

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2015 series**

**0607 CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/61**

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

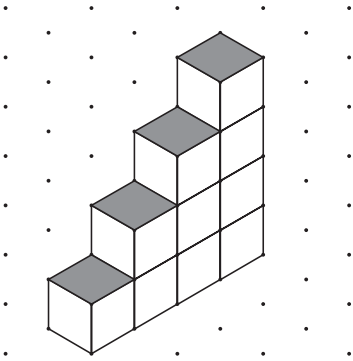
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

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## Abbreviations

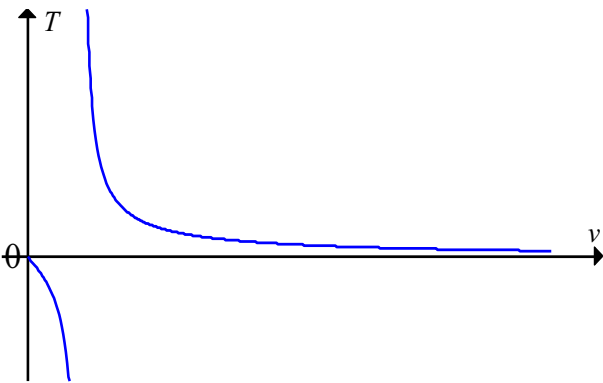
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

A INVESTIGATION STAIRCASES																	
1	(a)	3	1														
	(b)		1														
	(c)	<table border="1" data-bbox="331 1093 834 1187"> <tr> <td>Height</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>Cubes</td> <td>1</td> <td>3</td> <td>6</td> <td>10</td> <td>15</td> <td>21</td> </tr> </table>	Height	1	2	3	4	5	6	Cubes	1	3	6	10	15	21	1
	Height	1	2	3	4	5	6										
	Cubes	1	3	6	10	15	21										
(d)	$\frac{1}{2}n^2 + \frac{1}{2}n$ oe	1	C opportunity														
(e)	55	1FT	FT <i>their</i> (d) provided an expression in $n$ with numerical coefficients C opportunity														
2	(a)	16	1														
	(b)	<table border="1" data-bbox="331 1525 834 1619"> <tr> <td>Height</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>Cubes</td> <td>1</td> <td>4</td> <td>9</td> <td>16</td> <td>25</td> <td>36</td> </tr> </table>	Height	1	2	3	4	5	6	Cubes	1	4	9	16	25	36	1
	Height	1	2	3	4	5	6										
	Cubes	1	4	9	16	25	36										
(c)	$n^2$	1	oe														
(d)	100	1															

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3	(a)	<table border="1"> <tr> <th>Height</th> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <th>Cubes</th> <td>2</td> <td>6</td> <td>12</td> <td>20</td> <td>30</td> <td>42</td> </tr> </table>	Height	1	2	3	4	5	6	Cubes	2	6	12	20	30	42	1FT	FT of all values double <i>their</i> 1(c)	
	Height	1	2	3	4	5	6												
	Cubes	2	6	12	20	30	42												
	(b)	$n^2 + n$ oe	1	C opportunity															
(c)	110	1FT	FT <i>their</i> (b) provided an expression in $n$ of correct order with numerical coefficients C opportunity																
(d)	15	1	C opportunity																
4	(a)	<table border="1"> <tr> <th>Height</th> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <th>Cubes</th> <td>1</td> <td>6</td> <td>18</td> <td>40</td> <td>75</td> <td>126</td> </tr> </table>	Height	1	2	3	4	5	6	Cubes	1	6	18	40	75	126	2	<b>B1FT</b> for any two	
	Height	1	2	3	4	5	6												
Cubes	1	6	18	40	75	126													
(b)	$\frac{1}{2}n^3 + \frac{1}{2}n^2$ oe	1	C opportunity																
5		<table border="1"> <thead> <tr> <th>Type of staircase</th> <th>Max height using 1800 cubes</th> <th>Number of cubes left over</th> </tr> </thead> <tbody> <tr> <td>UP</td> <td>59</td> <td>30</td> </tr> <tr> <td>UP/DOWN</td> <td>42</td> <td>36</td> </tr> <tr> <td>DOUBLE</td> <td>41</td> <td>78</td> </tr> <tr> <td>MULTIPLE</td> <td>15</td> <td>0</td> </tr> </tbody> </table>	Type of staircase	Max height using 1800 cubes	Number of cubes left over	UP	59	30	UP/DOWN	42	36	DOUBLE	41	78	MULTIPLE	15	0	3FT	<p><b>FT</b></p> <p><i>their</i> UP <math>(\frac{1}{2}n^2 + \frac{1}{2}n)</math>,</p> <p><i>their</i> DOUBLE <math>(n^2 + n)</math>,</p> <p><i>their</i> MULTIPLE <math>(\frac{1}{2}n^3 + \frac{1}{2}n^2)</math></p> <p>if expression in <math>n</math> with numerical coefficients of correct order with at least two terms</p> <p><b>B1</b> for each pair (row)</p> <p>if <b>B0</b> then allow <b>B1</b> for correct column of maximum heights</p> <p>C opportunity</p>
	Type of staircase	Max height using 1800 cubes	Number of cubes left over																
	UP	59	30																
	UP/DOWN	42	36																
	DOUBLE	41	78																
MULTIPLE	15	0																	
Communication seen in three of 1(d), 1(e), 3(b), 3(c), 3(d), 4(b), 5			1																

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B MODELLING BOAT TRIPS				
1	(a)	40	1	C opportunity
	(b)	6	1	C opportunity
2	(a)	46.1[53...] or 46.2 seen or $\frac{10}{13} \times 60 = 46$ oe	1	may convert to metres per min etc; condone e.g. ... = 46 seconds; allow $\times 60$ to be implied by units stated
	(b)	4.33[3...] or $4\frac{1}{3}$ isw	1	C opportunity
	(c)	13.0[3...] or $13\frac{1}{30}$	1	C opportunity
3	(a) (i)	$[T =] \frac{20}{v+2} + \frac{20}{v-2}$ oe isw	1	
	(ii)	$[T =] \frac{20(v-2) + 20(v+2)}{(v+2)(v-2)}$ oe isw or $T(v-2)(v+2) = 20(v-2) + 20(v+2)$ oe isw	2	<b>B1</b> for either correct numerator or denominator/left hand side or right hand side;  must be from correct two partial fractions
	(iii)		2	<b>B1</b> correct shape with 2 branches <b>B1</b> asymptote at $v = 2$ only soi
	(iv)	$[k =] 2$ with valid reason in context	1	not for e.g. $T$ would be negative
	(b)	2.25 oe	1	
	(c)	13.6[2...] to 13.63 isw	1	isw halving after correct answer seen

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4	(a) (i)	$[T =] \frac{40v}{v^2 - 9}$	1	or $[T =] \frac{40v}{v^2 - 3^2}$ isw
	(ii)	13.9[7...] to 14.0	1FT	FT from <i>their</i> 9; FT correct to at least 3 sf
	(b)	5	1	C opportunity
5	(a)	Valid explanation	1	e.g. total distance travelled is now 80 [km] or it now travels 40 [km] each way oe
	(b)	Stretch, [scale factor =] 2, $v$ -axis invariant	2	<b>B1</b> for stretch with either factor 2 or $v$ -axis invariant
Communication seen in two of 1(a), 1(b), 2(b), 2(c), 3(c), 4(b)			1	