

**H**

**GCSE (9–1)**

**Mathematics**

**J560/06: Paper 6 (Higher tier)**

General Certificate of Secondary Education

**Mark Scheme for November 2020**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

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1. Annotations available in RM Assessor. These **must** be used whenever appropriate during your marking.

Annotation	Meaning
	Correct
	Incorrect
<b>BOD</b>	Benefit of doubt
<b>FT</b>	Follow through
<b>ISW</b>	Ignore subsequent working (after correct answer obtained), provided method has been completed
<b>M0</b>	Method mark awarded 0
<b>M1</b>	Method mark awarded 1
<b>M2</b>	Method mark awarded 2
<b>A1</b>	Accuracy mark awarded 1
<b>B1</b>	Independent mark awarded 1
<b>B2</b>	Independent mark awarded 2
<b>MR</b>	Misread
<b>SC</b>	Special case
	Omission sign
<b>BP</b>	Blank page
<b>SEEN</b>	Seen

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

**It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.**

### Subject-Specific Marking Instructions

2. **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.
3. 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 e.g. 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.
  - **nfww** means **not from wrong working**.
  - **oe** means **or equivalent**.
  - **rot** means **rounded or truncated**.
  - **soi** means **seen or implied**.
  - **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
  - **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.
4. 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.
5. Unless the command word requires that working is shown and the working required is stated in the mark scheme, 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, i.e. incorrect working is seen and the correct answer clearly follows from it.

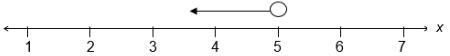
6. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct. For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, e.g. FT  $180 \times (\textit{their} '37' + 16)$ , or FT  $300 - \sqrt{(\textit{their} '52 + 72')}$ . Answers to part questions which are being followed through are indicated by e.g. FT  $3 \times \textit{their} (a)$ .

7. In questions **with no final answer line**, make no deductions for wrong work after an acceptable answer (i.e. **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.
8. In questions **with a final answer line and incorrect answer given**:
  - (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 if there is no other method leading to the incorrect answer. Use the **M0**, **M1**, **M2** annotations as appropriate and place the annotation ✗ next to the wrong answer.
9. 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. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.
  - (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 marks for the poorer response unless the candidate has clearly indicated which method is to be marked.
10. 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 marks for the poorer response unless the candidate has clearly indicated which response is to be marked.

11. 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. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.
12. 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.
13. Ranges of answers given in the mark scheme are always inclusive.
14. 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.
15. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

Question		Answer	Marks	Part marks and guidance	
1	(a)	Points plotted at (210, 130) and (100, 80)	2	<b>B1</b> for 100 soi or for one point plotted correctly	Half square tolerance May be implied by point plotted at duration 100
	(b)	Point at (220, 64) circled	1		
	(c) (i)	Ruled line of best fit drawn	1		Use overlay anchored on top right point Line must reach to edges of overlay
	(ii)	<i>Their</i> line used to give duration for £90 $\pm 5$ minutes	1 FT	Strict <b>FT</b> from their intended straight line of best fit	NB read ( $n, 90$ ) not ( $90, n$ )
	(d)	[7 hours is] is beyond the given data oe	1		Accept eg the trend may not continue

Question	Answer	Marks	Part marks and guidance
2	$x < 5$  AND  	4	<p><b>B2</b> for <math>x &lt; 5</math> or <b>M1</b> for <math>3x &lt; 19 - 4</math> or better</p> <p>AND</p> <p><b>B2FT</b> for <math>x &lt; 5</math>, or <i>their</i> inequality, correctly shown or <b>B1FT</b> for <math>x &lt; 5</math>, or <i>their</i> inequality, shown with a hollow circle and wrong arrow or filled circle and correct arrow</p> <p>Solution to inequality:  Allow <b>M1</b> for this expression with other inequality symbols or equals sign or <math>[x =] 5</math> as solution (can be implied by mark/circle on the diagram) or trials leading to selection of 5 or final correct trial using 5</p> <p>Displaying the solution:  Display must show an inequality that fits on the number line for FT Mark to candidate's advantage either <math>x &lt; 5</math> or <i>their</i> inequality Accept an arrow of any length or a line reaching 1</p> <p>If no solution to inequality seen: Hollow circle at 5 arrow to left <b>M1B2</b> Filled circle at 5 arrow to left <b>M1B1</b> Hollow circle at 5 arrow to right <b>M1B1</b> Filled circle at 5 arrow to right <b>M1B0</b> Mark at 5 no line or arrow <b>M1B0</b> Circle and/or arrow at other than 5 <b>M0B0</b></p>



Question		Answer	Marks	Part marks and guidance	
3	(a)	55.5[0] to 57.[0] nfw	3	<p><b>M1</b> for 1 kWh costs £0.125 or so</p> <p><b>M1</b> for their <math>0.125 \times 450</math> or cost <math>\times \frac{450}{\text{their equivalent electricity use}}</math></p> <p>OR</p> <p><b>M1</b> for finding costs of electricity that sum to 450 kWh <b>M1</b> for addition of these costs</p>	<p>eg 225 kWh costs £28.125 <math>\pm</math> £0.5[0] 200 kWh costs £25 <math>\pm</math> £0.5[0] 150 kWh costs £18.75 <math>\pm</math> £0.5[0] 100 kWh costs £12.5 <math>\pm</math> £0.5[0] 50 kWh costs £6.25 <math>\pm</math> £0.5[0]</p> <p>eg <math>25 \times \frac{450}{200}</math></p> <p>eg award <b>M2</b> for <math>4 \times (£12.5 \pm £0.5[0]) + (£6.25 \pm £0.5[0])</math></p> <p>For the first <b>M1</b> mark, costs must be from graph within <math>\pm\frac{1}{2}</math> small square ie <math>\pm£0.5[0]</math></p>

Question		Answer	Marks	Part marks and guidance	
	(b)	<p><b>Method 1:</b> By performing a calculation for A and comparing with B:</p> <p>12.5 or 0.125 or “cost ÷ usage” using a reading from the graph or <i>their</i> (a) ÷ 450</p> <p>14.3 or 0.143 stated or comparison against it clearly implied in a statement</p> <p>“B” with 12.5 and 14.3 or “B” with 0.125 and 0.143 or “B” with 12.5 or 0.125 and a comparison against 14.3 or 0.143 clearly implied</p>	<p><b>1</b></p> <p><b>1dep</b></p> <p><b>1</b></p>	<p><b>Method 2:</b> By performing a calculation for B and comparing with A:</p> <p>14.3 × <i>their</i> chosen usage soi or [0].143 × <i>their</i> chosen usage soi May be implied by line on graph</p> <p>Cost in p or £ from graph for <i>their</i> chosen usage stated</p> <p>“B” with both costs correct and in same units</p>	<p>Mark method not accuracy for first two marks e.g. 6.75 ÷ 50 = 0.135 but not 0.135 with no working</p> <p>Dep on first mark scored. Costs for A and B may be in different units. e.g. 1kWh costs 12.5p which is less than Company B’s charge</p> <p>No follow through</p> <p>e.g. B because 1kWh costs 12.5p which is less than Company B’s charge</p>
4	(a)	<p>e.g.</p> $\sqrt{\left(\frac{4 \times 400}{0.5 \times 200}\right)^3} = \sqrt{16^3} = 64$	<b>3</b>	<p><b>B2</b> for 4, 400, 0.5 and 200 or <b>B1</b> for at least two of 4, 400, 0.5 and 200</p>	<p>For full marks, at least one of these intermediate steps leading to 64 must be seen <math>\sqrt{16^3}</math> or <math>4^3</math> or <math>\sqrt{4096}</math></p>

Question		Answer	Marks	Part marks and guidance	
	(b)	38.7 to 38.9	4	<b>B2</b> for 46.1 to 46.11 or 17.89 to 17.9 or <b>B1</b> for 12.8 to 12.9 or 3.57 to 3.6[0] or 2125 to 2126  and  <b>M1</b> for $(64 - \textit{their} 46.1 \text{ to } 46.11) \div \textit{their}$ 46.1 to 46.11 [ $\times 100$ ] oe	Accept 39 with correct working
5	(a)	30 final answer	2	<b>B1</b> for 150 or 30 seen or <b>M1</b> for $360 \div 12$ oe	e.g. $180 - \frac{180 \times 10}{12}$
	(b)	150 or FT(180 – (a))	1		Only allow <b>FT</b> if $0 < \textit{their} (a) < 180$

Question		Answer	Marks	Part marks and guidance	
6		385 with correct working	6	<p>“Correct working” requires evidence of at least <b>M2</b> AND <b>B1</b> i.e. correct and consistent units used</p> <p><b>M2</b> for [mass of one panel =]  <math>2.4 \times 1.2 \times 0.018 \times 750</math>  or <math>240 \times 120 \times 1.8 \times 0.750</math>  or  <b>M1</b> for figs 24 × figs 12 × figs 18 × figs 750  or <math>2.4 \times 1.2 \times 0.018</math>  or <math>240 \times 120 \times 1.8</math></p> <p>AND</p> <p><b>B1</b> for 15 000 [kg] or 15 000 000 g seen or <i>their</i> mass correctly converted to tonnes</p> <p><b>M1</b> for <math>\frac{\text{figs } 15}{\text{their mass}}</math></p> <p><b>A1</b> for 385.[...] to 387</p> <p>If <b>0</b> or <b>B1</b> scored, instead award <b>SC2</b> for answer 385 with no working or insufficient working</p> <p>If <b>0</b> scored  <b>SC1</b> for answer 385.[...] to 387 with no working</p> <p>soi by 38.8 to 38.9 [kg]  soi by 38 800 to 38 900 [g]</p> <p>soi by 0.0518 to 0.0519 [m<sup>3</sup>]  soi by 51 800 to 51 900 [cm<sup>3</sup>]  Assume <i>their</i> mass unit from <b>M2</b>, but do not assume from <b>M1</b> only</p> <p>Accept any figure <b>but not</b> 2.4, 1.2, 1.8 and 750 for <i>their</i> mass  For <b>M1</b> accept one or more trial(s) of <i>their</i> mass × an integer in attempt to = <i>their</i> figs 15</p>	

Question		Answer	Marks	Part marks and guidance	
7	(a)	$\begin{pmatrix} 4 \\ -2 \end{pmatrix}$	2	<p><b>B1</b> for 1 component correct</p> <p>If <b>0</b> scored, then <b>SC1</b> for <math>\begin{pmatrix} -4 \\ 2 \end{pmatrix}</math></p> <p>or <math>\begin{pmatrix} 4 \\ -2 \end{pmatrix}</math> or (4, -2)</p>	Penalise first appearance of vinculum or poor form in vector but condone second use
	(b)	$\begin{pmatrix} 1 \\ 9 \\ -4 \end{pmatrix}$ oe	2	<p><b>B1</b> for 1 component correct or <math>\begin{pmatrix} 4 \\ 9 \end{pmatrix}</math> seen</p>	

Question		Answer	Marks	Part marks and guidance
8		31 nfw	4	<p><b>M2</b> for <math>20 : 10</math> or <math>\frac{20}{30}</math> and <math>21 : 9</math> or <math>\frac{21}{30}</math> and <b>SC1</b> for final answer 30 dep on <b>M2</b></p> <p>OR</p> <p><b>M1</b> for at least one other fraction equivalent to <math>\frac{2}{3}</math> seen, or one other fraction equivalent to <math>\frac{7}{10}</math> seen</p> <p><u>Alternative method using algebra</u> <b>M1</b> for <math>\frac{r-1}{t-1} = \frac{2}{3}</math> oe or <math>\frac{r}{t-1} = \frac{7}{10}</math> oe</p> <p><b>M1</b> for <math>3(r-1) = 2(t-1)</math> and <math>10r = 7(t-1)</math> or better</p> <p><b>M1</b> for elimination or substitution of <math>r</math></p> <p>If <b>0</b> scored <b>SC1</b> for answer 30 with no working</p> <p><u>Notes on alternative method</u> Where number of red = <math>r</math>. Does not need to be defined. Accept any other letter.</p> <p>Implies first <b>M1</b> mark</p> <p>A correct equation in <math>b</math> may imply first <b>M1M1</b> marks</p>

Question		Answer	Marks	Part marks and guidance
9		$z = 1.2x$ or $z = \frac{6x}{5}$	4	<p>Condone <math>\propto</math> for = in <b>B1</b> marks and <b>SC1</b> but not at <b>B3</b> or full marks</p> <p>e.g. <math>5z = 6x</math>, or <math>x = \frac{5z}{6}</math></p> <p><b>B3</b> for a correct equation involving just <math>x</math> and <math>z</math> but not in required form</p> <p>OR</p> <p><b>B1</b> for <math>y = 6x</math> oe  <b>B1</b> for <math>y = 5z</math> oe  <b>M1</b> for a correct equation involving just <math>x</math> and <math>z</math> using <i>their</i> two equations</p> <p>OR</p> <p><b>B1</b> for <math>y = 60</math> when <math>z = 12</math>  <b>B1</b> for <math>x : [y :] z</math> is <math>10 : [60 :]12</math>  <b>M1</b> for a correct equation involving just <math>x</math> and <math>z</math> using <i>their</i> triple ratio or <i>their</i> two ratios with a common <math>y</math> value</p> <p>If <b>0</b> scored  <b>SC1</b> for <math>y = kx</math> and <math>k = 6</math> found oe  or for <math>y = kz</math> and <math>k = 5</math> found oe</p> <p><i>Their</i> two equations of the form <math>y = ax</math> oe and <math>y = bz</math> oe</p> <p>Allow <b>B2</b> for other triple ratios of the form <math>5k : 30k : 6k</math> or two correct ratios with a common <math>y</math> value</p>

Question			Answer	Marks	Part marks and guidance	
10			22	3	<p><b>M2</b> for <math>1.403 \div 1.15</math> oe soi by 1.22 or <b>B1</b> for 1.15 soi</p> <p><u>Alternative method :</u> If starting from <math>(1 + k/100) \times 1.15 = 1.403</math> <b>M2</b> for reaching <math>1.15k/100 = 0.253</math> or <b>B1</b> for the 1.15</p>	Condone answer 22%
11	(a)	(i)	7	4	<p><b>M2</b> for <math>3x + 15 = 2(x + 11)</math> oe or <b>M1</b> for <math>3x + 15</math> or <math>2(x + 11)</math> oe</p> <p><b>M1</b> for a productive step towards solving <i>their</i> linear equation</p> <p><u>Alternative method by trials:</u> <b>M2</b> for at least two complete trials using the same inputs for both functions or <b>M1</b> for one complete trial using the same input for both functions</p> <p><b>A1</b> for at least one correct evaluation for A and one for B</p>	<p>Starting equation must have x on both sides e.g. from <math>3x + 15 = 2(x + 11)</math>: <b>M1</b> for <math>2x + 22</math> or <math>x + 15 = 22</math> or <math>3x = 2x + 7</math> or <math>1.5x + 7.5 = x + 11</math> e.g. from <math>3x + 15 = 2x + 11</math>: <b>M1</b> for <math>x + 15 = 11</math> or <math>3x = 2x - 4</math></p>



Question		Answer	Marks	Part marks and guidance	
	(ii)	Because $3x + 15$ and $2(x + 11)$ are <u>not equivalent</u> oe  OR  $3x + 15 = 2(x + 11)$ only has one solution oe	1		If not using the words 'not equivalent', must clearly imply that the two expressions will not be equal for <i>all</i> values of $x$  The mark is unlikely to be awarded unless algebra is used
	(b)	$p = 5, q = 3$	3	<b>B1</b> for $p = 5$ or $q = 3$  <b>M1</b> for $q(x + p)$ oe or $[3x + 15 =] 3(x + p)$ or $[3x + 15 =] q(x + 5)$  If no working <b>SC1</b> for $p = 3$ and $q = 5$ as answers	May be seen with a particular value of $x$ , eg. $q(2 + p)$
12		$\frac{4}{28}$ oe  or 0.1428 to 0.143	3	<b>M1</b> for 4 correct combinations soi by highlighting in list or table or by unsimplified numerator 4  <b>M1</b> for $4 \times 7$ soi by complete list or table or by 28  <u>Alternative method</u> <b>M2</b> for $\left(\frac{1}{4} \times \frac{1}{7}\right) + \left(\frac{1}{4} \times \frac{2}{7}\right) + \left(\frac{1}{4} \times \frac{1}{7}\right)$ oe or <b>M1</b> for $\frac{1}{4} \times \frac{1}{7}$ or $\frac{1}{4} \times \frac{2}{7}$ oe seen	Economics Engineering Geography German Geography Graphics Media Music

13			50	4	<p><b>B1</b> for 2.5 oe soi</p> <p><b>M2</b> for <math>8 \times (5 \div 2)^2</math> oe or <b>M1</b> for <math>(5 \div 2)^2</math> soi by 6.25 oe</p> <p><u>Alternative method:</u> <b>B1</b> for [AB : AC =] 2 : 5 oe soi</p> <p><b>M2</b> for <math>(8 \div 2^2) \times 5^2</math> oe or <b>M1</b> for [area ratio] <math>2^2 : 5^2</math> oe soi</p> <p><u>Alternative method:</u> <b>B1</b> for 2.5 oe soi</p> <p><b>M1</b> for numerical <math>\frac{b \times h}{2} = 8</math> where <math>b \times h = 16</math></p> <p><b>M1</b> for <math>\frac{2.5 \text{ their } b \times 2.5 \text{ their } h}{2}</math></p> <p><u>If evidence of using 2 : 3 seen:</u> <b>B0</b> for [AB : AC =] 2 : 3 or 1.5 oe soi</p> <p><b>M2</b> for <math>(8 \div 2^2) \times 3^2</math> oe or <b>M1</b> for [area ratio] <math>2^2 : 3^2</math> or <math>1.5^2</math> oe soi</p> <p><u>If no working:</u> <b>SC1</b> for final answer 18</p>	<p>Final answer 20 implies <b>B1</b> (from use of linear scale factor)</p> <p>6.25 scores <b>B1M1</b></p> <p><math>2^2 : 5^2</math> scores</p> <p>May be seen in stages</p>
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Question		Answer	Marks	Part marks and guidance
14		2.99 [cm] with correct working	5	<p>“Correct working” requires evidence of at least M2  Accept 2.99 or greater rot accuracy of 2.9947090608 with correct working  Accept 3[.0] as final answer only after <b>M3A1</b></p> <p><b>M3</b> for <math>\frac{5}{3}\pi r^3 + \pi r^3 = 225</math> soi by  <math>\frac{8}{3}\pi r^3 = 225</math>  <b>A1</b> for <math>\sqrt[3]{\frac{675}{8\pi}}</math> or <math>\sqrt[3]{26.8}</math> to <math>\sqrt[3]{26.9}</math></p> <p>or</p> <p><b>M2</b> for <math>\frac{1}{3}\pi r^2 \times 5r + \pi r^2 \times r</math> oe soi by  <math>\frac{8}{3}\pi r^3</math></p> <p>or</p> <p><b>M1</b> for <math>\frac{1}{3}\pi r^2 \times 5r</math> oe or <math>\pi r^2 \times r</math> oe</p> <p>If <b>0</b> or <b>M1</b> scored, instead award <b>SC2</b> for answer 2.99 or greater rot accuracy of 2.9947090608... with no working or insufficient working</p> <p>If <b>0</b> scored  <b>SC1</b> for <math>\sqrt[3]{\frac{675}{8\pi}}</math> or <math>\sqrt[3]{26.8}</math> to <math>\sqrt[3]{26.9}</math> with no working</p> <p><u>Trials:</u>  Full marks for trials leading to an answer 2.99 or greater rot accuracy of 2.9947090608...  Trials leading to any other final answer, including 3[.0], only score the <b>M</b> marks if seen</p>

Question		Answer	Marks	Part marks and guidance	
15		$\frac{9}{16}$ or [0].5625 oe	4	<p><b>B1</b> for 0.75 oe seen</p> <p><b>M2</b> for <math>0.25 \times 0.3 + \text{their } 0.75 \times 0.65</math> or <b>M1</b> for <math>0.25 \times 0.3</math> soi by 0.075 or <math>\frac{3}{40}</math> oe or for <i>their</i> <math>0.75 \times 0.65</math> soi by 0.4875 or <math>\frac{39}{80}</math> oe</p>	<p>Accept [0].56 or [0].563 as final answer for full marks if <b>B1M2</b> earned</p> <p>Award <b>B</b> and <b>M</b> marks for equivalent working with a base value e.g. 100 buses</p>
16	(a)	[angle in a] semi-circle oe	1		Accept other reasoning if fully justified
	(b)	13.5 to 13.6	4	<p><b>B1</b> for angle BAC = <math>58^\circ</math> or angle ABC = <math>32^\circ</math></p> <p><b>M2</b> for <math>16\sin(\text{their } 58)</math> or <math>16\cos(\text{their } 32)</math> or <b>M1</b> for <math>\sin(\text{their } 58) = \frac{BC}{\text{their } 16}</math> or <math>\cos(\text{their } 32) = \frac{BC}{\text{their } 16}</math> or better</p> <p>If <b>0</b> or <b>B1</b> scored then instead award <b>SC2</b> for 6.7 to 6.8 as final answer</p> <p><u>Grads or rads:</u> If <b>0</b>, <b>1</b> or <b>2</b> scored then instead award <b>SC3</b> for 15.8[8...] to 15.9 or 12.6[4...] as final answer <b>or</b> If <b>0</b> scored award <b>SC1</b> for 7.9[4...] or 6.3[2...]</p>	<p>May be seen on diagram or implied by use of <math>\sin 58</math> or <math>\cos 32</math></p> <p>Only award <b>M</b> marks if <i>their</i> angle and trig ratio are consistent ie do not accept <math>16\sin 32</math> unless angle BAC previously seen as <math>32^\circ</math>.</p>

Question		Answer	Marks	Part marks and guidance	
17	(a)	75	1		
	(b)	$3 [x](\sqrt{5})^{n-1}$ oe	3	<b>M2</b> for expression of correct form with two correct elements or <b>M1</b> for expression of correct form with one correct element	eg $3 [x](\sqrt{5})^n$  eg $5 [x](\sqrt{5})^n$
18		$\frac{412}{990} = \frac{206}{495}$ with correct working  or $\frac{41.2}{99} = \frac{206}{495}$ with correct working	3	<b>M2</b> for $1000x [-] 10x = 416.16[1\dots] [-]$ $4.16[1\dots]$ leading to $990x = 412$ or for $100x [-] x = 41.616[1\dots] [-]$ $0.416[1\dots]$ leading to $99x = 41.2$  or <b>M1</b> for $10x = 4.16[1\dots]$ or $100x = 41.616[1\dots]$ or $1000x = 416.16[1\dots]$ seen	“Correct working” requires <b>M2</b>  Subtractions can be implied
19	(a)	$[x =] -3, 1.5$	2	<b>B1</b> for 1 correct	
	(b) (i)	$[a =] 2$  $[b =] -5$	2	<b>B1</b> for each or for $2x - 5$ seen	

Question		Answer	Marks	Part marks and guidance	
	(ii)	$y = 2x - 5$ or FT $y = \textit{their ax} + \textit{their b}$ ruled on grid  1.1 to 1.3 and -1.8 to -1.6	<b>M2</b>       <b>A1</b>	<b>M2</b> and <b>M1</b> apply to $y = 2x - 5$ or FT $y = \textit{their ax} + \textit{their b}$  <b>M1</b> for 'correct' y-intercept or for 'correct' gradient or for freehand or broken 'correct' line or for at least 3 'correct' plots and no 'incorrect' plots	For <b>M2</b> line must cross curve For <b>M2</b> and <b>M1</b> , accuracy 1 small square at y-intercept (extended if necessary provided it fits on the grid) and gradient $\pm 1$ small square vertically for a run of 1 unit horizontally <b>Do not FT</b> if $a = 0$ or $b = 0$  Only award if <b>M2</b> scored
20		-9	4	<b>M2</b> for $\binom{7}{2k+11}$ or <b>M1</b> for $\binom{7}{\phantom{2k+11}}$ or $\binom{\phantom{7}}{2k+11}$ or $\binom{4}{2k}$  <b>M1</b> for $(\textit{their } 2k + 11) = -(\textit{their } 7)$	<i>their 7</i> must follow from their working for <b>M2</b> and must not be -1

Question		Answer	Marks	Part marks and guidance
21		$\frac{2x-1}{x+2}$ as final answer	6	<p><b>M1</b> for <math>x^2 - 4 = (x + 2)(x - 2)</math> soi in the denominator</p> <p>AND</p> <p><b>M3</b> for all 3 fractions combined with quadratic common denominator and expanded numerator</p> <p>or</p> <p><b>M2</b> for correct products on numerator of at least 2 equivalent fractions that are consistent with their common denominators</p> <p>or</p> <p><b>M1</b> for correct product on numerator of 1 fraction that is consistent with an attempted common denominator</p> <p>AND</p> <p><b>M1dep</b> for <math>\frac{(2x-1)(x-2)}{(x+2)(x-2)}</math> or <math>\frac{(2x-1)(x-2)}{x^2-4}</math> (<b>dep</b> on previous <b>M3</b> earned)</p> <p>Factorises numerator of combined fraction</p> <p>Can earn up to <b>M1 + M2 + M0</b> for common denominator used that is not in its lowest terms.</p> <p>eg. <b>M0 + M2</b> for <math>\frac{x(x-2)(x^2-4)}{(x+2)(x-2)(x^2-4)}</math> and <math>\frac{(x+1)(x+2)(x^2-4)}{(x+2)(x-2)(x^2-4)}</math></p> <p>eg. <b>M1 + M1</b> for <math>\frac{x(x-2)(x+2)(x-2)}{(x+2)(x-2)(x+2)(x-2)}</math></p>

Q1(d)

Response		Mark
No because it does not have a record for 7 hours	This scores 0 as there is no record for e.g. 80 min. Must imply "beyond"	0
7 hours isn't on the scale.	No. Implies a bigger diagram would be OK	0
No Because 420 minutes is too long to fit on the graph	Implies it would be OK with a bigger graph	0
No It only shows 2h 50 minutes	Suggests 7 hours is a missing value	0
No It would go up to 4200.	No implies scale not long enough	0
No Highest duration is 250 mins which isn't 7 hours. 420 mins is 7 hours.	No. Implies a bigger diagram would be OK	0
No His records only go up to 4hours 10minutes.	No. This is about the scale. However, if they had said 4 hours, then they would have been talking about the data	0
No It does not show this information. $7 \times 60 = 420$ mins. Graph only goes up to 250mins.	No scale again	0
No His record doesn't show any 7 hour flights.	No. Implies it is a missing value	0
No It would not fit on the graph.	No. Implies it is a missing value	0
No Duration only goes to 250 mins.	No. Implies it is a missing value	0
No Graph does not go beyond 250 minutes. $60 \times 7 = 420$ mins.	No. Implies it is a missing value	0
No Duration does not go up to 7 hours.	No. Implies a bigger diagram would be OK	0
No Extrapolation	Not explained	0
No. Should not extrapolate beyond 250 minutes/the graph	Graph not big enough	0
No. Extrapolating too far meaning his estimate would be inaccurate	Not quite sufficiently clear. What is "too far" and is it from 240 or 250?	0
No. The data only shows a maximum of a 250 minute flight so this would be unreliable	Contradiction. 240 rather than 250 would have been acceptable.	0
No There are only less amount of flights on the diagram.	Yes. This implies "beyond the data"	1
No because the duration only goes up to 240 minutes	Scores the mark for implying beyond the data	1
No because it does not have records that go as far as 7 hours.	This is OK as it implies "beyond"	1
No. Should not extrapolate beyond 240 minutes/the data	Beyond the data	1



**OCR (Oxford Cambridge and RSA Examinations)**  
**The Triangle Building**  
**Shaftesbury Road**  
**Cambridge**  
**CB2 8EA**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

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