UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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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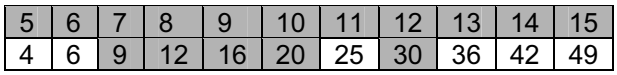
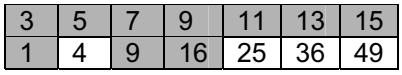
A INVESTIGATION ADDITION TRIPLES						
1	(1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 6, 7) (2, 5, 7)	**2**	**B1** for 6 or 7	First two numbers can be swapped		
2	(1, 2, 3) (1, 3, 4) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 2, 3) (1, 3, 4) (1, 4, 5) (2, 3, 5) (1, 5, 6) (2, 4, 6) (1, 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	 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	ft the numbers from their table unless wrongly counted.
4	 3 5 7 9 11 13 15 1 4 9 16 25 36 49					No marks awarded here

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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 Correct operations only. Accept bad form.
	Testing both shown	**1**		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 $\frac{(7-1)^2}{4} = \frac{36}{4} = 9$

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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 $(n–1\div2)^2$ or $(n–1/2)^2$ 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			

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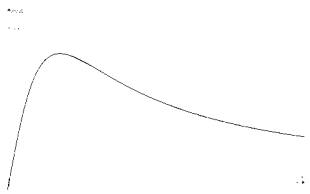
4 (a)		**2**	**G1** increasing from (0,0) to any single max lying on the left half of the grid **G1** decreasing & concave upwards after max. Not touching axis.	Allow 2 mm distance to the origin along either axis
(b)	1.4 to 1.42 [m]	**1**		
(c)	between 19° and 19.5°	**2**	**M1** [sin A =] 0.33 or better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

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