4 marks)

9 The diagram shows isosceles triangle *ABC*
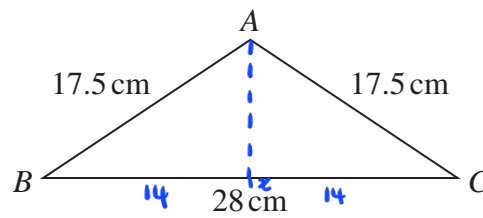
Diagram **NOT** accurately drawn

$AB = AC = 17.5$ cm $BC = 28$ cm

Calculate the area of triangle *ABC*

$$A x = \sqrt{17.5^2 - 14^2} \quad ①$$

$$= \sqrt{110 \cdot 25}$$

$$= 10 \cdot 5 \quad ①$$

$$\text{Area } ABC = 2 \times \frac{1}{2} \times 10 \cdot 5 \times 14 \quad ①$$

$$= 147 \text{ cm}^2$$
$$①$$

147

.... cm^2

(Total for Question 9 is 4 marks)

10 The diagram shows an isosceles triangle, with base length 24 cm.
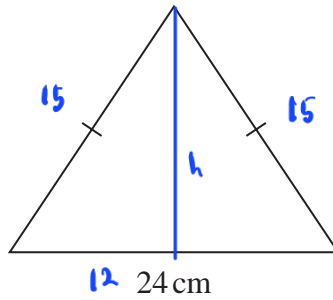
15   15

h

12   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 .... cm^2

(Total for Question 10 is 5 marks)

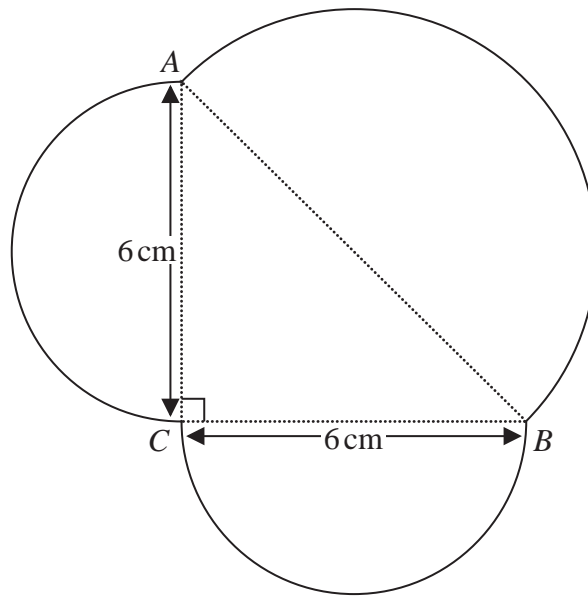**11** The diagram shows a shape made up of three semicircles, enclosing a right-angled triangle.

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.

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

$$AB^2 = 72 \quad ①$$

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

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

$$= 3\pi + 3\pi + 4.24\pi \quad ①$$

$$= 10.24\pi$$

$$= 32.17\dots$$

$$= 32.2 \ (1 \ d.p.) \quad ①$$

32.2

.... cm

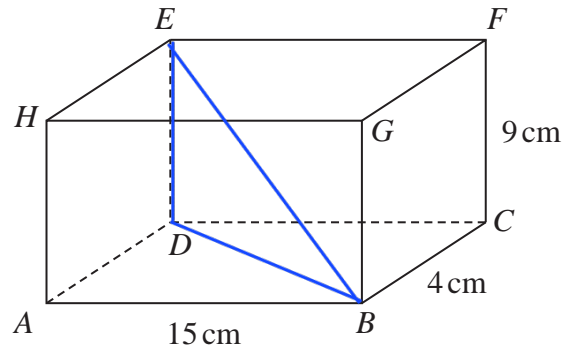**(Total for Question 11 is 5 marks)**

12 Here is a cuboid *ABCDEFGH*

Diagram **NOT** accurately drawn

$AB = 15$ cm $\qquad BC = 4$ cm $\qquad CF = 9$ cm

(a) Work out the length of *BE*
  Give your answer correct to 3 significant figures.

$$BD = \sqrt{15^2 + 4^2}$$

$$= \sqrt{225 + 16}$$

$$= \sqrt{241}$$

$$BE = \sqrt{(\sqrt{241})^2 + 9^2}$$

$$= \sqrt{241 + 81}$$

$$= \sqrt{322} \quad ①$$

$$= 17.9 \quad (3 \text{ s.f.})$$
$$①$$

.... cm
17.9

(2)

(Total for Question 12 is 2 marks)

13 The diagram shows a shaded shape *AEBCD* made by removing triangle *AEB* from rectangle *ABCD*
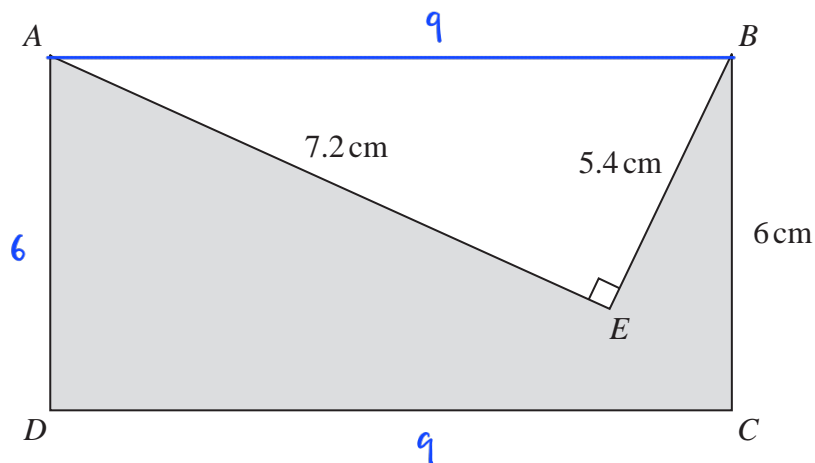
A ——— 9 ——— B

7.2 cm   5.4 cm   6 cm

6

D ——— 9 ——— C

E

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.

$$AB^2 = 7.2^2 + 5.4^2$$
$$= 81 \quad ①$$
$$AB = \sqrt{81} = 9 \quad ①$$

$$\text{Perimeter} = 6 + 7.2 + 5.4 + 6 + 9 \quad ①$$
$$= 33.6 \quad ①$$

33.6

.... cm

(Total for Question 13 is 4 marks)