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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/61**

Paper 6 (Extended)

**October/November 2016**

MARK SCHEME

Maximum Mark: 40

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**Published**

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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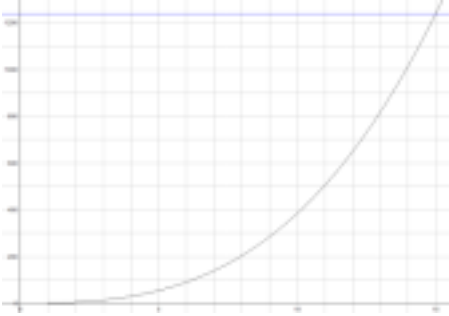
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### Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

A		INVESTIGATION	SQUARES ON GRIDS																						
Question	Answer	Mark	Part Marks																						
1 (a)	4 small and 1 large oe	1																							
(b)	9 4 1 14	1																							
(c)	16 9 4 1 30	1	If 0 scored in parts (b) and (c), <b>SC1</b> for 1, 4, 9, 16 (i.e. reverse order)																						
2 (a)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>Size</td> <td></td> <td>Total</td> </tr> <tr> <td>1 by 1</td> <td>1</td> <td>1</td> </tr> <tr> <td>2 by 2</td> <td>4 1</td> <td>5</td> </tr> <tr> <td>3 by 3</td> <td>9 4 1</td> <td>14</td> </tr> <tr> <td>4 by 4</td> <td>16 9 4 1</td> <td>30</td> </tr> <tr> <td>5 by 5</td> <td>25 16 9 4 1</td> <td>55</td> </tr> <tr> <td>6 by 6</td> <td>36 25 16 9 4 1</td> <td>91</td> </tr> </table>	Size		Total	1 by 1	1	1	2 by 2	4 1	5	3 by 3	9 4 1	14	4 by 4	16 9 4 1	30	5 by 5	25 16 9 4 1	55	6 by 6	36 25 16 9 4 1	91	2	<b>B1</b> for first 4 rows correct <b>B1</b> for rows 5 and 6 correct  If 0 scored in parts 1(b) and 1(c) or SC in 1(c), <b>SC1</b> for first 4 rows correct, in reverse order AND <b>SC1</b> for rows 5 and 6 correct, in reverse order	
Size		Total																							
1 by 1	1	1																							
2 by 2	4 1	5																							
3 by 3	9 4 1	14																							
4 by 4	16 9 4 1	30																							
5 by 5	25 16 9 4 1	55																							
6 by 6	36 25 16 9 4 1	91																							
(b)	Square [numbers]	1																							
(c)	204	1	C opportunity																						
(d)	$(n - 1)^2$ oe	1																							
3 (a)	$d = 0$	1																							
	$c = \frac{1}{6}$	1	C opportunity																						

Question	Answer	Mark	Part Marks																																				
(b)	$T = \frac{1}{3} 10^3 + \frac{1}{2} 10^2 + \frac{1}{6} 10$ leading to 385	1																																					
(c)	15	1	C opportunity																																				
4	$n$	1																																					
5 (a)	11	1																																					
(b)	<table style="border: none;"> <tr><td>2 by 1</td><td>2</td><td>0</td><td>2</td><td></td></tr> <tr><td>2 by 2</td><td>4</td><td>1</td><td>5</td><td></td></tr> <tr><td>2 by 3</td><td>6</td><td>2</td><td>8</td><td></td></tr> <tr><td>2 by 4</td><td>8</td><td>3</td><td>11</td><td></td></tr> <tr><td>2 by 5</td><td>10</td><td>4</td><td>14</td><td></td></tr> <tr><td>2 by <math>n</math></td><td><math>2n</math></td><td><math>n - 1</math></td><td><math>3n - 1</math></td><td>oe</td></tr> </table>	2 by 1	2	0	2		2 by 2	4	1	5		2 by 3	6	2	8		2 by 4	8	3	11		2 by 5	10	4	14		2 by $n$	$2n$	$n - 1$	$3n - 1$	oe	1 1							
2 by 1	2	0	2																																				
2 by 2	4	1	5																																				
2 by 3	6	2	8																																				
2 by 4	8	3	11																																				
2 by 5	10	4	14																																				
2 by $n$	$2n$	$n - 1$	$3n - 1$	oe																																			
6	<table style="border: none;"> <tr><td>3 by 1</td><td>3</td><td>0</td><td>0</td><td>3</td><td></td></tr> <tr><td>3 by 2</td><td>6</td><td>2</td><td>0</td><td>8</td><td></td></tr> <tr><td>3 by 3</td><td>9</td><td>4</td><td>1</td><td>14</td><td></td></tr> <tr><td>3 by 4</td><td>12</td><td>6</td><td>2</td><td>20</td><td></td></tr> <tr><td>3 by 5</td><td>15</td><td>8</td><td>3</td><td>26</td><td></td></tr> <tr><td>3 by <math>n</math></td><td><math>3n</math></td><td><math>2n - 2</math></td><td><math>n - 2</math></td><td><math>6n - 4</math></td><td>oe</td></tr> </table>	3 by 1	3	0	0	3		3 by 2	6	2	0	8		3 by 3	9	4	1	14		3 by 4	12	6	2	20		3 by 5	15	8	3	26		3 by $n$	$3n$	$2n - 2$	$n - 2$	$6n - 4$	oe	2	<b>B1</b> for rows 4 or 5 correct <b>B1 FT</b> for <i>their</i> linear expressions in columns 3, 4 and 5
3 by 1	3	0	0	3																																			
3 by 2	6	2	0	8																																			
3 by 3	9	4	1	14																																			
3 by 4	12	6	2	20																																			
3 by 5	15	8	3	26																																			
3 by $n$	$3n$	$2n - 2$	$n - 2$	$6n - 4$	oe																																		
7	$[n] < 3$ oe	1	C opportunity																																				
<b>Communication:</b> Seen in two of the following questions		1																																					
2 (c)	For showing $91 + 49 + 64$ or $1 + 4 + 9 + 16 + 25 + 36 + 49 + 64$ or in tabular form																																						
3 (a)	For showing working of a correct method																																						
3 (c)	For showing working or sketch 																																						
7	For $< 2$ in 2 by something and $< 3$ in 3 by something oe																																						

Page 4	Mark Scheme	Syllabus	Paper
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B MODELLING		MEASURING ROD	
Question	Answer	Mark	Part Marks
1 (a)	Cylinder	1	
(b)	152.7...cm oe	2	<b>M1</b> for $\frac{1200}{\pi \times 0.5^2}$ oe
2 (a)	Must be able to hold it oe	1	
(b) (i)	50	1	
(ii)	Cross-section narrows oe	1	
3 (a)	$\frac{1}{2} \times 50 \times 50 \times \sin x$	1	
(b)	$\frac{x}{360} \times \pi \times 50^2$	1	
	21.81x to 21.82x	1	
(c)	21.8x – 1250sinx isw	1	
(d)	their 3(c) × 153	1	<b>FT</b> their 3(c)
(e)	Correct curve	2	<b>B1</b> for correct shape <b>B1</b> for passing through approximately (80, 79 000) and approximately (150, 406 000)
(f) (i)	132 to 132.2	1	C opportunity
(ii)	29.6 to 29.75	2	<b>FT</b> their f(i) in $\cos\left(\frac{f(i)}{2}\right)$ <b>FT M1</b> for $50 \times \cos\left(\text{their } \frac{132}{2}\right)$ oe C opportunity
(g)	70.2 to 70.3	1	<b>FT</b> 100 – their (f(ii))
4	13.7 or 13.74 to 13.75	2	<b>M1</b> for $\cos\left(\frac{\text{their } 87.05}{2}\right) \times 50$ implied by 36.2 to 36.3 C opportunity

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part Marks
<b>Communication:</b> Seen in one of the following questions		<b>1</b>	
<b>3 (f) (i)</b>	seen in 3(e) For line on graph (sketch) at $V = 300000$		
<b>3 (f) (ii)</b>	For working shown i.e. extra stage like division by 2 or cos <i>their</i> angle		
<b>4</b>	seen in 3(e) For line on graph (sketch) at $V = 100000$ or $x = 87.0[5]$		