

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
MATHEMATICS B**

J567/04

Paper 4 (Higher Tier)

SPECIMEN

Duration: 1 hour 45 minutes

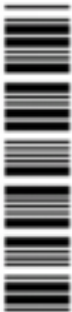
Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

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



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that 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.
- Answer all the questions.
- Do not write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Use the π button on your calculator or take π 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**.
- This document consists of **24** pages. Any blank pages are indicated.

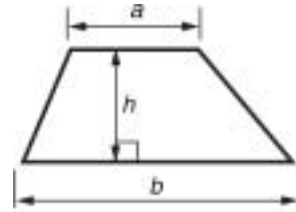


You are permitted to use a calculator for this paper.

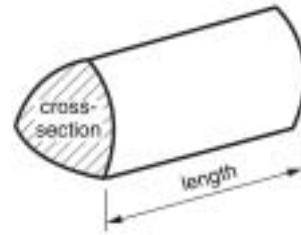


Formulae Sheet: Higher Tier

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



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

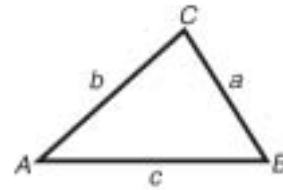


In any triangle ABC

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

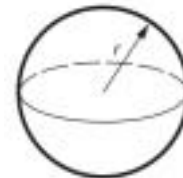
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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 $= \pi r l$



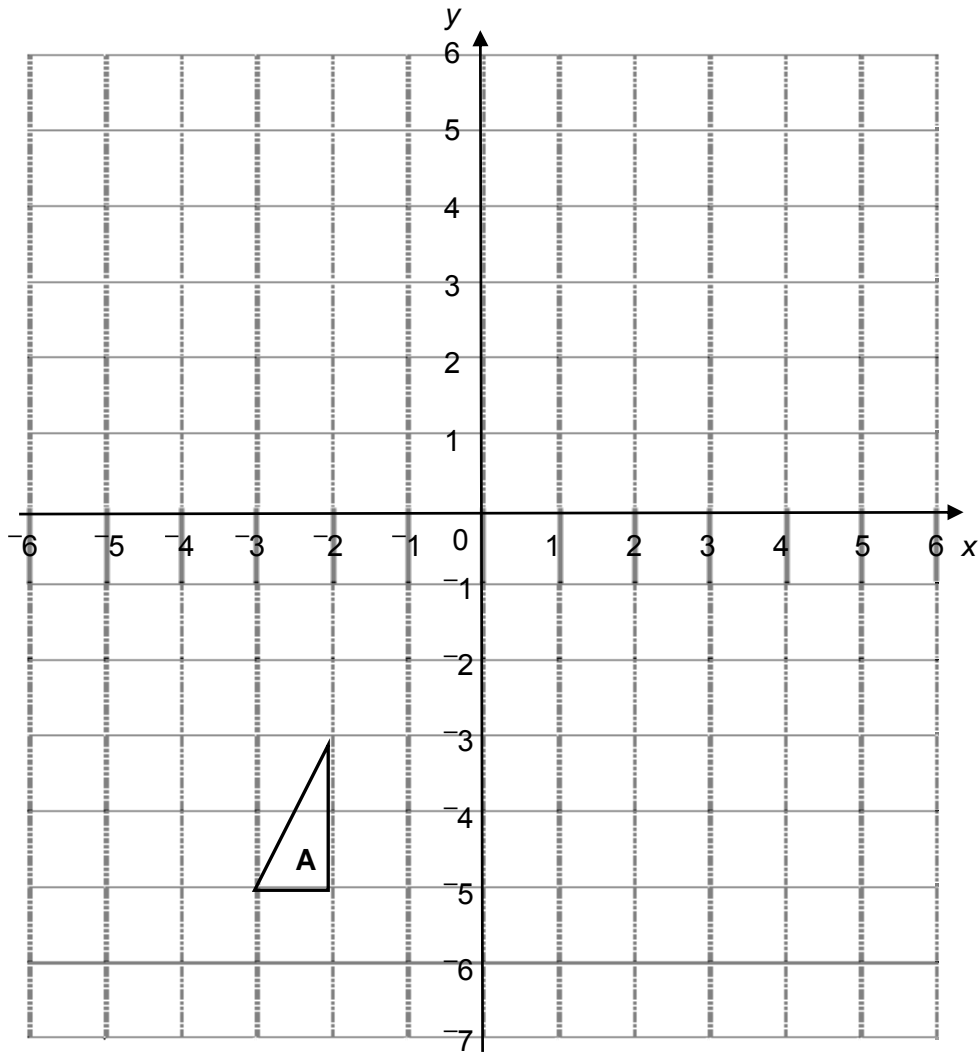
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

PLEASE DO NOT WRITE ON THIS PAGE

1



(a) Enlarge triangle **A** with centre $(-5, -6)$ and scale factor 3.

[3]

(b) The area of a rhombus is 4 cm^2 .
The rhombus is enlarged with scale factor 2.5.

Work out the area of the enlarged rhombus.

(b) _____ cm^2 [2]

2 Donna is doing a survey about the local library.

(a) Here is one of her questions.

How many books do you borrow from the library in a year?

Do you think this is a good question?
Explain your answer.



_____ because _____
_____ [1]

(b) Here is another of her questions.

Do you agree that the library is a good place to do your revision?

Yes

No

Write a better version of this question.

_____ [1]

(c) Donna stands inside the library on a Thursday afternoon to do her survey.

Explain why this is not a good idea.

_____ [1]

3 Here is the information panel in Adele's car at the end of a journey.

Journey Time:
3 hours 45 minutes

Average Speed:
77 km/h

(a) **Estimate** the distance, in kilometres, that she has travelled.
Show how you obtained your estimate.

_____ [2]

(b) **Calculate** the distance she has travelled.

(b) _____ km [2]

(c) This table summarises the weights of 25 cars.

Weight (w kg)	Frequency
$800 \leq w < 900$	1
$900 \leq w < 1000$	2
$1000 \leq w < 1100$	4
$1100 \leq w < 1200$	3
$1200 \leq w < 1300$	7
$1300 \leq w < 1400$	3
$1400 \leq w < 1500$	5

Calculate an estimate of the mean weight of these cars.

(c) _____ kg [4]

- 4 (a) In Year 9 at Mowden School there are 140 girls and 84 boys.

Write the ratio of girls to boys in its simplest terms.

(a) _____ [2]

- (b) In Year 10 the ratio of girls to boys is 3 : 2.
There are 240 students in this year group.

How many boys are there?

(b) _____ [2]

5 (a) Factorise.

$$5x - 3x^2$$

(a) _____ [2]

(b) Solve.

(i) $3(2x + 5) = 9$

(b)(i) _____ [3]

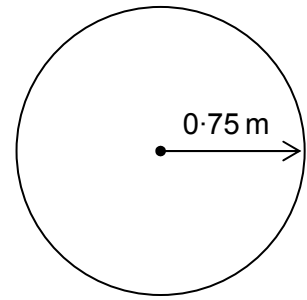
(ii)* $6x - 10 = 2x + 8$

(ii) _____ [3]

- 6 Kate has a pond in her garden.
The surface is a circle with radius 0.75 m.

Kate wants to keep fish in the pond.
She finds this information on the internet.

Total length of all the fish should not be more than
5 cm for each 0.1 m^2 of the pond's surface area.



The fish she chooses are each 8 cm long.

What is the maximum number of these fish that Kate can buy for her pond?

[6]

7 You must use a ruler and a pair of compasses for this question.
Construct and shade the region which is both:

- nearer to B than to A
- within 5 cm of A.

Leave your construction lines clearly visible.

• A

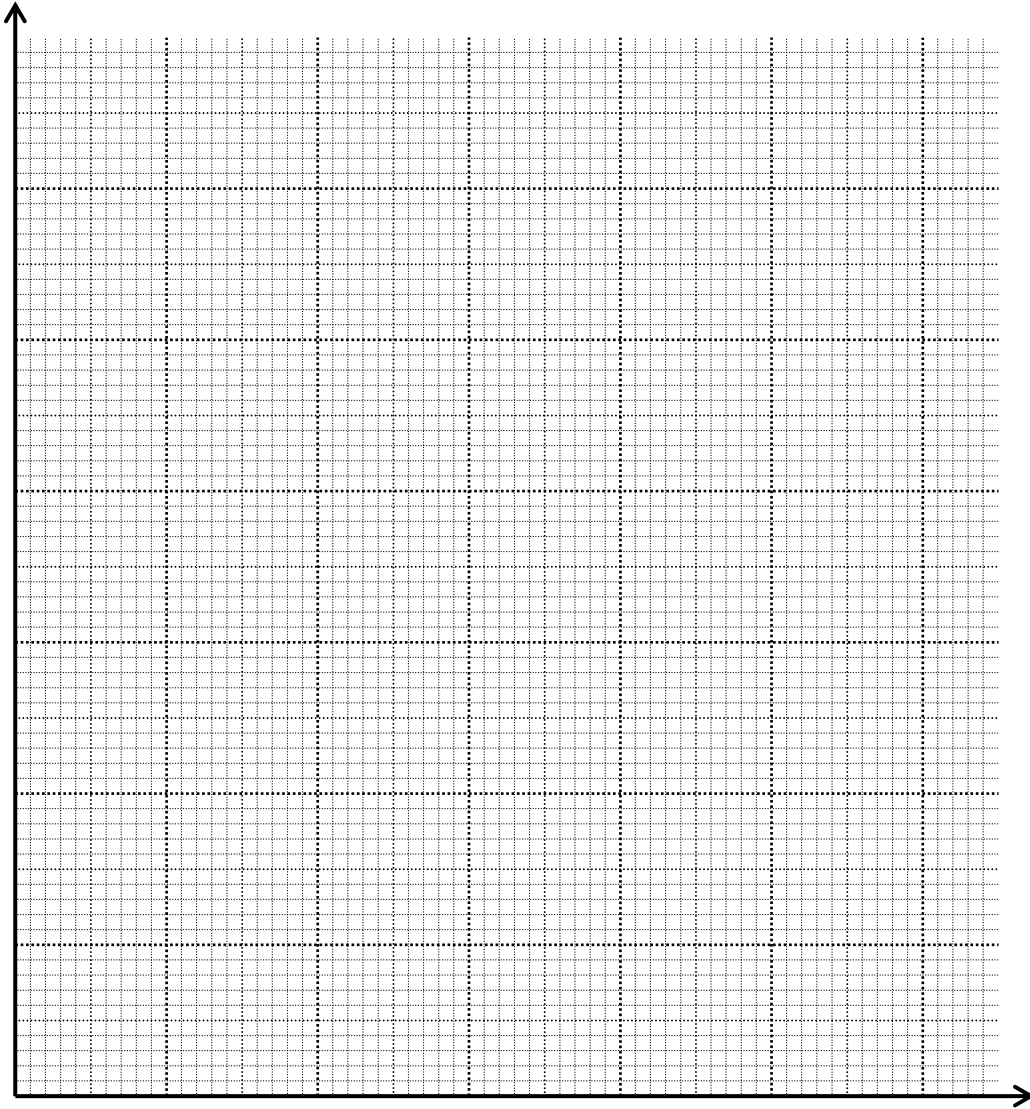
B •

[3]

- 8 Muttiah collects 8 leaves from his garden and measures their lengths and widths. His results are shown in the table below.

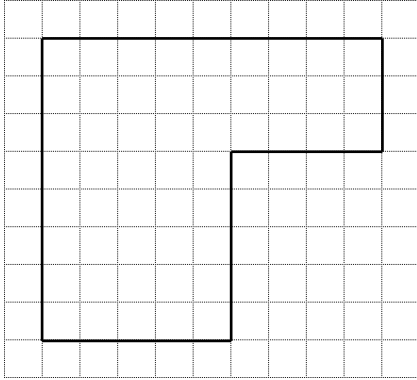
Which of these leaves come from the same type of tree and which do not?

Leaf	A	B	C	D	E	F	G	H
Length (mm)	144	123	116	149	126	148	118	137
Width (mm)	116	76	62	79	67	50	70	81



[5]

- 9* Adnan is insulating his loft.
One roll of insulation will cover an area of 1.97 m^2 .
Here is the plan view of Adnan's loft.



Scale: 1 cm to 2 m

How many rolls of insulation does Adnan need to buy to insulate his loft?

10 The equation $x^3 - 4x = 20$ has a solution between 3 and 4.

Find this solution correct to 1 decimal place.
Show all your trials and their outcomes.

$x =$ _____ [3]

11 Eyal's hard disk has a capacity of 240 gigabytes.

1 gigabyte (GB) = 1 000 000 000 bytes

(a) Write 240 GB as bytes in standard form.

(a) _____ bytes [1]

(b) The hard disk has 26% of its total capacity unused.

Work out the unused capacity.

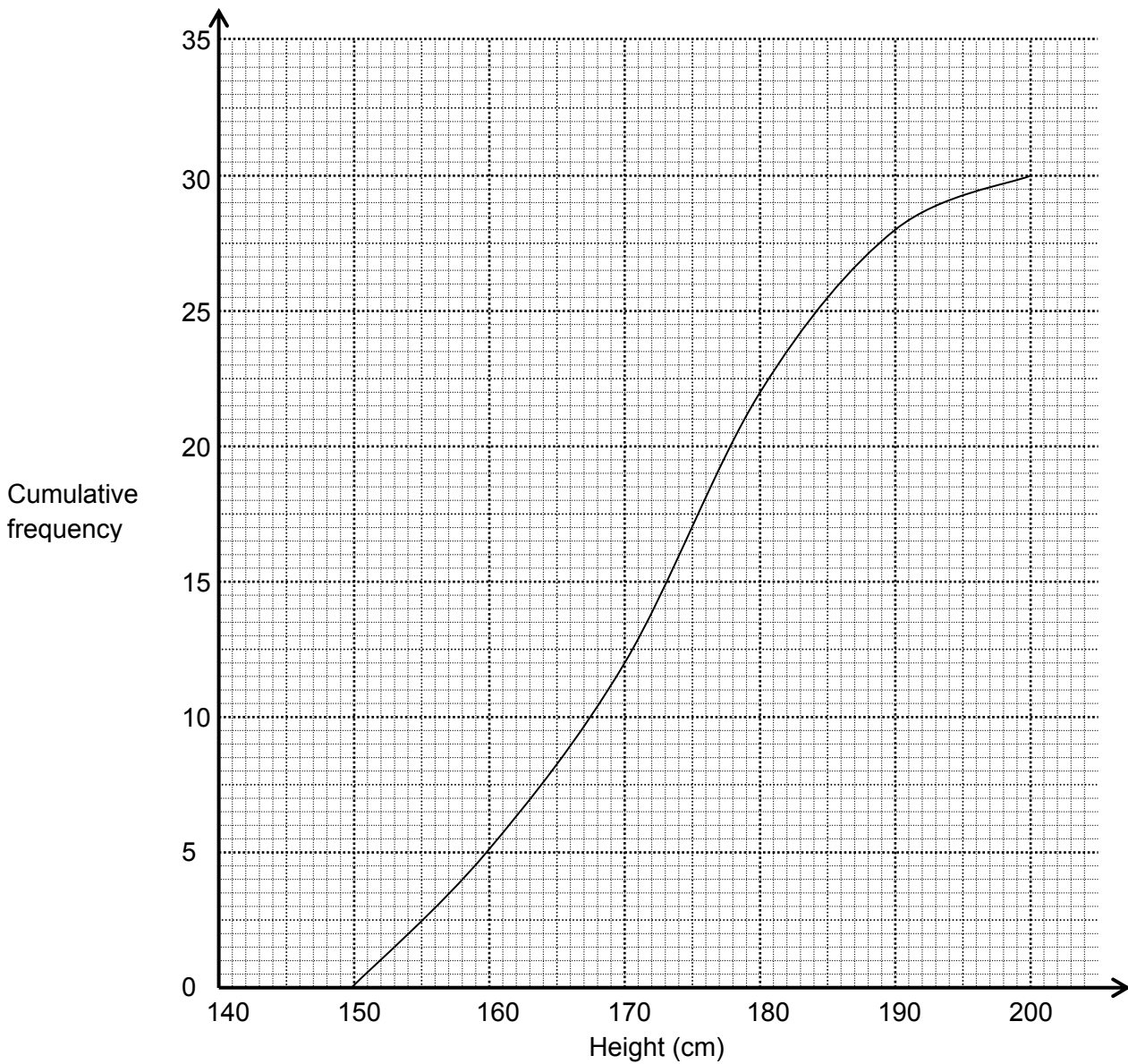
(b) _____ bytes [2]

(c) Eyal buys another hard disk with an unused capacity of 144 GB.

Work out the total unused capacity, in bytes, of both hard disks.
Write your answer in standard form, correct to 2 significant figures.

(c) _____ bytes [3]

12 The heights of pupils in classes 10A and 10B were measured.
 This cumulative frequency graph summarises the heights of pupils in class 10A.



(a) Use the graph to complete this table.

Class	Median (cm)	Interquartile range (cm)
10A		
10B	169	12

[3]

(b) Use the information in the table to write one comment comparing the heights of the pupils in classes 10A and 10B.

[1]

13 Solve.

$$3x + 2y = 8$$

$$2x - 5y = 18$$

$$x = \underline{\hspace{10cm}}$$

$$y = \underline{\hspace{10cm}} \quad [4]$$

14 (a) y is inversely proportional to x^2 and $y = 6$ when $x = 5$.

Write an equation connecting x and y .

(a) _____ [3]

(b) Calculate the value of y when $x = 10$.

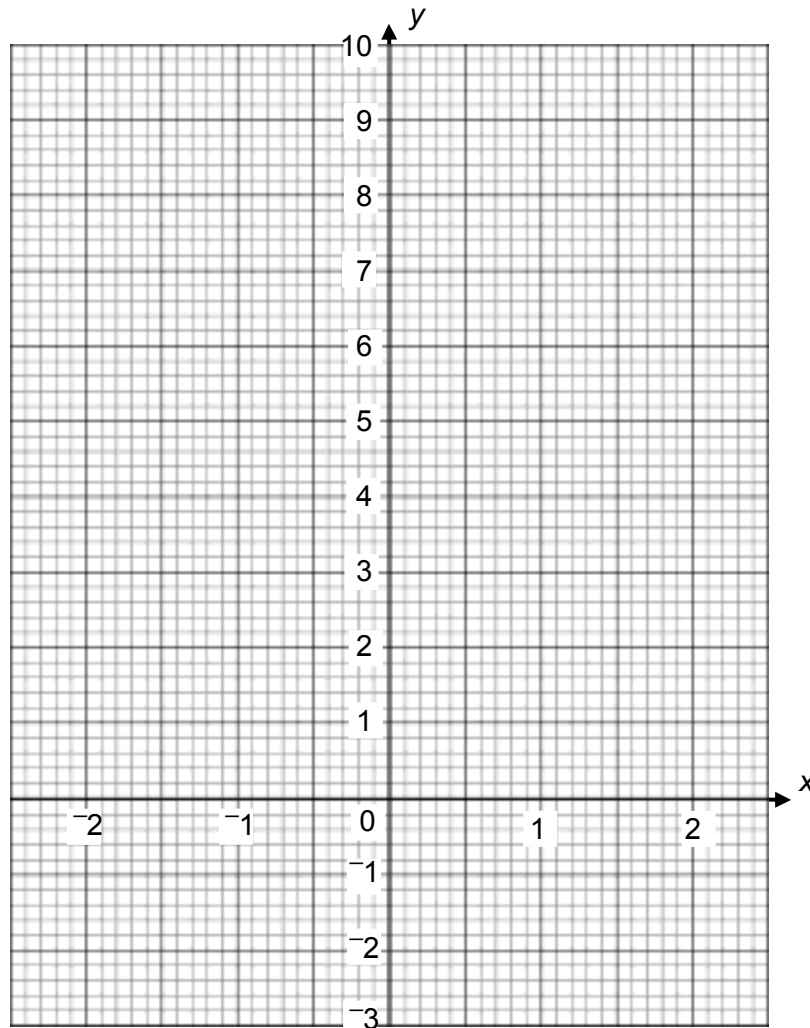
(b) _____ [1]

15 (a) Complete this table for the graph of $y = 2x^2 + x - 2$.

x	-2	-1	-0.5	0	0.5	1	2
y	4	-1	-2	-2	-1	1	

[1]

(b) Draw the graph of $y = 2x^2 + x - 2$.



[2]

(c) By drawing an appropriate line on the graph, solve this equation.

$$2x^2 + 2x - 3 = 0$$

(c) _____ [3]

16 (a) Factorise and solve.

$$x^2 - x - 30 = 0$$

(a) _____ [3]

(b) Solve this equation, leaving your answers in surd form.

$$2x^2 + x - 2 = 0$$

(b) _____ [3]

17 Show that $\frac{(3 + \sqrt{3})^2}{\sqrt{3}} \equiv 6 + 4\sqrt{3}$.

[3]

- 18 In a city 33% of the people have been vaccinated against influenza.
A person who has been vaccinated has a 6% chance of catching influenza.
A person who has not been vaccinated has a 41% chance of catching influenza.

What is the probability that a person in that city, selected at random, will catch influenza?

[3]

- 19** A plane travels 125 km from A to B on a bearing of 030° and then 184 km from B to C on a bearing of 160° .

Calculate the direct distance from A to C.

_____ km [5]

21 *Maghomes* sells caravans.

This is the number of caravans sold each quarter in 2008 and 2009.

	2008				2009			
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Frequency	30	64	44	18	22	72	40	6

The first three 4-point moving averages have been calculated.

39 37 39

Calculate the two remaining moving averages.

_____ , _____ [2]

TURN OVER FOR QUESTION 22

22 A population of bacteria is growing according to this rule.

$$B = 1200 \times 3^t.$$

B is the number of bacteria,
 t is the time in hours after 8 am on Tuesday.

(a) What is the value of B at 8 am on Tuesday, when $t = 0$?

(a) _____ [1]

(b) How many bacteria will there be at 12 noon?

(b) _____ [1]

(c) How many whole hours after 8 am will the number of bacteria first exceed 1 million?

(c) _____ [1]

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Oxford Cambridge and RSA Examinations

General Certificate of Secondary Education

MATHEMATICS B

J567/04

Paper 4 (Higher Tier)

Specimen Mark Scheme

The maximum mark for this paper is **100**.

This document consists of **8** printed pages.

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1	(a) Correct triangle (4, 3), (4, -3), (1, -3).	3	2 if two vertices correct or 1 for enlargement sf 3 drawn in wrong place or 1 for enlargement centre (-5, -6) but wrong sf
	(b) 25 cm ²	2	B1 for [\times] 2.5 ² oe seen, eg $\times 2.5 \times 2.5$ or 6.25
2	(a) No, difficult to answer precisely	1	Award mark for answer implying respondents not remembering the number of books they borrowed
	(b) Reworded non-leading question	1	Or question with a 'don't know' option
	(c) No, only asking people who use the library at that time	1	Accept implication that it will be a poor sample
3	(a) Accept any reasonable rounding leading to 280 – 320 eg $3.5 \times 80 = 280$, $4 \times 80 = 320$, $4 \times 70 = 280$ or $3\frac{3}{4} \times 80 = 300$	2	M1 for rounding evidenced by 3.5, 4 or 80 or correct 'product' but incorrect answer
	(b) 288.75 oe or 289 or 290	2	M1 77 \times <i>their</i> time, for time allow 3.75, 345, 225, 3.45
	(c) Use of midpoints (<i>m</i>) (850, 950, 1050, 1150, 1250, 1350, 1450) and at least 4 must be correct Σmf or 30450 \div 'their 25' 1218	B1 M1 M1 A1	
4	(a) 5 : 3	2	M1 for any equivalent ratio to 5 : 3 including 140 : 84, or 3 : 5
	(b) 96	2	M1 240 \div (3 + 2)

<p>5</p> <p>(a) $3x(2 - x)$</p>	<p>(b)(i) $6x + 15$ '$6x = 9$ – <i>their</i> '15' or better $x = \frac{k}{a}$ after $ax = k$ -1</p>	<p>2</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>M1 for $3(2x - x^2)$ or $x(6 - 3x)$</p> <p>} Maximum of 2 from these 3 marks</p> <p>Must have correct answer and working for all three marks</p>
	<p>(ii)* Answer of 4.5 or supported by correct and coherent algebraic notation. Each line of working must be an equation and any fractions must be written correctly.</p> <p>Correct answer obtained but with some errors in notation or minor errors in working but supported by correct and coherent algebraic notation.</p> <p>The answer is incorrect and there are no correct steps in any working.</p>	<p>3</p> <p>2-1</p> <p>0</p>	<p>For the lower mark – evidence of correctly combining like terms eg $4x = 18$, but incorrect or no final solution produced or incorrect solution with some evidence of attempt to combine like terms.</p>
<p>6</p>	<p>$\pi \times 0.75^2$ 1.767(1...) or 1.77 50 cm per m² implied <i>their</i> 1.767' $\times 50$ '<i>their</i> 88(-3...)' $\div 8$ 11</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>Accept integer answer only for final A1</p>
<p>7</p>	<p>Correct perpendicular bisector of AB with correct construction arcs and part circle radius 5 cm centre A and correct region shaded</p>	<p>3</p>	<p>allow tolerance of ± 2mm in all measurements and allow circle to be sufficiently drawn to intersect twice the perpendicular bisector of AB</p> <p>M1 for perpendicular bisector of AB with correct construction arcs</p> <p>M1 part circle radius 5 cm centre A</p>

8	<p>B, C, D, E, G, H are from the same tree A and F are outliers (can be implied) and evidence (see method)</p>	5	<p>Evidence :</p> <p><u>Scatter Diagram</u></p> <p>M1 correct axes labelled M2 for 7 correct points plotted (allow M1 for 4 points correct) M1 for identifying main cluster on diagram or in statement allow length on either axes</p> <p><u>Ratios</u></p> <p>M3 for 8 correct ratios (in order: 1.24, 1.78, 1.88, 1.89, 1.88, 2.96, 1.74, 1.76) (allow M2 for 4 correct ratios or M1 for any attempt at ratios) M1 for an identification of any acceptable cluster allow ratios either way round, these figures are correct to 3sf so allow figures to a greater degree of accuracy</p> <p>If ratio used, accept a cluster from B, G, H or C, D, E</p>
9*	<p>27 rolls with correct and clearly expressed supporting method showing area of loft/length of insulation required and converting to correct integer number of rolls.</p> <p>Area of loft found (52 m²) or total length of strips of insulation found within a clearly presented method.</p> <p>Clearly identifying real dimensions from plan view or showing layout of strips of insulation on plan and some evidence of method used.</p> <p>Incorrect answer with no relevant content</p>	<p>6-5</p> <p>4-3</p> <p>2-1</p> <p>0</p>	<p>For lower mark - incorrect integer number of rolls with correct and clearly expressed supporting method showing area of loft/length of insulation required and converting to rolls or correct number of rolls but method not clearly presented.</p> <p>For lower mark –an incorrect area or number of strips is indicated within a clearly presented method or the correct area or number of strips is indicated but the method is not clearly presented.</p> <p>For lower mark – real dimensions or layout of strips shown but little evidence of any method or explanation provided.</p>
10	<p>$x = 3.2 \text{ www}$</p>	3	<p>2 trials with 3 and 4 and at least 1 intermediate value shown 1 at least 2 trials shown</p>

11	(a) 2.4×10^{11}	1	
	(b) 62400000000 or 6.24×10^{10} oe	2	M1 $0.26 \times$ <i>their</i> ' 2.4×10^{11} ' oe or figs 624 ft from <i>their</i> (a) for 2 marks and accept numbers not in standard index form, Allow answers in GB if GB marked on answer line
	(c) <i>their</i> $6.24 \times 10^{10} + 1.44 \times 10^{11}$ figs 2064 2.1×10^{11}	M1 1 A1	
12	(a) 173 and 16.5/17	3	W1 173 W1 for either correct end of IQR seen eg 180.5/181 or 164
	(b) Allow any correct comment reference to heights not just median/IQR	1	Eg 10A are taller on average , or 10A heights are more spread out Note: <u>not</u> 10A have a larger mean
13	$x = 4, y = -2$ with correct supporting working	4	M2 for eq.1 $\times 5$ and eq.2 $\times 2$, or eq.1 $\times 2$ and eq.2 $\times 3$ (M1 for each operation) AND M1dep for correctly + or – <i>their</i> two equations Correct answers without working scores 1 Allow any pairs of multipliers that will eliminate x or y Allow one error in each operation
14	(a) $y = \frac{150}{x^2}$ oe	3	M1 $y = \frac{k}{x^2}$ oe M1(dep) substitute $x = 5$ and $y = 6$ into <i>their</i> expression or $k = 150$ soi
	(b) 1.5	1	ft <i>their</i> expression in (a) providing it involves x^2
15	(a) 8	1	
	(b) All <i>their</i> points correctly plotted and joined with a single curve	2	M1 for all points correctly plotted Allow ± 1 mm in plotting points and in drawing the line
	(c) Draw the line $y = 1 - x$ and give answers in ranges -1.8 to -1.9 and 0.7 to 0.8	3	M1 for the line $y = 1 - x$ drawn A1 each answer correct ft <i>their</i> graph (± 0.1)
16	(a) 6 (and) $^{-5}$	3	M2 $(x - 6)(x + 5)$ OR M1 $(x \pm 6)(x \pm 5)$
	(b) $\frac{-1 + \sqrt{17}}{4}$ and $\frac{-1 - \sqrt{17}}{4}$	3	B1 each and M1 correct subst'n: $\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -2}}{2 \times 2}$

21	38 and 35	2	M1 4 correct frequencies added and divided by 4 OR W1 38 or 35
22	(a) 1200	1	
	(b) 97 200	1	
	(c) 7	1	

Paper Total: 100 marks

Assessment Objectives and Functional Elements Grid

GCSE MATHEMATICS B

J567/04

Mathematics B Paper 4 (Higher Tier)

	Topic	Context	Ref	AO1	AO2	AO3	Functional
1	Transformations		HBG7 HSG7	5			
2	Questionnaire	Library	HIS5		3		3
3	Speed, estimation	Cars	HIN6 HBG2 HBS2		8		4
4	Ratio	School	HIN5	2	2		
5	Factorising, equations		HIA3 HIA2	8			
6	Area of circle, compound measures	Fish pond	HIG3 HBG2			6	6
7	Constructions and loci		HBG6	3			
8	Scatter diagram	Leaves	HBS3			5	5
9	Area, plans	Loft insulation	HIG4 HIG5			6	6
10	Trial and improvement		HIA5	3			
11	Standard index form	Computer	HSN3		6		
12	Cumulative frequency	Pupils' heights	HSS2 HSS3		4		1
13	Simultaneous linear equations		HSA4	4			
14	Inverse proportionality		HGA1	4			
15	Quadratic graph		HSA5 HGA3	6			
16	Factorise, solve quadratics		HSA2 HGA2 HGN2	6			
17	Simplify surds		HGN2	3			
18	Probability	Vaccination	HGS1			3	3
19	Cosine rule	Plane journey	HGG3			5	
20	Geometric proof		HGG1	3			
21	Moving averages	Caravan sales	HSS4		2		
22	Exponential growth	Bacteria	HGN5		3		2
	TOTALS			47	28	25	30

Paper Total: 100 marks