

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
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TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2013

Methods in Mathematics (Linked Pair Pilot)

93652H

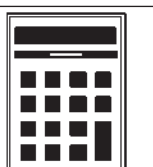
Unit 2 Geometry and Algebra

Friday 21 June 2013 9.00 am to 10.30 am

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 6, 14 and 20. 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.



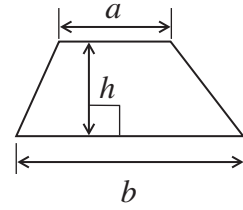
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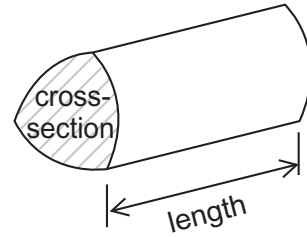
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Formulae Sheet: Higher Tier

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

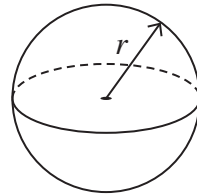


Volume of prism = area of cross-section \times length



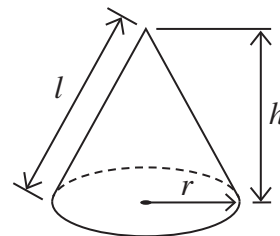
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

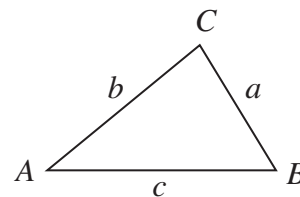


In any triangle ABC

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 Decrease 390 by 5.5%

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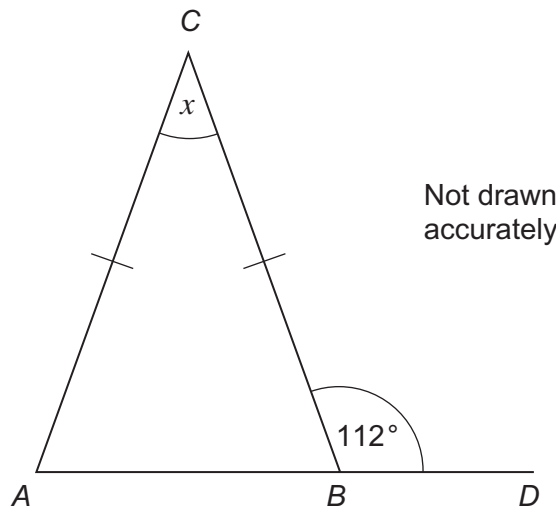
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Answer (3 marks)

2 *ABC* is an isosceles triangle.
ABD is a straight line.
 Angle *CBD* = 112°



Work out the size of angle *x*.
 You **must** show your working, which may be on the diagram.

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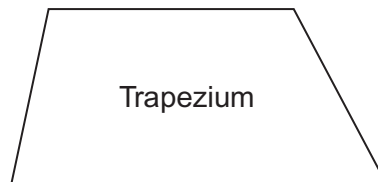
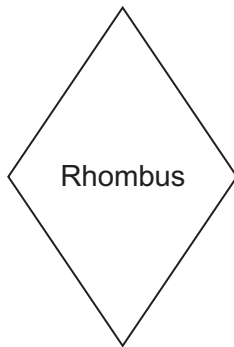
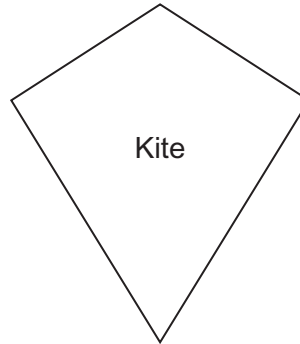
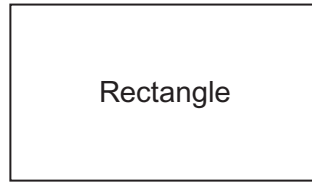
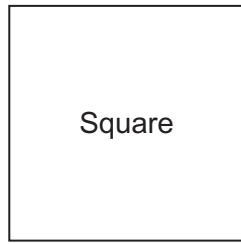
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Answer degrees (3 marks)

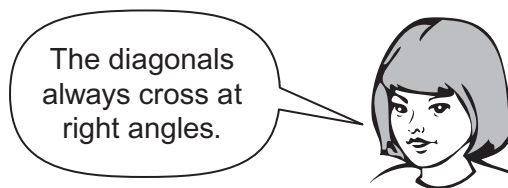
Turn over ►



3 Here are six quadrilaterals.



3 (a) Dana is describing a quadrilateral.



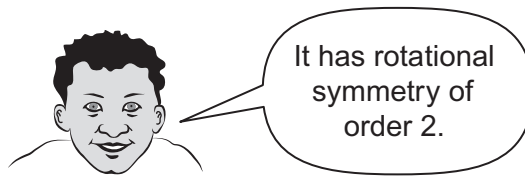
The rhombus is one possible quadrilateral she could be describing.

Write down the names of the other **two** quadrilaterals she could be describing.

Answer and (2 marks)



3 (b) Amir is describing a quadrilateral.



The rhombus is one possible quadrilateral he could be describing.

Write down the names of the other **two** quadrilaterals he could be describing.

Answer and (2 marks)

3 (c) Ed is describing a rhombus.



All quadrilaterals have 4 sides and 4 angles.

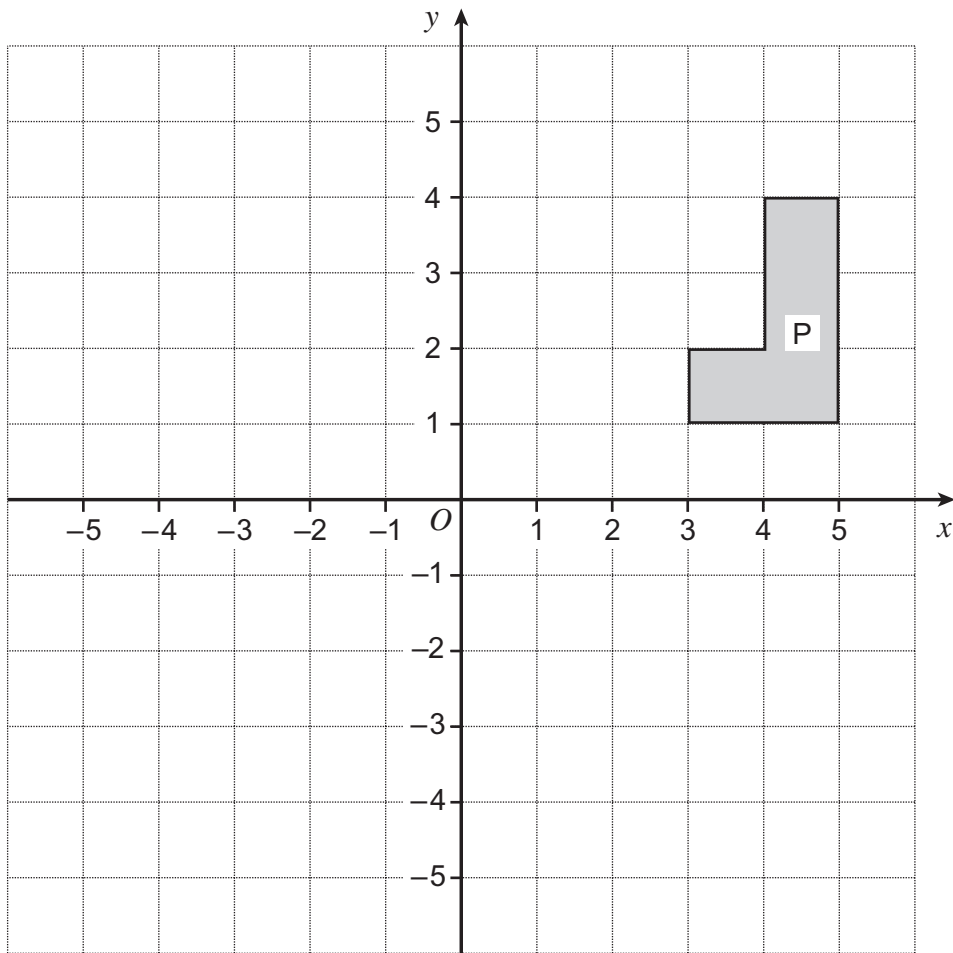
Fill in the empty speech bubble with **another** property of a rhombus.

(1 mark)

Turn over for the next question



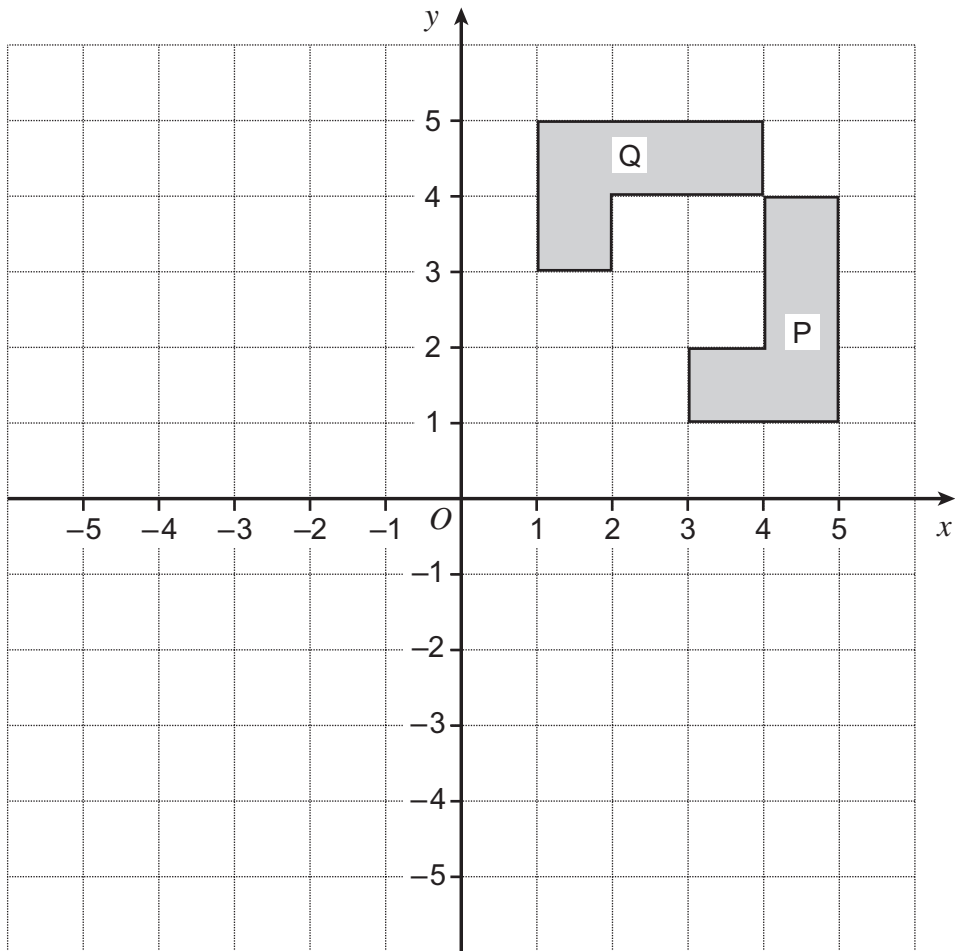
4 (a) Reflect shape P in the line $x = 1$



(2 marks)



4 (b)



Describe the **single** transformation that takes shape P to shape Q.

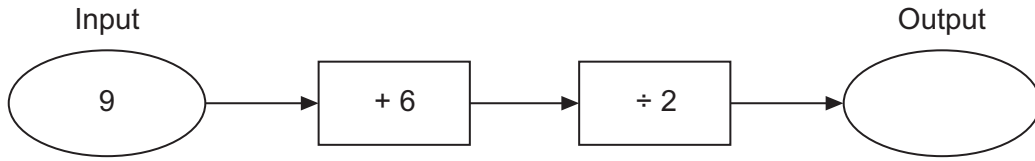
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(2 marks)



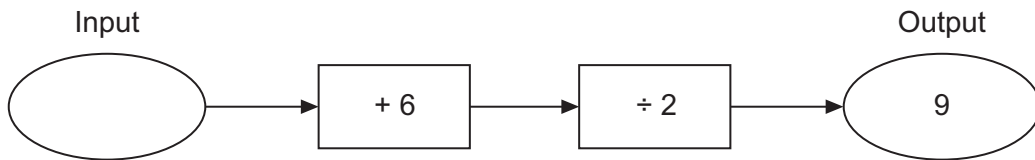
5 (a) Here is a number machine.



Work out the output when the input is 9.

Answer (1 mark)

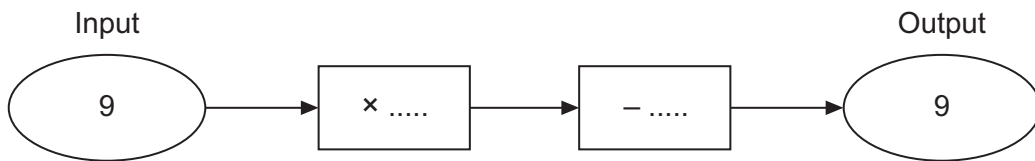
5 (b) Here is the same number machine.



Work out the input when the output is 9.

Answer (1 mark)

5 (c) Here is a different number machine.



Complete possible operations for this number machine.

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(1 mark)

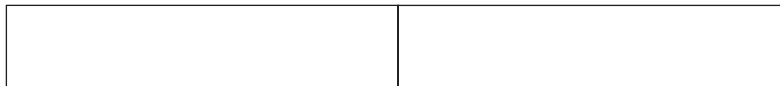


*6 This rectangle has an area of 48 cm^2 .
The perimeter is 32 cm .



Not drawn
accurately

Two of the rectangles are put together.



Not drawn
accurately

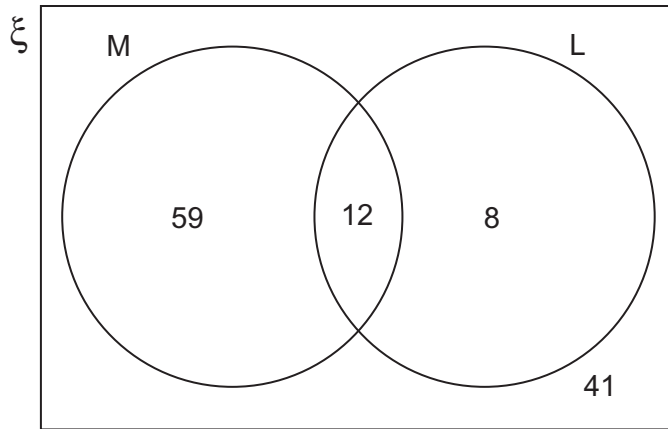
Work out the perimeter of the new shape.

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Answer cm (4 marks)



- 7 The Venn diagram shows information about members of a club.
The number of men is shown in set M.
The number of left-handed members is shown in set L.



- 7 (a) How many members are in the club altogether?

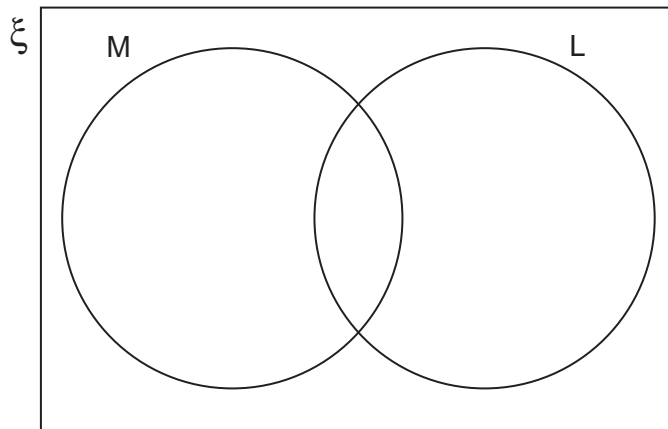
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Answer (1 mark)

- 7 (b) 3 right-handed men leave.
1 left-handed man joins.

2 left-handed women leave.
5 right-handed women join.

Complete this Venn Diagram to show the members of the club now.



(2 marks)



8 (a) Calculate the area of a circle of radius 4.5 cm.

Give your answer to 3 significant figures.

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Answer cm² (3 marks)

8 (b) Calculate the radius of a circle with circumference 93 cm.

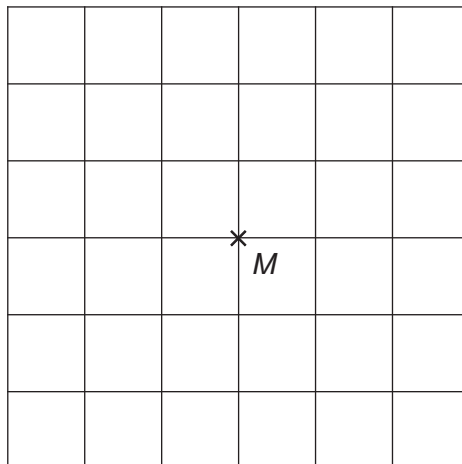
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Answer cm (3 marks)

9 This is a centimetre square grid.

Draw a square on the grid so that

M is the centre of the square
 the **area** of the square is 8 cm².



(2 marks)

Turn over ►



10 (a) Expand and simplify $5(x - 3) - 3(x - 1)$

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Answer (3 marks)

10 (b) Solve the equation $\frac{x + 2}{2} + \frac{2x + 1}{8} = 0$

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$x =$ (4 marks)



11 $x = 2^2 \times 3 \times 5$ $y = 2 \times 3^2 \times 5^2$

11 (a) Work out the Highest Common Factor (HCF) of x and y .

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Answer (1 mark)

11 (b) Work out the Least Common Multiple (LCM) of x and y .

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Answer (2 marks)

Turn over for the next question



12 Here is a formula $F = \frac{X}{Y}$

X **increases** by 25%.

Y **decreases** by 20%.

Work out the percentage increase in F .

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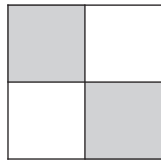
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Answer % (4 marks)

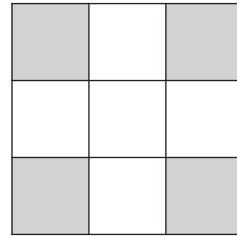


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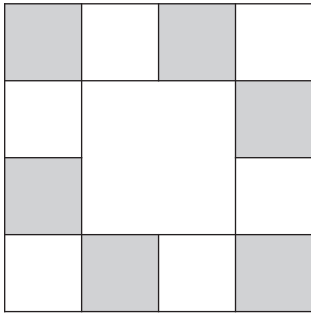
A square pattern is made from shaded and plain tiles.
Jon counts how many shaded tiles are in each square pattern.



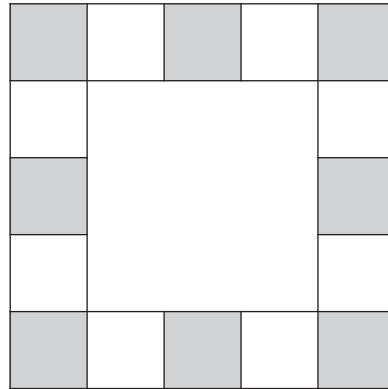
2 shaded tiles



4 shaded tiles



6 shaded tiles



8 shaded tiles

Jon counts 162 shaded tiles around the edges of a square pattern.

How many tiles are along one side of the square?

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Answer

(3 marks)

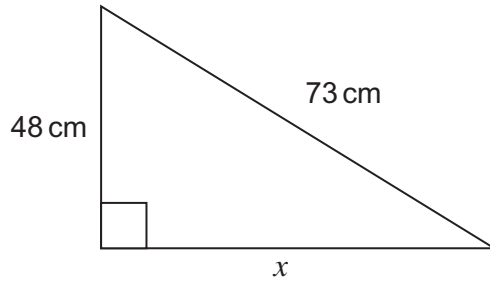
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***14 (a)** Calculate the length x .

You **must** show your working.

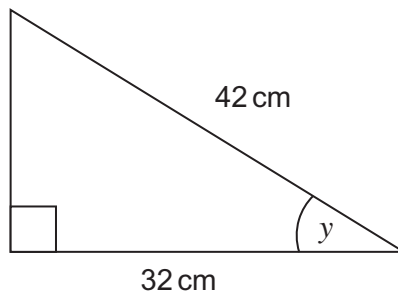


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accurately

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Answer cm (3 marks)

14 (b) Calculate the angle y .



Not drawn
accurately

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Answer degrees (3 marks)



15 (a) Show that $(x - 9)(x - 1) \equiv x^2 - 10x + 9$

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(1 mark)

15 (b) Solve $x^2 - 10x + 9 = x - 1$

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$x = \dots\dots\dots$ or $x = \dots\dots\dots$ (3 marks)

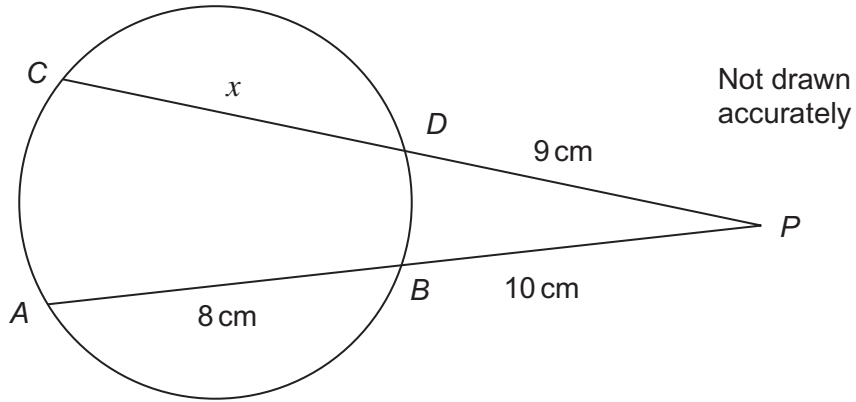
Turn over for the next question



16

AB and CD are two chords of a circle that intersect outside the circle at P .

$DP = 9\text{ cm}$, $AB = 8\text{ cm}$, $BP = 10\text{ cm}$.



Work out the length of CD marked x in the diagram.

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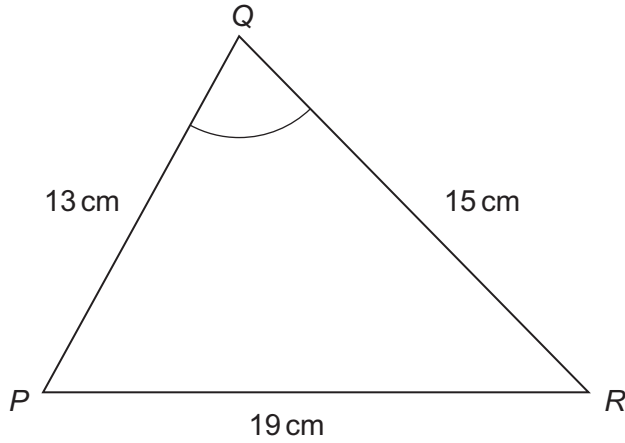
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Answer cm (3 marks)



17 Work out the size of angle PQR .



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accurately

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Answer degrees (3 marks)

Turn over for the next question



18

Simplify fully

$$\frac{4x^2 - 9}{2x^2 + x - 3}$$

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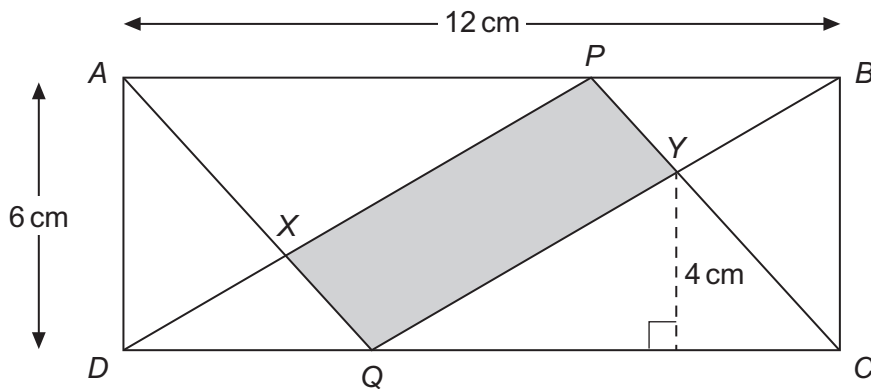
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Answer (4 marks)



19 *ABCD* is a rectangle.

P and *Q* are such that $AP : PB = CQ : QD = 2 : 1$



Not drawn accurately

Show that the shaded area is 16 cm^2 .

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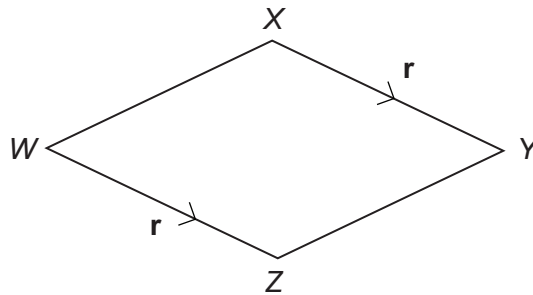
(4 marks)

Turn over ►



***20 (a)** WXYZ is a quadrilateral.

$\vec{WZ} = \mathbf{r}$ and $\vec{XY} = \mathbf{r}$



Not drawn
accurately

Explain why WXYZ must be a parallelogram.

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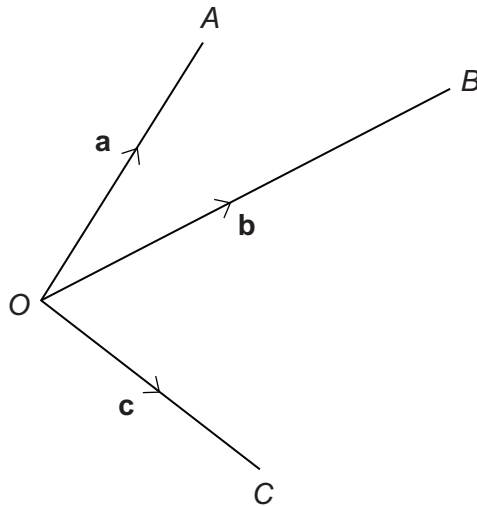
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(1 mark)

20 (b) O, A, B and C are four points.

$\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$ and $\vec{OC} = \mathbf{c}$



Not drawn
accurately

The vector $\vec{AC} = \mathbf{c} - \mathbf{a}$

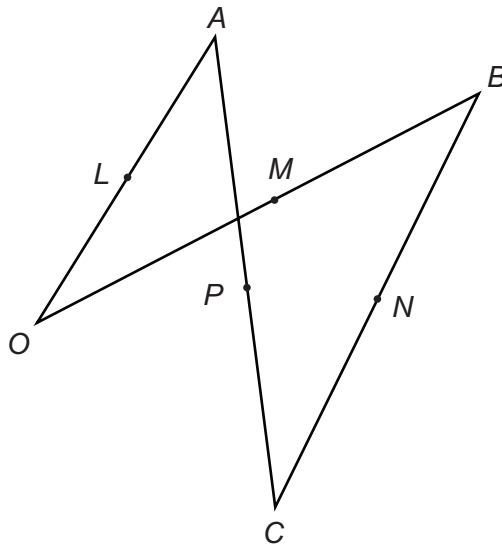
Write down the vector \vec{CB} in terms of \mathbf{b} and \mathbf{c} .

Answer

(1 mark)



- 20 (c) The four points O, A, B and C are joined as shown.
 L, M, N and P are the midpoints of OA, OB, CB and AC respectively.



Not drawn
accurately

Show that $\vec{LP} = \frac{1}{2} \mathbf{c}$

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(2 marks)

- 20 (d) Prove that $LMNP$ is a parallelogram.

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(2 marks)

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

