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EDEXCEL INTERNATIONAL GCSE MATHS: QUESTIONS BY TOPIC

Perimeter, Area & Volume (G4)

International GCSE Mathematics A (4MA1) · Foundation tier

108 questions · 405 marks · Mark schemes included

Past papers June 2018 - June 2025 · 3 sub-topics

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HOW TO USE THIS BOOKLET

Questions are grouped by sub-topic and run from the lowest to the highest mark tariff, then oldest paper first.
Click any row below to jump straight to that sub-topic or question.
On every question page, click ANSWER in the top-right corner to jump to its mark scheme; < QUESTION brings you back.
A gold bar in the left margin marks exactly where the question sits on the original page.
Diagrams, graphs, grids and tables are printed exactly as they appear in the original papers.
Each question is filed under its main topic; longer questions may also test skills from other topics.

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QUESTIONS

108 questions · 405 marks · 3 sub-topics

SUB-TOPIC G4a

PERIMETER & AREA OF 2D SHAPES

Sub-topic G4a · 44 questions · 179 marks · lowest tariff first

13 The diagram shows a trapezium.

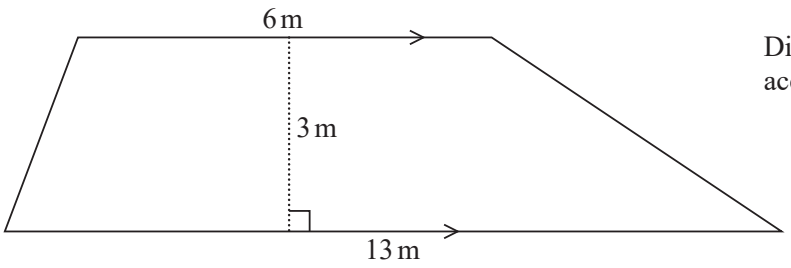


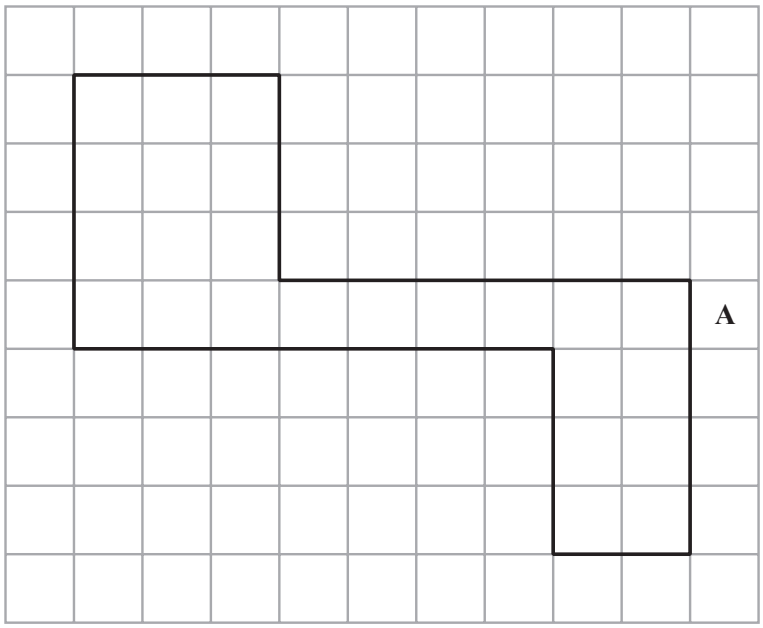
Diagram **NOT** accurately drawn

Work out the area of the trapezium.

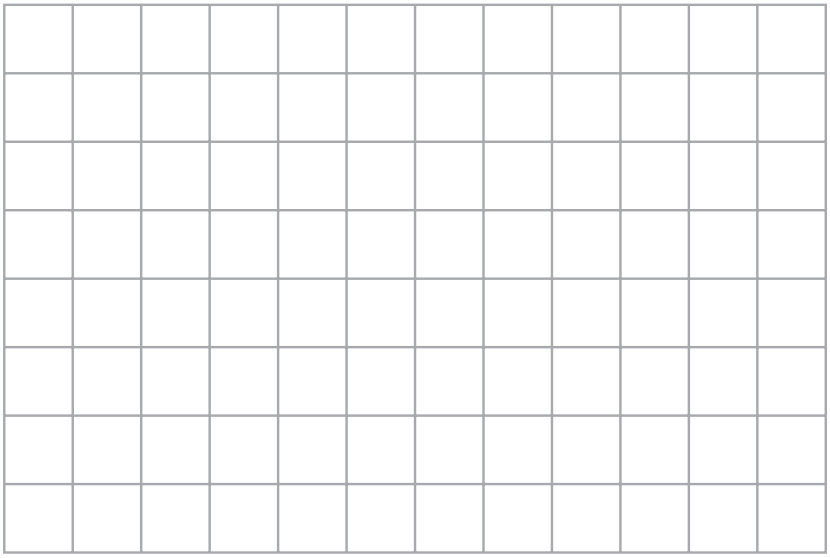
..... m^2

(Total for Question 13 is 2 marks)

10 The diagram shows shape **A** drawn on a centimetre grid.



On the centimetre grid below, draw a rectangle that has the same area as shape **A**



(Total for Question 10 is 2 marks)

2 A field is in the shape of a rectangle.

The width of the field is 70 m.
The length of the field is 100 m.

Fafa walks around the edge of the field 3 times.

Work out the total distance Fafa walks.

..... m

(Total for Question 2 is 3 marks)

3 Here is a rectangle made from 12 square tiles.

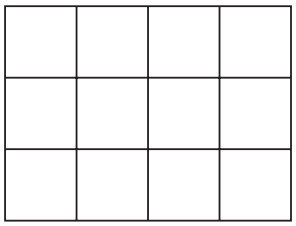


Diagram **NOT** accurately drawn

The perimeter of each tile is 20 cm.

Work out the area of the rectangle.

..... cm^2

(Total for Question 3 is 3 marks)

6 Here is a square.

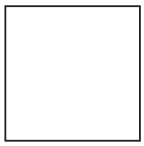


Diagram **NOT** accurately drawn

The perimeter of the square is 24 cm.

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



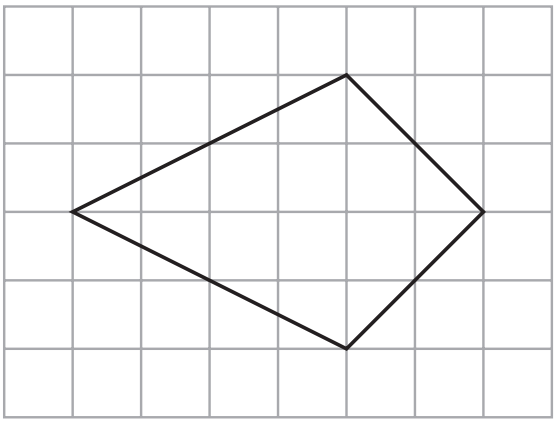
Diagram **NOT** accurately drawn

Work out the perimeter of the shaded rectangle.

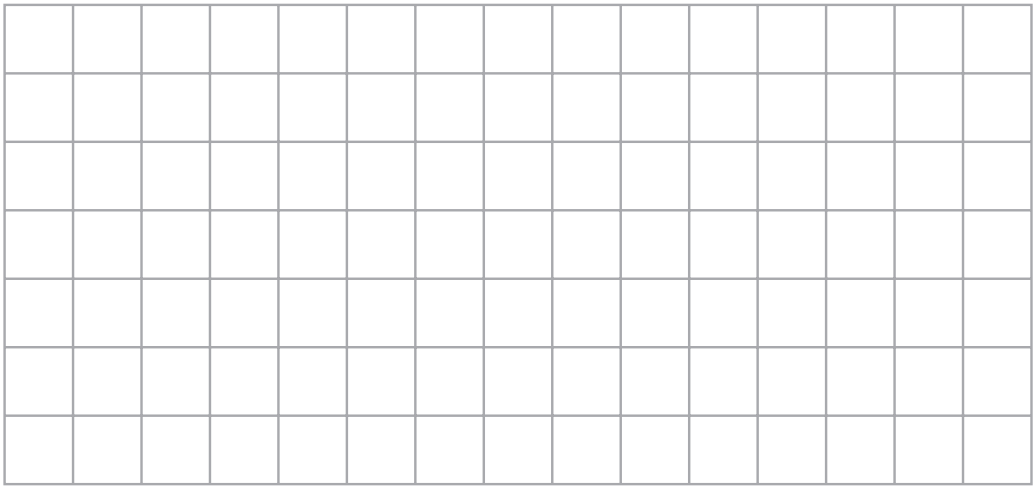
..... cm

(Total for Question 6 is 3 marks)

10 The diagram shows a kite drawn on a centimetre grid.



On the centimetre grid below, draw a rectangle that has the same area as the kite.



(Total for Question 10 is 3 marks)

7 The diagram shows a rectangle measuring 10 cm by 3 cm.

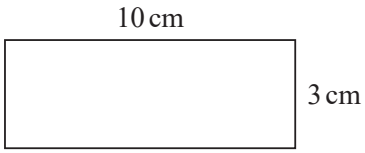
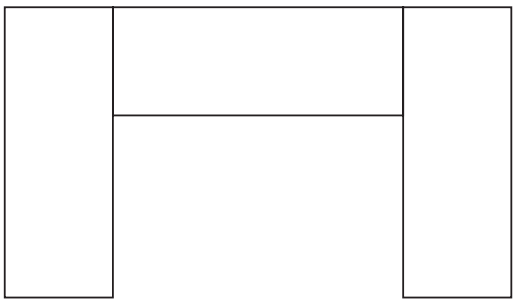


Diagram **NOT** accurately drawn

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



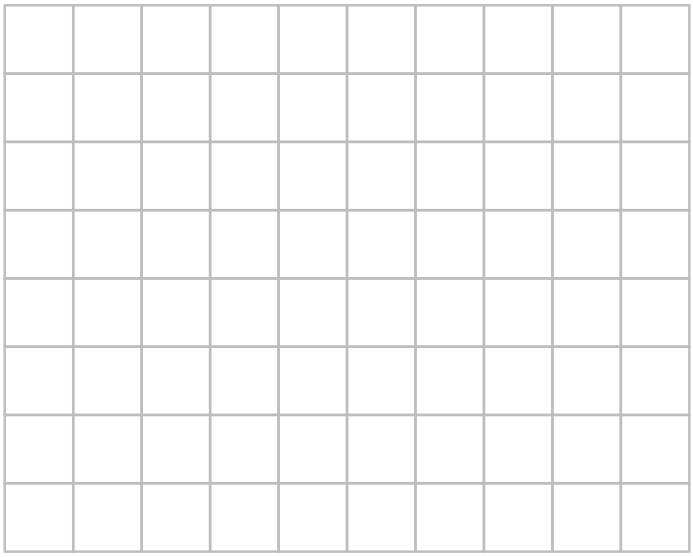
Work out the perimeter of the shape.

..... cm

(Total for Question 7 is 3 marks)

6 Here is a centimetre grid.

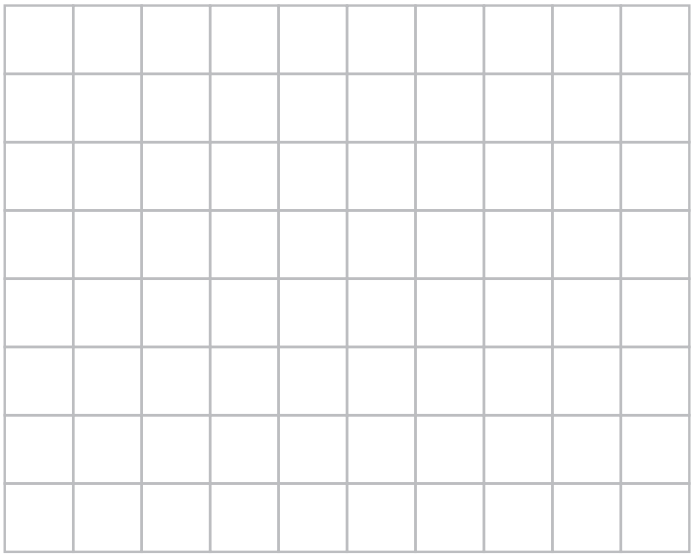
(a) On the grid, draw a right-angled triangle.



(1)

Here is a centimetre grid.

(b) On the grid, draw a rectangle with an area of $20\,cm^2$



(2)

(Total for Question 6 is 3 marks)

14 The diagram shows a shape *ABCDE* made from a square *ABDE* and an isosceles triangle *BCD*

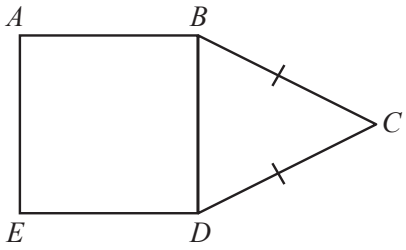


Diagram **NOT** accurately drawn

BC = *DC*

The area of square *ABDE* is 49 cm^2
The perimeter of triangle *BCD* is 27 cm

Work out the perimeter of *ABCDE*

..... cm

(Total for Question 14 is 3 marks)

16 The diagram shows a quadrilateral *ACDF*

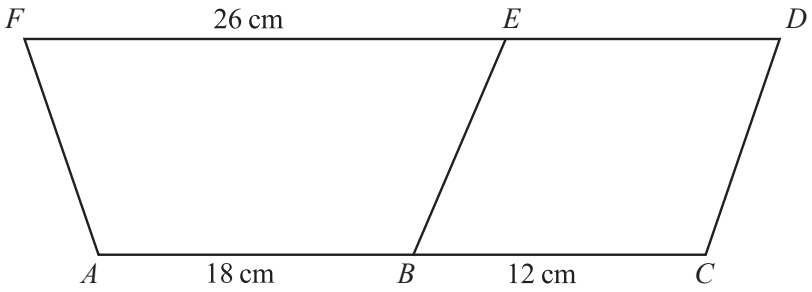


Diagram **NOT** accurately drawn

ABEF is a trapezium.
BCDE is a parallelogram.

$FE = 26\,\text{cm}$ $AB = 18\,\text{cm}$ $BC = 12\,\text{cm}$

The area of the parallelogram *BCDE* is $96\,\text{cm}^2$

Work out the area of the trapezium *ABEF*

..... cm^2

(Total for Question 16 is 3 marks)

16 Here is a hexagon *ABCDEF*.

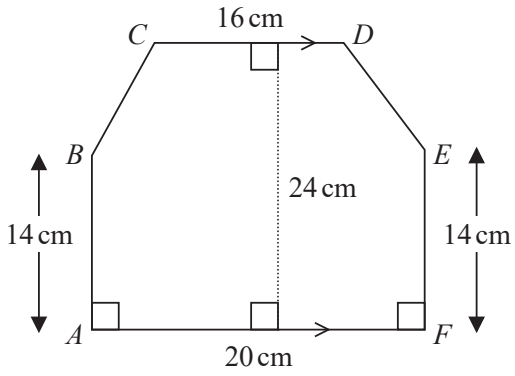


Diagram **NOT** accurately drawn

CD is parallel to *AF*.

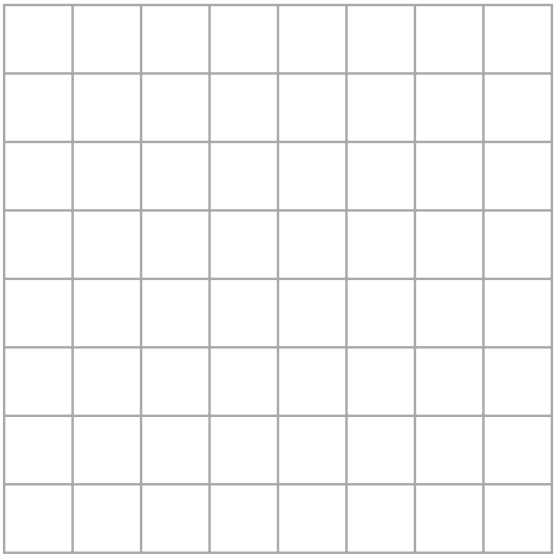
Work out the area of hexagon *ABCDEF*.

..... cm^2

(Total for Question 16 is 4 marks)

4 Here is a centimetre grid.

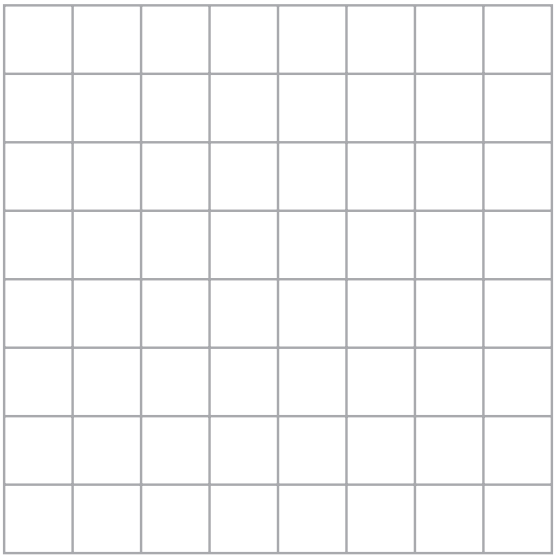
(a) On the grid, draw a rectangle with a perimeter of 14 cm.



(2)

Here is a centimetre grid.

(b) On the grid, draw a right-angled triangle with an area of 12 cm^2



(2)

(Total for Question 4 is 4 marks)

10 The diagram shows kite $ABCD$.

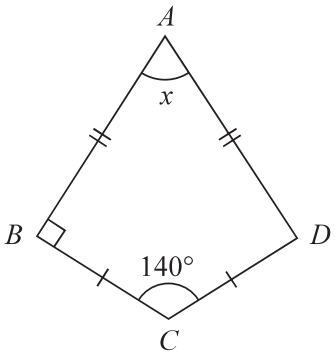


Diagram **NOT** accurately drawn

(a) Work out the size of the angle marked x.

.....°

(2)

The diagram shows kite $PQRS$.

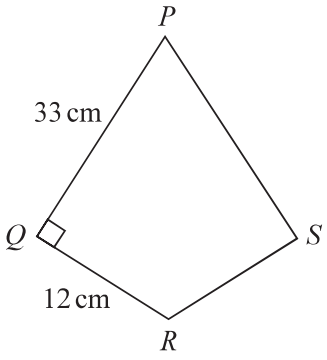


Diagram **NOT** accurately drawn

(b) Work out the area of kite $PQRS$.

..... cm^2

(2)

(Total for Question 10 is 4 marks)

16 The diagram shows a shape.

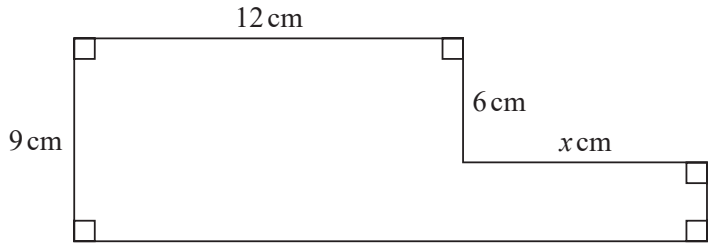


Diagram **NOT** accurately drawn

The shape has area 129 cm^2

Work out the value of x.

x = ...

(Total for Question 16 is 4 marks)

8 Here is a rectangle.

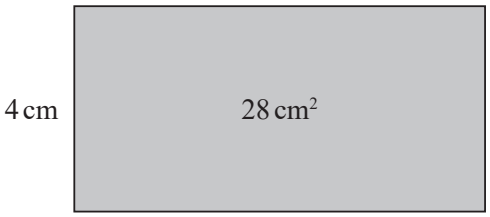


Diagram **NOT** accurately drawn

The area of the rectangle is 28 cm²

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

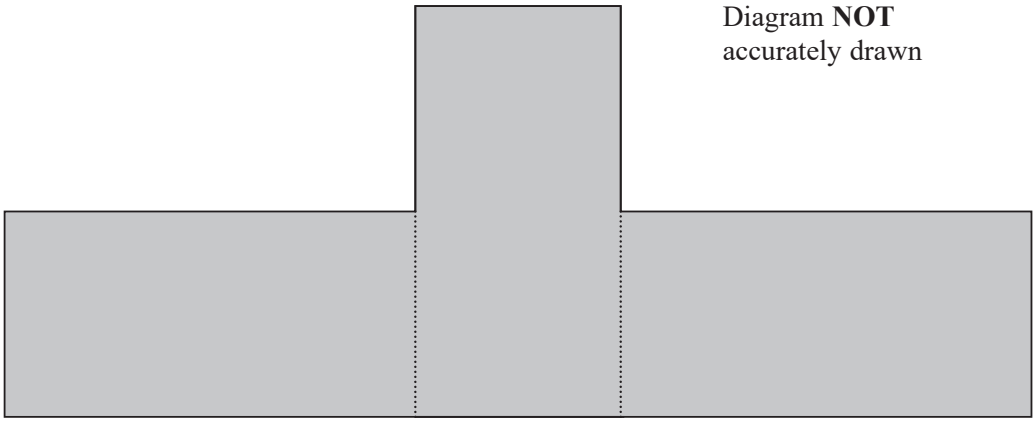


Diagram **NOT** accurately drawn

Work out the perimeter of the shape.

..... cm

(Total for Question 8 is 4 marks)

10 The diagram shows a square and an isosceles triangle.

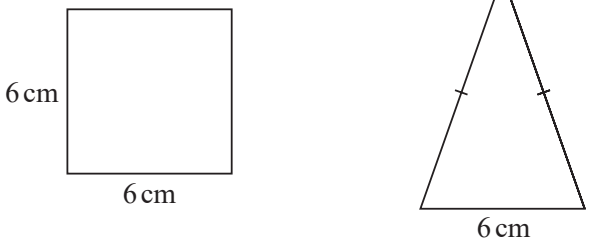


Diagram **NOT** accurately drawn

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.

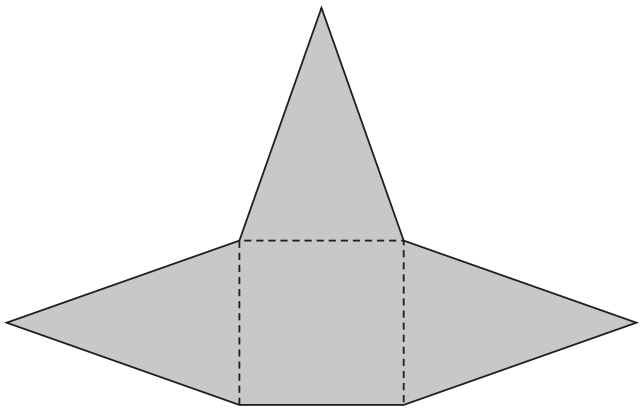


Diagram **NOT** accurately drawn

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

..... cm

(Total for Question 10 is 4 marks)

6 Janine has 2 litres of orange squash.

She also has some empty cups.
When full, each cup holds 300 millilitres of orange squash.

Janine fills as many cups as possible.

How much orange squash does Janine have left after filling as many cups as possible?
State the units of your answer.

.....

(Total for Question 6 is 3 marks)

7 The diagram shows a rectangle and a square.

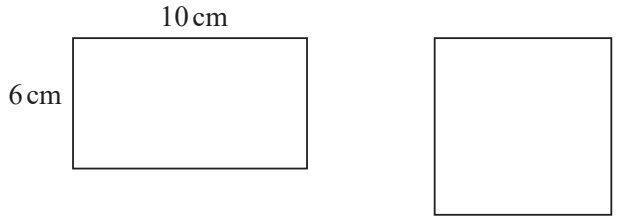


Diagram **NOT** accurately drawn

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.

..... cm^2

(Total for Question 7 is 4 marks)

18

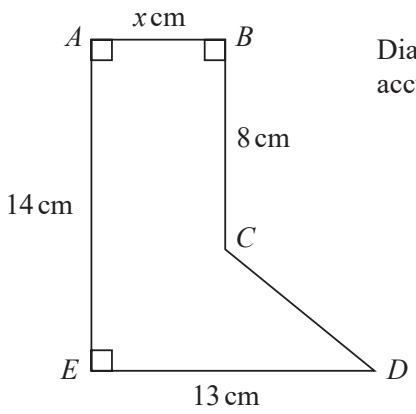


Diagram **NOT** accurately drawn

The diagram shows the shape *ABCDE*.

The area of the shape is 91.8 cm²

Work out the value of *x*.

x = ...

(Total for Question 18 is 4 marks)

18 Here are two rectangles, rectangle A and rectangle B.

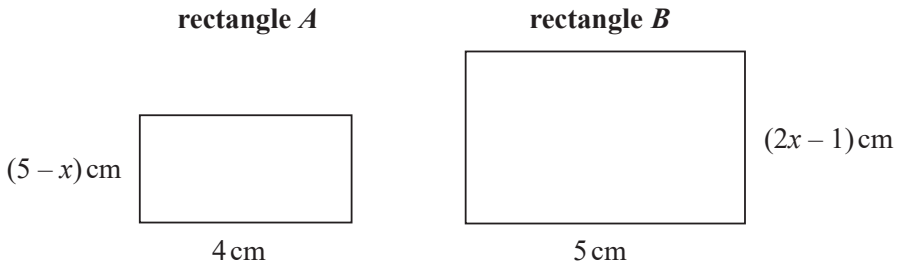


Diagram **NOT** accurately drawn

The area of rectangle B is twice the area of rectangle A.

Work out the value of x.
Show your working clearly.

$x =$ .....

(Total for Question 18 is 4 marks)

13 The diagram shows a classroom wall in the shape of a trapezium.

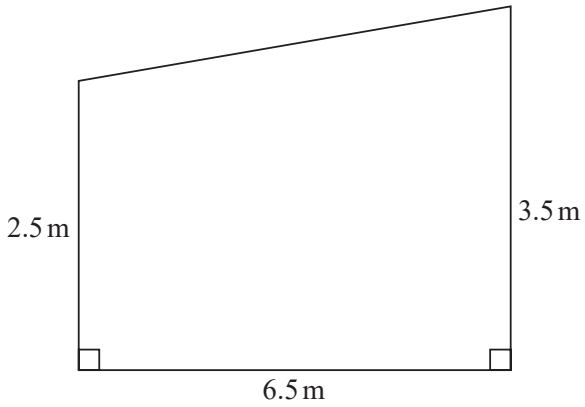


Diagram **NOT** accurately drawn

Dion wants to paint the classroom wall completely twice.
He knows that each tin of paint will cover $12\,m^2$

He is going to have to buy all the paint he needs.

Work out the least number of tins of paint that Dion will need to buy.
Show your working clearly.

.....

(Total for Question 13 is 4 marks)

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

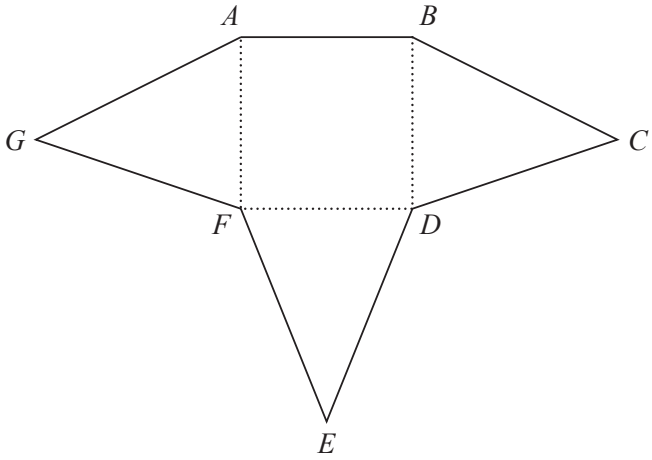


Diagram **NOT** accurately drawn

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*.

..... cm

(Total for Question 15 is 4 marks)

21 The diagram shows an 8-sided shape *ABCDEFGH*.

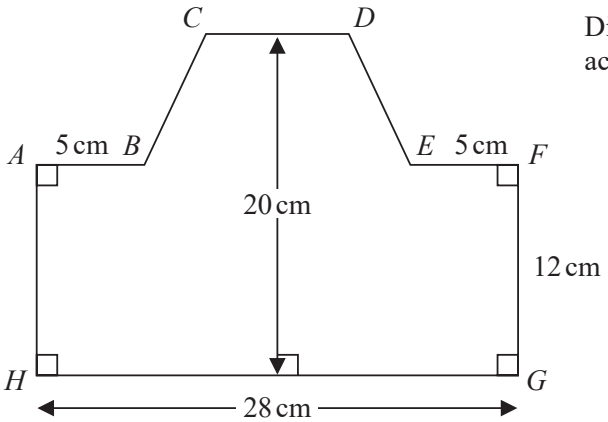


Diagram **NOT** accurately drawn

HG = 28 cm *FG* = 12 cm *AB* = *EF* = 5 cm
The height of the shape is 20 cm
CD is parallel to *HG*

The area of shape *ABCDEFGH* is 434 cm^2

Find the length of *CD*.

..... cm

(Total for Question 21 is 4 marks)

24 The diagram shows an isosceles triangle ABC

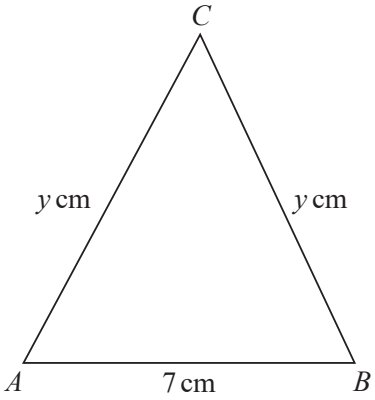


Diagram **NOT** accurately drawn

$AB = 7\,\text{cm}$ $AC = BC = y\,\text{cm}$

The area of the triangle is $42\,\text{cm}^2$

Work out the value of y

$y =$ .....

(Total for Question 24 is 4 marks)

19 The diagram shows rectangle $ABCD$

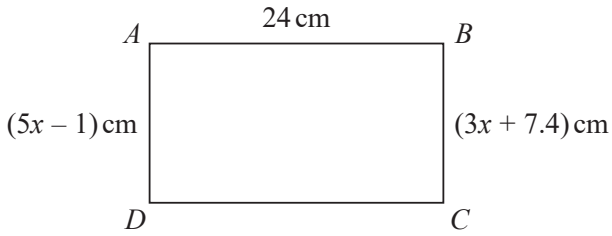


Diagram **NOT** accurately drawn

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

..... cm

(Total for Question 19 is 4 marks)

20 A field is in the shape of a trapezium.

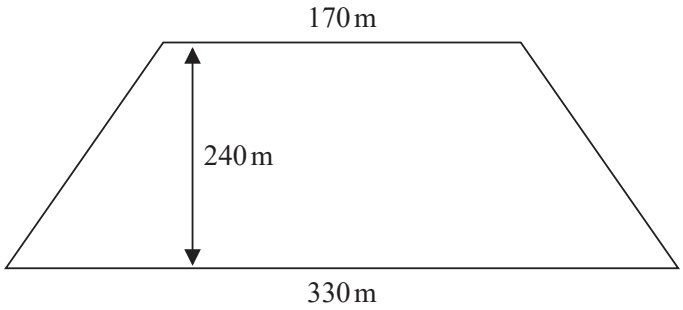


Diagram **NOT** accurately drawn

The field is sold for a price of $49 650

Given that 1 hectare = 10 000 m^2

work out the average price of the field per hectare.

$.....

(Total for Question 20 is 4 marks)

23 The diagram shows a 6-sided shape $ABCDEF$

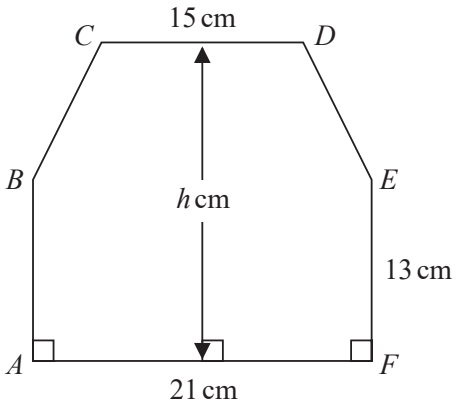


Diagram **NOT** accurately drawn

$AF = 21$ cm $CD = 15$ cm $AB = FE = 13$ cm

The perpendicular height of the shape is h cm
CD is parallel to AF

The area of the shape is 390 cm^2

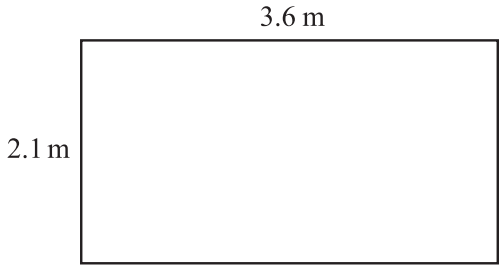
Work out the value of h

$h =$ .....

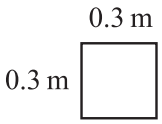
(Total for Question 23 is 4 marks)

13 The diagram shows a rectangular wall and a square tile.

Diagram **NOT** accurately drawn



Wall



Tile

Hamish wants to cover all the wall with tiles.

The tiles are sold in boxes.
There are 6 tiles in each box.
Each box of tiles costs £17.50

Work out the total cost of the tiles Hamish needs.

£.....

(Total for Question 13 is 4 marks)

17 The diagram shows the plan of a stage.

The stage is made up of a rectangle and an isosceles triangle.

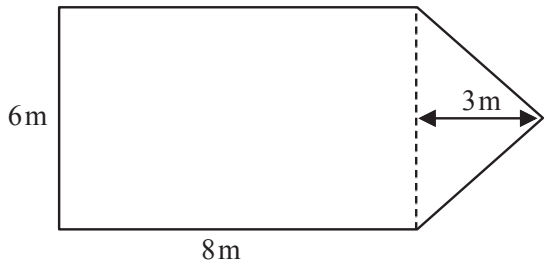


Diagram **NOT** accurately drawn

Yuko is going to cover the stage with varnish.
She needs to buy enough tins of varnish to cover the stage with one coat of varnish.

Each tin of varnish covers an area of $4\ m^2$

Work out the smallest number of tins of varnish that Yuko needs to buy.
Show your working clearly.

.....

(Total for Question 17 is 4 marks)

14 The diagram shows a plan of a garden made from three identical rectangles.

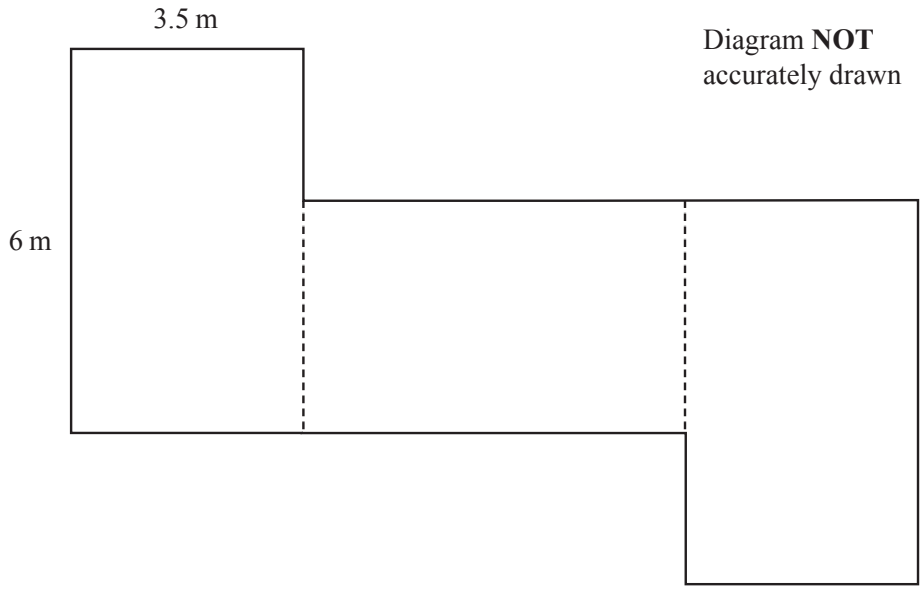


Diagram **NOT** accurately drawn

The length of each rectangle is 6 metres.
The width of each rectangle is 3.5 metres.

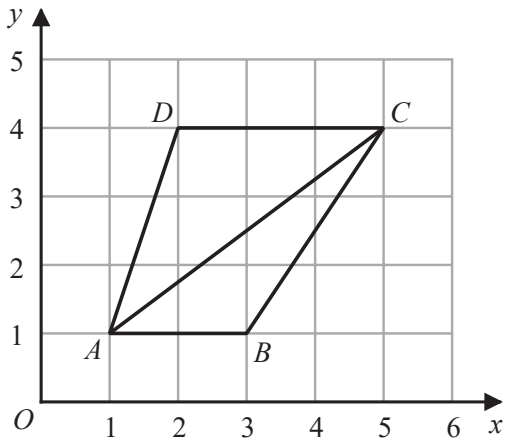
Jeremy puts a fence around the perimeter of the garden.
He charges 7.60 euros for each 1 metre of fence.

Work out how much Jeremy charges in total for the fence.

..... euros

(Total for Question 14 is 4 marks)

12 The diagram shows a quadrilateral *ABCD* on a centimetre grid.



(a) Work out the area of triangle *ABC*.
You must include the units with your answer.

.....

(3)

(b) Give a reason why angle *ACD* is equal to angle *CAB*.

.....

(1)

(c) Write down an equation for the straight line that passes through *D* and *C*.

.....

(1)

(Total for Question 12 is 5 marks)

19 Calvin has 12 identical rectangular tiles.
He arranges the tiles to fit exactly round the edge of a shaded rectangle, as shown in the diagram below.

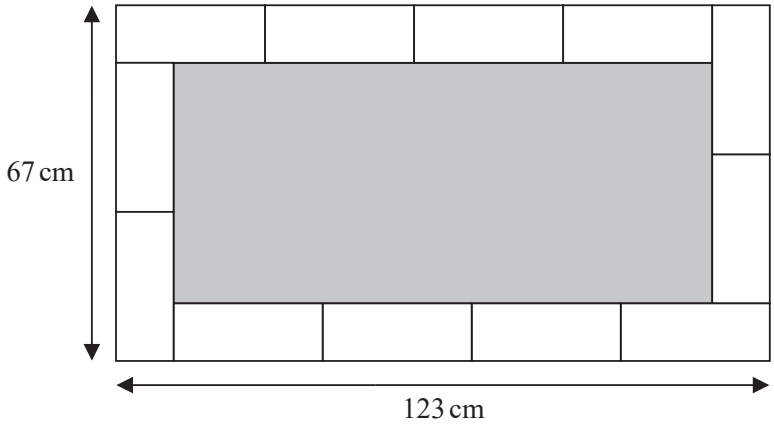


Diagram **NOT** accurately drawn

Work out the area of the shaded rectangle.

cm^2

(Total for Question 19 is 5 marks)

12 The diagram shows the plan of the floor in a room.

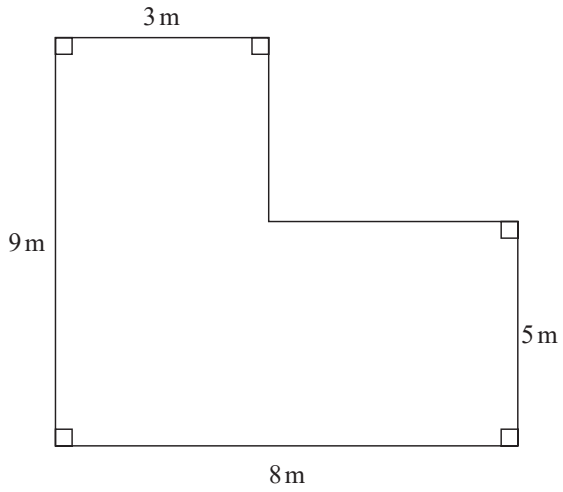


Diagram **NOT** accurately drawn

Alonso is going to cover the floor once with polish.
He buys some tins of polish.

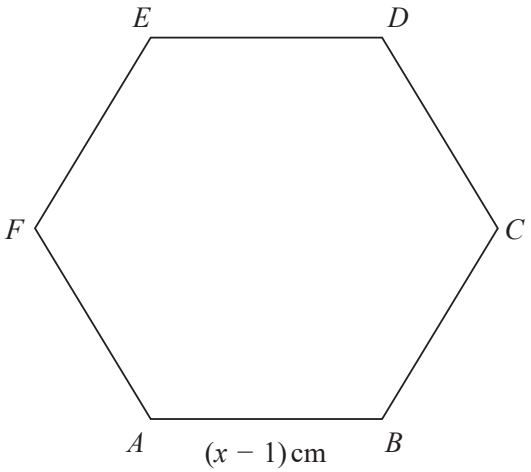
Each tin has enough polish to cover 14 m^2 of the floor.
Each tin costs 9.59 euros.

Work out the total cost of the tins that Alonso needs to buy.

euros

(Total for Question 12 is 5 marks)

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



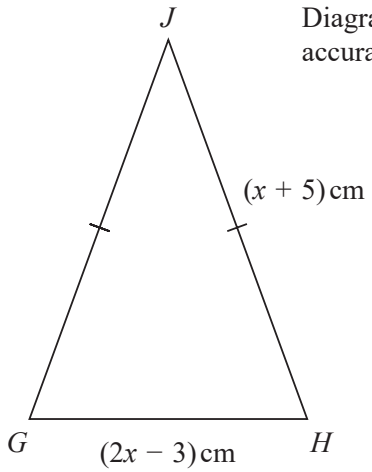


Diagram **NOT** accurately drawn

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.

..... cm

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

13 The diagram shows the plan of Sophia's gym floor.

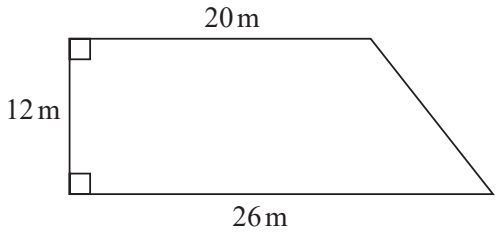


Diagram **NOT** accurately drawn

Sophia is going to paint all the gym floor.

Each tin of paint she is going to use covers an area of 20 m^2

There is a special offer on the paint that Sophia is going to buy.

Special Offer

1 tin for $13
4 tins for $40

Work out the least amount of money that Sophia has to pay in order to buy all the paint she needs.
Show your working clearly.

$ .....

(Total for Question 13 is 5 marks)

25 The diagram shows one face of a wall.
This face is in the shape of a pentagon with exactly one line of symmetry.

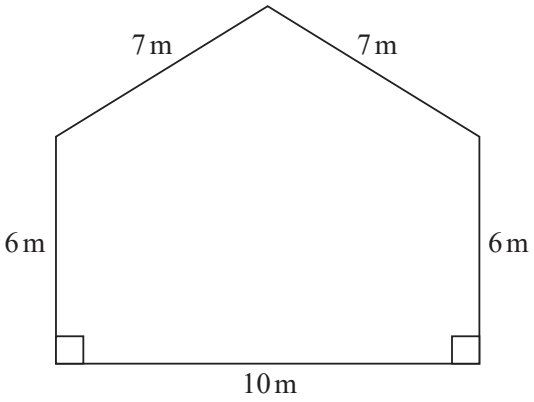


Diagram **NOT** accurately drawn

Omondi is going to paint this face of the wall once.
He has to buy all the paint that he needs to use.

The paint in each tin of paint Omondi is going to buy will cover 16 m^2 of the face of the wall.

Work out the least number of tins of paint Omondi will need to buy.
Show your working clearly.

.....

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

16 The diagram shows the front of a wooden door with a semicircular glass window.

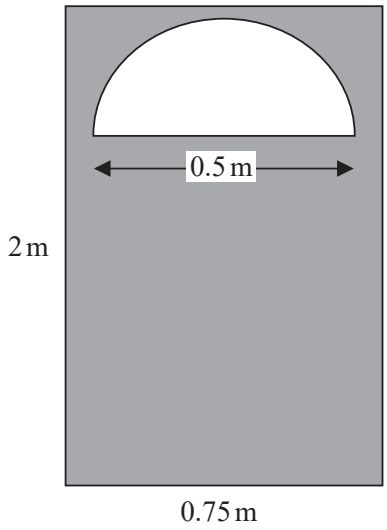


Diagram **NOT** accurately drawn

Julie wants to apply 2 coats of wood varnish to the front of the door, shown shaded in the diagram.

250 millilitres of wood varnish covers 4 m^2 of the wood.

Work out how many millilitres of wood varnish Julie will need.
Give your answer correct to the nearest millilitre.

..... millilitres

(Total for Question 16 is 5 marks)

15 Here is a floor plan of a stage.
The plan is formed from a triangle and a rectangle.

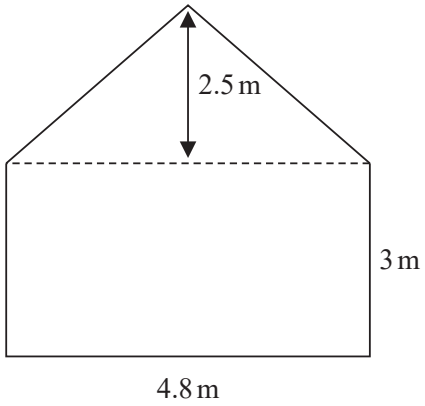


Diagram **NOT** accurately drawn

The stage manager is going to paint the floor.

One tin of paint covers an area of $1.8\,m^2$
One tin of paint costs \$16.40

Paint can only be bought in full tins.

The stage manager has \$190 to spend.

Does the stage manager have enough money to buy enough tins to paint all of the floor?
Show your working clearly.

(Total for Question 15 is 5 marks)

13 The diagram shows the plan of a floor.

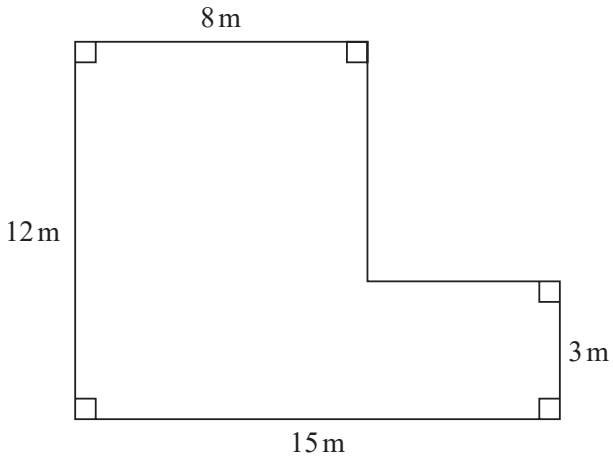


Diagram **NOT** accurately drawn

Indira is going to paint the floor.
She needs to buy enough tins of paint to cover the floor with one coat of paint.

Each tin of paint covers an area of 7 m^2
Each tin of paint costs £23.90

Indira buys the least possible number of tins of paint.

Work out the total cost of the tins of paint that Indira buys.
Show your working clearly.

£.....

(Total for Question 13 is 5 marks)

13 The diagram shows a rectangle and an isosceles triangle.

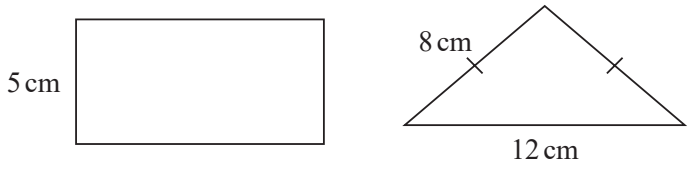


Diagram **NOT** accurately drawn

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

(a) Find the area of the rectangle.

..... cm^2

(3)

The diagram shows a cuboid.

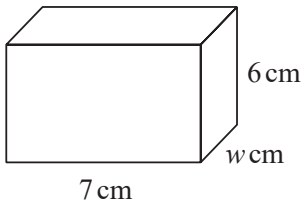


Diagram **NOT** accurately drawn

The volume of the cuboid is 231 cm^3

(b) Calculate the value of w

$w =$ .....

(2)

(Total for Question 13 is 5 marks)

13 The diagram shows the plan of a garden.

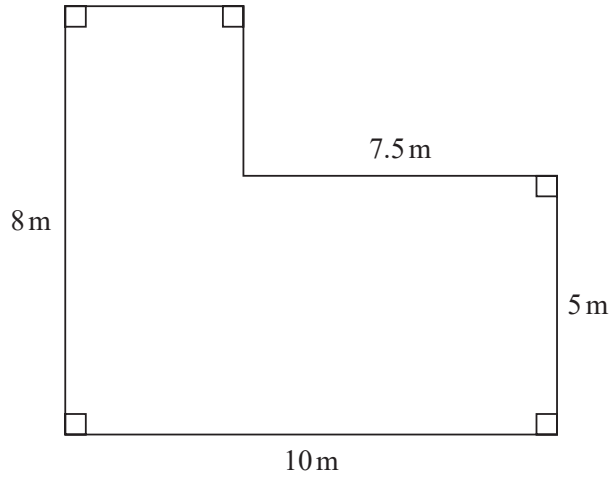
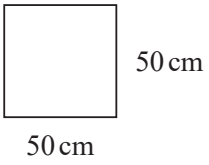


Diagram **NOT** accurately drawn



One tile

Martyn covers the garden with square tiles of side length 50 cm.
There are no gaps between the tiles.

It takes 4 minutes to lay each tile.

Work out how long it takes Martyn to cover the whole garden with tiles.
Give your answer in hours and minutes.

..... hours ..... minutes

(Total for Question 13 is 5 marks)

26 The diagram shows a hexagon *ABCDEF*

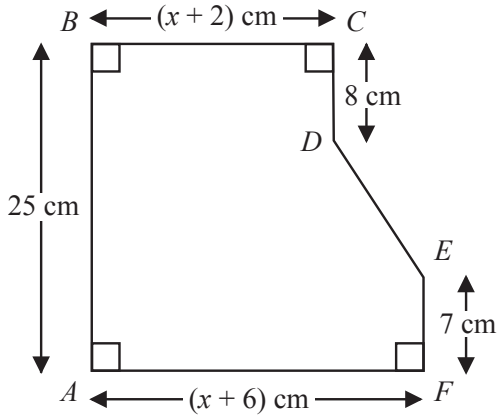


Diagram **NOT** accurately drawn

$AB = 25$ cm $BC = (x + 2)$ cm $CD = 8$ cm $EF = 7$ cm $AF = (x + 6)$ cm

The area of hexagon *ABCDEF* is 258 cm²

Work out the value of x

$x =$ .....

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

26 The diagram shows a hexagon *ABCDEF*

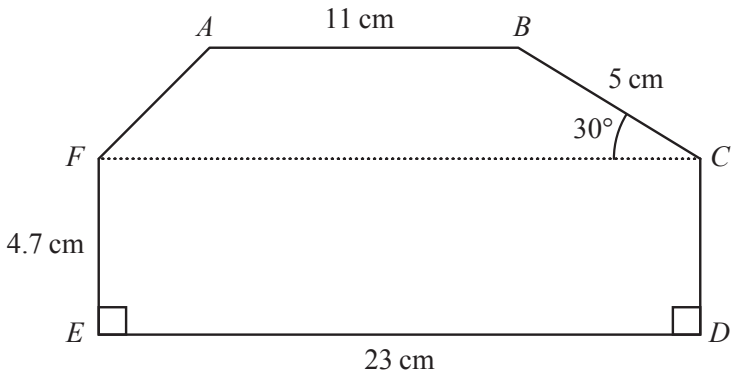


Diagram **NOT** accurately drawn

Angle *BCF* = 30°
AB, *FC* and *ED* are parallel.

Calculate the area of *ABCDEF*
Show your working clearly.

..... cm^2

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

26

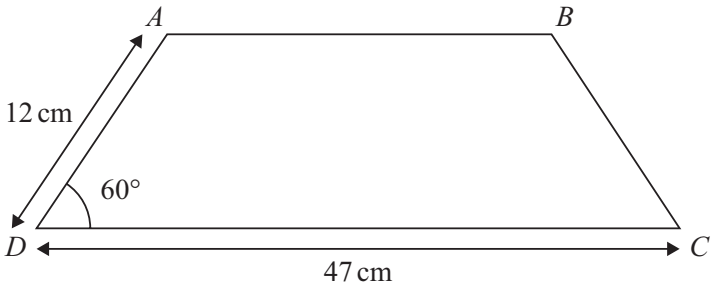


Diagram **NOT** accurately drawn

ABCD is a trapezium with one line of symmetry.

angle *ADC* = 60° *AD* = 12 cm *DC* = 47 cm

Work out the area of the trapezium.
Give your answer correct to 3 significant figures.
Show your working clearly.

..... cm^2

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

21 Joshua is going to cover a floor with tiles for a customer.
The area of the floor is 45 m^2

Joshua buys one box of tiles for each 1.5 m^2 of floor area.
Each box of tiles costs £64

Joshua also buys 5 bags of tile adhesive.
Each bag of tile adhesive costs £12

Joshua charges the customer £3000

Work out his percentage profit.
Give your answer correct to one decimal place.

.....%

(Total for Question 21 is 5 marks)

SUB-TOPIC G4b

CIRCLES, ARCS & SECTORS

Sub-topic G4b · 31 questions · 101 marks · lowest tariff first

11 A circle has radius 18 cm.

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

..... cm

(Total for Question 11 is 2 marks)

14 Find the lowest common multiple (LCM) of 20 and 35

.....

(Total for Question 14 is 2 marks)

15

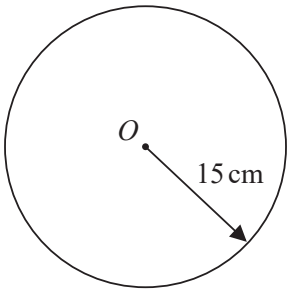


Diagram **NOT** accurately drawn

The diagram shows a circle, centre O, with radius 15 cm.

Work out the area of the circle.
Give your answer in cm^2 correct to the nearest whole number.

..... cm^2

(Total for Question 15 is 2 marks)

13 A circle has diameter 18 cm.

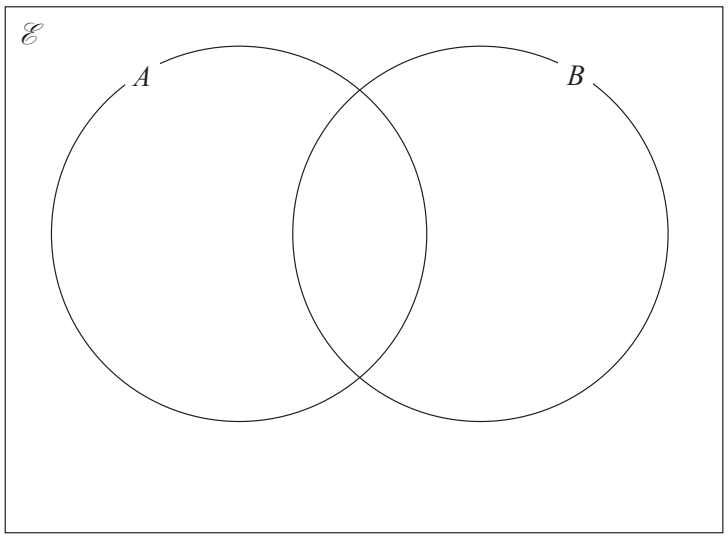
Work out the area of the circle.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 13 is 2 marks)

14 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{2, 4, 6, 8, 10, 12\}$
$B = \{3, 6, 9, 12\}$

(a) Complete the Venn diagram below for the sets $\mathscr{E}$, A and B.



(3)

One of the numbers in $\mathscr{E}$ is to be chosen at random.

(b) Find the probability that this number is not in set A **and** not in set B.

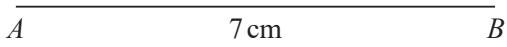
.....

(2)

(Total for Question 14 is 5 marks)

10 ABC is a triangle.
$AB = 7$ cm and $BC = 6.2$ cm
Angle $ABC = 65°$

Draw accurately the triangle ABC.
The line AB has been drawn for you.



(Total for Question 10 is 2 marks)

11 A circle has radius 7.5 cm

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

..... cm^2

(Total for Question 11 is 2 marks)

9 (a) Write $\frac{39}{150}$ as a percentage.

.....%

(1)

There are 30 dogs staying in some boarding kennels.
12 of the dogs are brown.

(b) What fraction of the dogs in the boarding kennels are **not** brown?
Give your fraction in its simplest form.

.....

(2)

(c) Show that $\frac{4}{9} + \frac{1}{6} = \frac{11}{18}$

(2)

(Total for Question 9 is 5 marks)

10 A circle has a **diameter** of 14 cm.

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

..... cm^2

(Total for Question 10 is 2 marks)

6 Here are two special offers for buying dog food.

Special offer A	**Special offer B**
Normally $1.40 a tin	Normally pack of 6 tins for $7.20
Special offer Buy 1 tin, get 1 tin half price	**Special offer** 20% off each pack of 6 tins

Gaspar buys 24 tins of dog food using special offer **A**.
Anna buys 24 tins of dog food using special offer **B**.

Work out the difference between the amount that Gaspar pays and the amount that Anna pays.

$.....

(Total for Question 6 is 4 marks)

7 A circle has radius 6.5 cm.

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

..... cm

(Total for Question 7 is 2 marks)

12 A circle has radius 8.5 cm

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

..... cm

(Total for Question 12 is 2 marks)

13 (a) Expand $x(3 - x)$

.....

(1)

(b) Factorise fully $12a - 18b$

.....

(2)

There are 8 slices of cheese in each small pack of cheese.
There are 20 slices of cheese in each large pack of cheese.

Afreen buys h small packs of cheese and j large packs of cheese.
She buys a total of T slices of cheese.

(c) Write down a formula for T in terms of h and j

.....

(3)

(Total for Question 13 is 6 marks)

8 Bargain Crafts and Art's Store each have a special offer on tins of crayons.

Bargain Crafts	**Art's Store**
Crayons $4.20 per tin	Pack of 5 tins of crayons for $18
Special offer	**Special offer**
Pay for 2 tins get 1 tin free	25% off each pack of 5 tins

Heidi buys 30 tins of crayons from Bargain Crafts using the special offer.
Amir buys 30 tins of crayons from Art's Store using the special offer.

Work out the difference between the amount that Heidi pays and the amount that Amir pays.

$.....

(Total for Question 8 is 4 marks)

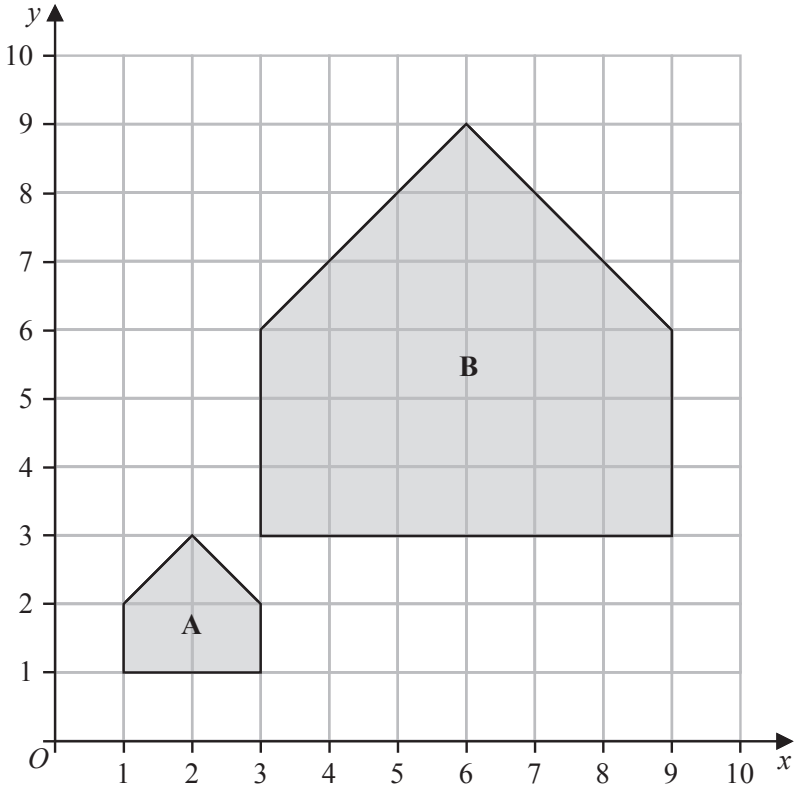
9 A circle has a radius of 9 cm.

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

..... cm^2

(Total for Question 9 is 2 marks)

15



Describe fully the single transformation that maps shape **A** onto shape **B**

.....

.....

(Total for Question 15 is 3 marks)

16 A circle has radius 9 cm

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

..... cm^2

(Total for Question 16 is 2 marks)

12 A shop accepts payment in pounds (£) or in Swiss francs.

In the shop, a shirt costs £35 or 42 Swiss francs.
The cost of a jacket is £54

Alex works out the cost of the jacket in Swiss francs.
She uses the same exchange rate that was used for the cost of the shirt.

What is the cost of the jacket in Swiss francs?

..... Swiss francs

(Total for Question 12 is 3 marks)

13 A circle has radius 6.4 cm

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

..... cm^2

(Total for Question 13 is 2 marks)

15 A circle has radius 16 cm

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

..... cm

(Total for Question 15 is 2 marks)

16 The diagram shows the positions of two villages, *A* and *B*

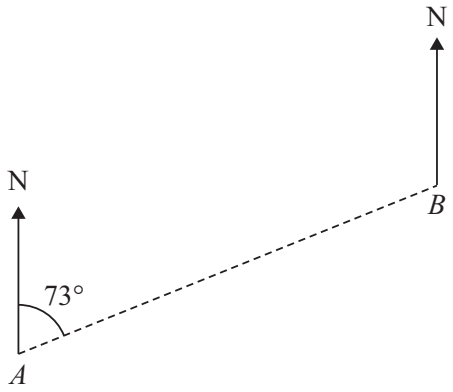


Diagram **NOT** accurately drawn

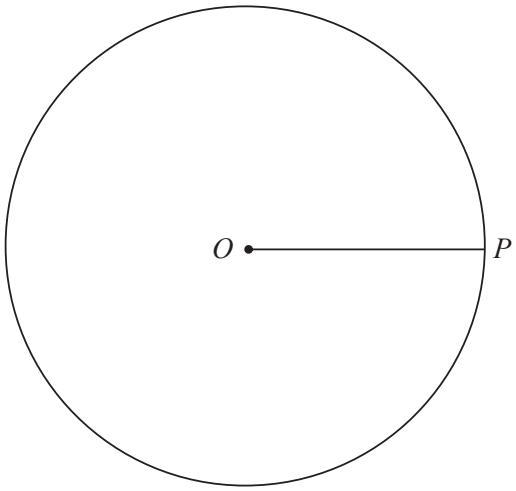
The bearing of *B* from *A* is 073°

Work out the bearing of *A* from *B*

..... °

(Total for Question 16 is 2 marks)

3 Here is a circle, centre O.



(a) Measure the radius, OP, of the circle.
Give your answer in centimetres.

cm

(1)

The point Q is 2 cm from O.
The angle between OP and OQ is a right angle.

(b) Mark with a cross (×) a possible position of the point Q.
Label the point Q.

(2)

(Total for Question 3 is 3 marks)

25 The shape, shown shaded in the diagram, is the region between two semicircles.

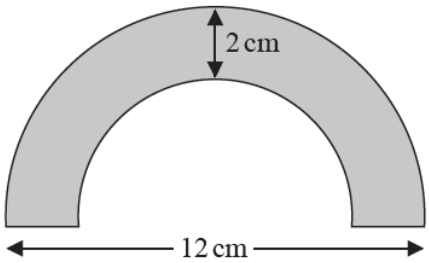


Diagram **NOT** accurately drawn

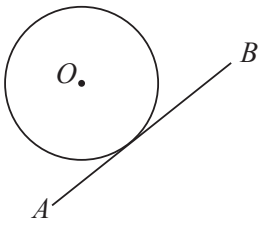
The diameter of the outer semicircle is 12 cm.
The shape has constant thickness 2 cm.

Calculate the area of the shape.
Give your answer as a multiple of π.

cm^2

(Total for Question 25 is 3 marks)

6 (a) The diagram shows a circle with centre O.



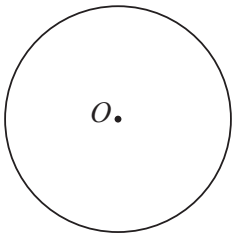
Write down the word from the box that describes the line AB.

sector	segment	tangent	chord	diameter

.....

(1)

(b) The diagram shows a circle with centre O.



On the diagram, draw a radius of the circle.

(1)

(c)

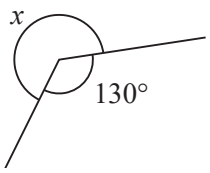


Diagram **NOT** accurately drawn

Work out the size of the angle marked x.

.....°

(1)

(Total for Question 6 is 3 marks)

In Manila, there are 90 badminton clubs and 60 football clubs.

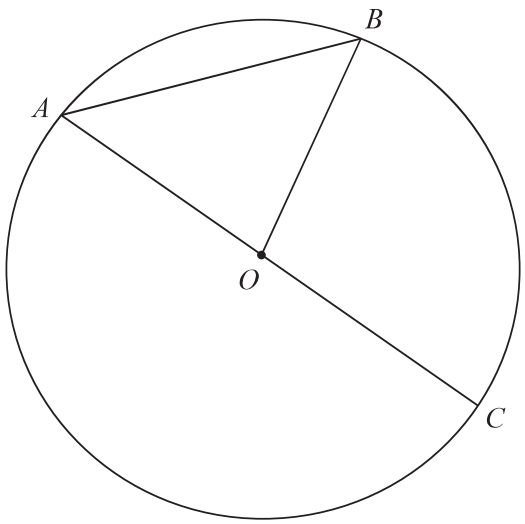
(e) Find the ratio of the number of badminton clubs to the number of football clubs.
Give your ratio in its simplest form.

.....

(2)

(Total for Question 2 is 6 marks)

3 A, B and C are points on a circle, centre O.
AOC is a straight line.



(a) Write down the mathematical name for the line AC.

.....

(1)

(b) Write down the mathematical name for the line AB.

.....

(1)

(c) On the diagram, shade a sector of the circle.

(1)

(Total for Question 3 is 3 marks)

18 The diagram shows Yuen's garden.

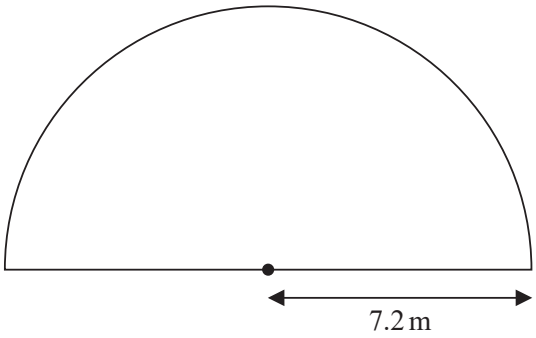


Diagram **NOT** accurately drawn

The garden is in the shape of a semicircle of radius 7.2 m.
Yuen is going to cover his garden with grass seed.

Yuen has 12 boxes of grass seed.
Each box of grass seed contains enough seed to cover 6 m^2 of the garden.

Has Yuen enough grass seed for his garden?
Show your working clearly.

(Total for Question 18 is 3 marks)

24 The region, shown shaded in the diagram, is a path.

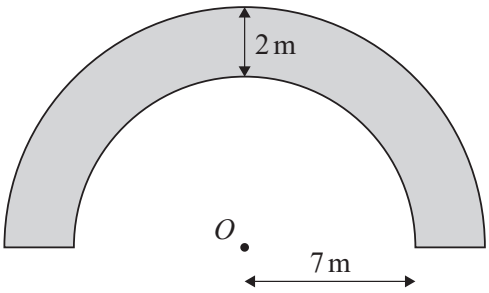


Diagram **NOT** accurately drawn

The boundary of the path is formed by two semicircles, with the same centre O, and two straight lines.

The inner semicircle has a radius of 7 metres.
The path has a width of 2 metres.

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

..... m

(Total for Question 24 is 3 marks)

12 The diagram shows a rectangle $ABCD$ and a semicircle with diameter AB where $AB = 12$ cm. The point E lies on DC and also on the semicircle.

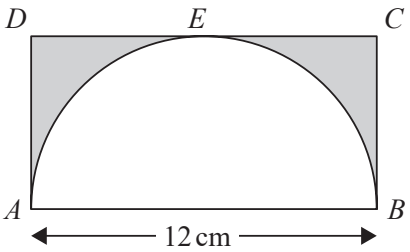


Diagram **NOT** accurately drawn

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

..... cm^2

(Total for Question 12 is 3 marks)

13 Solve $5(2x - 3) = 20$
Show clear algebraic working.

$x =$ .....

(Total for Question 13 is 3 marks)

19 The diagram shows a shaded shape made from three identical semicircles, ***X***, ***Y*** and ***Z***

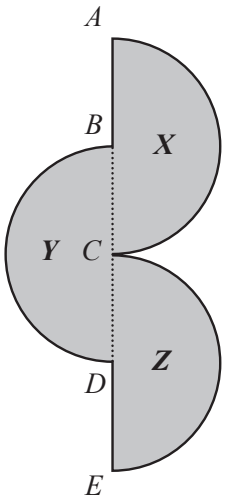


Diagram **NOT** accurately drawn

ABCDE is a straight line.

AC is the diameter of semicircle ***X*** and *B* is the centre of semicircle ***X***
BD is the diameter of semicircle ***Y*** and *C* is the centre of semicircle ***Y***
CE is the diameter of semicircle ***Z*** and *D* is the centre of semicircle ***Z***

$AC = BD = CE = 20$ cm

Work out the perimeter of the shaded shape.
Give your answer correct to the nearest whole number.

..... cm

(Total for Question 19 is 3 marks)

20

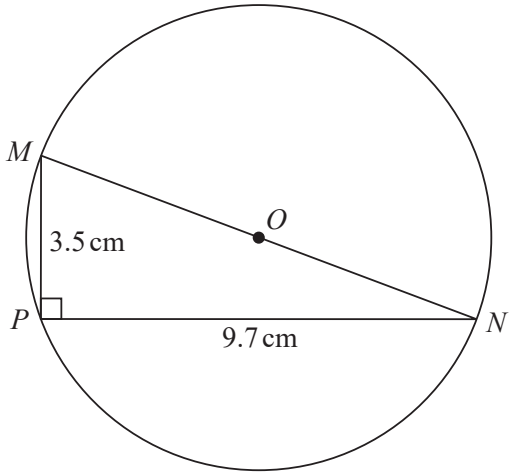


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

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

..... cm

(Total for Question 20 is 4 marks)

17 The diagram shows an isosceles triangle ABC and a semicircle with centre O and diameter 12 cm.

The point B lies on the semicircle.

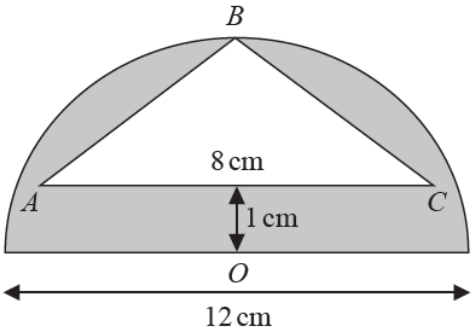


Diagram **NOT** accurately drawn

The line OB is the line of symmetry of the diagram.

AC is 1 cm from the diameter of the semicircle and $AC = 8$ cm.

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

cm^2

(Total for Question 17 is 4 marks)

22 The diagram shows a shape made from a square $ABCD$ and 4 identical semicircles.

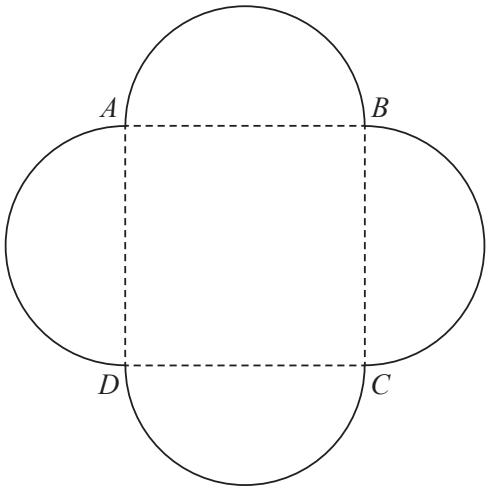


Diagram **NOT** accurately drawn

As shown in the diagram, the semicircles have AB, BC, CD and DA as diameters.

The area of the square is $36\,\text{cm}^2$

Calculate the total area of the shape.
Give your answer correct to one decimal place.

..... cm^2

(Total for Question 22 is 4 marks)

13 A wheel on a tractor has a diameter of 160 cm.

The tractor travels 1750 metres.

Work out the number of complete turns made by the wheel.
Show your working clearly.

.....

(Total for Question 13 is 4 marks)

21 The diagram shows the design for a badge, which will be made using wire.
The design is a circle inside a square *ABCD*

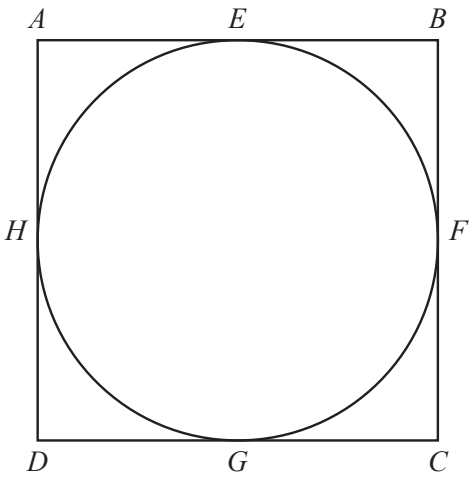


Diagram **NOT** accurately drawn

The circle touches the square at the points *E*, *F*, *G* and *H*

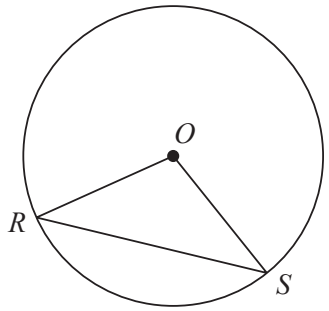
The area of the square is 81 cm^2

Calculate the total length of wire that will be needed to make the square and the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 21 is 4 marks)

9 R and S are points on a circle with centre O.



(a) On the diagram above, shade a segment of the circle.

(1)

(b) Write down the mathematical name of the straight line RS.

.....

(1)

In the diagram below, P and Q are points on a circle with centre O.

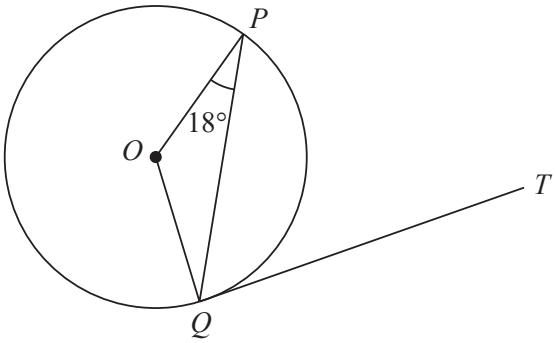


Diagram **NOT** accurately drawn

QT is a tangent to the circle.
Angle $OPQ = 18°$

(c) Work out the size of angle PQT.
Give a reason for each stage of your working.

.....

°

(3)

(Total for Question 9 is 5 marks)

12 A circle has radius 9 cm.

(a) Work out the circumference of the circle.
Give your answer correct to 1 decimal place.

cm

(2)

The diagram shows the pentagon *ABCDE*.

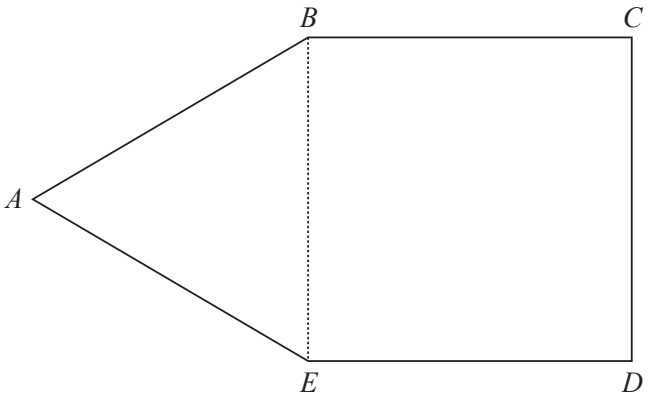


Diagram **NOT** accurately drawn

ABE is an equilateral triangle.

BCDE is a square with area 169 cm^2

(b) Work out the perimeter of *ABCDE*.

cm

(3)

(Total for Question 12 is 5 marks)

23 The diagram shows a shape made from a right-angled triangle and a semicircle.

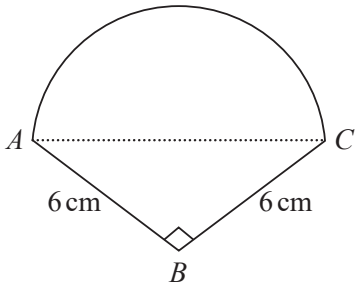


Diagram **NOT** accurately drawn

AC is the diameter of the semicircle.
$BA = BC = 6$ cm
Angle $ABC = 90°$

Work out the area of the shape.
Give your answer correct to 1 decimal place.

..... cm^2

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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

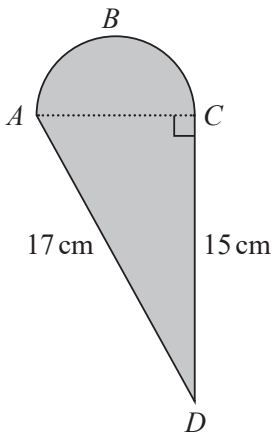


Diagram **NOT** accurately drawn

AC is the diameter of the semicircle *ABC*.

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

..... cm

(Total for Question 27 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

22 A, B and C are points on a circle with centre O.

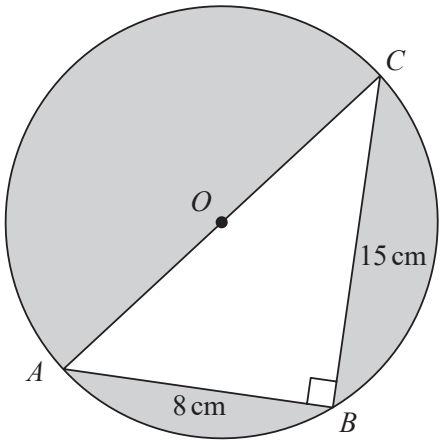


Diagram **NOT** accurately drawn

AOC is a diameter of the circle.

$AB = 8\,\text{cm}$ $BC = 15\,\text{cm}$

Angle $ABC = 90°$

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

..... cm^2

(Total for Question 22 is 5 marks)

23 $A = 2^3 \times 3^2 \times 5^2 \times 11$
$B = 2^4 \times 3 \times 5^4 \times 13$

Find the lowest common multiple (LCM) of A and B.
Give your answer as a product of powers of prime numbers.

.....

(Total for Question 23 is 2 marks)

26 In the diagram, ABC is a right-angled triangle and DEF is a semicircular arc.

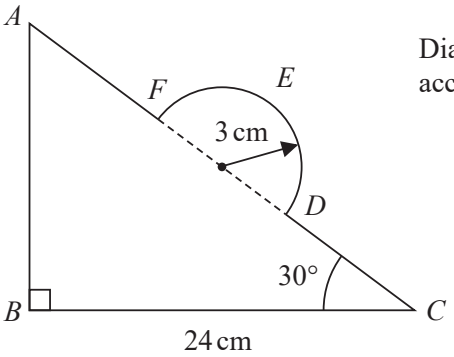


Diagram **NOT** accurately drawn

In triangle ABC

$BC = 24$ cm angle $ABC = 90°$ angle $BCA = 30°$

The points D and F lie on AC so that DF is the diameter of the semicircular arc DEF
The radius of the semicircular arc is 3 cm.

Work out the length of $AFEDC$
Give your answer correct to 2 significant figures.

..... cm

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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

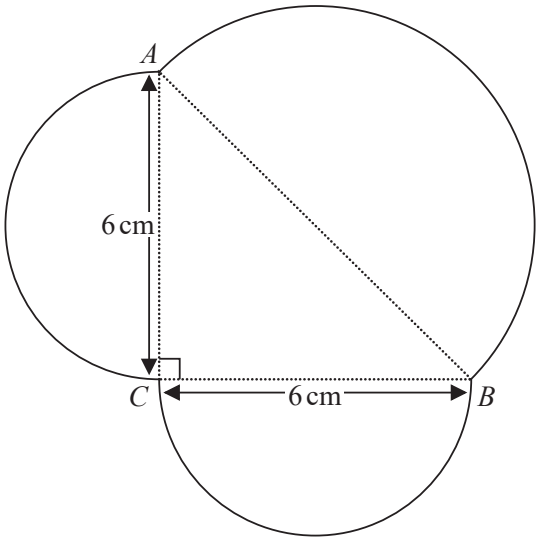


Diagram **NOT** accurately drawn

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.

..... cm

(Total for Question 20 is 5 marks)

SUB-TOPIC G4c

VOLUME & SURFACE AREA

Sub-topic G4c · 33 questions · 125 marks · lowest tariff first

15 A cylinder has diameter 14 cm and height 20 cm.

Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 15 is 2 marks)

8 Here is a rhombus.

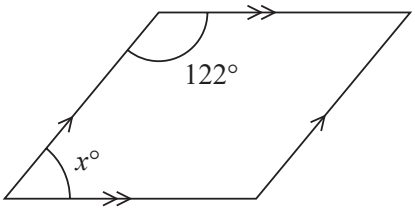


Diagram **NOT** accurately drawn

Work out the value of x.
Give a reason for your answer.

$x =$ .....

(Total for Question 8 is 3 marks)

9 The diagram shows a cuboid.

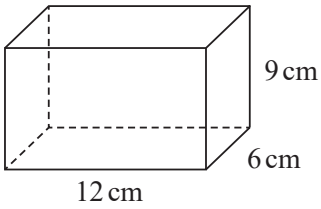


Diagram **NOT** accurately drawn

Work out the volume of the cuboid.

..... cm^3

(Total for Question 9 is 2 marks)

9 Don got on a bus at 07 35

He got off the bus at 13 25

How long was Don on the bus?
Give your answer in hours and minutes.

..... hours ..... minutes

(Total for Question 9 is 2 marks)

10 Here is a cuboid.

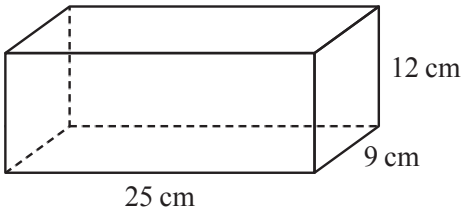


Diagram **NOT** accurately drawn

Work out the volume of the cuboid.

..... cm^3

(Total for Question 10 is 2 marks)

11

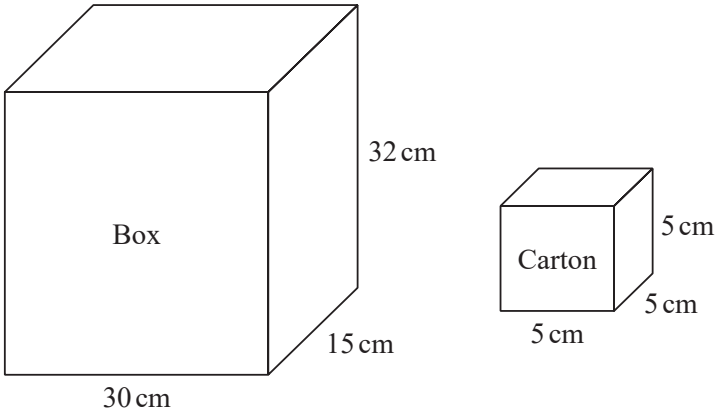


Diagram **NOT** accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

(Total for Question 11 is 3 marks)

15 The diagram shows a cylinder.

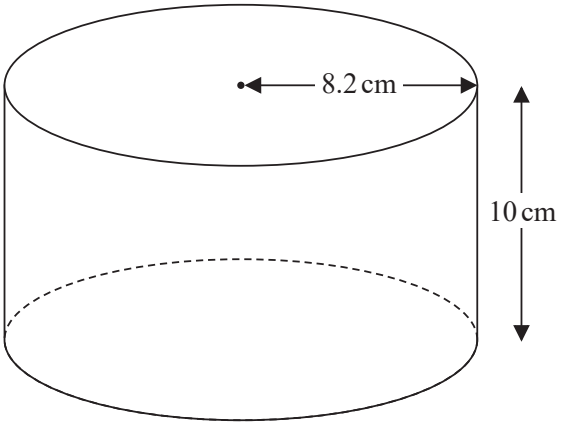


Diagram **NOT** accurately drawn

The cylinder has radius 8.2 cm and height 10 cm.
The cylinder is empty.

Pam pours 1.5 litres of water into the cylinder.

Work out the depth of the water in the cylinder.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 15 is 3 marks)

9 A box is to be filled with cartons.

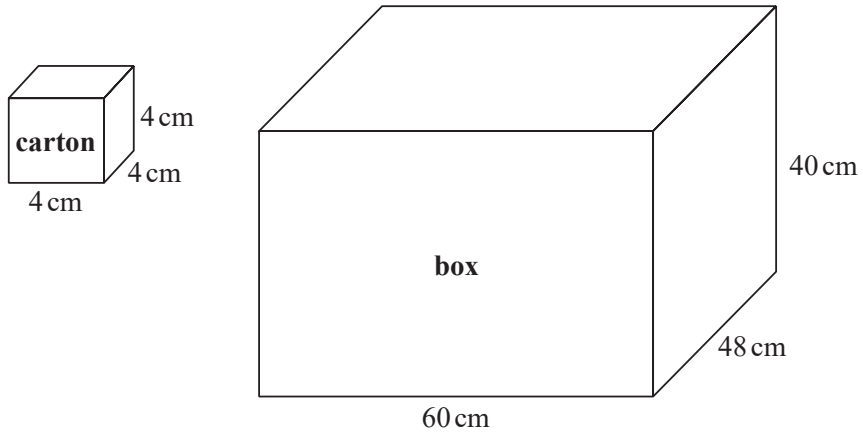


Diagram **NOT** accurately drawn

Each carton is a cube that measures 4 cm by 4 cm by 4 cm.
The box is a cuboid that measures 60 cm by 48 cm by 40 cm.

Work out the number of cartons that can completely fill the box.

.....

(Total for Question 9 is 3 marks)

13 The diagram shows a solid wooden cuboid.

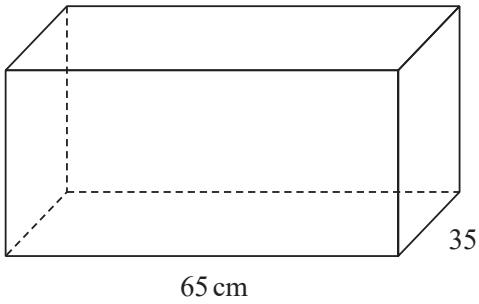


Diagram **NOT** accurately drawn

The cuboid measures 65 cm by 35 cm by 45 cm.

A machine cuts the cuboid to make cubes.
Each cube has edges of length 5 cm.

Work out the maximum number of cubes that can be made from the cuboid.

.....

(Total for Question 13 is 3 marks)

13

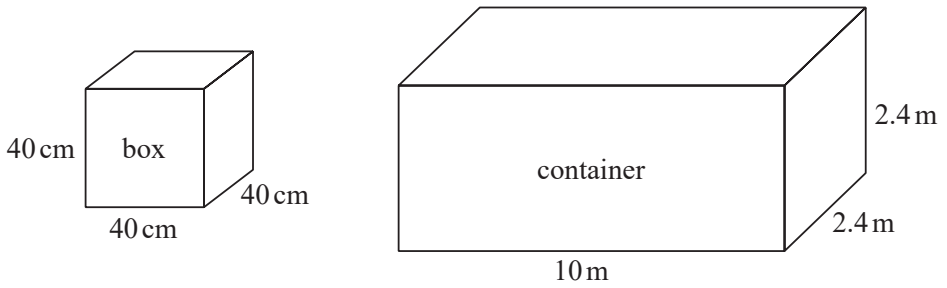


Diagram **NOT** accurately drawn

Tom puts boxes into a shipping container.

The container is a cuboid 10 metres by 2.4 metres by 2.4 metres.
Each box is a cube of side 40 centimetres.

Work out the greatest number of these boxes that Tom can put into the container.

.....

(Total for Question 13 is 3 marks)

16 The diagram shows a solid triangular prism.

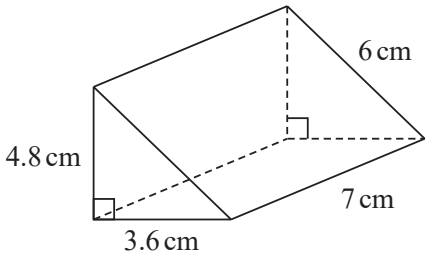


Diagram **NOT** accurately drawn

Work out the **total** surface area of the triangular prism.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 16 is 3 marks)

22 The diagram shows a solid triangular prism.

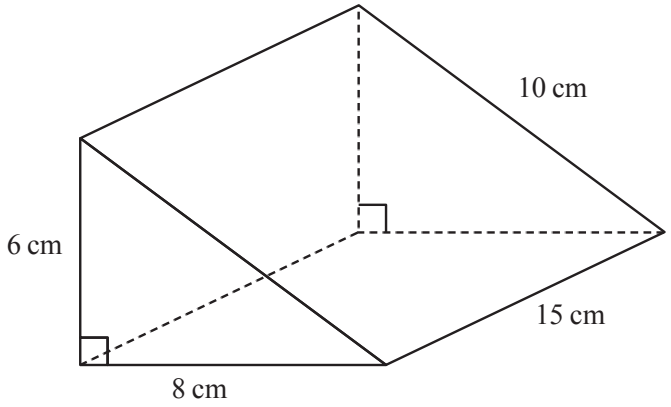


Diagram **NOT** accurately drawn

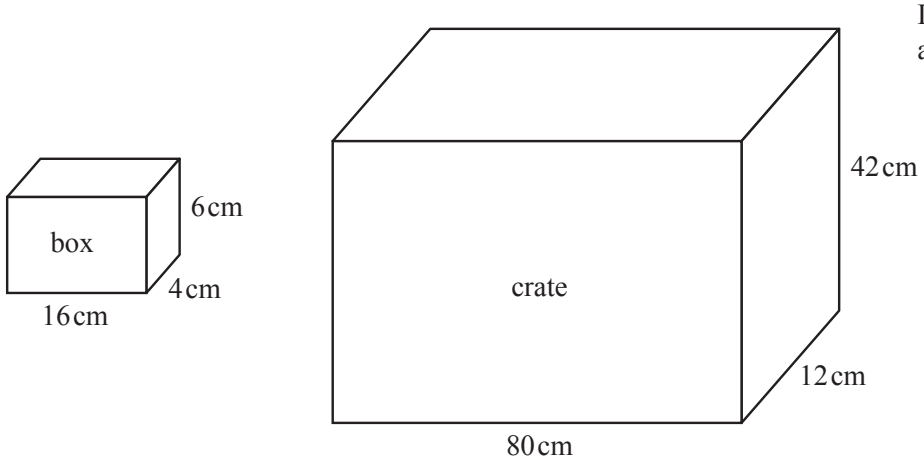
Work out the **total** surface area of the triangular prism.

..... cm^2

(Total for Question 22 is 3 marks)

10 Boxes are put into a crate.

Diagram **NOT** accurately drawn



Each box is a cuboid, 16 cm by 4 cm by 6 cm
The crate is a cuboid, 80 cm by 12 cm by 42 cm

Work out the greatest number of boxes that can be put into the crate.

.....

(Total for Question 10 is 3 marks)

24 Here is a solid cylinder.

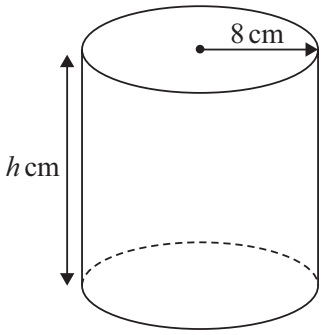


Diagram **NOT** accurately drawn

The radius of the cylinder is 8 cm
The height of the cylinder is h cm

The volume of the cylinder is 3892 cm^3

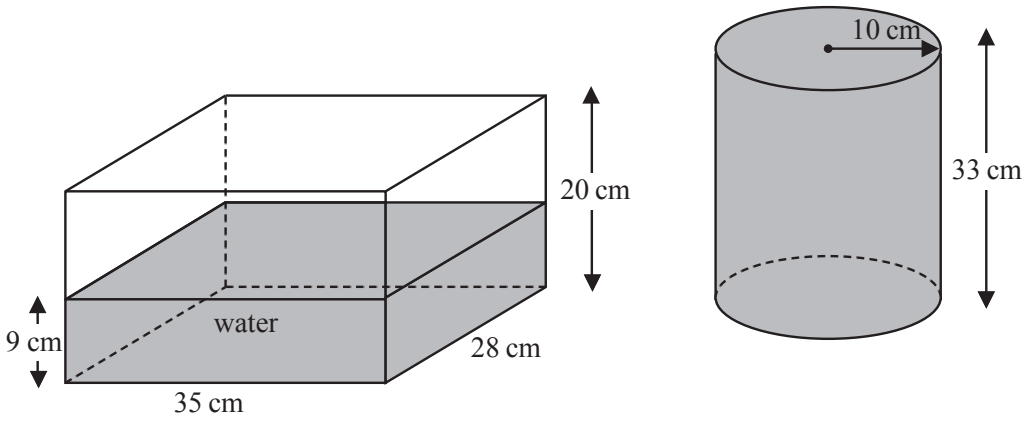
Work out the value of h
Give your answer correct to one decimal place.

$h =$ .....

(Total for Question 24 is 3 marks)

25 The diagram shows two water containers.
One is a cuboid and one is a cylinder.

Diagram **NOT** accurately drawn



The cuboid measures 35 cm by 28 cm by 20 cm
The surface of the water in the cuboid is 9 cm above the base of the cuboid.

The cylinder has a radius of 10 cm and a height of 33 cm
The cylinder is completely full of water.

Izzy is going to pour all the water from the cylinder into the cuboid.

Show that the cuboid will not be completely full of water.

(Total for Question 25 is 3 marks)

24 Here is an empty pool in the shape of a cuboid.

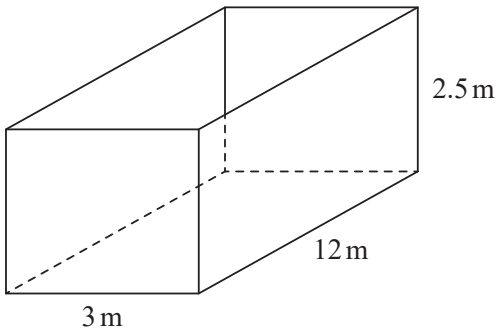


Diagram **NOT** accurately drawn

The width of the pool is 3 m.
The length of the pool is 12 m.
The top of the pool is 2.5 m above the base of the pool.

Jeb is going to put water in the pool.
The level of the surface of the water will be 60 cm below the top of the pool.

Water flows into the pool at 400 litres per minute.
$1\,m^3 = 1000$ litres

How long will it take to fill the pool to 60 cm below the top of the pool?
Give your answer in hours and minutes.

..... hours ..... minutes

(Total for Question 24 is 4 marks)

19 The diagram shows two cylinders, **A** and **B**.

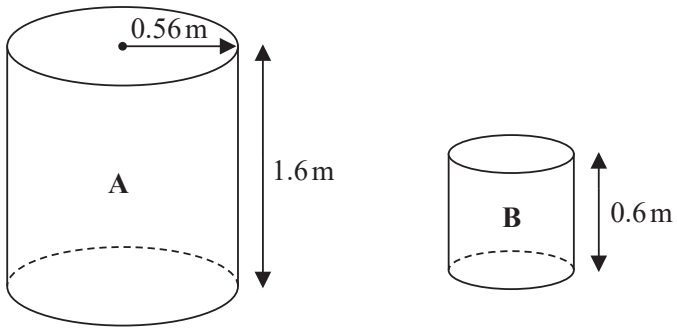


Diagram **NOT** accurately drawn

Cylinder **A** has height 1.6 m and radius 0.56 m.

(a) Work out the curved surface area of cylinder **A**.
Give your answer in m^2 correct to 3 significant figures.

..... m^2
(2)

Cylinder **B** is mathematically similar to cylinder **A**.
The height of cylinder **B** is 0.6 m.

(b) Work out the radius of cylinder **B**.

..... m
(2)

(Total for Question 19 is 4 marks)

15 The diagram shows Jonah's fish tank.

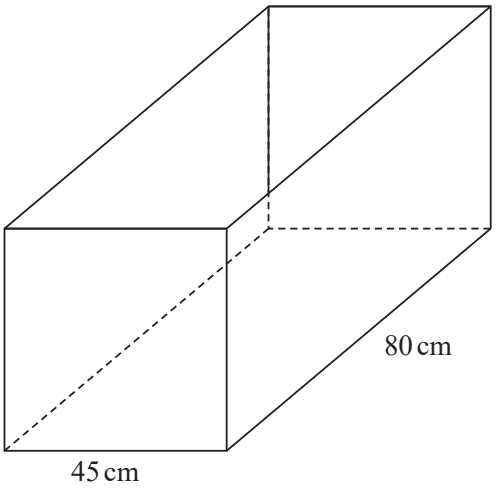


Diagram **NOT** accurately drawn

The fish tank is in the shape of a cuboid.

Jonah wants to keep 20 fish in the fish tank.
He knows that he must have 9 litres of water for each fish in the fish tank.

What is the minimum depth of water in the fish tank that Jonah must have?

cm

(Total for Question 15 is 4 marks)

9 Sahil has a fish tank in the shape of a cuboid, as shown in the diagram.

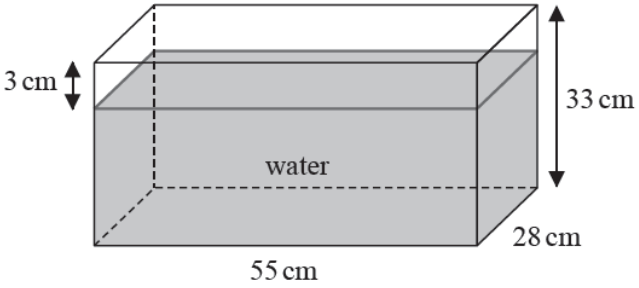


Diagram **NOT** accurately drawn

The tank is

55 cm long
28 cm wide
33 cm high

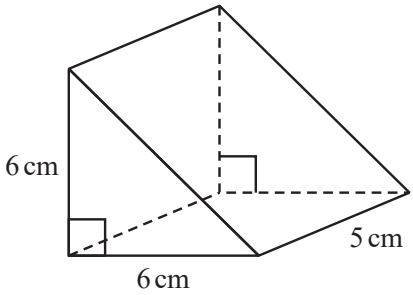
The surface of the water in the tank is 3 cm below the top of the tank.

Sahil is going to put some neon tetra fish in his tank.
He must allow 4 litres of water for each of the neon tetra fish he puts in the tank.

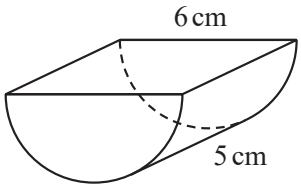
What is the greatest number of neon tetra fish Sahil can put in his tank?

(Total for Question 9 is 4 marks)

16 The diagram shows two solid toy bricks, Brick **A** and Brick **B**.



Brick **A**



Brick **B**

Diagram **NOT** accurately drawn

Brick **A** is a triangular prism of length 5 cm.
The cross section of Brick **A** is an isosceles right-angled triangle with equal sides of length 6 cm.

Brick **B** is half a cylinder of length 5 cm.
The semicircular cross section of Brick **B** has diameter 6 cm.

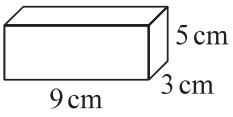
The volume of Brick **A** is greater than the volume of Brick **B**.

How much greater?
Give your answer correct to 1 decimal place.

cm^3

(Total for Question 16 is 4 marks)

11 Karl has 5700 bricks.
He wants to put all the bricks into crates.



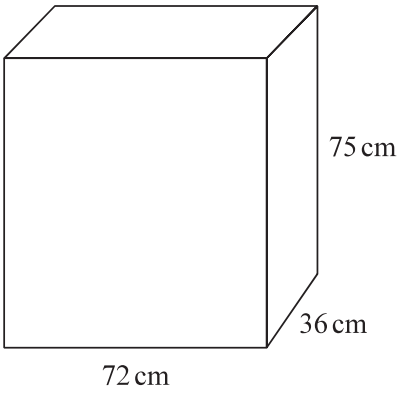


Diagram **NOT** accurately drawn

Each brick is a cuboid measuring 9 cm by 3 cm by 5 cm.
Each crate is a cuboid measuring 72 cm by 36 cm by 75 cm.

Karl has 4 crates.

Is there enough room in the 4 crates for 5700 bricks?
Show your working clearly.

(Total for Question 11 is 4 marks)

19 The diagram shows a container for water in the shape of a prism.

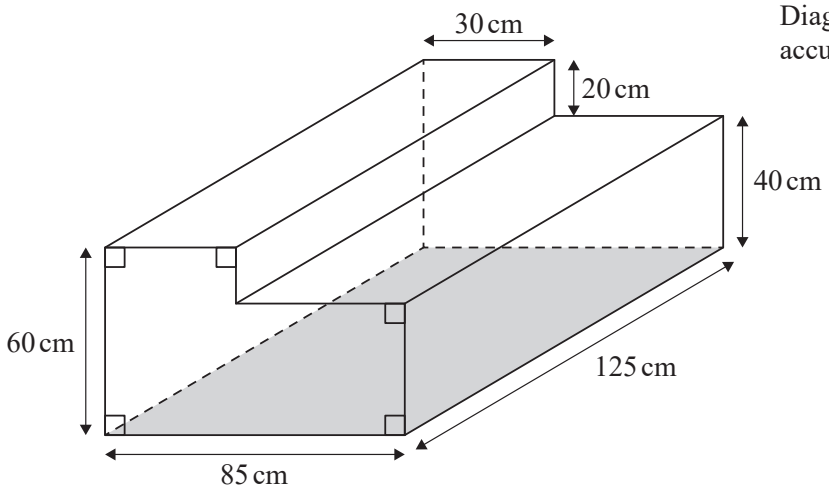


Diagram **NOT** accurately drawn

The rectangular base of the prism, shown shaded in the diagram, is horizontal.
The container is completely full of water.

Tuah is going to use a pump to empty the water from the container so that the volume of water in the container decreases at a constant rate.

The pump starts to empty water from the container at 10 30 and at 12 00 the water level in the container has dropped by 20 cm.

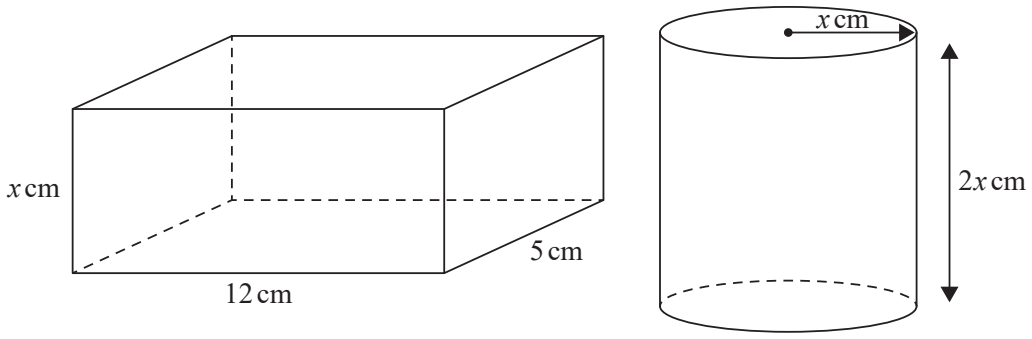
Find the time at which all the water has been pumped out of the container.

.....

(Total for Question 19 is 4 marks)

20 The diagram shows a cuboid and a cylinder.

Diagram **NOT** accurately drawn



The dimensions of the cuboid are x cm by 12 cm by 5 cm.
The volume of the cuboid is 270 cm^3

The radius of the cylinder is x cm.
The height of the cylinder is $2x$ cm.

(a) Work out the volume of the cylinder.
Give your answer correct to the nearest whole number.

..... cm^3
(3)

(b) Change 1 m^3 to cm^3

..... cm^3
(1)

(Total for Question 20 is 4 marks)

14 The diagram shows a solid prism.

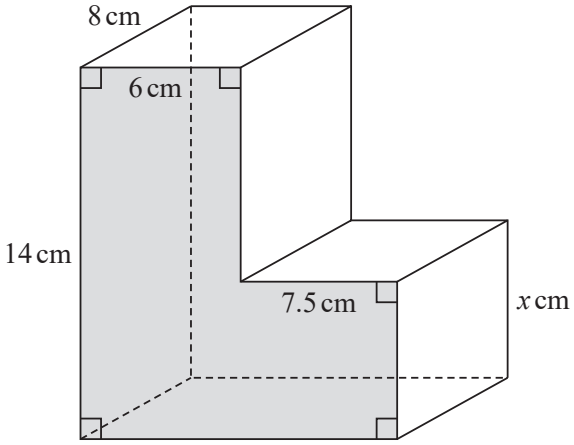


Diagram **NOT** accurately drawn

The cross section of the prism is shown shaded.

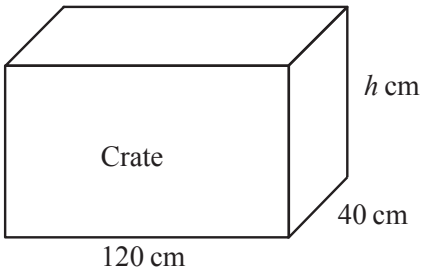
The volume of the prism is 924 cm^3

Work out the value of x

$x =$ .....

(Total for Question 14 is 4 marks)

16



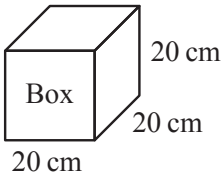


Diagram **NOT** accurately drawn

A crate is in the shape of a cuboid with inside lengths of 120 cm, 40 cm and h cm
The crate has a lid.

Micah has 48 boxes.
Each box is in the shape of a cube 20 cm by 20 cm by 20 cm

Micah wants to put all the boxes in the crate and shut the lid.

Work out the least possible value of h

.....

(Total for Question 16 is 4 marks)

15 The diagram shows a box and a crate with a lid.

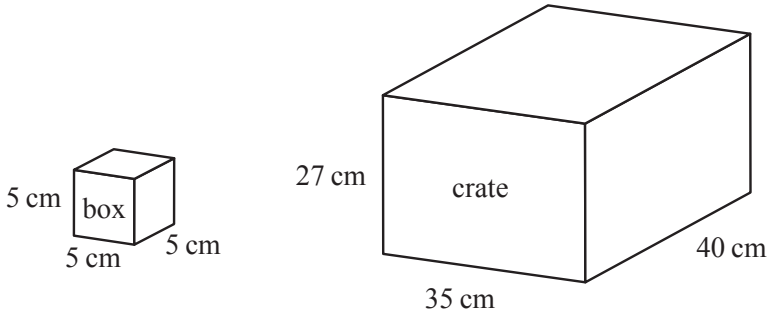


Diagram **NOT** accurately drawn

The box is a cube with sides of length 5 cm.
Tony has many boxes.

The crate is a cuboid with inside lengths of 27 cm, 35 cm and 40 cm.

Tony puts as many boxes as possible into the crate so that the lid will shut.

Work out the volume of space in the crate that is not filled up with boxes.

..... cm^3

(Total for Question 15 is 4 marks)

21 The diagram shows a solid wooden cylinder.

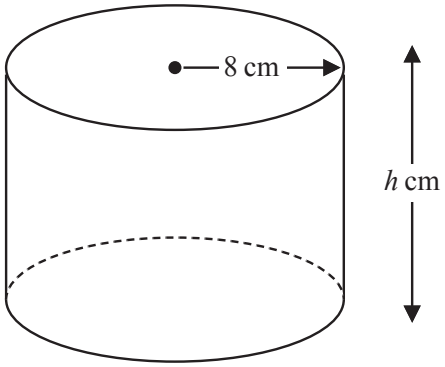


Diagram **NOT** accurately drawn

The cylinder has radius 8 cm and height h cm.
The volume of the cylinder is 1208 cm^3

(a) Work out the value of h
Give your answer correct to the nearest whole number.

$h =$ .....

(2)

The density of the wood is 1.25 g/cm^3

(b) Work out the mass of the cylinder.
Give your answer in kilograms.

..... kilograms

(2)

(Total for Question 21 is 4 marks)

22 The diagram shows a cylinder.

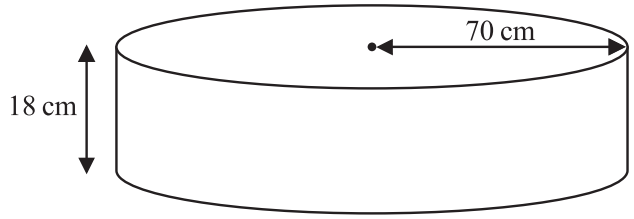


Diagram **NOT** accurately drawn

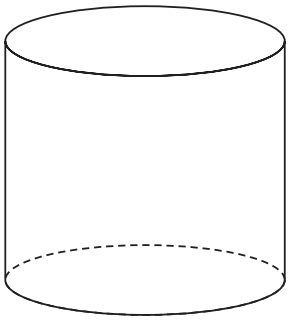
The radius of the cylinder is 70 cm
The height of the cylinder is 18 cm

Work out the volume of the cylinder.
Give your answer in litres correct to the nearest litre.

..... litres

(Total for Question 22 is 4 marks)

3 (a) Write down the mathematical name of this 3-D shape.



.....

(1)

Here is a solid cuboid.

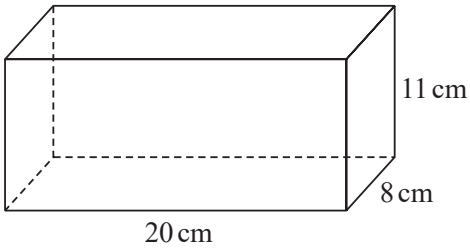


Diagram **NOT** accurately drawn

(b) (i) How many faces has the cuboid?

.....

(ii) How many vertices has the cuboid?

.....

(2)

(c) Work out the volume of the cuboid.

..... cm^3

(2)

(Total for Question 3 is 5 marks)

24 The diagram shows a solid cylinder with radius 3 m.

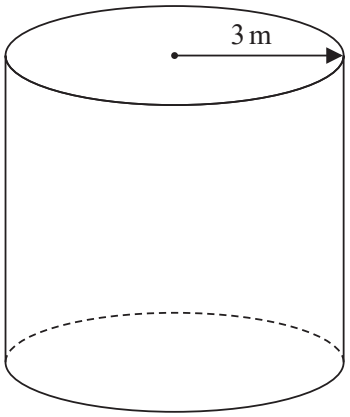


Diagram **NOT** accurately drawn

The volume of the cylinder is 72π m^3

Calculate the **total** surface area of the cylinder.
Give your answer correct to 3 significant figures.

..... m^2

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

14 The diagram shows a trapezium.

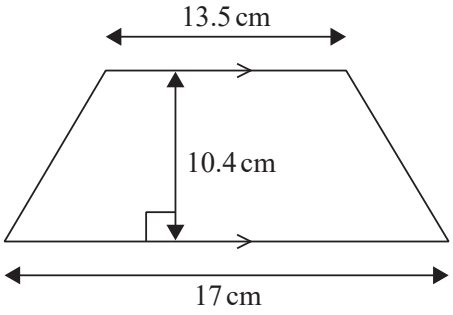


Diagram **NOT** accurately drawn

(a) Work out the area of the trapezium.

..... cm^2

(2)

The diagram shows a cuboid.

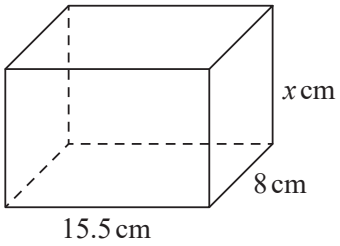


Diagram **NOT** accurately drawn

The volume of the cuboid is 806 cm^3

(b) Work out the value of x.

x = ...

(3)

(Total for Question 14 is 5 marks)

24 Here is a triangular prism.

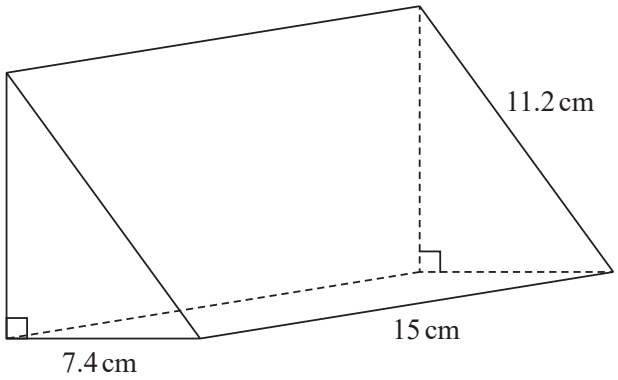


Diagram **NOT** accurately drawn

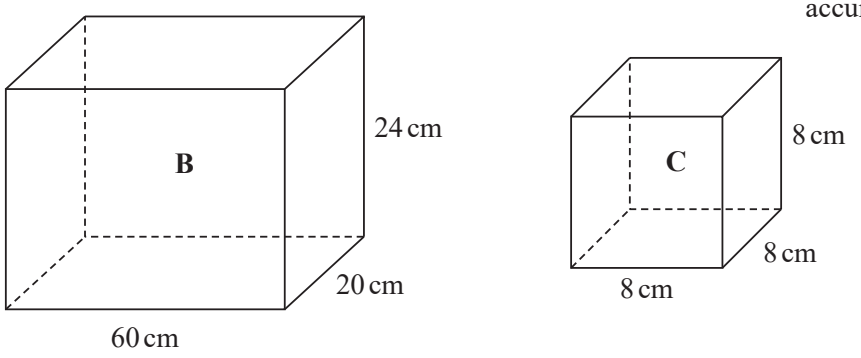
Work out the volume of the prism.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 24 is 5 marks)

12 The diagram shows a box **B** and a carton **C**

Diagram **NOT** accurately drawn



The box **B** is in the shape of a cuboid.
Each carton **C** is in the shape of an 8 cm cube.

Martha is going to put as many of the cartons as possible into the box.
She has enough cartons to do this.

Martha will then fill the remaining space inside the box with packing material.

Work out the volume of the space inside the box that Martha will fill with packing material.

..... cm^3

(Total for Question 12 is 5 marks)

24 Jonty has a storage container in the shape of a cuboid, as shown in the diagram.

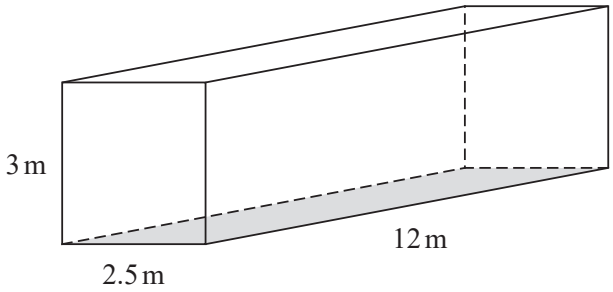


Diagram **NOT** accurately drawn

Jonty is going to paint the outside of his storage container, apart from the base which is shown shaded in the diagram.
He needs enough paint to cover the four sides and the top.

Each tin of paint covers an area of 15 m^2

The cost of each tin of paint recently increased by 10%
After the increase, the cost of each tin of paint is £26.95

Jonty says

"**Before** the increase, I could have bought enough paint for less than £200"

Show that Jonty is correct.
Show your working clearly.

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

24 The diagram shows a rectangular sheet of metal $ABCD$

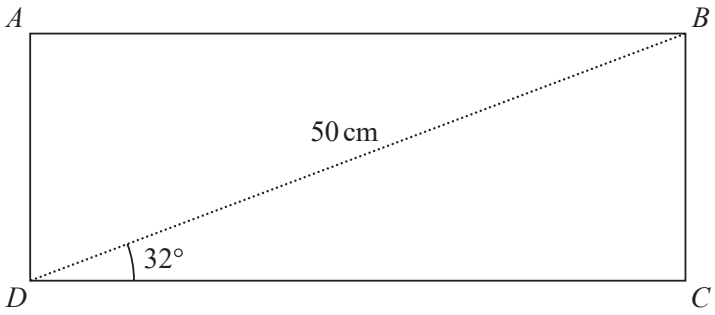


Diagram **NOT** accurately drawn

$BD = 50$ cm and angle $BDC = 32°$

Nasser joins side AD to side BC to form a cylinder.

BC is the height of the cylinder.
DC is the circumference of the cross section of the cylinder.

Work out the volume, in cm^3, of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 24 is 6 marks)

Turn over for Question 25

MARK SCHEMES

official mark schemes, in the same order as the questions

11		Correct triangle	2	B2	For a fully correct triangle with arcs shown (B1 for a correctly sized triangle with no arcs shown **or** for an incorrectly sized triangle with arcs shown where $AC = BC$ **or** correct arcs not joined) (overlay required)
					Total 2 marks

12	(a)		BL, BM, BS CL, CM, CS DL, DM, DS	2	B2 (B1	for all 9 combinations with no extras or repeats for at least 4 correct combinations (ignoring repeats))
	(b)		$\frac{47}{100}$	1	B1	oe
	(c)		$\frac{49}{53}$	2	B2 (B1	oe accept 0.9245... or 92(.45...)% for $\frac{c}{53}$ where $c < 53$ **or** $\frac{49}{d}$ where $d > 49$)
						Total 5 marks

13	e.g. $0.5 \times (6 + 13) \times 3$		2	M1	for a complete method
		28.5		A1	oe
					Total 2 marks

9	$\pi \times 9^2$ oe		2	M1	(use of π, 3.14, 3.142, $\frac{22}{7}$ multiplied by radius squared)
	Correct answer scores full marks (unless from obvious incorrect working)	254		A1	254 - 255
					Total 2 marks

10		A rectangle with area 24 cm²	2	B2	For a correct rectangle eg 2 squares by 12 squares, 3 squares by 8 squares, 4 squares by 6 squares, 5 squares by 4.8 squares etc (B1 for stating 24 or drawing any rectangle)
					Total 2 marks

IGCSE Maths - Paper 1FR (1-9) 2018 June Mark scheme

The correct answer, unless clearly, obtained by an incorrect method, should be taken to imply a correct method with the exception of Q24					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	a		African buffalo	1	B1 accept buffalo or 725
	b		100	1	B1 accept (one) hundreds
	c		1192	1	B1 accept −1192
	d	800 × 20 ÷ 1000	16	2	M1 ft for any number in the table A1
2		70 + 100 + 70 + 100 = 340 "340" × 3	1020	3	M1 for working out the perimeter M1 dep on first M mark A1
3	a		$\frac{4}{15}$	1	B1 Do not accept 4:15 but accept 4/15
	b		4 squares shaded	1	B1
4	a		R marked	1	B1
	b		Trapezium	1	B1
	c		65	1	B1 accept answer in the range 63 – 67

International GCSE Maths					
Apart from questions 19 and 24 the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method					
Q		**Working**	**Answer**	**Mark**	**Notes**
1	(i)		13 or 23	1	B1
	(ii)		36	1	B1
	(iii)		14	1	B1
					Total 3 marks

2	(a)		0.5, 0.501, 0.51, 0.55	1	B1
	(b)		$\frac{3}{10}$	1	B1 for $\frac{3}{10}$ oe eg $\frac{30}{100}$
	(c)		0.47	1	B1
					Total 3 marks

3	20 ÷ 4 (= 5) **or** width = 15 **or** length = 20		3	M1	Could be clearly shown on diagram
	(4 × '5') × (3 × '5') **or** 20 × 15 **or** ('5' × '5') × 12 **or** 25 × 12			M1	dep on M1
		300		A1	for 300 SCB1 for 60 × 80 (=4800)
					Total 3 marks

3	(a)		cylinder	1	B1 allow circular prism
	(b)		12	1	B1
					Total 2 marks

4	(a)		34	1	B1
	(b)		18	1	B1
					Total 2 marks

5	(a)		64	1	B1
	(b)		0.45	1	B1
	(c)		$\frac{3}{8}$	1	B1
	(d)		$2\frac{3}{4}$	1	B1
	(e)		square	1	B1
					Total 5 marks

6	24 ÷ 4 (= 6) **or** width = 24		3	M1 Could be clearly shown on diagram.
	10 × '6' oe **or** 24 + 24 + 6 + 6 oe			M1 dep M1
		60		A1 SC if no other marks scored B1 for 24 × 4 (= 96)
				Total 3 marks

9	200 (m*l*) written as 0.2 (*l*)or 3.5 (*l*) written as 3500 (m*l*)		4	B1	for a correct conversion
	3 × "0.2" (= 0.6) oe eg 0.2 + 0.2 + 0.2 or 3 × 200 (= 600) oe eg –200–200–200 or 3500 – 600 (= 2900)			M1	A correct calculation for the total amount of water in the 3 cups or the 4 jugs
	$\frac{3.5-"0.6"}{4}$ or $\frac{"3500"-"600"}{4}$ oe			M1	For a fully correct method or for an answer of 0.725 (this alone gains B1M2)
		725		A1	(SCB1M1 (no other marks) for (3.5 – 0.2) ÷ 4 (= 0.825) or (3500 – 200) ÷ 4 (= 825))
					Total 4 marks

10	(Area of kite =)12		3	B1	for a correct area of the kite – may be implied by their diagram
				M1	for any rectangle
				A1ft	A correct rectangle or ft for a rectangle with their stated area of the kite
					Total 3 marks

7	10 – 3 (= 7) (could be on diagram) **or** 10 + 3 + 10 + 3 (= 26) oe **or** (10 + 3 + 10 + 3) × 3 (= 78) oe **or** 6 × 10 + 4 × 3 (= 72) oe **or** 4 × 10 + 4 × 3 (= 52) oe		3	M1	for 10 – 3 (= 7) (could be on diagram) **or** for finding the perimeter of one rectangle **or** for finding the perimeter of 3 rectangles **or** for finding the perimeter including the internal sides **or** for finding the perimeter excluding the two lengths of 7
	eg 3 + 10 + 3 + 10 + 3 + 10 + 3 + "7" + 10 + "7" oe **or** 4 × 10 + 4 × 3 + 2 × "7" oe **or** "78" – (4 × 3) oe **or** "72" – (2 × 3) oe **or** "52" + (2 × "7") oe			M1	for a fully correct method to find the perimeter of the shape, with at most one error (which could be one length omitted or an extra length added)
	Correct answer scores full marks (unless from obvious incorrect working)	66		A1	
					Total 3 marks

8	use of 1 m = 100 cm eg 7 m = 700 cm or 185 cm = 1.85 m or 370 cm = 3.7 m		3	B1	for any correct conversion between metres and centimetres
	"700" – 2 × 185 (= 330) **or** 7 – 2 × "1.85" (= 3.3) oe			M1	use of their converted value for this method mark ie "700" is their converted 7 m and "1.85" is their converted 185 cm
	Correct answer scores full marks (unless from obvious incorrect working)	110		A1	allow 1.1 m or 1.1 metres
					Total 3 marks

Question		Working	Answer	Mark	Notes
5	(i)		a cross at the notch between ½ and 1	1	B1 A cross or other indication eg an arrow or large dot etc at the correct place.
	(ii)		a cross at 0	1	B1 A cross or other indication eg an arrow or large dot etc at the correct place.
					Total 2 marks

Question		Working	Answer	Mark	Notes
6	(a)		A right-angled triangle	1	B1 For a right angled triangle drawn.
	(b)		A rectangle with area 20 cm²	2	B2 eg a rectangle with dimensions 2 cm by 10 cm or 4 cm by 5 cm or 2.5 cm by 8 cm etc (B1 for a rectangle without area 20 cm² or any shape with area 20 cm²)
					Total 3 marks

13	(a)			2	M1	for 2.4544 or 17.5 or 17.53 or $\frac{3068}{175}$
		Correct answer scores full marks (unless from obvious incorrect working)	17.531(…….)		A1	At least 5 sf
	(b)		17.5	1	B1	ft a number with 2 or more decimal places
						Total 3 marks

14	(side of square =) $\sqrt{49}(=7)$ 7 could also be seen as part of a calculation eg 7 + 7 + 7…..		3	M1	could be on the diagram
	Other side of triangle = $(27-"7")\div 2(=10)$ or 2 sides of triangle = 27 – "7" (= 20) 10 or 20 could also be seen as part of a calculation eg 7 + 7 +…+ 10 + 10 or 7 + 7 + …+ 20			M1	dep on M1 **but we will allow** use of their side of square when assuming 49 is the perimeter eg $\frac{27-12.25}{2}(=7.375)$ or 27 – 12.25 (= 14.75)
	Correct answer scores full marks (unless from obvious incorrect working)	41		A1	
					Total 3 marks

16		96 ÷ 12 (= 8)		3	M1	for a complete method to find the height of the parallelogram
		$\frac{1}{2}(18+26)\times[8]$			M1	for a method to find the area of the trapezium (do not allow missing brackets unless recovered) where [8] is what they believe to be the height of the trapezium and must be positive. Do not allow [8] to be 12 or 1
		Correct answer scores full marks (unless from obvious incorrect working)	176		A1	
						Total 3 marks

17	(a)		$9c(2-5d)$	2	B2	for $9c(2-5d)$ or $-9c(5d-2)$ (B1 for $9(2c-5cd)$ or $c(18-45d)$ or $3c(6-15d)$ or $3(6c-15cd)$ **or** $9c(p+qd)$ where p and q are non-zero integers **or** $(2-5d)$ as a factor)
	(b)	eg $5-2x=18x-24$ **or** $\frac{5}{6}-\frac{2}{6}x=3x-4$		3	M1	for removal of the fraction **and** correctly multiplying out RHS by 6 in an equation **or** separating fractions on the LHS in an equation
		$5+24=18x+2x$ oe **or** $29=20x$ oe **or** $\frac{5}{6}+4=\frac{2}{6}x+3x$ oe			M1ft	dep on 4 terms for correctly rearranging their 4 term equation for terms in x on one side of the equation and number terms on the other
		Working required	1.45		A1	dep on M1 oe eg $\frac{29}{20}$ or $1\frac{9}{20}$
						Total 5 marks

Q	Working	Answer	Mark	Notes
16	20 × 14 (= 280)	460	4	M1
	$\frac{20+16}{2} \times (24-14)$ (= 180)			M1
	"280" + "180"			M1 (dep) on at least one of the previous M marks
				A1
				Total 4 marks
	Alternative scheme 1			
	(24 +14)÷2 (= 19) **and** (20−16)÷2 (=2)	460	4	M1
	2 × 19 (= 38) **and** 16 × 24 (= 384)			M1
	"38" + "38" + "384"			M1 (dep) on at least one of the previous M marks
				A1
				Total 4 marks
	Alternative scheme 2			
	20 × 24 (= 480)	460	4	M1
	(20−16)÷2 (=2) **and** 24 − 14 (= 10) 2 × 10 = 20			M1
	"480" – "20"			M1 (dep) on at least one of the previous M marks
				A1
				Total 4 marks

3	(a)	$\frac{72}{100}, \frac{36}{50}$		2	M1 Or other fraction equivalent to $\frac{18}{25}$
			$\frac{18}{25}$		A1
	(b)		75	1	B1
	(c)	e.g. $\frac{65}{100} \times 720$, 0.65 × 720, 720 ÷ 100 × 65 oe		2	M1
			468		A1
	(d)	$\frac{9}{20} = 0.45$ **or** $\frac{4}{9} = 0.44...$		2	M1 **OR** 4 out of 5 numbers in the correct order **OR** correct reverse order
			40.5%, 0.427, 0.43, $\frac{4}{9}, \frac{9}{20}$		A1 oe
					Total 7 marks

4	(a)			2	M1 Any rectangle
		e.g. Rectangle 1 × 6, 2 × 5, 3 × 4, 3.5 × 3.5	Rectangle with perimeter 14 cm		A1
	(b)			2	M1 Any right-angled triangle or any triangle with area 12 cm²
			Right-angled triangle with area 12 cm²		A1 e.g. B 4 cm & H 6 cm, B 3 cm & H 8 cm
					Total 4 marks

Question		Working	Answer	Mark	Notes	
10	(a)	360° − (90° + 90° + 140°) or 2 × (180° − 90° − 70°)	 40°	2	M1 A1	or 180 – 140 or 90 + 90 +140 + x = 360
	(b)	33 × 12 or $\frac{1}{2}$ × 33 × 12 × 2	 396	2	M1 A1	
						Total 4 marks

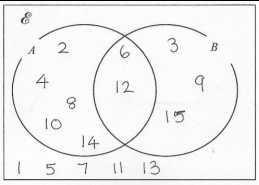
16		E.g. 12 × 9 (=108) **or** (9 – 6) × x (= 3x)		4	M1 for one correct relevant area
		E.g. 129 – '108' (= 21) **or** '108' + '3x' = 129 **or**			M1 dep on M1for 129 used correctly with another area **or** for a correct equation (ft) with bracket(s) expanded
		E.g. '21' ÷ (9 – 6) **or** $x = \frac{129 - '108'}{3}$			M1 for a complete method
			7		A1
					Total 4 marks

8	28 ÷ 4 (= 7)			M1
				M1 for using at least six lengths correctly (may be seen on diagram or in calculation)
	e.g. "7" + "3" + 4 + "3" + "7" + 4 + "7" + 4 + "7" + 4			M1 for a complete method to find perimeter
		50	4	A1
				SC Award B2 for an answer of 66 or 68
				Total 4 marks

9	a		24.9	1	B1
	b		7.1	1	B1 oe
	c	7 ÷ 8 × 100 oe			M1
			87.5	2	A1
					Total 4 marks

10	e.g. 4 × 6 (= 24)		4	M1	for finding the perimeter of square
	e.g. ("24" – 6) ÷ 2 (= 9)			M1	for finding the length of the longest side in the triangle
	e.g. 18 × 3 + 6 or "9" × 6 + 6			M1	oe, allow their length of the longest side in the triangle as long as clearly stated or identified (could be on diagram)
		60		A1	dep on M2
					Total 4 marks

11	x −1 0 1 2 3 4 y −5 −2 1 4 7 10	3	3		B3 for a correct line between −1 and 4 B2 for a correct straight line segment through at least 3 of (−1, −5)(0, −2)(1, 1)(2, 4)(3, 7)(4, 10) **OR** for all of (−1, −5)(0, −2)(1, 1)(2, 4)(3, 7)(4, 10) plotted but not joined B1 for at least 2 correct points plotted or stated (ignore incorrect points) **OR** for a line drawn with a positive gradient through (0, −2) and clear intention to use a gradient of 3 **OR** a line drawn with a gradient of 3
					Total 3 marks

12			3	B3 for all entries correct (B2 for 3 sections of the Venn diagram correct) (B1 for 2 sections of the Venn diagram correct)	
					Total 3 marks

7	[perimeter =]10 + 6 + 10 + 6 (= 32) **or** (10 + 6) × 2 (= 32) **or** 10 + 6 (= 16)		4	M1	for perimeter or semi perimeter of rectangle
	[area =]10 × 6 (= 60)			M1	(indep) for area of rectangle
	("32" ÷ 4)^2 – '60' **or** ("16" ÷ 2)^2 – '60'			M1	for a completely correct method Allow 60 – area of square
	Working not required, so correct answer scores full marks (unless from obvious incorrect working eg a wrong conversion)	4		A1	
					Total 4 marks

18	$8 \times x$ (= $8x$) **or** $14 \times x$ (= $14x$) **or** $(14 - 8) \times x$ (= $6x$) **or** $\frac{1}{2} \times (14 - 8) \times (13 - x)$ (= $39 - 3x$) **or** $\frac{13+x}{2} \times (14-8) (= 39 + 3x)$ **or** $\frac{1}{2} \times 13 \times (14 - 8)$ (=39) **or** $\frac{8+14}{2} \times x$ (= $11x$) **or** 14×13 (=182) **or** $8 \times (13 - x)$ (= $104 - 8x$) **or** $\left(\frac{8+14}{2} \times (13-x)\right)$ (= $143 - 11x$) oe		4	M1	one correct area linked to the shape
	$14x + 6 \times \frac{1}{2} \times (13 - x)$ oe eg $8x + \frac{x+13}{2} \times 6$ **or** $\frac{8+14}{2} \times x + \frac{13 \times (14-8)}{2}$ **or** "182" $- \left(\frac{8+14}{2} \times (13-x)\right)$ **or** $11x + 39$ oe			M1	ft from correct working expression for total area of shape – with no parts omitted or duplicated Adding up parts of given shape **or** Large rectangle subtracting trapezium (or subtracting (rectangle + triangle))
	eg $11x + 39 = 91.8$ **or** $14x + 39 - 3x = 91.8$ **or** "182" $- 143 + 11x = 91.8$ or $16x + 6x + 78 = 183.6$ oe			M1	fully correct equation with no fractions (allow 91.8 or multiples of 91.8 but no other decimals) **and** no brackets
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	4.8		A1	or $4\frac{4}{5}$ oe or $\frac{24}{5}$ oe
					Total 4 marks

18	$4 \times (5 - x)$ **or** $5 \times (2x - 1)$ **or** $20 - 4x$ **or** $10x - 5$ oe			4	M1	for setting up a correct expression for area *A* or area *B* (could be seen as part of an equation) (condone lack of brackets for multiplying if meaning is clear for this mark)
	one from: $4(5 - x) = 20 - 4x$ or $2 \times 4(5 - x) = 40 - 8x$ or $0.5 \times 4(5 - x) = 10 - 2x$ oe	**and** one from: $5(2x - 1) = 10x - 5$ or $2 \times 5(2x - 1) = 20x - 10$ or $0.5 \times 5(2x - 1) = 5x - 2.5$ oe			M1	for expanding 2 sets of brackets correctly (one for each shape) [We will allow for ×2 or ÷2 for the wrong shape for this expansion mark]
	eg $10x + 8x = 40 + 5$ **or** $-5 - 40 = -10x - 8x$ **or** $18x = 45$ **or** $-45 = -18x$ **or** $4x + 5x = 20 + 2.5$ oe				M1	for a correct equation with terms in *x* on one side and number terms the other side
	Working required		2.5		A1	oe dep on M1
						Total 4 marks

13	eg 2.5 × 6.5 (= 16.25) **or** 0.5 × 6.5 × 1 (= 3.25) **or** 3.5 × 6.5 (= 22.75)		4	M1	M2 for 0.5(2.5 + 3.5) × 6.5 (= 19.5) **or** 2 × (0.5(2.5 + 3.5) × 6.5) (= 39)
	2.5 × 6.5 + 0.5 × 6.5 × 1 (= 19.5) **or** 2 × (2.5 × 6.5 + 0.5 × 6.5 × 1) (= 39) **or** 3.5 × 6.5 – 0.5 × 6.5 × 1 (= 19.5) **or** 2 × (3.5 × 6.5 – 0.5 × 6.5 × 1) (= 39)			M1	
	2 × "19.5" ÷ 12 (= 3.25) **or** "39" ÷ 12 (= 3.25) **or** 12 + 12 + 12 + 12 (= 48) **or** 4 × 12 (= 48)			M1 **or** [their area] ÷ 12 (dep on M1) **or** using multiples of 12 for [their area] eg area = 19.5 **and** 12 + 12 (= 24) **or** 2 × 12 (= 24)	
		4		A1 dep on M2, must be from correct working	
					Total 4 marks

14 (a)	$\frac{10.1}{39.8}\times100$ oe or $\frac{10\,100\,000}{39\,800\,000}\times100$		2	M1	
		25.4		A1 awrt	
(b)	$\frac{21}{100}\times59.9$ (= 12.579) oe or $\frac{21}{100}\times59\,900\,000$ (= 12 579 000) oe		3	M1	M2 $\frac{121}{100}\times59.9$ oe or $\frac{121}{100}\times59\,900\,000$ oe
	59.9 + "12.579" (= 72.479) or 59 900 000 + 12 579 000 (= 72 479 000)			M1	
		72		A1 Accept 72 – 73 or 72 000 000 – 73 000 000	
					Total 5 marks

15	48 ÷ 4 (=12)		4	M1 could be on diagram
	30 – "48 ÷ 4" (= 18) or 9			M1 allow 9 on correct side of the triangle on the diagram
	3 × "18" + "12" or 6 × "18 ÷ 2" + "12" or "54" + "12"			M1 for a complete correct method
		66		A1
				Total 4 marks

20	$\frac{16}{3}-\frac{20}{7}$ or $(5)\frac{7}{21}-(2)\frac{18}{21}$ or $(5)\frac{7a}{21a}-(2)\frac{18a}{21a}$		3	M1	for correct improper fractions or fractional part of numbers written correctly over a common denominator
	$\frac{112}{21}-\frac{60}{21}$ or $\frac{112a}{21a}-\frac{60a}{21a}$ or $5\frac{7}{21}-2\frac{18}{21}=3-\frac{11}{21}$ oe or $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{21}-2\frac{18}{21}$			M1	for correct fractions with a common denominator with minus sign or mixed numbers to the stage shown
	$\frac{112}{21}-\frac{60}{21}=\frac{52}{21}=2\frac{10}{21}$ oe or $3-\frac{11}{21}=2\frac{10}{21}$ or $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{21}-2\frac{18}{21}=2\frac{10}{21}$	Shown		A1	Dep on M2 for a correct answer from fully correct working If all 3 fractions turned into improper fractions on the first line $\frac{16}{3}-\frac{20}{7}=\frac{52}{21}$ then the student **clearly** needs to show that the LHS $=\frac{52}{21}$
					Total 3 marks

21	28 × 12 (=336) or 5 × 12 (= 60) or 18 × 12 (= 216) or 28 × 20 (=560) or $\frac{1}{2}(CD+"18")"8"$ oe eg $72+4CD$ [numbers in " " come from correct working] **Check diagram for areas**		4	M1	For a correct method to find the area of a rectangle (may be seen as part calculation) or a correct expression for the area of the trapezium with numbers substituted. Allow for other correct method to find area linked to this shape.
	"336" + 0.5("18"+ *CD*)"8" = 434 oe eg 4("18" + *CD*) = 98 or eg 0.5("18" + *CD*)"8" = "98" oe eg $\frac{1}{2}(18+CD)=12.25$ or $"560"-2\left(0.5(5+x)"8"\right)=434$ oe (where *x* is horizontal from *D* to perp with *AF*) [numbers in " " come from correct working]			M1	correct use of their values from correct working for an equation involving *CD* (*CD* could be labelled with any letter)
	eg $(CD=)\frac{196-144}{8}\left(=\frac{52}{8}\right)$ or $(CD=)\frac{98-72}{4}\left(=\frac{26}{4}\right)$ or $(CD=)\frac{434+152-560}{4}$ or $(CD=)2\times12.25-18$ or $98\times2(=196)$, $"196"\div8(=24.5)$, $"24.5"-18$			M1	a correct process to solve a correct equation **or** a correct process to find *CD* using **correct values**
		6.5		A1	oe
					Total 4 marks

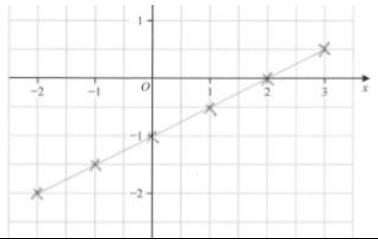
24	$\frac{1}{2}\times 7\times h = 42$ oe or $(h=)\frac{42\times 2}{7}$ (= 12) oe or $3.5^2 + h^2 = y^2$ or $h = \sqrt{y^2 - 3.5^2}$ oe		4	M1	A correct equation involving the height or a correct expression for height – could be in terms of y
	$y^2 = \left(\frac{7}{2}\right)^2 + (\text{"12"})^2$ oe or $\frac{1}{2}\times 7\times \text{"}\sqrt{y^2 - 3.5^2}\text{"} = 42$ oe			M1	(indep) use of *their* height (any found value that they have called 'height')
	$y = \sqrt{\left(\frac{7}{2}\right)^2 + (\text{"12"})^2}$ oe			M1	**all values must come from a correct method**
	Correct answer scores full marks (unless from obvious incorrect working)	12.5		A1	oe eg $\frac{25}{2}$
					Total 4 marks

Question	Working	Answer	Mark	Notes
19	eg $5x-1=3x+7.4$ oe **or** eg $10x-2+48$ **or** $6x+14.8+48$ **or** $24+24+5x-1+3x+7.4$ oe		4	M1 a correct equation to find x **or** a correct expression for the perimeter in terms of x
	$x=4.2$			A1 the correct value of x (implies previous mark)
	$2\times24+2(5\times$ "4.2" $-1)$ oe **or** $2\times24+2(3\times$ "4.2" $+7.4)$ oe **or** $2\times24+(5\times4.2-1)+(3\times4.2+7.4)$ oe eg $24+24+20+20$ oe			M1dep on a correct method to find the perimeter – use of positive x from correct working (1st M1 awarded for an equation) **and** only if used the same measurement for *AD* and *BC*
	working required	88		A1 cao dep on either M1 or $x=4.2$
				Total 4 marks

Question		Working	Answer	Mark	Notes
20	(a)		2.745	1	B1
	(b)		2.755	1	B1
	(c)	$(80\times60)\div2^2$		2	M1 For two of 80, 60, 2 or 4 rather than 2^2 oe
		eg $(80\times60)\div2^2=1200$ *working with rounded values seen required*	1200		A1 dep on M1 for answer coming from the use of the 3 rounded numbers – if 1200 seen then ignore any other working and comments
					Total 4 marks

20	$\frac{1}{2}(330+170)\times 240$ (= 60 000) oe or $\left(\frac{80\times 240}{2}\right)+(170\times 240)+\left(\frac{80\times 240}{2}\right)$ (= 60 000) oe or (2 × 9600) + 40 800 (= 60 000) oe		4	M1 for working out the area of the trapezium
	[60 000] ÷ 10 000 (= 6) or 10 000 × 6 (= 60 000)			M1 ft their area (must come from a two dimensional area) Allow $\frac{\text{their area}}{10\,000}$
	49 650 ÷ [6]			M1 dep on either previous M1 ft their number of hectares Allow $\frac{49\,650}{\text{their number of hectares}}$
	Correct answer scores full marks (unless from obvious incorrect working)	8275		A1
				Total 4 marks

23	eg 13×21 (=273) **or** $21 \times h$ (= $21h$) **or** $0.5(15 + 21) \times y$ oe **or** $15(h – 13)$ **or** $2 \times ½(3(h – 13))$ **or** $½(13 + h) \times 3$ (= $19.5 + 1.5h$) **or** $15 \times h$ (= $15h$)		4	M1	A correct calculation for an area linked to the shape. ($h – 13$) might be written as x or y etc: this is acceptable (even allow h) [allow without brackets for this mark only]
	eg $390 – “273”$ (= 117) **or** 13×21 **and** $0.5(15 + 21)(h – 13)$ oe **or** 13×21 **and** $0.5(15 + 21)y$ oe **or** $21h$ **and** $2 \times ½(3(h – 13))$ oe **or** 13×21 **and** $15(h – 13)$ **and** $2 \times ½(3(h – 13))$ oe **or** $2 \times ½(13 + h) \times 3$ **and** $15 \times h$			M1	For considering the area of all parts of the shape (parts need not be added or subtracted for the whole shape) (where y = height of $BCDE$) ($h – 13$) might be written as x or y etc: this is acceptable (even allow h) [correct use of brackets]
	“117” ÷ (0.5 × (15 + 21))(= 6.5) or **or** $\frac{1}{2}(15+21)\times y = "117"$ **or** $273 + 18(h – 13) = 390$ **or** $15(h – 13) + 2 \times ½(3(h – 13)) =$”117” oe **or** $2 \times ½(13 + h) \times 3 + 15h = 390$ **Typical equations here simplify to :** $18y = 117$, $18h – 234 = 117$, $18h + 39 = 390$, $18h = 351$			M1	A correct calculation to find height of trapezium or height of shape or a correct equation involving height of trapezium or height of shape or 6.5 ($h – 13$) might be written as x or y etc: this is acceptable (even allow h) [correct use of brackets]
	Correct answer scores full marks (unless from obvious incorrect working)	19.5		A1oe	eg $\frac{39}{2}$
					Total 4 marks

12	<table><tr><td>***x***</td><td>−2</td><td>−1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>***y***</td><td>−2</td><td>−1.5</td><td>−1</td><td>−0.5</td><td>0</td><td>0.5</td></tr></table> (−2, −2) (−1, −1.5) (0, −1) (1, −0.5) (2, 0) (3, 0.5)  	Correct line between $x = -2$ and $x = 3$	3	B3 for a correct line between $x = -2$ and $x = 3$ (B2 for a correct straight line segment through at least 3 of (−2, −2) (−1, −1.5) (0, −1) (1, −0.5) (2, 0) (3, 0.5) **or** for all of (−2, −2) (−1, −1.5) (0, −1) (1, −0.5) (2, 0) (3, 0.5) plotted but not joined) (B1 for at least 2 correct points stated (may be in a table) **or** plotted **or** for a line drawn with a positive gradient through (0, −1) **or** for a line with a gradient of 0.5)
				Total 3 marks

13	3.6 × 2.1 (= 7.56) or 0.3 × 0.3 (= 0.09) or 3.6 ÷ 0.3 (= 12) or 2.1 ÷ 0.3 (= 7)		4	M1
	"7.56" ÷ "0.09" (= 84) or "12" × "7" (= 84)			M1
	"84" ÷ 6 × 17.5(0) oe			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	245		A1
				Total 4 marks

17	eg 6×8 (= 48) **or** $\frac{1}{2} \times 6 \times 3 (= 9)$ **or** $\frac{1}{2} \times \frac{6}{2} \times 3 (= 4.5)$ **or** $\frac{1}{2} \times (11+8) \times 3 (= 28.5)$			4	M1	for a correct method to find one relevant area
	eg "48" + "9" (= 57) **or** "48" + "4.5" + "4.5" (= 57) **or** "28.5" × 2 (= 57)	**or** eg "48" ÷ 4 (= 12) **or** "9" ÷ 4 (= 2.25 or 3) **or** "4.5" ÷ 4 (= 1.125) **or** "28.5" ÷ 4 (= 7.125)			M1	**from this mark onwards follow either left hand column or right hand column** **left hand column** for a complete method to find the total area **or** **right hand column** a correct method to find the number of tins of paint for part of the stage
	eg "57" ÷ 4 (= 14.25) **or** their area ÷ 4 eg total area = 66 **and** 66 ÷ 4 (= 16.5) **or** 15×4 (= 60) **or** using multiples of 4 for their area eg total area = 66 **and** 17×4 (= 68)	eg "12" + "2.25"(= 14.25) **or** "12" + "1.125" + "1.125" (= 14.25) **or** $2 \times$ "7.125" (= 14.25)			M1	**left hand column** (indep) for a method to find the number of tins for their area ft from any value that has come from a calculation that includes at least 2 of the given dimensions **or** **right hand column** method to find the total number of tins of paint by adding number of tins from the parts of the stage
	Working required		15		A1	dep on M2, must be from correct working
						Total 4 marks

13	eg $\pi \times 6.4^2 \left(= \frac{1024}{25}\pi\right)$		2	M1	allow 3.14… or $\frac{22}{7}$ for π
	Correct answer scores full marks (unless from obvious incorrect working)	129		A1	accept 128 – 129
					Total 2 marks

14	6 – 3.5 (= 2.5) **or** 4 × 6 + 4 × 3.5 (= 38) **or** 6 × 6 + 6 × 3.5 (= 57) or 2 × 9.5 × 3 (= 57) or 19 × 3 (= 57)		4	M1	for a method to find the 'missing length' (may be shown on the diagram) **or** for a method to find the length of the solid lines excluding 2.5 cm, may include extra sides added **or** for a method to find the perimeter of the 3 rectangles
	4 × 6 + 4 × 3.5 + 2 × "2.5" (= 43) or 6 × 6 + 6 × 3.5 – 4 × 3.5 (= 43) or 2 × 9.5 × 3 – 4 × 3.5 (= 43) or 19 × 3 – 4 × 3.5 (= 43)			M1	for a complete method to find the perimeter of the shape
	eg "43" × 7.6			M1	for a method to find the cost, allow use of their "43" as long as from adding at least 4 correct lengths including a length of 3.5 **and** a length of 6 eg 57 × 7.6(0) or 38 × 7.6(0)
	Correct answer scores full marks (unless from obvious incorrect working)	326.8(0)		A1	
					Total 4 marks

Question		Working	Answer	Mark	Notes
11	(a)	4.3333(3…) + 0.37894(7…) **or** $\frac{13}{3}+\frac{36}{95}$		2	M1 Evaluate either fraction correctly as a decimal to at least 5SF(rounded or truncated) or as a simplified fraction or an answer of 4.71(2)
			4.7122(80702)		A1 Correct to at least 5SF (rounded or truncated).
	(b)		4.71	1	B1 ft if at least 4SF given in (a) (not 4.71)
					Total 3 marks

12	(a)	0.5 × 2 × 3		3	M1 Accept even if added to another area
			3 cm^2		A1 for 3 B1 for units
	(b)		alternate angles	1	B1 'alternate' or 'alternating' or equivalent statement
	(c)		$y=4$	1	B1
					Total 5 marks

Question	Working	Answer	Mark	Notes
19	123 – 67 (=56) **or** $2x = 123 – 67$ **or** $2x + y = 67$ **or** $4x + y = 123$ oe (x = length of tile, y = width of tile)			M1
	e.g. "56" ÷ 2 (=28)			M1 for method to find length or width
	67 – 56 (=11) **or** 67 – 2×"28" (=11) **or** 123 – 4×"28" (=11)			M1 for method to find other dimension
	(67 – 2×"11") × (123 – 2×"11") **(**45 × 101) **or** 123 × 67 – 12 × "28" ×" 11" (8241 – 3696)			M1 dep on M2
		4545	5	A1

Question		Working	Answer	Mark	Notes
10			Correct triangle	2	B For a fully correct triangle or 2 B1 for $BAC = 55° \pm 2°$ or $AC = 7$ cm ± 2 mm
11	(a)		$x(3x - 1)$	1	B1
	(b)		$8y + 12$	1	B1
	(c)	$5 \times -3 + 4 \times 6$ or for -15 or $(+)24$	9	2	M1 oe A1
	(d)	$3 \times (-4)^2 + 7 \times -4$ or for $(+)48$ or for -28	20	2	M1 oe A1
12		9×3 (=27) or 8×5 (=40) or 3×4 (=12) or 9×8 (=72) or 5×5 (= 25) or 4×5 (= 20) $9 \times 3 + 5 \times 5$ or $5 \times 8 + 3 \times 4$ or $9 \times 8 - 5 \times 4$ (= 52) '52' ÷ 14 (=3.714....) '4' × 9.59	38.36	5	M1 For correct method to find area of a relevant rectangle M1 For a fully correct method to find the area of the floor M1 For a correct method to find number of tins of polish needed M1 Method to find total cost - must be a whole number of tins rounded up A1
13	(a)	$7x - x = -18 - 3$ ($6x = -21$) oe	-3.5	2	M1 Collect terms in 'x' on one side and number terms on the other. A1
	(b)	$7w = t - 3$ oe	$w = \frac{t-3}{7}$	2	M1 Isolating term in w A1 Must have $w =$
	(c)		$T = 2p + 3r$	3	B3 For $T = 2p + 3r$ oe (B2 for $2p + 3r$ or $T = 3p + r$ or $T = p + 2r$ or $T = 3p + 2r$) (B1 for $2p + r$ or $p + 3r$ or $3p + 2r$ or or $3p + r$ or $p + 2r$)

24	e.g. $6(x - 1)$ $(= 6x - 6)$			M1	method to find expression for perimeter of hexagon
	e.g. $2(x + 5) + 2x - 3$ $(= 4x + 7)$			M1	method to find expression for perimeter of triangle
	"$6x - 6$" = "$4x + 7$"			M1	(dep on at least M1) for equating both expressions
	e.g. $6x - 4x = 7 + 6$			M1	(dep on previous M1 and equation of the form $ax + b = cx + d$)for rearranging the x terms on one side and the numerical terms on the other and all expansions correct.
		5.5	5	A1	oe (dep on M2)
					Total 5 marks

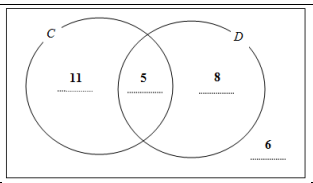
13	eg $\frac{1}{2}\times(20+26)\times12\,(=276)$ **or** $12\times20+\frac{1}{2}\times(26-20)\times12\,(=276)$ **or** $12\times26-\frac{1}{2}\times(26-20)\times12\,(=276)$		5	M2 complete method to find the area of the shape M1 for method to find the area of a rectangle 12 × 20 (= 240) **or** 12 × 26 (=312) **or** the area of the triangle $\frac{1}{2}\times(26-20)\times12\,(=36)$
	"276" ÷ 20 (= 13.8)			M1 (indep) method to find the number of tins for their area ft any value from a calculation that includes at least two of 20, 26 & 12
	eg 3 × \$40 + 2 × \$13 (= \$146) or 14 × \$13 (= \$182) or 4 × \$40 (= \$160)			M1 method to calculate a cost for their number of tins dep on previous M1 (NB: use *n* × \$40 where *n* is the next multiple of 4 greater than the number of tins needed, divided by 4)
		146		A1 cao dep on accurate figures
				Total 5 marks

25	$7^2-(10\div 2)^2\,(=24)$ or $\dfrac{\sin\left(\frac{1}{2}x\right)}{5}=\dfrac{\sin 90}{7}$ oe or $\cos x=\dfrac{7^2+7^2-10^2}{2\times 7\times 7}$ oe or $\sin\left(\frac{1}{2}x\right)=\dfrac{5}{7}$ oe or $\cos y=\dfrac{5}{7}$ oe		5	M1 or use of sine rule or cosine rule to find angle (x) of the apex or angle y $\left(=90-\frac{1}{2}x\right)$
	$\sqrt{7^2-(10\div 2)^2}$ $(=\sqrt{24}=2\sqrt{6}=4.898...)$ or $(x=)2\times\sin^{-1}\left(\dfrac{5\times\sin 90}{7}\right)(=91.169\ldots)$ oe or $(x=)2\times\sin^{-1}\left(\dfrac{5}{7}\right)(=91.169\ldots)$ oe or $(x=)\cos^{-1}\left(\dfrac{7^2+7^2-10^2}{2\times 7\times 7}\right)(=91.169\ldots)$ oe or $(x=)2\left(90-\cos^{-1}\left(\frac{5}{7}\right)\right)(=2(90-44.415)...=91.169...)$ Allow 5 from correct working			M1 for complete method to find height of triangle or the angle (x) of the apex $\cos^{-1}\left(\frac{5}{7}\right)(=44.415...)$ **and** $5\times\tan'44.415...'(=4.898...)$ or $7\times\sin'44.415...'(=4.898...)$ **or** $\sin^{-1}\left(\frac{5}{7}\right)(=45.584...)$ **and** $\dfrac{5}{\tan'45.584...'}(=4.898...)$ or $7\times\cos'45.584...'(=4.898...)$
	E.g. $6\times 10+\dfrac{(10\div 2)\times'\sqrt{24}'}{2}\times 2$ $(=60+10\sqrt{6}=84.494...)$ **or** $5\times\left(6+6+'\sqrt{24}'\right)(=60+10\sqrt{6}=84.494...)$ **or** $\left(\frac{1}{2}\times 7\times 7\times\sin'91.169...'+10\times 6\right)(=60+10\sqrt{6}=84.494...)$			M1 for method to find the total area of the pentagon allow answers in the range 84.49 – 85
	E.g. '84.494' ÷ 16 (= 5.28...) or $\left(60+10\sqrt{6}\right)\div 16\,(=5.28...)$			M1 for method to find the number of tins required using their area
		6		A1 dep on at least M2
				Total 5 marks

15	(a)	$54 \div 9 \times 4$ oe or $\frac{4}{9} \times 54$ oe		2	M1 Allow $0.44(44\ldots) \times 54$ or $\frac{24}{54}$
		Correct answer scores full marks (unless from obvious incorrect working	24		A1
	(b)	$\frac{"24"+n}{54+n} = \frac{1}{2}$ or $\frac{30}{60}$ or 54 – "24" (= 30) and "30" – "24" or 2 × "30" – 54		2	M1 ft if "24" < 27 or $\frac{6}{60}$
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1
					Total 4 marks

16	2×0.75 (= 1.5) oe or $2 \times 0.75 \times 2$ (= 3) oe		5	M1 for area of rectangle
	$\pi \times (0.5 \div 2)^2$ (= 0.1963) or $\frac{1}{2} \times \pi \times (0.5 \div 2)^2$ (= 0.09817)			M1 for area of circle **or** area of semicircle
	"1.5" – "0.09817" (= 1.4018…) or "3" – "0.1963" (= 2.8036…)			M1
	"1.4018" × 2 × 250 ÷ 4 (= 175.228…) or "2.8036" × 250 ÷ 4 (= 175.228…) or "1.4018" × 250 ÷ 4 (= 87.6…)			M1or for 87 – 88
	Correct answer scores full marks (unless from obvious incorrect working)	175		A1 Allow 175 – 176
				Total 5 marks

15	$\frac{1}{2}\times 4.8\times 2.5 (= 6)$ oe **or** 3 × 4.8 (= 14.4) oe or 4.8 × (3 + 2.5) (= 26.4)		5	M1
	$\frac{1}{2}\times 4.8\times 2.5 (= 6)$ oe **and** 3 × 4.8 (= 14.4) oe or [4.8 × (3 + 2.5)] – [0.5 × 2.4 × 2.5 + 0.5 × 2.4 × 2.5] or "26.4" – 6 (= 20.4) or			M1
	("6" + "14.4") ÷ 1.8 (= 11.3…) or "20.4" ÷ 1.8 (= 11.3…) or $\frac{"6"}{1.8}+\frac{"8"}{1.8}(3.3...+8=11.3...)$			M1 dep on M1 for a method to find the number of tins for their area
	"12" × 16.4(0) (= 196.8(0)) or 190 ÷ 16.4 (=11.58…) and "12"			M1 dep on previous M1 for a method to calculate the cost for their number of tins (their number of tins must be rounded up to the next integer) or the number of tins that can be bought compared with their number of tins
	Working required	No and 196.8(0) or 11.58 and 12 seen		A1 dep on M2 SC B1 for 190 ÷ 16.4(0) if M0 scored
				Total 5 marks

12 (a)		Correct Venn diagram	3	B3	for all sections completed correctly If not B3 then award B2 for 3 correct sections B1 for 1 or 2 correct sections
(b)(i)		$\frac{13}{30}$	1	B1	oe, ft their Venn diagram
(ii)		$\frac{6}{30}$	1	B1	oe, ft their Venn diagram
					Total 5 marks

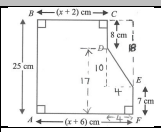
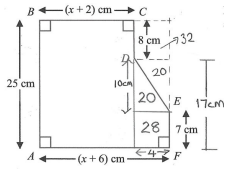
13	eg 8 × 12 (= 96) **or** 7 × 3 (= 21) **or** 3 × 15 (= 45) **or** 8 × 9 (= 72) **or** 15 × 12 (= 180) **or** 7 × 9 (= 63)		5	M1	for a method to find one relevant area accept 15 – 8 as 7 and 12 – 3 as 9
	eg "96" + "21" (= 117) **or** "45" + "72" (= 117) **or** "180" – "63" (= 117)			M1	for a complete method to find the total area
	eg 117 ÷ 7 (= 16.7... or 17)			M1	(indep) for a method to find the number of tins for their area ft from any value that has come from a calculation that includes at least 2 of the given dimensions
	eg "17" × 23.9			M1	for a method to calculate the cost for their number of tins dependent on previous M1
	Working required	406.3(0)		A1	dep on M1
					Total 5 marks

12	(a)		13	1	B1	cao
	(b)		2.5	1	B1	oe
	(c)	8×5 (= 40) oe		3	M1	for a method to find the total number of goals scored
		$8 \times 5 - (1 + 1 + 2 + 2 + 3 + 6 + 14)$			M1	for a complete method to work out the value of x
		Correct answer scores full marks (unless from obvious incorrect working)	11		A1	
						Total 5 marks

13	(a)	8 + 8 + 12 (= 28) oe **or** $\frac{8+8+12-2\times5}{2}$ (= 9) oe		3	M1	for a method to find the perimeter of the triangle **or** for a method to find the length of the rectangle (check the diagram)
		("28" – 5 – 5) ÷ 2 × 5 oe eg "9" × 5			M1	for a complete method to find the area of the rectangle
		Correct answer scores full marks (unless from obvious incorrect working)	45		A1	
	(b)	231 ÷ (7 × 6) **or** 7 × 6 × w = 231 oe		2	M1	for a complete method to find the value of w **or** for setting up an equation for the volume of the cuboid
		Correct answer scores full marks (unless from obvious incorrect working)	5.5		A1	oe $\frac{11}{2}$, $5\frac{1}{2}$
						Total 5 marks

13	eg 7.5 × 5 (= 37.5) oe **or** 8 × (10 – 7.5) (= 20) oe **or** 10 × 5 (= 50) oe **or** (10 – 7.5) × (8 – 5) (= 7.5) oe **or** 10 × 8 (= 80) oe **or** 7.5 × (8 – 5) (= 22.5) oe	eg 8 ÷ 0.5 (= 16) **or** (10 – 7.5) ÷ 0.5 (= 5) **or** (8 – 5) ÷ 0.5 (= 6) **or** 10 ÷ 0.5 (= 20) **or** 5 ÷ 0.5 (= 10) **or** 7.5 ÷ 0.5 (= 15)		5	M1	for a method to find a relevant area **OR** a method to find the number of tiles along one 'row'
	eg "37.5" + "20" (= 57.5) oe **or** "50" + "7.5" (= 57.5) oe **or** "80" – "22.5" (= 57.5) oe	eg "16" × "5" (= 80) **or** "10" × "15" (= 150) **or** "5" × "6" (= 30) **or** "10" × "20" (= 200)			M1	for a method to find the total area of the shape **OR** a method to find the number of tiles needed for one rectangle
	"57.5" ÷ 0.5^2 (= 230) oe or "575 000" ÷ 10 000 ÷ 0.5^2 oe or "57.5" ÷ "0.25" (= 230) oe or "57.5" ÷ ("2500" ÷ 10 000) (= 230) oe	eg "80" + "150" (= 230) **or** "30" + "200" (= 230)			M1	dep on M1 for a method to find the total number of tiles required (consistent units)
	"230" × 4 (= 920)				M1	dep on previous M1 for multiplying the total number of tiles by 4
	Correct answer scores full marks (unless from obvious incorrect working)		15 hours 20 minutes		A1	SCB1 for 0.5 × 0.5 (= 0.25) if no other marks are awarded
						Total 5 marks

13 **ALT**	eg 750 × 500 (= 375 000) oe **or** 800 × (1000 – 750) (= 200 000) oe **or** 1000 × 500 (= 500 000) oe **or** (1000 – 750) × (800 – 500) (= 75 000) oe **or** 1000 × 800 (= 800 000) oe **or** 750 × (800 – 500) (= 225 000) oe	eg 800 ÷ 50 (= 16) **or** (1000 – 750) ÷ 50 (= 5) **or** (800 – 500) ÷ 50 (= 6) **or** 1000 ÷ 50 (= 20) **or** 500 ÷ 50 (= 10) **or** 750 ÷ 50 (= 15)		5	M1	for a method to find a relevant area **OR** a method to find the number of tiles along one 'row'
	eg "375 000" + "200 000" (= 575 000) oe **or** "500 000" + "75 000" (= 575 000) oe **or** "800 000" – "225 000" (=575 000) oe	eg "16" × "5" (= 80) **or** "10" × "15" (= 150) **or** "5" × "6" (= 30) **or** "10" × "20" (= 200)			M1	for a method to find the total area of the shape **OR** a method to find the number of tiles needed for one rectangle
	"575 000" ÷ 50^2 (= 230) oe or "57.5" × 10 000 ÷ 50^2 oe or "575 000" ÷ "2500" (= 230) or oe "575 000" ÷ ("0.25" × 10 000) (= 230) oe	eg "80" + "150" (= 230) **or** "30" + "200" (= 230)			M1	dep on M1 for a method to find the total number of tiles required (consistent units)
	"230" × 4 (= 920)				M1	dep on previous M1 for multiplying the total number of tiles by 4
	Correct answer scores full marks (unless from obvious incorrect working)		15 hours 20 minutes		A1	SCB1 for 50 × 50 (= 2500) if no other marks are awarded
						Total 5 marks

Q	Working	An	Mark	Notes
26	 4 from F to left, vertically below D 17 from D vertically down to left of F 10 from D vertically to left of E 18 vertically up from E to right of C		5	B1 for a length of 4 (cm) or 17 (cm) or 25 – 7 – 8 (=10 (cm)) or 18 (cm) in the correct place on the diagram or calculated or used correctly in working.
	eg $25(x+2)(=25x+50)$ **or** $\frac{7+(25-8)}{2}\times((x+6)-(x+2))(=48)$ **or** $25(x+6)(=25x+150)$ **or** $\left(\frac{8+(25-7)}{2}\times 4\right)(=52)$ **or** $8(x+2)(=8x+16)$ **or** $\frac{(x+2)+(x+6)}{2}\times(25-8-7)(=10x+40)$ **or** $7(x+2)(=7x+14)$ **or** $10(x+2)(=10x+20)$ or $7(x+6)(=7x+42)$ **or** $(25-7)\times(x+2)(=18x+36)$ **or** $0.5(25-8-7)\times 4(=20)$			M2 for 2 correct expressions or values for the area of any 2 parts of the shape that do not overlap (unless subtracting) (need not be added or subtracted) (figures to be correct or come from correct working to award marks) **(M1 for one correct expression)** 
	eg $25x + 98 = 258$ or $25(x + 2) + 4 \times 7 + 0.5 \times 4 \times 10 = 258$ oe or $25(x + 6) = 258 + 20 + 32$ oe or eg $(258 - 98) \div 25$			M1 for an equation that is correct or from correct working. This need not have expanded terms and may not equal 258 if other work has been done. All parts for their method must be included with no overlaps OR a complete numerical method
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	6.4		A1 oe eg $160/25$
				Total 5 marks

26	23 × 4.7 (= 108.1) oe			5	B1 (indep) May be embedded in 23 × (4.7 + 2.5) (= 165.6)
	$\sin 30 = \frac{(x)}{5}$ or $\frac{(x)}{\sin 30} = \frac{5}{\sin 90}$ oe where x = height of trapezium	$5\cos 30\left(= \frac{5\sqrt{3}}{2} = 4.33...\right)$ **and** $\left(x^2 =\right) 5^2 - "5\cos 30"^2 \left(= 6.25\right)$			M1
	$\left(x =\right) 5\sin 30 \left(= 2.5\right)$ oe or $\left(x =\right) \frac{5}{\sin 90} \times \sin 30 \left(= 2.5\right)$ oe	$\left(x =\right) \sqrt{5^2 - "5\cos 30"^2} \left(= 2.5\right)$			M1
	$\frac{1}{2} \times (11 + 23) \times "2.5" (= 42.5)$ oe or $\left(\frac{1}{2} \times "2.5" \times (23 - 11)\right) + (11 \times "2.5") (= 42.5)$ oe or $\left(\frac{1}{2} \times "2.5" \times (23 - 11 - "4.3")\right) + (11 \times "2.5") + \left(\frac{1}{2} \times "2.5" \times "4.3"\right) (= 42.5)$ oe or $(11 \times "2.5") + \left(\frac{1}{2} \times 5 \times (23 - 11) \times \sin 30\right) (= 42.5)$ oe or $(23 \times "2.5") - \left(\frac{1}{2} \times "2.5" \times (23 - 11 - "4.3")\right) - \left(\frac{1}{2} \times "2.5" \times "4.3"\right) (= 42.5)$ oe or $(23 \times ("2.5" + 4.7)) - \left(\frac{1}{2} \times "2.5" \times (23 - 11 - "4.3")\right) - \left(\frac{1}{2} \times "2.5" \times "4.3"\right)$ oe				M1 for a correct method to find the area of the trapezium or the whole shape
	Working required		150.6		A1 dep on M1 awrt 150.6 Allow 151 Accept $\frac{753}{5}$
					Total 5 marks

26	eg $12\sin 60\left(=6\sqrt{3}=10.3(9...)\right)$ **or** $\sqrt{12^2-"6"^2}\left(=6\sqrt{3}=10.3(9...)\right)$ **or** (Area *ADC* =) $\frac{1}{2}\times 12\times 47\times\sin 60\,(=244.2...)$		5	M1 for a method find the height of the trapezium **or** the area of triangle *ADC* The first two M1 marks can be awarded in either order
	eg $12\cos 60(=6)$ **or** $\sqrt{12^2-\left("6\sqrt{3}"\right)^2}\,(=6)$			M1 (indep) for a method find the base of the triangle, condone missing brackets around $"6\sqrt{3}"$ The first two M1 marks can be awarded in either order
	eg (*AB* =) 47 – "6" – "6" (= 35)			M1 (dep on previous M1) for method to find the length of *AB*
	eg (Trapezium =) $\frac{1}{2}\times(47+"35")\times"10.3(9...)"$ **or** (Rectangle + 2 × Triangle =) $"35"\times"10.3(9...)"+2\times\frac{1}{2}\times"6"\times"10.3(9...)"$ **or** (Rectangle + 2 × Triangle =) $"35"\times"10.3(9...)"+2\times\frac{1}{2}\times"6"\times12\times\sin 60$ **or** (Triangle *ADC* + Triangle *ABC* =) $"244.2..."+\frac{1}{2}\times12\times"35"\times\sin 120$ oe eg $(47-"6")\times"10.3(9...)"$			M1 for a complete method There are other methods and marks should be awarded for a complete method that should give the correct area
	Working required	426		A1 (dep on M1) allow 420 – 427 from correct working
				Total 5 marks

21		45 ÷ 1.5 (= 30) **or** 5 × 12 (= 60) **or** $\frac{64}{1.5}$ $\left(=\frac{128}{3}=42.6(6...)\right)$		5	M1	for a method to find the number of boxes needed **or** the cost of adhesive **or** cost of tiles per m^2
		"30" × 64 (= 1920) **or** "42.6(6…)" × 45 (=1920)			M1	for a method to find the cost of the boxes of tiles
		"1920" + "60" (= 1980) **or** 3000 – 1920 – 60 (=1020)			M1	for a method to find the total cost **or** the profit
		eg $\frac{3000-"1980"}{"1980"}$ $(=0.515...)$ **or** $\frac{3000-"1980"}{"1980"}\times 100$ **or** $\frac{3000}{"1980"}$ (= 1.515…) **or** $\frac{3000}{"1980"}$ × 100 (= 151.5…) **or** $\frac{3000}{"1980"}\times 100-100$			M1	for a method to find the percentage profit or be one step away
		Correct answer scores full marks (unless from obvious incorrect working)	51.5		A1	awrt 51.5 SCB3 for answer 56.3 or 56.25 (from use of 1920 instead of 1980 as total cost)
						Total 5 marks

9 (a)	$3 \times 4 + 2 \times 7$ **or** $12 + 14$		2	M1	
		26		A1	
(b)	$2 \times (-6)^2 + 3 \times -2$ **or** $72 - 6$ **or** $2 \times -6 \times -6 + 3 \times -2$		2	M1	
		66		A1	
(c)		$T = 6g + 12h$	3	B3	for $T = 6g + 12h$ oe (B2 for $6g + 12h$ oe **or** $T = 6g + ah$ **or** $T = bg + 12h$ **or** $T = 12g + 6h$ oe) (B1 for $6g + ah$ **or** $bg + 12h$ **or** $12g + 6h$ **or** for an incorrect expression in g and h eg $T = g + h$)
					Total 7 marks

10 (a)	$\frac{88.96}{7.48...}$		2	M1	for 88.96 **or** 7.48…**or** for an answer of 11.9 or better
		11.88778…		A1	11.88778(004)
(b)		12	1	B1	ft provided (a) has at least 3 sig figs
					Total 3 marks

11	$2 \times \pi \times 18$ **or** $\pi \times 36$		2	M1	
		113		A1	for 113 – 113.15
					Total 2 marks

13	0.32×450 (= 144) oe **or** $\frac{2}{5} \times 375$ (= 150) oe		3	M1
	0.32×450 (= 144) oe **and** $\frac{2}{5} \times 375$ (= 150) oe			M1
		144 **and** 150 **and** $\frac{2}{5}$ of 375		A1
				Total 3 marks

14	2, 2, 5 and 5, 7 or seen on a ladder or at the end of branches **OR** for at least 3 multiples of both 20 and 35 e.g. 20, 40, 60, ... and 35, 70, 105, ...		2	M1
		140		A1 allow $2 \times 2 \times 5 \times 7$ oe
				Total 2 marks

15	$\pi \times 15^2$ (= 225π)		2	M1
		707		A1 awrt 707
				Total 2 marks

16	(a)		47	1	B1 Answer in range 46.5 – 47.5
	(b)	A correct method to convert either dirham to euros **or** euros to dirham e.g. 400 Dirham = 2 × 200 Dirham = 2 × "47" (= 94) euros **or** 90 euros = 30 + 60 = 127.5 +255 = 382.5 Dirham		2	M1
			France with correct calculations		A1
					Total 3 marks

12 ALT	$\frac{2}{2+3}\times 100$ (= 40)			M1 for method to find the percentage of £250 that Rose gives to charity
	$\frac{3}{2+3}\times 100\times 0.42$ (= 25.2) oe			M1 for method to find the percentage of £250 that Haydn gives to charity
	'40' – '25.2' (= 14.8)			M1 (dep M2) for method to find difference between the two percentages
	$\frac{\text{'14.8'}}{100}\times 250$ or '0.148' × 250 oe			M1
		37	5	A1
				Total 5 marks

13	$\pi \times (18 \div 2)^2$ (= 254.469...)			M1
		254	2	A1 accept 254 – 255
				Total 2 marks

Question	Working	Answer	Mark	Notes
11	$\pi \times 7.5^2$ or 3.14×7.5^2 or $\frac{22}{7} \times 7.5^2$ oe		2	M1 A correct method to find the area of the circle Students may use π or 3.14, 3.142 or $\frac{22}{7}$ oe
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	177		A1 answers in range 176.6 - 177
				Total 2 marks

9	(a)		26	1	B1
	(b)	eg $\frac{30-12}{30}\left(=\frac{18}{30}\text{oe}\right)$		2	M1 for $\frac{18}{30}$ or other correct but unsimplified fraction **or** an answer of $\frac{2}{5}$
			$\frac{3}{5}$		A1
	(c)	eg $\frac{8}{18}+\frac{3}{18}$ or $\frac{24}{54}+\frac{9}{54}$ oe		2	M1 for two fractions with a correct common denominator with at least one numerator correct
		eg $\frac{8}{18}+\frac{3}{18}=\frac{11}{18}$ or $\frac{24}{54}+\frac{9}{54}=\frac{33}{54}=\frac{11}{18}$ oe			A1 dep on M1, for a complete correct method leading to $\frac{11}{18}$
					Total 5 marks

10	eg $\pi\times\left(\frac{14}{2}\right)^2$ oe **or** $\pi\times7^2$ oe **or** 49π		2	M1
		154		A1 accept 153.86 – 154
				Total 2 marks

7	$2 \times \pi \times 6.5$ or $\pi \times 13$ oe		2	M1	Allow use of π as 3.14(2…) or $\frac{22}{7}$
		40.8		A1	40.8 – 40.9
					Total 2 marks

8	200 – 37 – 25 – 42 (= 96) oe eg 200 – "104" (= 96) or $\frac{37+25+42}{200}\left(=\frac{104}{200}\right)$		3	M1	
	$\frac{"96"}{200}$ **or** $"\frac{13}{25}"$			M1ft	for a correct fraction, but not in lowest terms or for 0.48 or 48% or for cancelling their $\frac{104}{200}$ to simplest form (if their fraction cannot be cancelled then this mark is not awarded)
		$\frac{12}{25}$		A1	cao
					Total 3 marks

12	$2\times\pi\times8.5$ oe		2	M1
	Correct answer scores full marks (unless from obvious incorrect working)	53.4		A1 allow answers in range 53.3 – 53.43
				Total 2 marks

13	(a)		$3x-x^2$	1	B1
	(b)		$6(2a-3b)$	2	B2 If not B2, then B1 for $3(4a-6b)$ or $2(6a-9b)$ or 6(expression with one error)
	(c)		$T=8h+20j$	3	B3 for $T=8h+20j$ oe eg $T = 4(2h + 5j)$ oe [accept $T = 8 \times h + 20 \times j$] (B2 for $8h + 20j$ or $T = 8h + aj$ or $T = bh + 20j$ or $T = 20h + 8j$ or a correct equation with letters such as S and L eg $T = 8S + 20L$) (B1 for $8h + aj$ or $bh + 20j$ or $20h + 8j$ or for T = an incorrect expression in h and j)
					Total 6 marks

15	enlarge, enlarged	enlargement	3	B1	oe with no mention of reflection, translation, rotation , move, flip, left, up, etc
	SF 3	Scale factor 3		B1	oe allow ×3 or 'three times'
	Origin, O allow $x = 0, y = 0$	Centre (0, 0)		B1	oe allow (0, 0) without the word 'centre' but not $\begin{pmatrix}0\\0\end{pmatrix}$
					Total 3 marks

16	$\pi \times 9^2$		2	M1	allow 3.14 or $\frac{22}{7}$ for π
	Correct answer scores full marks (unless from obvious incorrect working)	254		A1	254 – 255
					Total 2 marks

Question	Working	Answer	Mark	Notes
13	7.79 or 11.709…. or 0.67 or 0.665 or 0.6652		2	M1
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	0.66524(4…)		A1 At least 5 sf (0.665 244 513 4 calculator value)
				Total 2 marks

Question	Working	Answer	Mark	Notes
14	125 × 9 (= 1125) or 125 × 5 (= 625) or 9 × 5 (= 45) or 125 × 9 × 5 (= 5625) or 0.24 × 125 (= 30) or 0.24 × 9 (= 2.16) or 0.24 × 5 (= 1.2)		3	M1
	0.24 × (125 × 9 × 5) oe or 0.24 × "5625" oe or "30" × 9 × 5 oe or 125 × "2.16" × 5 oe or 125 × 9 × "1.2" oe			M1 for a complete method
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	1350		A1 SCB2 for 4275
				Total 3 marks

Question	Working	Answer	Mark	Notes
15	$2 \times \pi \times 16$ or $\pi \times$ "32"		2	M1 Allow 3.14… or $\frac{22}{7}$ for π
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	101		A1 100 to 101 NB 101 from $\pi \times 16^2$ (= 32π) scores M0A0
				Total 2 marks

Apart from questions 16, 21, 23 and 24 (b) (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.

Question		Working	Answer	Mark	Notes
1	(a)		Manchester	1	B1
	(b)		80	1	B1
	(c)		105	1	B1
2	(a)		$\frac{1}{10}$ $\frac{1}{6}$ $\frac{1}{2}$ $\frac{3}{4}$	1	B1
	(b)		0.25	1	B1
	(c)		20	1	B1
	(d)		$\frac{3}{8}$	1	B1 accept 0.375
3	(a)		3.5	1	B1 3.3 - 3.7
	(b)		*Q* marked	2	B2 for a correct point (B1 for angle or distance correct)

25	$\pi\times\left(\frac{12}{2}\right)^2$ (=113….) or $\pi\times\left(\frac{12}{2}-2\right)^2$ (= 50.2…) or $\pi\times\left(\frac{12}{2}\right)^2\div 2$ (=56.5...) or $\pi\times\left(\frac{12}{2}-2\right)^2\div 2$ (= 25.1…) eg $(\pi\times 6^2-\pi\times 4^2)\div 2$ oe	10π	3	M1 M1 for a complete method A1
26	$12\times 5.5=66$ "66" + 18 = 84 "84" ÷ 20	4.2	3	M1 M1 for a complete method A1

5	(a)		14	1	B1	Allow −14
	(b)		18	1	B1	Allow −18
	(c)		−12	1	B1	
						Total 3 marks

6	(a)		tangent	1	B1	
	(b)		Radius drawn	1	B1	Intention clear – do not accept diameter
	(c)		230	1	B1	
						Total 3 marks

7	4 × 2.40 + 1.20 + 5.75 (= 16.55)		3	M1	**or** subtracting 2 of 4 × 2.40, 1.20, 5.75 from 20 **or** 20 – 5.75 (= 14.25) **and** 4 × 2.40 + 1.20 (= 10.8(0))
	20 – (4 × 2.40 + 1.20 + 5.75) (= 3.45)			M1	**or** "14.25" – "10.8(0)" (= 3.45)
		1.15		A1	
					Total 3 marks

8	(a)		$4a$	1	B1	
	(b)		$15c^2$	1	B1	
	(c)		$8e + 3g$	2	B2	B1 for $8e$ or $3g$ seen
	(d)		23	1	B1	
	(e)		$5(y + 3)$	1	B1	
	(f)	$H + w = 3y$ **or** $-H - w = -3y$ **or** $\frac{H}{3} = y - \frac{w}{3}$		2	M1	
			$y = \frac{H + w}{3}$		A1	oe e.g. $y = \frac{-H - w}{-3}$, $y = \frac{H}{3} + \frac{w}{3}$
						Total 8 marks

3	(a)		Diameter	1	B1
	(b)		Chord	1	B1
	(c)		Sector shaded	1	B1 accept the semicircle shaded
					Total 3 marks

4	(a)		A	1	B1
	(b) (i)		D	1	B1
	(ii)		3	1	B1
	(c)		Octagon	1	B1 accept regular octagon
					Total 4 marks

5	(a)		$\frac{16}{20}$	1	B1
	(b)		12 squares shaded	1	B1
	(c)		80	1	B1
	(d)	48 ÷ 4 × 5 **or** 48 × 5 ÷ 4 **or** 48 ÷ 0.8 **or** 48 × 1.25 oe			M1 for a complete method
			60	2	A1
					Total 5 marks

18	$\pi \times 7.2^2 \div 2$ (= 81.4....)			M1 allow 81.3 – 81.5 for area of semi circle
	"81.4" ÷ 6 (= 13.5...) **or** 12 × 6 (= 72) **or** "81.4" ÷ 12 (= 6.7...)			M1 (dep) allow 13.5 – 13.6 for the number of boxes needed (NB: 12 × 6 = 72 alone is 0 marks)
		No with correct figures	3	A1
				Total 3 marks

19	a		4.35	1	B1 accept 4.349&
	b		4.25	1	B1 cao
					Total 2 marks

20	$(x \pm 9)(x \pm 4)$	$\frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 1 \times (-36)}}{2 \times 1}$ **or** $\frac{5 \pm \sqrt{25 + 144}}{2}$			M1 **or** $(x + a)(x + b)$ where $ab = -36$ **or** $a + b = -5$ **OR** correct substitution into quadratic formula (condone one sign error in a, b or c) (if + rather than ± shown then award M1 only unless recovered with answers)
	$(x - 9)(x + 4)$	$\frac{5 \pm \sqrt{169}}{2}$ **or** $\frac{5 \pm 13}{2}$			M1 **or** $\frac{5 \pm \sqrt{169}}{2}$ **or** $\frac{5 \pm 13}{2}$
			9, −4	3	A1 dep on at least M1
					Total 3 marks

24	$2 \times \pi \times 7$ (= 43.982… or 14π) **or** $(2 \times \pi \times 7) \div 2$ (= 21.991… or 7π) **or** $2 \times \pi \times 9$ (= 56.548… or 18π) **or** $(2 \times \pi \times 9) \div 2$ (= 28.274… or 9π)		3	M1	for finding the circumference of either the full circle or the length of the arc for either semicircle
	e.g. "21.991" + "28.274" (= 50.26…) **or** "7π" + "9π" (=16π) **or** "21.991" + "28.274" + 2 (= 52.26…) **or** "7π" + "9π" + 2 (= 52.26…) **or** "21.991" + "28.274" + 2 + 2 **or** "7π" + "9π" + 2 + 2			M1	for a method to find the length of the two arcs with intention to add
		54.3		A1	accept 54.2 – 54.3
					Total 3 marks

25	(a)		$16x^{12}y^{20}$	2	B2	B1 for an answer in the form ax^ny^m with 2 correct from $a = 16$, $n = 12$, $m = 20$
	(b)(i)	$(x \pm 9)(x \pm 4)$		2	M1	for $(x \pm 9)(x \pm 4)$ **or** for $(x + a)(x + b)$ where $ab = -36$ or $a + b = 5$
			$(x + 9)(x - 4)$		A1	
	(ii)		–9, 4	1	B1	ft from (b)(i)
						Total 5 marks

11	(a)	$5 \times (-2)^2 - (-2)^3$ (= 20 – –8)		2	M1	for correct expression or at least one of 20 or 5×4 or – – 8 or (+) 8
			28		A1	
	(b)		$2p(4p - 1)$	2	B2	B1 for $p(8p - 2)$ or $2(4p^2 - p)$ or $2p(4p - 1)$ with two terms inside the bracket with one term correct.
	(c)		$12t^2 - 8t$	2	B2	B1 for $12t^2$ or $-8t$
	(d)	$5x^2 + 20x - 2x - 8$		2	M1	for 4 correct terms (ignoring signs) or 3 correct terms with correct signs. or $5x^2 + 18x + ...$ or … + 18x − 8
			$5x^2 + 18x - 8$		A1	
						Total 8 marks

12	$0.5 \times \pi \times 6^2$ (= 56.54…) **or** 12×6 (= 72) **or** $\pi \times 6^2$ oe		3	M1	
	"72" – "56.54…"			M1	dep M1 for a complete method
		15.5		A1	15.4 to 15.5
					Total 3 marks

13	$2x - 3 = 20 \div 5$ or $10x - 15 = 20$		3	M1	
	$2x$ = "4" + 3 oe or $10x$ = 20 + "15" $10x$ = 35 oe			M1	For collecting terms, ft their expansion
		3.5 oe		A1	dep M1 accept $\frac{7}{2}$ or $\frac{35}{10}$
					Total 3 marks

19	$\pi \times 20 \left(= 20\pi = 62.8(31...)\right)$ oe or $2 \times \pi \times (20 \div 2) \left(= 20\pi = 62.8(31...)\right)$ oe or $0.5 \times \pi \times 20 \left(= 10\pi = 31.4(15...)\right)$ oe or		3	M1 for use of $\frac{1}{2}\pi d$ or πr or πd or $2\pi r$ oe with $d = 20$ or $r = 20 \div 2$ (= 10)
	3 × ("62.8" ÷ 2) + 20 ÷ 2 + 20 ÷ 2 oe or 1.5 × ("62.8") + 20 ÷ 2 + 20 ÷ 2 oe			M1 for a complete method
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	114		A1 114 – 115 SCB1 for awrt 471
				Total 3 marks

Question	Working	Answer	Mark	Notes	
20	$9.7^2 + 3.5^2$ (=106.34)	32.4	4	M1	M1 for the use of *MN* and a correct angle (70.1… or 70.2, 19.8…) in a correct trig statement eg $\cos 70.2 = \frac{3.5}{MN}$
	$\sqrt{9.7^2 + 3.5^2}$ or $\sqrt{"106.34"}$ (=10.3…)			M1	M1 for a complete method to find *MN* eg $MN = \frac{3.5}{\cos 70.2}$ (=10.3…)
	$\pi \times$ "10.3…" **or** $2 \times \pi \times \frac{"10.3..."}{2}$			M1 dep on M2	
				A1 for answer in range 32.3 – 32.41	

Question	Working	Answer	Mark	Notes
16 (a)		Rotation, 90° clockwise, centre $(-2, 3)$	3	B1 for rotation B1 90° clockwise or −90° (or 270° anticlockwise) B1 (centre) $(-2, 3)$ Note: Do not accept $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ for centre Award no marks if more than one transformation explicitly stated (the sight of a vector is **not** a second transformation) eg. moved and then rotated; rotation and translation
(b)		Triangle at (−2, 2), (−2, 4), (−1, 4)	1	B1 cao
(c)		Triangle at (−2, 1), (−2, 3), (−1, 3)	2	B2 If not B2 then award B1 for a triangle of the correct size and orientation **or** the wrong size but enlarged correctly from (-4, 2) with a sf other than 0.5 e.g. a triangle at (4, −2), (4, 6), (8, 6)
17	$\frac{\pi \times 6^2}{2}$ oe **or** 56.5(4866....) **or** 18π $\frac{1}{2} \times 8 \times (6-1)$ or 20 oe	36.5	4	M2 If not M2 then award M1 for $\pi \times 6^2$ oe (= 113(.09)) **or** 36π M1 for the area of the triangle A1 for 36.5 – 36.6

22	$\sqrt{36}$ (= 6) **or** 6 **or** 6 × 6		4	M1	for method to find the length of the square – may be seen in later working
	eg $\pi \times \left(\frac{\text{[their 6]}}{2}\right)^2 \div 2 (= 14.1... \text{ or } 4.5\pi \text{ or } \frac{9}{2}\pi)$ **or** $\pi \times \left(\frac{\text{[their 6]}}{2}\right)^2 (= 28.2... \text{ or } 9\pi)$			M1	for method to find the area of one semicircle **or** circle or the incorrect number of semicircles or circles provided correct area of circle formula is seen for [their 6] allow any value if there is a clear implication this is their side length of square.
	eg 4 × "14.1" (= 56.5... or 18π) **or** 2 × "28.2" (= 56.5... or 18π)			M1	for a complete method to find the total area of the semicircles ft from previous M1 [if the pupil multiplies again and uses the incorrect number of circles or semicircles this mark is not awarded]
		92.5		A1	accept 92.4 – 92.6 (not in terms of π)
					Total 4 marks

13	1750 × 100 (= 175 000)	160 ÷ 100 (= 1.6)		4	M1 for a correct conversion (can be embedded in working) eg. 502(.654…) ÷ 100
	$\pi \times 160$ (= 502(.654…))	$\pi \times$"1.6"(= 5.02…) or			M1
	"175 000 ÷ "502(.654…)" (= 348.151…)	1750 ÷ "5.02…" (= 348.151…)			M1 allow 1750 ÷ "502(.654…)" (= 3.48…) or 175 000 ÷ "5.02" (= 34815…)
			348		A1 cao
					Total 4 marks

14	(a)		30	1	B1 allow 28 – 32
	(b)	[7.8, 8.2] × 4.5		2	M1 allow 7.8 – 8.2
			36		A1 allow 35 – 37
					Total 3 marks

15	(a)		5 7 9 11 13 15	1	B1 all numbers must be present with no repeats. Numbers can be in any order
	(b)		5 15	1	B1
	(c)		6 8 12 14 16	1	B1
					Total 3 marks

21	$\sqrt{81}$ (= 9) **or** 9 **or** 9 × 9 (= 81)		4	M1	for method to find the length of the side of the square (may be seen on the diagram)
	4 × "9" (= 36) oe			M1	for the perimeter of the square (the first M mark can be implied by 36)
	eg $\pi \times$ "9" $(= 28.2(743...)$ or $9\pi)$			M1	for a correct expression for the circumference for using $2\pi r$ or πD (the first M mark can be implied by 28.2(743…) rounded or truncated to 1 dp or by 9π)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	64.3		A1	accept 64.26 – 64.3
					Total 4 marks

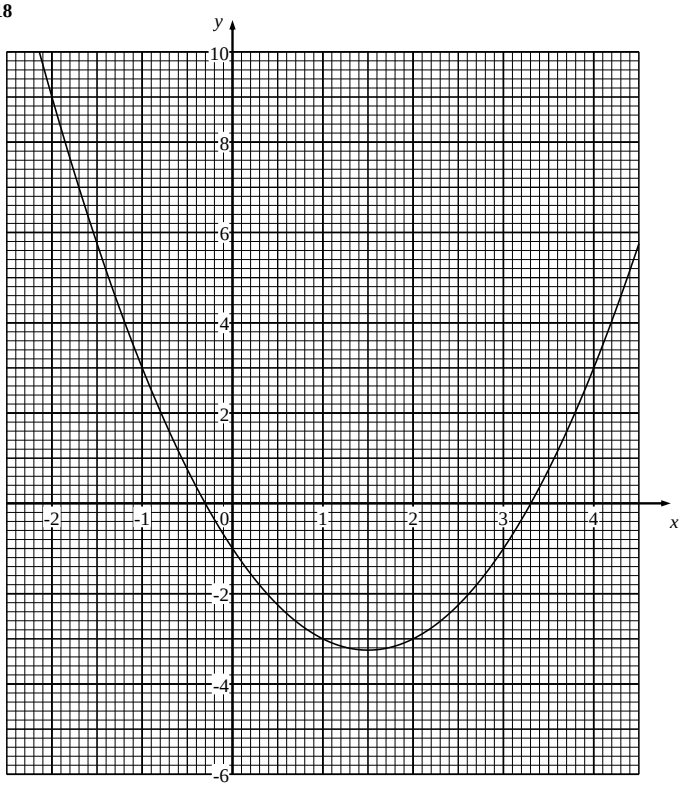
Question		Working	Answer	Mark	Notes
9	(a)		Segment shaded	1	B1 Accept minor segment or major segment.
	(b)		Chord	1	B1
	(c)	$\angle OQT = 90°$ **and** $\angle OQT = 18°$ **or** 90 – 18		3	M1 For 90° **and** 18° correctly identified in the working or on the diagram or for 90 – 18 or for other fully correct method
			72		A1
		Angle between tangent and radius is 90 degrees			B1 Correct reason for 90° angle [If used alternate segment theorem]
					Total 5 marks

10	(a)	$\frac{36+33}{135}$		2	M1 for numerator of 36 + 33(= 69) **or** denominator of 135
			$\frac{69}{135}$		A1 Accept 0.51(11...) **or** 51.(11...)% 2 sf or better
	(b)	$\frac{27}{135} \times 360$ **or** 360 ÷ 5 **or** 27 × $\frac{8}{3}$ oe		2	M1 allow use of $\frac{8}{3} = 2.666...$ to 1 dp truncated or rounded
			72		A1 cao
					Total 4 marks

Question		Working	Answer	Mark	Notes
11	(a)	$5m = 24 - 7$ **or** $m + \frac{7}{5} = \frac{24}{5}$		M1	
			3.4 oe	2 A1	for 3.4 oe e.g. $\frac{17}{5}$
	(b)	$2k = t - e$		M1	
			$t = 2k + e$	2 A1	NB: $2k + e$ only on answer line scores M1 unless $t = 2k + e$ in working and then M1A1
	(c)		p^5	1 B1	
	(d)		1	1 B1	
	(e)		$27x^6y^{15}$	2 B2	If not B2 then B1 for any two correct terms in a product
12	(a)	$2 \times \pi \times 9$ **or** $\pi \times 18$		M1	
			56.5	2 A1	for answer in range 56.5 – 56.6
	(b)	$\sqrt{169}$ (=13)		M1	
		5 × "13" oe		M1	
			65	3 A1	

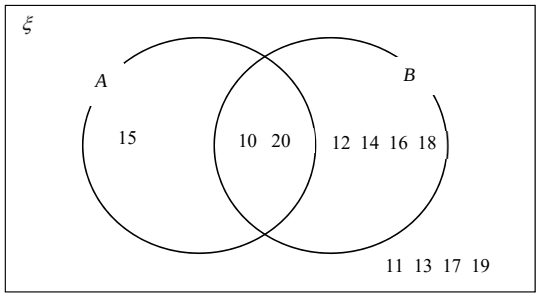
23		0.5 × 6 × 6 (=18)		5	M1 For area of triangle, or may use $\frac{1}{2}\times 6\times 6\sqrt{2}\sin 45$ or $\frac{1}{2}\times 6\sqrt{2}\times 3\sqrt{2}$ oe
		$(d^2 =) 6^2 + 6^2$ (=72) or $\frac{AC}{(\sin 90)} = \frac{6}{\sin 45}$			M1
		$\sqrt{6^2+6^2}$ $(=\sqrt{72} = 6\sqrt{2}$ =8.4(85...)or 8.5) **or** (= $AC = \frac{6(\sin 90)}{\sin 45} = 6\sqrt{2}$ =8.4(85...)or 8.5) oe			M1
		0.5 × π × $\left(\frac{"8.48.."}{2}\right)^2$ (= 9π or 28....)			M1
			46.3		A1 for 46.2 – 46.3
					Total 5 marks

Q18



27	$(AC^2 =)\ 17^2 - 15^2$		5	M1
	$(AC =)\sqrt{17^2 - 15^2}\ (=\sqrt{64} = 8)$			M1
	$\frac{\pi \times '8'}{2} (= 4\pi = 12.566...)$			M1 dep on M2 for $\frac{\pi \times '8'}{2}$ oe or 4π 12.5663…
	'12.566…'+ 15 + 17			M1 for '12.566' + 15 + 17 and no additional values
		44.6		A1 for awrt 44.6
				Total 5 marks
Alternative mark scheme for 11				
	$\cos^{-1}\left(\frac{15}{17}\right) (= 28.0724)$ or $\sin^{-1}\left(\frac{15}{17}\right) (= 61.9275)$		5	M1 for a correct method to find one of the angles
	15 × tan ('28.0724')(= 8) or 15 ÷ tan ('61.9275')(= 8)			M1
	$\frac{\pi \times '8'}{2}$ (= 4π = 12.566…)			M1 dep on M2 for $\frac{\pi \times '8'}{2}$ or 12.5663… or 4π
	"12.566" + 15 + 17			M1 for "12.566" + 15 + 17 and no additional values
		44.6		A1 for awrt 44.6
				Total 5 marks

Appendix 1



22		$8^2 + 15^2$ (= 289)		5	M1
		$\sqrt{8^2 + 15^2}$ (=17)			M1
		$\pi \times "8.5"^2$ (226.98...) **or** 0.5 × 15 × 8 (= 60)			M1
		$\pi \times "8.5"^2$ – 0.5 × 15 × 8 ("226.98" – "60")			M1
			167		A1 Accept answers which round to 167
					Total 5 marks

23			$2^4 \times 3^2 \times 5^4 \times 11 \times 13$	2	B2 (B1 for 12 870 000 or correct unsimplified product or $2^m \times 3^n \times 5^p \times 11 \times 13$ with at least 1 of *m*, *n* or *p* correct or for $2^4 \times 3^2 \times 5^4$)
					Total 2 marks

26	$\cos 30 = \frac{24}{(AC)}$ or $\sin'60' = \frac{24}{(AC)}$ **or** $\frac{\sin'60'}{24} = \frac{\sin 90}{(AC)}$ oe		5	M1 for correct trig ratio involving AC	M2 for use of tan **and** Pythagoras to obtain AC $(AB =)\ 24\tan 30\ (=13.856...)$ **and** $\sqrt{'13.856...'^2 + 24^2}\ (=27.712...)$ If not M2, then M1 for use of tan and Pythagoras to obtain AC^2 $(AB =)\ 24\tan 30\ (=13.856...)$ **and** $'13.856...'^2 + 24^2\ (=768)$
	$(AC =)\frac{24}{\cos 30}\ (=16\sqrt{3} = 27.712\ldots)$ or $(AC =)\frac{24}{\sin'60'}\ (=16\sqrt{3} = 27.712\ldots)$ **or** $(AC =)\frac{24\times\sin 90}{\sin'60'}$			M1 for a correct trig ratio for AC	
	$\frac{1}{2}\times 2\times\pi\times 3\ (=3\pi = 9.424\ldots)$			M1 for using $\pi\times 2\times 3$ or $2\pi\times 3$ correctly to find the arc length of the semicircle, or circumference of a circle with radius 3.	
	'27.712…' + '9.424…' – 2×3			M1 for a complete correct method to find the length $AFEDC$	
		31		A1 accept answers in range from 31 to 31.15	
				Total 5 marks	

20	eg $\left(AB^2=\right)6^2+6^2(=72)$ **or** $\sin 45=\frac{6}{(AB)}$ **or** $\cos 45=\frac{6}{(AB)}$ **or** **or** $\left(AB^2=\right)6^2+6^2-2\times6\times6\times\cos 90$		5	M1	for a correct start to the method to find *AB*
	eg $\left(AB=\right)\sqrt{6^2+6^2}\left(=\sqrt{72}\text{ or }6\sqrt{2}\text{ or }8.48...\right)$ **or** $\left(AB=\right)\frac{6}{\sin 45}\left(=\sqrt{72}=6\sqrt{2}=8.48...\right)$ **or** $\left(AB=\right)\frac{6}{\cos 45}\left(=\sqrt{72}=6\sqrt{2}=8.48...\right)$ **or** $\left(AB=\right)\sqrt{6^2+6^2-2\times6\times6\times\cos 90}$			M1	for a complete method to find the length of *AB*
	eg $\pi\times6(=6\pi\text{ or }18.8...)$ **or** $\pi\times6\div2(=3\pi\text{ or }9.42...)$ **or** $\pi\times$"8.48..."$(=26.6...)$ **or** $\pi\times$"8.48..."$\div2\ (=13.3...)$			M1	(indep) for a method to find the circumference of one whole circle **or** the arc length of one semicircle seen (may be embedded)
	eg $2\times$"3π"+"13.3..." **or** "9.42" + "9.42" + "13.3" **or** "18.8" + "13.3"			M1	for a complete correct method to find the perimeter of the shape
	Correct answer scores full marks (unless from obvious incorrect working)	32.2		A1	accept answers in the range 32.1 – 32.3
					Total 5 marks

15		$\pi \times 7^2 \times 20$ (= 3078.76...) or 980π			M1 for complete method to find volume
			3080	2	A1 for answer in range 3077.2 – 3080
					Total 2 marks

9	$12 \times 9 \times 6$		2	M1
		648		A1 cao
				Total 2 marks

10	(a)		$\frac{5}{29}$	2	B2 for a correct simplified fraction (B1 for $\frac{25}{145}$ oe or for $\frac{29}{5}$)
	(b)	$\frac{9}{25} \times 100$ or $\frac{9}{25} = \frac{36}{100}$		2	M1
			36		A1
	(c)	$28 \div 16 \times 27$ oe eg 1.75×27 or 1.75×11		2	M1 Fully correct method
			47.25		A1 cao
					Total 6 marks

11		Triangle drawn with correct intersecting arcs from *A* (5 cm) and *B* (8 cm)	2	B2 for arcs intersecting within overlay and triangle drawn (B1 for correct 5 cm arc from *A* or 8 cm arc from *B*) An accurate triangle drawn without arcs scores B1
				Total 2 marks

10	9 × 12 × 25 oe		2	M1
	Correct answer scores full marks (unless from obvious incorrect working)	2700		A1
				Total 2 marks

11	*ACB* = 53 or *ACD* or *BCE*= 180 – 53 (= 127) (must be seen on diagram or the angle stated) **or** 180 – (77 + 53)		2	M1	for *ACB* or a correct calculation for *ACD* or *BCE* **or** a correct calculation for *x*
	Correct answer scores full marks (unless from obvious incorrect working)	50		A1	
					Total 2 marks

Question	Working	Answer	Mark	Notes
10 a	12, 24, 36… **and** 20, 40, 60, … **or** 2 , 2 , 3 **and** 2 , 2 , 5 (may be on a factor tree oe)	60	2	M1 accept prime factors seen in factor tree **or** correct position in Venn diagram A1 for 60 **or** 2 × 2 × 3 × 5 oe
b	at least 3 of 2, 3, 4, 6, 8, 12 **and** at least 3 of 2, 4, 7, 8, 14, 28 **or** 2 , 2 , 2 , 3 **and** 2 , 2 , 2 , 7 (may be on a factor tree oe)	8	2	M1 accept prime factors seen in factor tree or correct position in Venn diagram A1 for 8 **or** 2 × 2 × 2 oe
11	32 ÷ 5 (= 6.4 or 6) **or** 15 ÷ 5 (=3) **or** 30 ÷ 5 (=6) "6" × "3" × "6" (=108)	No with 108	3	M1 M1 integer values must be used A1 SC: If no marks awarded then award B1 for an answer of 'yes' with 115(.2) **OR** 'yes' and 14400 and 13750

14	(a)	(−3, 3)(−1, 3)(−1, 6)(−2, 6)(−2, 4)(−3, 4)		1	B1	Correct translation of shape **P**
	(b)		Rotation	3	B1	
			90° clockwise		B1	**or** −90° **or** 270° anticlockwise
			About (*O*)		B1	or about (0, 0) If more than one transformation then no marks
						Total 4 marks

15	e.g. $\pi \times 8.2^2$ (= 211.24..., $\frac{1681}{25}\pi$) **or** 1.5 × 1000 (= 1500) **or** $\pi \times 8.2^2 \times 10$ (= 2112.4..., $\frac{3362}{5}\pi$)		3	M1	for a correct first step
	e.g. (1.5 × 1000) ÷ ($\pi \times 8.2^2$) (= 7.1009...) **or** (1.5 × 1000) ÷ "2112.4" × 10 oe (= 7.1009...) **or** 10 – (("2112.4" – 1.5 × 1000) ÷ ($\pi \times 8.2^2$)) (= 7.1009...)			M1	for a complete method to find the depth of the water or an answer of 2.89 – 2.91
		7.1		A1	accept 7.09 – 7.11
					Total 3 marks

7	(a)	e.g. (8.3 – 3.2) ÷ 3		2	M1	for a complete method
			1.7		A1	
	(b)	9.45 ÷ 7		2	M1	
			1.35		A1	
						Total 4 marks

8	(a)		**bus** | **train** | **plane** | **total** **men** | ***12*** | 15 | ***53*** | 80 **women** | 17 | ***28*** | ***25*** | ***70*** **total** | 29 | 43 | ***78*** | 150		3	B3 for all 6 entries correct (B2 for 4 or 5 correct entries) (B1 for 2 or 3 correct entries)
	(b)		$\frac{15}{80}$	1	B1	oe e.g. $\frac{3}{16}$, 0.1875, 18.75%
						Total 4 marks

9	4 × 4 × 4 (= 64) **or** 60 × 48 × 40 (= 115 200) **OR** 60 ÷ 4 (= 15), 48 ÷ 4 (= 12), 40 ÷ 4 (+ 10) oe		3	M1	for finding the volume of either the cube **or** carton **OR** finding the number of cartons that fit along each edge of the box
	"115 200" ÷ "64" **or** "15" × "12" × "10"			M1	for a complete method
		1800		A1	
					Total 3 marks

13	65 × 35 × 45 (= 102 375) and 5 × 5 × 5 (= 125) or (65 ÷ 5) (= 13), (35 ÷ 5) (= 7) and (45 ÷ 5) (= 9)		3	M1
	'102 375' ÷ '125' or '13' × '7' × '9'			M1
		819		A1
				Total 3 marks

14	eg 360 – (160 + 90) (= 110)	eg $360\times\frac{400}{160}(=900)$ oe or $90\times\frac{400}{160}(=225)$ oe		3	M1 method to calculate angle for Sandeep **or** total number of votes **or** for number of votes for Anjali
	eg $\frac{400}{160}\times'110'$ oe	'900'–'225'–400			M1 complete method to calculate number of votes for Sandeep
			275		A1
					Total 3 marks

13	2.4 ÷ 0.4 (= 6**)** or 240 ÷ 40 (= 6) or 10 ÷ 0.4 (= 25) or 1000 ÷ 40 (= 25) or 40 × 40 × 40 (= 64 000) or 0.4 × 0.4 × 0.4 (= 0.064) or 1000 × 240 × 240 (= 57 600 000) or 10 × 2.4 × 2.4 (= 57.6) oe		3	M1	could show the number of boxes along the edge of a container – award marks if this is unambiguous.
	"6" × "6" × "25" oe or "57 600 000" ÷ "64 000" or "57.6" ÷ "0.064" oe			M1	fully correct method to find greatest number of boxes
	Correct answer scores full marks (unless from obvious incorrect working)	900		A1	
					Total 3 marks

14 (a)		121	1	B1	Accept 119 – 123
(b)	Stating 6.5cm **or** an arc with centre *T*, radius 6.5 cm		3	B1	
	Line drawn or × from *S*, with a bearing of 084°			B1	
		B correctly indicated		B1	See overlay
					Total 4 marks

16			3	M1	For area of 2 different faces (ie not 2 triangles)
	0.5 × 4.8 × 3.6 (= 8.64) oe or 4.8 × 3.6 if clear intention for this to be 2 triangles 7 × 3.6 (= 25.2) 7 × 4.8 (= 33.6) 7 × 6 (= 42) (**all measurements with intention to add**)			M1	For adding together 5 areas , at least 4 of which are correct NB: (3.6 + 4.8 + 6) × 7 (= 100.8) is 3 faces
	Correct answer scores full marks (unless from obvious incorrect working)	118		A1	118.1 or 118.08
					Total 3 marks

17		(x =) 3	3	B1
		(y =) 6		B1
		(z =) 10		B1
				Total 3 marks

22	8 × 6 (=48) 0.5 × 8 × 6 (= 24) 15 × 8 (= 120) 15 × 6 (= 90) 15 × 10 (= 150)		3	M1	For a correct method to find the areas of 2 different faces (ie not 2 triangles) allow 8 × 6 as one area (allow if included with incorrect areas for this mark)
	0.5 × 8 × 6 (= 24) (× 2 (= 48)) oe 15 × 8 (= 120) 15 × 6 (= 90) 15 × 10 (= 150) (measurements with intention to add for the 2nd M mark) Surface area = "120" + "90" + "150" + "24" + "24" [allow "120" + "90" + "150" + "48" + "48" (= 456)]			M1	for adding together 4 or 5 values for area, at least 3 of which are from a correct method NB: (6 + 8 + 10) × 15 (= 360) is 3 faces but only award this if clearly not intended to be the volume – eg by the addition of the area of a triangular end.
	Correct answer scores full marks (unless from obvious incorrect working)	408		A1	cao SCB2 for an answer of 456 if no other marks awarded
					Total 3 marks

10	eg 80 × 12 × 42 (= 40 320) **or** 16 × 4 × 6 (= 384)	eg 42 ÷ 6 (= 7) **or** 12 ÷ 4 (= 3) **or** 80 ÷ 16 (= 5) **or** $\frac{80\times12}{16\times4}(=15)$ **or** $\frac{80\times42}{16\times6}(=35)$ **or** $\frac{42\times12}{6\times4}(=21)$		3	M1	for method to find the volume of the crate or the box **or** method to find the number of boxes along one dimension of the crate **or** for dividing the areas of corresponding faces
	"40 320" ÷ "384"	eg "7" × "3" × "5" **or** "15" × "7" **or** "35" × "3" **or** "21" × "5"			M1	for a complete method to find the number of boxes
	Correct answer scores full marks (unless from obvious incorrect working)		105		A1	cao
						Total 3 marks

11	eg (1 box =) 708 ÷ 12 (= 59) **or** (2 boxes =) 708 ÷ 6 (= 118) **or** (3 boxes =) 708 ÷ 4 (= 177) **or** (4 boxes =) 708 ÷ 3 (= 236) **or** (6 boxes =) 708 ÷ 2 (= 354) **or** 12 ÷ 5 (= 2.4) **or** 708 ÷ $\frac{12}{5}$ oe eg 708 ÷ 2.4 **or** 708 × $\frac{5}{12}$ **or** 708 × 5 (3540)		2	M1	for starting to work with proportion
	Correct answer scores full marks (unless from obvious incorrect working)	295		A1	cao
					Total 2 marks

24	$3892 = \pi \times 8^2 \times h$ **or** $\pi \times 8^2 \left(= 64\pi = 201...\right)$		3	M1 allow use of 3.14… or $\frac{22}{7}$ for π
	$\left(h =\right) \frac{3892}{\pi \times 8^2}$ oe eg 3892 ÷ 64 = 60.8… **and** 60.8… ÷ π			M1 allow use of 3.14… or $\frac{22}{7}$ for π
	Correct answer scores full marks (unless from obvious incorrect working)	19.4		A1 allow 19.3 – 19.4
				Total 3 marks

25 (a)		5.2×10^8	1	B1
(b)		0.000 087 9	1	B1
(c)	35×10^{-138} **or** $3.5 \times 10 \times 10^{-138}$ **or** 3.5×10^n where $n \neq -137$		2	M1
	Correct answer scores full marks (unless from obvious incorrect working)	3.5×10^{-137}		A1
				Total 4 marks

<table>
<tr><td>25</td><td>(volume of water =) $9\times35\times28(=8820)$
or (total volume of cuboid =) $20\times35\times28(=19600)$
or (volume of space =) $(20-9)\times35\times28(=10780)$</td><td></td><td>3</td><td>M1 for a method to find a relevant volume for the cuboid</td></tr>
<tr><td></td><td>$\pi\times10^2\times33$ $(=3300\pi$ or $10367(.25...))$ oe</td><td></td><td></td><td>M1 (indep) for a method to find the volume of the cylinder, accept a volume in the range 10362 to 10368.6
Allow 3.14… or $\frac{22}{7}$ for π</td></tr>
<tr><td></td><td>(total volume of water =) “8820” + “10367(.25...)” (= 19187(.25...))
(difference between volumes of both solids =)
“19600” – “10367(.25…)”(= 9232(.74…))
(volume not filled =) “19600” – “8820” – “10367(.25…)”
(=412(.74…))

Working required</td><td>Shown</td><td></td><td>A1 correct workings with accurate figures
eg
<table>
<tr><td>Value 1</td><td>Value 2</td></tr>
<tr><td>10780</td><td>10367(.25…)
accept 10362 to 10372</td></tr>
<tr><td>19600</td><td>19187(.25…)
accept 19182 to 19192</td></tr>
<tr><td>8820</td><td>9232(.74…)
accept 9228 to 9238</td></tr>
<tr><td>412(.74…) or 413
accept 408 to 418</td><td>none needed</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 3 marks</td></tr>
</table>

24	$2.5 - 0.6 = 1.9$	2 hours 51 minutes	4	M1	
	$3 \times 12 \times$ "1.9" (= 68.4)			M1	for using length × width × height to find a volume
	"68.4" × 1000 ÷ 400 (= 171 minutes)			M1	for their volume × 1000 ÷ 400
				A1	
					Total 4 marks
	Alternative scheme				
	$250 - 60 = 190$	2 hours 51 minutes	4	M1	
	$300 \times 1200 \times$ "190" (= 6.84×10^7)			M1	for using length × width × height to find a volume
	"6.84×10^7" ÷ 10^6 × 1000 ÷ 400 (= 171 minutes)			M1	for their volume ÷ 10^6 × 1000 ÷ 400
				A1	
					Total 4 marks

25	$16x = 32$ or $32y = 144$	(2, 4.5)	3	M1	for a correct sequence of operations which leads to 1 equation in one unknown, allowing one arithmetical error
	$3 \times$ '2' + $2y = 15$ or $3x + 2 \times$ '4.5' = 15			M1	(dep) substitute found value of one variable in one equation
				A1	
					Total 3 marks

Question		Working	Answer	Mark	Notes
19	(a)	$2\times\pi\times0.56\times1.6$		2	M1 Award even if part of a calculation including 1 or 2 circles
			5.63		A1 awrt 5.63
	(b)	$\frac{0.6}{1.6}$ (=0.375) **or** $\frac{1.6}{0.6}$ $(=\frac{8}{3}=2.\dot{6})$ **or** $\frac{r}{0.56}=\frac{0.6}{1.6}$ **or** $(r=)\frac{0.56\times0.6}{1.6}$ **or** $0.56\div2.\dot{6}$ oe		2	M1 Correct scale factor (given as a fraction or a ratio) or correct equation in *r* or a correct expression for *r*. Allow 2.6666... to 1 dp rounded or truncated
			0.21		A1 Allow 21 cm oe if units shown
					Total 4 marks

Question	Working	Answer	Mark	Notes
15	$45 \times 80 \times h$ or $3600h$ or 45×80 (= 3600)		4	M1
	$9 \times 1000 \times 20$ (= 180 000)			M1
	"180 000" ÷ (45 × 80)			M1
		50		A1
16	$\frac{5}{3}+\frac{11}{4}$		3	M1 converts to improper fractions
	$\frac{20}{12}+\frac{33}{12}$			M1 converts to fractions with the same common denominator
	$\frac{53}{12} = 4\frac{5}{12}$	Shown		A1 Dep on M2
	Alternative method			
	$\frac{2}{3}+\frac{3}{4}=\frac{8}{12}+\frac{9}{12}$			M1 correct method to add proper fractions
	$\frac{17}{12} = 1\frac{5}{12}$			M1
	$1\frac{5}{12} + 1 + 2 = 4\frac{5}{12}$	Shown		A1 Dep on M2

Question		Working	Answer	Mark	Notes
9		55 × 28 × (33 – 3) oe (=46 200) or 55 × 28 × 33 (=50820) "46 200" ÷ 1000 ÷ 4 "50820" ÷ 1000 ÷ 4 "46 200" ÷ (4 × 1000) "50820" ÷ (4 × 1000)	11	4	M1 correct method to find the volume of water in fish tank or volume of fish tank M2 For ÷ 1000 ÷ 4 (or ÷ by 4000) or for an answer of 11.55 (M1 for division of volume by one of these or for 4 × 1000 (= 4000)) A1 cao
10	(a)	150 : 75	2 : 1	2	M1 for any ratio equivalent to 150 : 75 eg 6 : 3 **or** 1 : 2 A1 Accept 1 : 0.5 oe
	(b)	75 ÷ 40 × 8 oe **or** 40 ÷ 8 (=5) **and** 75 ÷ "5"	15	2	M1 A1
	(c)		eg don't know with reason	1	B1 E.g. Can't be sure as pie chart shows proportions and not actual numbers, We don't know how many each degree represents, etc

Question		Working	Answer	Mark	Notes
16		0.5 × 6 × 6 × 5 (= 90) 0.5 × π × 3² × 5 (=22.5π = 70.6858...) or π × 3² × 5 (=45π = 141.37166...) '90' – '70.6858.....'	19.3	4	M1 Correct method for volume of **A** M1 Correct method for volume of **B** or correct volume of cylinder M1 Correct method to find the difference in the volume A1 19 – 19.4
17	(a)		$6n + 4$	2	M1 for $6n + k$ (k may be 0 or absent) oe A1 oe eg $10 + (n – 1)6$ or $n \times 6 + 4$
	(b)	...40, 46,... −2, 1, 6, 13, 22, 33 46 ... $6n + 4 = n^2 - 3$ oe	e.g. 22 or 46	2	M1 continuing sequence and writing at least 5 terms of 2nd sequence – allow one error or for a correct equation ft part (a) A1 or other number in both sequences eg −2
18		0.07 × 10 800 (= 756) oe 10 800 + '756'	11 556	3	M1 M1 A1 M2 for 1.07 × 10 800 oe
19	(a)		2, 4, 6, 8, 10, 12	1	B1
	(b)		8, 10, 12	1	B1
	(c)		1, 3, 5	1	B1
	(d)		$\frac{9}{12}$	2	M1 for 9 or $\frac{m}{12}$ ($m < 12$) A1 oe

11		Capacity of 1 brick = 9 x 3 x 5 (= 135) Capacity of 5700 bricks = 5700 x "135" (= 769500) Capacity of 1 crate = 72 x 36 x 75 (= 194400) Capacity of 4 crates = 4 x "194400" (= 777600) Bricks needed in 1 crate = 5700 ÷ 4 (= 1425) Max no: of bricks in 1 crate = 8 x 12 x 15 (= 1440) or 194400 ÷ 135 (=1440)	Yes as 777600 > 769500 or Yes as 1440 > 1425	4	M3 A1	M3 for calculations leading to any 3 of 135, 769500, 194400, 777600, 1425 or 1440 M2 for any 2 of the above M1 for any 1 of the above NB: sight of 769500 implies 135 and sight of 777600 implies 194400 Comparing 777600 with 769500 or Comparing 1440 with 1425 **NB. To get A1 they have to state that there is enough room for the bricks or "Yes") and justify this by referring explicitly to 2 values e.g 777600 – 769500 (= 8100)**
		Alt: max number of bricks in 4 crates v 5700 72 ÷ 9 (=8) and 36 ÷ 3 (=12) and 75 ÷ 5 (= 15) "8" × "12" × "15" (= 1440) "1440" × 4 (= 5760) or 5700 ÷ 4 (= 1425)	Yes as 5760 > 5700 or Yes as 1440 > 1425		M1 M1 M1 A1	Dividing lengths, widths & heights Max number of bricks in 1 crate Max number of bricks in 4 crates Yes + comparison of 2 numbers **NB. Ditto comments above**
						Total 4 marks

19	e.g. 30 × 20 × 125 (= 75 000) **or** 85 × 40 × 125 (= 425 000) **or** $(60\times30+(85-30)\times40)\times125(=500\ 000)$ oe		4	M1	for a method to find the volume of water already pumped out **or** the volume of water left **or** the total volume of the container
	"75 000" ÷ 1.5 (= 50 000) **or** "75 000" ÷ 90 (= 833.3... or $\frac{2500}{3}$) **or** $\frac{"425000"}{"75000"}(=5.66...$ or $\frac{17}{3})$ **or** $\frac{"500000"}{"75000"}(=6.66...$ or $\frac{20}{3})$			M1	M2 for $\frac{"425000"}{"75000"}\times1.5$ oe (= 8.5) **or** $\frac{"500000"}{"75000"}\times1.5$ oe (= 10)
	"425 000" ÷ "50 000" (= 8.5) **or** "425 000" ÷ ("833.3..." × 60) oe (= 8.5) **or** "5.66…" × 1.5 (= 8.5) **or** "6.66…" × 1.5 (= 10)			M1	
		20 30		A1	Allow 8 30 (pm)
					Total 4 marks

20	(i)		21, 27	1	B1
	(ii)		21, 23, 24, 25, 27, 29	1	B1
					Total 2 marks

19	3.4 or $\frac{17}{5}$ or $3\frac{2}{5}$ or $3\frac{24}{60}$ or 204 oe		3	B1	
	433.5 ÷ 3.4 or 433.5 ÷ $\frac{17}{5}$ or 433.5 ÷ $3\frac{2}{5}$ or $\frac{433.5}{'204'} \times 60$ oe			M1	for use of speed = distance ÷ time Allow 433.5 ÷ 3.24 (= 133.796…) for this mark only
		127.5		A1	oe allow 128
					Total 3 marks

20	a	(x =) 270 ÷ (12 × 5) (= 4.5) oe		3	M1	
		π × '4.5'^{2} × 2 × '4.5' (= 182.25π oe)			M1	ft dep on M1
			573		A1	accept 572 − 573
	b		1 000 000	1	B1	or (1 ×) 10^6 or (one or 1) million oe
						Total 4 marks

21	a	e.g. $A + 5z = \frac{c}{y}$ oe **or** $Ay = c - 5yz$ oe		2	M1	for a correct first step e.g. add 5z to both sides **or** multiply all terms by y
			$c = y(A + 5z)$		A1	oe
	b		1	1	B1	
	c	$(x \pm 3)(x \pm 8)$		2	M1	or for $(x \pm a)(x \pm b)$ where $ab = 24$ or $a + b = -11$
			$(x - 3)(x - 8)$		A1	
						Total 5 marks

14	eg 6 × 14 (= 84) **or** 13.5 × 14 (= 189) **or** 7.5 × x (= 7.5x) **or** 924 ÷ 8 (= 115.5) **or** any correct calculation that leads to an area linked to the cross section of the shape	eg 14 × 6 × 8 (= 672) **or** 7.5 × x × 8 (= 60x) **or** 13.5 × 14 × 8 (= 1512) any correct calculation that leads to a volume linked to the 3D shape		4	M1	a correct calculation linked to the area of the cross section of the shape – can be numerical or algebraic and maybe part of another calculation. **or** a correct calculation linked to the volume of the shape – can be numerical or algebraic and may be part of another calculation
	$\frac{924}{8} - 84 (= 115.5 - 84 = 31.5)$ oe **or** 6 × 14 + 7.5x = "115.5"oe	$\frac{924 - "672"}{8} \left(= \frac{252}{8} = 31.5 \right)$ or $\frac{924 - "672"}{7.5} \left(= \frac{252}{7.5} = 33.6 \right)$ **or** 8(6 × 14 + 7.5x) = 924 oe			M1	a calculation that leads to a value one step away from the value of x eg a calculation leading to 31.5 (one step remains which is to divide by 7.5) or a correct equation in x
	eg $\left(\frac{924}{8} - "84" \right) \div 7.5 \quad (= 31.5 \div 7.5)$ **or** $\frac{"115.5" - "84"}{7.5}$ oe **or** "33.6" ÷ 8				M1	a fully correct calculation that leads to the value for x
	Correct answer scores full marks (unless from obvious incorrect working)		4.2		A1oe	
						Total 4 marks

Question	Working	Answer	Mark	Notes
16	120 ÷ 20 (= 6) **or** 40 ÷ 20 (= 2) **or** 120 × 40 (= 4800) **or** $120 \times 40 \times h = 4800h$ **or** 20 × 20 (= 400) **or** 20 × 20 × 20 (= 8000)		4	M1 May be seen on diagram
	"8000" × 48 (= 384 000) **or** 48 ÷ ("2" × "6") (= 4 (number of layers)) **or** 6 × 2 (= 12 (on one layer)) **or** 4800 ÷ 400 (= 12 (on one layer))			M1
	(48 ÷ 12) × 20 oe eg 4 × 20 **or** 384 000 ÷ 4800 oe or showing a fully correct equation in h eg (120 × 40 × h) ÷ 8000 = 48 or 120 × 40 × h = 384 000			M1 or for 120 × 40 × 80 = 384 000 if the correct answer is not selected
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	80		A1
				Total 4 marks

Watch out for 80 coming from 120 – 40 or from another incorrect method

14			2	M1 for 18.4(867…) **or** 2.65(88) **or** 6.95 **or** 6.953 **or** 6.9530
	Correct answer scores full marks (unless from obvious incorrect working)	6.95304(3483...)		A1
				Total 2 marks

15	eg 35 ÷ 5 (= 7) **or** 27 ÷ 5 (= 5…) **or** 40 ÷ 5 (= 8) **or** 5 × 5 × 5 (= 125) **or** 27 × 35 × 40 (= 37 800) **or** 25 × 35 × 40 (= 35 000)		4	M1 for finding the number of boxes that fit along a side of the crate **or** the volume of the box **or** the volume taken up by the boxes
	eg "7" × "5" × "8" (= 280) **and** 5 × 5 × 5 (= 125) **or** 27 – 5 × "5" (= 2) **or** 27 × 35 × 40 (= 37 800) **and** 25 × 35 × 40 (= 35 000) **or** ("37 800" ÷ "125") – ("7" × "5" × "8") (= 22.4)			M1 for finding the total number of boxes that will fit in the crate **and** the volume of the box **or** the number of cm remaining without a box **or** the volume of the crate and the total volume of the boxes that fit **or** the volume of space left at the top in terms of number of boxes
	"37 800" – "280" × "125" oe eg "37 800" – "35 000" **or** "2" × 35 × 40 **or** "22.4" × "125"			M1 for a fully correct method to find the volume of space left
	Correct answer scores full marks (unless from obvious incorrect working)	2800		A1 cao
				Total 4 marks

21	(a)	$\pi \times 8^2 \times h = 1208$ oe **or** $\frac{1208}{\pi \times 8^2}$ oe		2	M1	for setting up an equation in h using the volume of the cylinder **or** a correct calculation for h (may be seen in stages)
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1	accept 6 – 6.02
	(b)	$\frac{m}{1208} = 1.25$ oe **or** (m =) 1208 × 1.25 (= 1510)		2	M1	for setting up an equation using $D = M / V$ **or** for a calculation to find the mass (may convert density to kg/cm^3 first)
		Correct answer scores full marks (unless from obvious incorrect working)	1.51		A1	
						Total 4 marks

22	$\pi \times 70^2 \times 18$ oe or $\pi \times 0.7^2 \times 0.18$ oe		4	M1 for use of $\pi r^2 h$
	88200π or 277 088(.472)) or 0.0882π or $\frac{441}{5000}\pi$ or 0.277(088472)			A1 Allow 276 948 – 277 200 or Allow 0.276 948 – 0.277 200
	"277 088(.472)" ÷ 1000 (= 277.088…) or $88200\pi \div 1000$ (= 88.2π or $\frac{441}{5}\pi$) "0.277(088472)" × 1000 (= 277.088…) or $88200\pi \div 1000$ (= 88.2π or $\frac{441}{5}\pi$)			M1 Allow a value for their volume which contains $\boldsymbol{\pi}$, **70** and **18** to be divided by 1000 Allow a value for their volume which contains $\boldsymbol{\pi}$, **0.7** and **0.18** to be multiplied by 1000
	Correct answer scores full marks (unless from obvious incorrect working)	277		A1 awrt 277
				Total 4 marks

International GCSE Maths					
Apart from questions 20(a) (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method					
Q		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		Gabon	1	B1
	(b)		11 100	1	B1 accept −11 100
	(c)		248 000	1	B1
					Total 3 marks

2	(a)		100	1	B1
	(b)		1 ¾ pictures	1	B1
	(c)	$2\frac{1}{2}+3\frac{1}{4}+5+4\frac{1}{4}+'1\frac{3}{4}'(=16\frac{3}{4})$ oe **or** $2\frac{1}{2}\times 20+3\frac{1}{4}\times 20+5\times 20+4\frac{1}{4}\times 20+35\ (=335)$ **or** 50 + 65 + 100 + 85 + 35 (= 335)		3	M1 ft from (b) for adding up the number of squares or finding the total number of books – allow one error or omission
		$500 - '16\frac{3}{4}' \times 20$ oe **or** 500 – '335'			M1 ft
			165		A1
					Total 5 marks

3	(a)		cylinder	1	B1
	(b)(i)		6	1	B1
	(b)(ii)		8	1	B1
	(c)	20 × 8 × 11		2	M1
			1760		A1
					Total 5 marks

24	$\pi \times 3^2 \times h = 72\pi$ oe		5	M1	Allow use of 3.14... or $\frac{22}{7}$ for π and use of 226... for 72π
	$h = 72\pi \div (\pi \times 3^2)$ oe **or** $h = 8$			M1	method to isolate h (may be seen in several stages)
	$2 \times \pi \times 3^2$ (= 18π or 56.54...) **or** $2 \times \pi \times 3 \times$ "8" oe (= 48π or 150 - 151)			M1	method to find the area of the two circles **or** curved surface area – use of their h, dep on M1 (NB may get this mark for area of 2 circles with no previous marks awarded)
	$2 \times \pi \times 3^2 + 2 \times \pi \times 3 \times$ "8" oe (= 66π)			M1	complete method to find the total surface area ft their h dep on 1st M1, including intention to add, to find the total surface area
		207		A1	accept 207-208
					Total 5 marks

13	(a)		209	1	B1
	(b)			2	M1 For showing or stating N*TR* = 180 – 125 = 55°(where N is North at *T*) or S*RT* = 180 – 125 = 55° (where S is South at *R*) or *RT*S = 125°(where S is south of *T*) or N*T*(SE) = 125°(where N is north of *T* and SE is South-East of *T*) or for 360 – (180 – 125) or 180 + 125
			305		A1
					Total 3 marks

14	(a)	0.5 × (13.5 + 17) × 10.4	158.6	2	M1 for a complete method eg rectangle ±2 triangles
					A1 allow 159
	(b)	15.5 × 8 (=124) or 15.5 × 8 × *x* 15.5 × 8 × *x* = 806	6.5	3	M1
		806 ÷ "124"			M1 dep
					A1
					Total 5 marks

15	6 hrs 39 mins = 6.65 (hrs) or $6\frac{39}{60}$ or $6\frac{13}{20}$ or $\frac{133}{20}$ or 399 (mins)		3	B1
	Average speed = $\frac{429}{6.65}$ oe eg $\frac{429}{399}\times 60$			M1 Use of *S* = *D* ÷ *T* (use of their time in hours) [Allow $\frac{429}{6.39}$ if B0 awarded]
		64.5		A1 awrt 64.5
				Total 3 marks

Question	Working	Answer	Mark	Notes
24	$11.2^2 - 7.4^2$ (= 70.68) or $[x =]\cos^{-1}\left(\frac{7.4}{11.2}\right)$ (= 48.64...) or $[y =]\sin^{-1}\left(\frac{7.4}{11.2}\right)$ (= 41.35...) or $\sin^{-1}\left(\frac{7.4\sin 90}{11.2}\right)$		5	M1 A correct first stage to finding the perpendicular height of the triangular cross section
	eg $\sqrt{11.2^2 - 7.4^2}$ (= 8.407...) **or** $[h =]\sin"48.64..."\times 11.2$ **or** $\tan"48.64..."\times 7.4 (= 8.407...)$ **or** $[h =]\cos"41.35..."\times 11.2$ **or** $\frac{7.4}{\tan"41.35..."}$ (=8.407…)			M1 oe eg $h = \frac{11.2\sin"48.64..."}{\sin 90}$
	eg 7.4 × "8.407" ÷ 2 (= 31.10....) **or** 7.4 × "8.407" × 15 (= 933.19...)			M1 for method to find area of cross section **or** volume of cuboid
	eg "31.10" × 15 (= 466.59...) **or** "933.19" ÷ 2 (= 466.59...)			M1 complete method to find volume of the prism
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	467		A1 accept 466 – 467 SCB2 (if M0 awarded) for $0.5 \times 7.4 \times \sqrt{11.2^2 + 7.4^2} \times 15$ (= 745) **or** SCB1 (if M0 awarded) for $7.4 \times \sqrt{11.2^2 + 7.4^2} \times 15$ (= 1490) or $0.5 \times 7.4 \times \sqrt{11.2^2 + 7.4^2}$ (49.6…) or 0.5 × 7.4 × 11.2 × 15 (= 621.6) or 622
				Total 5 marks

12	two of: 60 ÷ 8 (= 7.5) or 7 20 ÷ 8 (= 2.5) or 2 24 ÷ 8 (= 3)		5	M1	at least two divisions to find number of cartons for *l* or *w* or *h*. Could be written on sides of box
	"7" × "2" × "3" (= 42) **or** "7" × 8 (=56) and "2" × 8 (= 16) and "3" × 8(= 24)			M1	correct method to find the number of cartons that fit **or** finding the dimensions of the occupied space
	60 × 24 × 20 (= 28 800) **or** 8 × 8 × 8 (= 512) or (7 × 8) ×(2 × 8) × (3 × 8) (= 21 504) oe eg 56 × 16 × 24 (= 21 504)			M1	method to work out volume of either **B** or **C**
	"28 800 – "42" × "512" **or** "28 800" – "21504"			M1	complete method to find volume of packing material.
		7296		A1	allow 7300 from correct working
					If no marks scored SC B3 for 60 × 24 × 20 – "56" × 8 × 8 × 8 (= 128)
12 **Alt** **Finding space left**	two of 7 × 8 (= 56), 3 × 8 (= 24), 2 × 8 (= 16) **or** two of 60 – 56 (= 4), 20 – 16 (= 4), 24 – 24 (= 0)		5	M1	two lengths of filled space found **or** two lengths of empty space found.
	"4" × 24 × 20 (= 1920) **or** "4" × 24 × 60 (= 5760) **or** "4" × "4" × 24 (= 384) **or** **or** "4" × 24 × "16"(= 1536) **or** "4" × 24 × "56"(= 5376)			M1	at least one correct product seen
				M1	at least two correct products seen
	eg "1920 + "5760" – "384" **or** "1536" + "384" + "5376" **or** "5760" + "1536" **or** "1920" + "5376" oe			M1	complete method to find volume of packing material.
		7296		A1	
					Total 5 marks

24	3 × 2.5 (= 7.5) oe or 2 × 3 × 2.5 (= 15) oe or 12 × 3 (= 36) oe or 2 × 12 × 3 (= 72) oe or 12 × 2.5 (= 30)		6	M1 for area of rectangle
	(2 × 3 × 2.5) + (2 × 12 × 3) + (12 × 2.5) (= 117) or (2 × 7.5) + (2 × 36) + (12 × 2.5) (= 117) or 15 + 72 + 30 (= 117)			M1 for a complete method to find the surface area
	1 + 0.1 (= 1.1) **or** 100(%) + 10(%) (= 110(%)) **or** $\frac{26.95}{110}$ (= 0.245) oe			M1
	26.95 ÷ "1.1" (= 24.5(0)) **or** 26.95 ÷ "110" × 100 (= 24.5(0)) **or** 26.95 × 100 ÷ "110" (= 24.5(0)) oe **or** "0.245" × 100 (= 24.5(0)) oe			M1 dep on previous M1
	"117" ÷ 15 (= 7.8 or 8) **and** "8" × "24.50" (= 196) **or** "117" ÷ 15 (= 7.8 or 8) **and** 200 ÷ "24.5" (= 8.1...) **or** "117" ÷ 15 (= 7.8 or 8) **and** 200 ÷ "8" (= 25)			M1for working with a whole number of tins (rounded up) to reach figures where a decision can be made
		Correct figures to show that Jonty is correct		A1 e.g. 196 7.8 or 8 **and** 8.1... 24.5 **and** 25
				Total 6 marks

24	$\sin 32 = \frac{(BC)}{50}$ or $\cos 32 = \frac{(CD)}{50}$ or $\frac{(BC)}{\sin 32} = \frac{50}{\sin 90}$ oe or $\frac{(CD)}{\sin(90-32)} = \frac{50}{\sin 90}$ oe		6	M1
	$(BC =) 50\sin 32 (= 26.4(959...))$ or $(BC =) \sqrt{50^2 - (50\cos 32)^2} (= 26.4(959...))$ or $(BC =) \sqrt{50^2 - "42.4..."^2} (= 26.4(998...))$ or $(BC =) \frac{50}{\sin 90} \times \sin 32$ oe			M1 for finding *BC* or *AD* Can be written on the diagram
	$(CD =) 50\cos 32$ (= 42.4(024)…) or $(CD =) \sqrt{50^2 - (50\sin 32)^2} (= 42.4(024...))$ or $(CD =) \sqrt{50^2 - "26.4..."^2} (= 42.4(622...))$ or $(CD =) \frac{50}{\sin 90} \times \sin(90-32)$			M1 for finding *CD* or *BA* Can be written on the diagram
	$(r =)$"42.4(024…)" ÷ 2π (= 6.74(855…))			M1 for finding the radius of the cylinder
	$(V =) \pi \times$ "6.74(855…)"$^2 \times$ "26.4(959…)"			M1 dep on previous M mark for the use of $\pi r^2 h$
	Correct answer scores full marks (unless from obvious incorrect working)	3790		A1 allow answers in the range 3737 – 3794 Accept answers in standard form
				Total 6 marks