OCR
Oxford Cambridge and RSA

GCSE

Mathematics (9-1)

Unit **J560/06:** Paper 6 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2018

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

1. Annotations used in the detailed Mark Scheme.

Annotation	Meaning
✓	Correct
✗	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	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

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. 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.

4. 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 × (*their* '37' + 16), or FT 300 – √(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *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.

5. 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.

6. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

   - **cao** means **correct answer only**.
   - **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).
   - **nfww** 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**.

7. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

8. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

9. 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.

10. 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.

11. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.

    If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

    If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

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.

Question			Answer	Marks	Part marks and guidance	
1			8, 8, 13 and 15	3	**B2** for 3 or 4 numbers with at least two conditions met out of: • At least two numbers are 8 • The range is 7 • The total is 44 or **B1** for 4 numbers with one condition met or 44 seen	Accept any order Examples: **B2** for 8, 8, 10.5, 17.5 **B2** for 8, 8, 8, 20 **B2** for 8, 8, 28 **B2** for 1, 8, 8 **B1** for 8, 8, 8, 8 **B0** for 8, 8
2			18 nfww	4	**B1** for [green] 36 or ratio(s) equivalent to 5 : 9 : 36 AND **M2** for $\frac{\textit{their}\ 9}{\textit{their}\ (5+9+36)}[\times 100]$ or **M1** for *their* (5 + 9 + 36) soi	For **B1** accept 5 : 36 or 9: 36 or ratio(s) involving a common term for blue eg 10 : 18 and 18 : 72 eg 1 : 1.8 : 7.2 eg $\frac{5}{9}$: 1 [: 4] (decimals should be accurate rot to 3 figs) *Their* (5 + 9 + 36) must come from a ratio (or ratios) with a common term. 1 + 4 + 5 + 9 =19 followed by $\frac{5}{19}$ scores **0**.

Question			Answer	Marks	Part marks and guidance	
3			$\frac{300\times(7-3)}{60}=20$ AND it is close to 19.5 oe or 19.5 rounds to 20 oe or [Asha's estimate] is reasonable	3	**B2** for 300, 7, 3 and 60 seen or **B1** for two of 300, 7, 3 and 60 seen or 300, 4 and 60 seen or 300.0, 7.0, 3.0. 60.0 AND **B1dep** for result 20 and correct conclusion following **B1** or **B2**	Actual answer 19.475959...(may be rounded) scores **0** Accept "Yes" or "She's right" or "It is" or equivalent comment
4	(a)		$a^5 \times a^6 = a^{5+6} = a^{11}$ or $a^5 \times a^3 \times a^3 = a^{5+3+3} = a^{11}$	2	**B1** for $[(a^3)^2 =]$ a^6 or $a^3 \times a^3$ **Alternative:** **B2** for $[a^5 \times (a^3)^2 =]$ $a \times a \times \ldots \times a$ $[= a^{11}]$ or **B1** for $[(a^3)^2 =]$ $a \times a \times a \times a \times a \times a$	a^{5+6} or a^{5+3+3} or intent to add indices stated or unambiguously indicated (eg 5 + 6, add indices etc) written in full with eleven a's. written in full with six a's May be implied by $(a \times a \times a \times a \times a \times a)$ seen within an incorrect lengthier product.
	(b)		5^{15}	3	**B1** for $\left[\frac{1}{125}=\right]$ 5^{-3} or $[125 =]$ 5^3 **B1** for 5^{18}	

Question			Answer	Marks	Part marks and guidance	
5	(a)		$y = 0.75x + 2$ oe	3	**B2** for $y = 0.75x$ [+ c] or answer $0.75x + 2$ OR **M1** for attempt at $\frac{\text{change in y}}{\text{change in x}}$ soi by $\frac{\pm(5-2)}{\pm(4-0)}$ or ±0.75 and **B1** for $y = kx + 2$ with $k \neq 0$	ISW after a correct equation if attempting rearrangement Accept oe throughout eg **B2** for $4y = 3x$ Examples: **M1B1** for $y = -0.75x + 2$ **M1B0** for 0.75, 0.75x, −0.75, $-0.75x$ If gradient inverted: **M0B1** for $y = 1.3x + 2$ **M0B0** for $1.3x + 2$, $y = 1.3x$ Condone poorly written ¾x unless clearly 3 over 4x.
	(b)		3 nfww	3	**M2** for $12 = 16 - 4k + 8$ or better OR **M1** for $12 = -4^2 + -4 \times k + 8$ or sign errors in $12 = 16 - 4k + 8$ or better or $k = \frac{y - x^2 - 8}{x}$	Condone -4 not in brackets but $12 = -4^2 + k - 4 + 8$ with no times sign or dot between k and -4 scores **0** unless subsequently clarified.

Question	Answer	Marks	Part marks and guidance	
(c)	**Using symmetry:** Q is (0, 8)	**1**	**dep** mark is always dependent on 3 marks being achieved	For first mark in all methods, condone [Q =] 8 or [QA =] 8-2 or 6, seen in working or on diagram.
	Midpoint, M, of AQ is at (0, 5)	**1**	Accept implied symmetry	eg 8 – 5 = 3 and 5 – 2 = 3 so B is in the middle of A and Q
	MB is perpendicular to QA	**1**		May see "midpoint" or any other letter for M
	So isosceles/Diann is correct	**1dep**		
	OR	**OR**		
	Using Pythagoras: Q is (0, 8)	**1**	**Using gradients, vectors or descriptions of translations** **1** for Q is (0, 8)	Condone poor notation, such as missing vector brackets or fraction lines in vectors if intention is clear.
	$AB^2 = 4^2 + 3^2$ oe or AB = 5 nfww or $QB^2 = 4^2 + (\textit{their}\ 8 - 5)^2$ or QB = 5 nfww	**1**	**1** for gradients/vectors/descriptions of translations for both AB **and** QB (must be seen together in part (c): eg	
	AB = 5 and QB = 5 or $AB^2 = 25$ and $QB^2 = 25$	**1**	gradients: AB = 3/4 **and** QB = $^-$3/4 (may be implied from the equations of the two lines)	eg gradient AB = ¾ **and** gradient QB = $^-$3/4 scores a max of 1 1 0 0
	AB = QB or "two sides are equal" oe so isosceles/Diann is correct	**1dep**	descriptions: AB is 4 along (treat as in positive sense) and 3 up **and** QB is 4 along and 3 down oe	eg gradient AB = ¾ **and** gradient QB = $^-$3/4, so triangle is isosceles also scores a max of 1 1 0 0
	OR	**OR**	**To score more than 2 marks, the approach needs to be developed to justify isosceles, such as by switching to the 3rd and 4th marks of the Pythagoras or trig methods.**	
	Using trig: Q is (0, 8)	**1**		Warnings: dimensions of triangle shown as (8 – 2), 4, 4 and isosceles stated is B1 only; blank answer space but BQ drawn on diagram is **0** not **NR.**
	tan BAQ = 4/3 [=53.1]	**1**		
	tan BQA = 4/3 [= 53.1]	**1**		
	BAQ = BQA or "two angles are equal" oe so isosceles/Diann is correct	**1dep**		

Question			Answer	Marks	Part marks and guidance	
6			0.1 oe nfww	3	**M2** for $80 \times 0.04 = y \times 32$ or $3.2 = 32y$ or $y = \frac{3.2}{32}$ oe OR **M1** for 80×0.04 soi by 3.2 or $\frac{16}{5}$ or $y = \frac{k}{x}$ soi	
7			$r = 5$ $t = 2$	4	**M2** for $u = 14$, may be seen in table **A1** for $r = 5$ or $t = 2$ OR **M1** for $\pm(u - 3) = 11$ oe soi by $u = -8$ or $\pm(u - 8) = 6$ oe soi by $u = 2$ **A1FT** for $r = 17$ and $t = 20$ following $u = -8$ or $r = 7$ and $t = 10$ following $u = 2$	If no credit-worthy working **B2** for $r = 5$ **B2** for $t = 2$ **FT** only from a partially correct value for u (ie. -8 or 2)

Question			Answer	Marks	Part marks and guidance	
8	(a)		0.3 oe	2	**M1** for $\frac{[\pm]6}{85-65}$ oe or answer -0.3 If **0** scored, allow **SC1** for 0.092[3…] or $\frac{6}{65}$ as final answer	Allow unsimplified equivalents for full marks eg. $\frac{6}{20}$
	(b)		255	3	**M2** for valid method to find complete area under the graph using one or more parts OR **M1 for** attempt to find partial area below the graph	**M2** examples: eg $\frac{85\times 6}{2}$ oe or two triangles soi by 195 and 60 or [*r*ectangle] 6 × 85 – two triangles oe **M1** examples a triangle between *t* = 0 and 65 or a triangle between *t* = 65 and 85 or [*r*ectangle] 6 × 85 – one triangle **M0** for [*r*ectangle] 6 × 85 Allow full marks for equivalent with units stated eg. 0.255 km

Question			Answer	Marks	Part marks and guidance	
	(c)		21.6 or $\frac{108.}{5}$ or $21\frac{3}{5}$ nfww	4	**B1** for 6 soi AND **M2** for $\frac{their 6\times 60\times 60}{1000}$ oe or **M1** for *their* 6 × 60 × 60 oe soi 21 600 or *their* 6 ÷ 1000 oe soi 0.006 or $\frac{60\times 60}{1000}$ oe soi 3.6	Condone missing or incorrect units in working eg 6 m for 6 m/s *their* 6 could be the average speed 255/85 21600 or 0.006 imply B1M1
9	(a)		-6	1		
	(b)		[x = 4,] y = 24 Change of sign, so p lies between 3 and 4 oe	2	**B1** for 24 seen If using 3.27 < x < 4 rather than 4: **SC2** evaluate y correctly (see table in (c)), state change of sign oe and that because 3 < p < their x-value, then so 3 < p < 4. **0** for just evaluating y.	After x = 4, y = 24 scored: Examples just sufficient for second mark include: change of sign -6 < 0 < 24 x = 3 gives an answer < 0 and x = 4 gives an > 0 Examples insufficient for second mark: so p lies between 3 and 4

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th colspan="2">Part marks and guidance</th></tr>
<tr><td></td><td>(c)</td><td></td><td>Examples:
when $x = 3.5$, $y = 6.4$, so $3 < p < 3.5$
when $x = 3.1$, $y = -3.9$, so $3.1 < p < 4$
when $x = 3.1$, $y = -3.9$ and when $x = 3.5$,
$y = 6.4$, so $3.1 < p < 3.5$</td><td>3</td><td>M2 for one further value of y evaluated correctly, possibly rot to 2 or more sf, for a value of x such that $3 < x < 4$

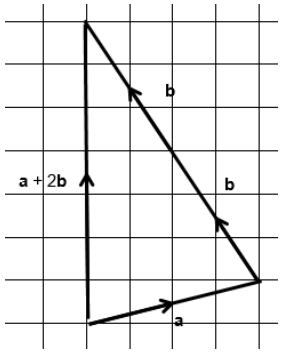
OR

M1 for working shown to calculate one further value of y for a value of x such that $3 < x < 4$

Note after SC considered in (b):
if SC2 was awarded then they must use a value of x that produces a smaller interval than
$3 < x <$ their x-value in (b);
if SC2 was not awarded then $3 < x < 4$ applies

If 0 scored, award SC1 or SC2 if evidence for M1 or M2 has not yet been credited in (b)</td><td>Solution is approx. 3.2670

Common values:
<table><tr><th>x</th><th>y</th></tr><tr><td>3.1</td><td>-3.909</td></tr><tr><td>3.2</td><td>-1.632</td></tr><tr><td>3.25</td><td>-0.422</td></tr><tr><td>3.26</td><td>-0.174</td></tr><tr><td>3.27</td><td>0.0758</td></tr><tr><td>3.3</td><td>0.837</td></tr><tr><td>3.4</td><td>3.504</td></tr></table><table><tr><th>x</th><th>y</th></tr><tr><td>3.5</td><td>6.375</td></tr><tr><td>3.6</td><td>9.456</td></tr><tr><td>3.7</td><td>12.75</td></tr><tr><td>3.75</td><td>14.48</td></tr><tr><td>3.8</td><td>16.27</td></tr><tr><td>3.9</td><td>20.02</td></tr></table>
A correct narrower range scores 0 unless accompanied by the relevant correct calculation(s).
eg M2 only for when $x = 3.1$, $y = -3.9$ so $3.1 < p < 3.5$ (as 3.5 has not been correctly justified)
Calculations in support of $x = 3$ or $x = 4$ need not be repeated from parts (a) or (b).</td></tr>
</table>

Question			Answer	Marks	Part marks and guidance	
10			Correct triangle drawn with **a** + 2**b** labelled and with correct arrows or **a** and 2**b** labelled and with correct arrows AND length 7cm indicated on diagram  OR $\begin{pmatrix}4\\1\end{pmatrix}+2\begin{pmatrix}-2\\3\end{pmatrix}=\begin{pmatrix}0\\7\end{pmatrix}$ with brackets	3	**M1** for vector 2**b** drawn on grid **M1** **a** + *k***b** drawn on grid The two vectors must be joined end to end but arrows may be contradictory. *k***b** should be in the direction of **b** OR **B1** for $\begin{pmatrix}4\\1\end{pmatrix}$ **B1** for $\begin{pmatrix}-2\\3\end{pmatrix}$ or $\begin{pmatrix}-4\\6\end{pmatrix}$	If both methods shown/started, mark the better one For **M** marks condone missing or incorrect arrows and labels on vectors Mark intent: end of vectors within 2mm of of vertices of relevant square Examples (ignore arrows): **M1M1** for **a** + 2**b** drawn (3 marks if labelled and 7 cm indicated) **M1M1** for **a** – 2**b** **M1M0** for 2**b** or – 2**b** **M0M1** for **a** + **b**, **a** – 1.5**b** etc For **B1** marks, condone missing brackets and fraction lines

Question			Answer	Marks	Part marks and guidance	
11			angle *BCA* = 44° and angles [in a] triangle [= 180°] or angle *DCA* = 56° and angles [in a] triangle [= 180°]	1		*C* = 44 (or 56) is not sufficient. Accept angles shown on diagram. **0** if alternate angles is given as the reason unless the parallelogram has been justified Notation needed for these marks.
			Best two statements from: (i) [side] *AC* is common (ii) [angle] *ACB* = [angle] *CAD* (iii) [angle] *BAC* = [angle] *ACD* (iv) angle *B* = angle *D* or [angle] *ABC* = [angle] *CDA*	2	**B1** for each to a max of 2	44 = 44 is not sufficient. 56 = 56 is not sufficient "angle" required if using just *B* or *D*
			Conclusion and third statement [congruent because] ASA after stating (i), (ii), (iii) AAS after stating (i), (ii), (iv) or (i), (iii), (iv)	1		Final mark needs a third statement (ignore superfluous ones) and the appropriate congruence conclusion.
					If **0 (or 1** for statements) scored then, to a maximum total of 2 marks, allow: **SC1** for angle *BCA* = 44° and angle *DCA* = 56° stated or on diagram and **SC1** for a correct statement lacking precision eg "both triangles have a common side", "both triangles have an angle of 80", "all the angles are the same°	Possible marks (without SC): **1 + 2 + 1, 1 + 2 + 0, 1 + 1 + 0**, **0 + 2 + 1, 0 + 2 + 0, 0 + 1 + 0,** **0 + 0 + 0.**

Question			Answer	Marks	Part marks and guidance	
12			[QS =] $\sqrt{80}$, $4\sqrt{5}$ oe or 8.9[4..]	2	**M2** for [QS =] $\sqrt{4^2+8^2}$ oe or **M1** for $4^2 + 8^2$	Accept QS on diagram First **M2** may be implied by $QP = 2\sqrt{5}$ oe or 4.47[…] Example values: angle RSQ = $\tan^{-1}\left(\frac{4}{8}\right) = \cos^{-1}\left(\frac{8}{\sqrt{80}}\right)$ $= \sin^{-1}\left(\frac{4}{\sqrt{80}}\right)$ = 26.5(…) or 26.6 angle QSP = $\tan^{-1}\left(\frac{\sqrt{20}}{\sqrt{80}}\right) = \cos^{-1}\left(\frac{\sqrt{80}}{10}\right)$ $= \sin^{-1}\left(\frac{\sqrt{20}}{10}\right)$ = 26.5(…) or 26.6 Accept as fractions or ratios. $\frac{PS}{QS} = \frac{10}{\sqrt{80}} = \frac{\sqrt{5}}{2}$ =1.118[…] $PS : QS = 10 : \sqrt{80}$ oe $\frac{QS}{RS} = \frac{\sqrt{80}}{8}$ with any of the above $\frac{PS}{QS}$ is insufficient for (iii) and (iv) as it is not clear that the ratios are the same.
			Best two from: (i) shows a pair of corresponding angles are equal (ii) shows a second pair of corrresponding angles are equal or states [angle] QRS = [angle] PQS (iii) shows two pairs of corresponding sides are in the same ratio (iv) shows the third pair of corresponding sides have the same ratio. Ratios of corresponding sides need to be seen in equiavlent form.	2	**B1** for each to a max of 2 For these marks, answers to calculations are sufficient, but corresponding pairs must be either exact or the same when rot to 3sf. In (ii) accept QRS and PQS are both right angles oe (iii) and (iv) can be shown using scale factors eg QS = 1.118 × RS and PS = 1.118 × QS Note: there is no mark for just finding QP = $\sqrt{20}$	
			Conclusion: two (or three) equal angles oe after showing (i) and (ii) or three pairs of corresponding sides in the same ratio after showing (iii) and (iv) or two pairs of corresponding sides in the same ratio and an equal angle between them oe after showing relevant combination of (i)/(ii) and (iii)	1	In all cases, it must be clear which angles and ratios are being used to support the conclusion made, usually by using labels or from values on a diagram. If it is not clear, withold the final mark. Where more than two facts are shown, allow the final mark if the conclusion is fully supported.	
13	(a)		288π or 904.3 to 905	2	**M1** for $\frac{4}{3}$ (×) π (×) 6^3	Accept 904 if **M1** scored

Question	Answer	Marks	Part marks and guidance	
(b)	20.0[9...] to 20.1[...] or $\frac{32}{5}\pi$ oe nfww	5	**M1** for [hemisphere=] 0.5 × *their* (a) soi or 0.5 × $\frac{4}{3}$ (×) π (×) 6^3 or [pyramid=] $\frac{1}{3}\times 15\times 15$ [×'*h*'] soi **M1** for [hemisphere=] 0.5 × *their* (a) soi or 0.5 × $\frac{4}{3}$ (×) π (×) 6^3 and [pyramid=] $\frac{1}{3}\times 15\times 15$ [×'*h*'] soi OR 0.3 × *their* pyramid [×'*h*'] or $\frac{\textit{their}\ \text{hemisphere}}{0.3}$ oe **M1** for hemisphere soi and 0.3 × *their* pyramid [×'*h*'] OR $\frac{\textit{their}\ \text{hemisphere}}{0.3}$ oe and pyramid [×'*h*'] soi **M1** for $\frac{\textit{their}\ \text{hemisphere}}{0.3} \div$ *their* pyramid oe If **0** scored, allow **SC3** for $\frac{64}{5}\pi$ or 40.[1..] to 40.2[…] as final answer	Accept answer 20 after full working. No requirement at any stage for a formal equation. Values below provided as a guide to method being used, but mark method not accuracy: ie hemisphere (144π or 452.(..)) or pyramid (75[*h*]) ie hemisphere (144π or 452.(..)) and pyramid (75[*h*]) OR 30% of pyramid (22.5[*h*]} or "reverse %" using hemisphere (480 π or 1507(..)) ie hemisphere (144π or 452.(..)) and 30% of pyramid (22.5[*h*]} OR "reverse %" using hemisphere (480 π or 1507(..)) and pyramid (75[*h*]). To receive **M1M1M1** they should have both parts of the "ands" correct If correct, at this stage, it should be (480 π or 1507(..)) ÷ 75 oe 1507(..)) ÷ 225 is likely to score **M1M1M0M1**

Question			Answer	Marks	Part marks and guidance	
14	(a)		21.45 × 4663 ÷ 100 000 = 1.000 2[1..] (km) or 21.45 × 4663 = 100 020 to 100 021.4 > 100 000 (cm) or. 100 000 ÷ 21.45 = 4662[.0..] < 4663 or 100 000 ÷ 4663 = 21.44[5..] < 21.45 Note the first method does not require a comparison against 1 (km)	4	**B1** for (minimum length =) 21.45 seen **B1** for 1 km = 100 000 cm soi oe such as ÷ 100 then ÷ 1000 or use of 1m = 100cm and 1km = 1000m if working in metres. **M1** for *their* 21.45 × 4663 (÷ 100 000) or 100 000 ÷ *their* 21.45 or 100 000 ÷ 4663 If **M0** scored, allow **SC1** for *k* × 4663 (÷ 100 000) or 100 000 ÷ *k* with *k* in the range 10.25 to 10.35 or 6.45 to 6.55	Allow access to all marks if brick and 1 km are in consistent units. Allow these conversions even with *their* volume or surface area. eg 21.5 × 10.3 × 6.5 = 1439.425 cm/cm^2/cm^3 = 0.014 394 25 km *their* 21.45 must be in the range 21.45 to 21.55 but accept equivalent if attempting the unit conversion first eg **B0B0M1** for 21.5 cm = 0.0215 km followed by 0.0215 × 4663 Thus, use of width or height of the brick may score **B0,B1,SC1** whereas use of volume may score **B0/1,B1,SC0** Accept equivalent if working in m or km
	(b)	(i)	7017 to 7020	3	**B1** for 20 000 or 2.849[…] or 2.85 or 0.0028[…] seen **M1** for *their* 20 000 ÷ *their* 2.85 or 20 ÷ *their* 0.00285	Ignore other bound ie a division after an attempt to reach consistent units *their* 2.85 must be in the range 2.75 to 2.85 inc.; *their* 0.00285 must be in the range 0.00275 to 0.00285. **B0M0** for 20 ÷ 2.8 as no attempt to reach consistent units

Question			Answer	Marks	Part marks and guidance	
		(ii)	The truck may not have enough room oe Safety regulations may not allow it	1		Mark their best reason. **0** for we do not know the exact weight of the bricks oe **0** for because the truck may need to carry other loads **0** there may not be enough bricks available
15			7.2[0] or 7.19[9…] nfww	4	**M3** for $\sqrt{\frac{1379.02}{1200}}$ oe soi by 1.067[…] to 1.072{…] OR **M2** for $\frac{1379.02}{1200}$ oe soi by 1.14 to 1.15 OR **M1** for $1200x^2 = 1379.02$ Trials or no working: **SC4** for correct answer 7.2[0] or 7.19[9…] on answer line OR **SC3** for $1200 \times 1.072[0]^2 = 1379.02$ or $1200 \times 1.0719[9\ldots]^2 = 1379.02$ OR **SC1** for use of $1200x^2$ oe	Condone % symbol with correct answer. Warning: 1200 ÷ 179.02 = 6.7 Allow $(1 + \frac{r}{100})$ or any letter, including *r*, in place of *x*.

Question			Answer	Marks	Part marks and guidance	
16	(a)		37 000	1		Allow 37k
	(b)		22 000	2	**M1** for figs 43 – figs 21 soi by figs 22	Allow 22k
	(c)		Box plot drawn with: Lowest = 17 000 Lower Quartile = 28 000 Median = 37 000 Upper Quartile = 50 000 Highest = 85 000	3	**B2** for 4 or 5 correct markers OR **B1** for 3 correct markers or 17 000 seen	Tolerance ½ square Award the markers even if not correctly representing the information eg if 17000 is plotted at 68000 still credit the markers at 28000, 37000 etc.
	(d)		Interquartile range is the same for both oe or Range for CC is higher oe Average/median salaries are the same or The middle 50% of salaries for CC are higher	1 1	.	IQR = 22 000 for both BB range = 59 000 CC range = 68 000 Medians = 37 000 for both When given, figures should be correct. Ignore additional incorrect comparisons provided they do not contradict a correct answer given Do not accept comments just about a max (or min) salary **B0** for CC has the highest salary **B0** for highest paid worker at CC earns more than highest paid worker at BB **B0** (some) people earn more at CC **B0** for wider distribution at CC

Question			Answer	Marks	Part marks and guidance	
17	(a)		$\frac{x}{5} - 14$ oe	2	**M1** for $\frac{x}{5}$ If **0** scored then **SC1** for $\frac{x-14}{5}$ oe	Condone use of another letter for **M1** max Must use *x* in **SC1** **0** for *x* – 14 ÷ 5
	(b)		-17.5 or $-\frac{35}{2}$ oe nfww	3	**M1** for 5(‘*k*’ + 14) = ‘*k*’ or ‘*k*’ = $\frac{k}{5} - 14$ **M1FT** for 4’*k*’ = -70 or better or re-arrangement of *their* comparable f(*k*) = g(*k*) equation into the form *ak* = *b*. **M1FT** solving their *ak* = *b* **Alternative (FT as above):** **M1** for ‘*k*’ = $\frac{k}{5} - 14$ **M1FT** for $\frac{4k}{5}$ = -14 or better **M1FT** solving *their ak* = *b* Trials or no working: **SC3** for -17.5	eg 5*k*+14=*k* becomes 4*k*=-14 and then *k*=-3.5 scores **M0 M1FT M1FT** *k* + 70 = *k* is not comparable Answers may be in decimal or fractional form but fractions equating to integers should be simplified

Question			Answer	Marks	Part marks and guidance	
18	(a)		Bars are of different width oe	1		**0** for large tin looks larger than it is **0** for the bars are different sizes **0** for incorrect/no *x*-axis
	(b)		11.4[...] nfww	4	**B1** for 1.5 or $\frac{3}{2}$ or 3 : 2 soi AND **M2** for $10 \times \sqrt[3]{1.5}$ or **M1** for $\sqrt[3]{1.5}$ soi by 1.14(47…) If **0** scored allow **SC1** for 15 as final answer or seen radius of large tin **Alternative:** **B1** for 0.666 to 0.667 or $\frac{2}{3}$ or 2 : 3 soi AND **M2** for $10 \div \sqrt[3]{0.666 \text{ to } 0.667}$ oe or **M1** for $\sqrt[3]{0.666 \text{ to } 0.667}$ oe soi 0.873(…)	

Question			Answer	Marks	Part marks and guidance	
19			$\frac{(2x+5)(x+4)}{(2x+5)(x-2)} = \frac{x+4}{x-2}$	4	**M3** for $(2x + 5)(x + 4)$ and $(2x + 5)(x – 2)$ seen OR **M2** for $(2x + 5)(x + 4)$ or $(2x + 5)(x – 2)$ seen OR **M1** for any two linear factors giving two correct terms in numerator or denominator **Alternative:** **M1** for $(2x^2 + 13x + 20)(x – b)$ and $(2x^2 + x – 10)(x + a)$ seen **M1** two correct from $^-10a = ^-20b$ oe $a – 10 = 20 – 13b$ oe $2a + 1 = 13 – 2b$ oe **M1dep** (on M1M1) valid attempt to *solve their* simultaneous equations (condone one error) If **0** scored, allow **SC2** for $\frac{x+4}{x-2}$ as final answer from incomplete working, or **SC1** for $\frac{x+4}{x-2}$ seen.	Warning: $\frac{2(x+5)(x+4)}{2(x+5)(x-2)} = \frac{x+4}{x-2}$ scores **SC1** eg. $(2x + 10)(x + 2)$ which gives $2x^2$ and 20

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

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553