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.

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A II	NVE	STIGAT	ION 7	THE F	IBON	ACCIS	SEQUE	NCE			
1		orm sition		12	13	14	15				
	Fibonacci number		144	233	377	610		2 C1	1 1ft	ft for 610 – 233 +	
									01	C1 for showing working	'their 377'
2	(a)							_			
	Term position36912					12			1 for both in row 1		
		Fibonac number	ci	2	8	34	144		2	1 for both in row 2	
	(b) (i)										
								_			
	Term position481216						1				
	Fibonacci number321144987						987			2ft for all 3 in row 2 -1 eeoo	ft from Q1 for 987 – 'their 377' + 'their
	3 is the 4^{th} term										610'
	Every 4 th term								5		
	(ii)										
	Term 5 10 15 20									2 for all 3 in row 1 -1eeoo	
	Fibonacci number5556106765					6765			1ft	ft from Q1 for 'their 610'	
	5 is the 5 th term Every 5 th term in the is a multiple of 5								5	1 1 for both entries	
	(c) Every 6 th term in the								1		

3(a) 5 by 8 rectangle drawn, divided into: one 5 by 5 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown excluding the two 1 by 1 squares(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 3 by 3 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown excluding the two 1 by 1 squares(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown(c) (i) $\frac{1}{12 2 3 4 5 6}$ 1(ii) 81(iii) 89 14421 each(d) $n-1$ 1oeThe 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 (and the length OR width (smallest) position plus 1 or length11ClftClftClft	Page 3				Mark Scheme: Teachers' version							Syllabu	
for any 2 squares one 3 by 3 square one 2 by 2 square and two 1 by 1 squaresfor any 2 squares shown excluding the two 1 by 1 squares(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 3 by 3 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown(c) (i) $\boxed{\frac{1}{\text{by 1}} \frac{1}{1} \frac{1}{2} \frac{2}{3} \frac{1}{4} \frac{5}{5} \frac{6}{6}$ 11(ii) 8 (iii) 89 14411for all 4 entries(iii) 8 (iii) 89 144121 each1The 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 (smallest) position plus 1 or length10 0 width (smallest) position plus 1 or length210 0 width (smallest) position plus 1 or length010 0 width (smallest) position plus 1 or length010 0 01110 0 021111111111111111111111111111111111					IG	SCSE	- Octo	ober/N	Novemb	er 2010)	0607	06
for any 2 squares shown excluding the two 1 by 1 squares(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 3 by 3 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown(b) 8 by 13 rectangle drawn, divided into: one 8 by 8 square one 2 by 2 square and two 1 by 1 squares2If not all correct 1 for any 2 squares shown(c) (i) $\overline{breetangle}$ $\overline{breetangle}$ 111 for all 4 entries(ii) 8 (iii) 89 144121 each(d) $n-1$ 10ec.g. $\frac{n(n-1)}{n}$ 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 (smallest) position plus 1 or length1OR width (smallest) position plus 1 or lengthC1ftC1ft										-	1		
(1) 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 squaresfor any 2 squares shown(c) (i) $\frac{1}{12} colspan=10^{-1} col$	3	one 5 by 5 square one 3 by 3 square one 2 by 2 square					2	for any shown of the two	2 squares excluding 1 by 1				
Size of rectangle1 by 11 by 22 by 33 by 55 by 88 by 13Least number of123456(ii)81(iii)81(iii)8914421 each(d) $n-1$ 1oee.g. $\frac{n(n-1)}{n}$ 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 length1OR width (smallest) position plus 1 or lengthC1ftC1ft		one 8 by 8 square one 5 by 5 square one 3 by 3 square one 2 by 2 square					2	for any					
rectangeLeast number of squares123456(ii)8111 for all 4 entries(iii)8914421 each(d) $n-1$ 1oee.g. $\frac{n(n-1)}{n}$ 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 													
(iii) 89 14421 each(d) $n-1$ 1oee.g. $\frac{n(n-1)}{n}$ 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 the mean of the position numbers of the width and the length OR the mean of the position numbers of the width (smallest) position plus 1 or length1oee.g. $\frac{n(n-1)}{n}$ 21 identifying 'term' or 'position' number of width/length calculation/showing connection1 for explaining lead number of squares sequential from 2 OR identifying width/length and $n+2$ 'width' + 1 scores unless width is		rectangle1 by 11 by 22 by 33 by 55 by 88 by 13Least number of123456								1	1 for all	4 entries	
(d) $n-1$ 1oee.g. $\frac{n(n-1)}{n}$ 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 the mean of the position plus 1 or length1oee.g. $\frac{n(n-1)}{n}$ 21 identifying 'term' or 'position' number of calculation/showing connection1 for explaining lea number of squares sequential from 2 OR uidth/length and $n+2$ 'width' + 1 scores unless width is		(iii) 89 144						1					
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 length1 identifying 'term' or 'position' number of width/length calculation/showing connection1 for explaining lea number of squares sequential from 2 width/length and $n + 2$ 'width' + 1 scores width isOR width (smallest) position plus 1 or lengthC1ftC1ftInterval term'								2	1 each				
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 the mean of the position numbers of the width and the length OR the mean of the position plus 1 or lengthor 'position' number of aclculation/showing connectionnumber of squares sequential from 2 Width/length and $n+2$ 'width' + 1 scores unless width is								1	oe		e.g. $\frac{n(n-1)}{n}$		
OR e.g. for n^{th} and $(n+2)^{th}$ terms, answer of $n+1$ shown to identify/illustrate answerside, and same for 'length'-1 For C1 must show	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 $n +$							or 'posi number width/le 1 metho calculat connect C1ft sketche shown t identify	tion' of ength od of tion/showing tion s/working	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			
[Total: 26 + C2 = 28 scaled to 24												[Total: 26 +	C2 = 28 scaled to 241

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BM	ODELLING THE SOLAR SYSTEM			
1	8.4 2.8 8.9 3.6 9.2 4.0	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
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	$2.8 \times 10^9 (\text{km}) / 3.2 \times 10^9 (\text{km})$	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 <i>m</i> C opportunity if working shown for <i>m</i> and <i>c</i>	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	$7.6 \times 10^4 (\text{days}) / 6.0 \times 10^4 (\text{days})$	1ft C	Maybe necessary to ft from <i>m</i> and <i>c</i> 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 $m \times log(4.5 \times 10^9)$ + their c))

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