

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
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12 – 13	
14 – 15	
16 – 17	
18 – 19	
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TOTAL	



General Certificate of Secondary Education
Higher Tier
January 2013

Methods in Mathematics (Linked Pair Pilot)

93652H

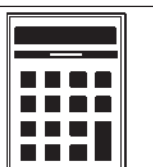
Unit 2 Geometry and Algebra

Tuesday 15 January 2013 1.30 pm to 3.00 pm

H

For this paper you must have:

- a calculator
- mathematical instruments.



Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 2, 4 and 19. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.



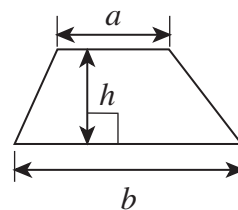
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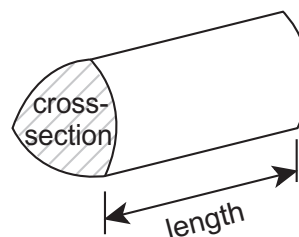
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Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

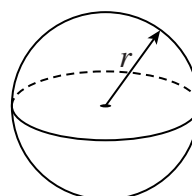


Volume of prism = area of cross-section \times length



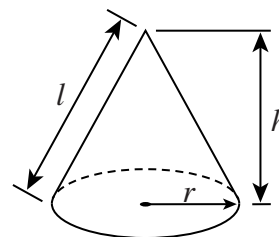
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = $\pi r l$

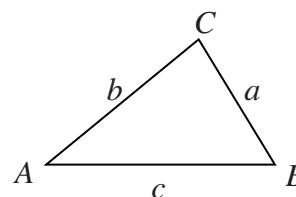


In any triangle ABC

Area of triangle = $\frac{1}{2}ab \sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Answer **all** questions in the spaces provided.

1 (a) Expand $5(x - 9)$

Answer (1 mark)

1 (b) Factorise $x^2 + 8x$

Answer (1 mark)

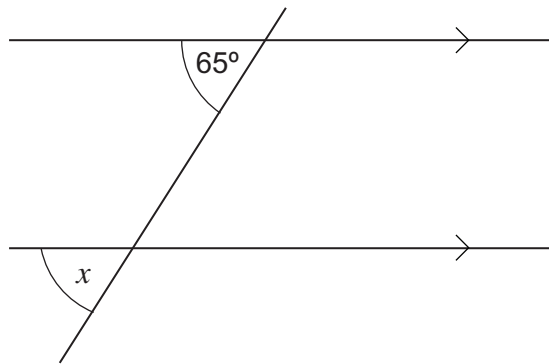
1 (c) Solve $\frac{x}{6} = \frac{9}{2}$

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$x =$ (2 marks)

*2 Write down the size of angle x .
Give a reason for your answer.



Not drawn
accurately

Answer degrees

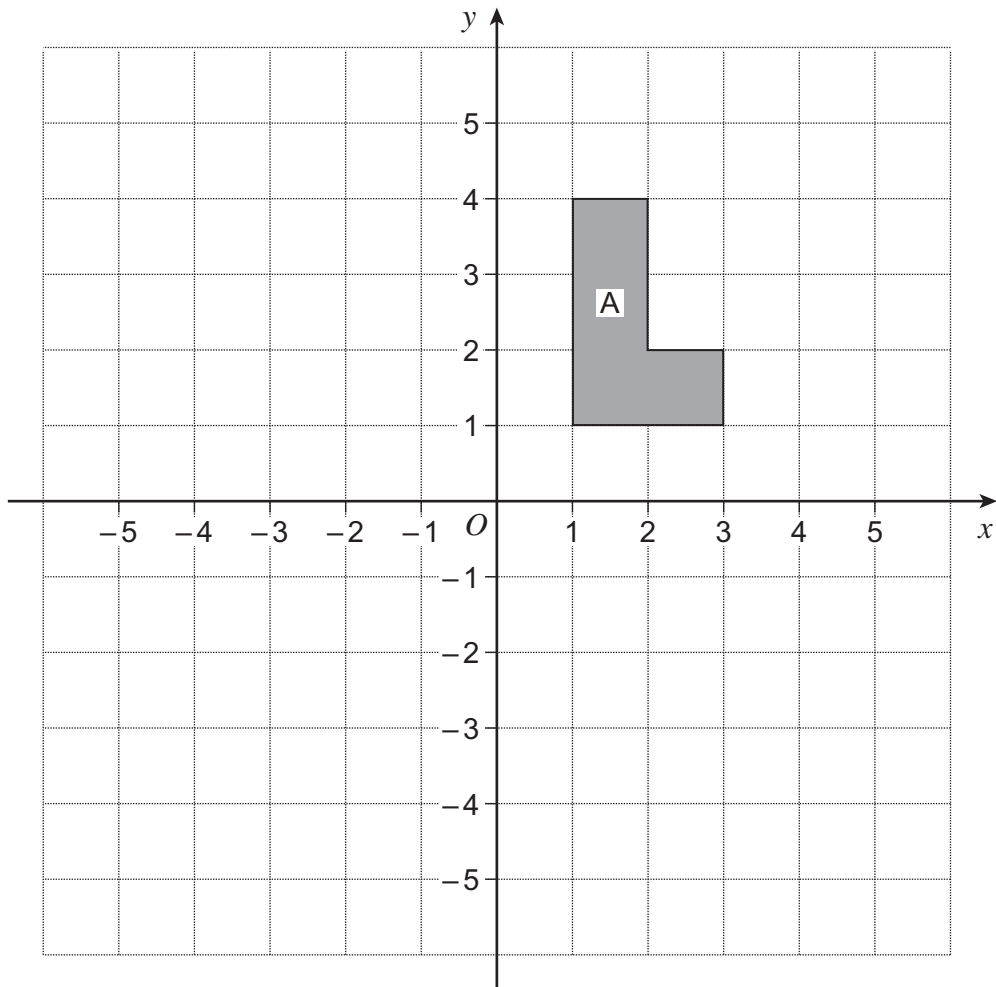
Reason

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(2 marks)



3



3 (a) Reflect shape A in the x -axis.
Label the new shape B. (1 mark)

3 (b) Reflect shape B in the y -axis.
Label the new shape C. (1 mark)

3 (c) Describe **fully** the rotation that maps shape C to shape A.

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(2 marks)



*4 Which is greater?

$$\frac{5}{8} \text{ of } 900$$

or 320 increased by 68%

You **must** show your working.

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Answer (5 marks)

Turn over for the next question



5 (a) Fill in the **two** missing numbers in this sequence.

2 5 11 20 47

(2 marks)

5 (b) A different sequence has second term 2 and third term 4.

..... 2 4

Write down a possible rule for continuing the sequence.

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Write down the first and fourth terms of the sequence using your rule.

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Answer and (2 marks)

6 A code is a three-digit number.

- The first digit is a square number greater than 1.
- The second digit is a cube number greater than 1.
- The third digit is a prime number.
- The three-digit number is divisible by 3.

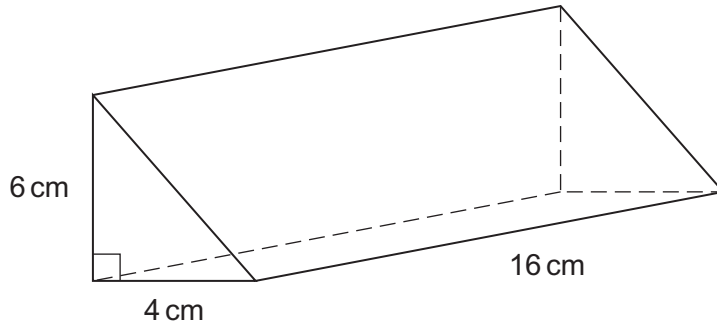
Work out the **two** possible codes.

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Answer and (3 marks)



7



Calculate the volume of the prism.
 State the units of your answer.

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Answer (4 marks)

8

Expand and simplify $2(w + 3) + 4(w - 1)$

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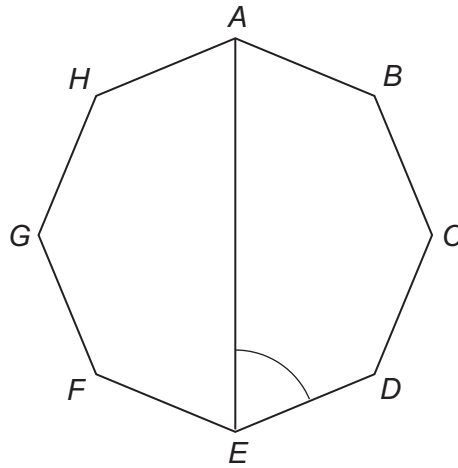
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Answer (2 marks)



9 Here is a regular octagon.



Not drawn
accurately

Work out the size of angle AED .

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Answer degrees (3 marks)



10 In a class of 30 students

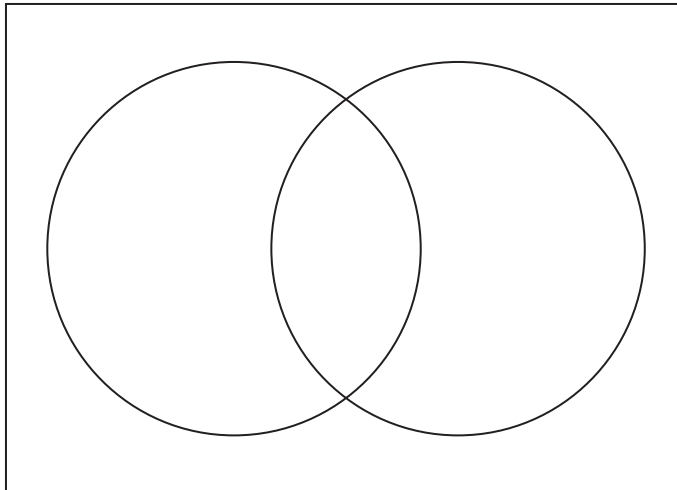
19 have a brother

15 have a sister

4 do **not** have a brother or a sister.

How many students have a brother and a sister?

You may use the Venn diagram to help you.



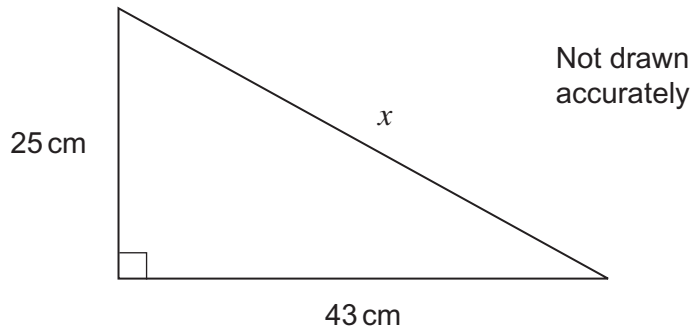
Answer

(4 marks)

Turn over for the next question



11 (a) Calculate the length x in the triangle.



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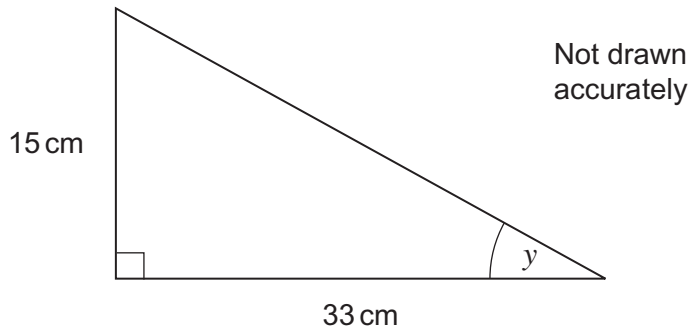
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Answer cm (3 marks)

11 (b) Calculate the angle y in the triangle.



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Answer degrees (3 marks)



12 (a) Solve $5x - 8 = 3x + 6$

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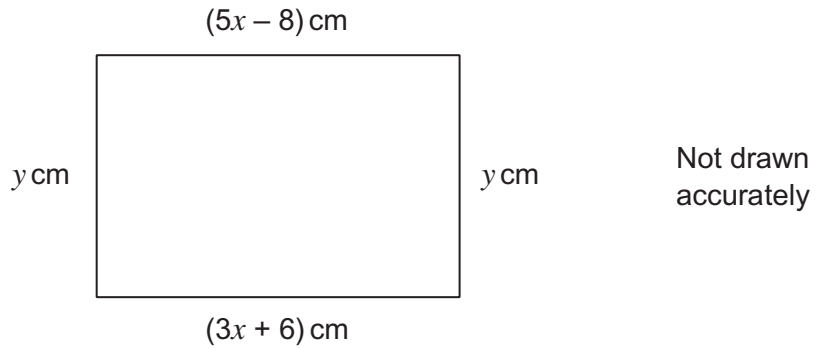
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$x =$ (3 marks)

12 (b) The area of this rectangle is 270 cm^2 .



Work out the value of y .

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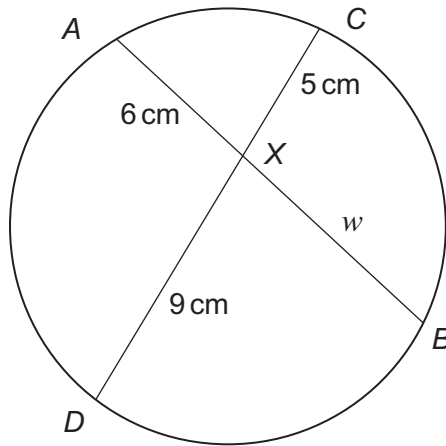
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$y =$ (3 marks)



13 *AB* and *CD* are chords of a circle that intersect at *X*.



Not drawn accurately

Calculate the length *BX* marked *w* in the diagram.

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Answer cm (3 marks)

14 I think of a number.

I round the number to 3 significant figures.

I now round that number to 2 significant figures.

My final answer is 230.

What is the **smallest** number I could have first thought of?

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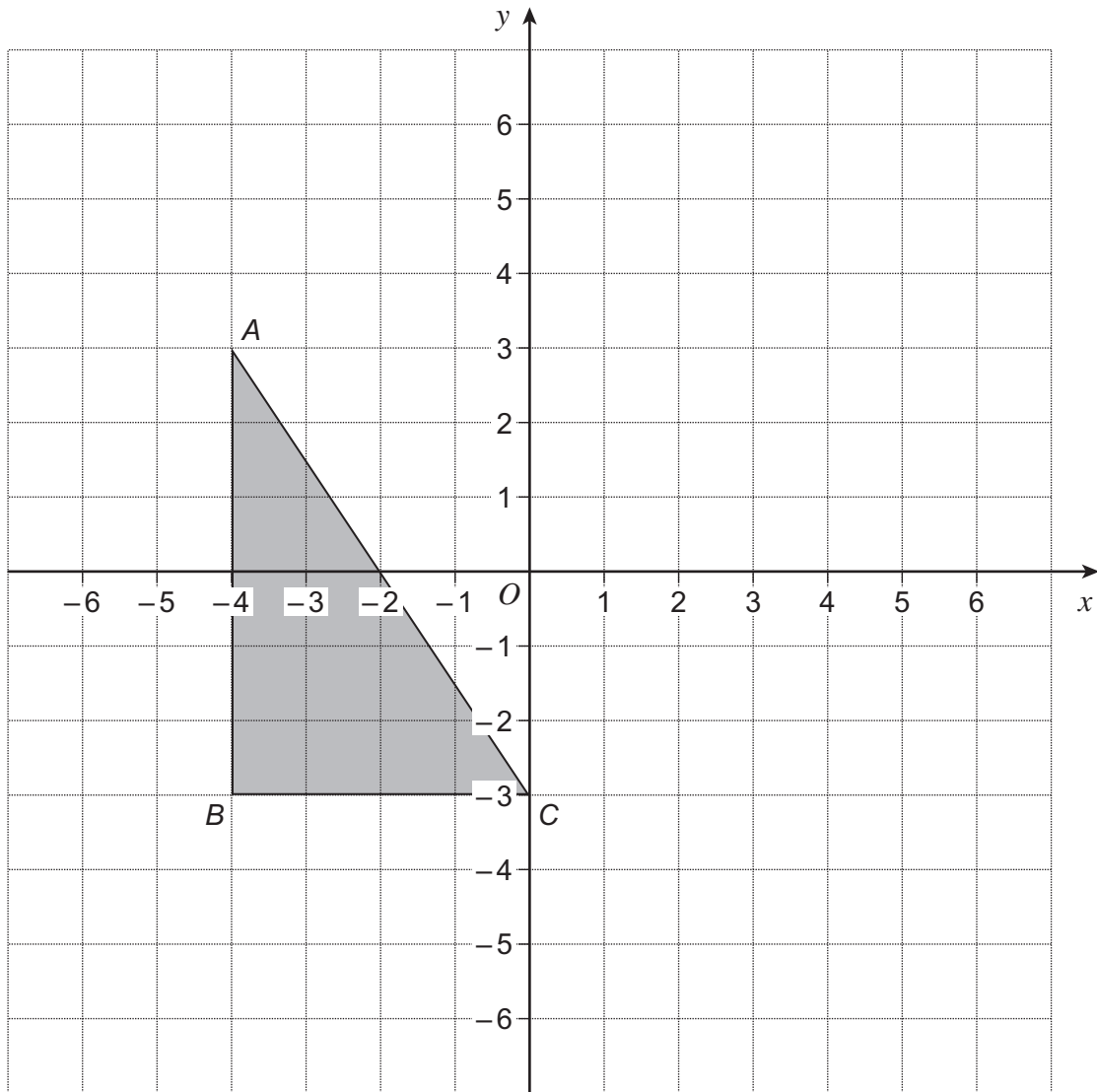
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Answer (2 marks)



15



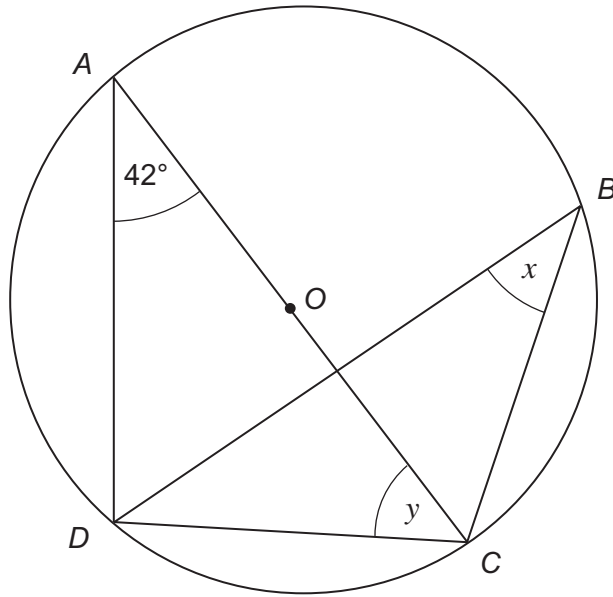
Enlarge triangle ABC by scale factor $\frac{1}{2}$, centre $(4, 1)$.

(2 marks)

Turn over ►



- 16** A, B, C and D are points on the circumference of a circle centre O .
 AC is a diameter.
 Angle $DAC = 42^\circ$



Not drawn
accurately

- 16 (a)** Write down the value of x .

Answer degrees (1 mark)

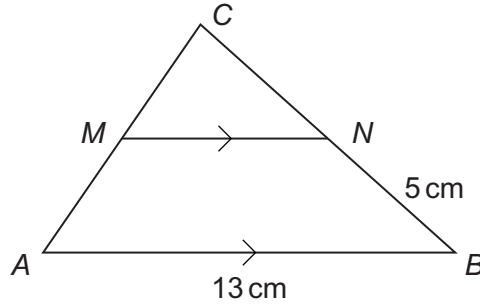
- 16 (b)** Work out the value of y .

Answer degrees (1 mark)



17 The perimeter of the triangle ABC is 30 cm.

M is the midpoint of side AC .
 MN is parallel to AB .
 $NB = 5$ cm, $AB = 13$ cm



Not drawn accurately

Work out the length MA .

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Answer cm (3 marks)

18 Solve $2x^2 + 3x - 7 = 0$

Give your answers to 2 decimal places.

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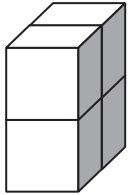
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Answer (3 marks)

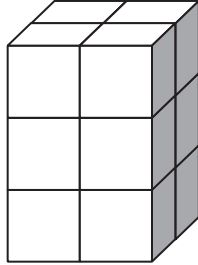


*19

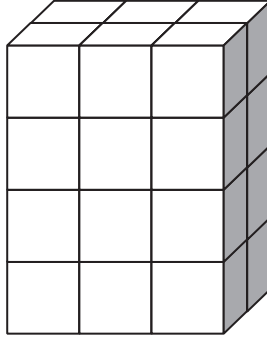
Cuboids are made with small cubes.
Each new cuboid is 1 cube wider and 1 cube higher than the previous cuboid.
The depth of each cuboid is always 2 cubes.



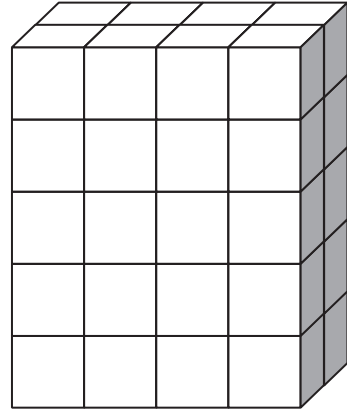
Cuboid 1



Cuboid 2



Cuboid 3



Cuboid 4

Can cuboid 16 be made with 500 small cubes?
You **must** show your working.

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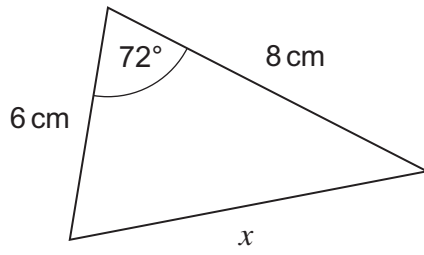
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(5 marks)



20

Work out the length x for this triangle.



Not drawn accurately

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Answer cm (3 marks)

Turn over for the next question

8

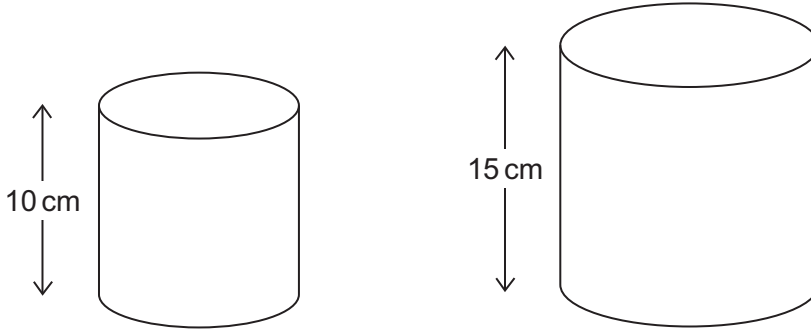
Turn over ►



21

A solid cylinder has a volume of 454 cm^3 .
The cylinder has a height of 10 cm.

A similar cylinder has a height of 15 cm.



What is the volume of the larger cylinder?

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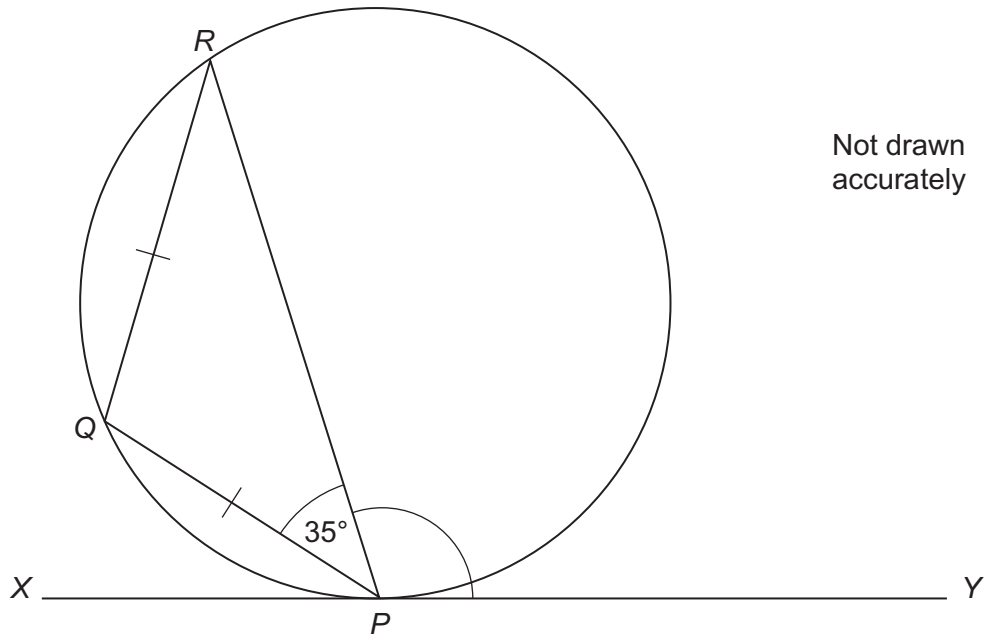
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Answer cm^3 (3 marks)



22

P , Q and R are points on a circle.
Triangle PQR is isosceles.
 XY is a tangent to the circle at P .



Not drawn
accurately

Work out the size of angle RPY .

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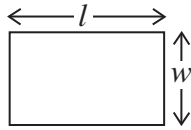
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Answer degrees (2 marks)

Turn over for the next question



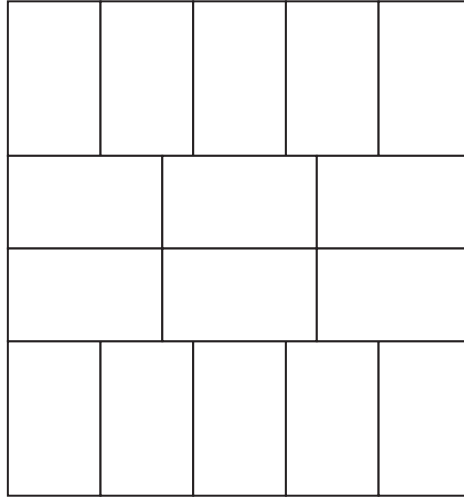
23 A rectangle has a width w cm and a length l cm.



Not drawn accurately

16 of the rectangles are put together to form a larger rectangle as shown.

The area of the larger rectangle is 38.4 cm^2 .



Not drawn accurately

Calculate the value of w .

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Answer cm (5 marks)

END OF QUESTIONS

5

