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Paper 6 (Extended)

May/June 2017

MARK SCHEME

Maximum Mark: 40

Published

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

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MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M Method marks, awarded for a valid method applied to the problem.
- A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘**dep**’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

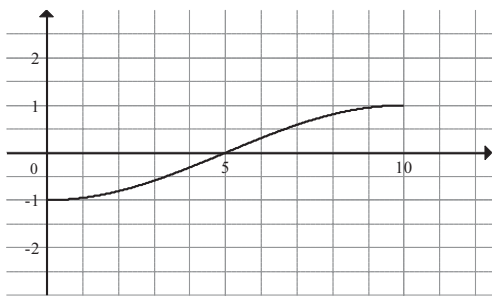
Abbreviations

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

Question	Answer	Marks	Part Marks																
A	INVESTIGATION NUMBER STEMS																		
1(a)	<table border="1"> <tr><td>15</td></tr> <tr><td>6</td></tr> </table> <table border="1"> <tr><td>48</td><td>60</td><td>72</td><td>84</td><td>96</td><td>108</td><td>120</td></tr> <tr><td>3</td><td>6</td><td>9</td><td>3</td><td>6</td><td>9</td><td>3</td></tr> </table>	15	6	48	60	72	84	96	108	120	3	6	9	3	6	9	3	1	
15																			
6																			
48	60	72	84	96	108	120													
3	6	9	3	6	9	3													
1(b)(i)	39	1																	
1(b)(ii)	$9n + 3$ oe	2	B1 for $9n + a$ oe																
1(b)(iii)	786	1	FT <i>their</i> $(9n + 3)$ C opportunity																
1(c)(i)	<table border="1"> <tr><td>4</td><td>$22 \div 9$</td><td>2 remainder 4</td></tr> <tr><td>8</td><td>$35 \div 9$</td><td>3 remainder 8</td></tr> <tr><td>7</td><td>$k \div 9$</td><td>j remainder 7</td></tr> </table>	4	$22 \div 9$	2 remainder 4	8	$35 \div 9$	3 remainder 8	7	$k \div 9$	j remainder 7	2	B1 for 5, 6 or 7 correct k is any integer with a number stem of 7 j is the integer part of $\frac{\text{their } k}{9}$							
4	$22 \div 9$	2 remainder 4																	
8	$35 \div 9$	3 remainder 8																	
7	$k \div 9$	j remainder 7																	
1(c)(ii)	[They are the] same oe	1																	
1(c)(iii)	8	1	Answer found from division scores 0.																
2(a)	38, 47	1																	
2(b)	$9n + 2$ oe	1	C opportunity																
2(c)	9992	2	B1FT for $[n=]1110[. \dots]$ C opportunity																
3(a)	$k + 9, k + 18, k + 27, k + 36$ oe	1																	
3(b)	$9n + k$ oe	1	SC1 for $9n + k - 9$ oe from an answer of $k, k + 9, k + 18, k + 27$ in part (a)																
4(a)	<table border="1"> <tr><td>$7 \div 12$</td><td>0 remainder 7</td></tr> <tr><td>$15 \div 12$</td><td>1 remainder 3</td></tr> <tr><td>$23 \div 12$</td><td>1 remainder 11</td></tr> </table>	$7 \div 12$	0 remainder 7	$15 \div 12$	1 remainder 3	$23 \div 12$	1 remainder 11	1											
$7 \div 12$	0 remainder 7																		
$15 \div 12$	1 remainder 3																		
$23 \div 12$	1 remainder 11																		
4(b)	$12n + f$ oe	1																	

Question	Answer	Marks	Part Marks
4(c)	$12n + f = f + 10$	M1	FT <i>their</i> $(12n + f) = f + 10$ soi
	$12n = 10$ and leading to n is not an integer oe	A1	SC2 $f + 10$ is smaller than any term in the sequence $f + 12, f + 24 \dots$ or SC1 if $f + 12$ not explicitly stated
Communication: Seen in two of the following questions		1	
1(b)(iii)	<i>their</i> $(9 \times 87 + 3)$ seen		
2(b)	At least two differences of 9 seen (may be in Q2 stem or in part(a)) or “The sequence is 1 less than the previous sequence” oe		
2(c)	<i>their</i> $(9n + 2) * 10\,000$, where * is = or < or \leq or two trials of the form $9 \times n + 2$ with $1000 \leq n \leq 1200$ substituted and number found. or two trials of the form $999N$, N a single digit, and correct number stems calculated.		

Question	Answer	Marks	Part Marks																												
B	MODELLING ELEVATORS																														
1(a)(i)	<table border="1"> <tr> <td>Trial 7</td> <td>85</td> <td>85</td> <td>70</td> <td>85</td> <td>85</td> <td>410</td> </tr> <tr> <td>Trial 8</td> <td>85</td> <td>70</td> <td>50</td> <td>85</td> <td>70</td> <td>360</td> </tr> <tr> <td>Trial 9</td> <td>50</td> <td>50</td> <td>70</td> <td>85</td> <td>85</td> <td>340</td> </tr> <tr> <td>Trial 10</td> <td>85</td> <td>50</td> <td>50</td> <td>70</td> <td>70</td> <td>325</td> </tr> </table>	Trial 7	85	85	70	85	85	410	Trial 8	85	70	50	85	70	360	Trial 9	50	50	70	85	85	340	Trial 10	85	50	50	70	70	325	2	B1 for any correct row
Trial 7	85	85	70	85	85	410																									
Trial 8	85	70	50	85	70	360																									
Trial 9	50	50	70	85	85	340																									
Trial 10	85	50	50	70	70	325																									
1(a)(ii)	$\frac{2}{10}$ oe	1	FT <i>their</i> completed table																												
1(b)(i)	3	1																													
1(b)(ii)	0 and 2 oe	1	Allow 0 and 1 or ground and first or 1 and 2 or ground and second																												
1(b)(iii)	5	1	C opportunity																												
2(a)(i)	$\frac{1}{8}$ oe 1 2 6, 7	1																													
2(a)(ii)	<table border="1"> <tr> <td>Trial 5</td> <td>70</td> <td>50</td> <td>85</td> <td>205</td> </tr> <tr> <td>Trial 6</td> <td>70</td> <td>50</td> <td>70</td> <td>190</td> </tr> <tr> <td>Trial 7</td> <td>70</td> <td>70</td> <td>70</td> <td>210</td> </tr> <tr> <td>Trial 8</td> <td>50</td> <td>70</td> <td>70</td> <td>190</td> </tr> </table>	Trial 5	70	50	85	205	Trial 6	70	50	70	190	Trial 7	70	70	70	210	Trial 8	50	70	70	190	1									
Trial 5	70	50	85	205																											
Trial 6	70	50	70	190																											
Trial 7	70	70	70	210																											
Trial 8	50	70	70	190																											
2(b)(i)	10	1	C opportunity																												
2(b)(ii)	9	1	C opportunity																												
3(a)	No, and the probability [of less than the maximum] is 0.8 oe or No, and the probability [of more than the maximum] is more than 0.05 oe	1	FT $1 - \textit{their} \frac{2}{10}$ in 1(a)(ii)																												
3(b)	No, and <i>EasyUp-3</i> takes 10 seconds [to move between floors] oe	1	FT <i>their</i> 10 in 2(b)(i) Accept “more than 5” instead of 10. If 0 scored in (a) and (b), SC1 for both explanations correct.																												
4	Increase the number of trials oe Increase the number of masses oe	2	B1 for each																												

Question	Answer	Marks	Part Marks
5(a)(i)	$\frac{1}{m}$ 1 2 $m - 3$	1	C opportunity
5(a)(ii)	Valid comment	1	If m is less than 4 the proportion [with a mass of 85] is 0 [or negative] oe Comment about the number of passengers on its own scores 0.
5(b)(i)	$[y =] -\cos(\text{their } k \times 2t)$	1	Expect $y = -\cos 18t$
5(b)(ii)		1	FT <i>their</i> cosine equation if the graph fits on the axes.
5(c)	It moves [between floors] at [an average of] <i>their</i> 5 seconds [per floor] oe and “Probability [that x is less than the max] > 0.95 ” oe	1	FT <i>their</i> cosine graph.
Communication: Seen in two of the following questions		1	
1(b)(iii)	4 floors in 20 seconds or 0.2 oe floors in 1 second or $\frac{6.3 + 3.7 + 4 + 6}{4}$ or similar values with one decimal place or $\frac{20}{4}$ but not if $\frac{6 + 4 + 4 + 6}{4}$ oe seen		
2(b)(i)	seconds in final answer		
2(b)(ii)	40 is 360° or $\frac{360}{40}$ or $\frac{360}{9} = 40$ or 10 is 90° etc. as above or 20 is 180° etc. as above		

Question	Answer	Marks	Part Marks
5(a)(i)	$\frac{m-3}{m} + \frac{2}{m} + ? = 1 \text{ oe}$ $\text{or } \frac{m}{m} - \frac{2}{m} - \frac{m-3}{m} = \frac{m-2-m+3}{m} = \frac{1}{m} \text{ oe}$ $\text{or } m - 3 + 2 + 1 = m \text{ oe}$ $\text{or } \frac{m-3+2}{2} = \frac{m-1}{m}$ <p>or unsimplified form for 1 in the table: $m - 2 - (m - 3) \text{ oe}$</p>		