Version : 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Mathematics

Use of Maths
UOM4/2

Mark Scheme

2005 examination – June series

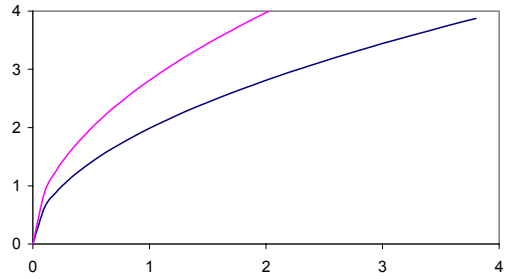
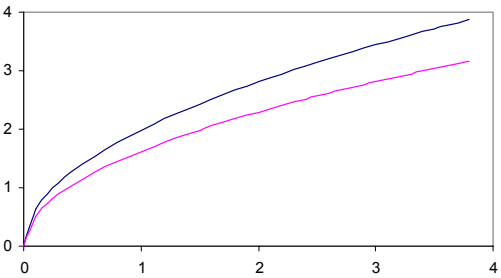
Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Use of Mathematics
Advanced Subsidiary Level – Applying Mathematics Paper 2 (UOM 4/2)

Answers and marking Scheme – June 2005

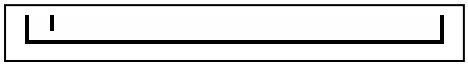
Question 1

(a)	$T = 2\pi\sqrt{\frac{l}{g}} = 2\pi\sqrt{\frac{l}{g}} = 2\pi\sqrt{0.1} = 1.99\ s$	**M1 A1**	1.98 M1 $2\pi\sqrt{\frac{1}{10}}$ M1
(b)	$1 = 2\pi\sqrt{\frac{l}{g}}$	**M1**	
	$\therefore \sqrt{\frac{l}{g}} = \frac{1}{2\pi}$		
	$\Rightarrow \frac{l}{g} = \frac{1}{4\pi^2}$	**M1**	
	$l = \frac{g}{4\pi^2} = \frac{10}{4\pi^2} = 0.253$	**A1**	condone 0.254 0.25 without working gains 2 marks (M2 implied)
(c)(i)		**B1**	Line correct shape
		B1	Above given line through (0,0)
(ii)	(As g decreases) the time period increases	**B2**	
(d)(i)		**B1**	Line correct shape
		B1	Below given line through (0,0)
(ii)	The time period of the rod acting as a pendulum is **shorter** (quicker) than that of the simple pendulum.	**B2**	It is shorter B1
(e)	$T = 2\pi\sqrt{\frac{2L}{3g}} = 2\pi\sqrt{\frac{l}{g}}$	**M1**	Equating
	so $\frac{2L}{3g} = \frac{l}{g}$,	**M1 A1,**	M1 squaring (could include $4\pi^2$) A1 squaring correctly
	$\therefore L = \frac{3}{2}l$	**A1**	A1
	Total	**17**	

Question 2

(a)	A_1	£500.00		
	A_2	£510.00	**B1**	A_2
	A_3	£520.20		
	A_4	£530.60	**B1**	A_3 and A_4
	A_5	£541.22		
	A_6	£552.04	**B1**	A_5 and A_6
				SC2 for correct answer but not to nearest penny
(b)	B_1	£100.00		
	B_2	£205.00	**B1**	B_2
	B_3	£315.25		
	B_4	£431.01	**B1**	B_3 and B_4
	B_5	£552.56		
	B_6	£680.19	**B1**	B_5 and B_6
				SC2 as above
(c)	The amount at the end of the previous year is increased by 5% – this is achieved by the multiplying factor 1.05		**B2**	Marks can only be gained by clearly relating to the real situation
	A further deposit of £100 is then added – achieved by adding 100		**B2**	
(d)	B_n gives the amount in the second saver's account at the start of a year,		**B1**	
	but the saver has deposited £100 at the start of each year, ie £100n is the saver's own money		**B2**	
	therefore interest, ie money from the bank, is given by $B_n - 100n$		**B1**	
(e)	after 3 years or start of year 4		**B2**	B1 $n = 4$
	Total		**16**	

Question 3

(a)(i)	4	**B1**	
(a)(ii)	2	**B1**	
(b)(i)	amplitude: 2 (metres)	**B1**	
(b)(ii)	period: 12 (hours)	**B2**	
(c)		**B1**	general shape – approx. 2 complete waves (accept $1\frac{1}{2}$ to $2\frac{1}{2}$)
	6 4 2 12 24	**B1** **B1**	central value of 4 peaks and troughs at 6m and 2m (indicated on axes or stretch)
		B1	clear 12 hour period
(d)(i)	6 metres	**B1**	condone 6
(d)(ii)	3am, 3pm	**B2**	SC1 for two values, 12 hours apart. B1 for 3 and 3. B2 for 3 and 15.
(e)	$5.5 = 4 + 2 \sin 30 (t – 12)^\circ$	**M1**	
	$1.5 = 2 \sin 30 (t – 12)^\circ$		
	$0.75 = \sin 30 (t – 12)^\circ$	**A1**	
	$48.59 = 30 (t – 12)$	**M1**	
	$t – 12 = 1.6196$		
	$t = 13.6196$	**A1**	13.62 or 1.62 SC4 (without working)
	so earliest time 1.6196 am		
	therefore time is 1.37 am	**A1**	cao (Do not accept 1.37pm)
	Total	**17**	

Question 4

(a)	The probability that four passengers will arrive is 0.2.	**B1**	
	Therefore 2 out of 10 integers (0 to 9 inclusive) are assigned.	**B1**	
(b)			

Time	**06 50**	**06 51**	**06 52**	**06 53**	**06 54**	**06 55**	**06 56**	**06 57**	**06 58**	**06 59**	**07 00**
Random No	6	0	3	0	1	2	2	1	4	2	6
No of passengers arriving	3	0	2	0	0	1 ←	1 B1 →	0	2 ←	1 B1 →	3
Passengers arriving	*A, B, C*	-	*D, E*	-	-	*F*	*G*	-	*H, I*	*J*	*K, L, M*

		B1	correct no of passengers at times 06 55, 06 56, 06 57
		B1	correct no of passengers at times 06 58, 06 59, 07 00
		B1ft	for correct passengers identified at 06 55, 06 56, 06 57, 06 58, 06 59, 07 00
		B1 ft	for times of passengers arriving (F to M on table 2, 2nd column)

Order in which passengers arrive and join queue at ticket office	**Time passenger arrives**	**Time to buy ticket**		**Time at which passenger has bought ticket**
		Random Number	**Length of time to buy ticket (minutes:seconds)**	**(hours:minutes:seconds)**
A	06 50	6	1:00	06:51:00
B	06 50	0	0:30	06:51:30
C	06 50	3	0:30	06:52:00
D	06 52	4	0:30	06:52:30
E	06 52	2	0:30	06:53:00
F	06 55	1	0:30	06:55:30
G	06 56	8	1:30	06:57:30
H	06 58	8	1:30	06:59:30
I	06 58	5	1:00	07:00:30
J	06 59	5	1:00	07:01:30
K	07 00	7	1:00	07:02:30
L	07 00	3	0:30	07:03:00
M	07 00	6	1:00	07:04:00

(c)	Passenger K	**B1 ft**	"Their" first 7.00
(d)	Length of time to buy ticket column	**B1** **B1** **B1**	for F, G for H, I, J for K, L, M
(e)		**B1ft** **B1ft** **B1ft** **B1ft**	for FG correct for HI correct for JK correct for LM correct } ft their times and when they arrive
((f)	Passenger I	**B1 ft**	condone; bought ticket at 7am, caught train
(g)	Do not employ another clerk because only 2 people miss their train due to waiting to buy a ticket or next train in 5 minutes	**B2**	OR: Do employ another clerk because few passengers wait or miss the train
(h)	Any 3 sensible Examples: Simulate arrival time of train Simulate whether each passenger needs to buy a ticket or not Simulate greater variability in how long passengers take to buy a ticket Simulate greater variability in when passengers arrive	 **B1** **B1** **B1** **Max B3**	 Identify 2 flaws in current simulation B1 Identify 3 flaws B2
	TOTAL	**20**	
	TOTAL FOR PAPER	**70**	