

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**GCSE**

**J567/04**

**MATHEMATICS B**

**Paper 4 (Higher Tier)**

**FRIDAY 8 NOVEMBER 2013: Morning**

**DURATION: 1 hour 45 minutes**  
**plus your additional time allowance**

**MODIFIED ENLARGED**

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

- Geometrical instruments**
- Tracing paper (optional)**
- Scientific or graphical calculator**

**YOU ARE PERMITTED TO USE A CALCULATOR**  
**FOR THIS PAPER**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer ALL the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

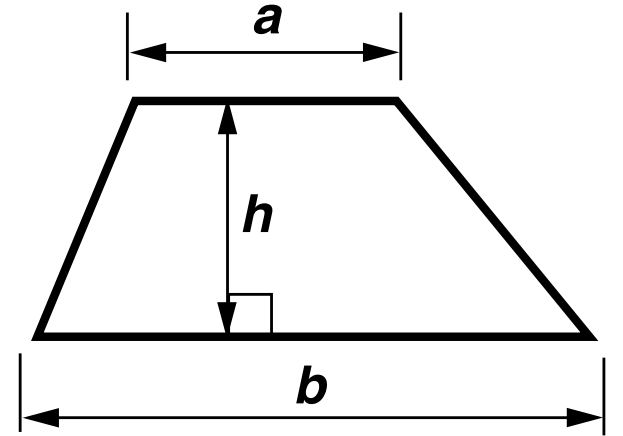
## **INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- Your quality of written communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is 100.

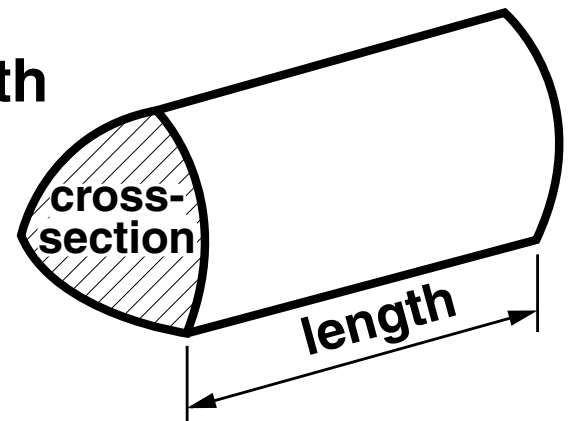
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# FORMULAE SHEET: HIGHER TIER

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



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

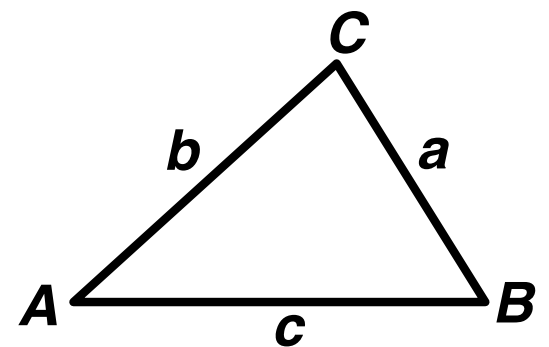


In any triangle  $ABC$

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

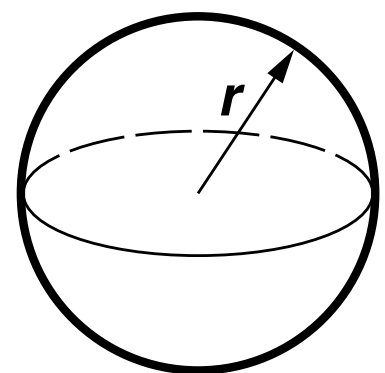
Cosine rule  $a^2 = b^2 + c^2 - 2bc \cos A$

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



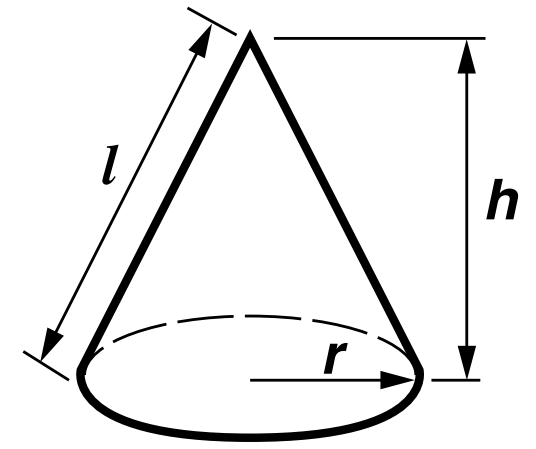
Volume of sphere =  $\frac{4}{3} \pi r^3$

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



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

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



### **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 the questions.**

**1 (a) Calculate.**

$$\frac{6.3^2 - 3.7}{5.8}$$

**Write your answer correct to 2 decimal places.**

**(a) \_\_\_\_\_ [2]**

**(b) Calculate.**

$$\sqrt{4.5 \times 6.7 + 1.8 \times 2.4}$$

**Write your answer correct to 2 significant figures.**

**(b) \_\_\_\_\_ [2]**

2 Samuel has six types of coin in a bag.  
The following table shows the probability of each type of coin being picked.

Coin	1p	2p	5p	10p	20p	50p
Probability	0.07	0.23	0.18	0.28	0.19	$x$

(a) Work out  $x$ .

(a) \_\_\_\_\_ [2]

(b) Samuel picks one coin out of the bag at random.

Work out the probability that he picks a coin worth 5p or less.

(b) \_\_\_\_\_ [2]

**3    A train travels from Kelford to Brightwood.  
The graph opposite shows the first ten minutes of the  
train’s journey.**

**The two stations are 70 kilometres apart.  
The train is due to arrive at Brightwood at 10:00 am.**

**Will it arrive on time if it continues to travel at the  
same speed?  
Show clearly how you decide.**

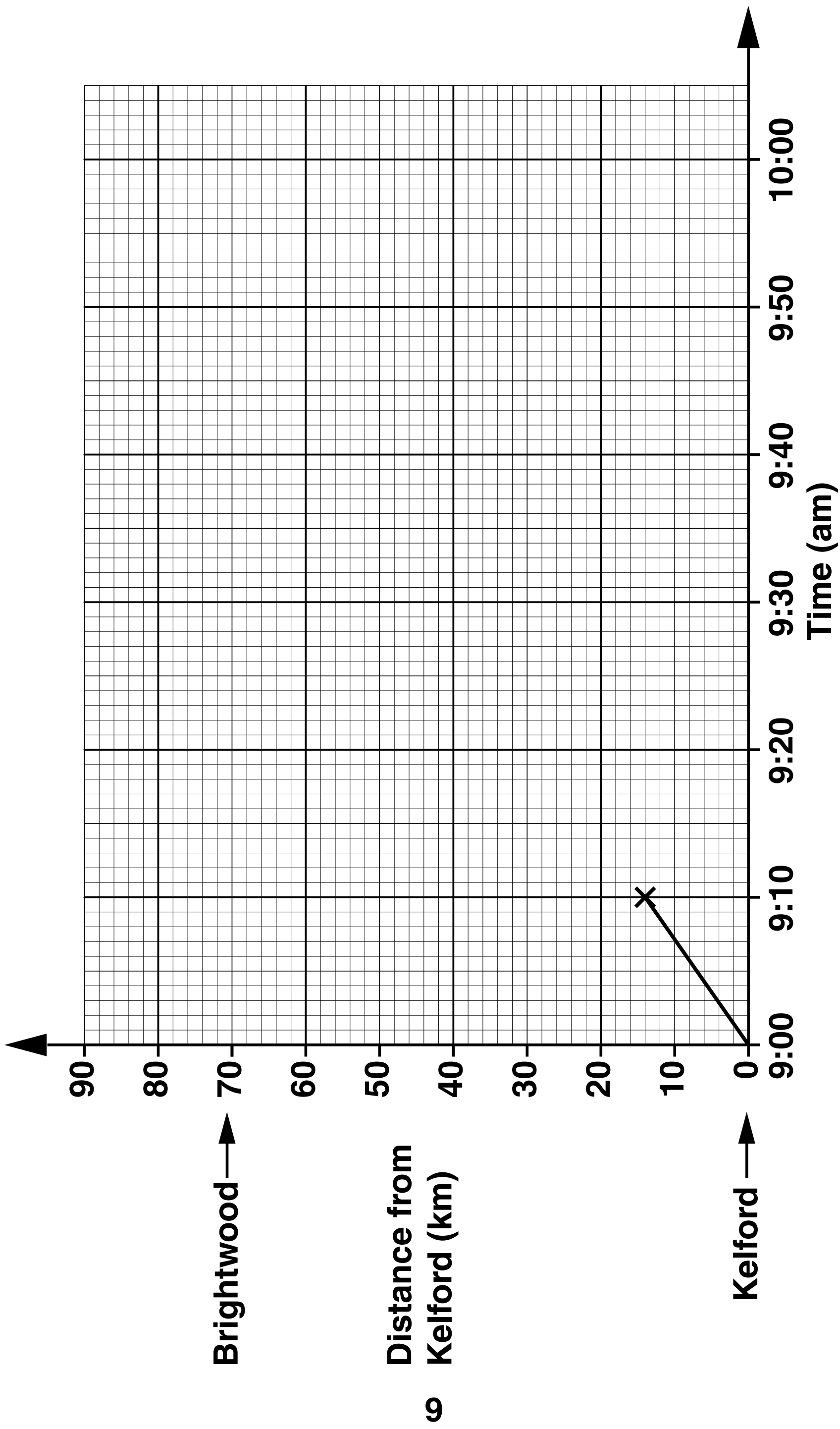
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**[3]**





4 (a) Here are the first four terms of a sequence.

**7                  12                  17                  22**

**Write an expression for the  $n$ th term of this sequence.**

(a) \_\_\_\_\_ [2]

(b) The  $n$ th term of another sequence is given by the expression  $100 - 8n$ .

**Write down the first three terms of this sequence.**

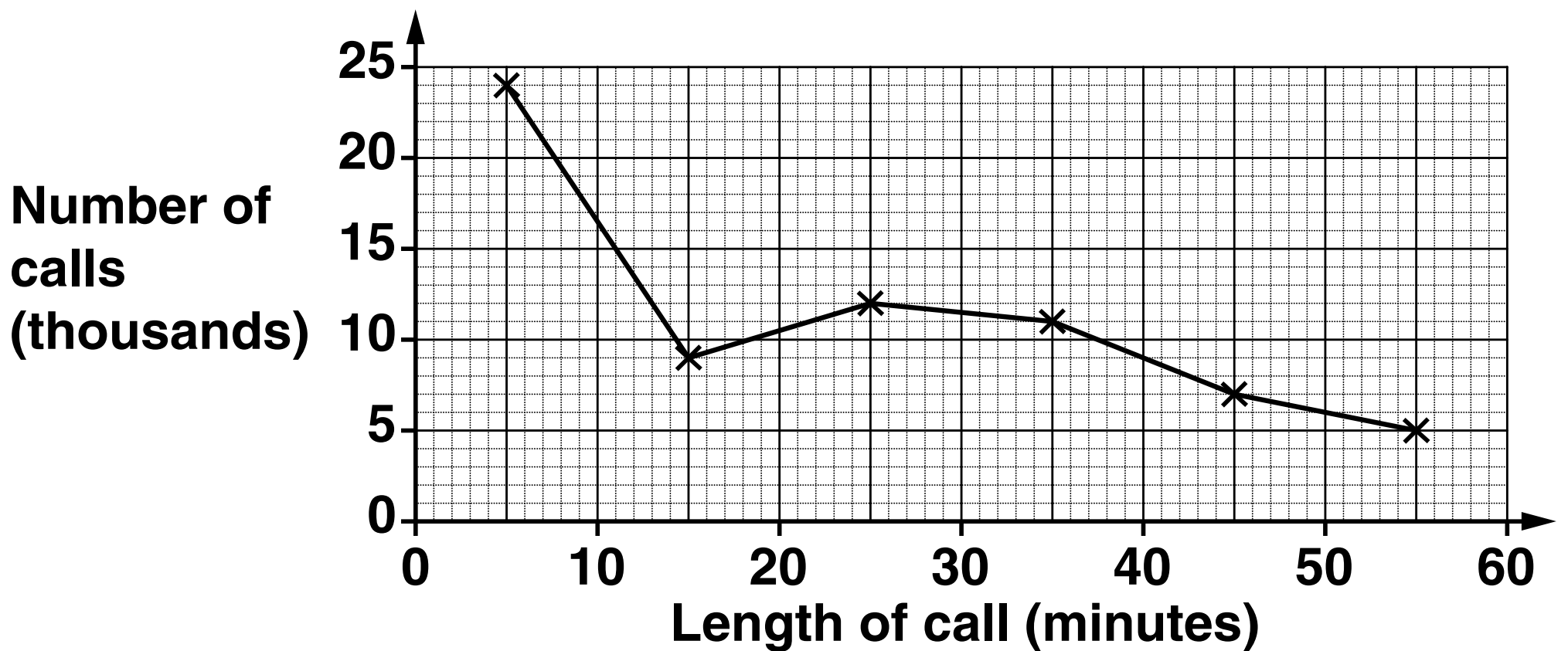
(b) \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ [2]

**5 Solve.**

$$6(2x - 3) = 24$$

**$x =$  \_\_\_\_\_ [3]**

- 6 (a) The Bilberry Telephone Company records the lengths of telephone calls in one day. The information is summarised in the frequency polygon below.



- (i) Estimate how many calls lasted less than 20 minutes.

(a)(i) \_\_\_\_\_ thousand [2]

- (ii) Write down the modal class.

(ii) \_\_\_\_\_ minutes [1]

**(b) The lengths of Desmond's telephone calls, in minutes, are summarised in the table below.**

<b>Length of call (<math>t</math> minutes)</b>	<b>Number of calls</b>		
<b><math>0 &lt; t \leq 10</math></b>	<b>0</b>		
<b><math>10 &lt; t \leq 20</math></b>	<b>3</b>		
<b><math>20 &lt; t \leq 30</math></b>	<b>3</b>		
<b><math>30 &lt; t \leq 40</math></b>	<b>6</b>		
<b><math>40 &lt; t \leq 50</math></b>	<b>8</b>		
<b><math>50 &lt; t \leq 60</math></b>	<b>5</b>		

**Calculate an estimate of the mean length of Desmond's calls.**

**(b)\_\_\_\_\_ minutes [4]**

- (c) The table below summarises the lengths, in minutes, of Harriet's calls in November and December.**

	<b>Mean</b>	<b>Range</b>
<b>November</b>	<b>34.2</b>	<b>67.4</b>
<b>December</b>	<b>39.7</b>	<b>43.8</b>

- (i) In which month were Harriet's calls longer on average?  
Explain how you decide.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ **[1]**

- (ii) In which month were the lengths of Harriet's calls more spread out?  
Explain how you decide.**

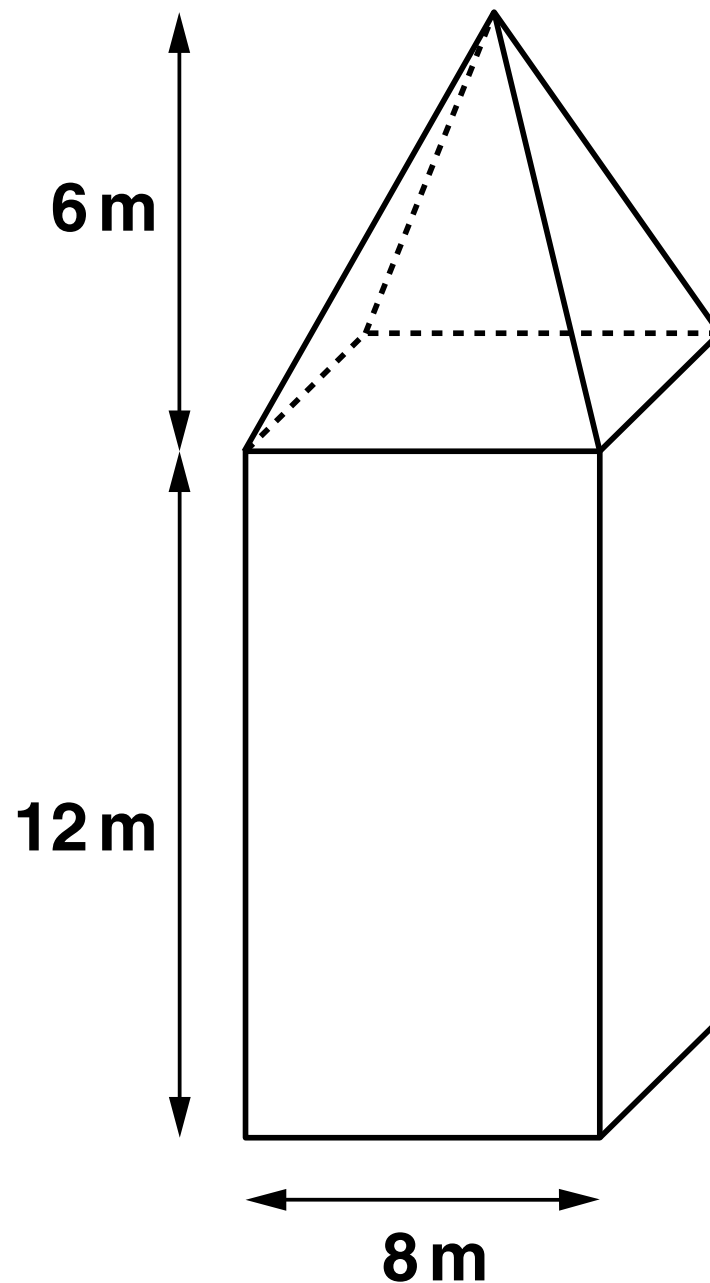
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\_\_\_\_\_ **[1]**

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- 7 A tower is in the shape of a cuboid with a pyramid on top.  
The height of the cuboid is 12 m and the height of the pyramid is 6 m.  
The base of the tower is a square of side 8 m and it has a TOTAL height of 18 m.**

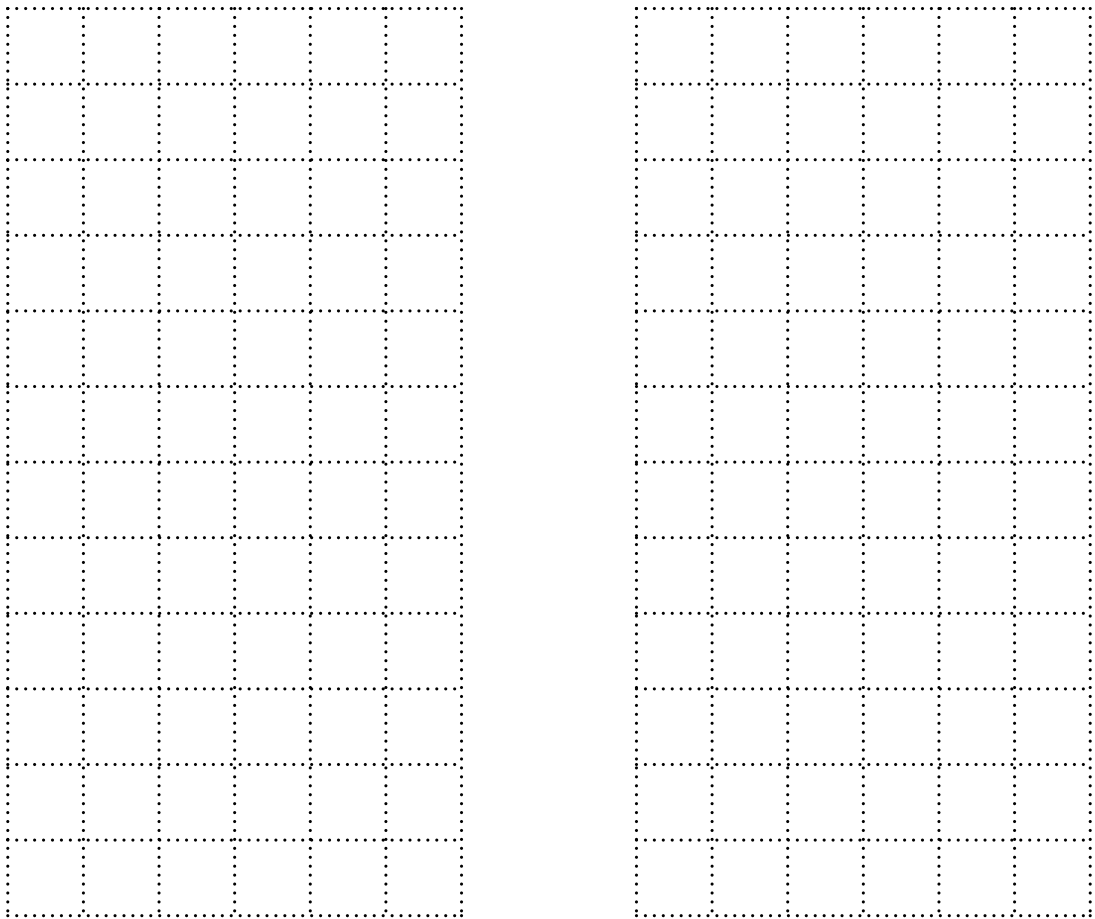




On the grids below draw accurately the plan and the front elevation of the tower.  
Use a scale of 1 cm to 2 m. [4]

Plan

Front  
Elevation



8 (a) **Riverside Tennis Club has 24 members.**  
**They have four types of membership.**

- SM Senior Male**
- SF Senior Female**
- JM Junior Male**
- JF Junior Female**

**The membership information is recorded below.**

<b>SM</b>	<b>JM</b>	<b>SM</b>	<b>JM</b>	<b>SF</b>	<b>JM</b>	<b>SM</b>	<b>JF</b>
<b>JM</b>	<b>SF</b>	<b>JF</b>	<b>SM</b>	<b>SM</b>	<b>JF</b>	<b>SF</b>	<b>SM</b>
<b>SF</b>	<b>SM</b>	<b>JM</b>	<b>JM</b>	<b>JF</b>	<b>SM</b>	<b>JM</b>	<b>SF</b>

(i) **On the grid below, design and draw a two-way table to show this information. [3]**


**(ii) One member is selected at random.**

**Write down the probability that the member is a Junior.**

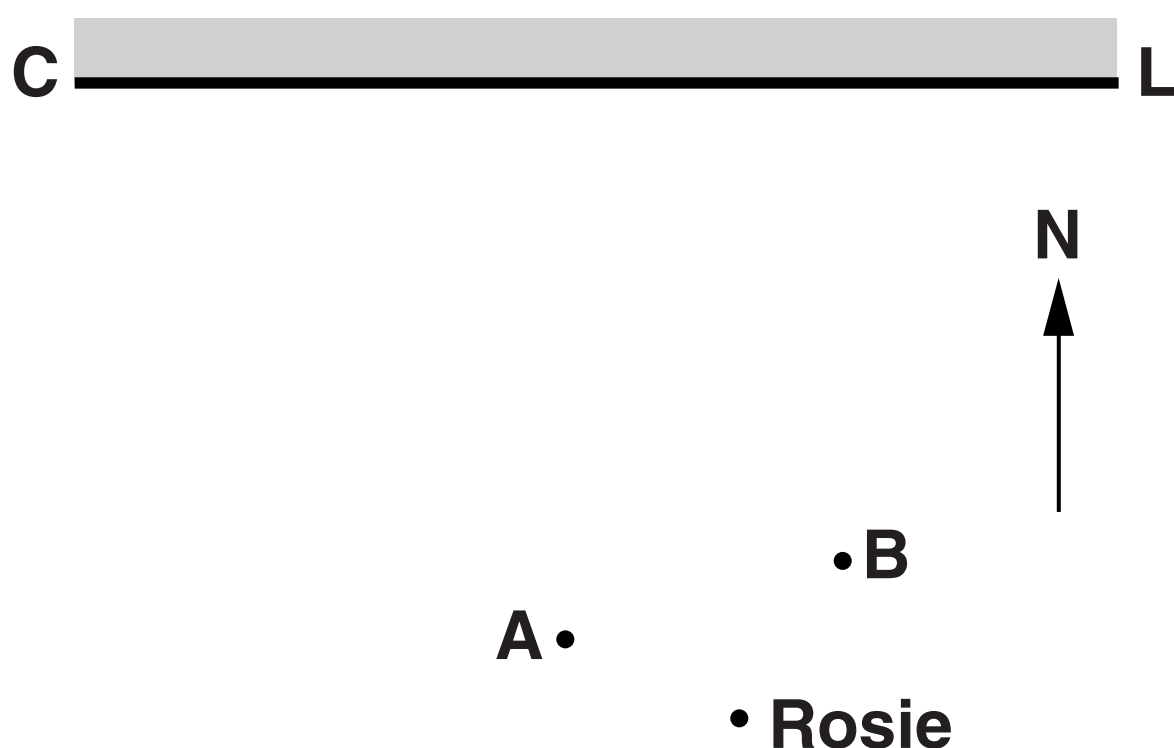
**(a)(ii) \_\_\_\_\_ [1]**

**(b) In 2011, Greenmeadows Tennis Club had 25 members and in 2012 it had 31 members.**

**Calculate the percentage increase in the number of members.**

**(b) \_\_\_\_\_ % [3]**

- 9 The scale diagram below shows a coastline, CL.  
A and B are two rocks in the sea.  
The scale of the diagram is 1 cm represents 500 m.



**SCALE: 1 cm REPRESENTS 500 m**

**Rosie is sailing her boat.**

**She sails on a course towards the coast so that she is an equal distance from the rocks, A and B.**

**When she is less than 1 km from the coast she turns and sails due West.**

**She now sails so that she is between 500 m and 1 km from the coast.**

**Construct a route that Rosie could take.**

**You must leave in all your construction lines. [4]**

**10 Gwen is taking her class of 28 pupils to a pantomime.  
The total cost of the trip is £575.**

**Use estimation to find an approximate cost of this trip  
for each pupil.**

**Show your working clearly.**

$$\underline{\hspace{2cm}} \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \quad [2]$$

**11 Here are six equations of straight lines, each labelled with a letter.**

**A**

$$y = 4x - 7$$

**B**

$$y = 3x + 14$$

**C**

$$y = 2x + 5$$

**D**

$$y = -3x + 1$$

**E**

$$y = 14x - 7$$

**F**

$$y = 4x + 3$$

**Choose the correct letters to make each statement true. [3]**

**Line \_\_\_\_\_ is the steepest line.**

**Lines \_\_\_\_\_ and \_\_\_\_\_ are parallel.**

**Lines \_\_\_\_\_ and \_\_\_\_\_ meet on the  $y$ -axis.**

**12 In Westercote, house prices rose by 6% from 2010 to 2011.**

**(a) On 1 January 2010 a house was priced at £180 000.**

**Calculate its price on 1 January 2011.**

**(a) £ \_\_\_\_\_ [3]**

**(b) On 1 January 2011 another house was priced at £371 000.**

**Calculate its price on 1 January 2010.**

**(b) £ \_\_\_\_\_ [3]**

**13 (a) Multiply out and simplify.**

$$(x + 7)(x - 3)$$

**(a) \_\_\_\_\_ [2]**

**(b) Factorise fully.**

$$6xy - 12x^2$$

**(b) \_\_\_\_\_ [2]**

**(c) Rearrange this formula to make  $x$  the subject.**

$$A = x^2 - 4y$$

**(c) \_\_\_\_\_ [2]**

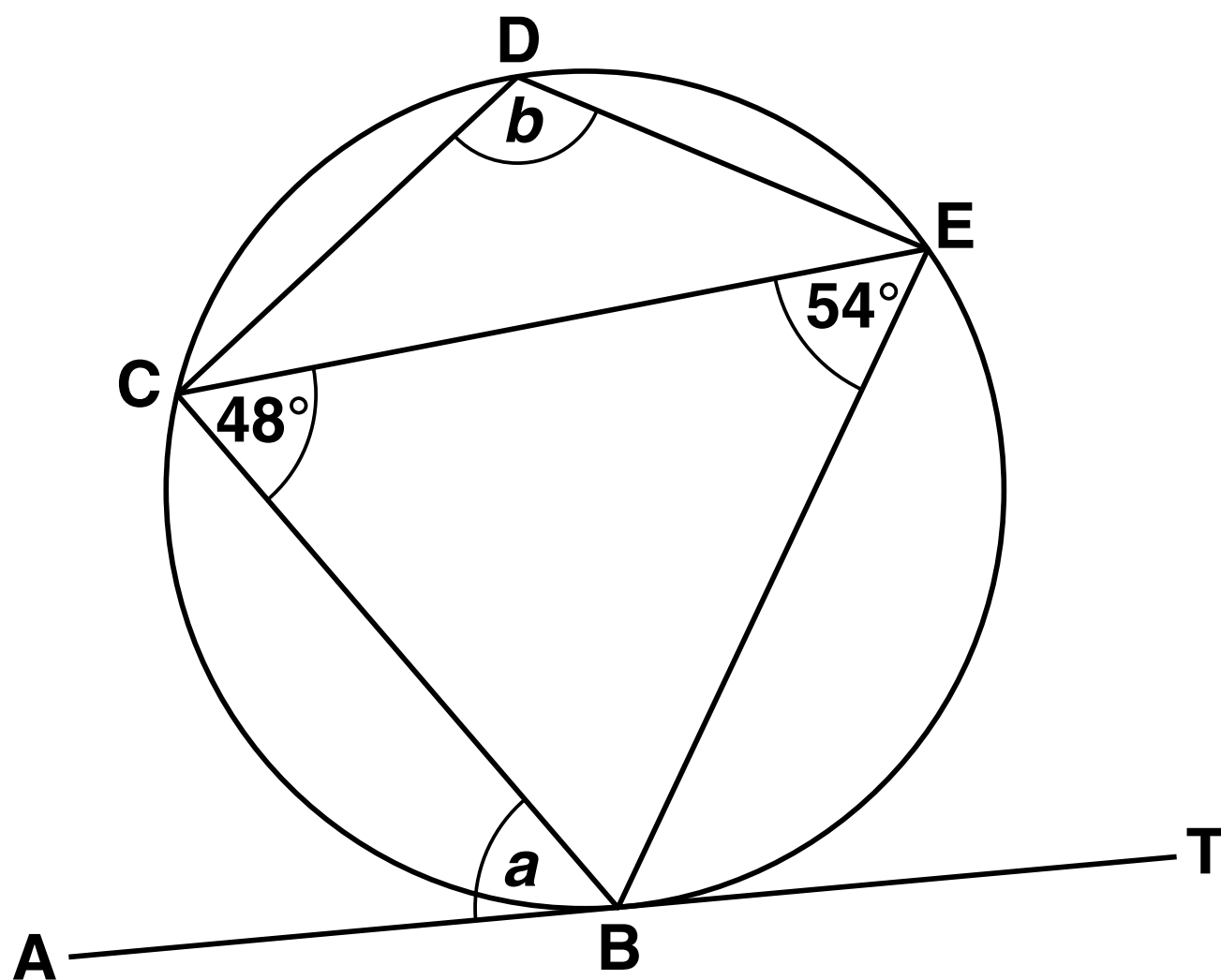


**(d)  $y$  is inversely proportional to  $x$  and  $y = 30$  when  $x = 4$ .**

**Write an equation linking  $x$  and  $y$ .**

**(d) \_\_\_\_\_ [3]**

- 14 In the diagram below B, C, D and E are points on the circumference of a circle.  
 AT is the tangent to the circle at B.  
 Angle BCE =  $48^\circ$  and angle BEC =  $54^\circ$ .



NOT TO SCALE

- (a) Find angle  $a$ .  
 Give a reason for your answer.

(a) Angle  $a =$  \_\_\_\_\_ $^\circ$

\_\_\_\_\_  
 \_\_\_\_\_ [2]

**(b) Calculate angle  $b$ .  
Give a reason for each step of your working.**

**(b) Angle  $b$  = \_\_\_\_\_° [3]**

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**15 A town has a population of 120 000, correct to the nearest ten thousand, and an area of 54 km<sup>2</sup>, correct to the nearest whole number.**

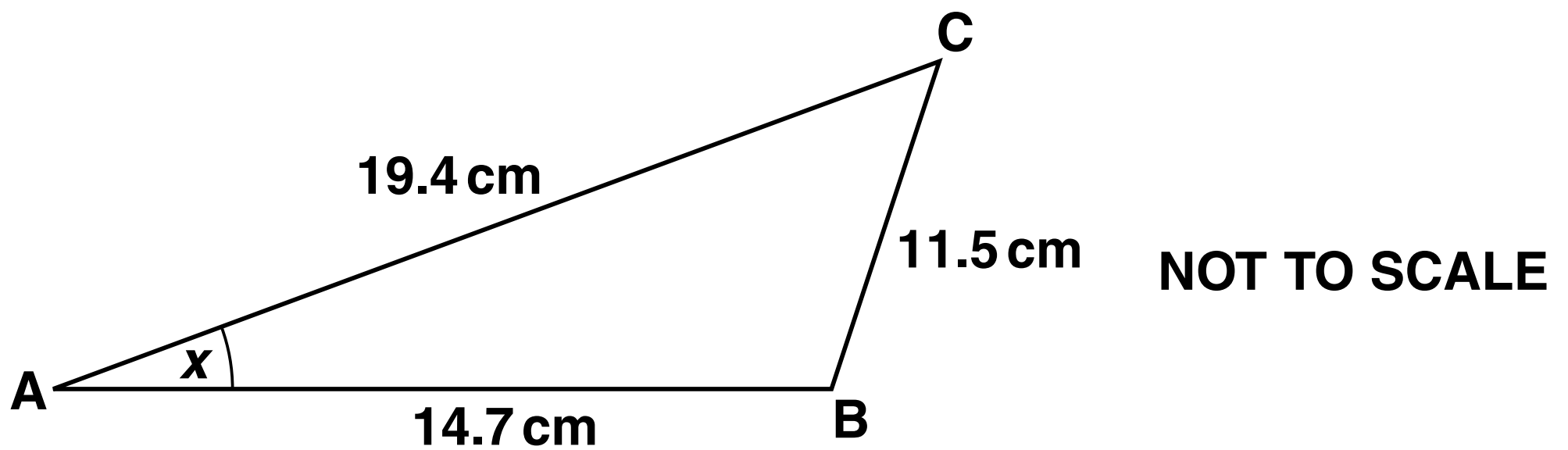
**(a) Write down the upper bound of the population.**

**(a) \_\_\_\_\_ [1]**

**(b) Calculate the upper bound of the population density.**

**(b) \_\_\_\_\_ people/km<sup>2</sup> [3]**

- 16 (a) The diagram below shows a triangle ABC.  
AB = 14.7 cm, BC = 11.5 cm and AC = 19.4 cm.

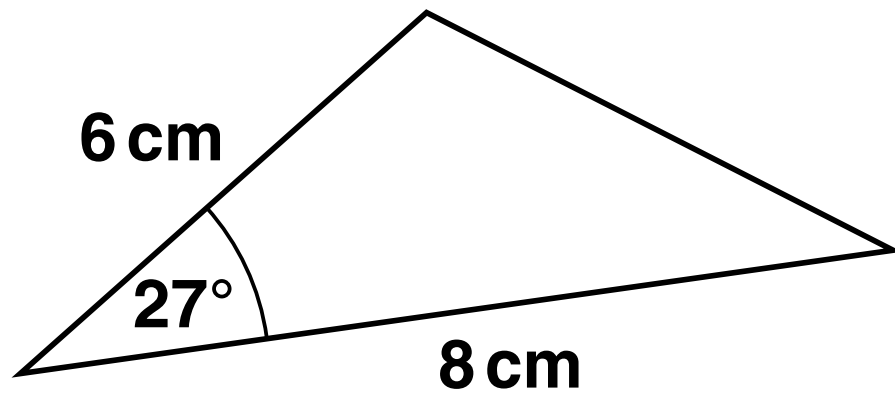


- (i) Show that triangle ABC is NOT a right-angled triangle. [3]

**(ii) Calculate angle  $x$ .**

**(a)(ii) \_\_\_\_\_° [3]**

**(b) Calculate the area of this triangle.**



**NOT TO SCALE**

**(b) \_\_\_\_\_ cm<sup>2</sup> [2]**

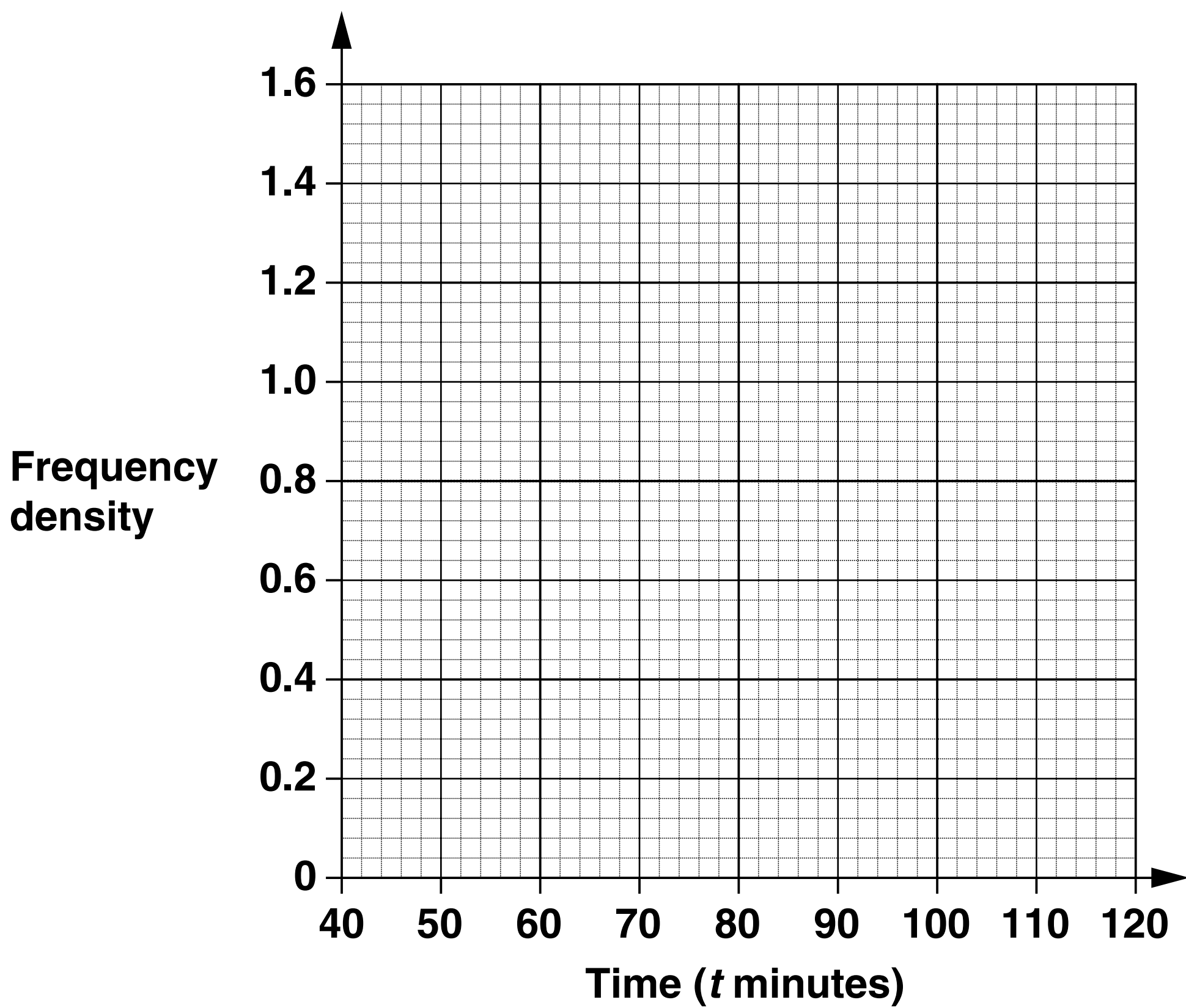


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- 17 A teacher records the times taken for pupils to complete a cross-country course.  
The results are summarised in the table below.**

<b>Time (<math>t</math> minutes)</b>	<b>Number of pupils</b>
<b><math>40 &lt; t \leq 50</math></b>	<b>8</b>
<b><math>50 &lt; t \leq 60</math></b>	<b>15</b>
<b><math>60 &lt; t \leq 80</math></b>	<b>6</b>
<b><math>80 &lt; t \leq 120</math></b>	<b>4</b>

**Draw a histogram on the grid opposite to show this data. [3]**



**18 (a) Solve algebraically.**

$$5x - 2y = 22$$

$$2x + 3y = 5$$

**(a)  $x =$  \_\_\_\_\_**

**$y =$  \_\_\_\_\_ **[4]****

**(b) (i) Write  $x^2 - 6x + 4$  in the form  $(x + a)^2 + b$ .**

**(b)(i) \_\_\_\_\_ [3]**

**(ii) Using your answer to (b)(i), or otherwise,  
solve  $x^2 - 6x + 4 = 0$ .  
Write your answers correct to 1 decimal place.**

**(ii)  $x =$  \_\_\_\_\_ or  $x =$  \_\_\_\_\_ [2]**

**19 On Finch Island there are bullfinches and chaffinches.  
In the spring of 2013:**

**the population of bullfinches was 6700 and was  
DECREASING by 3% each year,**

**the population of chaffinches was 4800 and was  
INCREASING by 4% each year.**

**In the spring of which year will the population  
of chaffinches first be greater than that of the  
bullfinches?**

**Show your working clearly.**

\_\_\_\_\_ **[4]**

**20\* Assume that the Earth is a sphere with radius 6371 km.  
The land area on the surface of the Earth is 148 940 000 km<sup>2</sup>.**

**Use this information to show that the ratio of land area to water area is approximately 3 : 7. [5]**

**END OF QUESTION PAPER**

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