IGCSE · Cambridge (CIE) · Maths

2 hours 30 questions

Non-Calculator Questions

Forming & Solving Equations

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

Medium (11 questions)	/43
Hard (8 questions)	/28
Very Hard (11 questions)	/50
Total Marks	**/121**

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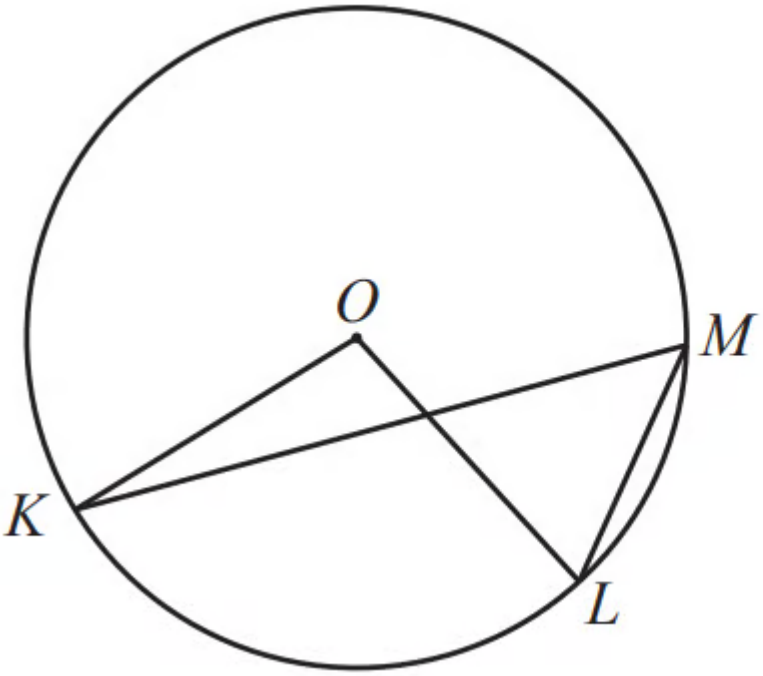
Medium Questions

1



NOT TO SCALE

In the diagram, *K*, *L* and *M* lie on the circle, centre *O*.
Angle *KML* = $2x°$ and reflex angle *KOL* = $11x°$.
Find the value of x.

x = ...

(3 marks)

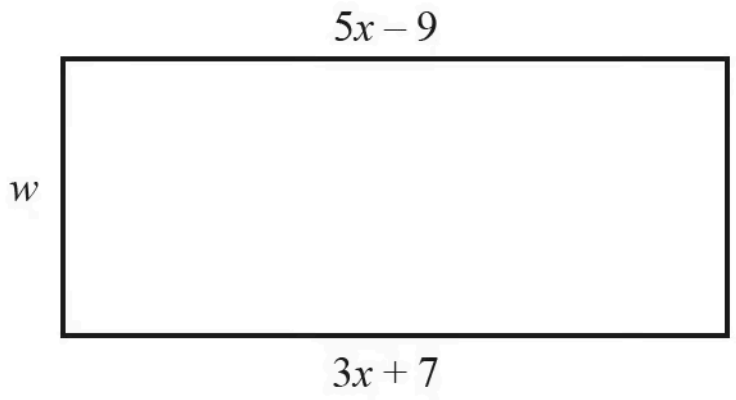
2 $5n$ is the mean of the three numbers 391, n and $n-1$.

Find the value of n.

n = ...

(3 marks)

3 In this part, all measurements are in metres.



NOT TO SCALE

The diagram shows a rectangle.
The area of the rectangle is 310 m^2.
Work out the value of w.

$w =$ .....

(4 marks)

4 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.

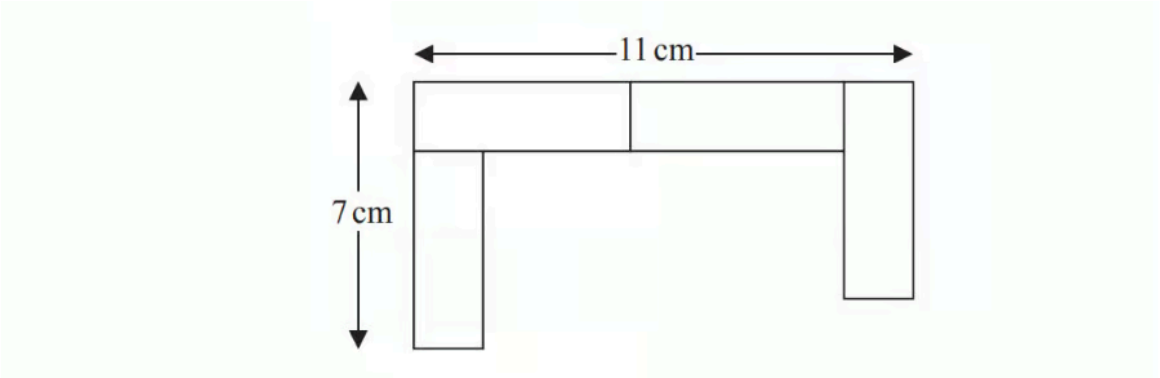
Liam subtracts the number from IO
He writes down his answer.

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)

5 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

(4 marks)

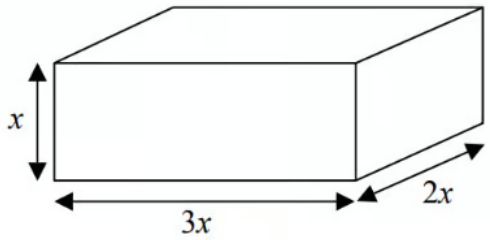
6 Gemma has the same number of sweets as Betty.

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.

(4 marks)

7 Here is a cuboid.

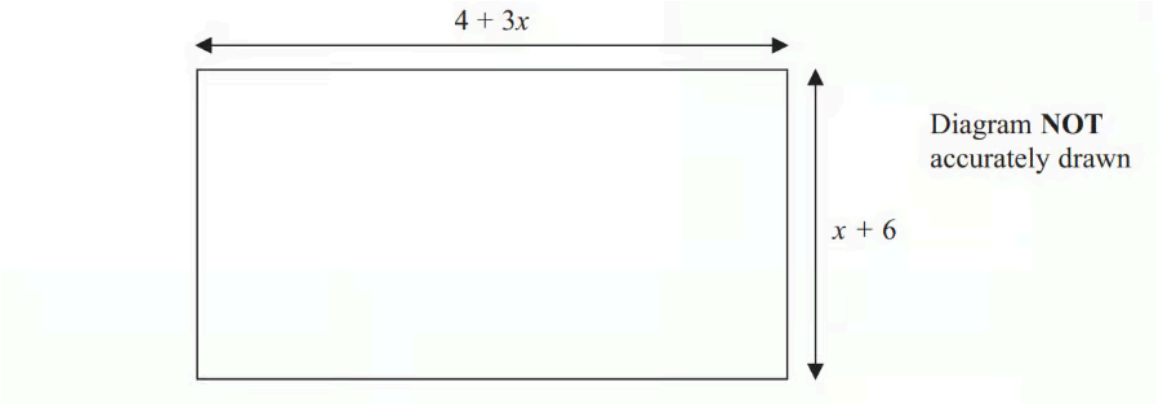


All measurements are in centimetres. x is an integer.
The total volume of the cuboid is less than 900 cm^3

Show that $x \leqslant 5$

(3 marks)

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

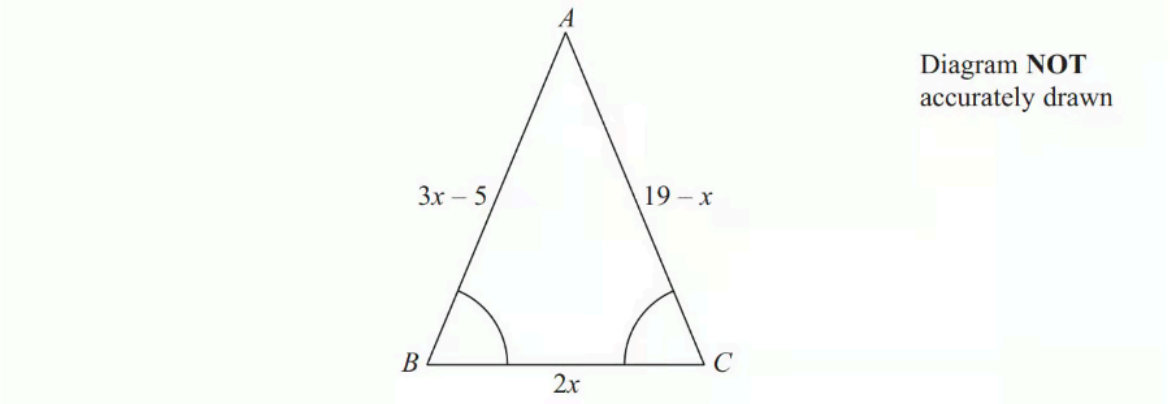


All measurements are in metres.
The perimeter of the garden is 32 metres.

Work out the value of x.

(4 marks)

9 ABC is a triangle.



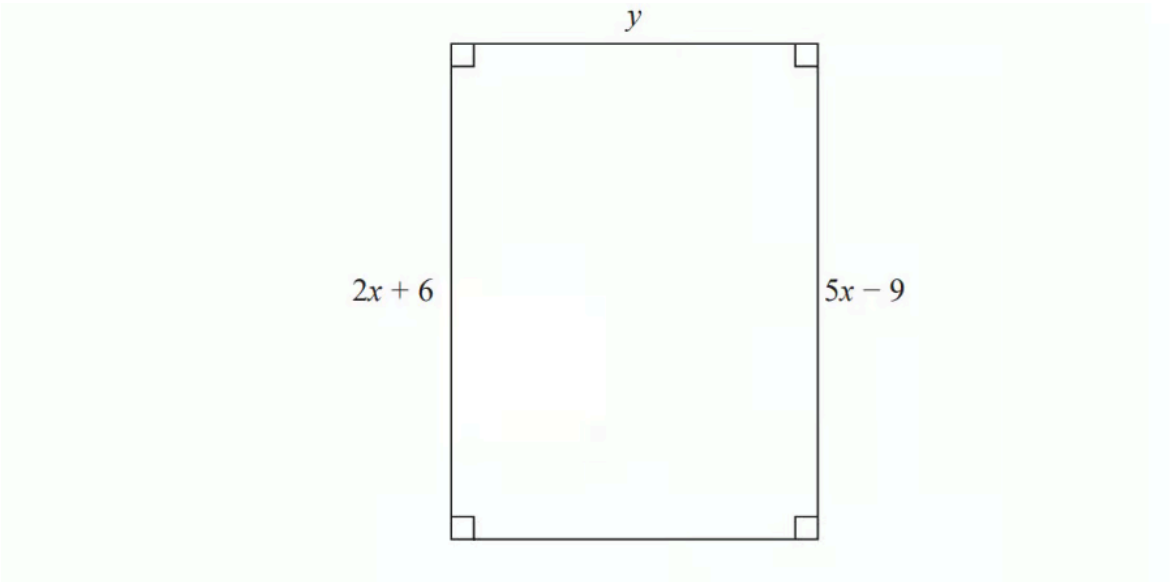
Angle ABC = angle BCA.

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)

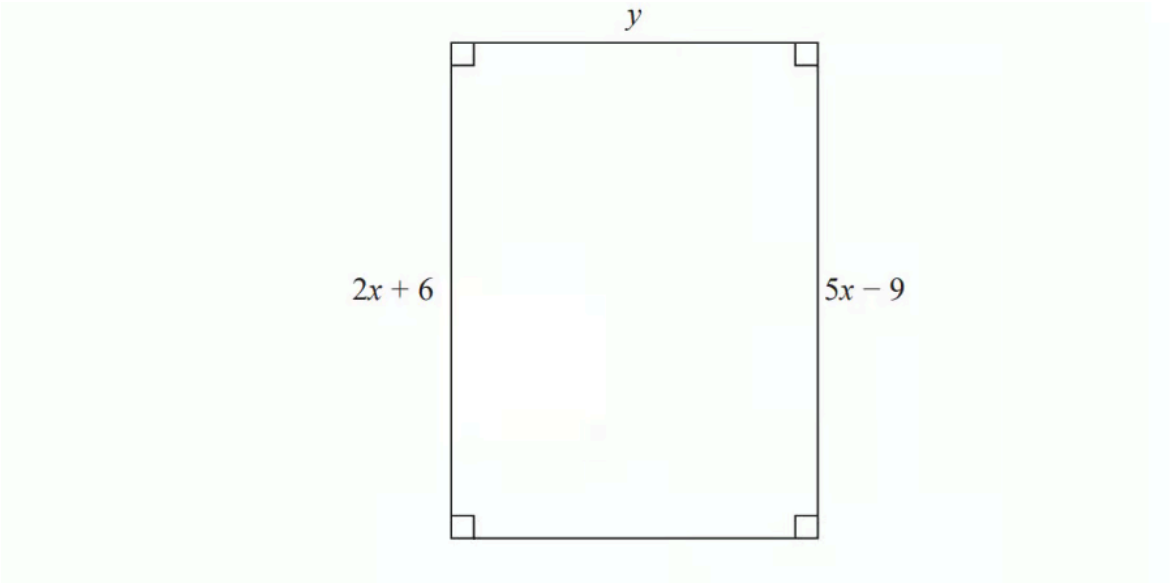
10 Here is a rectangle.



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

(4 marks)

11 Here is a rectangle.



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

(4 marks)

Hard Questions

1 Ahmed sells different types of cake in his shop. The cost of each cake depends on its type and its size.

Every small cake costs $\$x$ and every large cake costs $\$(2x + 1)$.

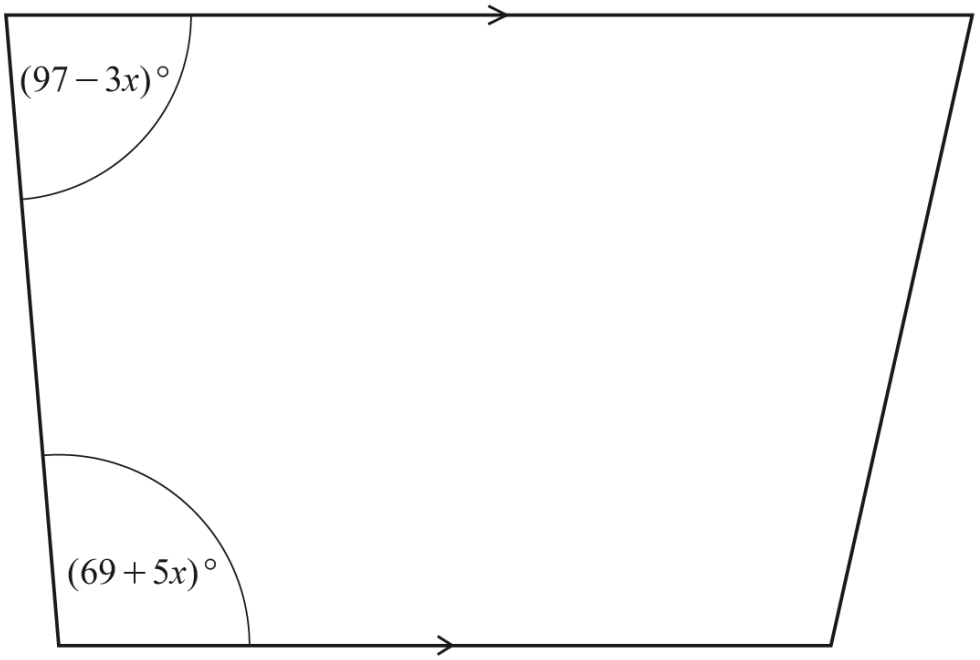
The number of small cherry cakes that can be bought for \$4 is the same as the number of large cherry cakes that can be bought for \$13.

Find the cost of a small cherry cake.

\$ .....

(3 marks)

2 The diagram shows a trapezium.



NOT TO SCALE

Work out the value of x.

$x =$ .....

(3 marks)

3 Naga has n marbles.
Panav has three times as many marbles as Naga.
Naga loses 5 marbles and Panav buys 10 marbles.
Together they now have more than 105 marbles.

Write down and solve an inequality in n.

(3 marks)

4 The cost of one ruler is r cents.
The cost of one protractor is p cents.

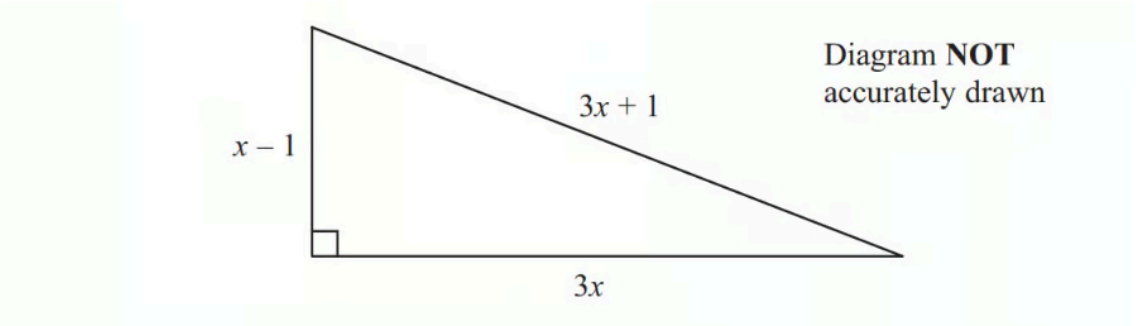
The total cost of 5 rulers and 1 protractor is 245 cents.
The total cost of 2 rulers and 3 protractors is 215 cents.

Write down two equations in terms of r and p and solve these equations to find the cost of one protractor.

..... cents

(5 marks)

5 The diagram shows a triangle.



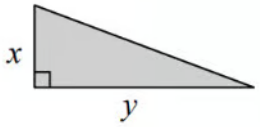
In the diagram, all the measurements are in metres.

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

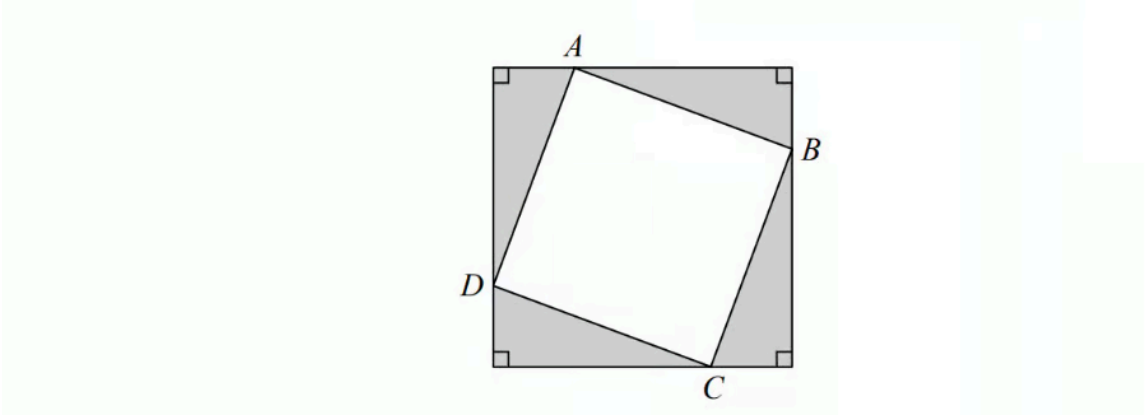
Work out the value of A.

(4 marks)

6 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)

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

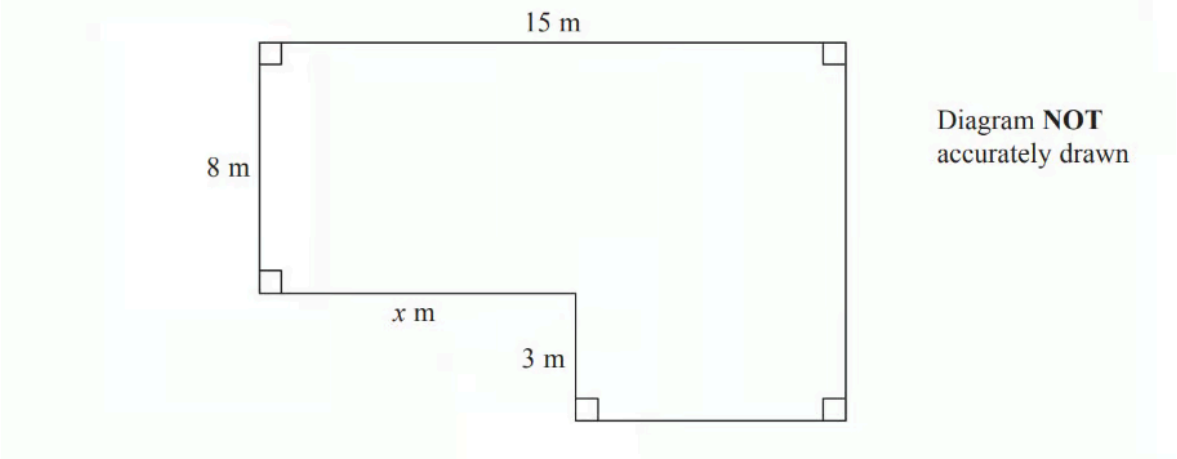
They have a total of 57 marbles.

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.

(3 marks)

8 The diagram shows the plan of a floor.



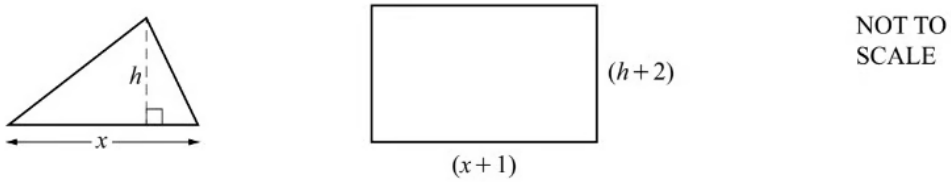
The area of the floor is 138 m^2.

Work out the value of x.

(4 marks)

Very Hard Questions

1 (a) In this question, all measurements are in centimetres.



The height of the triangle is h and the height of the rectangle is $(h + 2)$.
The length of the base of the triangle is x and the length of the rectangle is $(x + 1)$.
The area of the triangle is 11cm^2 and the area of the rectangle is 39cm^2.

Write down an expression, in terms of x, for the height of the rectangle.

(1 mark)

(b) Show that $2x^2 - 15x + 22 = 0$.

(3 marks)

(c) By factorising and solving $2x^2 - 15x + 22 = 0$, find the two possible heights of the triangle.

$h =$ ..... or $h =$ .....

(5 marks)

2 m is inversely proportional to the square of $(p-1)$. When $p=4$, $m=5$.
Find m when $p=6$.

$m=$ .....

(3 marks)

3 Carol walks 12 km at x km/h and then a further 6 km at $(x-1)$ km/h.
The total time taken is 5 hours.

i) Write an equation, in terms of x, and show that it simplifies to $5x^2-23x+12=0$.

[3]

ii) Factorise $5x^2-23x+12$.

[2]

iii) Solve the equation $5x^2-23x+12=0$.

x = ... or x = ... [1]

iv) Write down Carol's walking speed during the final 6 km.

..... km/h [1]

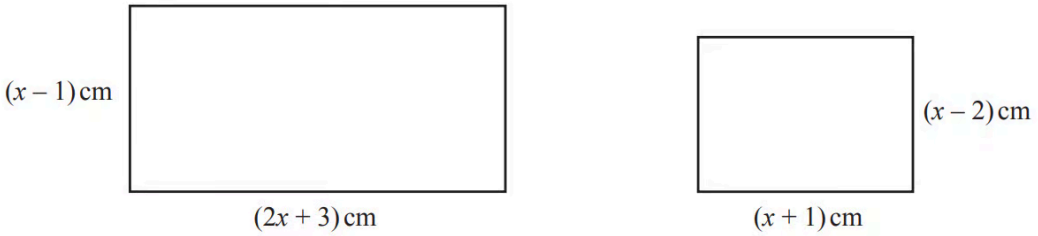
(7 marks)

4 Petra records the score in each test she takes.

The mean of the first n scores is x.
The mean of the first $(n-1)$ scores is $(x+1)$.
Find the nth score in terms of n and x.
Give your answer in its simplest form.

(3 marks)

5 (a)



The difference between the areas of the two rectangles is 62 cm^2.

i) Show that $x^2 + 2x - 63 = 0$.

[3]

ii) Factorise $x^2 + 2x - 63$.

[2]

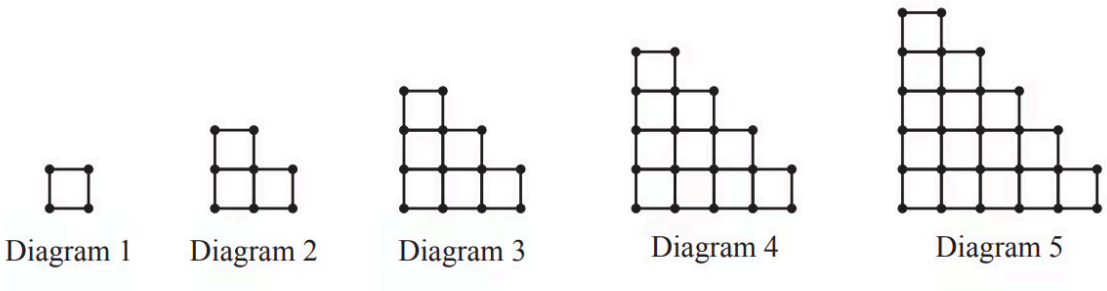
(5 marks)

(b) Solve the equation $x^2 + 2x - 63 = 0$ to find the difference between the perimeters of the two rectangles.

..... cm

(2 marks)

6



The sequence of diagrams above is made up of small lines and dots.

The number of dots in Diagram n is $an^2 + bn + 1$.
Find the value of a and the value of b.

a = ...
b = ...

(2 marks)

7 $\mathrm{f}(x) = \frac{x^2}{4} - \frac{4}{x}, x \neq 0 \quad \mathrm{g}(x) = \frac{9}{x}, x \neq 0.$

The exact answer to $\mathrm{f}(x) = \mathrm{g}(x)$ is $\sqrt[3]{k}$.
Use algebra to find the value of k.

k = ...

(2 marks)

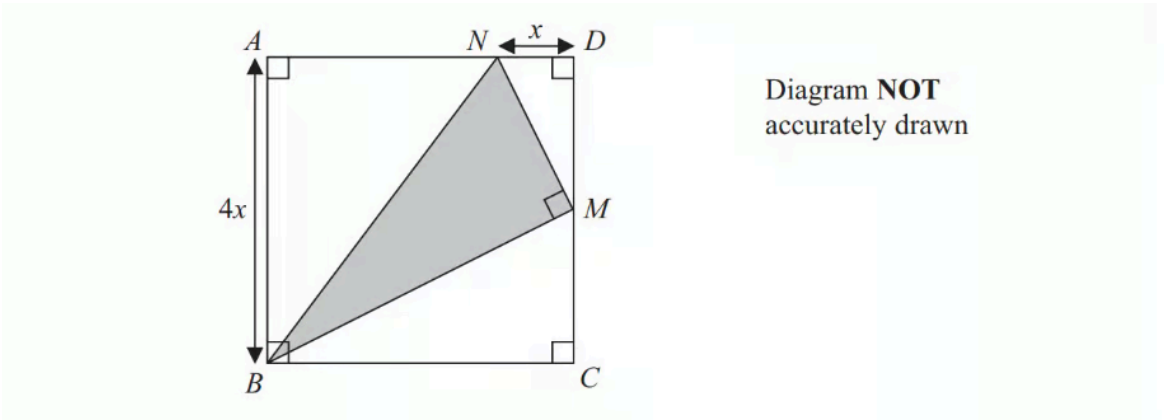
8 Klaus buys x silver balloons and y gold balloons for a party. He buys

- more gold balloons than silver balloons
- at least 15 silver balloons
- less than 50 gold balloons
- a total of no more than 70 balloons.

Write down four inequalities, in terms of x and/or y, to show this information.

(4 marks)

9



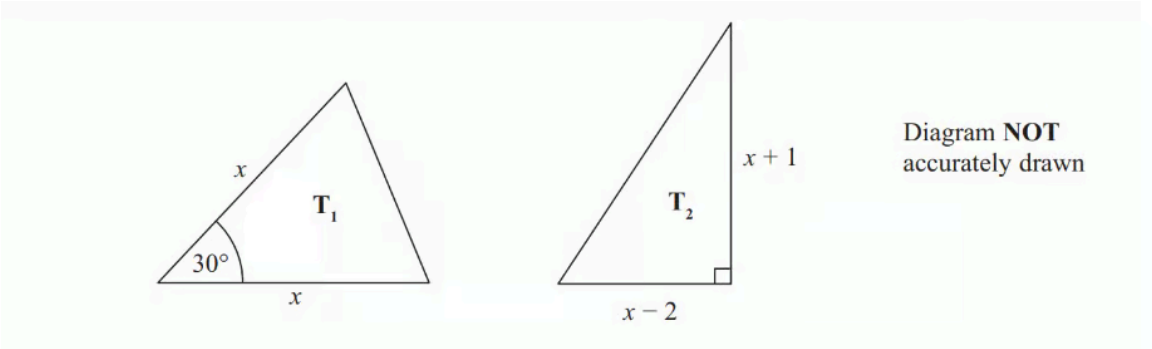
$ABCD$ is a square with a side length of $4x$
M is the midpoint of DC.
N is the point on AD where $ND = x$

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)

10



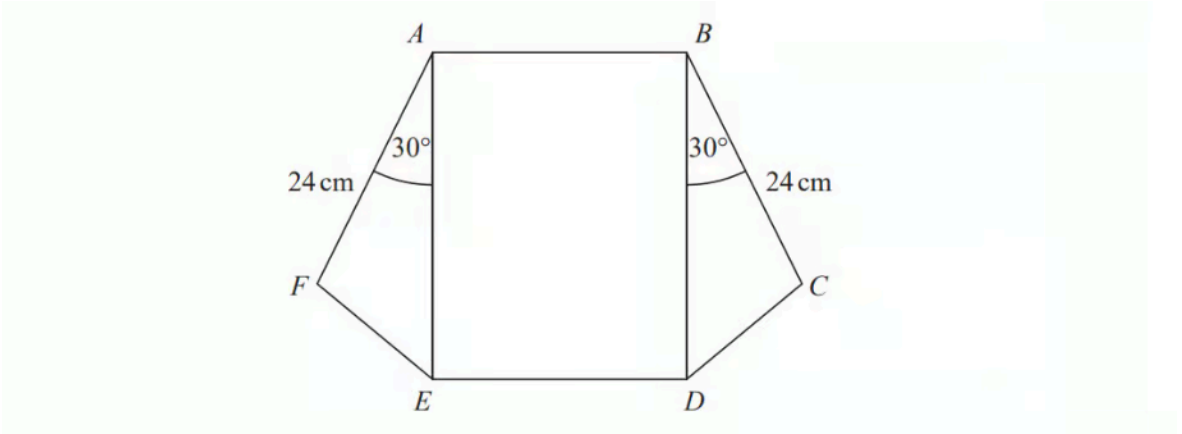
The lengths of the sides are in centimetres.

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)

11 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)