Chhetri Academy

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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 38

Pythagoras' theorem (incl. 3D)

Higher tier

Past paper question booklet

57	2003-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

3.

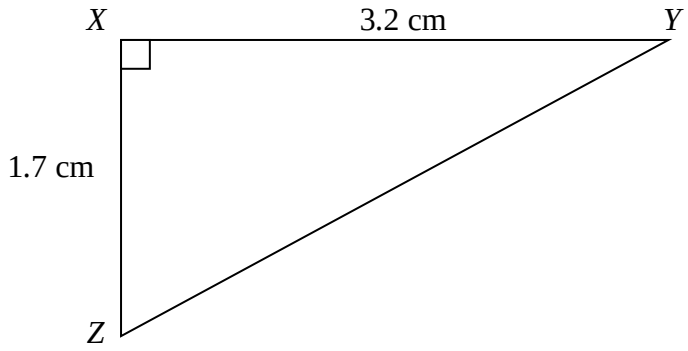


Diagram **NOT** accurately drawn

XYZ is a right-angled triangle.
XY = 3.2 cm.
XZ = 1.7 cm.

Calculate the length of *YZ*.
Give your answer correct to 3 significant figures.

..... cm
(3)

4.

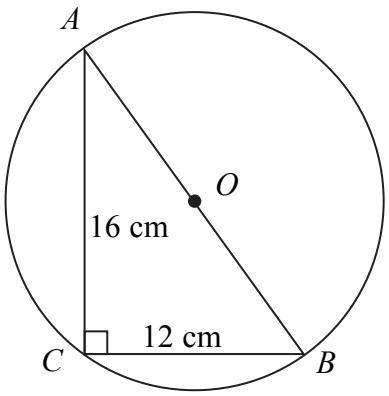


Diagram **NOT** accurately drawn

The diagram shows triangle ABC and a circle, centre O.
A, B and C are points on the circumference of the circle.
AB is a diameter of the circle.

$AC = 16$ cm and $BC = 12$ cm.

(a) Angle $ACB = 90°$.
Give a reason why.

.....

(1)

(b) Work out the diameter AB of the circle.

..... cm

(3)

(c) Work out the area of the circle.
Give your answer correct to 3 significant figures.

..... cm^2

(3)

Q4

(Total 7 marks)

17.

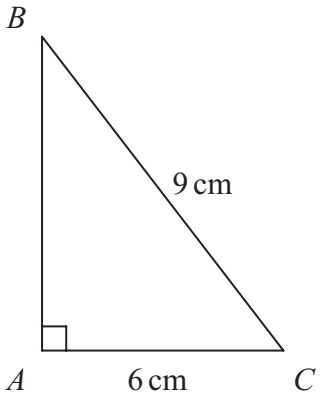


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.

AC = 6 cm.
BC = 9 cm.

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

..... cm

(Total 3 marks)

Q17

16.

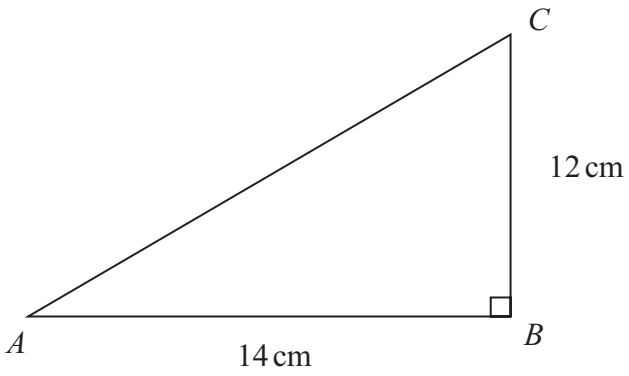


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
AB = 14 cm.
BC = 12 cm.

Calculate the length of *AC*.
Give your answer correct to 3 significant figures.

..... cm

Q16

(Total 3 marks)

25.

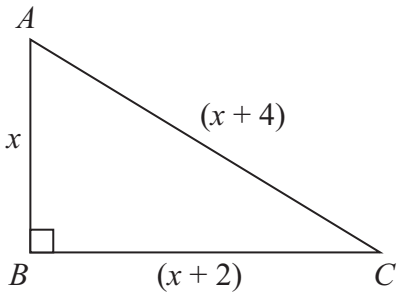


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
All the measurements are in centimetres.

$AB = x$
$BC = (x + 2)$
$AC = (x + 4)$

(a) Show that $x^2 - 4x - 12 = 0$

(3)

(b) (i) Solve $x^2 - 4x - 12 = 0$

.....

(ii) Hence, write down the length of *AC*.

$AC =$ ..... cm

(4)

(Total 7 marks)

Q25

12.

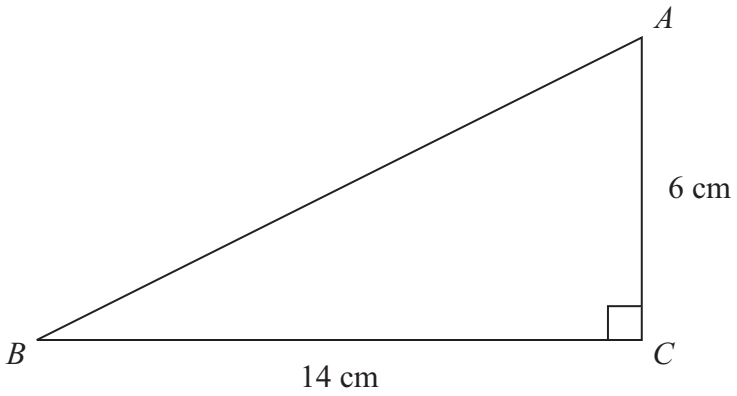


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
AC = 6 cm.
BC = 14 cm.

(a) Work out the area of triangle *ABC*.

..... cm^2
(2)

(b) Calculate the length of *AB*.
Give your answer correct to 2 decimal places.

..... cm
(3)

Q12

(Total 5 marks)

19.

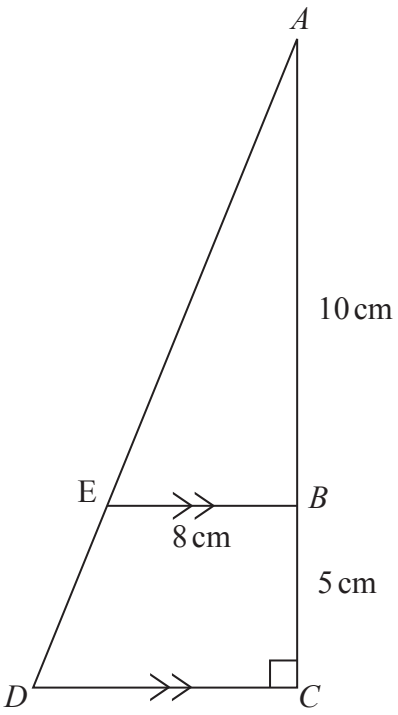


Diagram **NOT** accurately drawn

ABC and *AED* are straight lines.
EB is parallel to *DC*.
Angle *ACD* = 90°.

AB = 10 cm.
BC = 5 cm.
EB = 8 cm.

(a) Work out the length of *DC*.

..... cm
(2)

(b) Work out the area of the trapezium *EBCD*.

..... cm^2
(2)

Q19

(Total 4 marks)

25.

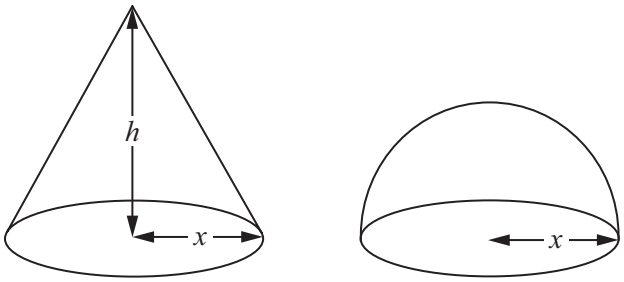


Diagram **NOT** accurately drawn

The diagram shows a solid cone and a solid hemisphere.

The cone has a base of radius x cm and a height of h cm.
The hemisphere has a base of radius x cm.
The surface area of the cone is equal to the surface area of the hemisphere.

Find an expression for h in terms of x.

.....

Q25

(Total 4 marks)

25.

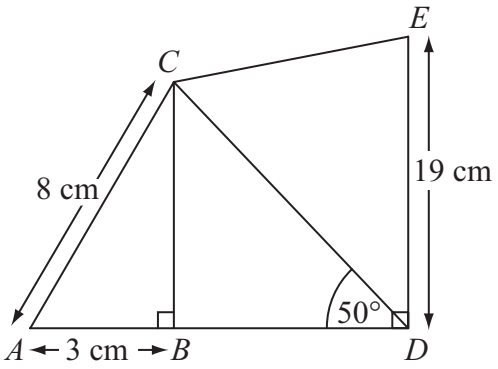


Diagram **NOT** accurately drawn

$AC = 8$ cm.
$AB = 3$ cm.
$DE = 19$ cm.
Angle ABC = angle CBD = angle $BDE = 90°$.
Angle $BDC = 50°$.

(a) Calculate the length of CD.
Give your answer correct to 3 significant figures.

..... cm
(4)

(b) Calculate the length of CE.
Give your answer correct to 3 significant figures.

..... cm
(3)

(Total 7 marks)

Q25

21.

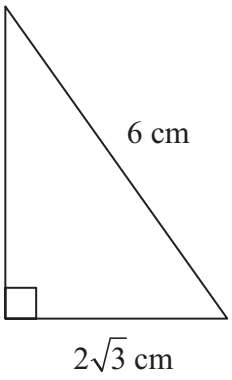


Diagram **NOT** accurately drawn

The diagram shows a right-angled triangle.

The length of the base of the triangle is $2\sqrt{3}$ cm.

The length of the hypotenuse of the triangle is 6 cm.

The area of the triangle is A cm^2.

Show that $A = k\sqrt{2}$ giving the value of k.

.....

Q21

(Total 5 marks)

18 The diagram shows a quadrilateral $ABCD$.

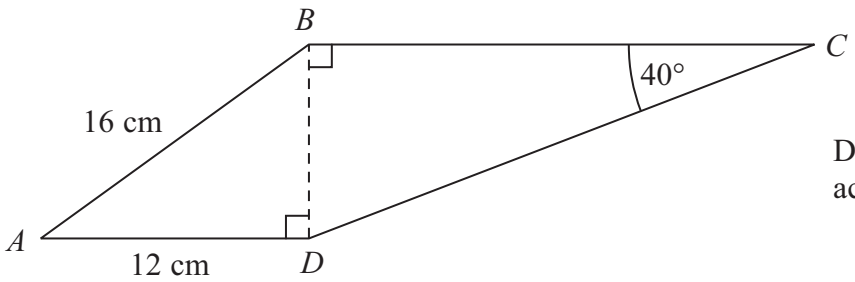


Diagram **NOT** accurately drawn

$AB = 16$ cm.
$AD = 12$ cm.
Angle $BCD = 40°$.
Angle ADB = angle $CBD = 90°$.

Calculate the length of CD.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 18 is 5 marks)

10 Janice cuts a triangle from a rectangular piece of metal.
She uses the rest of the metal to make a name badge.

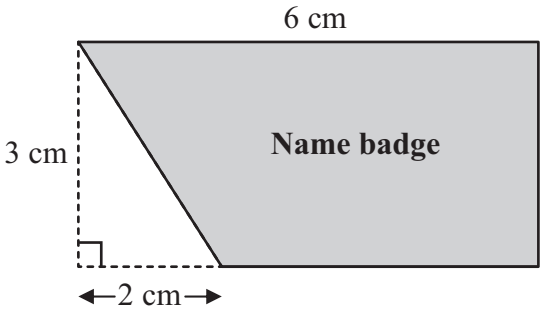


Diagram **NOT** accurately drawn

The rectangle has length 6 cm and width 3 cm.
The right-angled triangle has base 2 cm and height 3 cm.

Work out the area of the name badge.

.....

(Total for Question 10 is 4 marks)

9 The diagram shows the marking on a school playing field.

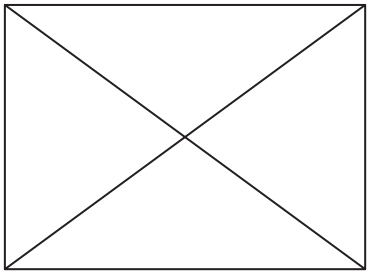


Diagram **NOT** accurately drawn

The diagram shows a rectangle and its diagonals.

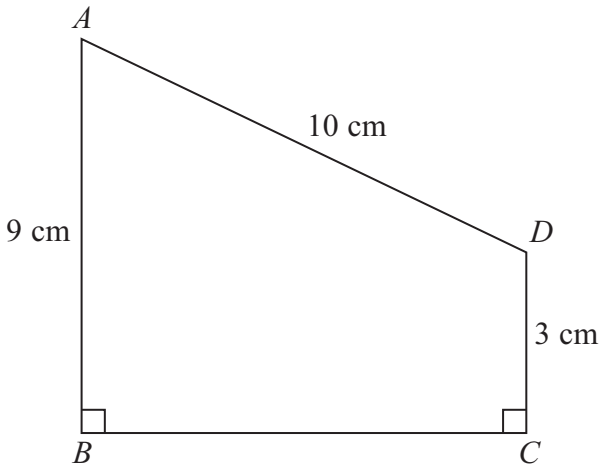
Work out the total length of the four sides of the rectangle and its diagonals.

..... m

(Total for Question 9 is 5 marks)

15 $ABCD$ is a trapezium.

Diagram **NOT** accurately drawn



$AD = 10$ cm
$AB = 9$ cm
$DC = 3$ cm
Angle ABC = angle $BCD = 90°$

Calculate the length of AC.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 15 is 5 marks)

3 Here is a right-angled triangle.

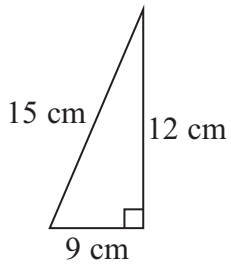


Diagram **NOT** accurately drawn

The shape below is made from 4 of these triangles.

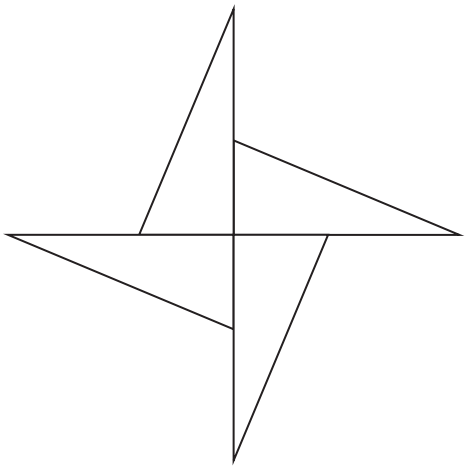


Diagram **NOT** accurately drawn

Work out the perimeter of the shape.

..... cm

(Total for Question 3 is 3 marks)

7

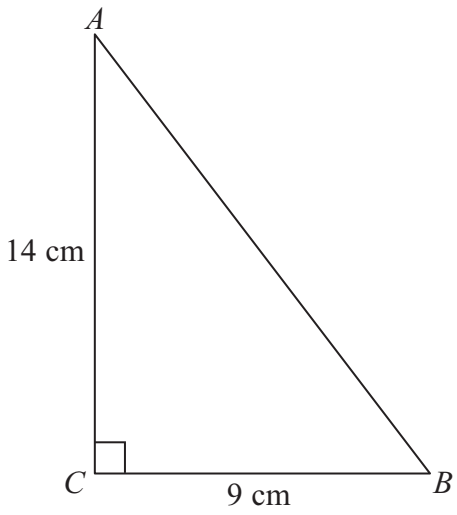


Diagram **NOT** accurately drawn

Calculate the length of AB.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 7 is 3 marks)

13

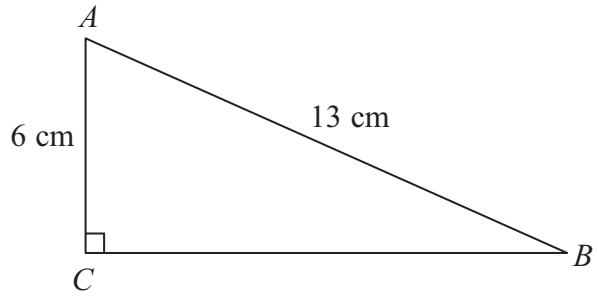


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
$AC = 6$ cm
$AB = 13$ cm

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

..... cm

(3)

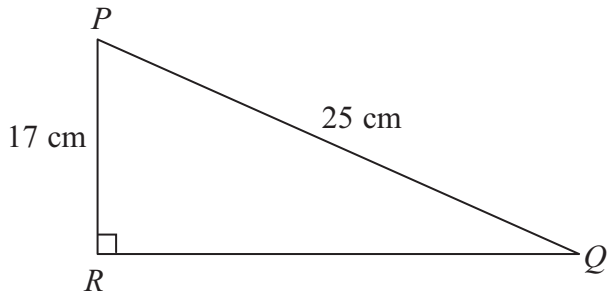


Diagram **NOT** accurately drawn

PQR is a right-angled triangle.
$PR = 17$ cm
$PQ = 25$ cm

(b) Work out the size of angle RPQ.
Give your answer correct to 1 decimal place.

.....°

(3)

(Total for Question 13 is 6 marks)

19

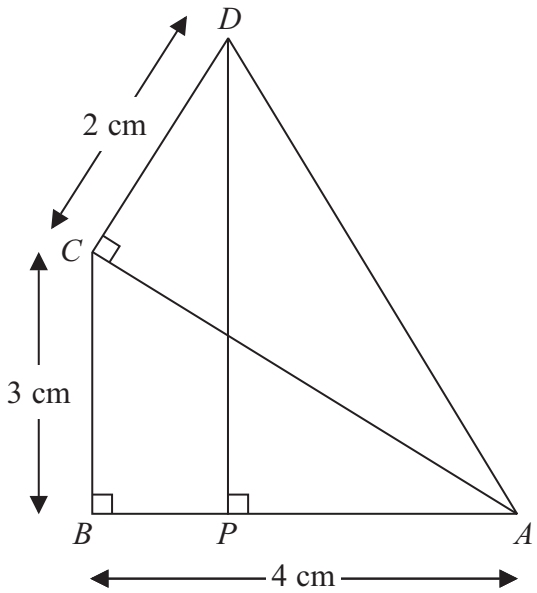


Diagram **NOT** accurately drawn

In the diagram,

ABC, *ACD* and *APD* are right-angled triangles.
AB = 4 cm.
BC = 3 cm.
CD = 2 cm.

Work out the length of *DP*.

..... cm

(Total for Question 19 is 5 marks)

22

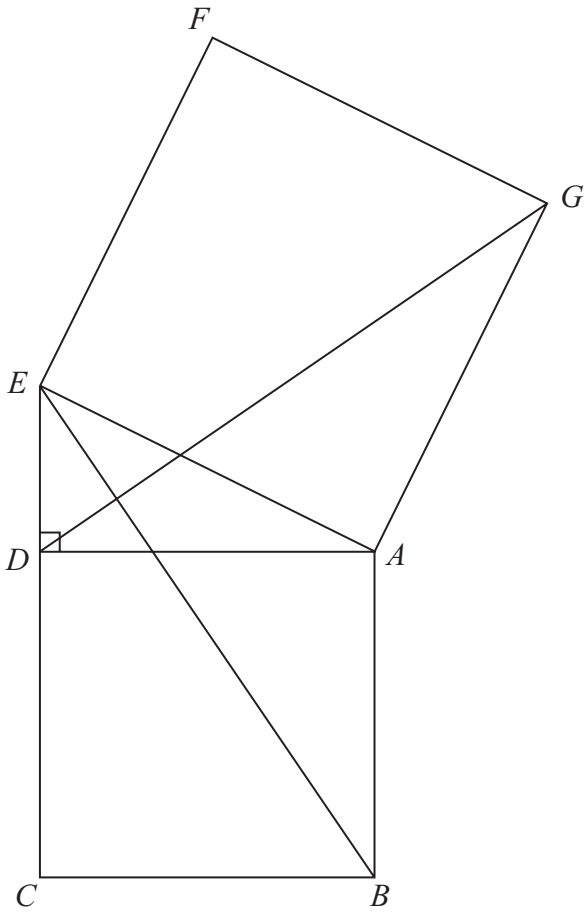


Diagram **NOT** accurately drawn

In the diagram,

ADE is a right-angled triangle,
ABCD and *AEFG* are squares.

Prove that triangle *ABE* is congruent to triangle *ADG*.

(Total for Question 22 is 3 marks)

20

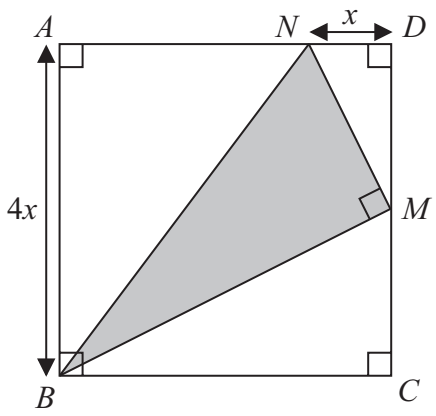


Diagram **NOT** accurately drawn

ABCD is a square with a side length of $4x$
M is the midpoint of *DC*.
N is the point on *AD* where $ND = x$

BMN is a right-angled triangle.

Find an expression, in terms of x, for the area of triangle *BMN*.
Give your expression in its simplest form.

.....

(Total for Question 20 is 4 marks)

11 XYZ is a right-angled triangle.

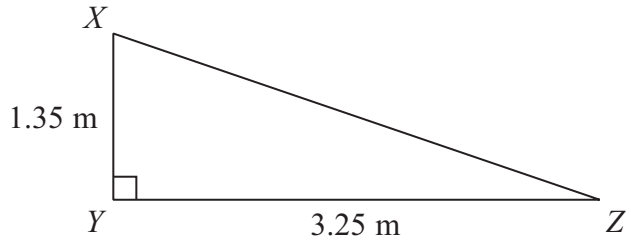


Diagram **NOT** accurately drawn

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

..... m

(Total for Question 11 is 3 marks)

10 *GHJ* is a right-angled triangle.

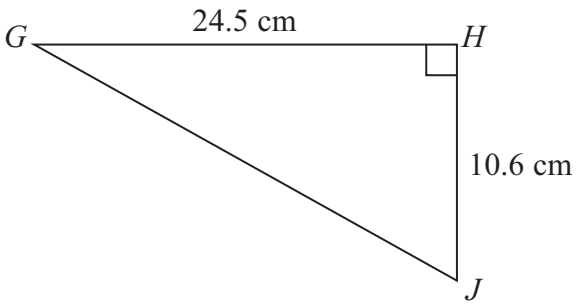


Diagram **NOT** accurately drawn

(a) Calculate the length of *GJ*.
Give your answer correct to one decimal place.

..... cm
(3)

LMN is a different right-angled triangle.

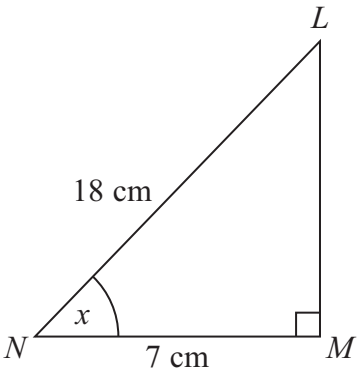


Diagram **NOT** accurately drawn

(b) Calculate the size of the angle marked *x*.
Give your answer correct to one decimal place.

°
.....
(3)

(Total for Question 10 is 6 marks)

15 Here is a right-angled triangle.

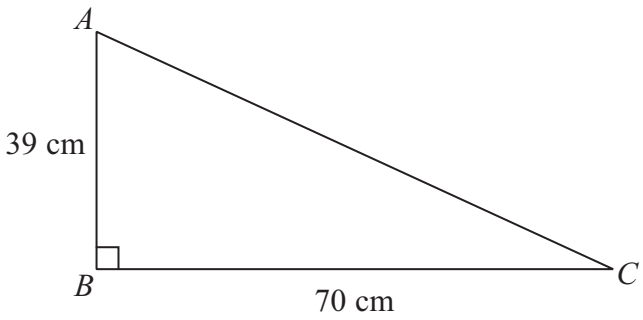


Diagram **NOT** accurately drawn

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

..... cm

(Total for Question 15 is 3 marks)

16 Jane has a flower bed in the shape of an equilateral triangle.
The perimeter of the flower bed is 15 metres.

(a) Work out the area of the flower bed.
Give your answer correct to 1 decimal place.

.....m^2

(3)

Jane has some containers in the shape of hemispheres with diameter 35 cm.

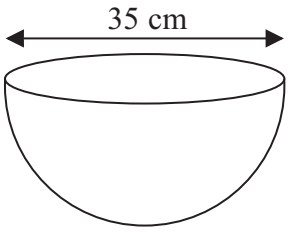


Diagram **NOT** accurately drawn

Jane is going to fill the containers completely with compost.
She has 80 litres of compost.
1 litre = 1000 cm^3.

(b) Work out how many containers Jane can fill completely with compost.

.....

(4)

(Total for Question 16 is 7 marks)

16 Jane has a flower bed in the shape of an equilateral triangle.
The perimeter of the flower bed is 15 metres.

(a) Work out the area of the flower bed.
Give your answer correct to 1 decimal place.

.....m^2

(3)

Jane has some containers in the shape of hemispheres with diameter 35 cm.

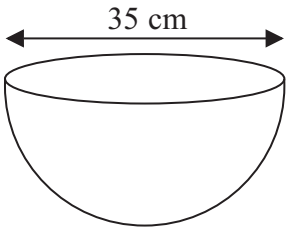


Diagram **NOT** accurately drawn

Jane is going to fill the containers completely with compost.
She has 80 litres of compost.
1 litre = 1000 cm^3.

(b) Work out how many containers Jane can fill completely with compost.

.....

(4)

(Total for Question 16 is 7 marks)

16 The diagram represents a metal frame.

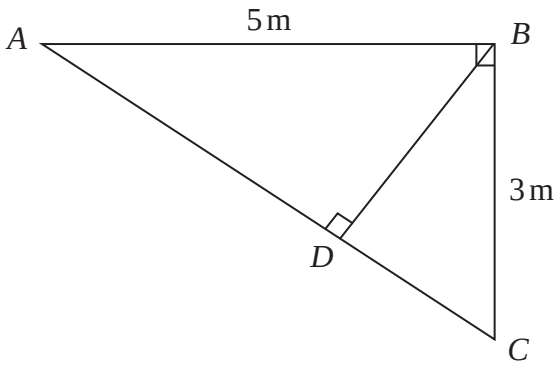


Diagram **NOT** accurately drawn

The frame is made from four metal bars, *AB*, *AC*, *BC* and *BD*.

Angle *ABC* = angle *ADB* = 90°
AB = 5 m
BC = 3 m

Work out the total length of the four metal bars of the frame.
Give your answer correct to 3 significant figures.

..... m

(Total for Question 16 is 5 marks)

11

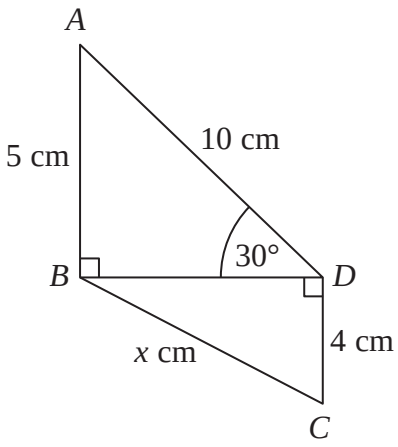


Diagram **NOT** accurately drawn

In the diagram,

triangles *ABD* and *BCD* are right-angled triangles
AB = 5 cm
AD = 10 cm
CD = 4 cm
Angle *ADB* = 30°

Work out the value of *x*.
Give your answer correct to 2 decimal places.

.....cm

(Total for Question 11 is 4 marks)

13 Here is a rectangle.

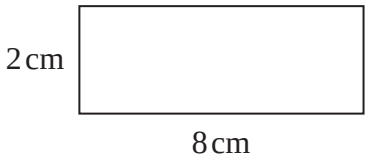


Diagram **NOT** accurately drawn

The 8-sided shape below is made from 4 of these rectangles and 4 congruent right-angled triangles.

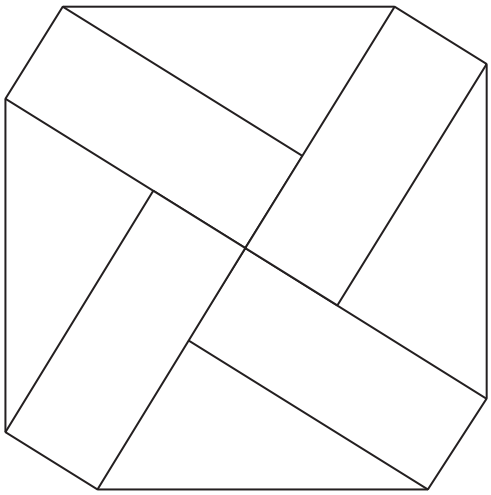


Diagram **NOT** accurately drawn

Work out the perimeter of the 8-sided shape.
You must show all your working.

..... cm

(Total for Question 13 is 5 marks)

13

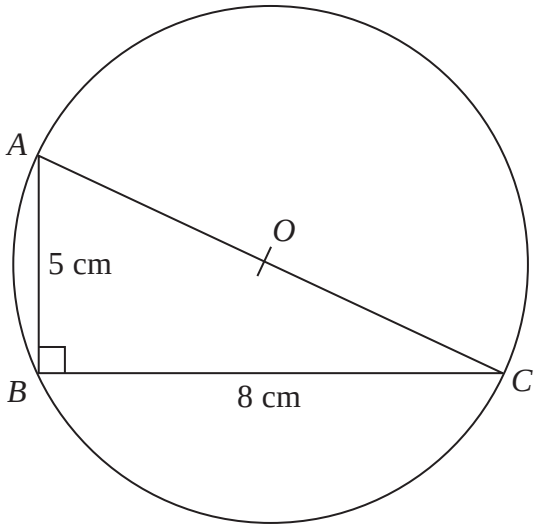


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
A, *B* and *C* are points on the circumference of a circle centre *O*.
AB = 5 cm
BC = 8 cm

AOC is a diameter of the circle.

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

..... cm

(Total for Question 13 is 4 marks)

*7 Here is part of a field.

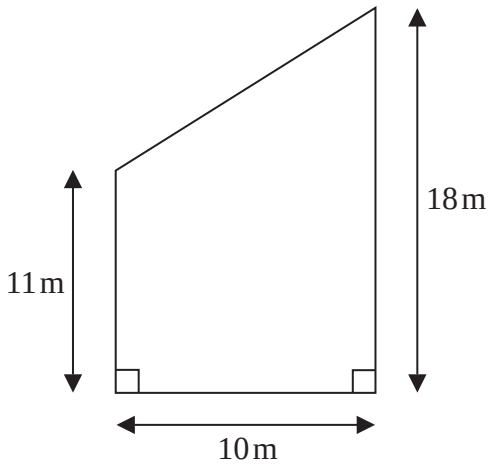


Diagram **NOT** accurately drawn

This part of the field is in the shape of a trapezium.
A farmer wants to put a fence all the way around the edge of this part of the field.

The farmer has 50 m of fence.

Does he have enough fence?
You must show all your working.

(Total for Question 7 is 5 marks)

25 *ABD* is a right angled triangle.

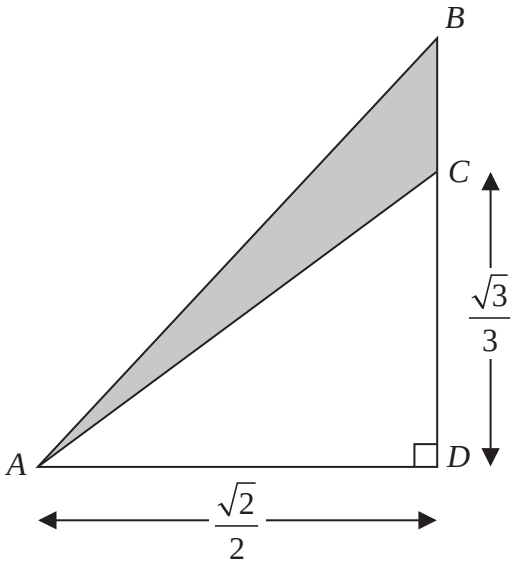


Diagram **NOT** accurately drawn

All measurements are given in centimetres.

C is the point on BD such that $CD = \frac{\sqrt{3}}{3}$

$AD = BD = \frac{\sqrt{2}}{2}$

Work out the exact area, in cm^2, of the shaded region.

.....cm^2

(Total for Question 25 is 3 marks)

10

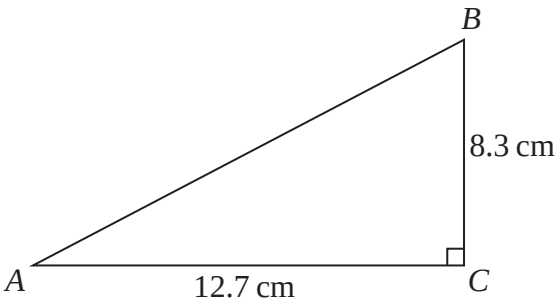


Diagram **NOT** accurately drawn

(a) Calculate the length of *AB*.
Give your answer correct to one decimal place.

..... cm

(3)

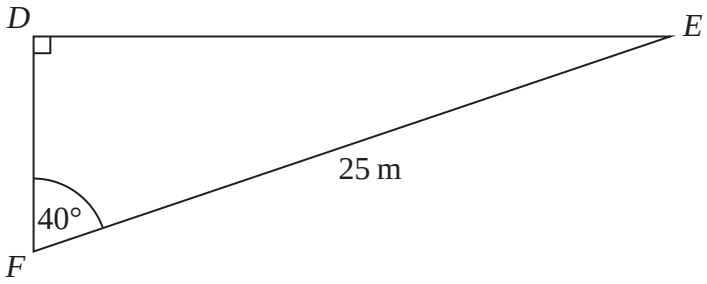


Diagram **NOT** accurately drawn

(b) Calculate the length of *DE*.
Give your answer correct to three significant figures.

..... m

(3)

(Total for Question 10 is 6 marks)

9 The diagram shows a rectangular framework.

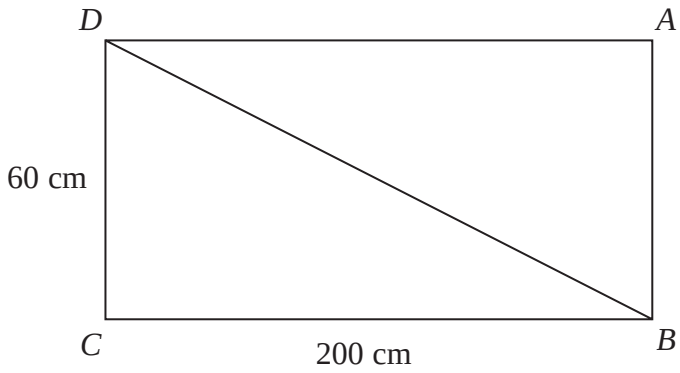


Diagram **NOT** accurately drawn

The framework is made from 5 metal rods.
The metal rods have a weight of 0.9 kg per metre.

Work out the total weight of the framework.
Give your answer, in kg, correct to 3 significant figures.

..... kg

(Total for Question 9 is 4 marks)

11 The diagram shows a square *ABCD* inside a circle.

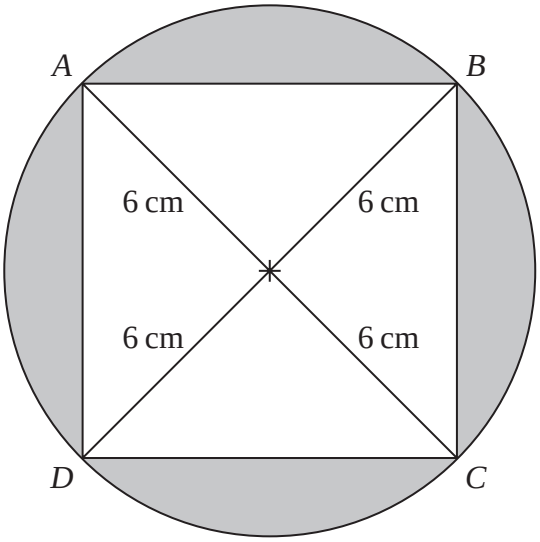


Diagram **NOT** accurately drawn

The points *A*, *B*, *C* and *D* lie on the circle.

The radius of the circle is 6 cm.

Work out the total area of the shaded regions.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 11 is 4 marks)

11 *DEF* is a right-angled triangle.

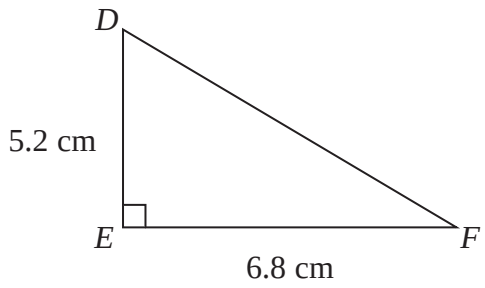


Diagram **NOT** accurately drawn

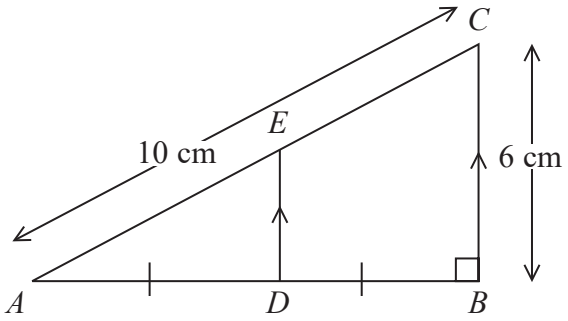
Work out the length of *DF*.
Give your answer correct to 2 decimal places.

.....cm

(Total for Question 11 is 3 marks)

15

Diagram **NOT** accurately drawn



ADB and *AEC* are straight lines.
DE is parallel to *BC*.

Angle *ABC* = 90°
AC = 10 cm.
BC = 6 cm.

D is the midpoint of *AB*.

Work out the area of trapezium *BCED*.

.....cm^2

(Total for Question 15 is 4 marks)

Question 37

8 A square, with sides of length x cm, is inside a circle.
Each vertex of the square is on the circumference of the circle.

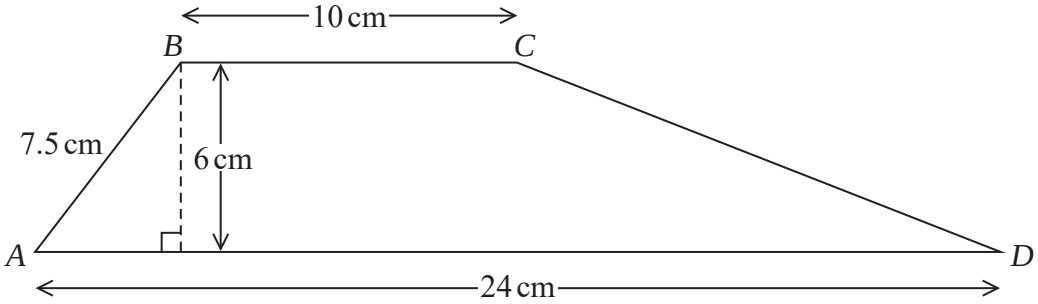
The area of the circle is 49 cm^2.

Work out the value of x.
Give your answer correct to 3 significant figures.

.....

(Total for Question 8 is 4 marks)

7 *ABCD* is a trapezium.

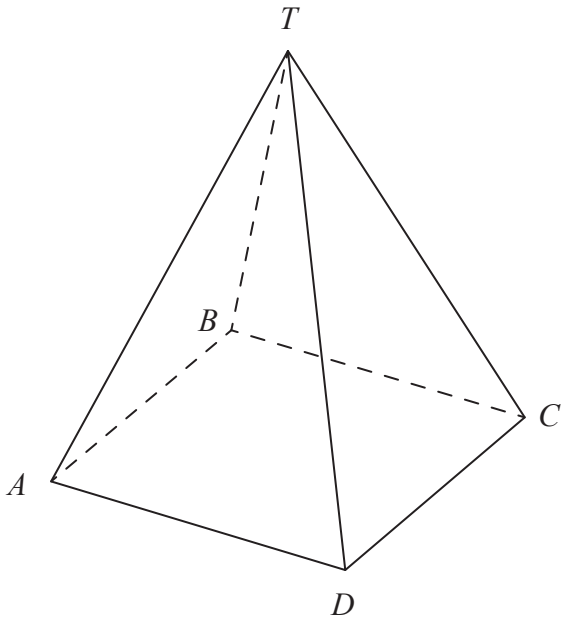


Work out the size of angle *CDA*.
Give your answer correct to 1 decimal place.

.....°

(Total for Question 7 is 5 marks)

12 Here is a pyramid with a square base $ABCD$.



$AB = 5\,\text{m}$

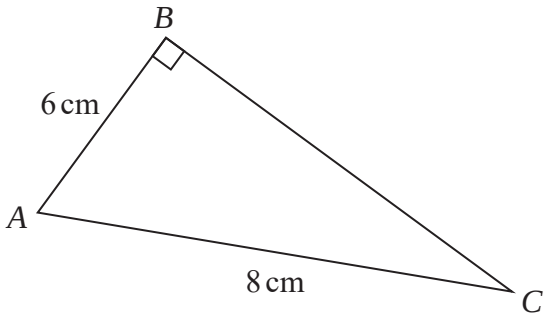
The vertex T is 12 m vertically above the midpoint of AC.

Calculate the size of angle TAC.

.....°

(Total for Question 12 is 4 marks)

8 ABC is a right-angled triangle.



Here is Sarah's method to find the length of BC.

$$\begin{aligned} BC^2 &= AB^2 + AC^2 \\ &= 6^2 + 8^2 \\ &= 100 \\ BC &= 10 \end{aligned}$$

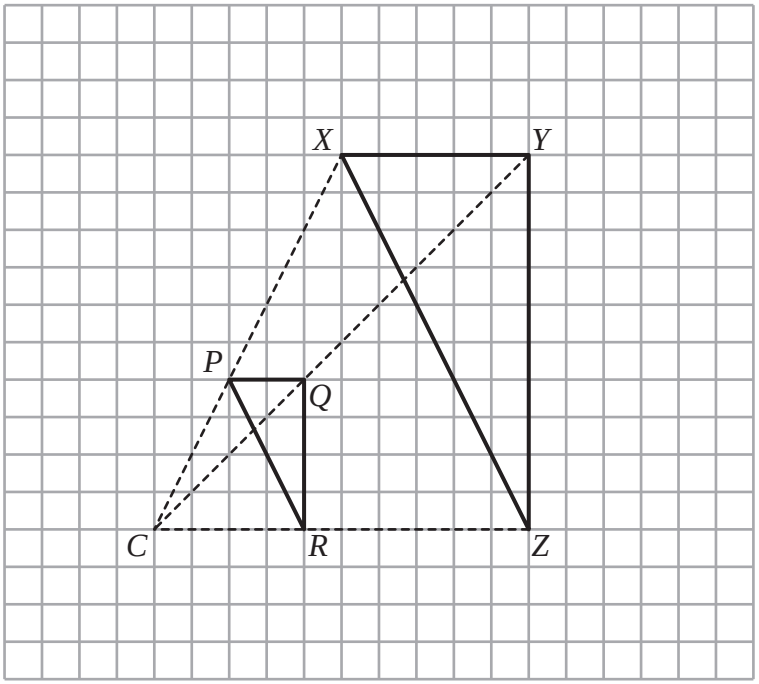
(a) What mistake has Sarah made in her method?

.....

.....

.....

(1)



Roy is going to enlarge triangle PQR with centre C and scale factor $1\frac{1}{2}$

He draws triangle XYZ.

(b) Explain why Roy's diagram is **not** correct.

.....

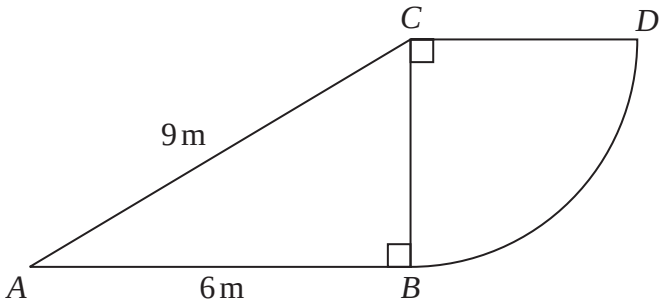
.....

.....

(1)

(Total for Question 8 is 2 marks)

7 The diagram shows a right-angled triangle and a quarter circle.



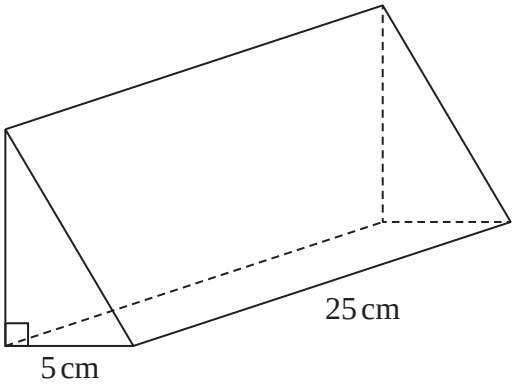
The right-angled triangle *ABC* has angle *ABC* = 90°
The quarter circle has centre *C* and radius *CB*.

Work out the area of the quarter circle.
Give your answer correct to 3 significant figures.
You must show all your working.

..... m^2

(Total for Question 7 is 4 marks)

6 The diagram shows a prism.



The cross section of the prism is a right-angled triangle.
The base of the triangle has length 5 cm

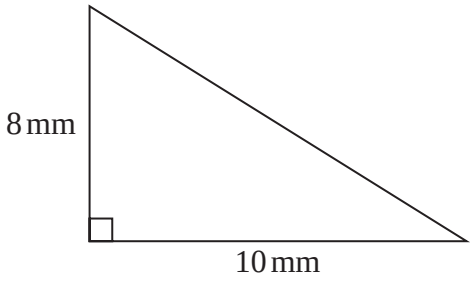
The prism has length 25 cm
The prism has volume 750 cm^3

Work out the height of the prism.

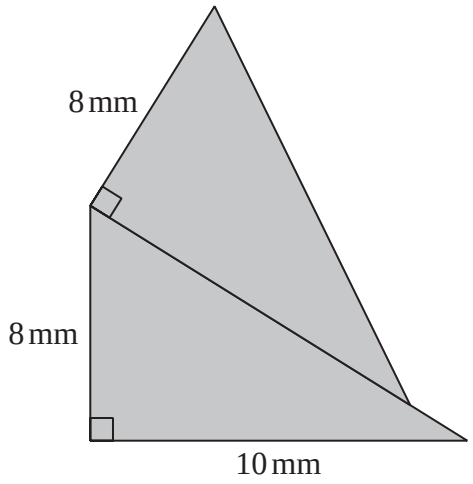
..... cm

(Total for Question 6 is 3 marks)

5 Here is a right-angled triangle.



The shaded shape below is made from two of these triangles.

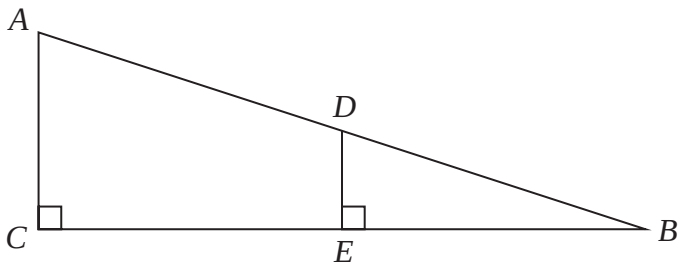


Work out the perimeter of the shaded shape.
Give your answer correct to 3 significant figures.

..... mm

(Total for Question 5 is 4 marks)

10 The diagram shows two right-angled triangles *ACB* and *DEB*.



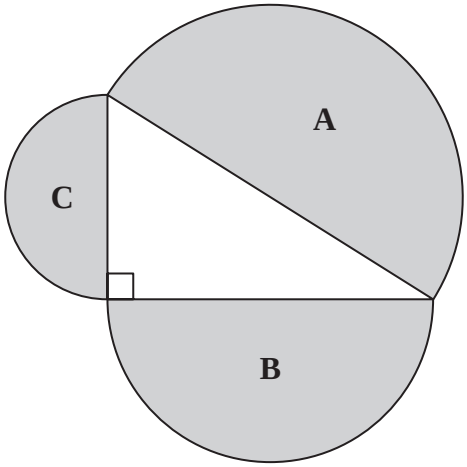
AD = 9 cm
DE = 2 cm
DB = 6 cm

Calculate the length of *CB*.
Give your answer correct to 2 decimal places.

..... cm

(Total for Question 10 is 4 marks)

13 A right-angled triangle is formed by the diameters of three semicircular regions, **A**, **B** and **C** as shown in the diagram.



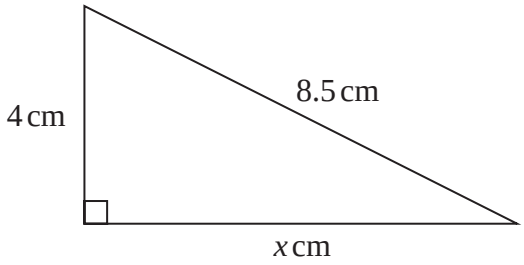
Show that

area of region **A** = area of region **B** + area of region **C**

(Total for Question 13 is 3 marks)

Question 46

1 Here is a right-angled triangle.

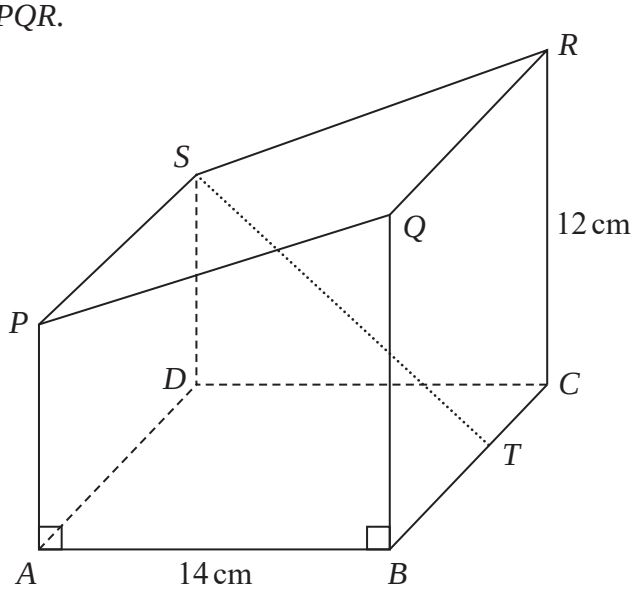


Work out the value of x.

$x =$ .....

(Total for Question 1 is 2 marks)

18 Here is a prism *ABCDSPQR*.



The base *ABCD* of the prism is a square of side 14 cm
T is the point on *BC* such that *BT* : *TC* = 4 : 3

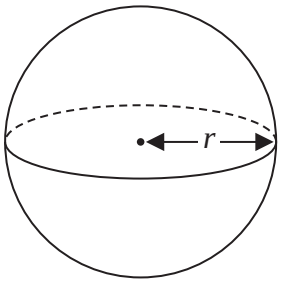
The cross section of the prism is in the shape of a trapezium of area 147 cm^2
CR = 12 cm

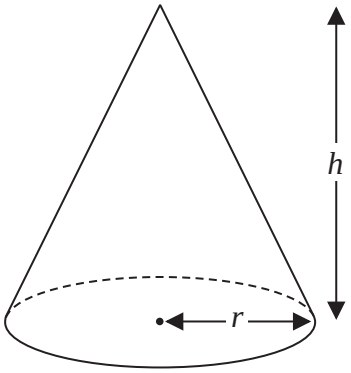
Find the size of the angle between the line *ST* and the base *ABCD*.
Give your answer correct to 1 decimal place.

.....°

(Total for Question 18 is 5 marks)

24 Here is a solid sphere and a solid cone.





Volume of sphere = $\frac{4}{3}\pi r^3$

Volume of cone = $\frac{1}{3}\pi r^2 h$

All measurements are in cm.

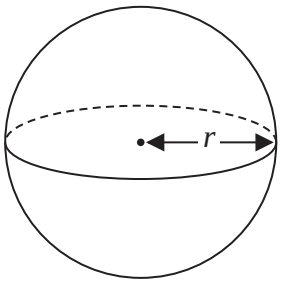
The volume of the sphere is equal to the volume of the cone.

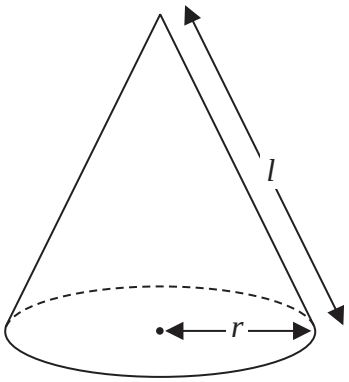
(a) Find $r : h$
Give your answer in its simplest form.

.....

(2)

Here is a different solid sphere and a different solid cone.





Surface area of sphere = $4\pi r^2$

Curved area of cone = $\pi r l$

All measurements are in cm.

The surface area of the sphere is equal to the **total** surface area of the cone.

(b) Find $r : h$

Give your answer in the form $1 : \sqrt{n}$ where n is an integer.

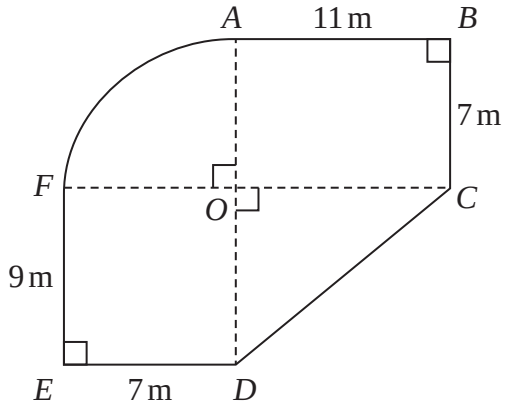
.....

(4)

(Total for Question 24 is 6 marks)

4 The diagram shows a plan of Jason's garden.

ABCO and *DEFO* are rectangles.
CDO is a right-angled triangle.
AFO is a sector of a circle with centre *O* and angle *AOF* = 90°



Jason is going to cover his garden with grass seed.
Each bag of grass seed covers 14 m^2 of garden.
Each bag of grass seed costs £10.95

Work out how much it will cost Jason to buy all the bags of grass seed he needs.

£.....

(Total for Question 4 is 5 marks)

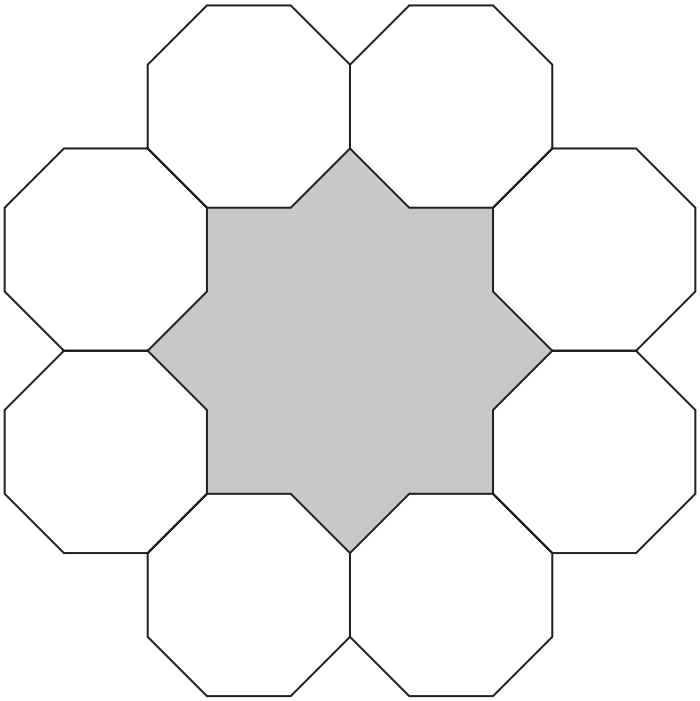
13 A and B are points on a centimetre grid.
A is the point with coordinates $(-7, 6)$
B is the point with coordinates $(8, -5)$

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

..... cm

(Total for Question 13 is 2 marks)

24 The diagram shows 8 identical regular octagons joined to enclose a shaded shape.



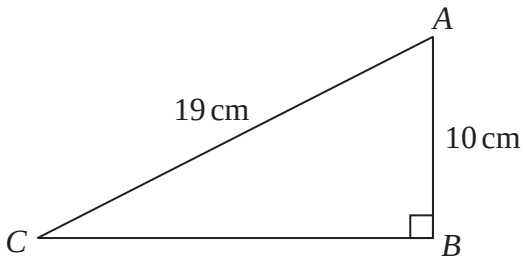
Each octagon has sides of length a.

Find, in terms of a, an expression for the area of the shaded shape.
Give your answer in the form $p\left(2+\sqrt{2}\right)a^2$ where p is an integer.
You must show all your working.

.....

(Total for Question 24 is 5 marks)

1 *ABC* is a right-angled triangle.

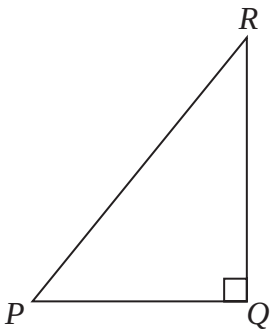


Work out the length of *CB*.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 1 is 2 marks)

8 A playground is in the shape of a right-angled triangle.



Dan makes a scale drawing of the playground.
He uses a scale of 1 cm represents 5 m

The area of the playground on the scale drawing is 28 cm^2

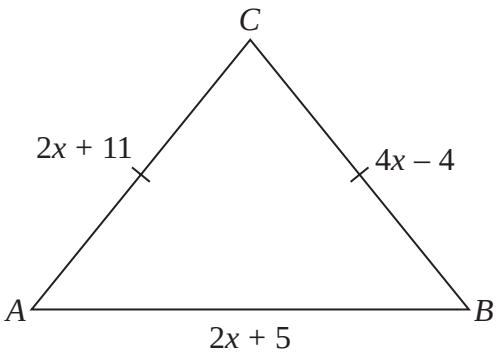
The real length of QR is 40 m

Work out the real length of PQ.

..... m

(Total for Question 8 is 3 marks)

7 The diagram shows triangle *ABC*.



In the diagram, all measurements are in centimetres.

$AC = BC$

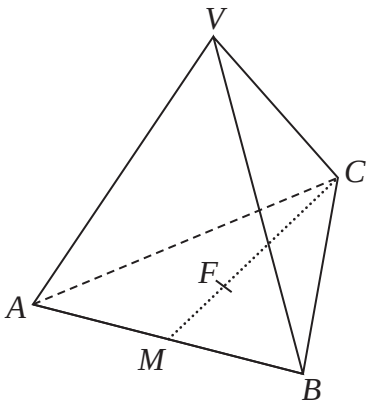
The perimeter of the triangle is 72 cm.

Work out the area of the triangle.

..... cm^2

(Total for Question 7 is 5 marks)

20 *VABC* is a solid pyramid.
ABC is an equilateral triangle.



M is the midpoint of *AB*.
F is the point on *MC* such that $MF : FC = 1 : 2$

The vertex *V* is vertically above *F*.
$VA = VB = VC$

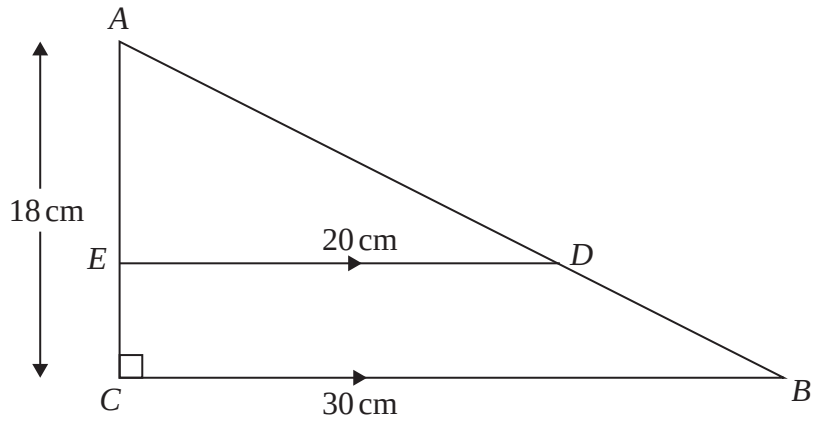
$VF = 8\,\text{cm}$ Angle $VCM = 52°$

Work out the side length of the equilateral triangle *ABC*.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 20 is 3 marks)

8 *ABC* is a right-angled triangle.



AEC and *ADB* are straight lines.
ED is parallel to *CB*.

(a) Prove that triangle *ABC* is similar to triangle *ADE*.

(2)

ED = 20 cm *CB* = 30 cm *AC* = 18 cm

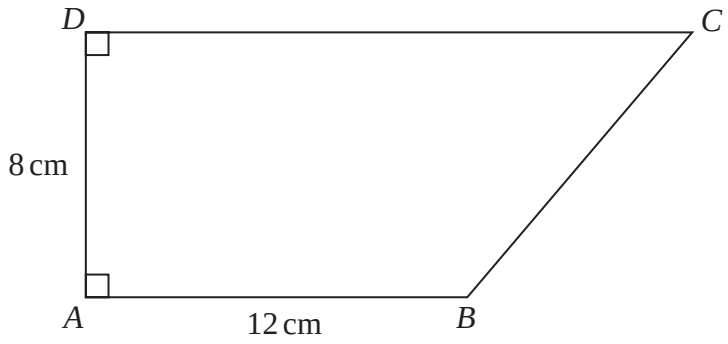
(b) Work out the length of *EC*.

..... cm

(3)

(Total for Question 8 is 5 marks)

8 The diagram shows trapezium *ABCD*.



AB = 12 cm
AD = 8 cm

The trapezium has an area of 112 cm^2

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

..... cm

(Total for Question 8 is 5 marks)