Surname	
Other Names	
Candidate Signature	

AQA

General Certificate of Secondary Education
Higher Tier
June 2014

Methods in Mathematics (Linked Pair Pilot)   **93652H**
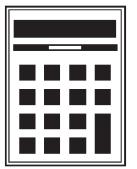
H

Unit 2   Geometry and Algebra

Friday 20 June 2014   9.00 am to 10.30 am

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, 5 and 18. 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 book.
- You are expected to use a calculator where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.
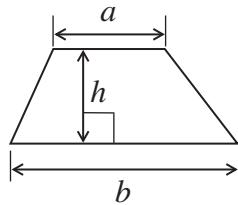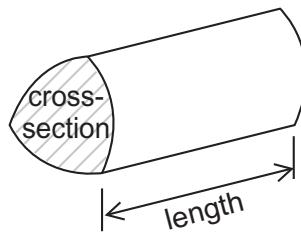
Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$
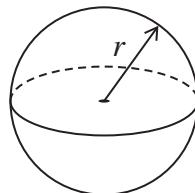
Volume of prism = area of cross-section × length
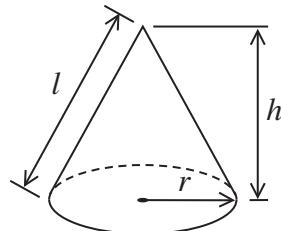
Volume of sphere = $\frac{4}{3}\pi r^3$

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

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

Curved surface area of cone = $\pi r l$
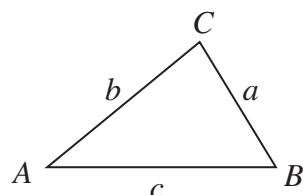
In any triangle ABC

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

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

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

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 There are 40 counters in a bag.
23 of them are red.

What percentage of the counters is **not** red?

[3 marks]

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....

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Answer .... %

*2 a is an odd number.
b is an even number.

Tick the correct statement.

$a^2 + b^2$ is always even ☐

$a^2 + b^2$ is always odd ☐

$a^2 + b^2$ could be even or odd ☐

Give a reason for your answer.

[2 marks]

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5

Turn over ▶
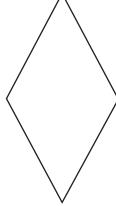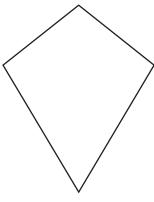
3 Tick (✓) or cross (✗) the properties of the quadrilaterals shown.
The square has been done as an example.

[4 marks]

	Property				
	Diagonals cross at right angles	**One pair of equal opposite angles**	**All sides equal**	**Exactly one line of symmetry**	**Rotational symmetry of order 2**
Square	✓	✗	✓	✗	✗
Rhombus					
Kite					

0 4

4   Use your calculator to work out $\dfrac{3.21 + 4.89}{5.62 - 1.89}$ as a decimal.

4 (a)   Write down your full calculator display.

[1 mark]

....

Answer ....

4 (b)   Write your answer to 1 decimal place.

[1 mark]

....

Answer ....

Turn over for the next question
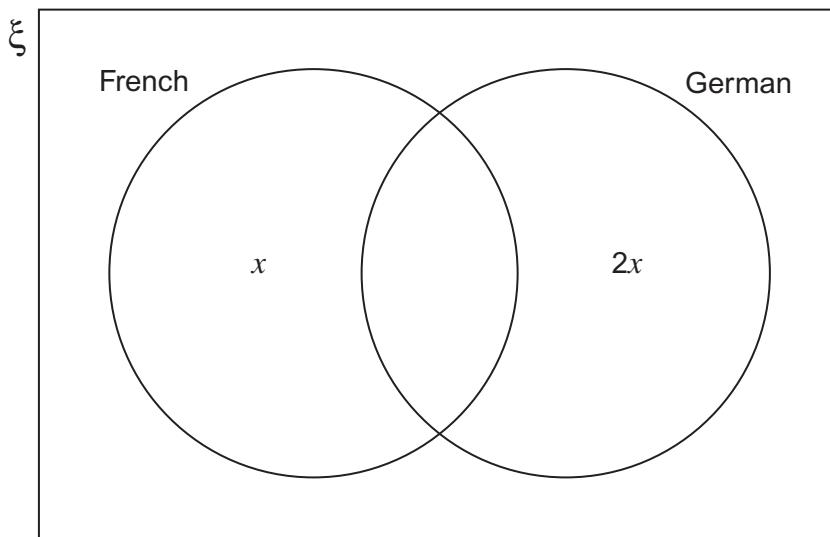
5 In a group of 30 students

x students take French **only**

2x students take German **only**

This information is shown in the Venn diagram.

French $\qquad$ German

x $\qquad$ 2x

ξ

5 (a) 3 students take **both** French and German.
6 students do **not** take either French **or** German.

Add this information to the Venn diagram.

[1 mark]

*5 (b) Set up and solve an equation to work out the value of x.

[3 marks]

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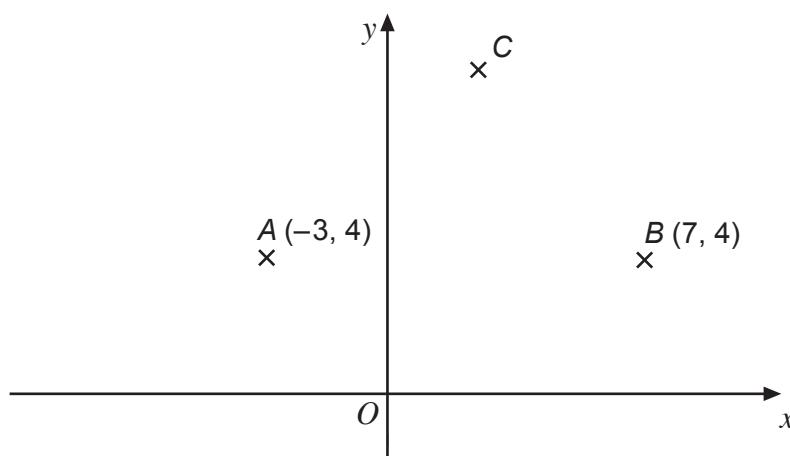
$x =$ ....

6 Points *A*, *B* and *C* are plotted.

y

×*C*

Not drawn accurately

A (−3, 4)
×

B (7, 4)
×

O

x

They form an **isosceles** triangle such that *AC* = *BC*
A is (−3, 4) and *B* is (7, 4).
The area of triangle *ABC* is 20 square units.

Work out the coordinates of *C*.
You **must** show your working, some of which may be on the diagram.

[4 marks]

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Answer (................... , ...)

Turn over for the next question

8
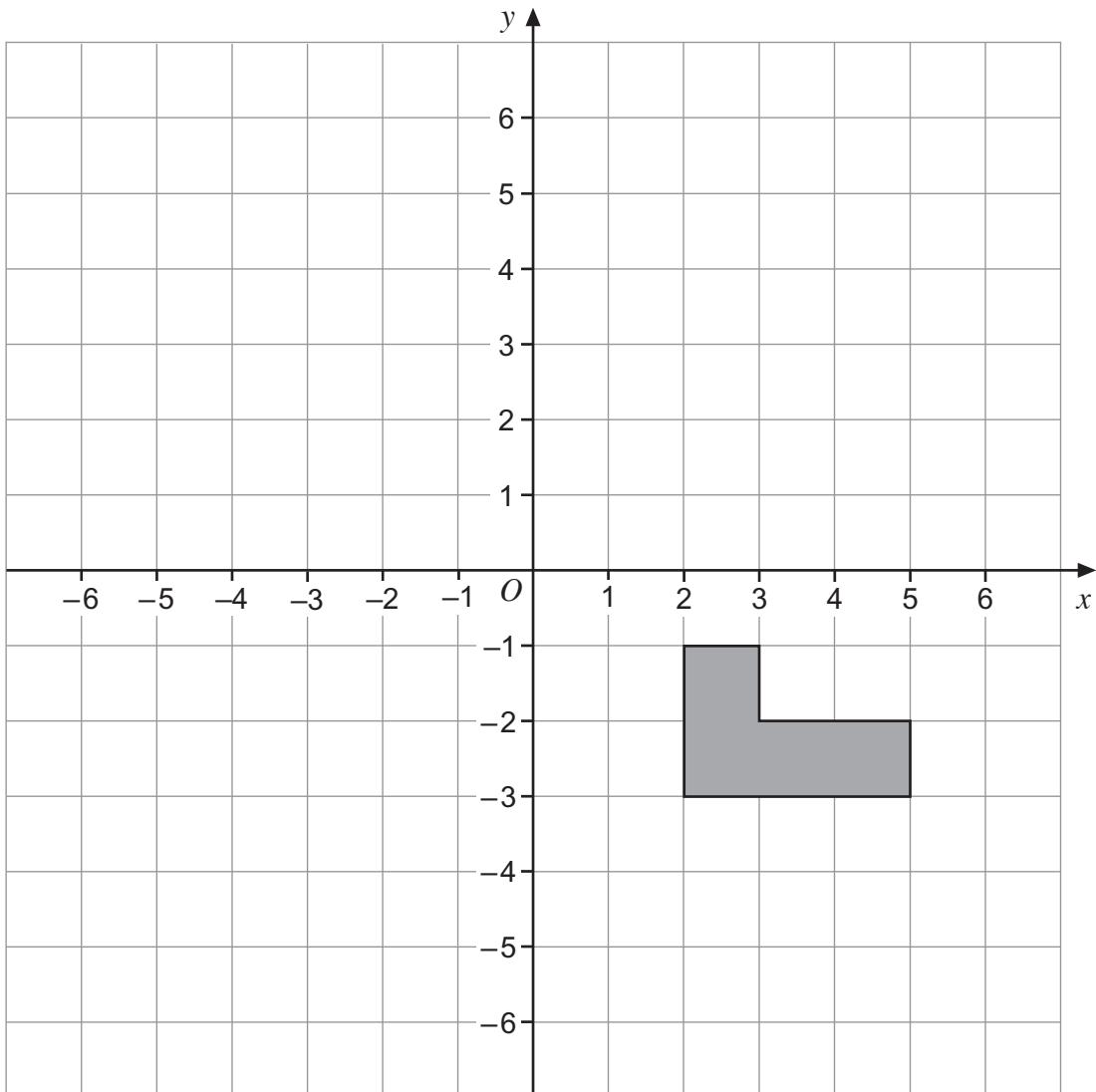
Turn over ▶

7 (a) Reflect the shape in the line $x = 2$

[2 marks]
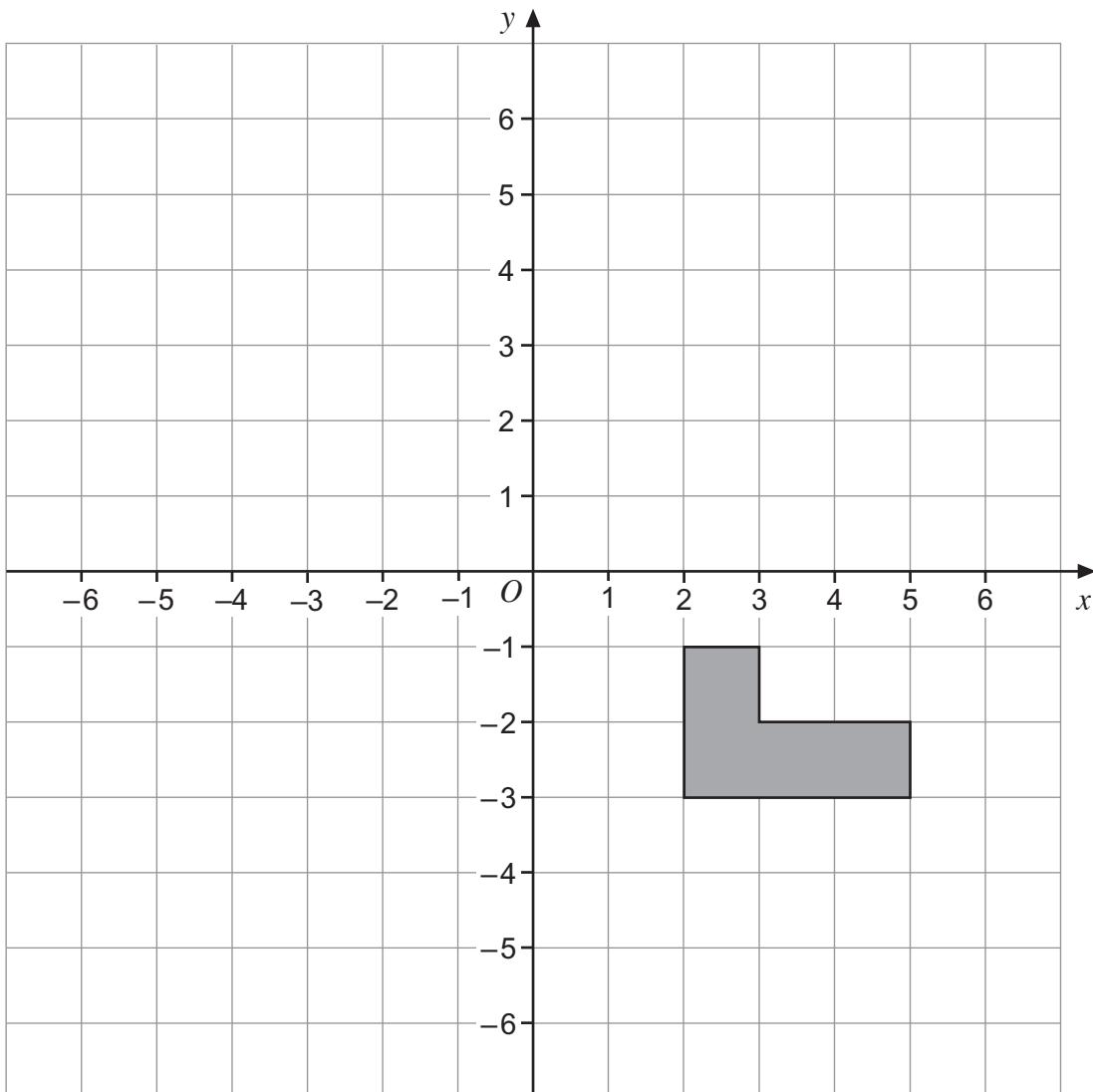
7 (b) Translate the shape by the vector $\begin{pmatrix} -5 \\ 6 \end{pmatrix}$.

[2 marks]

4
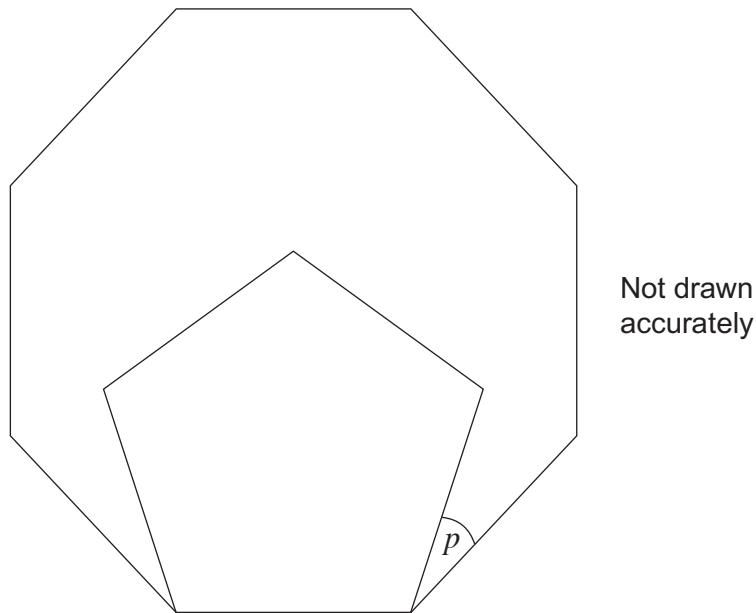
8 A regular pentagon is drawn inside a regular octagon as shown.

Not drawn accurately

Calculate the size of angle p.
You **must** show your working.

[3 marks]

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Answer .... degrees
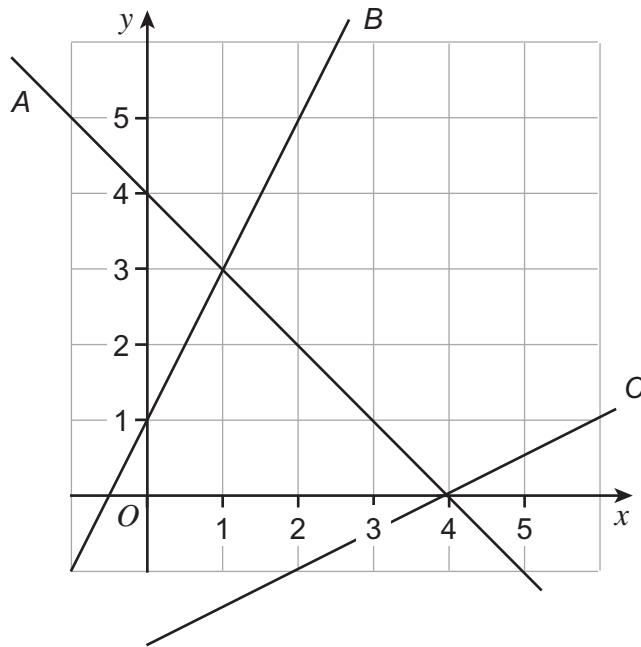
9 The graph shows three lines, *A*, *B* and *C*.

9 (a) Complete these sentences with *A*, *B* or *C* to make them true.

[2 marks]

$y = \frac{1}{2}x - 2$ is the equation of line ....

$x + y = 4$ is the equation of line ....

$y = 2x + 1$ is the equation of line ....

9 (b) Which of the lines does the point (−4, −4) lie on?
Circle your answer.

[1 mark]

$y = \frac{1}{2}x - 2$ $\qquad\qquad$ $x + y = 4$ $\qquad\qquad$ $y = 2x + 1$

6
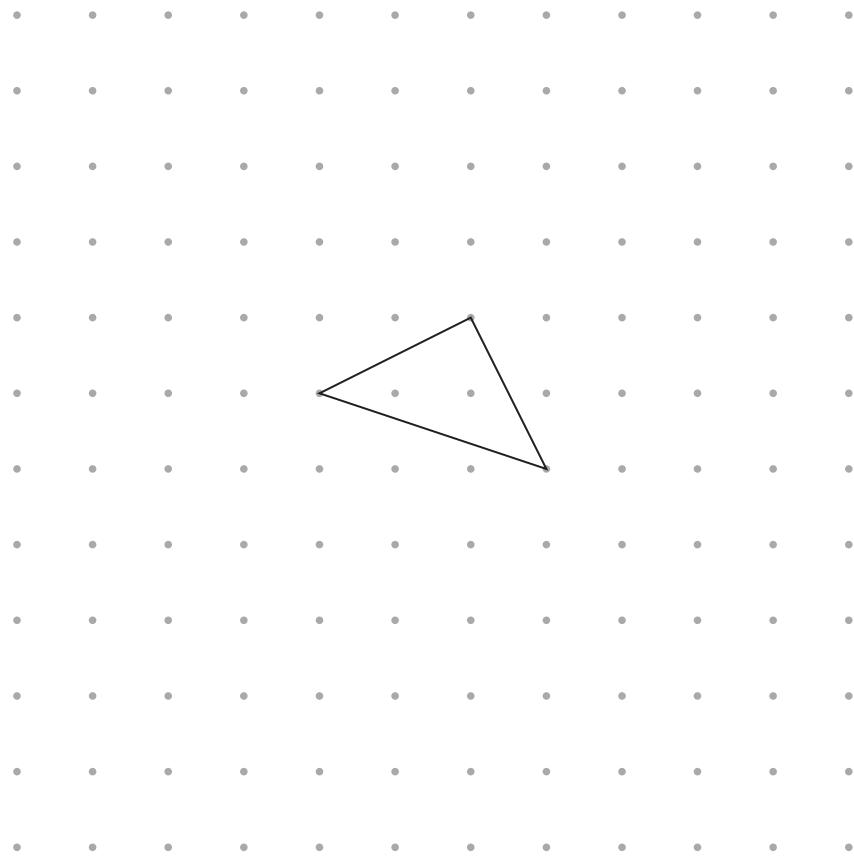
10   A triangle is shown on the grid.

Draw enough triangles to show that it will tessellate.

[2 marks]
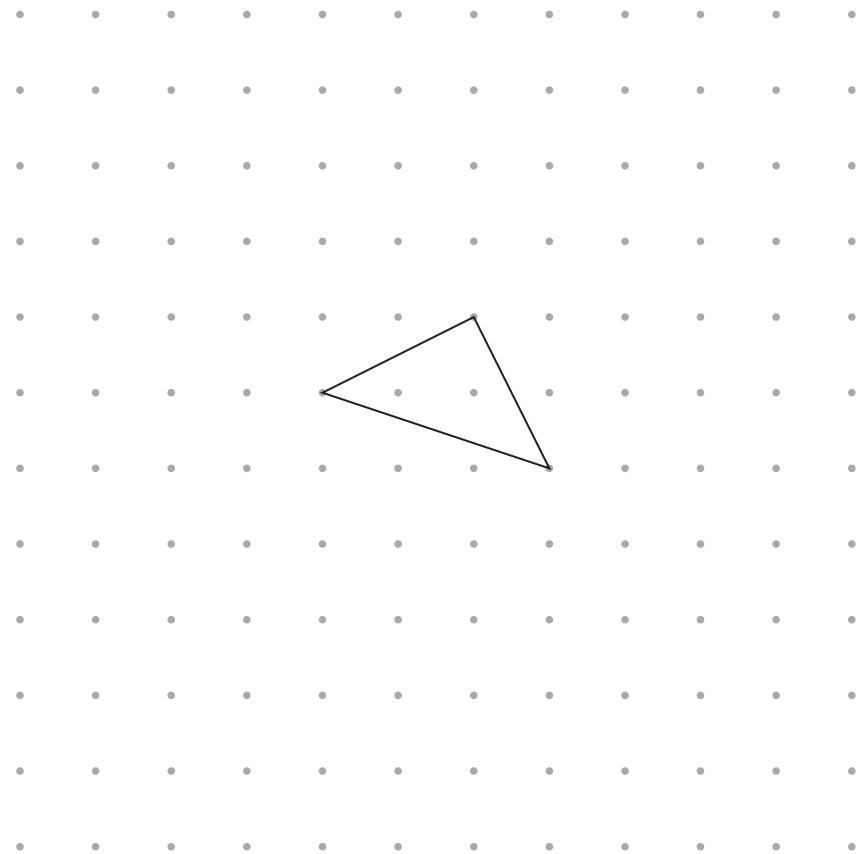
Use this grid for practice.

Use this grid for your answer.

Turn over for the next question

11 (a) As a product of prime factors $40 = 2^3 \times 5$

Write 50 as a product of prime factors.

[2 marks]

....

....

Answer ....

11 (b) Work out the Least Common Multiple of 40 and 50

[2 marks]

....

....

Answer ....

12 Work out the nth term of the sequence.

7   13   19   25   31   .....

[2 marks]

....

....

Answer ....

13 Solve the following equations.
Do **not** use trial and improvement.

13 (a) $\frac{x}{5} + 2 = x$

[3 marks]

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$x =$ ....

13 (b) $\frac{2y - 3}{4} + \frac{y - 4}{3} = 1$

[4 marks]

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$y =$ ....

Turn over ▶
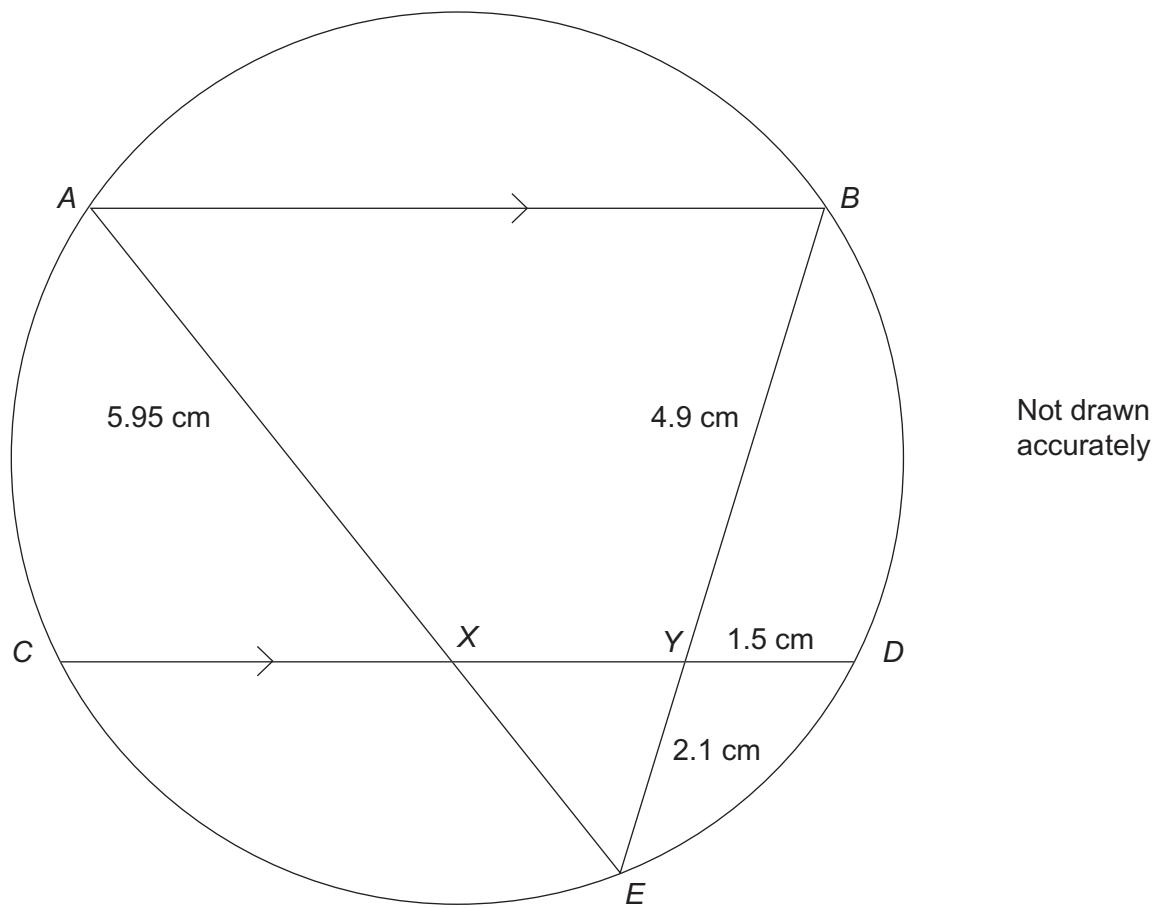
14 AB and CD are parallel chords of a circle.
AE and BE intersect the chord CD at X and Y respectively.

AX = 5.95 cm
BY = 4.9 cm
YE = 2.1 cm
YD = 1.5 cm

Not drawn accurately

14 (a) Use the intercept theorem to show that XE = 2.55 cm

[2 marks]

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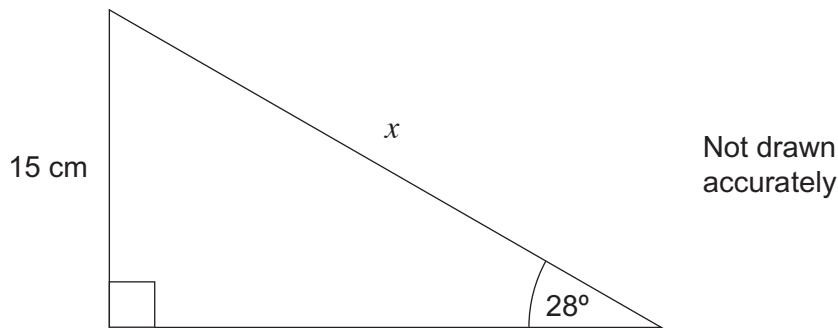
14 (b) Use the intersecting chords theorem to show that *CY* = 6.86 cm

[2 marks]

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15 Work out the length x.

[3 marks]

15 cm

x

28°

Not drawn
accurately

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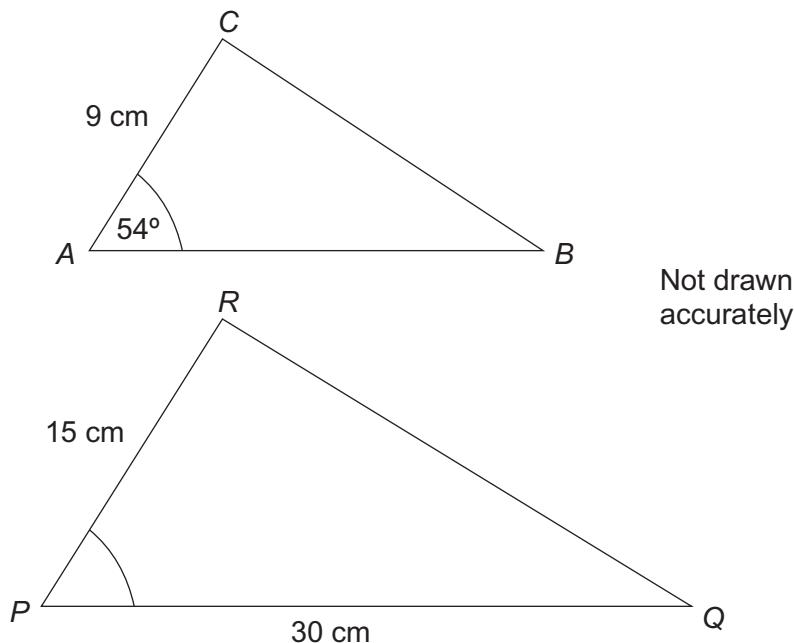
Answer .... cm

7

Turn over ▶

16 Triangle *PQR* is an enlargement of triangle *ABC*.

C

9 cm

54°

A   B

R

15 cm

P

30 cm   Q

Not drawn accurately

16 (a) Work out the scale factor of the enlargement.

[1 mark]

....

Answer ....

16 (b) Write down the size of angle *P*.

[1 mark]

Answer .... degrees

16 (c) Work out the length *AB*.

[1 mark]

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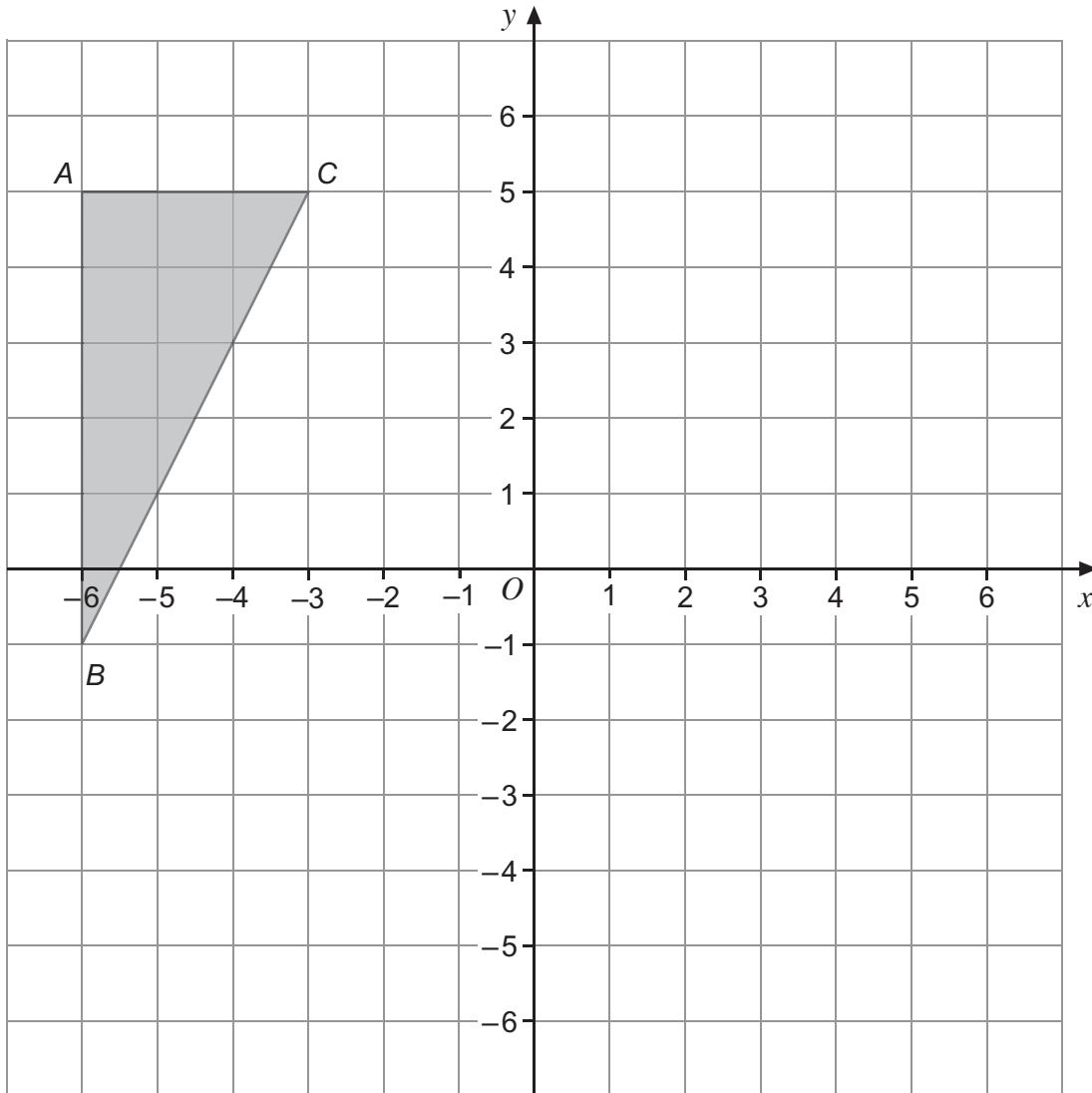
Answer .... cm

17 Enlarge triangle *ABC* by scale factor $-\dfrac{2}{3}$, centre (0, 2).

[2 marks]

Turn over for the next question

Turn over ▶

5
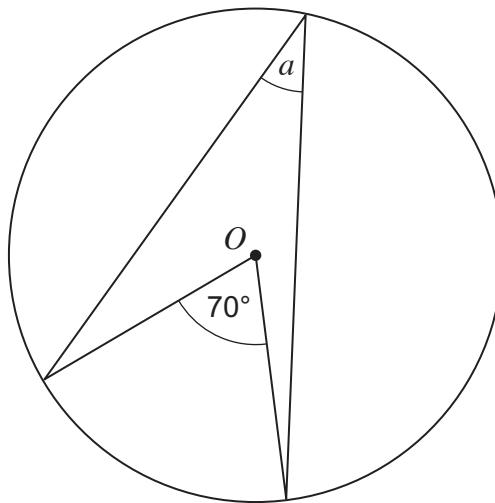
18 (a) O is the centre of the circle.

Write down the size of angle a.

[1 mark]
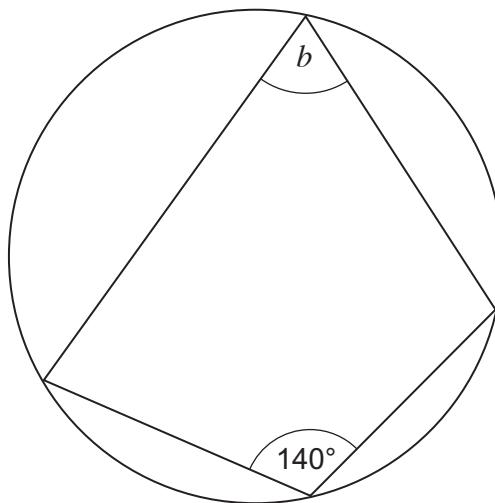
Not drawn accurately

Answer .... degrees

*18 (b) Write down the size of angle b.
Give a reason for your answer.
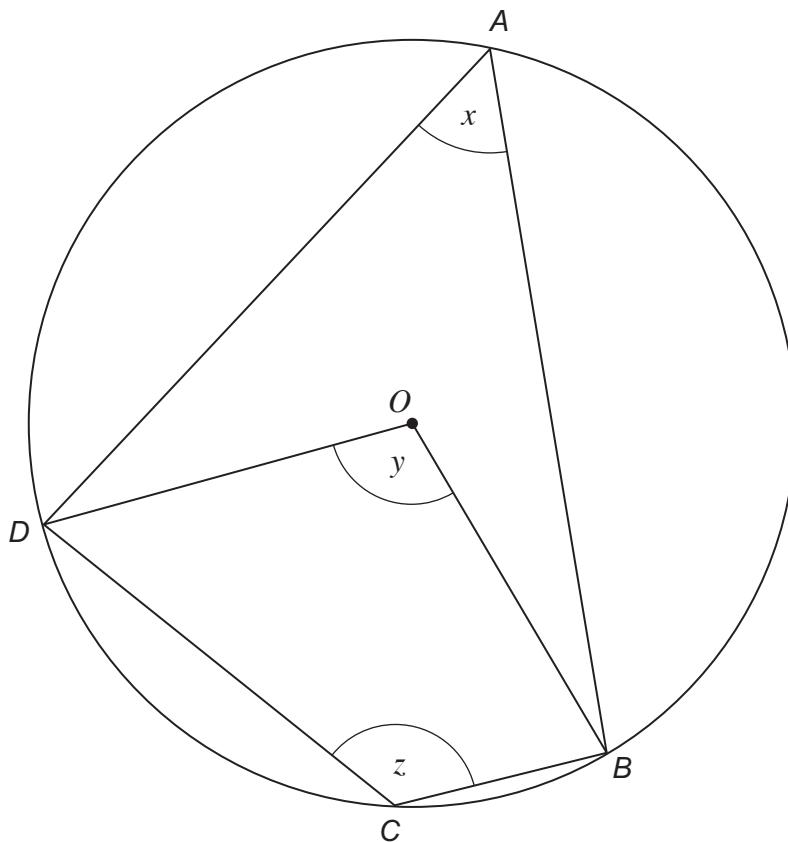
[2 marks]

Not drawn accurately

Answer .... degrees

Reason ....

....

18 (c) *A*, *B*, *C* and *D* are points on a circle, centre *O*.

Not drawn accurately

$x + y + z = 290°$

Work out the values of *x*, *y* and *z*.

[3 marks]

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x = ... degrees

y = ... degrees

z = ... degrees
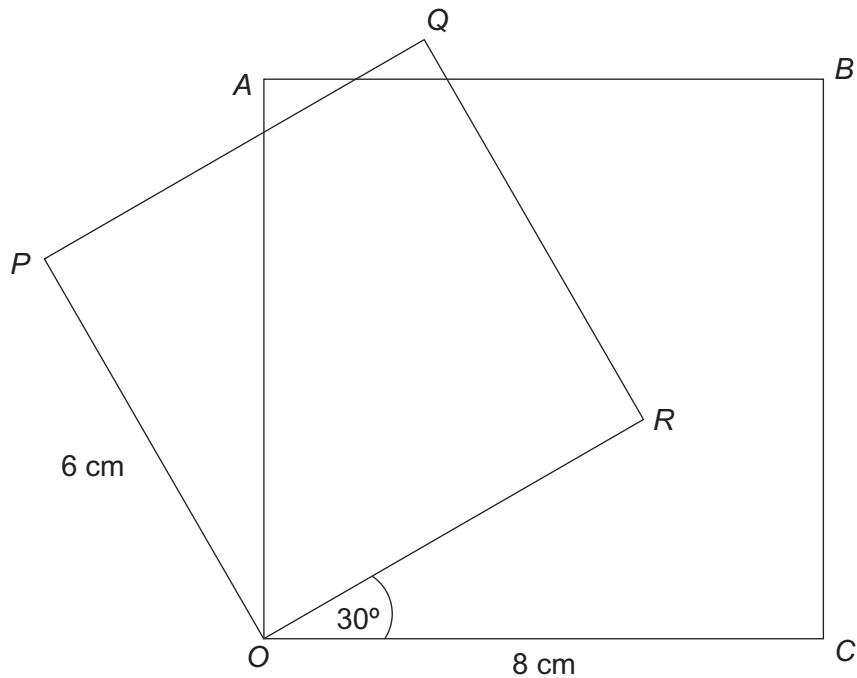
19 *OABC* is a square of side 8 cm
OPQR is a square of side 6 cm
Angle *ROC* is 30º

Not drawn accurately

Prove that triangle *ORC* and triangle *OPA* are congruent.

[4 marks]

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20 Use the quadratic formula to solve $2x^2 - 5x - 4 = 0$
Give your answers to 2 decimal places.

[3 marks]

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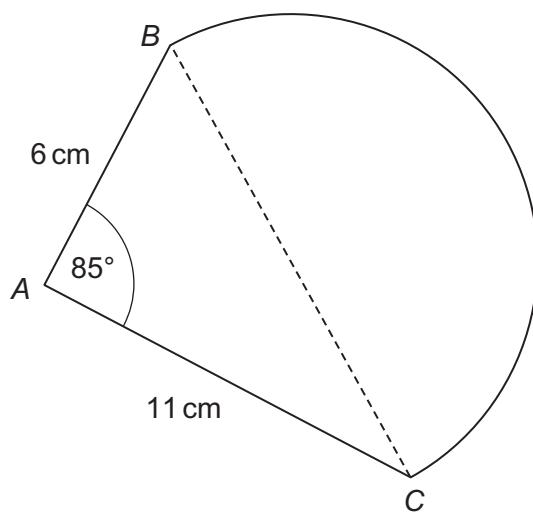
Answer ....

Turn over for the next question

Turn over ▶

21 This shape is made from a semicircle and a triangle.

6 cm

85°

A

B

11 cm

C

Not drawn
accurately

Calculate the perimeter of the shape.

[5 marks]

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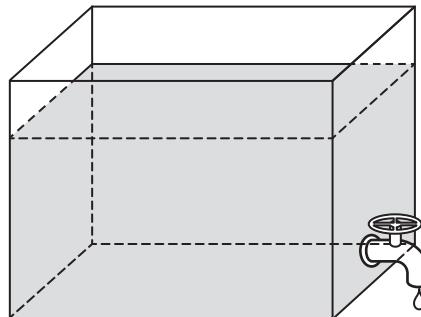
Answer .... cm

22 A water tank contains V m³ of water.
The tank begins to leak.

At the end of each day the tank has lost $\frac{1}{9}$ of the volume of water at the start of the day.

Show that after 6 days the volume of water is **just below** $\frac{V}{2}$ m³

[3 marks]

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**Turn over for the next question**

8
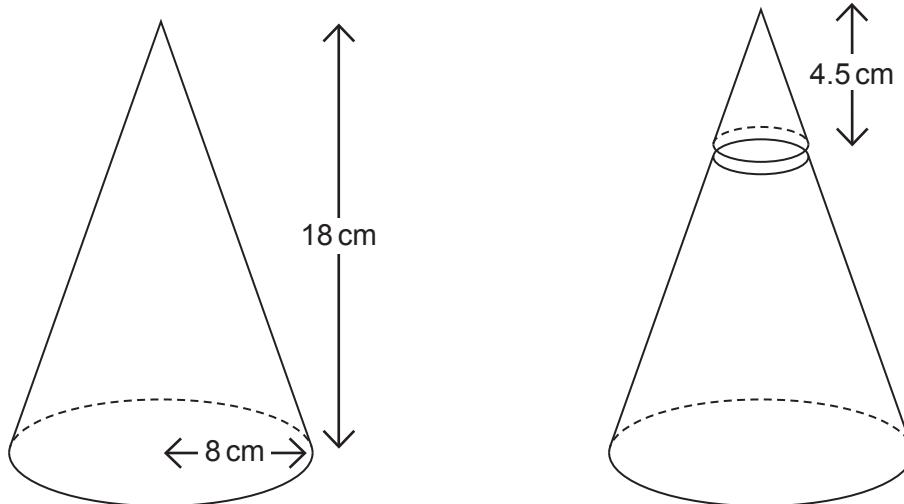
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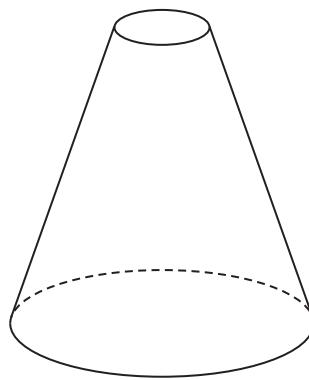
23 A cone has a vertical height of 18 cm and a base radius of 8 cm

A cut is made parallel to the base so that a cone of height 4.5 cm is removed.

18 cm

← 8 cm →

4.5 cm

Calculate the volume of the remaining frustum.

[3 marks]

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Answer .... cm^3

END OF QUESTIONS

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