

**MARK SCHEME for the October/November 2010 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.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

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A INVESTIGATION THE FIBONACCI SEQUENCE

1	<table border="1"> <tr> <td>Term position</td> <td>...</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> </tr> <tr> <td>Fibonacci number</td> <td>...</td> <td>144</td> <td>233</td> <td>377</td> <td>610</td> </tr> </table>	Term position	...	12	13	14	15	Fibonacci number	...	144	233	377	610	2 C1	1 1ft C1 for showing working	ft for 610 – 233 + 'their 377'																		
	Term position	...	12	13	14	15																												
Fibonacci number	...	144	233	377	610																													
2	<p>(a)</p> <table border="1"> <tr> <td>Term position</td> <td>3</td> <td>6</td> <td>9</td> <td>12</td> </tr> <tr> <td>Fibonacci number</td> <td>2</td> <td>8</td> <td>34</td> <td>144</td> </tr> </table> <p>(b) (i)</p> <table border="1"> <tr> <td>Term position</td> <td>4</td> <td>8</td> <td>12</td> <td>16</td> </tr> <tr> <td>Fibonacci number</td> <td>3</td> <td>21</td> <td>144</td> <td>987</td> </tr> </table> <p>3 is the 4th term... Every 4th term...</p> <p>(ii)</p> <table border="1"> <tr> <td>Term position</td> <td>5</td> <td>10</td> <td>15</td> <td>20</td> </tr> <tr> <td>Fibonacci number</td> <td>5</td> <td>55</td> <td>610</td> <td>6765</td> </tr> </table> <p>5 is the 5th term... Every 5th term in the... is a multiple of 5</p> <p>(c) Every 6th term in the...</p>	Term position	3	6	9	12	Fibonacci number	2	8	34	144	Term position	4	8	12	16	Fibonacci number	3	21	144	987	Term position	5	10	15	20	Fibonacci number	5	55	610	6765	2 1 5 5 1	1 for both in row 1 1 for both in row 2 1 2ft for all 3 in row 2 – 1 eooo 2 for all 3 in row 1 – 1 eooo 1ft 1 1 for both entries	ft from Q1 for 987 – 'their 377' + 'their 610' ft from Q1 for 'their 610'
Term position	3	6	9	12																														
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3	<p>(a) 5 by 8 rectangle drawn, divided into: one 5 by 5 square one 3 by 3 square one 2 by 2 square and two 1 by 1 squares</p>	2	If not all correct 1 for any 2 squares shown excluding the two 1 by 1 squares															
	<p>(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 5 by 5 square one 3 by 3 square one 2 by 2 square and two 1 by 1 squares</p>	2	If not all correct 1 for any 2 squares shown															
	<p>(c) (i)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Size of rectangle</td> <td style="text-align: center;">1 by 1</td> <td style="text-align: center;">1 by 2</td> <td style="text-align: center;">2 by 3</td> <td style="text-align: center;">3 by 5</td> <td style="text-align: center;">5 by 8</td> <td style="text-align: center;">8 by 13</td> </tr> <tr> <td style="text-align: center;">Least number of squares</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> </tr> </table>	Size of rectangle	1 by 1	1 by 2	2 by 3	3 by 5	5 by 8	8 by 13	Least number of squares	1	2	3	4	5	6	1	1 for all 4 entries	
	Size of rectangle	1 by 1	1 by 2	2 by 3	3 by 5	5 by 8	8 by 13											
	Least number of squares	1	2	3	4	5	6											
<p>(ii) 8</p>	1																	
<p>(iii) 89 144</p>	2	1 each																
<p>(d) $n - 1$</p> <p>The least number of squares is: the same as the term number that comes between the position numbers of the width and the length OR the mean of the position numbers of the width and the length OR width (smallest) position plus 1 or length (largest) position minus 1 OR e.g. for n^{th} and $(n + 2)^{\text{th}}$ terms, answer of $n + 1$ oe</p>	1	oe	e.g. $\frac{n(n-1)}{n}$															
		2	1 identifying 'term' or 'position' number of width/length 1 method of calculation/showing connection	1 for explaining least number of squares is sequential from 2 OR Identifying width/length as e.g. n and $n + 2$ 'width' + 1 scores 1 unless width is identified as shorter side, and same for 'length' – 1 For C1 must show some understanding														
		C1ft	C1ft sketches/working shown to identify/illustrate answer															
			[Total: 26 + C2 = 28 scaled to 24]															

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B MODELLING THE SOLAR SYSTEM					
1	8.4	2.8	3	2 for 5 or 4 correct 1 for 3 or 2 correct 0 for 1 or 0 correct	Note: In Q 1, 3, 4, 5 a penalty of -1 once for not rounding to 2 sf
	8.9	3.6			
	9.2	4.0			
2	(a) 7 points plotted		P2ft	P1 ft for 4, 5 or 6 correct plots ft for 3 points in Q1	Condone inaccuracies of up to 1 mm in plotting
	(b) Mean (8.6, 3.2) plotted Line of best fit ruled through mean		P1 L1	Between (7.6, 1.9) and (8, 1.9) and between (9.6, 5) and (10, 5)	Condone inaccuracies of up to 1 mm in plotting and drawing
3	2.8×10^9 (km) / 3.2×10^9 (km)		3 C	1 for 4.5 seen (maybe on axis) 1ft for 9.45 / 9.5 oe ft from line of best fit 1ft for answer C opportunity for minimum of 4.5 on graph or 4.5 and 9.45/9.5 oe in working	Note: In Q 1, 3, 4, 5 a penalty of -1 once for not rounding to 2 sf (anti-log value read from 4.5 and line of best fit)
4	$(m =) 1.5$ [1.3 – 1.7] $(c =) -9.6 / -9.7$		1 1ft C	Maybe necessary to ft from m C opportunity if working shown for m and c	Note: In Q 1, 3, 4, 5 a penalty of -1 once for not rounding to 2 sf ($c = 3.2 - \text{their } m \times 8.6$)
5	7.6×10^4 (days) / 6.0×10^4 (days)		1ft C	Maybe necessary to ft from m and c C opportunity if working shown	Note: In Q 1, 3, 4, 5 a penalty of -1 once for not rounding to 2 sf (anti-log (their $m \times \log(4.5 \times 10^9) + \text{their } c$))

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6	(a) $\log T = \log S^m + \log k$ $\log T = \log kS^m$ $T = kS^m$ (AG)	M1 E1		\div by log = E0
	(b) ($k =$) $2.0 \times 10^{-10} / 2.5 \times 10^{-10}$	1ft	ft from their c	(anti-log their c)
	(c) $T = \text{their } k \times (1.5 \times 10^8)^{\text{their } m}$ $T \approx 367 / 459$ OR $365 = \text{their } k \times S^{\text{their } m}$ $S \approx 1.5 \times 10^8$	1ft 1ft	Substitution of their values ft from 6(b) and 4 and value of S or T from table Q1	
	Comment that is appropriate to result of their test	1 C C1	 C opportunity if working shown 1 for <u>two</u> C opportunities shown	
				[Total: 20 scaled to 16]