Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
November 2013

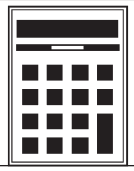
Methods in Mathematics (Linked Pair Pilot) 93652H

H

Unit 2 Geometry and Algebra

Monday 11 November 2013 9.00 am to 10.30 am

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed
- 1 hour 30 minutes

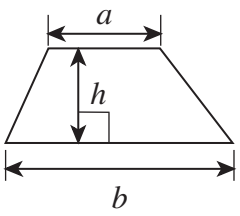
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this 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 4, 5, 11 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.

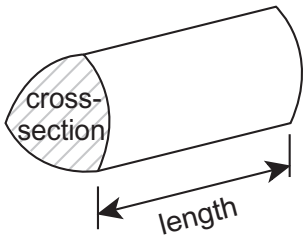
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

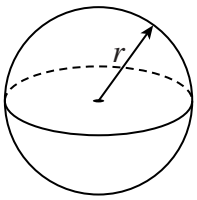


Volume of prism = area of cross-section × length



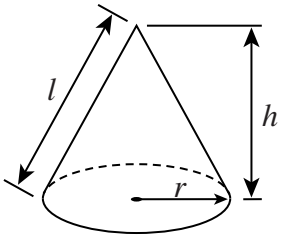
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

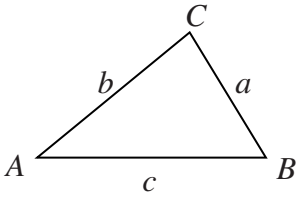
Curved surface area of cone = $\pi r l$



In any triangle ABC

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

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



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) Use your calculator to work out $\dfrac{27.4 \times 12.2}{16.3 - 4.8}$

Give your answer as a decimal.
Write down all the figures in your calculator display.

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Answer ..... *(1 mark)*

1 (b) Give your answer to 1 significant figure.

.....

Answer ..... *(1 mark)*

2 Bob adds together two **different** prime numbers.

The total is **between** 24 and 30

Which two prime numbers could Bob have added?

.....

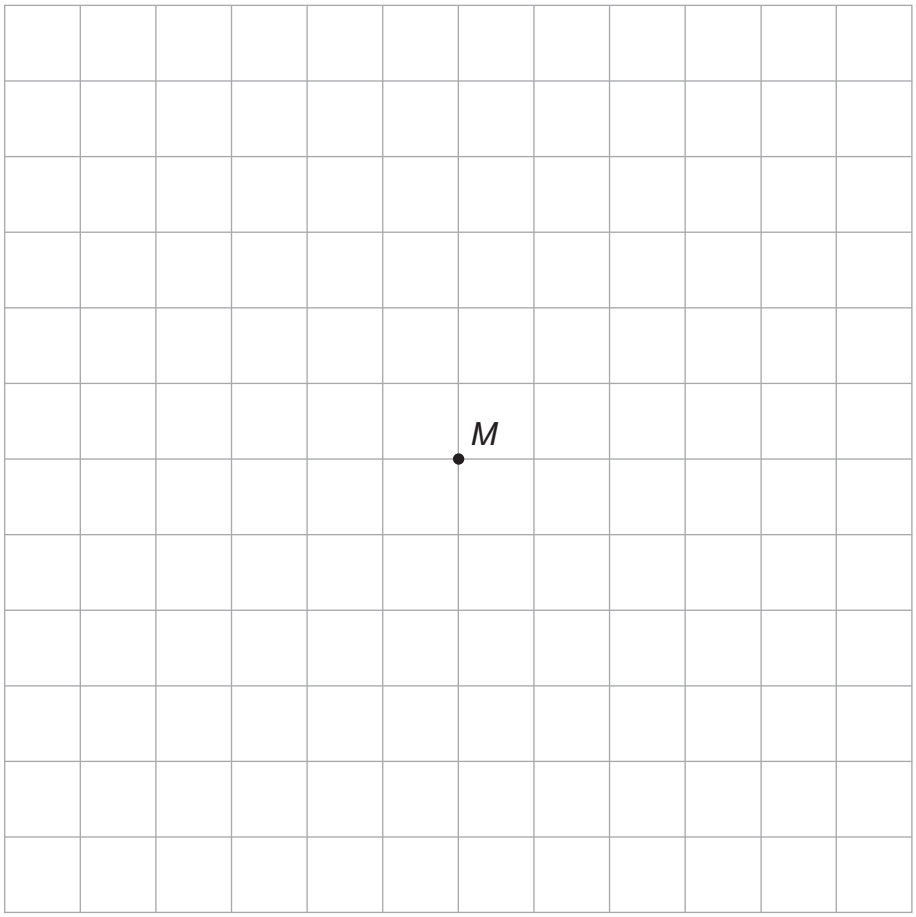
.....

Answer ..... and ..... *(2 marks)*

4

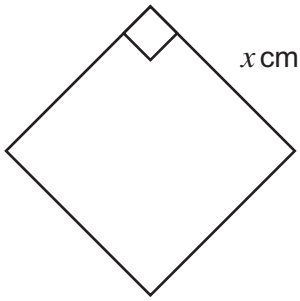
3 *M* is the centre of a rectangle with an area of 12 cm^2

Draw a possible rectangle on grid.

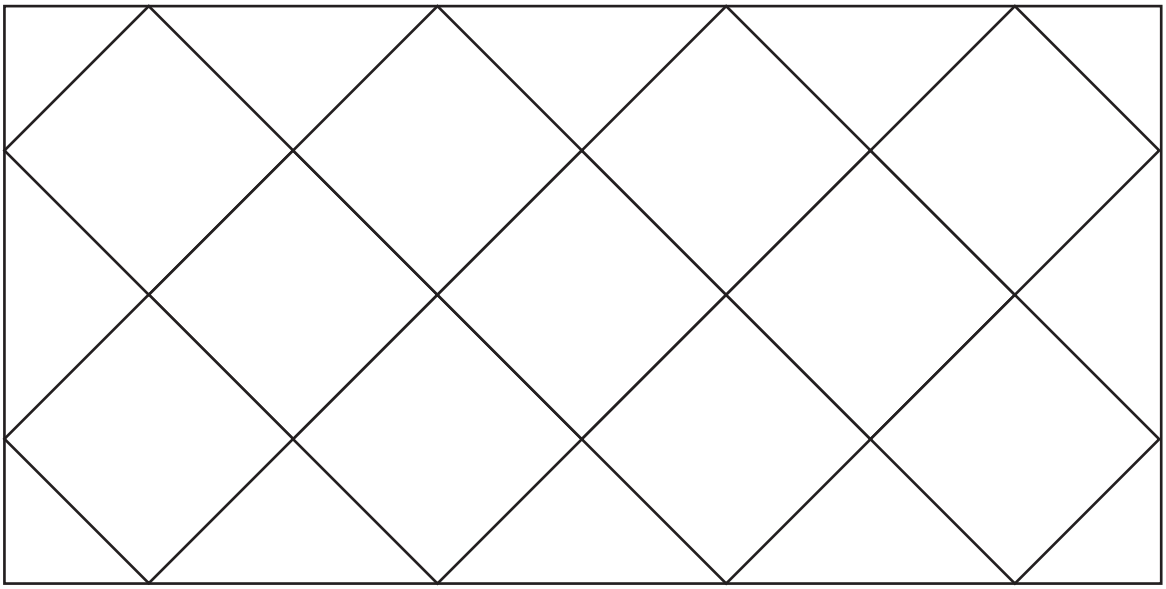


(2 marks)

***4** This square has a side of x cm



A rectangle is drawn around 11 of these squares as shown.



Show clearly that the area of the rectangle is $16x^2$ cm^2
Some of your working may be on the diagram.

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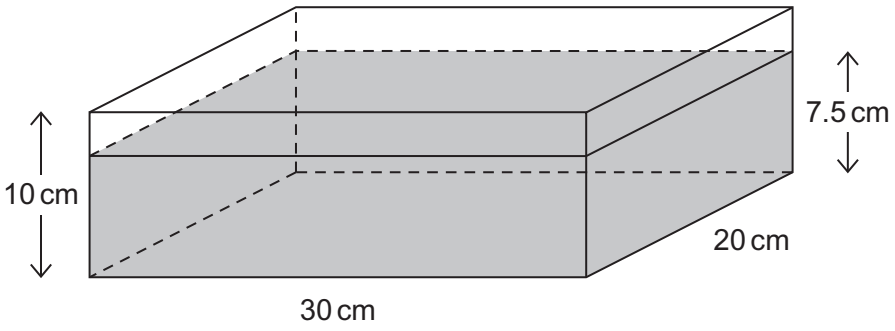
(4 marks)

6

Turn over ▶

***5** A sealed hollow glass container is a 30 cm by 20 cm by 10 cm cuboid.
It contains some coloured water.
When placed on the 30 cm by 20 cm face the depth of the water is 7.5 cm



7.5 cm is three-quarters of 10 cm

The cuboid can be placed on any face.

Show that the depth of the water will always be three-quarters of the vertical height.

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(4 marks)

6 Solve $4(3y - 1) = 28$

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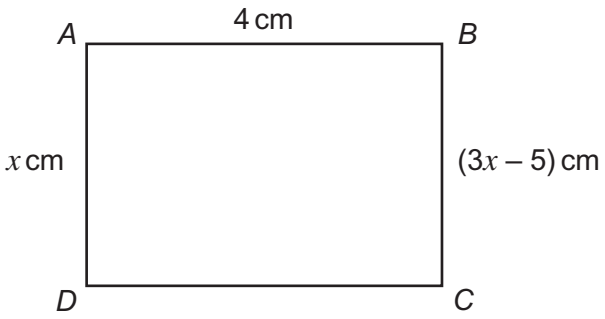
$y =$ ..... *(3 marks)*

7 *ABCD* is a rectangle.



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Work out the perimeter of the rectangle *ABCD*.

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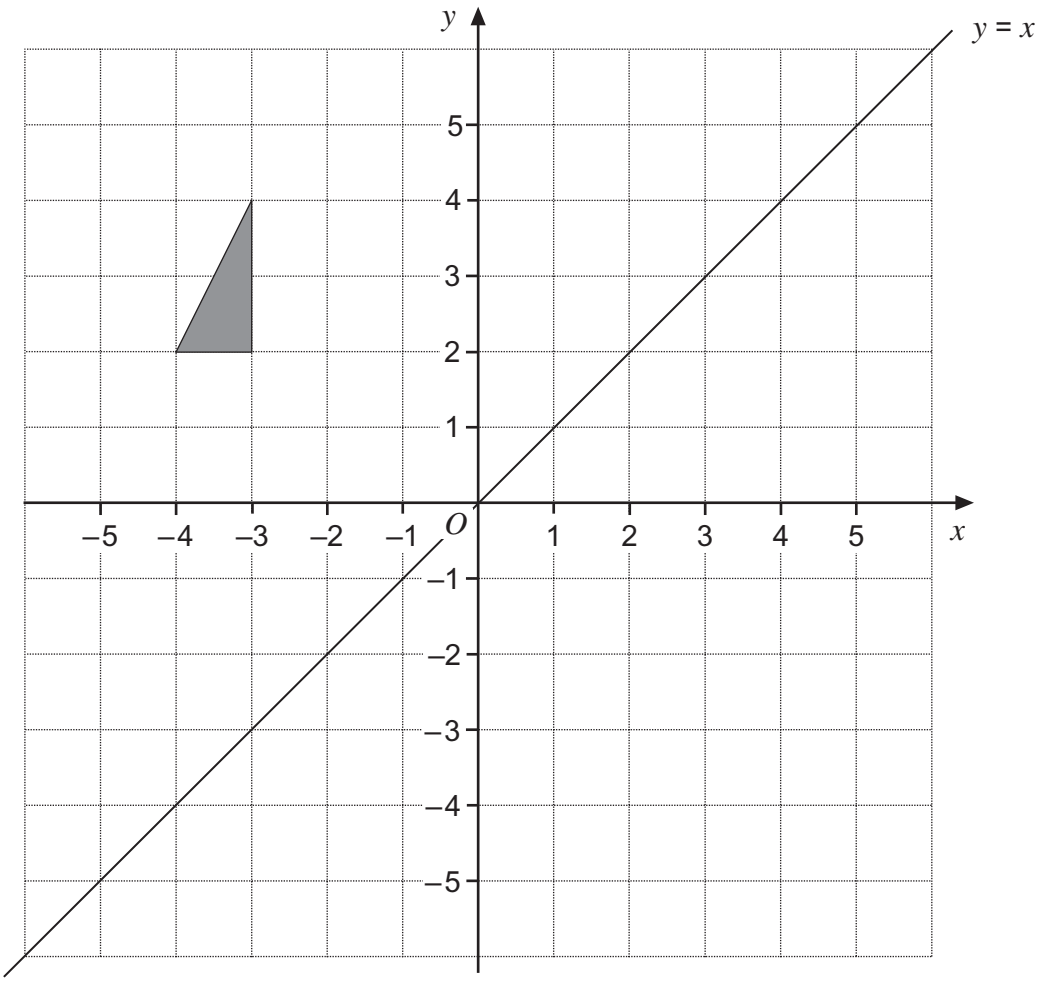
Answer ..... cm *(3 marks)*

10

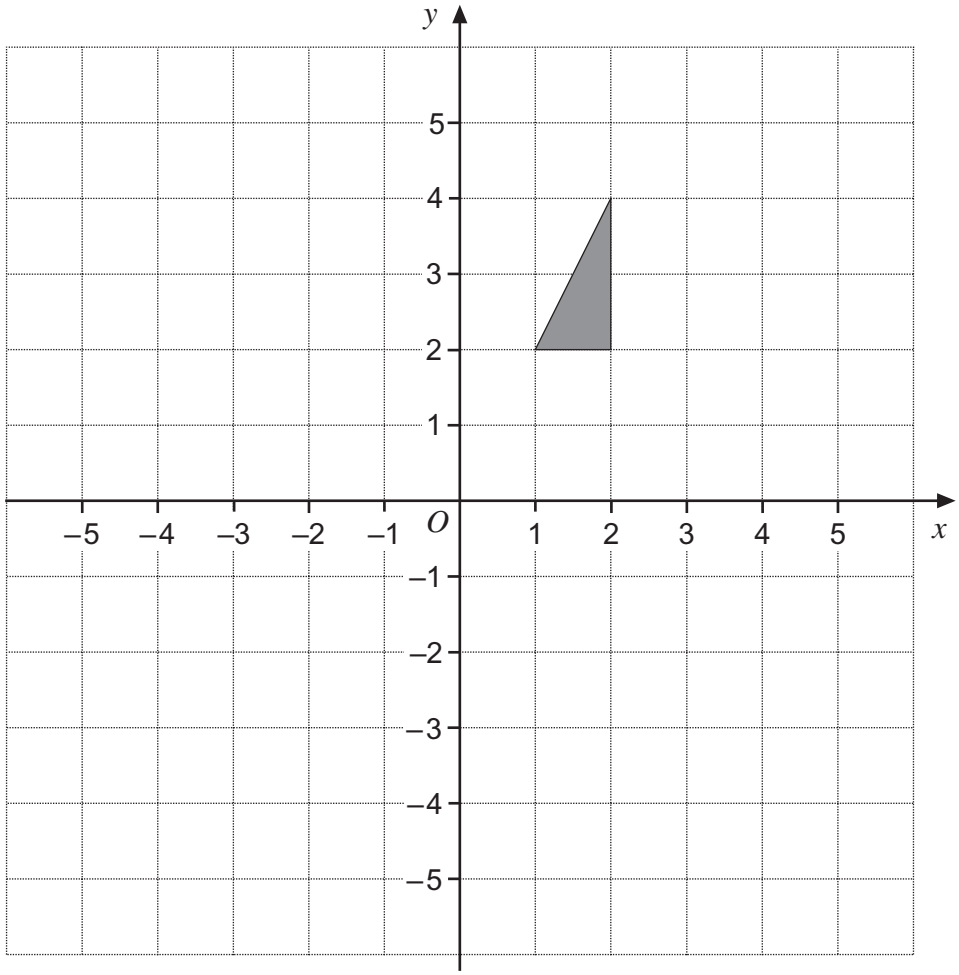
8 (a)



Reflect the shaded triangle in the line $y = x$

(2 marks)

8 (b)



Rotate the shaded triangle 90º anti-clockwise about (0, 2).

(2 marks)

Turn over for the next question

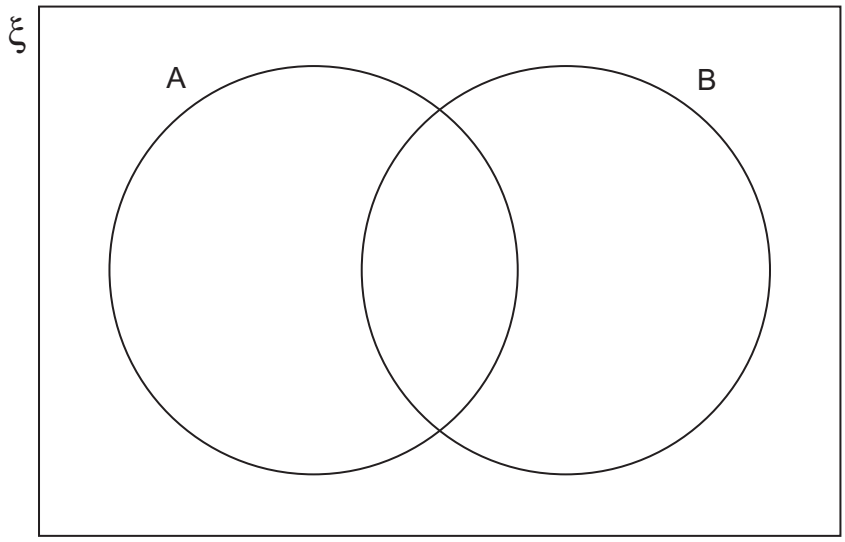
4

9 (a) Write the numbers from 1 to 12 inclusive in the correct position in this Venn Diagram.

$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

Set A = Factors of 12

Set B = Multiples of 3



(2 marks)

9 (b) Work out the Least Common Multiple (LCM) of the numbers in Set B.

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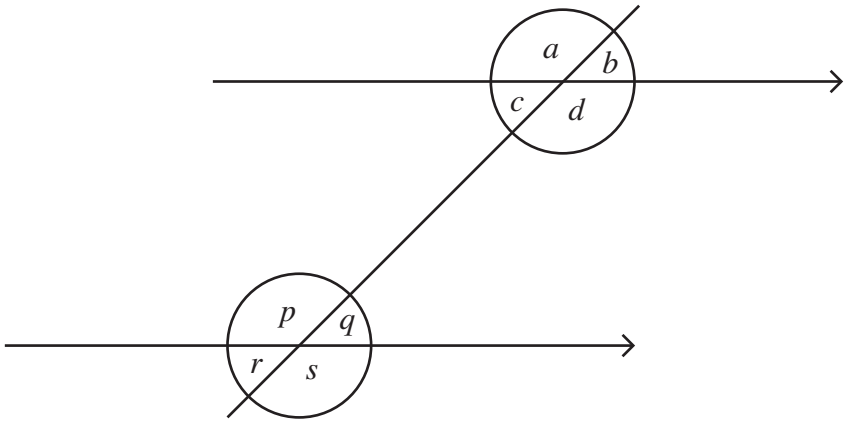
Answer ..... *(2 marks)*

10 (a)



Choose pairs of angles to make these sentences true.

The first one has been done for you.

Angle c and angle q are **alternate** angles.

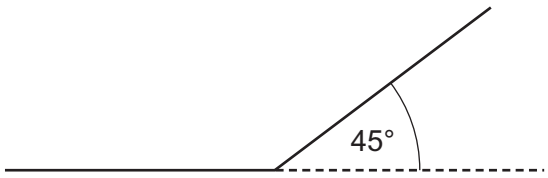
Angle ..... and angle ..... are **corresponding** angles.

Angle ..... and angle ..... are **vertically opposite** angles.

Angle ..... and angle ..... are **interior** angles.

(3 marks)

10 (b) A regular polygon has an exterior angle of 45º



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How many sides does this polygon have?

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Answer ..... *(2 marks)*

9

Turn over ▶

11 (a) The nth term of a linear sequence is given by $3n - 10$

Work out the first 5 terms of the sequence.

.....

.....

Answer ..... , ... , ... , ... , ... *(2 marks)*

11 (b) Work out the nth term of the linear sequence.

90 82 74 66 58 ...

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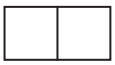
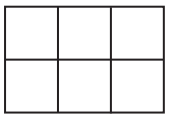
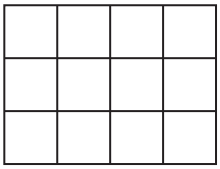
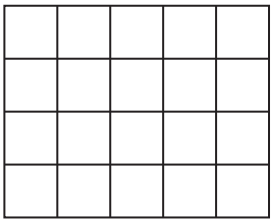
Answer ..... *(2 marks)*

***11(c)** Centimetre squares are used to make rectangles.

Diagrams are not drawn to scale.

Rectangle number	1	2	3	4
Rectangle				
Area (cm^2)	2	6	12	20

Show clearly that the area of the nth rectangle is $(n^2 + n)$ cm^2

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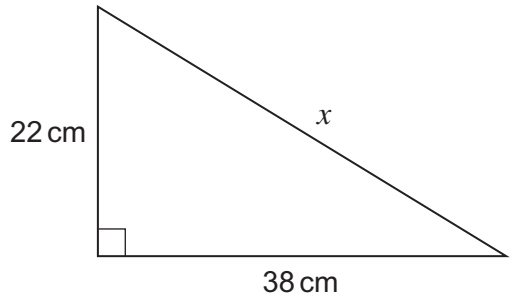
(3 marks)

Turn over for the next question

7

12 (a) Work out the length x in the right-angled triangle.



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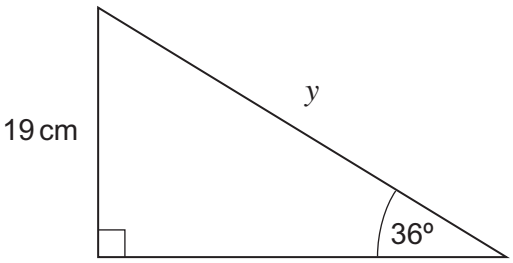
Answer ..... cm *(3 marks)*

12 (b) Work out the length y in the right-angled triangle.



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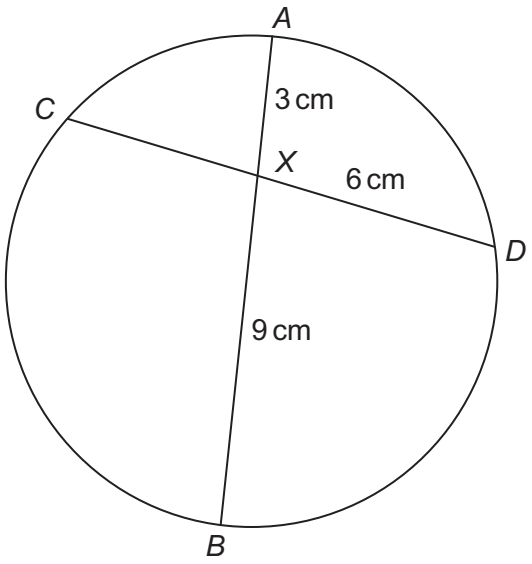
Answer ..... cm *(3 marks)*

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

AX = 3 cm, *XB* = 9 cm, *XD* = 6 cm



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Calculate the length *CX*.

.....

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Answer ..... cm *(3 marks)*

Turn over for the next question

9

14 Solve $\frac{x + 1}{3} + \frac{x + 5}{4} = 1$

You **must** show your working.
Do **not** use trial and improvement.

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x = ... *(4 marks)*

15 A quantity is divided in the ratio 2 : 5

The larger share is 45 more than the smaller share.

What was the original quantity?

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Answer ..... *(3 marks)*

16 Use the quadratic formula to solve $3x^2 - 5x - 3 = 0$
Give your answers to 2 decimal places.

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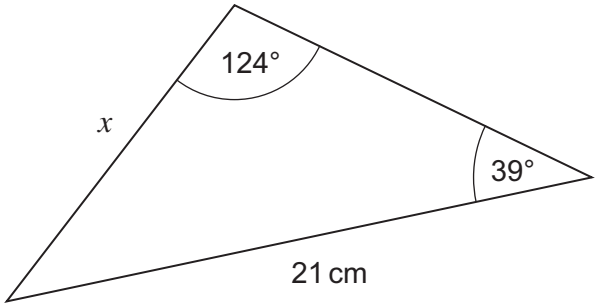
Answer ..... *(3 marks)*

Turn over for the next question

10

17 (a) Work out the length x.



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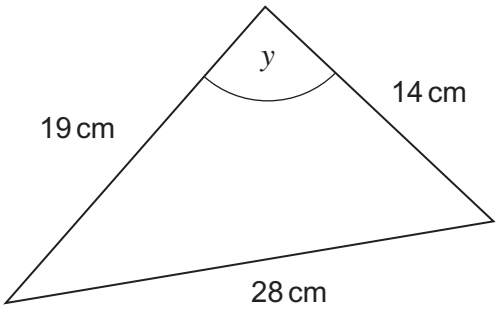
Answer ..... cm *(3 marks)*

17 (b) Work out the size of angle y.



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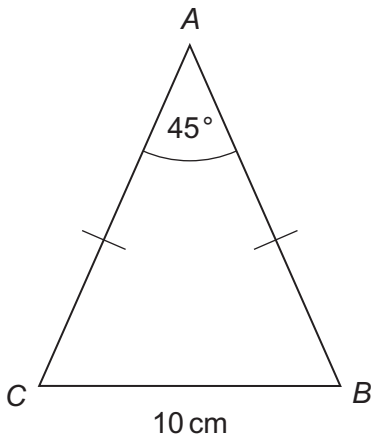
Answer ..... degrees *(3 marks)*

Turn over for the next question

6

18 (a) *ABC* is an isosceles triangle.

Show that the area of *ABC* is 60.4 cm^2 to 3 significant figures.



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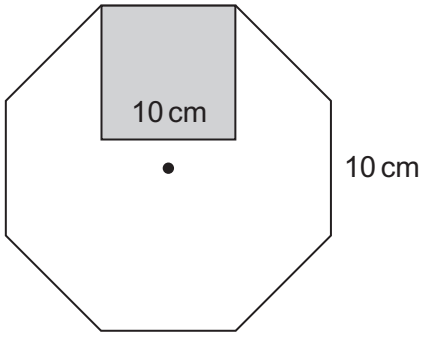
(3 marks)

18 (b) A square of side 10 cm is drawn inside a regular octagon of side 10 cm



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Use your answer to (a) to work out what percentage of the octagon is shaded.

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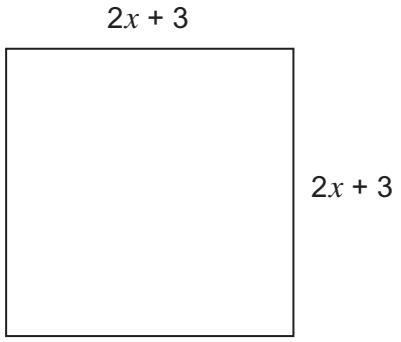
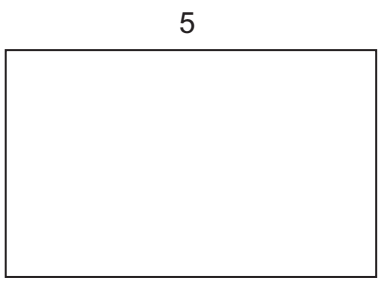
Answer ..... % *(3 marks)*

Turn over for the next question

6

19 The **square** and the **rectangle** have the same area.
All lengths are in centimetres.





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19 (a) Show that $4x^2 - 3x - 1 = 0$

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(3 marks)

***19(b)** Work out the value of x.

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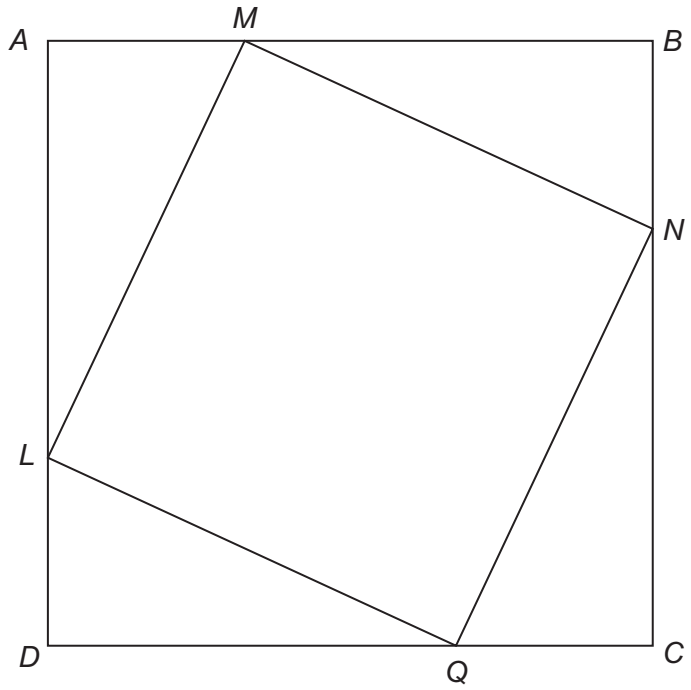
x = ... *(2 marks)*

20 *ABCD* and *LMNQ* are squares.

AM = *BN* = *CQ* = *DL*



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Prove that triangles *LAM* and *MBN* are congruent.

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(4 marks)

END OF QUESTIONS

9

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED