

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



Level 1/Level 2 Certificate  
Higher Level  
June 2015

# Use of Mathematics

# 43503H

Core unit

Monday 18 May 2015 9.00 am to 10.15 am

- For this paper you must have:**
- a clean copy of the Data Sheet (enclosed)
  - a calculator
  - a pair of compasses
  - a protractor
  - a ruler.

**Time allowed**

- 1 hour 15 minutes

- Instructions**
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
  - 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.
  - Do all rough work in this book. Cross through any work that you do not want to be marked.
  - You may **not** refer to the copy of the Data Sheet that was available prior to this examination. A clean copy is enclosed for your use.

- Information**
- The marks for questions are shown in brackets.
  - The maximum mark for this paper is 50.
  - You are expected to use a calculator where appropriate.

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

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



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

**Section A**

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Train services** on page 3 of the Data Sheet.

**1 (a) (i)** At what time does the 18 13 train from Ipswich arrive in Lowestoft?

**[1 mark]**

Answer .....

**1 (a) (ii)** How many trains per hour are there from Ipswich to Felixstowe?

**[1 mark]**

Answer .....

**1 (a) (iii)** How long does it take the 15 54 train from Ipswich to get to Lowestoft?

**[2 marks]**

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Answer ..... hours ..... mins

**1 (a) (iv)** The distance by rail from Ipswich to Westerfield is  $\frac{1}{14}$  of the distance by rail from Ipswich to Lowestoft.

The distance, by rail, from Ipswich to Lowestoft is 49 miles.

What is the distance from Ipswich to Westerfield?

**[2 marks]**

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.....

Answer ..... miles



**1 (b)** In 2012, the cost of a ticket from Ipswich to Lowestoft was £11.69 .  
In January 2013, the cost of this ticket increased by 4.4%.

What was the cost of this ticket after the increase?

**[3 marks]**

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.....

Answer £ .....

9

**Turn over for the next question**

**Turn over ►**



**There are no questions printed on this page**

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



**Section B**

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Air temperature** on pages 4 and 5 of the Data Sheet.

- 2 (a)** The table shows the highest and lowest temperatures for every day of one week in March 2013 in Glasgow.

Day	Glasgow	
	Lowest temperature (°C)	Highest temperature (°C)
Sunday	5	8
Monday	-1	8
Tuesday	-3	9
Wednesday	3	6
Thursday	5	7
Friday	4	5
Saturday	2	4

- 2 (a) (i)** What was the range in the **lowest** temperatures for the week? **[1 mark]**

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 .....  
 Answer ..... °C

- 2 (a) (ii)** Calculate the mean of the **lowest** temperatures for the week. **[3 marks]**

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 Answer ..... °C

**Question 2 continues on the next page**

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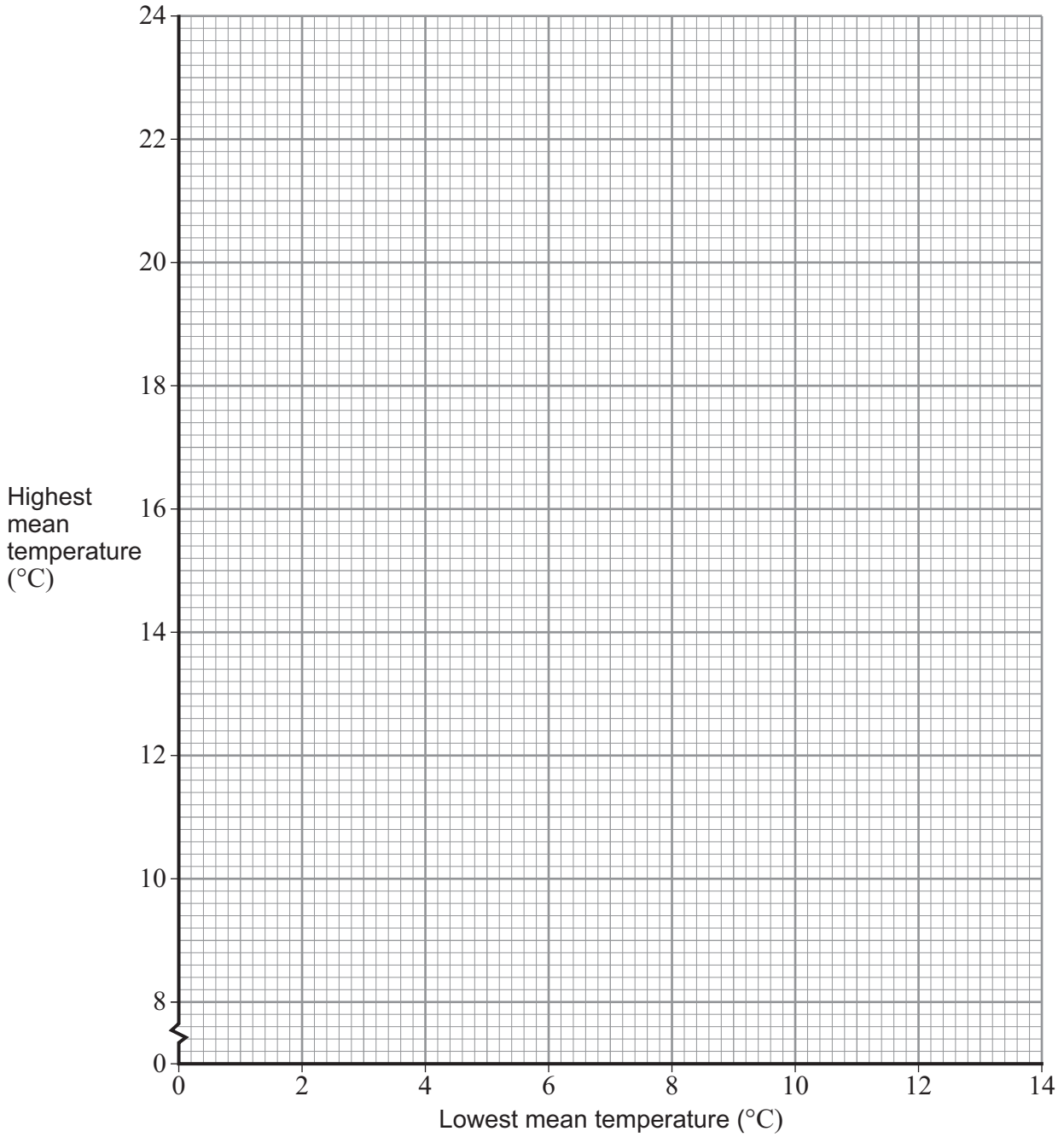
- 2 (b)** Over the thirty-year period from 1981 to 2010, the lowest and highest mean monthly temperatures for London were recorded. The table below shows these data for the months from March to August.

Month	London	
	Lowest mean temperature (°C)	Highest mean temperature (°C)
March	4.6	11.6
April	5.9	14.6
May	8.9	18.1
June	11.8	21.0
July	13.7	23.4
August	13.8	23.1

- 2 (b) (i)** Plot a scatter diagram on the graph paper opposite for the months from March to August.

**[2 marks]**





2 (b) (ii) Draw a line of best fit on the scatter diagram.

[1 mark]

2 (b) (iii) Use your line of best fit to estimate the highest mean temperature in London in a month when the lowest mean temperature was 8 °C.

[1 mark]

Answer ..... °C

8

Turn over for the next question

Turn over ►



3 Temperatures in degrees Celsius,  $C$ , and in degrees Fahrenheit,  $F$ , are connected by the formula

$$C = \frac{5}{9}(F - 32)$$

Find the value of  $F$  when  $C = 25$ .

[3 marks]

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Answer .....

3

4 Mary says that the temperature indoors is 10 degrees higher than  $t$ , the temperature outdoors.

Julian says that the temperature indoors is 12 degrees lower than three times  $t$ , the temperature outdoors.

Use Mary's and Julian's descriptions to form an equation in  $t$ .  
Solve your equation to find the temperature outdoors.

[5 marks]

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Answer ..... degrees

5





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ANSWER IN THE SPACES PROVIDED**

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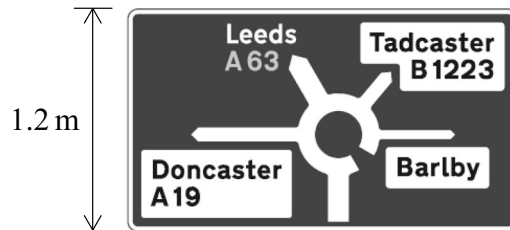
**Section C**

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Road signs and road safety** on pages 6 and 7 of the Data Sheet.

**5 (a)** A road sign modelled by a rectangle is shown.



Not to scale

The width of the sign is twice its height.  
The height of the sign is 1.2 metres.

Calculate the area of the road sign.

**[2 marks]**

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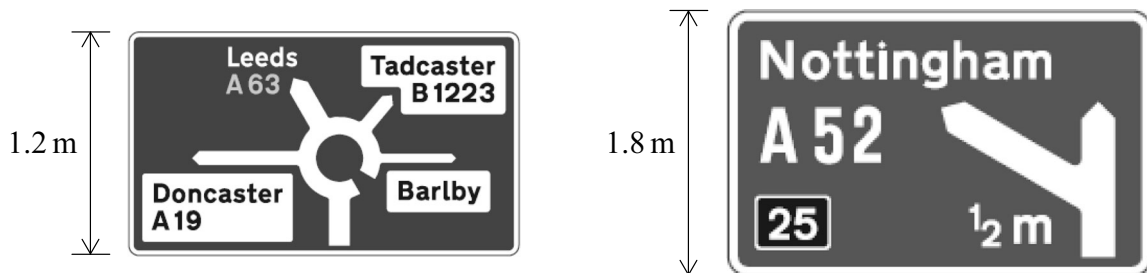
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Answer .....m<sup>2</sup>

**5 (b)** Two road signs modelled by rectangles are similar in shape.  
The smaller sign is 1.2 metres high.  
The larger sign is 1.8 metres high.

Not to scale



What is the scale factor of enlargement from the small sign to the large sign?

**[2 marks]**

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Answer .....

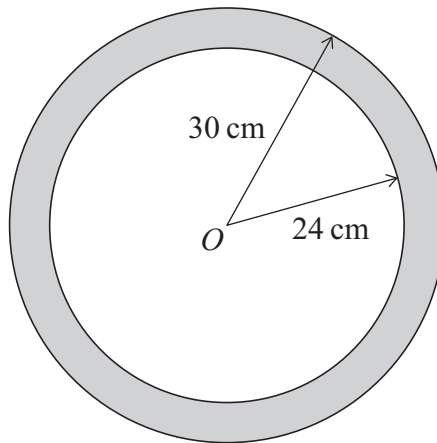


5 (c) A circular road sign is shown.



The sign consists of two different sized circles with the same centre.

The area between the two circles is shaded, as shown in the following diagram.



Not to scale

The centre of the circles is  $O$ .  
The radius of the inner circle is 24 cm.  
The radius of the outer circle is 30 cm.

Calculate the shaded area.

**Give your answer correct to three significant figures.**

**[4 marks]**

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Answer .....cm<sup>2</sup>

**Question 5 continues on the next page**

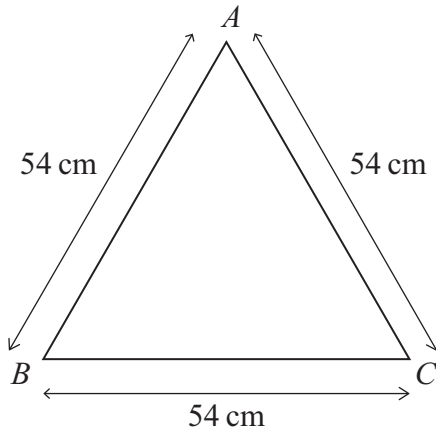
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5 (d) A road sign is shown below.



All three sides of the inner triangle are 54 cm long, as shown below.



Not to scale

Calculate the length of the perpendicular from  $A$  to  $BC$  and hence, or otherwise, find the area of the inner triangle.

[5 marks]

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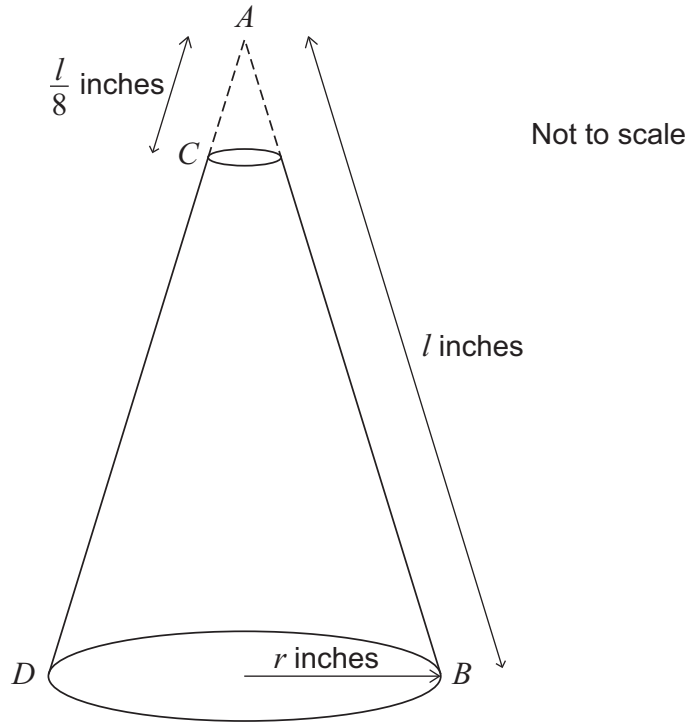
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Length of perpendicular is ..... cm

Area is .....  $\text{cm}^2$



- 5 (e) A traffic cone can be modelled as a cone with its top removed. The following is a diagram of such a model.



The cone originally has a slant height,  $l$  inches, and radius,  $r$  inches.

The top section of the cone that has been removed has a slant height  $\frac{l}{8}$  inches.

The total surface area,  $S$  square inches, of the frustum, including the curved surface, the top and the bottom, is given by

$$S = \frac{\pi r}{64}(63l + 65r)$$

Find the value of  $S$  when  $l = 24$  and  $r = 8$ .

[2 marks]

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Answer .....

15
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Turn over ►



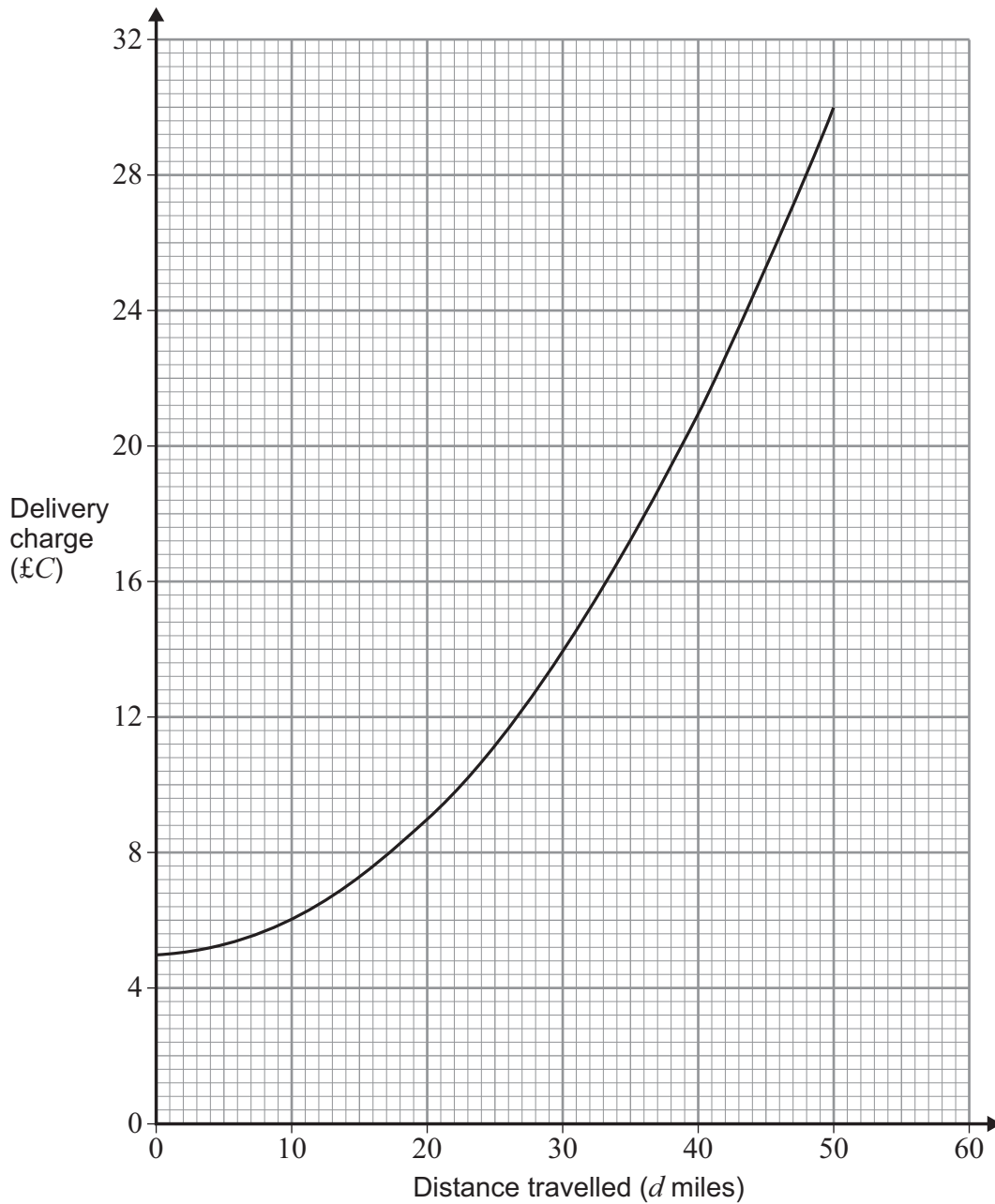
**Section D**

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Delivery charges** on page 8 of the Data Sheet.

- 6 (a)** The delivery charges, £ $C$ , made by 'Fast Couriers' up to a distance of 50 miles are shown by the graph.
- A formula for such a delivery charge is  $C = ad^2 + F$ , where  $a$  and  $F$  are constants.



- 6 (a) (i)** What is the fixed cost used by Fast Couriers?

[1 mark]

Answer £ .....



**6 (a) (ii)** Use the graph to find the delivery charge when the distance travelled is 30 miles.

[1 mark]

.....  
 .....

Answer £ .....

**6 (a) (iii)**  $P$  is the point on the graph where  $d = 40$  and  $C = 21$ .  
 Use the point  $P$  together with your answer to part (a)(i) to find the value of  $a$ .

[3 marks]

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$a =$  .....

**6 (b)** Another courier service, 'Expert Couriers', calculates charges using the formula

$$C = \frac{1}{3}d + 6$$

where  $C$  is the cost, in £, and  $d$  is the distance travelled in miles.

**6 (b) (i)** On the grid opposite, which shows Fast Couriers' costs, draw an accurate graph of

$$C = \frac{1}{3}d + 6 \quad \text{for values of } d \text{ from 0 to 60.}$$

[4 marks]

*Space for working*

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**Question 6 continues on the next page**

**Turn over ►**



**6 (b) (ii)** Use the two graphs to find the value of  $d$  for which Expert Couriers' charges are the same as Fast Couriers' charges.

**[1 mark]**

.....  
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Answer ..... miles

10
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**END OF QUESTIONS**

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