

Centre Number						Candidate Number				
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For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
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14 – 15	
16 – 17	
18 – 19	
20 – 21	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
June 2015

# Mathematics (Linear)

4365/1H

## Paper 1

H

Thursday 4 June 2015 9.00 am to 10.30 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>mathematical instruments.</li> </ul> <p>You must <b>not</b> use a calculator.</p>	
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### 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.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- The quality of your written communication is specifically assessed in Questions 5, 19 and 21. These questions are indicated with an asterisk (\*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

### Advice

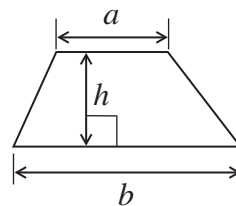
- In all calculations, show clearly how you work out your answer.



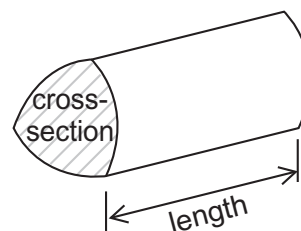
J U N 1 5 4 3 6 5 1 H 0 1

### Formulae Sheet: Higher Tier

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

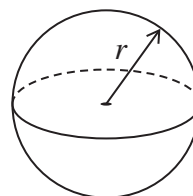


**Volume of prism** = area of cross-section  $\times$  length



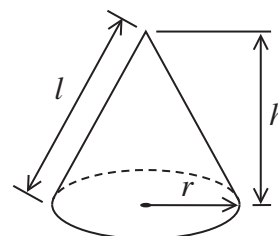
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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

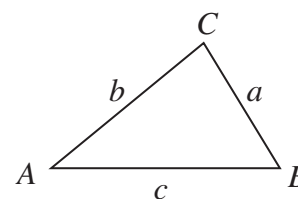


**In any triangle ABC**

**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)**      Multiply out       $5(3x + 7)$  **[1 mark]**

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.....

Answer .....

**1 (b)**      Make  $w$  the subject of the formula       $z = w + 3$  **[1 mark]**

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Answer .....

**1 (c)**      Factorise fully       $4y^2 + 6y$  **[2 marks]**

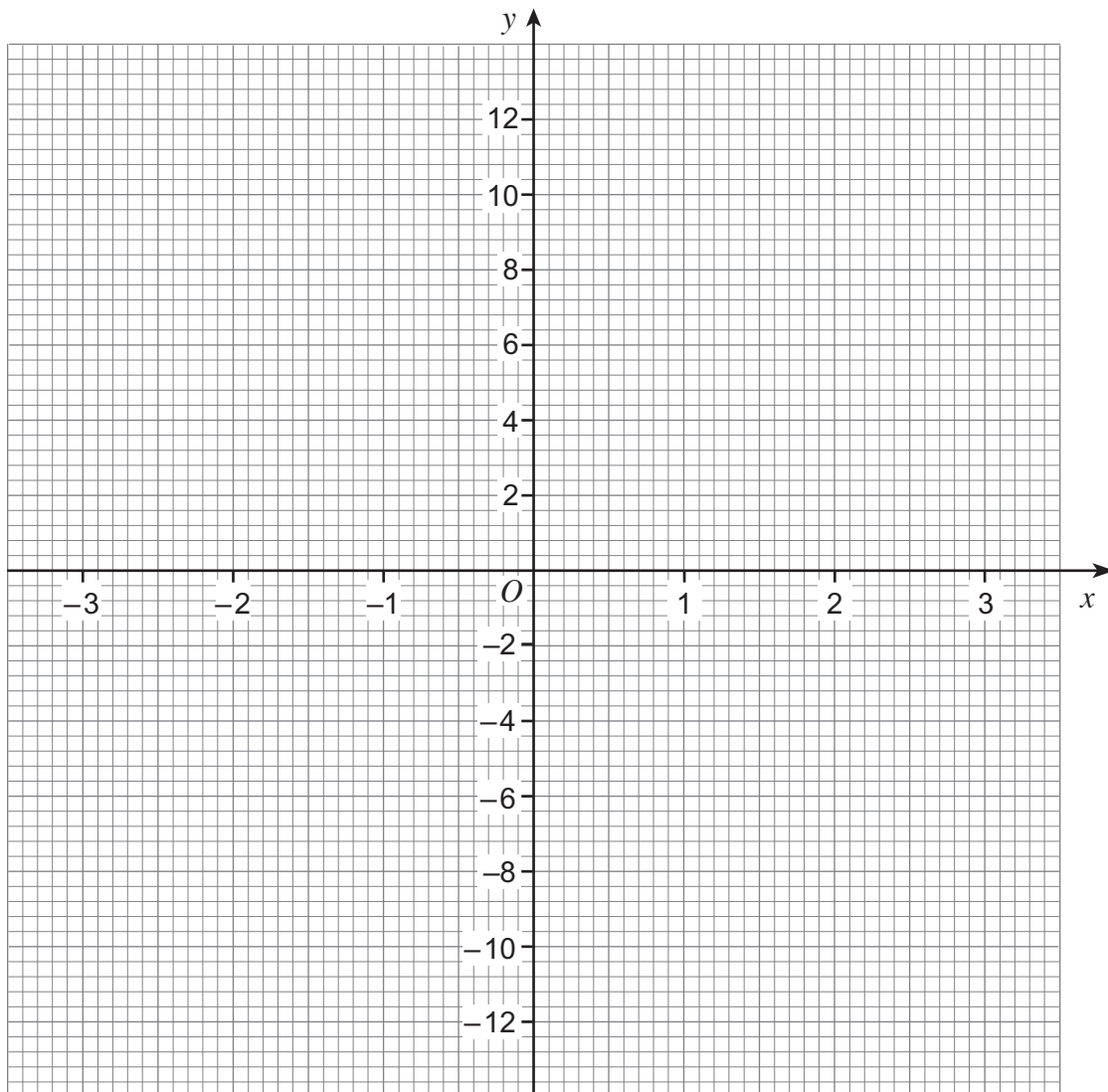
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Answer .....



2 Draw the graph of  $y = 3x - 2$  for values of  $x$  from  $-3$  to  $3$

[3 marks]



**3** These instructions are on a bottle of lawn feed.

‘Mix 200 millilitres of lawn feed with 10 litres of water.’

How many millilitres of lawn feed should be mixed with 3 gallons of water?  
Use 1 gallon = 4.5 litres

**[3 marks]**

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Answer ..... millilitres

**Turn over for the next question**



- 4 The table shows information about water used in a household.  
The value for April is missing.

Month	Water used (m <sup>3</sup> )
January	16.2
February	18.1
March	15.9
April	
May	17.8
June	21.0

The mean monthly water used for the six months is 18 m<sup>3</sup>

Work out the value for April.

**[3 marks]**

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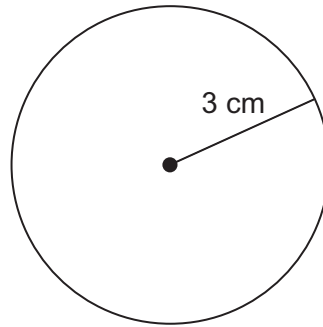
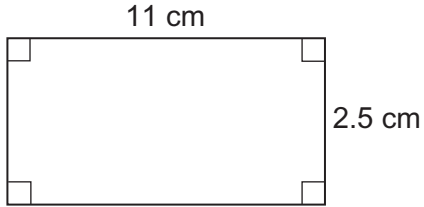
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Answer ..... m<sup>3</sup>



\*5 Which has the **greater** area?



Not drawn  
accurately

Use  $\pi = 3.1$   
You **must** show your working.

[3 marks]

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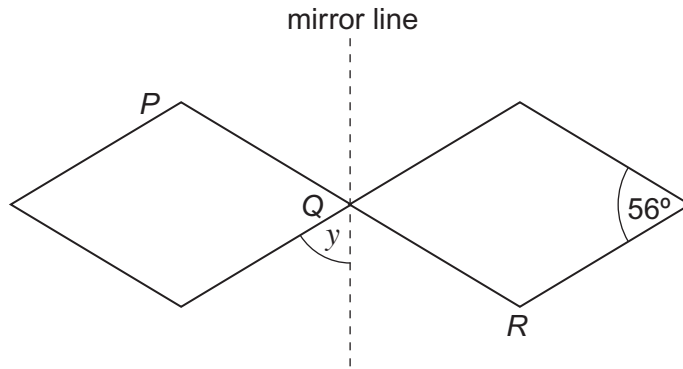
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Answer .....



6 A rhombus is reflected in a mirror line as shown.  
 PQR is a straight line.



Not drawn accurately

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

[2 marks]

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Answer ..... degrees

7 The first buses to X and Y leave a bus station at 7 am

Buses to X leave every 25 minutes.

Buses to Y leave every 20 minutes.

When will the buses to X and Y next leave at the same time?

[3 marks]

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Answer .....





**8** Six whole numbers have

a median of 10

a mode of 11

a range of 4

Work out a possible set of six numbers.  
Write the numbers in order.

**[3 marks]**

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Answer ..... , ..... , ..... , ..... , ..... , .....

**Turn over for the next question**

8
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**Turn over** ►



**9** A fishing lake contains thousands of fish.  
The fish are Carp, Bream or Roach.

10 fish are caught.  
The table shows some of the results.

	Carp	Bream	Roach
Frequency	4		
Relative frequency		0.1	

**9 (a)** Complete the table.

**[3 marks]**

**9 (b)** The owner uses the results to estimate the proportion of Carp in the lake.

How can she make her estimate more reliable?

**[1 mark]**

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.....

**10** Here is a linear sequence.

46      40      34      28      22      .....

Work out the  $n$ th term of the sequence.

**[2 marks]**

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Answer .....



11

You will need a ruler and a pair of compasses to answer this question.

Construct the perpendicular **from** point  $P$  to the line  $L$ .  
You **must** show your construction arcs.

**[3 marks]** $P$  $\times$  $L$ 

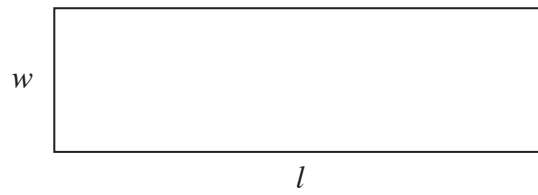
9

Turn over ►



**12** In this question all lengths are in centimetres.

A rectangle has length  $l$  and width  $w$ .



Not drawn  
accurately

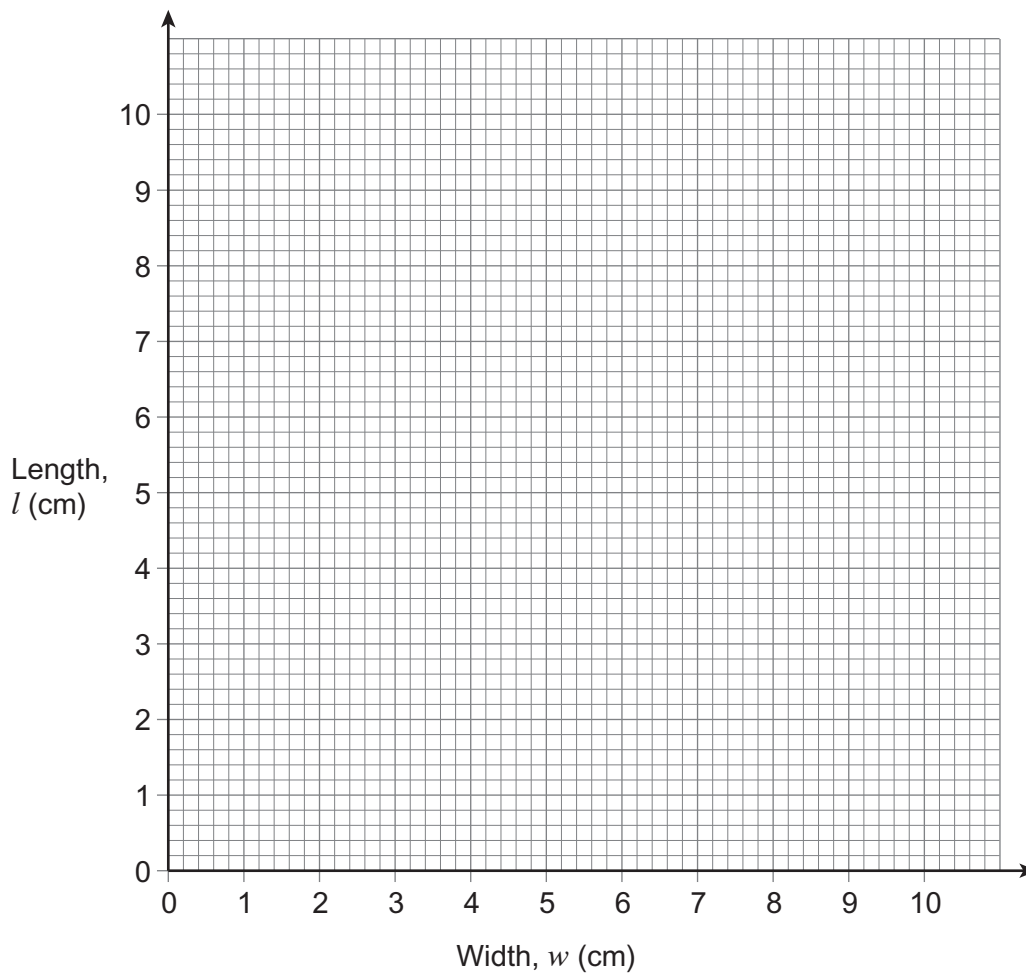
**12 (a)**  $w$  and  $l$  are such that

$$1 \leq w \leq 9$$

$$w + l = 10$$

Show this information on the graph.

**[2 marks]**



12 (b)

Use the graph, or otherwise, to work out the value of  $w$  when  $l = 3w$   
You **must** show your working.

[2 marks]

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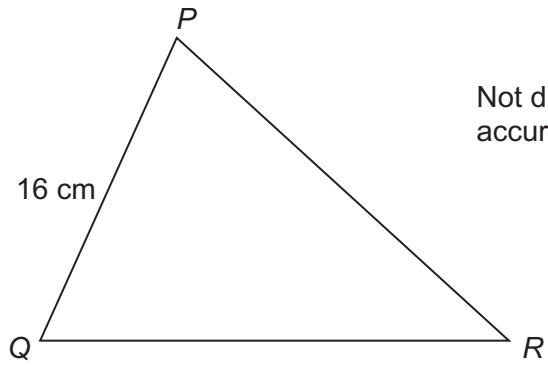
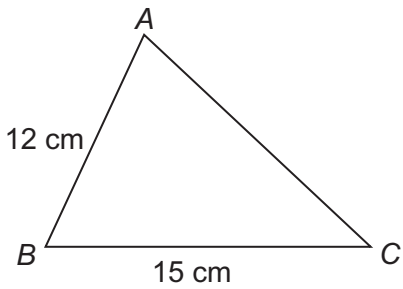
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Answer .....

13

Triangles  $ABC$  and  $PQR$  are similar.



Not drawn  
accurately

Work out the length  $QR$ .

[2 marks]

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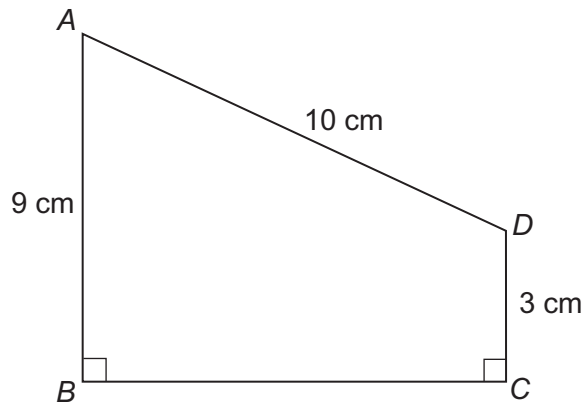
Answer ..... cm

6
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Turn over ►



14 *ABCD* is a trapezium.



Not drawn  
accurately

Work out the length of *BC*.  
You **must** show your working.

**[4 marks]**

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Answer ..... cm



15 Work out the smallest integer value that satisfies the inequality

$$5x + 2 > 3x + 7$$

[3 marks]

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Answer .....

16 (a) Line *M* has the equation  $3x + 2y = 7$

Circle the gradient of line *M*.

[1 mark]

- 3                       $-\frac{3}{2}$                       3                       $\frac{3}{2}$

16 (b) Line *N* has the equation  $y = 5 - \frac{3}{4}x$

Circle the gradient of a line that is **perpendicular** to line *N*.

[1 mark]

- $-\frac{4}{3}$                        $\frac{3}{4}$                        $\frac{4}{3}$                       3



- 17 Dan is a vet.  
In February he saw 250 customers.

82 were dog owners.  
107 were cat owners.  
61 were owners of other pets.

Dan wants to survey a sample of customers.  
He chooses a sample of 50, stratified by the type of pet.

Complete the table.

[3 marks]

	Dog owners	Cat owners	Owners of other pets	Total
Number of customers	82	107	61	250
Number in sample				50





18

Simplify

$$\frac{9a^2 - b^2}{3a - b}$$

**[2 marks]**

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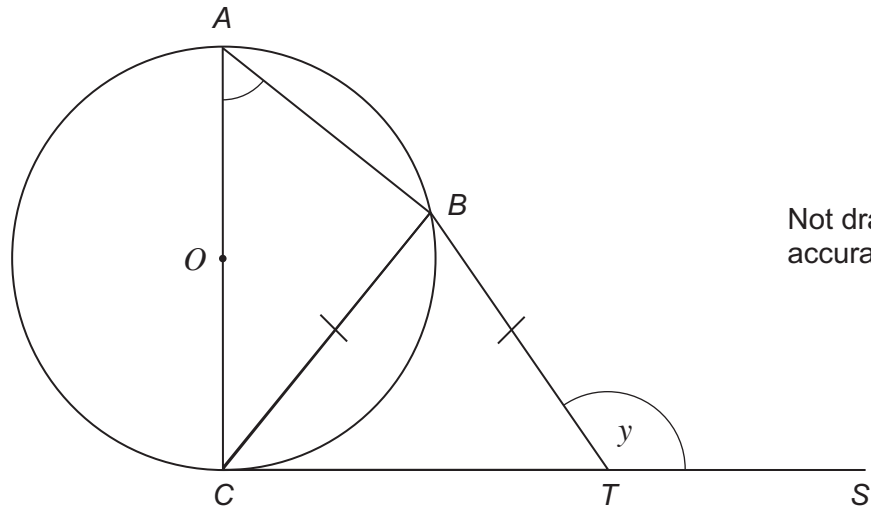
Answer .....

**Turn over for the next question**

5
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**Turn over ►**

- 19** AC is a diameter of a circle, centre  $O$ .  
 CTS is a tangent to the circle.  
 B is a point on the circumference of the circle such that  $BC = BT$   
 Angle  $BTS = y$



Not drawn  
accurately

- \*19 (a)** Prove that angle  $CAB = 180^\circ - y$   
 Give reasons for any angles you write down or calculate.

**[3 marks]**

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**19 (b)** You are given that angle  $ACB = 20^\circ$

Work out the value of  $y$ .

You **must** show your working which may be on the diagram.

**[2 marks]**

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Answer ..... degrees

**Turn over for the next question**

5
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**Turn over** ►



20 (a) Simplify fully  $\frac{m^3 \times m^5 \times m}{m^2 \times m^4}$

[1 mark]

.....  
.....

Answer .....

20 (b) Expand and simplify  $(3 + \sqrt{2})(5 - \sqrt{2})$

[2 marks]

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Answer .....

20 (c) Work out the value of  $25^{-\frac{1}{2}} \times 81^{\frac{3}{4}}$

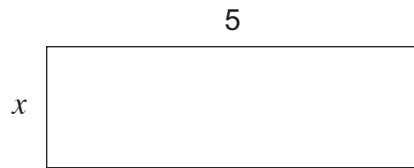
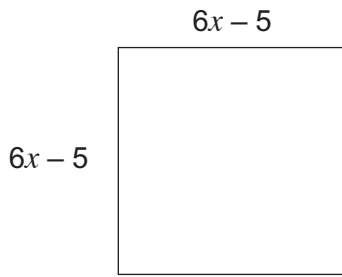
[3 marks]

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Answer .....



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



Not drawn  
accurately

**21 (a)** Show that  $36x^2 - 65x + 25 = 0$

**[2 marks]**

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**\*21 (b)**  $36x^2 - 65x + 25 = 0$

Work out the value of  $x$ .

**[4 marks]**

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$x =$  .....

**END OF QUESTIONS**



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