



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/61**

Paper 6 (Extended)

**May/June 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.

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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
nfww	not from wrong working
soi	seen or implied

<b>A INVESTIGATION</b>		<b>MOVING TRIANGLES</b>													
<b>Question</b>	<b>Answer</b>	<b>Mark</b>	<b>Part Marks</b>												
<b>1 (a)</b>	2	<b>1</b>													
<b>(b)</b>	<table border="1"> <thead> <tr> <th>Scale factor</th> <th><i>PS</i></th> <th><i>PB</i></th> </tr> </thead> <tbody> <tr> <td>3</td> <td>4</td> <td>12</td> </tr> <tr> <td>5</td> <td>6</td> <td>30</td> </tr> <tr> <td>7</td> <td>2</td> <td>14</td> </tr> </tbody> </table>	Scale factor	<i>PS</i>	<i>PB</i>	3	4	12	5	6	30	7	2	14	<b>3</b>	<b>B1</b> for each one correct
Scale factor	<i>PS</i>	<i>PB</i>													
3	4	12													
5	6	30													
7	2	14													
<b>(c)</b>	Similar	<b>1</b>													
<b>2 (a)</b>	$\frac{2}{20} = \frac{1}{10}$ oe	<b>1</b>	Allow, for example, 2 : 20 = 1 : 10 or 2 : 1 = 20 : 10 or 2 × 10 = 20 and 1 × 10 = 10 or 2 : 20 and 1 : x so 2x = 20, x = 10 or <i>PS</i> is double <i>RS</i> so <i>PB</i> is double <i>QB</i> or equivalent												
<b>(b)</b>	8	<b>1</b>	<b>C</b> opportunity												
<b>(c)</b>	$\frac{y}{2}$ oe	<b>1</b>	condone $\frac{y}{2} \times 1$												
<b>3</b>	$\frac{y}{4}$ oe	<b>1</b>	condone $\frac{y}{4} \times 1$  If 0 scored in 2(c) and 3, allow <b>SC1</b> for answers of $y = 2x$ and $y = 4x$												

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Question	Answer	Mark	Part Marks
4 (a)	18	1	C opportunity
(b)	12	1	C opportunity
(c)	their 6	1FT	strict FT <i>their y – their z</i>
5	[y =] 5x and [z =] 4x [AP =] 5x – 4x = x	M1 A1	may be on diagram Allow 2 marks for $y = 5x$ and $z = 4x$ seen or clearly indicated [AP =] $y - z = x$
6	[AP =] $nx - (n - 1)x = x$	1	or $nx - (nx - x) = x$ or $nx - nx + x = x$ not from wrong working  or equating expressions for $BQ$ $\frac{y}{n} = \frac{z}{n-1}$ and rearranging to show that either $y - z = \frac{y}{n}$ with $x = \frac{y}{n}$ or that $y - z = \frac{z}{n-1}$ with $x = \frac{z}{n-1}$  C opportunity
7 (a)	$\frac{x}{2}$	2	M1 for $\frac{1}{2}xn$ and $\frac{1}{2}x(n-1)$ oe seen or for $x = 2AP$
(b)	$\frac{x}{m}$	1	C opportunity
Communication seen in 3 of 2(b), 4(a), 4(b), 6 or 7(b)		2	C1 if seen in two of them

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B MODELLING		MUSICAL NOTES	
Question	Answer	Mark	Part Marks
1	<p>Correct curve over full domain.</p>	2	<p><b>B1</b> for at least one correct, complete cycle e.g. over the domain  <math>0 \leq t \leq \frac{1}{110}</math></p> <p>or for a graph of incorrect shape but that has 4 cycles over the full domain</p> <p>or for a graph with more than 3 inaccurate <math>t</math>-intercepts with 4 cycles over the full domain</p> <p>or for a fully correct and accurate sketch graph of the sine wave for the note <math>A_0</math></p>
2	<p>(a) (i) 32.7[0] or 32.703 to 32.7032 isw</p> <p>(ii) <math>C_1</math></p> <p>(iii) 41.2[0] or 41.203 to 41.2035 isw</p> <p>(b) [0, 12,] 24, 36, 48, 60, 72, 84</p> <p>(c) <math>C_7</math> and 4190 or 4186 or 4186.0 or 4186.00 or 4186.009 to 4186.01</p>	1 1 1 1 1	C opportunity
3	$2^{\frac{1}{12}}$ or exact equivalent	1	isw conversion to decimal, but decimal answer only does not score C opportunity
4	<p>(a) Correct exponential shape</p> <p>(b) <math>F_5</math></p>	1 2	<p>Intent of smooth curve;  must not cross <math>x</math>-axis;  condone graph not drawn on full domain;  condone <math>y</math>-intercept at origin;</p> <p><b>M1</b> for <math>n = 68</math> soi e.g. <math>f(68)</math> or <math>27.5 \times 2^{\frac{68}{12}}</math></p> <p>C opportunity</p>

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Question	Answer	Mark	Part Marks
5 (a)	600	1	
(b)	$\frac{1}{10}$ oe isw	1	
(c)	Uses an algebraic process to find either $h(n+1) = 2^{\text{their } \frac{1}{10}} \times h(n)$ oe or $k = 2^{\text{their } \frac{1}{10}}$ or 1.07 or 1.071 to 1.072	1FT	FT <i>their</i> value of $b$ , provided $b \neq 1$ ; Allow $k = 2^b$ isw Condone $k$ found by calculating the ratio of at least 2 pairs of consecutive values e.g. $\frac{h(2)}{h(1)}$ and $\frac{h(4)}{h(3)}$
6 (a)	77.3 or 77.29 to 77.295	2	M1 for $2^{\frac{k}{23}}$ where $k$ may be a constant or a variable seen C opportunity
(b)	9	2	not from wrong working M1 for $100 \times 2^n = 108$ or $100 \times 1.08^n = 200$ or $1.08^n = 2$ or for $1.08^9 = 1.99\dots$ soi or for two correct trials using a valid relationship seen C opportunity
Communication in 2 of 2(a)(iii), 3, 4(b), 6(a) or 6(b)		2	C1 if seen in 1 of them