

Candidate forename						Candidate surname					
Centre number						Candidate number					

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**GCSE**  
**J567/04**  
**MATHEMATICS B**  
**Paper 4 (Higher Tier)**

**WEDNESDAY 13 JUNE 2012: Morning**  
**DURATION: 1 hour 45 minutes**  
**plus your additional time allowance**

**MODIFIED ENLARGED**

**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Geometrical instruments**  
**Tracing paper (optional)**  
**Scientific or graphical calculator**  
**A model for question 12**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

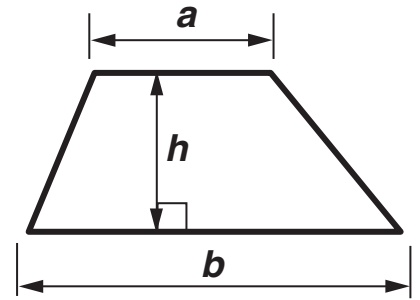
- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer ALL the questions.
- Read each question carefully. Make sure you know what you have to do before 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**

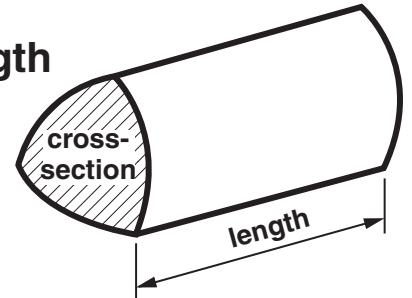
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- The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

# FORMULAE SHEET: HIGHER TIER

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



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

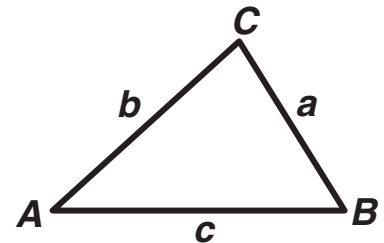


In any triangle  $ABC$

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

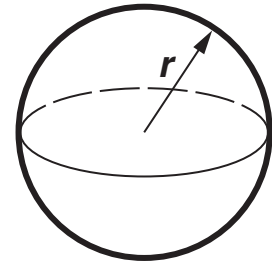
Cosine rule  $a^2 = b^2 + c^2 - 2bc \cos A$

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



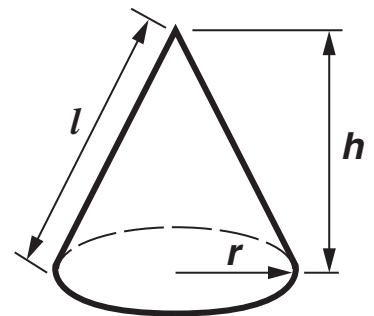
Volume of sphere =  $\frac{4}{3} \pi r^3$

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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- 1 (a) Work out the value of  $u + 5t$   
when  $u = -16.4$  and  $t = 3.5$ .

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

- (b) Rearrange  $v = u + 5t$  to make  $t$  the subject.

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

**2 (a) Write 600 as a product of its prime factors.**

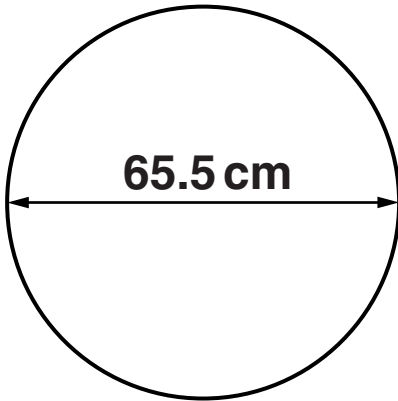
**(a) \_\_\_\_\_ [3]**

**(b) At Rumblestone Station northbound trains stop every 20 minutes and southbound trains stop every 16 minutes. Two trains stopped together at the station at 15 00.**

**Work out the next time when two trains will stop together at this station.**

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

- 3 Parvinder has a bicycle.  
Each wheel has a diameter of 65.5 cm as shown on the following diagram.**



**On one journey each wheel rotated 3509 times.**

**Calculate the distance Parvinder cycled.  
Give your answer in kilometres.**

\_\_\_\_\_ km [4]

- 4 (a) The label on a sports drink states that each serving supplies 185 calories. This is 9% of an adult's guideline daily amount (GDA).**

**Using this information, work out an adult's GDA.**

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



- (b) Betterbuy supermarket sells 3 brands of low-sodium salt.

The following table shows, for each brand, how much sodium is in a packet.

Brand	Weight of packet (g)	Amount of sodium (g)
Low-salt	350	72
Salt-what-salt?	500	96
Salt Lite	1200	236

Which brand has the lowest proportion of sodium?

Show your working clearly.

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

- 5 Ahmed grows 12 tomato plants.  
He feeds each plant once with a different amount of fertiliser.  
He records these amounts and the height to which each plant grows.

Amount of fertiliser (g)	36	58	14	26	10	43	52	40	18	50	55	30
Height of plant (cm)	37	66	24	35	32	46	69	54	33	47	58	42

- (a) The first 10 points have been plotted.

Complete the scatter diagram by plotting the last two points on the grid opposite. [1]

- (b) State the correlation shown.

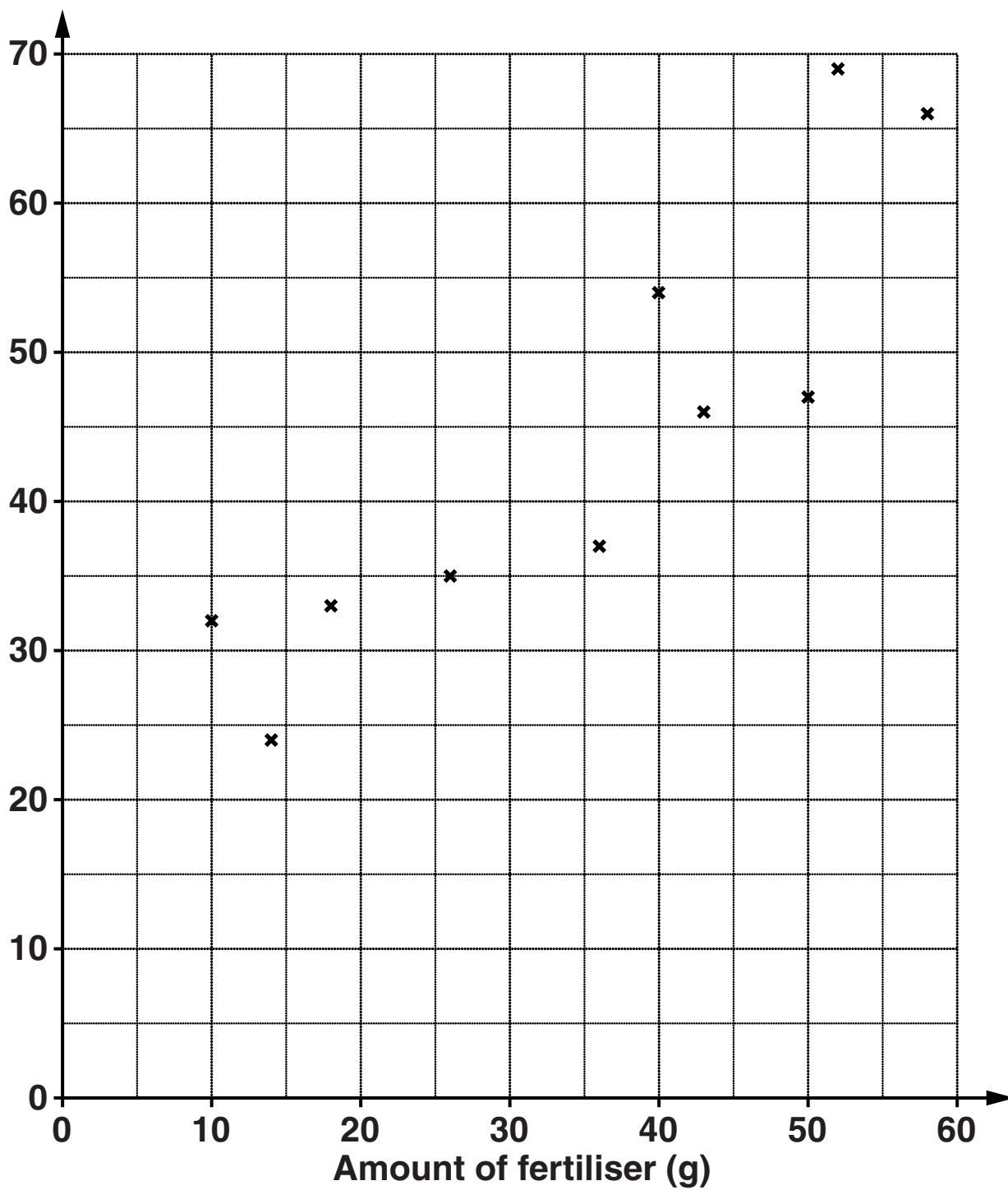
\_\_\_\_\_ [1]

- (c) (i) Draw a line of best fit on the diagram. [1]

- (ii) Estimate the height of a tomato plant which was given 35 g of fertiliser.

(c)(ii) \_\_\_\_\_ cm [1]

Height of  
plant (cm)



- 6 (a) Lee completes a marathon in 2 hours 30 minutes.  
The marathon is 42.195 km long.

Calculate Lee's average speed.

(a) \_\_\_\_\_ km/h [3]

**(b) Calculate.**

$$\sqrt{\frac{16.4 - 5.87}{5.42 + 1.09}}$$

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

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

**7 Jenny is doing a survey of the athletes at her club.**

**(a) Here is one of her questions.**

**How many competitions have you entered  
during the past 12 months?**  
*(Please tick one of the boxes)*

<b>1 - 4</b>	<b>5 - 8</b>	<b>9 - 12</b>	<b>13 - 16</b>
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**Make one criticism of this question.**

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**[1]**

**(b) Jenny wants to find out how many hours the athletes train at the weekend.**

**Write a suitable question for Jenny to use to find this out.**

**Remember to include response boxes.**

**[2]**

- (c) Jenny will give the survey to a sample of athletes in her club.

Some information about the 175 members in her club is shown in this table.

	Female	Male
Junior	16	31
Senior	53	75

- (i) **EXPLAIN** how to take a representative stratified sample.

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[2]

- (ii) Jenny will use a sample size of 30.

How many junior males should be included in her stratified sample?

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

**(d) Jenny is a javelin thrower.**

**Here is a summary of the lengths of 40 of Jenny's throws this year.**

<b>Length of throw (s metres )</b>	<b>Frequency</b>		
<b><math>40 \leq s &lt; 46</math></b>	<b>4</b>		
<b><math>46 \leq s &lt; 52</math></b>	<b>12</b>		
<b><math>52 \leq s &lt; 58</math></b>	<b>19</b>		
<b><math>58 \leq s &lt; 64</math></b>	<b>5</b>		

**Calculate an estimate of the mean length of her javelin throws.**

**(d) \_\_\_\_\_ m [4]**



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**TURN OVER FOR QUESTION 8**

- 8 (a) Complete this table for  $y = 3x - 4$ . (There are two missing values.)

$x$	0	1	2	3	4
$y$		-1		5	8

[1]

- (b) Plot these points on the grid opposite and draw the graph of  $y = 3x - 4$ .

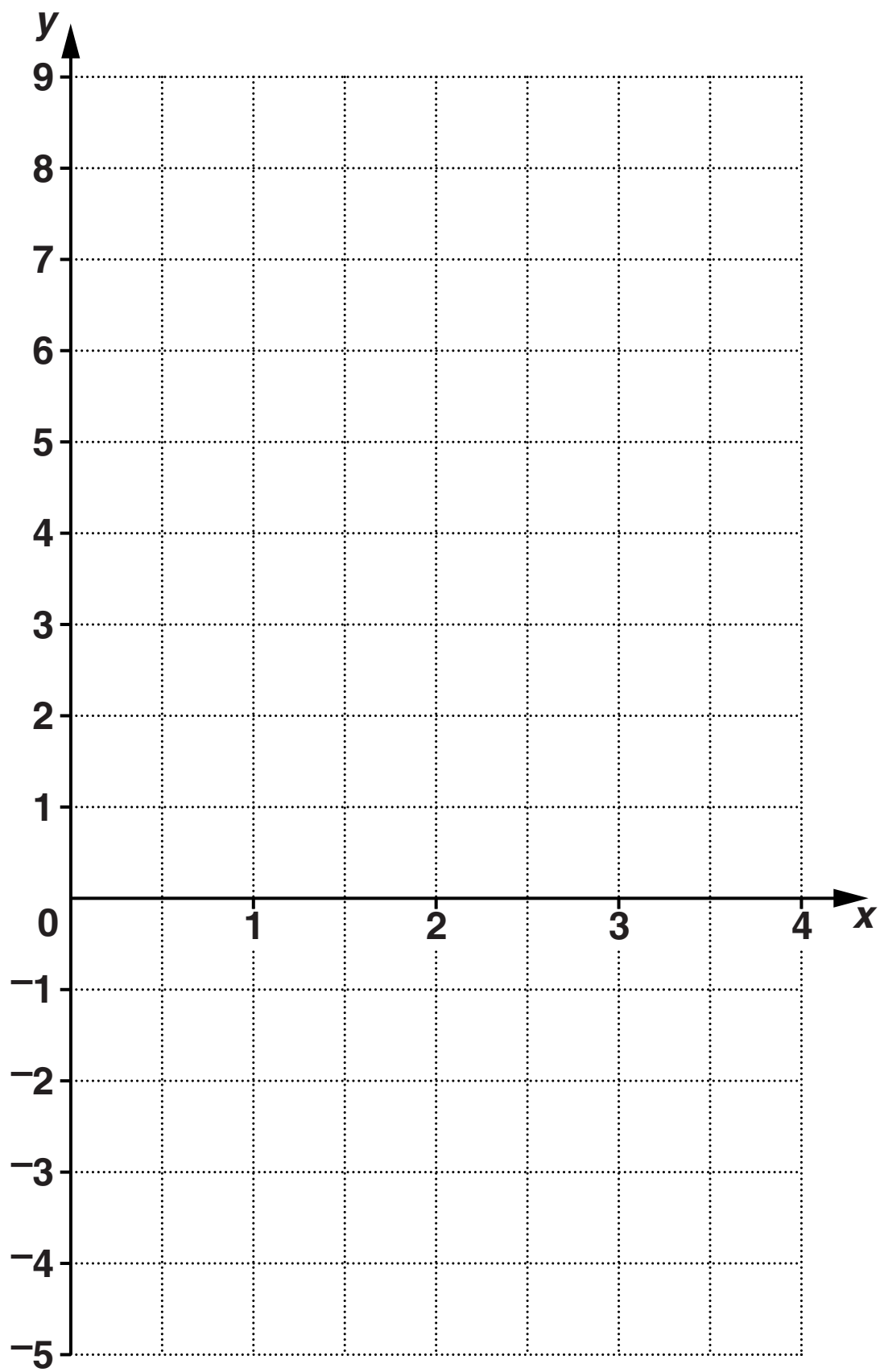
- (c) On your graph put a cross (X) at the point where  $3x - 4 = 0$ . [1]

- (d) Write down the gradient of the line  $y = 3x - 4$ .

(d) \_\_\_\_\_ [1]

- (e) Write down the equation of a line parallel to  $y = 3x - 4$ .

(e) \_\_\_\_\_ [1]



[2]

- 9 The equation  $x^3 - 5x - 6 = 0$  has a solution between  $x = 2$  and  $x = 3$ .

Find this solution correct to 1 decimal place.  
Show clearly your trials and the values of their outcomes.

Set your answers out in the following table, you may not need to use all the rows.

$x$	$x^3 - 5x - 6$	too big	too small
2	-8		✓
3	6	✓	

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

- 10 The population of a species of bird is estimated using the formula

$$N = 6400 \times (0.85)^t$$

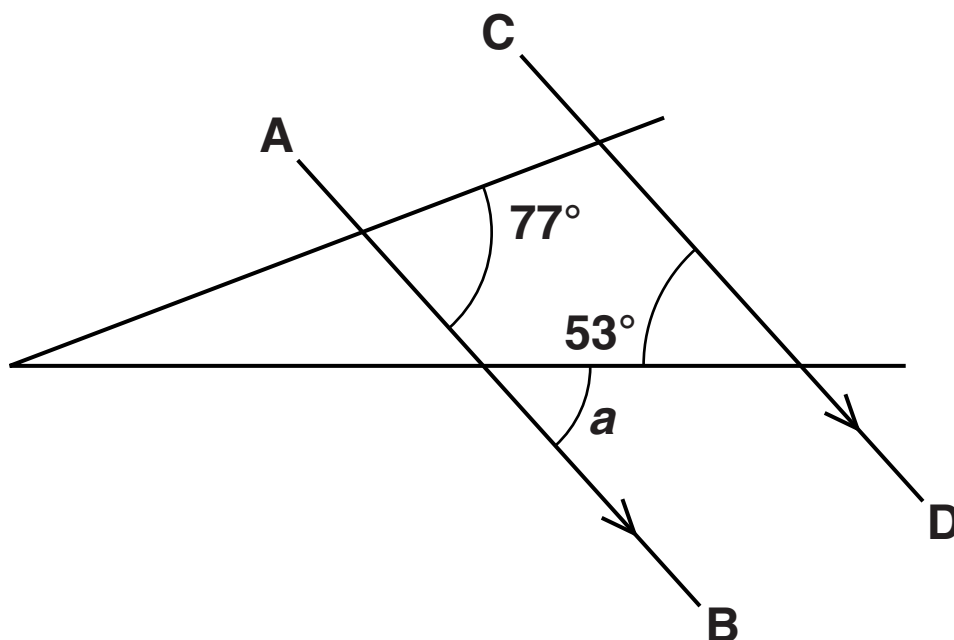
where  $N$  is the number of birds  
and  $t$  is the number of years after 2012.

Estimate the number of birds in 2015.

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[2]

11 (a) In the diagram below, AB is parallel to CD.



NOT TO SCALE

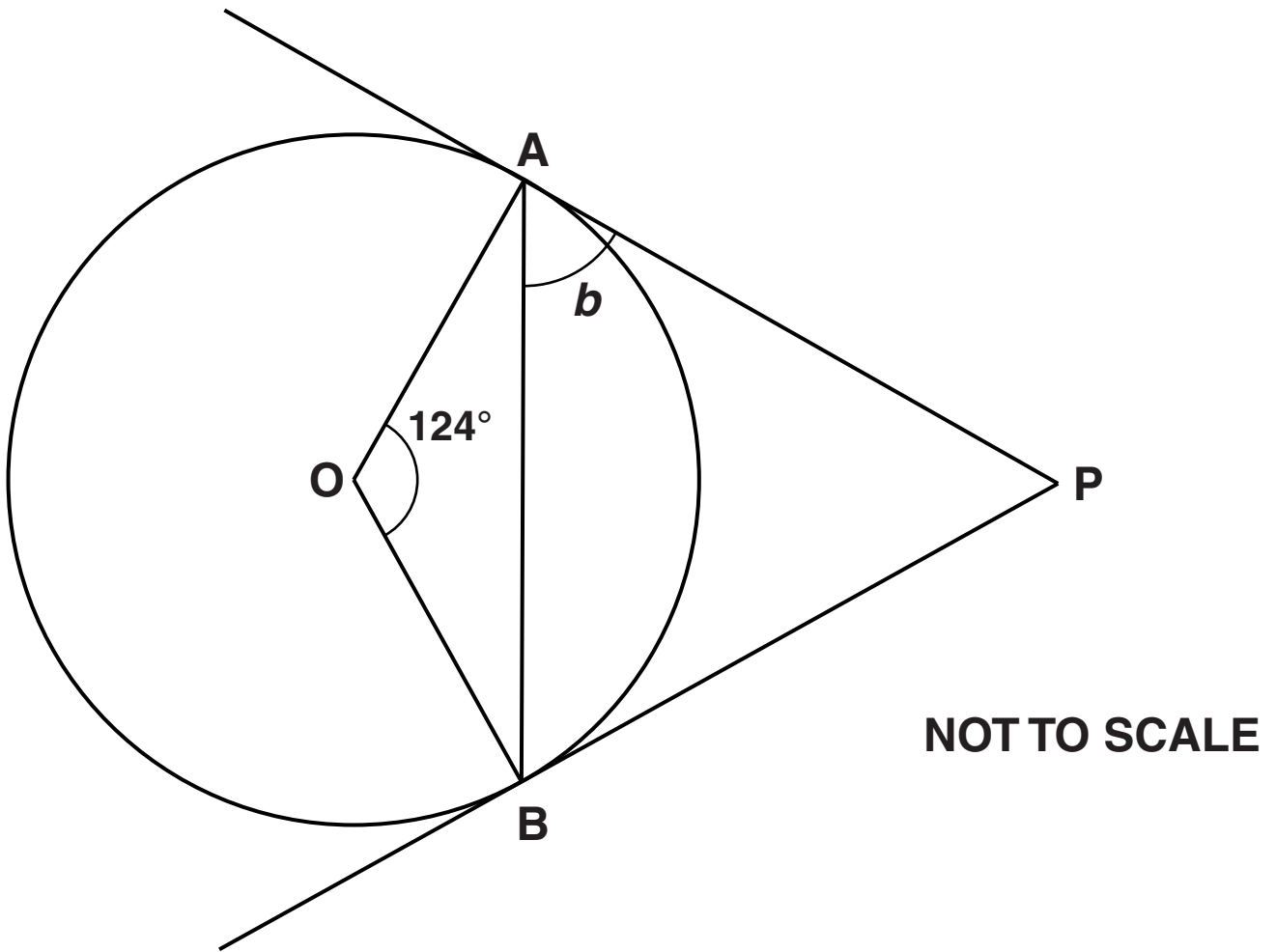
Complete this sentence.

Angle  $a$  = \_\_\_\_\_<sup>°</sup> because \_\_\_\_\_

\_\_\_\_\_

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

- (b) In the diagram, A and B are points on the circumference of a circle, centre O.  
PA and PB are tangents to the circle.

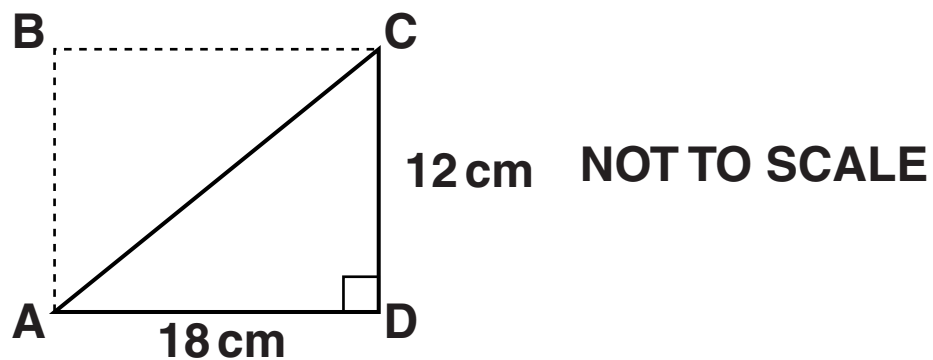


Calculate angle  $b$ .

(b) \_\_\_\_\_  $^\circ$  [2]

**12 ABCDEFGH is a cuboid.  
A labelled model is provided.**

**(a) Here is a diagram of the base.**

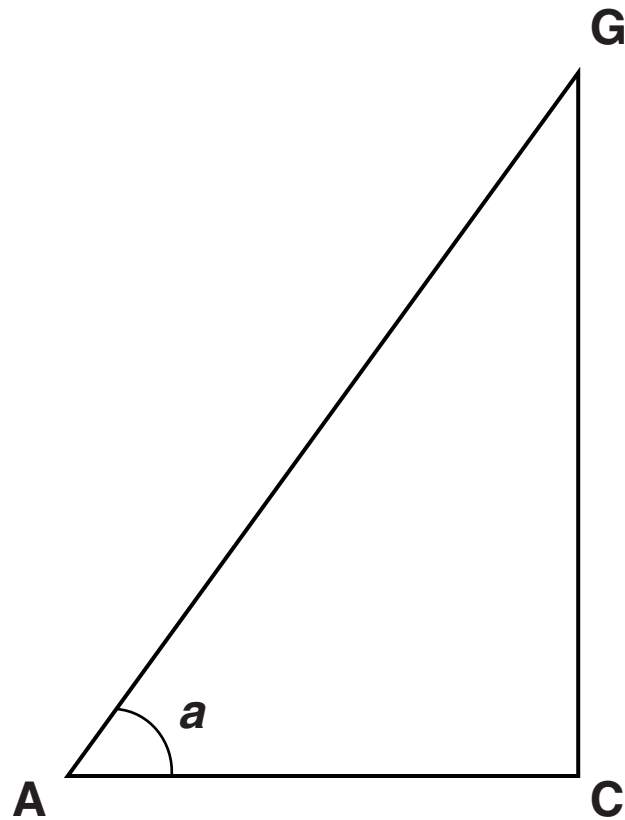


**Calculate the length of the diagonal AC.**

**(a) \_\_\_\_\_ cm [3]**



(b) Calculate angle  $a$  which is shown on the following diagram.



(b) \_\_\_\_\_<sup>°</sup> [3]

**13 (a) Solve.**

$$\frac{6x - 1}{4} = x + 5$$

**(a)  $x =$  \_\_\_\_\_ [3]**

**(b) Expand and simplify.**

$$(x - 6)(x + 6)$$

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

**(c) Factorise and solve.**

$$x^2 - 4x - 32 = 0$$

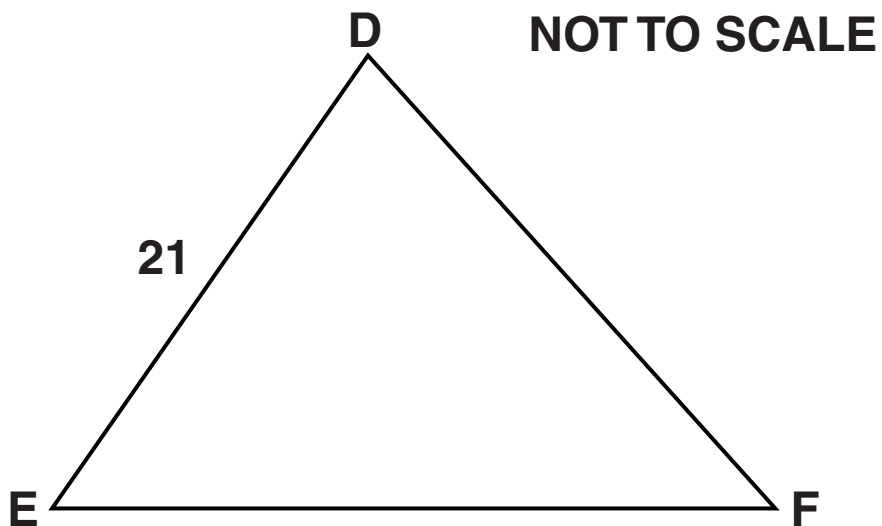
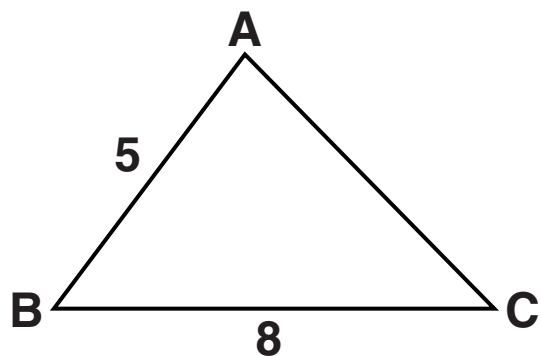
**(c)** \_\_\_\_\_ **[3]**

**(d) Rearrange this formula to make  $r$  the subject.**

$$S = 4\pi r^2$$

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

- 14 Triangles ABC and DEF are similar.  
All lengths on the following diagrams are in centimetres.



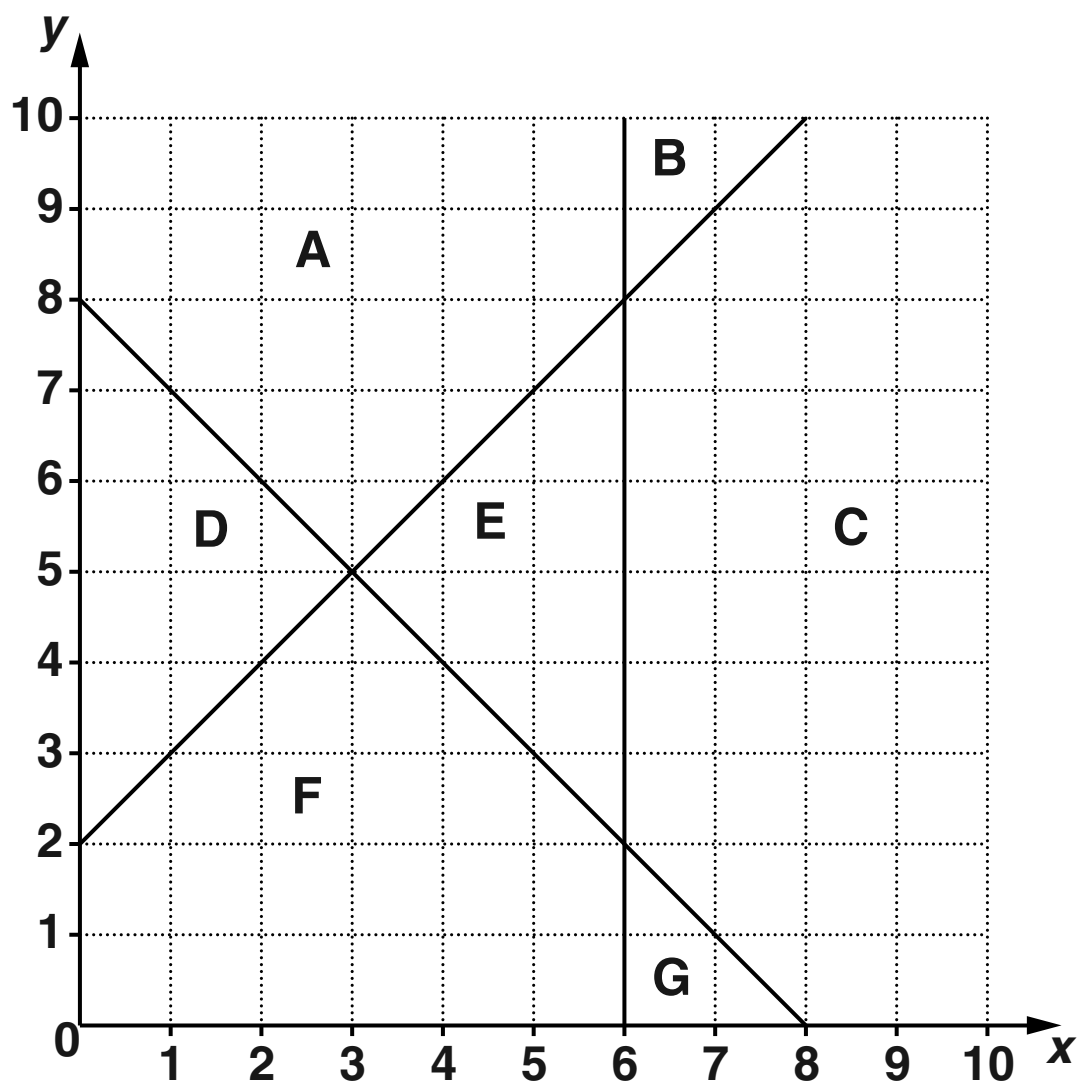
Calculate EF.

\_\_\_\_\_ cm [3]

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**TURN OVER FOR QUESTION 15**

- 15 A, B, C, D, E, F and G are regions shown on the following coordinate grid.



- (a) Write down the letters of ALL the regions which satisfy the inequality  $x \geq 6$ .

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

**(b) The regions D, F and G satisfy a different inequality.**

**Write down this inequality.**

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

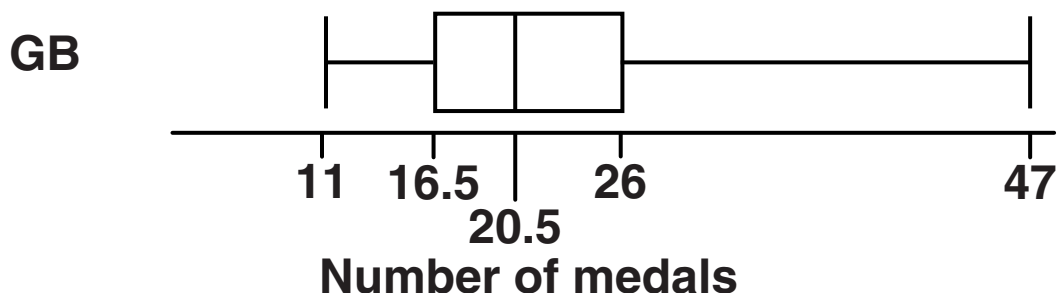
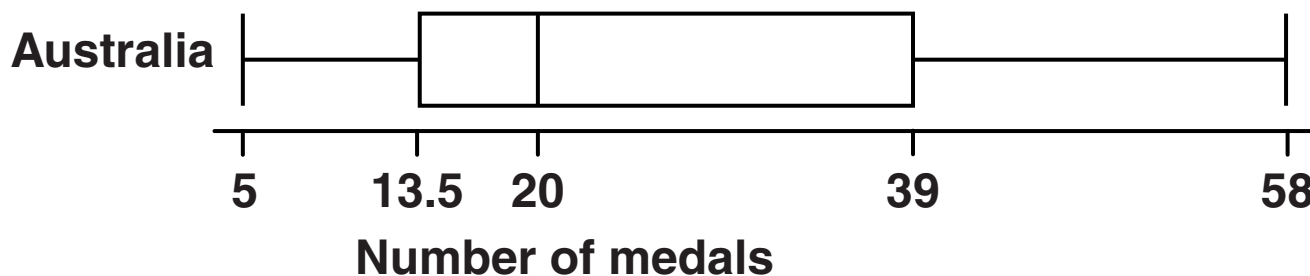
- 16 (a) In the 2004 Olympic Games, Great Britain (GB) won 30 medals.  
In the 2008 Olympic Games, GB won 47 medals.**

**Calculate the percentage increase in the number of medals won by GB from 2004 to 2008.**

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



(b) The box plots below summarise the number of medals won by Australia and GB at each Olympic Games since 1948.



(i) Work out the interquartile range for GB.

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

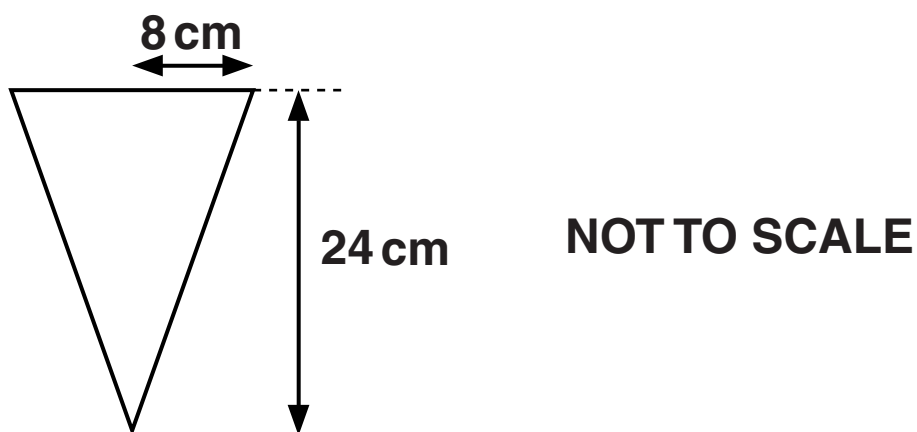
(ii) Make one comment comparing the numbers of medals won by Australia and GB.

\_\_\_\_\_

\_\_\_\_\_

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

- 17 The diagram below shows the side view of a container in the shape of a cone.  
The radius of the top is 8 cm and the vertical height is 24 cm.  
Both of these measurements are correct to the nearest centimetre.



Calculate the upper bound for the volume of this cone.

\_\_\_\_\_  $\text{cm}^3$  [4]

**18 The curve  $y = x^2$  is translated by  $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ .**

**Write down the equation of the transformed curve.**

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**[2]**

- 19 Solve these simultaneous equations.  
Give your answers correct to 2 decimal places.**

$$y^2 = 3x + 2$$

$$y = 2x - 1$$

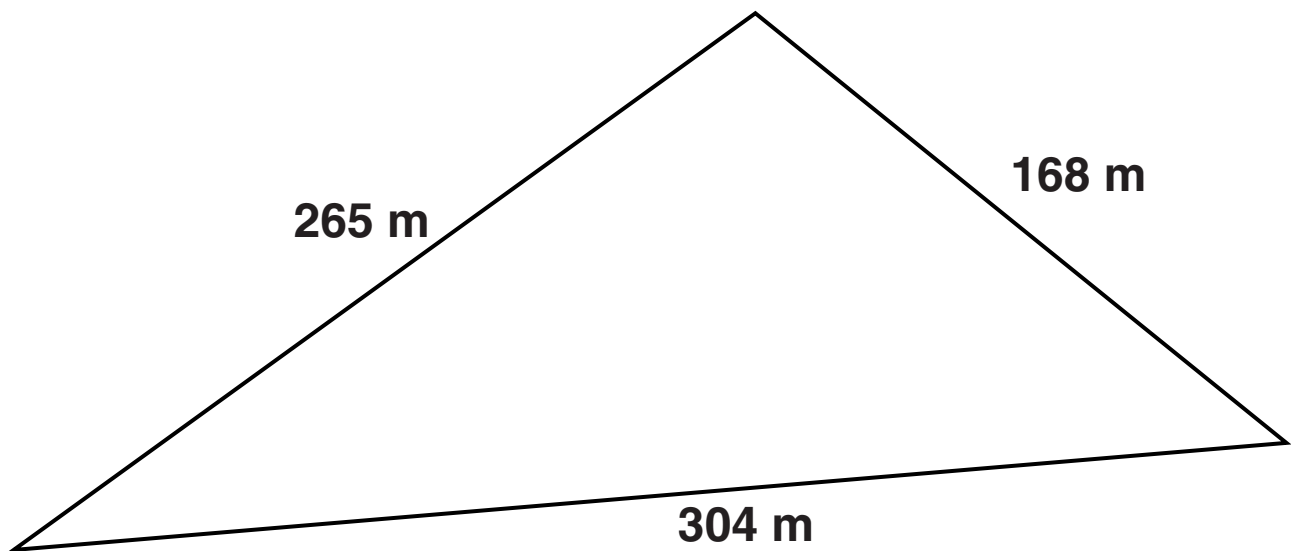
$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}} \quad [6]$$

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**TURN OVER FOR QUESTION 20**

**20\* This is a diagram of a field where Lucy wants to keep horses.**



**NOT TO SCALE**

**Each horse must have one acre of field.  
One acre is equivalent to  $4046.856 \text{ m}^2$ .**

**What is the largest number of horses Lucy can keep in this field?**

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**[6]**

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