

**Applications of Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **A382/02**: Higher Tier

**Mark Scheme for June 2012**

---

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, OCR Nationals, 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.

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

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

## 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

- 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  $180 \times (\textit{their} '37' + 16)$ , or FT  $300 - \sqrt{(\textit{their} '5^2 + 7^2')}$ . 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).
  - 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. 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'.
7. 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).

8. 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.
9. 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.
10. 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.
11. Ranges of answers given in the mark scheme are always inclusive.
12. 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.
13. 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	(a)	Both positions marked	1		
	(b)	(6, 6) and (0, -2)	2	<b>M1</b> for either one correct If <b>M0</b> scored, then <b>SC1</b> for both (5, 7) & (-1, -1) or either both x or both y ordinates correct	
	(c)	(4.5, 4) or (1.5, 0)	1		
2		Plan view fully correct	2	<b>M1</b> for rectangle with line same length & parallel to shorter side dividing shape into two rectangles, dimensions may not be accurate or rectangle 10cm by 3cm with no line	Condone diagrams drawn without a ruler  Condone diagrams not labelled side/plan/view or labels incorrectly assigned  If more than 3 views allow all marks as appropriate if extras are duplicates  Do not accept a net or 3D diagrams
		Front view fully correct	2	<b>M1</b> for rectangle, dimensions may not be accurate	
		Side view fully correct	2	<b>M1</b> for trapezium with two right angles, dimensions may not be accurate	

Question		Answer	Marks	Part Marks and Guidance	
3	(a)	$\begin{array}{r} 5.8 \quad 0.8 \quad 5.4 \\ 5.4 \quad 5.370 \quad 0.0296 \quad 5.3851 \\ 5.3851 \quad 5.38514.. \quad 0.00004... \end{array}$	5	<p><b>M1</b> for 5.8 and <math>(\pm) 0.8</math> (1<sup>st</sup> row)</p> <p>and <b>M1</b> for 5.4 in 1<sup>st</sup> row final column</p> <p>and <b>M1</b> for 5.4 in 2<sup>nd</sup> row 1<sup>st</sup> column or same value given in 1<sup>st</sup> row final column and 2<sup>nd</sup> row 1<sup>st</sup> column</p> <p>and <b>M1</b> for <math>5.370</math> and <math>(\pm)0.0296</math> or <math>5.3851</math></p> <p>and <b>B1</b> for 5.38514... and 0.00004...</p>	<p>For 5.8 allow <math>29 \div 5</math></p> <p>For <math>5.370</math> allow <math>29 \div 5.4</math> or <math>5.37 - 5.3704</math></p> <p>For <math>0.0296</math> ignore <math>\pm</math> and allow <math>0.0296 - 0.03</math></p> <p>For <math>5.3851</math> allow <math>5.385 - 5.39</math></p> <p>For 5.38514... allow <math>5.38 - 5.386</math></p> <p>For 0.00004 allow <math>4 \times 10^{-5}</math></p>
	(b)	5.385	1	Correct or <b>FT</b> <i>their</i> value in last row of N/C column provided answer given to 4 significant figures	
4		(Nevada) Oregon Arizona Washington California	4	<p><b>B1</b> for California in correct position (last)</p> <p><b>B1</b> for Arizona placed anywhere below Oregon</p> <p><b>B1</b> for Washington placed anywhere below Oregon</p> <p><b>B1</b> for Washington placed anywhere below Arizona</p>	Accept clear abbreviations

Question		Answer	Marks	Part Marks and Guidance	
5		84.2 - 84.45 nfw Allow 84 provided complete <u>trig</u> method seen	5	<p><b>M4</b> for <math>180 \sin 11 + 200 \sin 14.5</math> or <math>180 \sin 11 / \sin 90 + 200 \sin 14.5 / \sin 90</math></p> <p><b>or</b></p> <p><b>M3</b> for <math>180 \sin 11</math> and <math>200 \sin 14.5</math> or <math>180 \sin 11 / \sin 90</math> and <math>200 \sin 14.5 / \sin 90</math></p> <p><b>or</b></p> <p><b>M2</b> for <math>180 \sin 11</math> or <math>180 \sin 11 / \sin 90</math> or <math>200 \sin 14.5</math> or <math>200 \sin 14.5 / \sin 90</math></p> <p><b>or</b></p> <p><b>M1</b> for <math>\sin 11 = h / 180</math> or <math>h / \sin 11 = 180 / \sin 90</math> or <math>\sin 14.5 = h / 200</math> or <math>h / \sin 14.5 = 200 / \sin 90</math></p> <p>If <b>M0</b> then</p> <p><b>SC2</b> for <math>180 \cos 11 + 200 \cos 14.5</math> or <math>180 \tan 11 + 200 \tan 14.5</math></p> <p><b>or</b></p> <p><b>SC1</b> for consistent use of same trig ratio to find both heights eg <math>180 \cos 11</math> &amp; <math>200 \cos 14.5</math> or <math>180 \tan 11</math> &amp; <math>200 \tan 14.5</math></p> <p><u>Alternative:</u> For scale drawing angles <math>\pm 2^\circ</math> and lengths <math>\pm 2\text{mm}</math></p> <p><b>M1</b> for two right-angled triangles one with angle 11 &amp; the other with angle 14.5</p> <p><b>M1</b> for two right-angled triangles one with hyp 180 &amp; other with hyp 200 drawn using the same scale</p> <p><b>M1 dep</b> for appropriate side lengths <math>\pm 2\text{mm}</math> added</p>	<p><math>34. (3\dots) + 50(. \dots)</math> <math>34.(3\dots)</math> and <math>50(. \dots)</math> <math>34.(3\dots)</math> or <math>50(. \dots)</math> www</p> <p>Award <b>M</b> marks as appropriate if rads/grads</p> <p>If Rads then <math>-179.998\dots</math> &amp; <math>186.979\dots</math> &amp; final answer <math>6.98 - 7</math></p> <p>If Grads then <math>30.947\dots</math> &amp; <math>45.16\dots</math> &amp; final answer <math>76 - 76.11</math></p> <p>NB Scale drawing giving final answer from correct triangles of 84.2 - 84.45 scores full marks</p>
6	(a)	75	1		Allow 74 - 76
	(b)	120	1		Allow 115 - 125

Question		Answer	Marks	Part Marks and Guidance		
	(c)	30	1			
	(d)	15	2	<b>M1</b> for use of any pair of values, readings from graph $\pm\frac{1}{2}$ small square, in $\Sigma(v - 30)/w$ eg $(90 - 30) / 400$ or $(60 - 30) / 200$	For <b>M1</b> allow $45 - 30 (/100)$	
	(e)	(i)	Line through (0, 0) and (200, 70)	3	<b>M2</b> for correct part line or any two points on the line plotted or identified eg in a table  <b>or</b> <b>M1</b> for one point identified on the line except (0, 0)	
		(ii)	150	1	Correct answer or if straight line graph drawn in part <b>(e)(i)</b> <b>FT</b> where their graphs cross $\pm\frac{1}{2}$ small square	Allow 145 - 155
	(f)	(i)	42.56	1		Condone 4256 pence

Question		Answer	Marks	Part Marks and Guidance	
	(ii)	121.6(0) or 12160 pence	3	<p><b>M2</b> for <i>their</i> '42.56' <math>\div 0.35</math>  <b>or</b>  <b>M1</b> for 35% of X = <i>their</i> '42.56'</p> <p>If <b>M1</b> then also <b>SC1</b> for final answer 121 or 122</p> <p>If <b>M0</b> then <b>SC2</b> for 17.37 <b>or SC1</b> for <math>6.08 \div 0.35</math></p> <p>If <b>M0</b> and T &amp; I method then  <b>SC2</b> for first trial £110 - £130 inclusive and another trial £115 - £125 inclusive <u>and</u> improved from the first trial; both trials and solutions correct  <b>or</b>  <b>SC1</b> for first trial £110 - £130 inclusive, both trial and solution correct</p>	<p>Trial      Solution (<b>rot</b>)</p> <p>110      38.5</p> <p>111      38.85</p> <p>112      39.2</p> <p>113      39.55</p> <p>114      39.9</p> <p>115      40.25</p> <p>116      40.6</p> <p>117      40.95</p> <p>118      41.3</p> <p>119      41.65</p> <p>120      42</p> <p>121      42.35</p> <p>122      42.7</p> <p>123      43.05</p> <p>124      43.4</p> <p>125      43.75</p> <p>126      44.1</p> <p>127      44.45</p> <p>128      44.8</p> <p>129      45.15</p> <p>130      45.5</p>
7	(a)	$30 < v \leq 40$	1		<p>Allow any indication of this class eg 30 - 40</p> <p>Do not allow frequency 68</p>
	(b)	<p>29.6 <b>nfww</b></p> <p>Allow final answer 30 provided <math>5920 \div 200</math> <b>seen</b></p>	4	<p><b>M1</b> for at least 4 midpoints seen or used  <b>and M1</b> for <i>their</i> midpoints <math>\times</math> freq or 5920  <b>and M1</b> for <i>their</i> <math>\Sigma(\text{midpoints} \times \text{freq}) \div 200</math></p> <p>If <b>M0</b> then <b>SC2</b> for 24.6 or 34.6</p>	<p>Midpoints <math>\times</math> freq: 80 480  1100 2380 1440 440</p> <p>For <i>their</i> midpoints allow any value in class both endpoints inclusive</p>

Question		Answer	Marks	Part Marks and Guidance		
	(c)	Decision and reason eg Modal class (mode) more than 30 & No Mean under 30 & Yes Mean under and modal class (mode) over 30 & Cannot tell Less than half or 92 under 30 <b>oe</b> & No	1	Must have reason & decision  If <i>their</i> modal class and mean both >30 then allow 'Average over 30 so No'	Condone use of the word average for any of mean, median or modal class or mode <b>FT</b> <i>their</i> values to <b>(a)</b> and/or <b>(b)</b> provided consistent decision	
	(d)	(i)	16, 48, 92, 160, 192, 200	1		
		(ii)	Fully correct cumulative frequency graph all points $\pm\frac{1}{2}$ small square & curve or lines joining points within $\frac{1}{2}$ small square	3	For all <b>M</b> marks <b>FT</b> <i>their</i> values in <b>(d)(i)</b> provided increasing & non-linear & clear attempt to add frequency not speeds  <b>M2</b> for points correct $\pm\frac{1}{2}$ small square, no graph or correct graph translated horizontally with heights within correct class interval <b>or</b> <b>M1</b> for 4 or 5 points correct $\pm\frac{1}{2}$ small square or all heights correct within correct class interval (implied by bar chart)  If <b>M0</b> then <b>SC1</b> for all <i>their</i> points $\pm\frac{1}{2}$ small square plotted at upper cumulative boundary	Condone (0, 0) missing  Bar chart with increasing heights in correct classes: - scores <b>3</b> marks if correct graph superimposed - scores <b>M2</b> if midpoints of bars joined - scores <b>M1</b> if no graph  If part of cumulative frequency graph has double line assume correct version & use this to <b>FT</b> in <b>(iii)</b> & <b>(e)</b>
		(iii)	31.5	1	<b>FT</b> <i>their</i> increasing cumulative frequency graph $\pm\frac{1}{2}$ small square	

Question		Answer	Marks	Part Marks and Guidance	
	(e)	<p>Yes, (just) over half travel faster</p> <p>43% of 200 = 86 or 57% of 200 = 114 or reading at 35mph</p> <p>Reading at 86 or reading at 114 or <i>their</i> reading at 35mph given as % of 200 or 200 – <i>their</i> reading given as % of 200</p> <p>No (less than 43%)</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p><b>FT</b> <i>their</i> median</p> <p>For both <b>M</b> marks <b>FT</b> <i>their</i> reading from increasing cumulative frequency graph <math>\pm \frac{1}{2}</math> small square</p> <p><u>Must</u> have at least one <b>M</b> mark</p> <p>If <b>M0</b> then <b>SC2</b> for 37% <u>and</u> No</p>	<p>May use table &amp; value 92 under 30, 108 above 30</p> <p>The <b>A</b> mark may be awarded without 'No' by implication given eg only 36% exceeded speed limit (provided <i>their</i> 36% follows correct method)</p>
8	(a)	<p>Anything which rounds to 4.9 <b>nfww</b></p> <p>Allow final answer 5 provided at least <math>60 \times 40 \times \pi \times 650</math> <b>oe</b> shown</p>	4	<p><b>M3</b> for <math>60 \times 40 \times \pi \times 650 \div 1000000</math></p> <p><b>or</b></p> <p><b>M2</b> for <math>60 \times 40 \times \pi \times</math> <b>figs</b> 65 or <math>60 \times 40 \times 2 \times \pi \times</math> <b>figs</b> 325 or <math>\pi \times 650 \div 1000000</math> or <math>60 \times 40 \times 650 \div 1000000</math></p> <p><b>or</b></p> <p><b>M1</b> for <math>60 \times 40</math> or <math>\pi \times</math> <b>figs</b> 65 or <math>2 \times \pi \times</math> <b>figs</b> 325 or <math>650 \div 1000000</math></p> <p>If <b>M0</b> then <b>SC2</b> for <math>60 \times 40 \times \pi \times 325 \div 1000000</math> or <math>60 \times 40 \times \pi \times 650^2 \div 1000000</math> or <math>60 \times 40 \times \pi \times 325^2 \div 1000000</math></p>	<p>Allow <math>\pi</math> or 3.142</p> <p>May be done in stages</p> <p>A final answer <b>figs</b> 49... scores <b>M2</b></p> <p>For <b>M2</b> &amp; <b>M1</b> follow working through as the product or quotient may not be seen explicitly</p>
	(b)	14.7(...)	1 FT	Correct answer or <b>FT</b> <i>their</i> (a) $\times 3$	

Question	Answer	Marks	Part Marks and Guidance	
(c)*	<p>Gear ratio 3.7[...] : 1 greater than gear ratio 3.4 : 1 so No or 54.6 .. &lt; 60 so No</p> <p>Travels in 1 hour = 54.6 ...km with no clear comparison to 60 km/h or <b>figs</b> 546... with a comparison to 60 or substantial attempt to find speed involving the ratio 51 : 15 and compared to 60 or gear ratio 3.7[...] (: 1) with no clear comparison to calculation using sprockets with 51 and 15 teeth or attempt to find Chris's gear ratio with errors in calculation and calculation using sprockets with 51 and 15 teeth seen</p> <p>Substantial attempt to find gear ratio or substantial attempt to find distance but 51 &amp; 15 not used or ratio calculation using sprockets with 51 and 15 teeth seen and either first step to find distance in 1 hour or first step in attempt to find Chris's gear ratio</p> <p>No relevant measurement or calculation</p>	<p>5</p> <p>4 – 3</p> <p>2 – 1</p> <p>0</p>	<p>Allow 3.4 : 1 to be just 3.4</p> <p>For lower mark – errors in calculation to finding gear ratio Chris needs or <b>figs</b> 546 for distance or calculation using sprockets with 51 and 15 teeth seen and either substantial attempt to find distance in 1 hour or Chris's gear ratio</p> <p>For lower mark calculation using sprockets with 51 and 15 teeth seen or first step to find distance in 1 hour or first step in attempt to find Chris's gear ratio</p>	<p>For 54.6 allow 54 - 55</p> <p>For 3.736 ... allow 3.7 - 3.8</p> <p>Sprockets gear ratio 51 : 15 = 3.4 : 1 <b>oe</b></p> <p>Substantial attempt means working to at least the same standard as for a mark of <b>M2</b> or <b>SC2</b> in part (a)</p> <p>Distance in 1 hour  <math display="block">\frac{(51 \div 15) \times 60 \times 120 \times \pi \times 710}{1000000}</math> </p> <p>One rev <math>\pi \times \frac{710}{1000000} = 0.00223... \text{km}</math></p> <p>120 revs/min = 0.26766... km                      120 revs/hour = 16.0598.. km</p> <p>Chris's gear ratio  <math display="block">60 \div (60 \times 120 \times \pi \times \frac{710}{1000000})</math> </p> <p>To achieve target speed need gear ratio                      60/16.0598... = 3.736...</p>

Question		Answer	Marks	Part Marks and Guidance	
9	(a)	Yes; $0.12 > 0.075$	1	<u>Must</u> have reason	Condone 'Sam' for 'Yes' Allow reference to .12 & .075 or probability if Yes / Sam and no other reason given
	(b)	$0.075 \times 3200 \times 1.3 (= 312)$	1	If <b>0</b> then <b>SC1</b> for $0.12 \times 2080 \times 1.25 (= 312)$	Allow 1.3 written as $1 + 30 \div 100$ and 1.25 written as $1 + 25 \div 100$  Allow the mark if 312 is used to show that $\mu = 3200$ <b>oe</b>
	(c)	2500	3	<b>M2</b> for $150 \div (0.05 \times 1.2)$ <b>or</b> <b>M1</b> for $0.05 \times \mu \times (1 + 20 \div 100) = 150$ or better	If no answer given accept value 2500 in correct position of table for all marks For <b>M1</b> condone attempt at 5% and 20% in correct places

Question		Answer	Marks	Part Marks and Guidance	
	(d)	$\mu = \text{£}1\,000\,000$ Unlikely to happen or to prove claim $P = 1500$	1 1 3	<b>M2</b> for $\left(1 + \frac{p}{100}\right) = 80 \div (\text{their } \mu' \times 0.000\,005)$ or better <b>or</b> <b>M1</b> for $\text{their } \mu' \times 0.000\,005 \times \left(1 + \frac{p}{100}\right) = 80$ or better or $\mu \times \left(1 + \frac{p}{100}\right) = 16\,000\,000$ or better or $80 \div (1\,000\,000 \times 0.000\,005) (= 16)$	If 1500 seen in working & final answer 15 for P then allow all <b>3</b> marks Condone brackets missing for <b>M</b> marks
<b>10</b>	(a)	$21 \times 26 \div (21 - 1.5)$ or $21 \div ((21 - 1.5) \div 26)$	2	<b>M1</b> for $26 \div (21 - 1.5)$ or $(21 - 1.5) \div 26$ or $21 \div 1.5 = (26 + x) \div x$ or $x \div (26 + x) = 1.5 \div 26$	Allow for fully correct alternative solutions eg $28 \div 21 \times 1.5 = 2$ and $26 + 2 = 28$
	(b)	$4707 - 4708.3$ <b>nfw</b> Accept 4700 or 4710 provided correct working shown	4	<b>M1</b> for $h = 20$ with $r = 15$ or $h = 2$ with $r = 1.5$ <b>and</b> <b>M1</b> for $\frac{1}{3} \pi 15^2 \times \text{their } 20$ or $\frac{1}{3} \pi 1.5^2 \times \text{their } 2$ <b>seen and</b> <b>M1</b> for $(\frac{1}{3} \pi 15^2 \times \text{their } 20) - (\frac{1}{3} \pi 1.5^2 \times \text{their } 2)$ If <b>M0</b> then <b>SC1</b> for $\frac{1}{3} \pi 21^2 \times 28$	Allow $\pi$ or 3.142 $4712(\dots)$ or $4.7(\dots)$ For the 3 <sup>rd</sup> <b>M1</b> , allow $h = 1$ with $r = 1.5$ & condone $\frac{1}{3}$ missing in both places

Question		Answer	Marks	Part Marks and Guidance	
	(c) (i)	-0.675 -0.6 to -0.75 provided full correct working shown & allow fraction or decimal	3	<p><b>M1</b> for clear use of tangent to find vertical and horizontal displacement <b>and</b> <b>M1</b> for <i>their</i> vertical value ÷ <i>their</i> horizontal value</p> <p>If <b>M0</b> or <b>M1</b> then also <b>SC1</b> for final answer negative value</p>	<p>Ignore ± for <b>M</b> marks ie working leading to answer in range 0.6 to 0.75 (fraction or decimal) gets <b>M2</b></p> <p>For final answer embedded in equation <math>y = mx + c</math> or just <math>mx</math> award <b>M2</b> for <math>m</math> negative in correct range <b>or M1</b> for <math>m</math> positive in correct range</p>
	(ii)	Rate of decrease in depth	1		Anything linking the change in depth with respect to time & not implying volume or amount
	(d)		2	<b>M1</b> for incorrect graph starting at (0, 0) or correct shape graph not through (0, 0)	Allow if 60 marked on horizontal axis & extra straight horizontal line drawn after 60
11	(a)	Initial (rabbit) population or number (of rabbits) released	1		Allow if extra reasons given provided not contradictory
	(b)	<p><math>b = 1.196\dots</math> or 1.2 with working shown or <math>(600\,000\,000/12)^{1/99}</math> <b>seen</b></p> <p>19.(6 ...) % or 20% <b>nfww</b></p>	<p>3</p> <p>1</p>	<p><b>M2</b> for <math>(600\,000\,000 / 12) = b^{99}</math> <b>or</b> <b>M1</b> for <math>600\,000\,000 = 12 \times b^{99}</math></p> <p>If <b>M0</b>, then <b>SC2</b> for 1.193 – 1.194</p> <p>If <b>M0</b> or <b>M1</b>, then <b>SC1</b> for <math>b = 1.04\dots</math> Correct or <b>FT</b>(<i>their</i> <math>b - 1</math>) <math>\times 100</math></p>	<p>Allow standard form in working</p> <p>For <b>M1</b> condone incorrect number of zeroes in 600 million eg for <b>M1</b> allow <math>600 = 12 \times b^{99}</math></p>

## APPENDIX 1

Exemplar responses for questions **10(c)(ii)**

<b>Response</b>	<b>Mark awarded</b>
Rate of change in height or depth or water level	1
Rate of decrease in height	1
Change in depth/second	1
Rate of decrease	1 <b>BOD</b>
Speed of loss in height or speed at which depth decreases	1 <b>BOD</b>
Rate of change (how quickly the water trickles down)	0
Rate of change of water trickling down	0
Speed of loss	0
How much liquid is falling or decrease in height	0
Speed the water is flowing	0
Acceleration	0
Rate of liquid with time	0
Steepness of the curve	0
How fast the amount of water was lost	0

**OCR (Oxford Cambridge and RSA Examinations)**  
1 Hills Road  
Cambridge  
CB1 2EU

**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)**

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; 1 Hills Road, Cambridge, CB1 2EU  
Registered Company Number: 3484466  
OCR is an exempt Charity

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

© OCR 2012

