

MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/06

Paper 6 (Extended), maximum raw mark 40

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2012	0607	06

A INVESTIGATION ADDITION TRIPLES																										
1	(1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 6, 7) (2, 5, 7)	2	B1 for 6 or 7	First two numbers can be swapped																						
2	(1, 2, 3) (1, 3, 4) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 6, 7) (2, 5, 7) (3, 4, 7) (1, 7, 8) (2, 6, 8) (3, 5, 8)	4	B1 B1 cao B1 cao B1	Communication for systematic setting: ascending order within each triple and first or last numbers in order (after repeating previous set)																						
3	<table border="1"> <tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr> <tr><td>4</td><td>6</td><td>9</td><td>12</td><td>16</td><td>20</td><td>25</td><td>30</td><td>36</td><td>42</td><td>49</td></tr> </table>	5	6	7	8	9	10	11	12	13	14	15	4	6	9	12	16	20	25	30	36	42	49	2	B1 for 3	fit the numbers from their table unless wrongly counted.
5	6	7	8	9	10	11	12	13	14	15																
4	6	9	12	16	20	25	30	36	42	49																
4	<table border="1"> <tr><td>3</td><td>5</td><td>7</td><td>9</td><td>11</td><td>13</td><td>15</td></tr> <tr><td>1</td><td>4</td><td>9</td><td>16</td><td>25</td><td>36</td><td>49</td></tr> </table>	3	5	7	9	11	13	15	1	4	9	16	25	36	49			No marks awarded here								
3	5	7	9	11	13	15																				
1	4	9	16	25	36	49																				

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2012	0607	06

5	÷ 2, square OR square, ÷ 4	2	B1 square oe	correct order required Accept $\left(\frac{n-1}{2}\right)^2$ or $\frac{(n-1)^2}{4}$ only if written here in correct form For B1 accept n^2 on its own OR these are square numbers
	Testing both shown	1		Correct operations only. Accept bad form. Communication: any example written out correctly: $7 - 1 = 6; \frac{6}{2} = 3; 3^2 = 9$ OR $\frac{7-1}{2} = 3; 3^2 = 9$ OR $\left(\frac{7-1}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = 9$ OR $\left(\frac{7-1}{2}\right)^2 = 3^2 = 9$ OR $\frac{(7-1)^2}{4} = \frac{6^2}{4} = 9$ OR $\frac{(7-1)^2}{4} = \frac{36}{4} = 9$

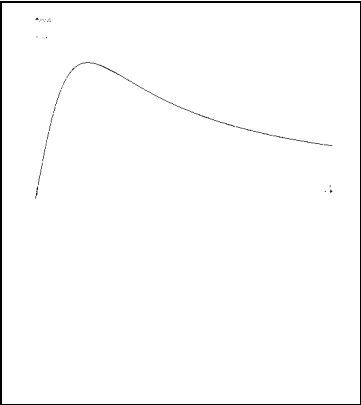
Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2012	0607	06

6 (a)	2500	2	M1 50 soi	Communication: $\frac{100}{2} = 50$ or $\frac{101}{2} = 50.5$ and $50^2 = 2500$ or $50 \times 50 = 2500$ OR substitution in formula seen
(b)	215	2	M1 107 soi	Communication: $\sqrt{11449} = 107$ and $107 \times 2 = 214$ OR Solving $0.25n^2 - 0.5n + 0.25 = 11449$ by graph or the quadratic formula OR solving an expression = 11449 using steps. OR $\sqrt{11449} \times 2 + 1$
(c)	$\left(\frac{n-1}{2}\right)^2$ oe	2	SC1 $\frac{n-1^2}{2}$ or $\frac{(n-1 \div 2)^2}{2}$ or $\frac{(n-1/2)^2}{2}$ or $\frac{n-1^2}{4}$	Other forms e.g. $0.25n^2 - 0.5n + 0.25$; $\left(\frac{n}{2} - \frac{1}{2}\right)^2$; $\frac{(n-1)^2}{4}$ Allow use of x for n SC0 $n - 1 \div 2^2$ (two errors in writing)
7 (a)	2450	1		Communication: their 6(a) – 50 OR $49^2 + 49$ OR 50×49
(b)	74	1		Communication: $\sqrt{1332} = 36.5$ and $37^2 - 37$ OR 37×36 OR $36^2 + 36$ OR 37×2 OR Solving $0.25n^2 - 0.5n = 1332$ by graph or quadratic formula
(c)	$\left(\frac{n-2}{2}\right)^2 + \left(\frac{n-2}{2}\right)$ oe	2	SC1 as in 6(c) (one bracketing error)	Other forms e.g: $0.25n^2 - 0.5n$ $\left(\frac{n}{2}\right)^2 - \left(\frac{n}{2}\right)$; $\left(\frac{n}{2}\right)\left(\frac{n}{2} - 1\right)$; $\frac{n(n-2)}{4}$; $\frac{n^2}{4} - \frac{n}{2}$; $\left(\frac{n}{2} - 1\right)^2 + \left(\frac{n}{2} - 1\right)$
	Communication	2	B2 for 2 B1 for 1	Communication seen in questions 2, 5, 6(a)(b), 7(a)(b)
			[Total: 23]	
			Scaled total 20	

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2012	0607	06

B MODELLING REGIOMONTANUS' STATUE				
1	(a) (i)	$3^2 + 2^2$ seen	1	Accept $4 + 9$
	(ii)	$\frac{3}{\sqrt{13}}$ oe	1	Accept 0.832 or $\frac{3}{3.6}$ or better
	(b)	$3^2 + 1^2$ seen	1	
	(c)	$\sin A = \frac{3}{\sqrt{10}\sqrt{13}}$	1	Substitution in the Sine Rule must be seen or implied Accept $\sin 56.3^\circ \times \frac{1}{\sqrt{10}}$ or $\frac{0.832}{\sqrt{10}} = 0.263 = \frac{3}{\sqrt{130}}$
2		$\frac{1}{\sqrt{10}}$ oe isw	3	Accept 0.31 to 0.325 . Accept $\frac{1}{3.16}$ Allow $\sqrt{5} = 2.2$ and $\sqrt{2} = 1.4$ Incorrect answers must be accurate to 2 decimal places Communication: Pythagoras and Sine Rule (even if arithmetical errors)
3		$AB = \sqrt{x^2 + 2^2}$ or $AB = \sqrt{x^2 + 4}$ $AC = \sqrt{x^2 + 1^{[2]}}$ $\sin A = \frac{\sin B}{b} = \frac{x}{\sqrt{x^2 + 4}}$ or $\frac{x}{\sqrt{x^2 + 4}} \frac{1}{\sqrt{x^2 + 1}}$	3	M1 M1 M1 dependent Assume $AB =$ if clear from the diagram. Accept $AB^2 = x^2 + 4$ Assume $AC =$ if clear from the diagram. Accept $AC^2 = x^2 + 1$ Sine Rule must be seen or implied OR accept $\frac{x}{\sqrt{x^2 + 4}\sqrt{x^2 + 1}}$ if square roots used Question 1 and 2.

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	IGCSE – May/June 2012	0607	06

4 (a)		2	<p>G1 increasing from (0,0) to any single max lying on the left half of the grid</p> <p>G1 decreasing & concave upwards after max. Not touching axis.</p>	Allow 2 mm distance to the origin along either axis
(b)	1.4 to 1.42 [m]	1		
(c)	between 19° and 19.5°	2	M1 [sin A =] 0.33 or better	SC1 if 0.33 seen in part (a) or (b).
5 (a)	$\frac{[\sin BAC =] \quad xh}{\sqrt{(x^2 + 1)(x^2 + (h+1)^2)}} \text{ oe}$	2	B1 correct numerator	Denominator must have the correct form.
(b) (i)	[increases by] 10.5° to 11°	2	B1 correct denominator	Communication: Pythagoras & Sine Rule
(ii)	[increases by] 0.3[m]		B1 for each	ft if one of the following in part (a)
			SC1 30° and 1.7 to 1.75	$\frac{x}{\sqrt{(x^2 + 1)(x^2 + (h+1)^2)}}$ 5° and 0.3 SC1 14.5° and 1.73
				$\frac{xh}{\sqrt{(x^2 + 1)(x^2 + h^2)}}$ no change and 1.73 SC1 19.5° and 3.5
				$\frac{xh}{\sqrt{(x^2 + 1)(x^2 + h^2 + 1)}}$ 18.7° and 0.08 or 0.09 SC1 38.1° and 1.5
	Communication	1		Seen in question 2 or 5(a)
		[Total: 20]		