GCSE · Edexcel · Maths

4 hours 52 questions

Exam Questions

Forming & Solving Equations

Forming Equations from Words / Forming Equations from Shapes / Problem Solving with Equations

Easy (9 questions)	/27
Medium (15 questions)	/59
Hard (17 questions)	/72
Very Hard (11 questions)	/52
Total Marks	**/210**

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Easy Questions

1 The diagram shows a rectangle.

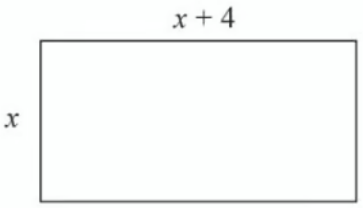

Diagram **NOT** accurately drawn

All measurements are given in centimetres.

The perimeter of the rectangle is 45 cm.

Work out the value of x.

(3 marks)

2 Kalinda buys x packs of currant buns and y boxes of iced buns.

There are 6 currant buns in a pack of currant buns.
There are 8 iced buns in a box of iced buns.

Kalinda buys a total of T buns.
Write down a formula for T in terms of x and y.

(3 marks)

3 A shop sells packets of envelopes.

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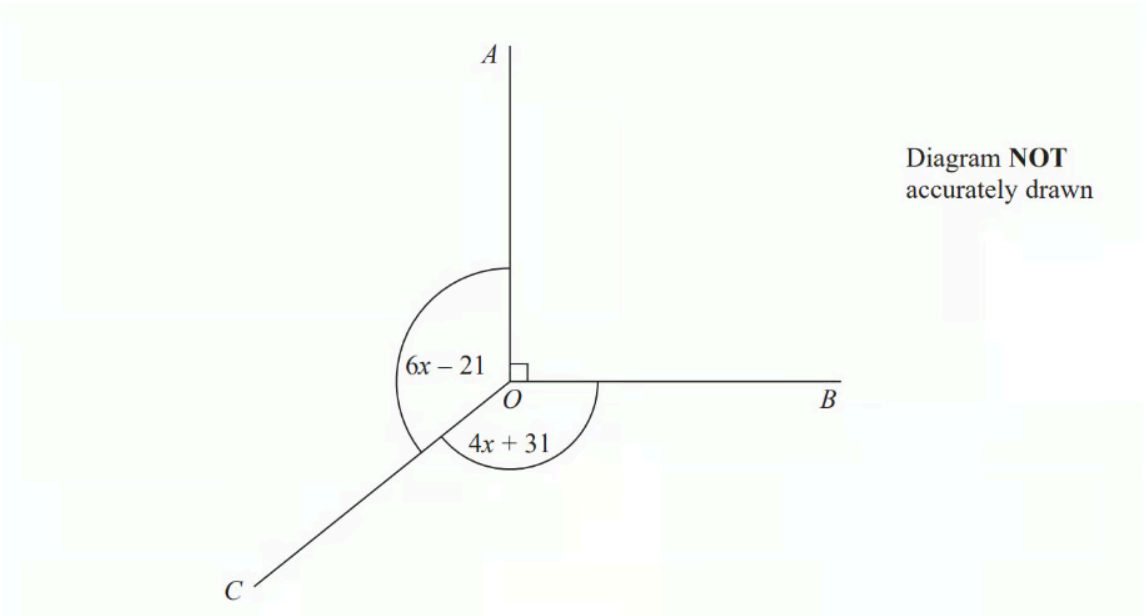
There are 5 envelopes in a small packet.
There are 20 envelopes in a large packet.

There is a total of T envelopes in x small packets and y large packets.

Write down a formula for T in terms of x and y.

(3 marks)

4



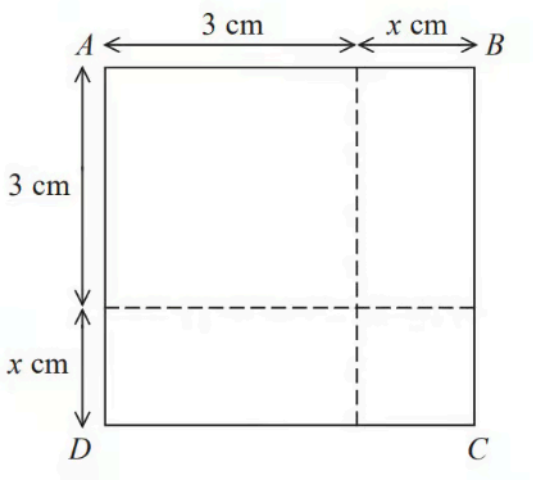
In the diagram, all angles are in degrees.

Angle AOB is a right angle.
Angle AOC = Angle BOC.

Work out the value of x.

(3 marks)

5



The area of square $ABCD$ is $10\ \text{cm}^2$.

Show that $x^2 + 6x = 1$

(3 marks)

6 The diagram shows a triangle.

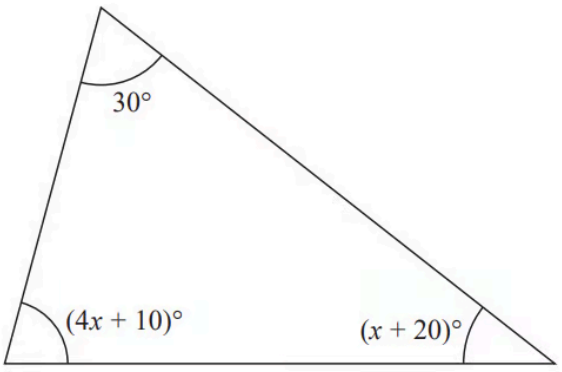


Diagram **NOT** accurately drawn

Work out the value of x.

x = ...

(4 marks)

7 Three tins, A, B and C, each contain buttons.

Tin A contains x buttons.
Tin B contains 4 times the number of buttons that tin A contains.
Tin C contains 7 fewer buttons than tin A.

The total number of buttons in the three tins is 137

Work out the number of buttons in tin C.

(4 marks)

8 b is 3 more than the square root of a.

Choose the correct equation.

A. $b = \sqrt{a} + 3$

B. $b = \sqrt{a} - 3$

C. $b = \sqrt{a+3}$

D. $b = \sqrt{a-3}$

(1 mark)

9 The length of a rectangle is five times the width.

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The area of the rectangle is 1620 cm^2

Not drawn accurately

Work out the width of the rectangle.

.....cm

(3 marks)

Medium Questions

1 Julie and Liam write down the same number.

Julie multiplies the number by 5 and then adds 4 to the result. She writes down her answer.

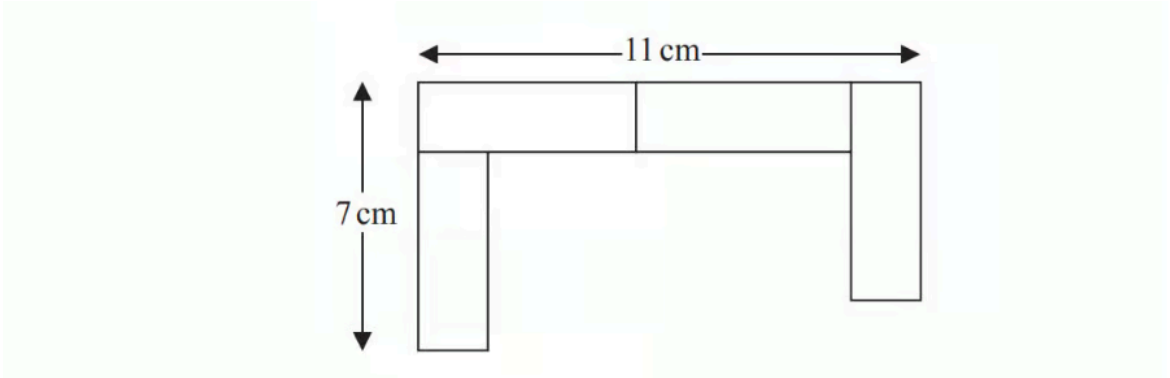
Liam subtracts the number from 10
He writes down his answer.

Julie's answer is two thirds of Liam's answer.

Work out the number that Julie and Liam started with.
You must show your working.

(5 marks)

2 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

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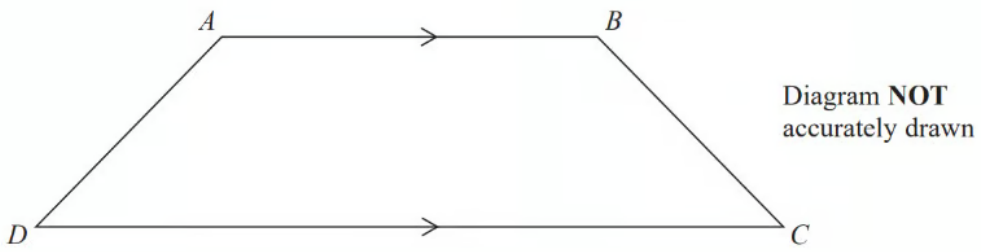
(4 marks)

3 The diagram shows a trapezium.



AD = x cm.
BC is the same length as AD.
AB is twice the length of AD.
DC is 4 cm longer than AB.

The perimeter of the trapezium is 38 cm.
Work out the length of AD.

(4 marks)

4 Gemma has the same number of sweets as Betty.

Gemma gives 24 of her sweets to Betty.
Betty now has 5 times as many sweets as Gemma.

Work out the total number of sweets that Gemma and Betty have.

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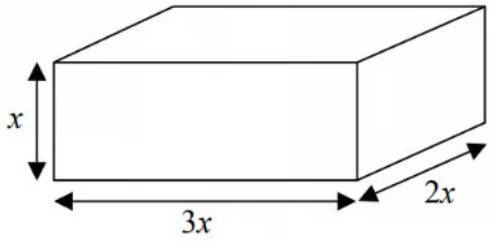
(4 marks)

5 Here is a cuboid.



All measurements are in centimetres.
x is an integer.
The total volume of the cuboid is less than 900 cm^3

Show that $x \leqslant 5$

(3 marks)

6 3 kg of potatoes and 4 kg of carrots have a total cost of 440p.
4 kg of potatoes and 3 kg of carrots have a total cost of 470p.

Work out the total cost of 1 kg of potatoes and 1 kg of carrots.

(4 marks)

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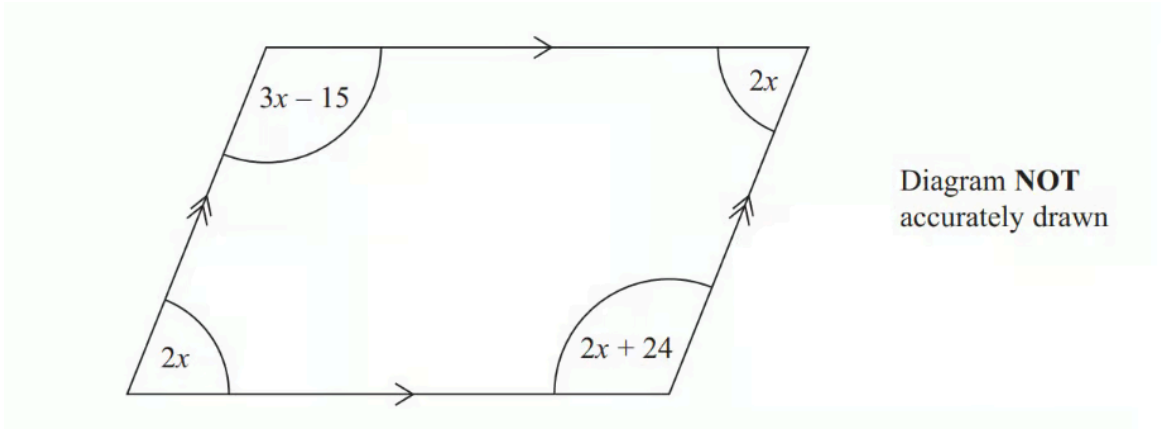
7



The diagram shows a parallelogram. The sizes of the angles, in degrees, are

$2x$

$3x - 15$

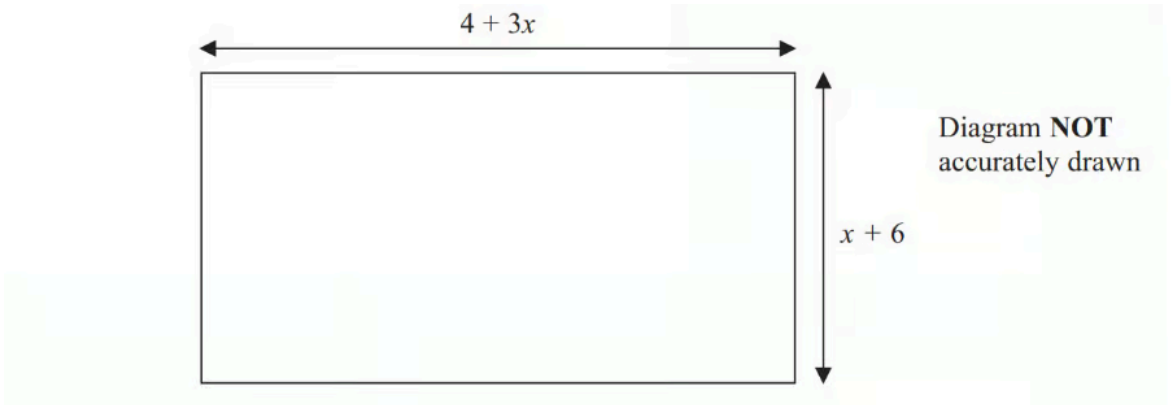
$2x$

$2x + 24$

Work out the value of x.

(3 marks)

8 The diagram shows a garden in the shape of a rectangle.

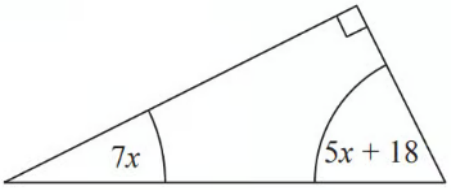


All measurements are in metres.
The perimeter of the garden is 32 metres.

Work out the value of x.

(4 marks)

9 The diagram shows a right-angled triangle.



All the angles are in degrees.
Work out the size of the smallest angle of the triangle.

(3 marks)

10 ABC is a triangle.

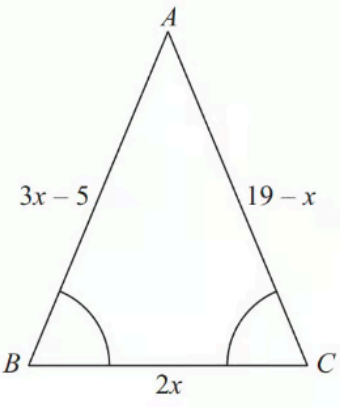


Diagram **NOT** accurately drawn

Angle ABC = angle BCA.

The length of side AB is $(3x - 5)$ cm.
The length of side AC is $(19 - x)$ cm.
The length of side BC is $2x$ cm.

Work out the perimeter of the triangle.
Give your answer as a number of centimetres.

(5 marks)

11 Redlands School sent x students to a revision day.

St Samuel's School sent twice as many students as Redlands School.
Francis Long School sent 7 fewer students than Redlands School.

- Each student paid £ 15 for the revision day.
- The students paid a total of £1155.

Work out how many students were sent by each school to the revision day.
You must show all your working.

(5 marks)

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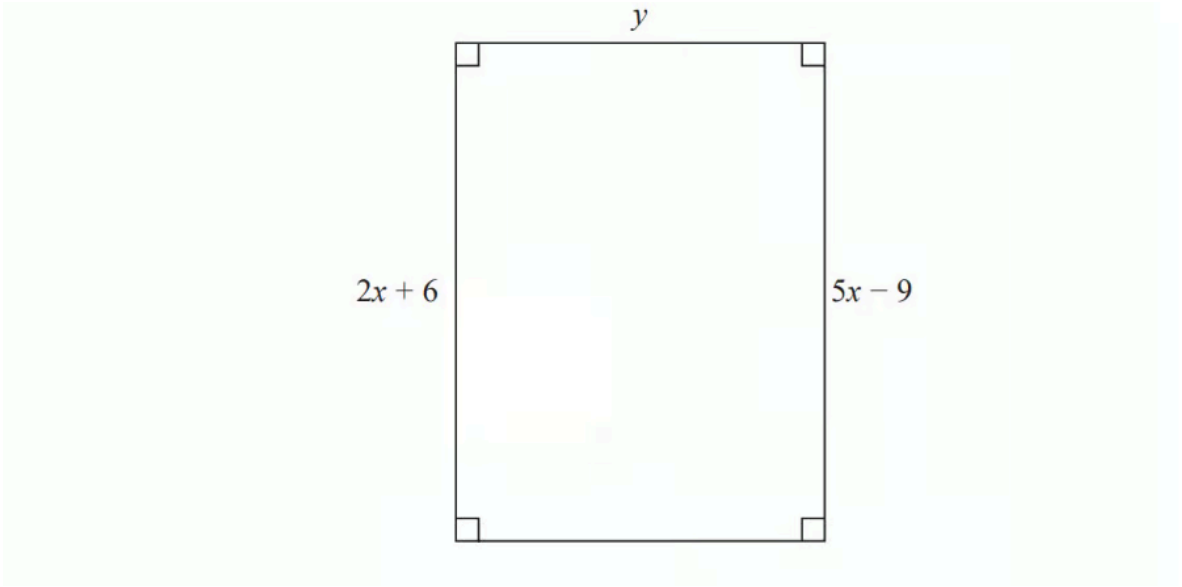
12 Here is a rectangle.



All measurements are in centimetres.
The area of the rectangle is 48 cm^2.
Show that $y = 3$

(4 marks)

13 Ali is y years old.

Bhavara is twice as old as Ali.

Ceris is 3 years younger than Ali.

The total of their ages is 125 years.

Work out the age of each person.

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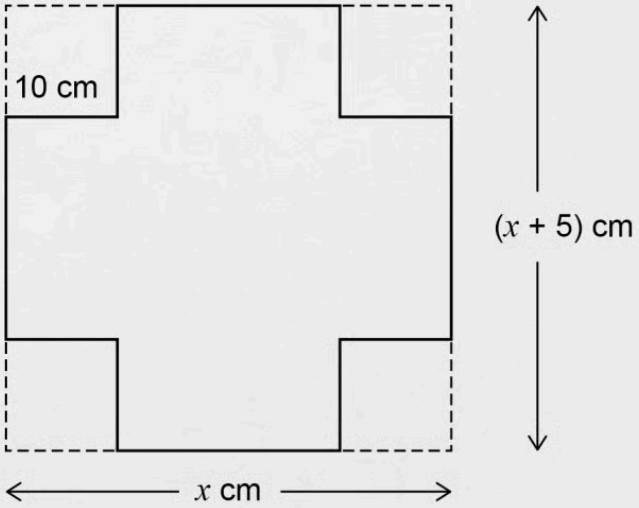
(4 marks)

14 (a) Kate has the following question for homework.

The net of a box is made by cutting four squares from a piece of cardboard.
The cardboard is a rectangle with width x cm and length $(x + 5)$ cm
Each square has side length 10 cm
The area of the net is 1000 cm^2
Work out the value of x.

Not drawn accurately



Show that Kate can form the equation $x^2 + 5x - 1400 = 0$

(3 marks)

(b) Kate correctly factorises the equation to get $(x + 40)(x - 35) = 0$

Her answer to the homework question is $x = -40$ or $x = 35$

Is her answer correct? Tick a box.

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☐ Yes ☐ No

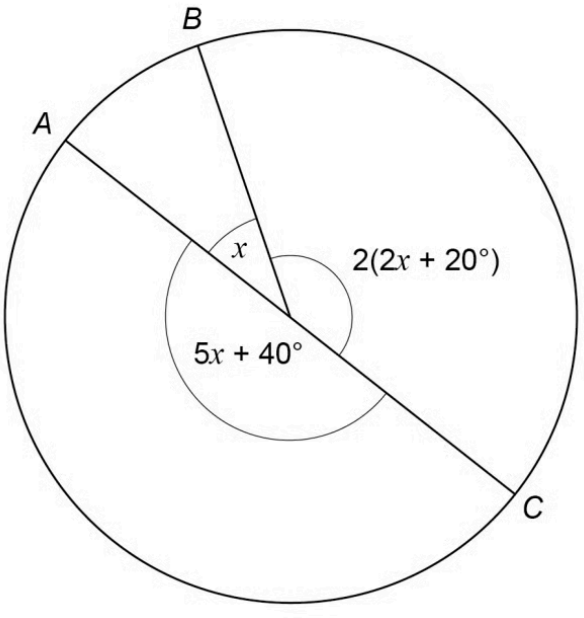
Give a reason for your answer.

(1 mark)

15 A, B and C are three points on a circle.

The radii from A, B and C are shown.

Not drawn accurately

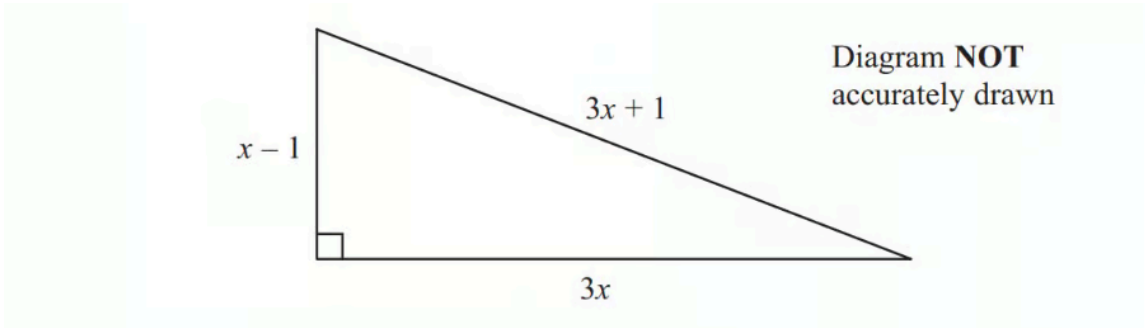


Is AC a diameter of the circle?
You **must** show your working.

(3 marks)

Hard Questions

1 The diagram shows a triangle.



In the diagram, all the measurements are in metres.

The perimeter of the triangle is 56 m.
The area of the triangle is A m^2.

Work out the value of A.

(4 marks)

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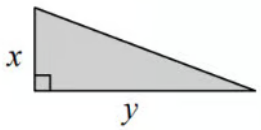
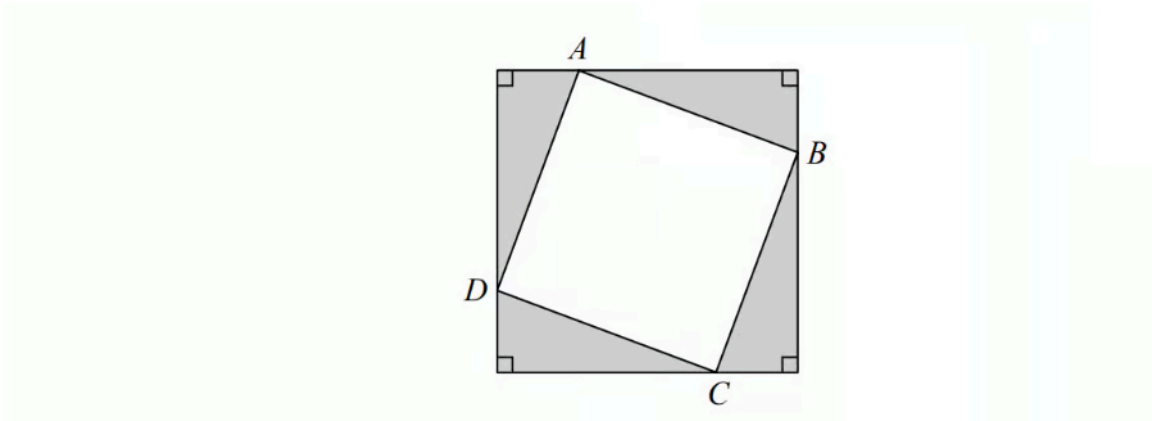
2 Here is a right-angled triangle.



Four of these triangles are joined to enclose the square $ABCD$ as shown below.



Show that the area of the square $ABCD$ is $x^2 + y^2$

(3 marks)

3 Becky has some marbles.
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says, "If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.

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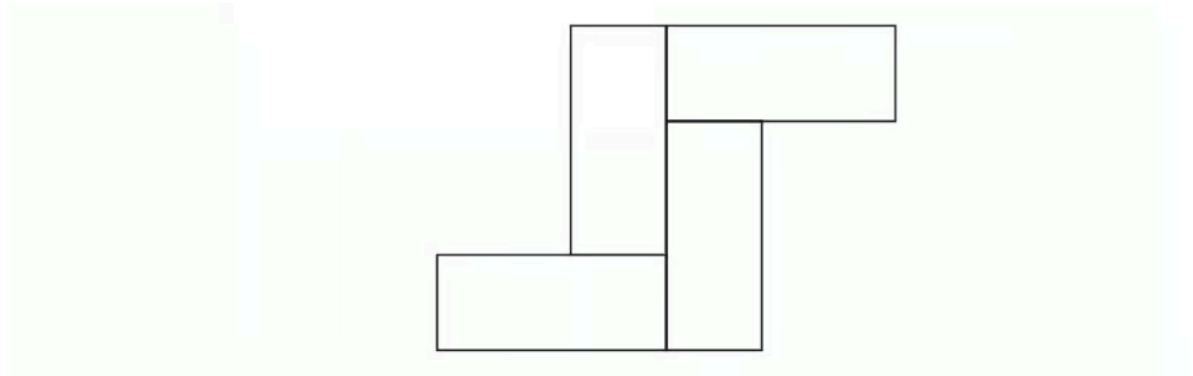
(3 marks)

4 Here is a rectangle.

The length of the rectangle is 7 cm longer than the width of the rectangle.

4 of these rectangles are used to make this 8-sided shape.



The perimeter of the 8-sided shape is 70 cm.
Work out the area of the 8-sided shape.

(5 marks)

5 $ABCD$ is a rectangle.

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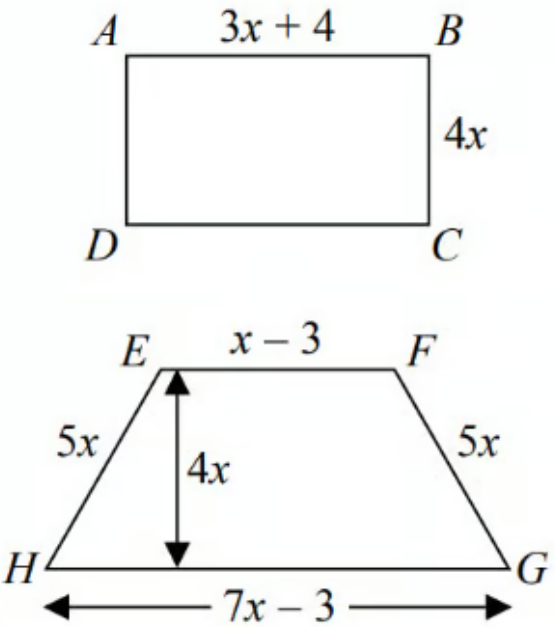
$EFGH$ is a trapezium.



All measurements are in centimetres.
The perimeters of these two shapes are the same.

Work out the area of the rectangle.

(5 marks)

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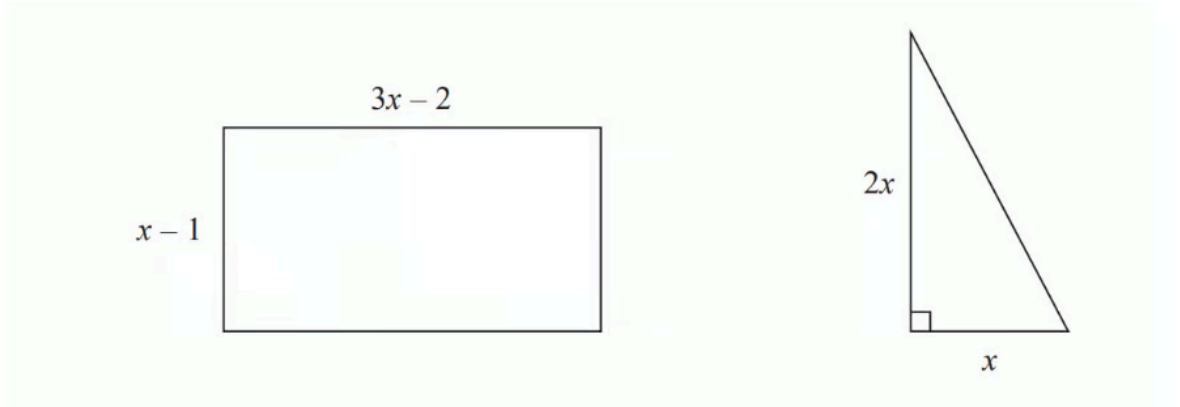
6 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.
The area of the rectangle is greater than the area of triangle.

Find the set of possible values of x.

(5 marks)

7 A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30
The total cost of 1 adult ticket and 3 child tickets is £22

Work out the cost of an adult ticket and the cost of a child ticket.

(4 marks)

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8 3 teas and 2 coffees have a total cost of £7.80
5 teas and 4 coffees have a total cost of £14.20

Work out the cost of one tea and the cost of one coffee.

(4 marks)

9 (a) The diagram shows a trapezium.

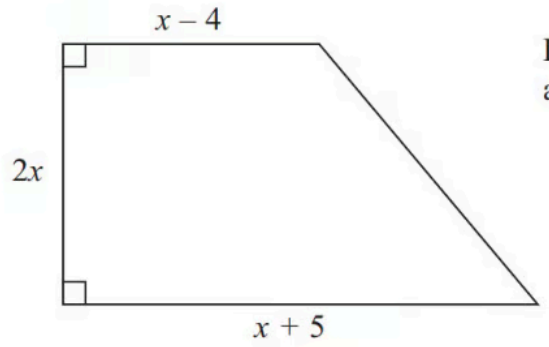


Diagram **NOT** accurately drawn

All the measurements are in centimetres.

The area of the trapezium is 351 cm^2.

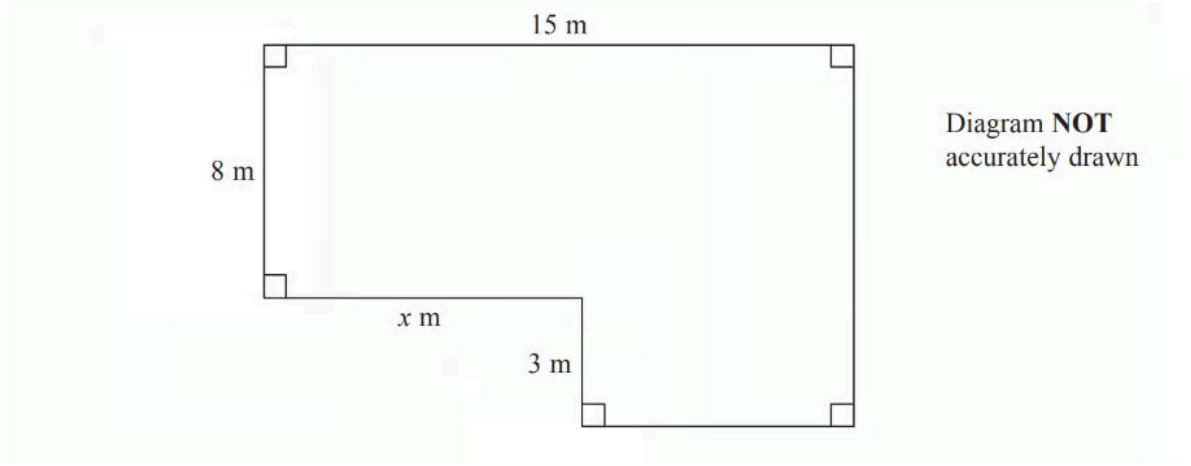
Show that $2x^2 + x - 351 = 0$

(2 marks)

(b) Work out the value of x.

(3 marks)

10 The diagram shows the plan of a floor.

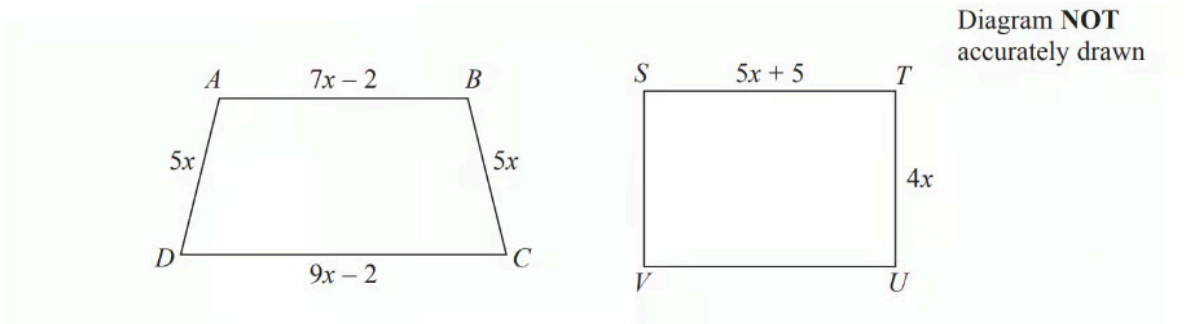


The area of the floor is 138 m^2.

Work out the value of x.

(4 marks)

11 $ABCD$ is a trapezium.
$STUV$ is a rectangle.



All measurements are in centimetres.

The two shapes have the same perimeter.

Work out the length of ST.

(5 marks)

12 Given that

$$x^2 : (3x + 5) = 1 : 2$$

find the possible values of x.

(4 marks)

13 (a) In a chess club, there are x boys and y girls.

If 5 more boys and 8 more girls join, there would be half as many boys as girls.

Show that $y = 2x + 2$

(2 marks)

(b) If instead,

10 more boys and 1 more girl join, there would be the same number of boys and girls. Work out x and y.

x = ...

y = ...

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(3 marks)

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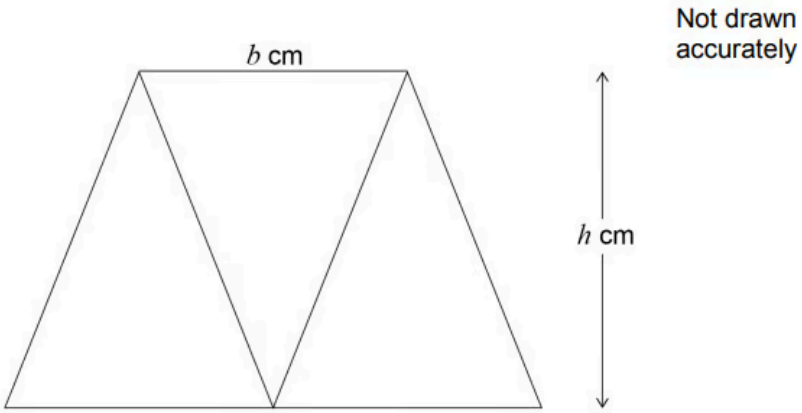
14 (a) Three identical isosceles triangles are joined to make this trapezium.

Each triangle has base b cm and perpendicular height h cm



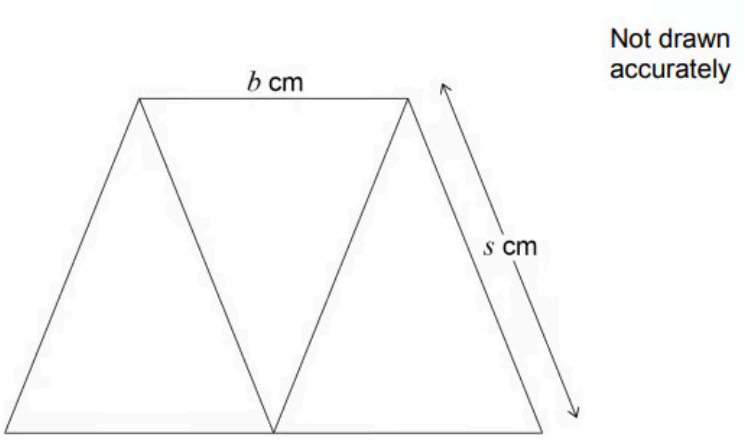
Work out an expression, in terms of b and h, for the area of the trapezium.

Give your answer in its simplest form.

.....cm^2

(2 marks)

(b) This diagram shows the same trapezium.



$b : s = 2 : 3$

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Work out an expression, in terms of b, for the perimeter of the trapezium.

.....cm

(2 marks)

15 Theo starts with savings of £18
James starts with no savings.

Each week from now, Theo will save £4.50 and James will save £4.

In how many weeks will Theo and James have savings in the ratio 15 : 8 ?

(3 marks)

16 Rana sells 192 cakes in the ratio small : medium : large = 7 : 6 : 11

The profit for one medium cake is twice the profit for one small cake.
The profit for one large cake is three times the profit for one small cake.

Her total profit is £532.48

Work out the profit for one small cake.

£.....

(5 marks)

17 Sundip and Emma have some money.
The ratio of Sundip's money to Emma's money is 3 : 5.
Emma spends £450 of her money.
The ratio of Sundip's money to Emma's money is now 2 : 3.

Find how much money Sundip has.

£ .....

(4 marks)

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Very Hard Questions

1

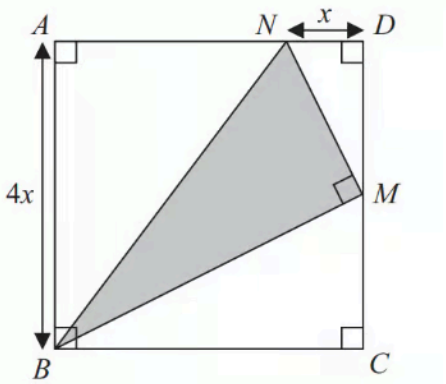

Diagram **NOT** accurately drawn

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

BMN is a right-angled triangle.

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

(4 marks)

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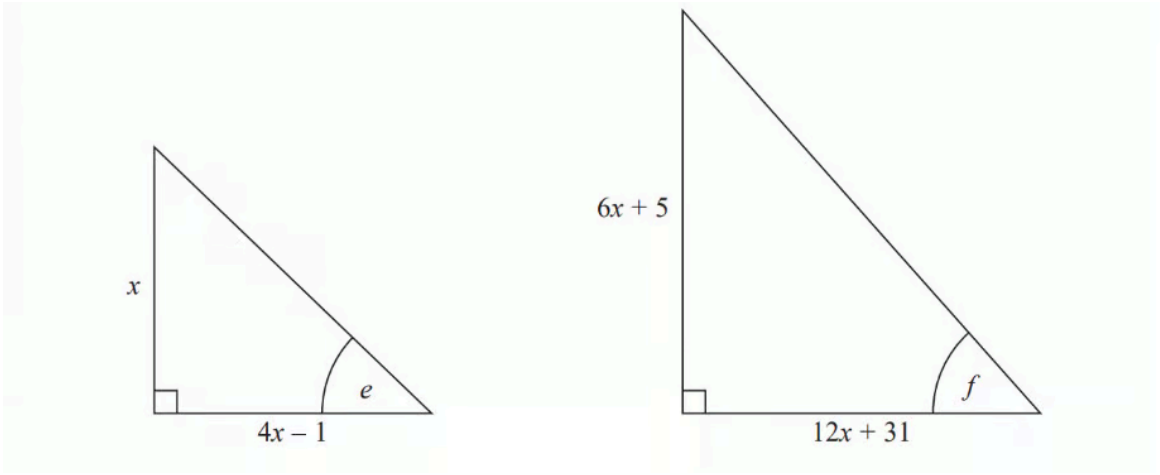
2 Here are two right-angled triangles.



Given that

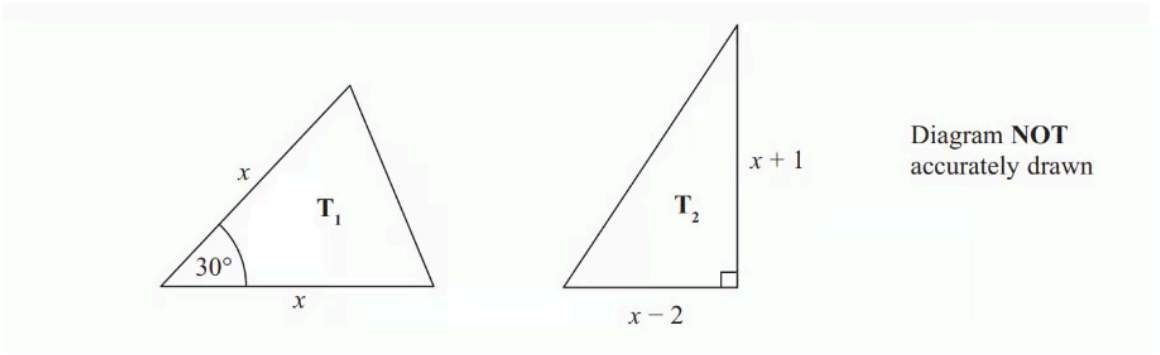
$$\tan e = \tan f$$

find the value of x.

You must show all your working.

(5 marks)

3



The lengths of the sides are in centimetres.

The area of triangle $\mathbf{T}_1$ is equal to the area of triangle $\mathbf{T}_2$.

Work out the value of x, giving your answer in the form $a + \sqrt{b}$ where a and b are integers.

(5 marks)

4 There are only r red counters and g green counters in a bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{3}{7}$

The counter is put back in the bag.

2 more red counters and 3 more green counters are put in the bag.
A counter is taken at random from the bag.

The probability that the counter is green is $\frac{6}{13}$

Find the number of red counters and the number of green counters that were in the bag originally.

(5 marks)

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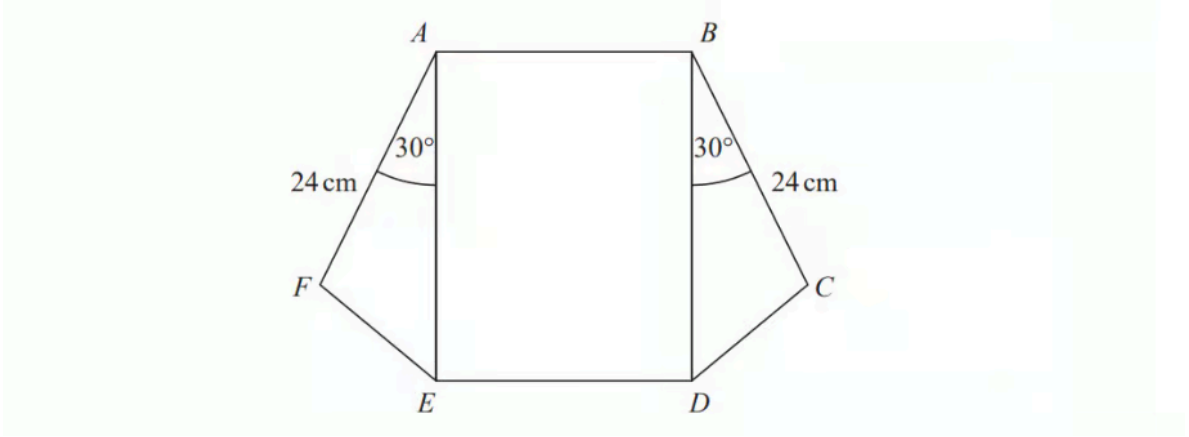
5 The diagram shows a rectangle, $ABDE$, and two congruent triangles, AFE and BCD.



area of rectangle $ABDE$ = area of triangle AFE + area of triangle BCD

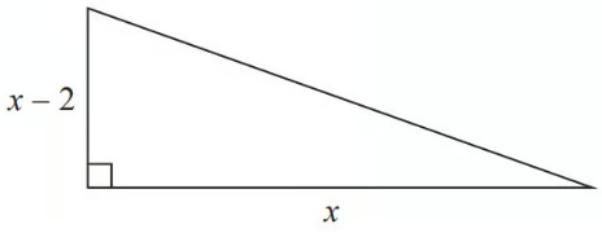
$$AB : AE = 1 : 3$$

Work out the length of AE.

.....cm

(4 marks)

6 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm^2 .

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Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

(6 marks)

7 $ABCED$ is a five-sided shape.

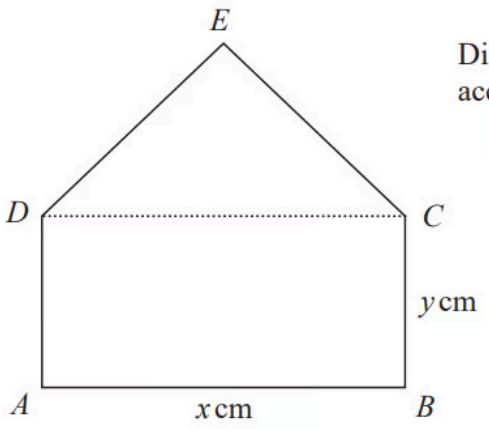

Diagram **NOT** accurately drawn

$ABCD$ is a rectangle.
CED is an equilateral triangle.

$AB = x$ cm $BC = y$ cm

The perimeter of $ABCED$ is 100 cm.
The area of $ABCED$ is R cm^2

Show that $R = \frac{x}{4}\left(200 - \left[6 - \sqrt{3}\right]x\right)$

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(3 marks)

8 The diagram shows a sector OBC of a circle with centre O and radius $(6 + x)$ cm.

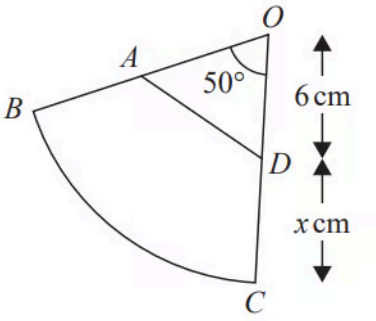

Diagram **NOT** accurately drawn

A is the point on OB and D is the point on OC such that $OA = OD = 6$ cm

Angle $BOC = 50°$

Given that

the perimeter of sector $OBC = 2 \times$ the perimeter of triangle OAD

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

(6 marks)

9 The total surface area of a solid hemisphere is equal to the curved surface area of a cylinder.

The radius of the hemisphere is r cm.
The radius of the cylinder is twice the radius of the hemisphere.

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Given that

$$\text{volume of hemisphere} : \text{volume of cylinder} = 1 : m$$

find the value of m.

(4 marks)

10 A bowl contains n pieces of fruit.
Of these, 4 are oranges and the rest are apples.

Two pieces of fruit are going to be taken at random from the bowl.

The probability that the bowl will then contain $(n - 6)$ apples is $\frac{1}{3}$

Work out the value of n
Show your working clearly.

(6 marks)

11

Volume of a sphere $= \frac{4}{3}\pi r^3$ where r is the radius

Volume of a cone $= \frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height

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A sphere has radius $2x$ cm

A cone has

radius $3x$ cm
perpendicular height h cm

The sphere and the cone have the same volume.

Work out radius of cone : perpendicular height of cone

Give your answer in the form $a : b$ where a and b are integers.

(4 marks)

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