

GCSE

Mathematics B (Linear)

Component **J567/04**: Mathematics Paper 4 (Higher)

General Certificate of Secondary Education

Mark Scheme for June 2014

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations used in the detailed Mark Scheme.

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	Correct
	Incorrect
	Benefit of doubt
	Follow through
	Ignore subsequent working (after correct answer obtained), provided method has been completed
	Method mark awarded 0
	Method mark awarded 1
	Method mark awarded 2
	Accuracy mark awarded 1
	Independent mark awarded 1
	Independent mark awarded 2
	Misread
	Special case
	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A**, **B**, etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate these scripts to show how the marks have been awarded. It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

1. **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.
2. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

3. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT $180 \times (\textit{their} \text{'37'} + 16)$, or FT $300 - \sqrt{(\textit{their} \text{'5}^2 + 7^2)}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \textit{their} (a)$.

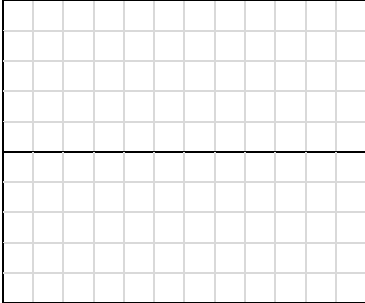
For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.
5. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
 - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
 - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
 - **nfw** means **not from wrong working**.
 - **oe** means **or equivalent**.

- **rot** means **rounded or truncated**.
 - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
 - **soi** means **seen or implied**.
6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.
7. In questions with a final answer line following working space,
- (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.
 - (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.
 - (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.
8. In questions with a final answer line:
- (i) If one answer is provided on the answer line, mark the method that leads to that answer.
 - (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.
 - (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.
9. In questions with no final answer line:
- (i) If a single response is provided, mark as usual.
 - (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

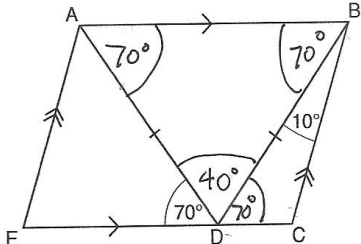
10. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.
11. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.
12. Ranges of answers given in the mark scheme are always inclusive.
13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
14. Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.

MARK SCHEME

Question		Answer	Marks	Part marks and guidance	
1	(a)	2.15–2.25	2	M1 for 4.3–4.5 seen Or for answer <i>their</i> length $\div 2$	Must see their measurement
	(b)		2	Accept any orientation, must include central line B1 for rectangle 5cm by 6cm, any orientation Or for any rectangle (or square) with line dividing into two halves	Use overlay NB lines on overlay just under correct size to allow candidate's drawing to be seen Condone dashed lines Clear intention at correct size
2	(a)	2.92	2	Mark final answer B1 for 2.9[...] seen Or for <i>their</i> answer to more than 3sf correctly rounded to 3sf	Both unrounded and rounded value must be seen
	(b) (i)	Comment implying 0.25 is 15 minutes or implying quarter of an hour is not 25 minutes	1	Or comment using [60 minutes in hour] not 100 minutes Accept answer is 2 hours 15 minutes	See exemplars for alternative acceptable answers Award 0 if any incorrect statement
	(ii)	Answer should be >3570	1	Or dividing by number < 1 so answer should be bigger	See exemplars for alternative acceptable answers
3	(a)	0.4 0.36 0.38 oe	2	B1 for 1 correct Or answers figs 4, 36 and 38	Accept $\frac{4}{10}$, $\frac{18}{50}$, $\frac{76}{200}$ etc

Question		Answer	Marks	Part marks and guidance	
	(b)	0.38, more trials [give a better estimate]	1		See exemplars Accept any implication of 200 spins column for 0.38 Award 0 if any incorrect statement
	(c)	180 to 200	1	FT 500 × <i>their</i> relative frequency from (b)	allow ±10 from calculated value Accept a range if end values are within given range FT only if relative frequency < 1 Condone eg 190/500 as answer
	(d)	No, would expect probability of 0.2 if fair Or No, would expect 100 3s if fair	1		See exemplars Should compare probabilities or expected outcomes If 'Yes' award 0
4	(a)	1.4	3	M1 for $11 \times 0 + 8 \times 1 + 6 \times 2 + 0 \times 3 + 3 \times 4 + 2 \times 5$ M1 dep for <i>their</i> '42' ÷ 30 soi	Attempt to find sum of products, at least 4 correct products seen Implied by 42 seen Attempt to divide <i>their</i> sum by 30, implied by correct answer to division after total seen

Question		Answer	Marks	Part marks and guidance		
	(b)	Autumn, Spring With 17[.1...] and 16[.3...] or 16.4 and 12 or 11[.7...] seen OR Autumn, Spring with 21 and 17[.4] and 19[.2] seen	3	M2 for at least two of 17, 16 and 12 (or 11) or better seen Or M1 for $24 \div 140$ or $19 \div 116$ or $15 \div 128$ soi Alternative method M2 for at least two of 21, 17[.4], and 19[.2] seen Or M1 for 0.15×140 or 0.15×116 or 0.15×128 soi	For 3 marks all 3 values must be rounded or truncated to at least 2 s.f. Allow decimal equivalents for percentages Exact percentages are: Autumn 17.14...% Spring 16.379..% Summer 11.718...% For non-calculator method, must see 10% correctly evaluated with attempt at 5% and attempt to add	
5	(a)	(i)	3, 11, 19	2	B1 for 2 correct in correct position Or SC1 for 5, 3, 11	
		(ii)	No with valid reason	1	Reasons to involve one of: A All numbers are odd or 96 is even B Use of 91 and 99 C Use of 12.625 D Use of 91 and add 8 E Use of 101 and divide by 8 F 96 is a multiple of 8	See exemplars
	(b)		$23 - 7n$ oe	2	M1 for $7n$ seen	Condone $s = 23 - 7n$, $t_n = 23 - 7n$ for 2 marks But $n = 23 - 7n$ scores M1 only

Question		Answer	Marks	Part marks and guidance	
6	(a)	$\angle BCD = 100^\circ$ Correct relevant reason seen Two relevant reasons linked with correct angles and no reasons linked incorrectly with angles	B2 M1 A1	Or B1 for two correct angles found Relevant reasons are: alternate [angles] isosceles [triangle] Co-interior/allied [angles] ... 180 [angles in] triangle [is>equals/adds to] 180 [angles on a straight] line [is>equals/adds to] 180 Any of the relevant angles must be correct if stated A0 if any reason used incorrectly or angles stated incorrectly	Angles may be indicated on diagram 100 marked on diagram can be one angle for B1, but for B2 must be identified as angle BCD. Condone Z angle for alternate Condone C angle ... 180 for co-interior Condone isos for isosceles Where 180 is required in reason, this may be seen in the relevant calculation  Diagram shows relevant angles
	(b)	15	2	M1 for $180 - 156$ soi	M1 implied by 24 seen or may be part of calculation such as $180n - 156n = 360$ or better
7	(a)	$2y(3x + 4y)$	2	Mark final answer B1 for $2y(3x + \dots)$ or $y(6x + 8y)$ or $2(3xy + 4y^2)$ seen	Condone missing final bracket Condone for B1 $4y(1.5x + 2y)$ or $(2y + 0)(3x + 4y)$

Question		Answer	Marks	Part marks and guidance	
	(b)	$x^2 - 8x + 15$	2	Mark final answer M1 for three of x^2 , $-5x$, $-3x$, $+15$ in working or part of 4-term answer Or two of x^2 , $-8x$, $+15$ in 3-term final answer	Condone double signs for 1 mark only $x^2 + 15$ alone as final answer scores 0
	(c)	$x < 10$ or $10 > x$	3	Mark final answer M2 for $5x - 3x < 18 + 2$ or better Or M1 for $5x - 3x - 2 < 18$ or better collecting x Or $5x < 3x + 18 + 2$ or better collecting constants AND M1 for $x < \frac{m}{k}$ after $kx < m$ seen Max 2 marks if answer incorrect Or B2 for answer 10 or $x \dots 10$ with = or any incorrect inequality symbol or answer $5 \times 10 - 2 < 3 \times 10 + 18$	Condone use of = or incorrect inequality symbol instead of < for all method marks Implied by $2x < m$ Implied by $kx < 20$ $m \neq 0$, $k \neq 1$ Accept improper fraction or correct 3 s.f. decimal

Question		Answer	Marks	Part marks and guidance	
	(d)	1.6 or $\frac{8}{5}$ oe	3	<p>M1 for $x = 4(2 - x)$ or better eliminating fraction</p> <p>And M1 for $x + 4x = 8$ or better FT Collecting x terms</p> <p>AND M1 for $x = \frac{b}{a}$ after $ax = b$ seen</p> <p>Max 2 marks if answer incorrect</p>	<p>Alternative method for first two M marks</p> <p>M1 for $\frac{x}{4} + x = 2$ or better</p> <p>And M1 for $\frac{5x}{4} = 2$</p> <p>$b \neq 0, a \neq 1$ Accept improper fraction or correct 3 s.f. decimal ISW for incorrect conversion of improper fraction</p>
8		Reflection in $y = -x$ oe	3	<p>B1 for reflection only</p> <p>B2 for $y = -x$</p> <p>Or B1 for $y = x$</p> <p>Award B0 if second transformation mentioned or implied</p> <p>After B0 award SC1 for triangle with vertices $(-1, -1), (-2, -1), (-1, -4)$ seen</p>	<p>These marks are only available if single transformation only mentioned</p> <p>SC1 can be awarded if more than one transformation stated Clear intention of correct triangle</p>
9	(a)	345.9[3...] or 346	4	<p>B3 for 120.9[3...] or 121 as answer OR</p> <p>M2 for $\sqrt{145^2 - 80^2}$ or $\sqrt{14625}$</p> <p>Or M1 for $145^2 = 80^2 + AC^2$ or better</p> <p>AND M1 for $145 + 80 + \text{their '120.9'}$</p>	<p>Allow any number for 120.9 unless contradicted by their AC</p>

Question			Answer	Marks	Part marks and guidance	
	(b)		326.5 to 326.6 or 327	4	<p>B3 for 33.4 to 33.5 or 33</p> <p>OR</p> <p>M2 for $\sin^{-1}(80/145)$ or $\cos^{-1}(\text{their } 120.9/145)$ or $\tan^{-1}(80/\text{their } 120.9)$</p> <p>Or</p> <p>M1 for $\sin [\dots] = 80/145$ or $\cos [\dots] = (\text{their } 120.9/145)$ or $\tan [\dots] = (80/\text{their } 120.9)$</p> <p>Or</p> <p>B1 for 56.5 to 56.6 seen</p> <p>AND</p> <p>M1 for $360 - \text{their BAC}$ correctly evaluated</p>	<p>Allow 3 marks for answer 326 with no working</p> <p>Or M1 for any correct statement of sine or cosine rule with values correctly substituted and M2 for correct \sin^{-1} or \cos^{-1} statement following from this</p> <p><i>Their</i> BAC must be clearly identified, may be seen on diagram or be any angle found using trig</p>
10	(a)	(i)	10	1		
		(ii)	At least 6 points plotted correctly Correct smooth curve drawn for $-2 < x < 4$	1 1	<p>1 mm tolerance, FT <i>their</i> table</p> <p>1 mm tolerance from correct points, must be daylight between curve and $y = -2$</p>	<p>No ft mark for curve</p> <p>Intention of smooth curve with intention of a minimum between $x = 1$ and $x = 2$, not ruled, ignore curve for $x > 4$</p>
	(b)		Straight line through $(-2, 7)$ and $(4, 1)$	3	<p>B2 for correct short straight line</p> <p>Or B1 for one correct pair of coordinates found or plotted</p>	<p>1 small square tolerance at $(0, 5)$ and $(4, 1)$</p> <p>Condone line between $x = -1.5$ and $x = 3.5$ for 3 marks</p> <p>Any line through one correct integer point implies B1</p>

Question		Answer	Marks	Part marks and guidance	
	(c)	$x = 3.4-3.5, y = 1.3-1.7$ $x = 1.4-1.5, y = 6.3-6.7$	1 1	Or FT intersection of <i>their</i> curve with <i>their</i> straight line Or SC1 for two correct <i>x</i> -values ft or two correct <i>y</i> -values ft	Correct or follow through Tolerance for readings \pm one small square
11	(a)	7.5, 8.25, 8.75	3	B2 for two correct values seen Or B1 for one correct value seen	6.75, 6.25, 5.75 scores 0 Mark answer line first, if blank mark table Condone 7500 etc on answer line but not in table for all marks
	(b)	Upwards oe	1		Do not accept comments about seasonal changes See exemplars

Question	Answer	Marks	Answer
12	<p>Fixed rate account, £2751.76 or £2751.75 With fully correct calculations for both accounts shown, clearly laid out and annotated. This may be either total amount in each account or total interest for both accounts linked with account name</p> <p>4a Correct calculations for both accounts linked with account names with incorrect conclusion eg interest rather than total</p> <p>4b Correct conclusion with totals found for both accounts but no calculations or calculations not linked with account names</p> <p>4c Clearly laid out and annotated work with one error in calculations or with rounding errors which lead to 2745 (Bonus) and 2751 or 2752 (Fixed) or better and correct FT conclusion</p> <p>2a One correct total seen [£]2751.76 or [£]2745.08, correct to at least nearest pound</p> <p>2b Attempt at compound interest calculation for 3 years for one account</p> <p>2c Correct calculations seen for totals in both accounts after at least one year: 2500×1.035 oe and 2500×1.0325 oe</p> <p>2d Simple interest calculations for both accounts seen linked with correct accounts and answer Fixed Rate, £2743.75</p> <p>No worthwhile work attempted</p> <p>Statements are minimum requirement for each mark</p>	<p>5</p> <p>4-3</p> <p>2-1</p> <p>0</p>	<p>Bonus account After 1 year: $2500 \times 1.035 = 2587.50$ After 3 years: $2587.5 \times 1.03^2 = 2745.08$ or 2745.07[875] Fixed rate account: After 3 years: $2500 \times 1.0325^3 = 2751.76$ or 2751.75[7695]</p> <p>3a Correct amount in one account after 3 years stated or correct calculation for one account seen with account clearly identified</p> <p>3b Total interest for both accounts seen not necessarily linked with account names, [£]245.08 and [£]251.76</p> <p>3c Totals for both accounts seen, correct to at least nearest pound, not linked with account names</p> <p>1a Attempt at correct calculation for one account for at least one year: 2500×1.035 oe or 2500×1.0325 oe seen</p> <p>1b Attempt to find interest for both accounts for at least one year seen or implied: 3.5% of 2500 or 87.5 or 3% of 2500 or 75 and 3.25% of 2500 or 81.25</p> <p>Alternative method: Bonus account after 3 years $1.035 \times 1.03^2 = 1.098$[0315] Fixed rate account after 3 years $1.0325^3 = 1.100$[703078] Fixed rate is more with $2500 \times 1.0325^3 = £2751.76$</p>

Question			Answer	Marks	Part marks and guidance	
13			$[y =] 2x - x^2$ $[y =] \frac{1}{x}$ $[y =] x^3 + 2$	1 1 1		
14	(a)		(8, 0, 4)	1		
	(b)		7.48[3...]	2	M1 for $\sqrt{56}$ or $\sqrt{6^2 + 2^2 + 4^2}$ oe	M1 implied by answer 7.5
15	(a)	(i)	No, leading question Or No, intrusive or No, already a mother Or No, impossible to predict	1	No, needs to include age ranges	See exemplars for alternative acceptable answers If 'yes' award 0 Mark best part of answer
		(ii)	11	2	M1 for $\frac{180}{140 + 145 + 170 + 165 + 180} \times 50$ oe	11.25 implies M1
	(b)	(i)	Correct histogram drawn	3	B2 for all 7 bars correct heights OR B1 for at least 5 bars correct heights or 5 correct frequency densities soi 4.1, 27.4, 39.8, 40.4, 23.2, 5.2, 0.1 and B1 for at least 5 bars correct width	Tolerance is \pm one small square Tolerance is \pm one small square Accept to nearest integer Maximum 2 marks if frequency polygon seen

Question		Answer	Marks	Part marks and guidance	
	(ii)	Two valid, worthwhile comparisons e.g. More mothers > 40 in 2010 More mothers < 20 in 1980 More positive skew in 1980 than 2010	2	B1 for each Comments may compare mode, spread or different bars for example	Mark best part of each comment Comments must include some comparison If graph drawn must fit from their graphs otherwise must be correct Do not accept comments about frequency density If ranges other than those given are used, comparison must be clearly correct See exemplars
16	(a)	$I = \frac{12}{R}$ or $IR = 12$ or $R = \frac{12}{I}$	2	Mark final answer M1 for $I = \frac{k}{R}$ oe or $1.2 = \frac{k}{10}$ oe or SC1 for $R \propto \frac{12}{I}$ oe	Allow any letter/number for k other than R or I For M1/SC1 allow any rearrangement of these
	(b)	24	1	Or FT <i>their</i> equation in I and R in (a)	Answer must be correct to 3sf
17	(a) (i)	x^8	1	Mark final answer	
	(ii)	x^6	1	Mark final answer	
	(b)	$\frac{3x-4}{x+1}$	4	Mark final answer M1 for $(3x+4)(3x-4)$ seen AND M2 for $(3x+4)(x+1)$ seen Or M1 for factors using integers excluding 0 giving two terms correct when expanded or $(3x \pm 4)(x \pm 1)$ AND M1 for correct simplification of <i>their</i> algebraic fraction Max 3 marks if answer is incorrect	e.g. M1 for $(3x+1)(x+4)$

Question		Answer	Marks	Part marks and guidance																																																													
18	(a)	9200	1																																																														
	(b)	8140 or 8139	2	M1 for 9200×0.96^3	M1 implied by 8139.5 to 8139.6 seen																																																												
	(c)	2027	3	<p>B2 for answer 17 or 2026 or 2028 Or B1 for answer 16 or 18</p> <p>OR</p> <p>M1 for correct trial seen with $t > 9$ correct to at least 3 s.f. AND M1 for second better trial seen correct to at least 3 s.f.</p>	<p>Trials finding P</p> <table border="1"> <thead> <tr> <th>t</th> <th>P</th> <th></th> <th>t</th> <th>P</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>6116</td> <td></td> <td>15</td> <td>4987</td> </tr> <tr> <td>11</td> <td>5871</td> <td></td> <td>16</td> <td>4787</td> </tr> <tr> <td>12</td> <td>5636</td> <td></td> <td>17</td> <td>4596</td> </tr> <tr> <td>13</td> <td>5411</td> <td></td> <td>18</td> <td>4412</td> </tr> <tr> <td>14</td> <td>5194</td> <td></td> <td>19</td> <td>4235</td> </tr> </tbody> </table> <p>Trials finding 0.96^t</p> <table border="1"> <thead> <tr> <th>t</th> <th>0.96^t</th> <th></th> <th>t</th> <th>0.96^t</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>0.6648</td> <td></td> <td>15</td> <td>0.5421</td> </tr> <tr> <td>11</td> <td>0.6382</td> <td></td> <td>16</td> <td>0.5204</td> </tr> <tr> <td>12</td> <td>0.6127</td> <td></td> <td>17</td> <td>0.4996</td> </tr> <tr> <td>13</td> <td>0.5882</td> <td></td> <td>18</td> <td>0.4796</td> </tr> <tr> <td>14</td> <td>0.5647</td> <td></td> <td>19</td> <td>0.4604</td> </tr> </tbody> </table> <p>Allow year seen in trials in place of t (= $t + 2010$)</p>	t	P		t	P	10	6116		15	4987	11	5871		16	4787	12	5636		17	4596	13	5411		18	4412	14	5194		19	4235	t	0.96^t		t	0.96^t	10	0.6648		15	0.5421	11	0.6382		16	0.5204	12	0.6127		17	0.4996	13	0.5882		18	0.4796	14	0.5647		19	0.4604
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10	6116		15	4987																																																													
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Question	Answer	Marks	Part marks and guidance
19	<p>States $\angle AOB = \angle DOC$ and $AO = DO$ and $BO = CO$</p> <p>States a correct reason for a pair of angles and a correct reason for a pair of sides [vertically] opposite [angles] [equal] radii</p> <p>Selects correct congruence statement for their argument</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>Or two pairs of angles and one pair of sides $\angle OAB = \angle ODC$, $\angle ABO = \angle DCO$</p> <p>Or [angles] same segment [equal] or [angles on] same chord/arc [equal]</p> <p>SAS or ASA</p> <p>After B0 award SC1 for two correct pairs of sides and/or angles with correct reasons seen</p> <p>Condone $AO = CO$ and $BO = DO$ Allow angles named A, B, C, D but $\angle AOB$ and $\angle DOC$ must be clearly identified</p> <p>Condone 'half diameter' for radius</p> <p>Or AAS</p>

APPENDIX

Exemplar responses for Q.2(b)(i)

Response	Mark
Quarter of an hour is 15 minutes not 25 minutes	1
There are 60 minutes in an hour not 100, so 0.25 of an hour can't be 25 minutes	1 [first part alone is sufficient]
2.25hours for 2h 25 m suggests 100 mins in an hour	1
There aren't 100 mins in an hour so 0.25 is not 25 minutes	1
Not 100 mins in an hour so 0.01 is not 1 minute.	1
2 hours 25 mins is not 2.25 hours it is 2.416 hours.	1 [shows correct conversion, acceptable to give 2.42]
0.25 is a quarter of an hour not 25 minutes	1
It doesn't say in the question that the .25 is minutes so it is $\frac{1}{4}$ which would be 15 minutes	1
It's not 25 minutes it's 25% of an hour	1
She didn't times 60 by 2.25. Decimals go up to 100 not 60.	1 [suggests how to get correct answer]
2.25 gives 2 hours and a quarter so its 2.15 minutes	1 [condone incorrect notation]
She thinks there are 100 minutes in an hour	1 [bod just enough]
All she did was remove the decimal point, and she didn't convert it to minutes using 60	1 [just enough]
Time goes in 60 not 100.	0 [not enough, needs some units]
A quarter of 60 is 20	0 [incorrect]
There are 60 minutes in an hour	0 [not enough]
She hasn't fully changed the hours into minutes	0 [not enough]
$60 + 60 + 25 = 145$ minutes	0 [not enough]
The journey would be 145 minutes	0 [not enough]
2.25 hours in minutes is actually 135 minutes	0 [not enough, needs to relate 135 to 2 h 25 min]
Because both times are different the first one is two and a quarter hours	0 [needs to compare with 25 mins]
0.25 is quarter of an hour	0 [not compared]
0.25 is not 25 minutes	0 [just not enough, no explanation]

Exemplar responses for Q.2(b)(ii)

Response	Mark
The answer should be larger than 3570	1
The answer should be bigger than the original number	1 [implies 3570]
The answer should be higher because she has divided by a number less than 1 (0:....)	1
The answer is lower than the original number	1 [answers question]
$3600 \div 0.9 = 4000$ so too small	1 [if estimation used both rounding and answer must be correct]
Because 0.93×3391.5 would not give a whole number because of the decimals so can't be 3570	1 [correctly identifies a different aspect of the error]
It's not going to have a first decimal number of 5	1 [only accept this type of explanation if .5 is specified]
Her answer is lower than her starting number	1 [implies 3570]
The number when dividing below 1 would be larger than the answer she gave	1
She is dividing by a decimal which would make her number bigger	1 [bod 'decimal' implies <1]
The answer is too small when dividing by a decimal the number increased	1 [bod 'decimal' implies <1]
Because it's less than the number its being divided from.	1 [very borderline]
Her answer should get larger as she is dividing by a decimal	1 [bod 'decimal' implies <1 condone lack of what it is larger than]
It should get higher not smaller	0 [not clear enough]
The answer is too small	0 [not enough]
$3600 \div 1 = 3600$ so her answer should be roughly the same as the original number	0 [not enough]
Estimate $3500 \div 1 = 3500$ the answer should be higher than 3500	0 [not clear]
$3570 \div 0.9 = 3966.7$ meaning her answer has to be greater	0 [no credit for calculations using calculator]
Because the answer is higher than the question	0 [not clear enough]
Because 0.93 is almost equal to 1 so it would be closer to 3570	0 [needs to imply larger than 3570]
Because it is close to 1 and $3570 \div 1$ is not close to 3391.5	0
The answer should be higher.	0 [not enough]

Exemplar responses for Q.3(b)

Response	Mark
0.38, used more spins	1 [implies more trials]
200, if you do more spins then you will get more accurate results	1
0.38, he span it 200 times so more reliable	1
124, it samples a larger number	1 [bod, 124 identifies correct column]
0.38 because it's the highest number	0 [not clear that highest number of spins]
98 out of 200, it shows that Jayden has also scored other numbers out of the 200 spins	0 [irrelevant]
0.38, it's between 0.4 and 0.36 so is more reliable	0 [irrelevant]

Exemplar responses for Q.3(d)

Response	Mark
No, for 10 it should be 2, for 50 it should be 10 and for 200 it should be 40	1 [compares expected outcomes]
No, you shouldn't expect 180, you should expect 100 if it was fair	1 compares expected outcomes]
No, if it was fair he would score 3 every 5 times, but he scores it much more frequently than every 5 times	1 [implies expected outcomes]
No, more 3s were scored than other numbers, it was not equal	1 [borderline but implies unequal probabilities]
No the relative frequency of 3 is higher than it should be if it was fair	1 [borderline as doesn't state 0.2]
No, out of the 5 sides 3 comes up nearly half the times	1 [just acceptable, implies unequal]
No, he scores 3 roughly a quarter of the time and there are 5 numbers so it's likely the 3 section is bigger than the others	0 [but if it said more than quarter we would accept]
No, it has a better chance of landing on 3 than on any other number	0 [this may not be true, would be acceptable if also said not equal]
No, the numbers are not close together	0

Exemplar responses for Q.5(a)(i)

Response	Mark
No, all numbers in sequence are odd and 96 is even	1 A
No, the sequence is all odd numbers	1 A
No, no even numbers in sequence	1 A
No, 91 and 99 are in the sequence	1 B
No, the sequence is + 8, when we come to 91 we have to plus it with 8, so then it becomes 99	1 B or D
No, because $8 \times 12 - 5 = 91$ / $8 \times 13 - 5 = 99$	1 B
No, $8n - 5 = 96$ gives 12.625 which is not an integer	1 C
No, 12.625 is not an integer	1 C
No, because $101 \div 8 = 12.625$	1 C
No, because 8 cannot be added to 91 to get 96	1 D
No, 91 is in the sequence and then we have to add 8 not 5	1 D
No, Add 8 to 91 and it gives 99	1 B or D
No, 8 does not go into 101	1 E
No, because $101 \div 8$ gives a decimal answer	1 E
No, because 101 is not in the 8 times table	1 E
No, because $8 \times 12 = 96$	1 F [implies multiple of 8]
No, because $96 \div 8 = 12$	1 F [implies multiple of 8]
No, because $96 \div 8 = 12 - 5 = 91$	1 F [implies multiple of 8]
No, because 96 is in the 8 times table so we don't need to subtract 5	1 F [implies multiple of 8]
No, the difference between the terms are adding 8	0 [no 91]
No, it is because the term closest to 96 is 91 which makes it impossible to be the next term	0 [no 99 or add 8]
No, because in this sequence if you add 8 you will not get 96	0 [no 91]
No, never in the " + 8 " sequence	0 [no 91]
No, n won't be a whole number	0 [insufficient, need to see 12.625]
No, 96 is a factor of 8	0 [incorrect use of factor]

Exemplar responses for Q.11(b)

Response	Mark
It is increasing	1
The number of people going to the museum had increased	1
There are more visitors visiting the museum, positive trend	1 [first part clarifies what they mean]
It is a positive trend	0 [unclear, confuses correlation?]
The numbers go up every second moving average	0 [not true]
The visitor numbers rise for each quarter of the year	0 [not true]
It increases during the second and third quarters for each year	0 [describes seasonal variation]
Always biggest in 3 rd quarter	0 [describes seasonal variation]

Exemplar responses for Q.15(a)(ii)

Response	Mark
No, cannot predict the future	1
No, you can't choose and be certain when you get pregnant	1
No, it doesn't give a choice for people that don't want or can't have kids	1
No it implies every woman will have a baby	1
No, it's biased	1 [implies leading]
No, some people may feel uncomfortable answering it	1
No, they won't know the answer	1
No, interviewees cannot predict precisely so it should provide choices	1
No, it assumes that the girls want to have a baby	1
No, too personal	1
No, need to include ranges e.g. 20-30, 30-40 etc	1
No, should have response boxes	1 [just sufficient]
No, there are no options to choose from	1 [just sufficient]
No, it's not asking them how they feel about having a baby	0 [suggesting different question]
No, it is too broad	0
No, it gives too large a choice and would be difficult to represent	0
No, it's an open question	0 [not enough]

Exemplar responses for Q.15(b)(ii)

Response	Mark
30-40 year olds births per year has now increased Women over 45 now have children	1 [now implies 2010] 0 [no comparison]
More people aged between 10-20 gave birth in 1980 On both the age between 25-30 is large	1 0
Births were more spread out in 2010 More births in 1980	1 [more spread implies comparison] 0 [incorrect, but this type of comparison is not acceptable because a calculation is needed to check it]
In 2010 the most common age is between 30 and 35 whereas in 1980 it is between 25 and 30 In 2010 older people are having babies with 100 babies per year when the woman is aged between 45 and 60 whereas in 1980 no one above 45 had a baby	1 1 [mark best part of comment, so ignore 100 per year]
There are more older women giving birth in 2010 between 45 and 65 There are less births in women aged 10-20 in 2010	1 1
The range of ages is larger in 2010 from 10 years old to 65 years old The most popular ages in 1980 are 20-30 in 2010 25-35	1 1 [implies comparison]
A lot more had babies at age 20-25 in 1980 25-30 is not much different from 1980 – 2010	1 [bod comparing years] 1
A lot more births between the age of 10 and 20 in 2010 compared to 1980 More births in 2010 for over 45 year olds than in 1980	1 [follows through correctly from their incorrect histogram] 1
The frequency density for $10 < a < 20$ year olds is about the same in both years There were a higher number of births for $25 < a < 30$ year olds in 1980 than 2010	0 [do not accept comments about frequency density] 1
There are a higher amount of 30 year olds giving birth in 2010 There are also a higher number of 40-45 year olds giving birth	0 [needs age range] 1 [implies in 2010 if two statements read together]
More women in 1980 were given birth at younger age than in 2010 The interquartile range of about women in 2010 is higher than the interquartile range of 1980	0 ['younger' not specific enough, needs an age range] 0 [range would be acceptable, IQR can't be determined]
The number of births were more between 20s to 30s in 1980 There is no number of births to women in age groups 45-50 in 1980 comparing to 2010	1 [read as 20 to 40, clearly correct ft their histogram] 0 [age range must be one given or total of complete groups if obvious]

The frequency of births have risen since 1980 all the way through to 2010 People of older ages have started having children in 2010	0 [no evidence] 0 ['older' is not specific enough]
The 1980s median has a bigger value than 2010 of 20 1980s range has bigger value which makes 2010 more consistent	0 [the median is not obvious so 0] 0 [incorrect]
A majority of women gave birth when they were 20-35 years old Not many gave birth from the ages of 10-20 and 35-45 years old	0 [no comparison] 0 [no comparison]
There are a higher number of babies born in 2010 than in 1980 The age bracket of over 45 in 1980 shows no births after but 2010 has consistent births until age 65	0 0 [misunderstanding]
The age of women giving birth has risen More women are having babies	0 [don't know this] 0 [when are there more?]
Most women give birth between the ages of 20 and 30 Small distribution of births over the age of 40	0 [no comparison] 0 [no comparison]
The modal ages in 2010 are between 25-35 and in 1980 it is 20-30 The overall number of births per year has decreased since 1980	0 [not comparison of same intervals] 0
Less people are having kids before the age of 40 in 2010 In 2010 women kept having children through their 40s unlike in 1980	0 [not obvious] 1 [bod]
More people in 1980 had children between the ages of 10 and 40 than in 2010 More people in 2010 had children between the ages of 40 and 50 than in 1980	0 [not obvious] 0
More teens have got pregnant in 2010 There are more births $30 < a < 35$ in 2010	0 1
Older people are giving birth in 2010 till they are 65 whereas in 1980 they stopped at 45 There are more births in 2010 than in 1980 and it has a higher mean	1 0
In 1980 nobody over the age of 45 had a baby but in 2010 nobody over the age of 65 had a baby	1 [bod]
The range of distributions is greater in 2010 than 1980 with class width to 65 years instead of 45 years In 1980 the highest distribution, modal class, was $25 < a < 30$ whereas in 2010 it's $30 < a < 35$	1 [bod implies bigger range] 1
There are more 30-35 in 2010. There are fewer 30-35 in 1980.	1 0 [same comment]
In 2010 there were 4000 births between 10 and 20 but in 1980 there were 6000 In 2010 there were 137000 births between 20 and 25 but in 1980 there were 200 000 births	0 [heights of bars is comparing frequency density so does not score] 1 [comparing frequencies, so bod 1 mark as long as numbers are approx correct and thousands used]

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