ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applying Mathematics UOM4/2

Mark Scheme

2008 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.

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Key to mark scheme and abbreviations used in marking

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation

√or ft or F	follow through from previous incorrect result	MC	mis-copy
CAO	correct answer only	MR	mis-read
CSO	correct solution only	RA	required accuracy
AWFW	anything which falls within	FW	further work
AWRT	anything which rounds to	ISW	ignore subsequent work
ACF	any correct form	FIW	from incorrect work
AG	answer given	BOD	given benefit of doubt
SC	special case	WR	work replaced by candidate
OE	or equivalent	FB	formulae book
A2,1	2 or 1 (or 0) accuracy marks	NOS	not on scheme
–*x* EE	deduct *x* marks for each error	G	graph
NMS	no method shown	c	candidate
PI	possibly implied	sf	significant figure(s)
SCA	substantially correct approach	dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded. However, there are situations in some units where part marks would be appropriate, particularly when similar techniques are involved. Your Principal Examiner will alert you to these and details will be provided on the mark scheme.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

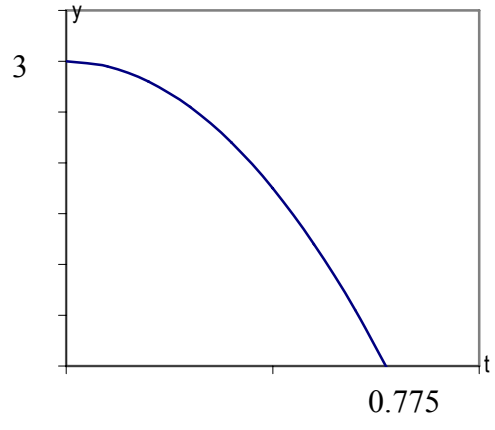
Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

AS Use of Mathematics
Applying Mathematics (UOM4/2)
Answers and Marking Scheme - June 2008

Question 1

(a)(i)	$x = 18.4 = 27.5t$ $t = \frac{18.4}{27.5} = 0.669$	**M1, A1**	Accept substitution of 0.669 into formula for x
(ii)	$0 = h - 5 \times 0.669^2$ $h = 2.2384 = 2.24$ (Accept 2.237…)	**M1** **A1**	Need eg with a variable SC1 2.2 if no working seen
(iii)	$12 = 27.5t$ $t = 0.43636 = 0.436$	**M1** **A1**	0 marks for 0.44 without working
(b)(i)	when the ball hits the ground $y = 0 = 3 - 5t^2$ so $t = \sqrt{\frac{3}{5}} = 0.77459 = 0.775$	**M1** **M1, A1**	attempted use of zero in equation for y
(ii)	in which case $x = 32.5 \times 0.77459 = 25.174$ which is greater than the length of the court (24 metres)	**M1, A1 ft** **B1 ft**	(from (b)(i))
(iii)		**B1** **B1** **B1**	general shape intercept (0, 3) intercept (0.775, 0)
	TOTAL	**15**	

Question 2

<table>
<tr><td>(a)</td><td>$H_1 = 1000$
$H_2 = 0.9 \times H_1 - 25 = 0.9 \times 1000 - 25$

$= 900 - 25 = 875$</td><td>M1

A1</td><td>M1 use of $H_1 = 1000$ in equation</td></tr>
<tr><td>(b)</td><td>$H_3 = 0.9 \times 875 - 25 = 762.50$
$H_4 = 0.9 \times 762.50 - 25 = 661.25$

so total cost = £1000 + £875 + £762.50 + £661.25 = £3298.75</td><td>B1
B1 ft

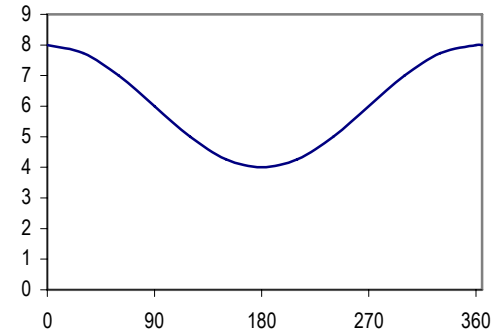
B1 ft</td><td>Condone 762.5

ft needs 4 different amounts</td></tr>
<tr><td>(c)(i)</td><td>20%</td><td>B1</td><td></td></tr>
<tr><td>(ii)</td><td>10%</td><td>B1</td><td></td></tr>
<tr><td>(d)</td><td>$A_1 = 0.8 \times 200 + 0.1 \times 100 = 170$

$B_1 = 0.9 \times 100 + 0.2 \times 200 = 130$</td><td>B1

B1</td><td>Condone 160 + 10 = 170
Or 300–170</td></tr>
<tr><td>(e)</td><td><table><tr><th>Week</th><th>Number of barges in Town A</th><th>Number of barges in Town B</th></tr><tr><td>0</td><td>200</td><td>100</td></tr><tr><td>1</td><td>170</td><td>130</td></tr><tr><td>2</td><td>149</td><td>151</td></tr><tr><td>3</td><td>134</td><td>166</td></tr></table></td><td>B1 + B1
B1ft + B1ft</td><td>B1 149; B1 151.
SC1 134.3 & 165.7</td></tr>
<tr><td>(f)</td><td>Sensible reason such as:
it is unlikely that the same percentage of customers will return barges to Centres A and B each week
or
the recurrence relations give fractions of barges which is unrealistic</td><td>B2</td><td></td></tr>
<tr><td></td><td>TOTAL</td><td>15</td><td></td></tr>
</table>

Question 3

(a)	$T_{\text{sunrise}} = 6 + 2\cos(30)^\circ = 6 + 2 \times 0.866$ $= 7.73$ $= 7.44$ (am)	**M1** **A1** **A1 ft**	$n = 31$, T = 7.71 SC1 or 7.43 SC2 Condone 7.438 (am) No marks for radians
(b)(i)	4 (am)	**B1**	
(ii)	$n = 180$	**B1**	Accept 29 June or 30 June
(iii)	The earliest that the sun rises is 4am (on day 180).	**B1 ft**	(b)(i)
(c)(i)	8 (am)	**B1**	
(ii)	$n = 0, 360$	**B1,B1**	Jan 1st & Dec 26 or 27
(iii)	The latest time that the sun rises is 8 (am) [at the beginning of January and end of December] (on days 0 and 360).	**B1 ft**	(c)(i)
(d)		**M1** **A1**	for general shape of one cycle of cosine wave maximum points at 8 & minimum point at (180, 4)
(e)	$6 + 2\cos n^\circ = 7$ $2\cos n^\circ = 1$ $\cos n^\circ = \frac{1}{2}$ n=60, 300	**M1** **M1 ft** **A1** **A1**	
	TOTAL	**16**	

Question 4

(a)(i)	$\frac{2}{10} = \left(\frac{1}{5}\right)$	**B1**	Condone 20%
(ii)	two out of ten integers are assigned to 10 seats being sold	**B1**	
(b)			

No of months before flight	Price of seat	TRIAL 1		
		Random number	Number of seats sold	Income
5 – 6	£5	7	30	150
4 – 5	£7.50	4	20	150
3 – 4	£10	5	20	200
2 – 3	£12.50	1	10	125
1 – 2	£20	9	30	600
0 – 1	£30	9	30	900
		Total	140	2125

B1 for any three rows with correct numbers of seats + **B1** for three additional rows correct
M1 ft for correct incomes (any 3 correct incomes)
A1 for correct totals CAO

TRIAL 2		
Random number	Number of seats sold	Income
9	30	150
7	30	225
2	20	200
9	30	375
3	20	400
0	10	300
Total	140	1650

B1 for any three rows with correct numbers of seats + **B1** for three additional rows correct
M1 ft for correct incomes (any 3 correct incomes)
A1 for correct totals CAO

(c)	Although the same number of seats is sold in each trial the income in trial 1 is higher.	**B1 ft** **B1 ft**	Reference to number of seats & income Comment on above

(d)

No of months before flight	Price of seat	Random number	Number of seats sold	Income
5 – 6	£10	9	10	£100
4 – 5	£12.50	7	20	£250
3 – 4	£15	2	30	£450
2 – 3	£20	4	30	£600
1 – 2	£25	3	30	£1250
0 – 1	£50	0	30	£2250
		Total	150	£4900

B1 for any three rows with correct numbers of seats + **B1** for three additional rows correct
M1 ft for any three rows with correct income + **A1** £1250
A1 for correct total (£4900)

Alternatively:

No of months before flight	Price of seat	Random number	Number of seats sold	Income		
5 – 6	£10	9	10	£100		
4 – 5	£12.50	7	20	£250		
3 – 4	£15	2	30	£450		
2 – 3	£20	4	30	£600		
1 – 2	£25	3	30	£750	£3650	**B2 M1**
0 – 1	£50	0	30	£1500	+ £1250	**A1**
		Total	150	£3650	£4900	**A1**

So total = £3650 + 50 X £25 = £3650 + 1250 = £4900

With the same mark distribution

(e)	one suggestion related to the simulation, such as: have more variation in the number of seats that can be sold in any one month	**B1**	
	TOTAL	**18**	

+ up to 3 marks for ability to present information accurately using correct notation.
+ up to 3 marks for mathematical arguments presented clearly and logically.

NOTATION

N3	4 or 5 of:	2 units (m and s)
N2	3	£ sign in question 2
N1	2	both graphs labelled
		use of degrees in question 3
		hours and minutes in question 3

ARGUMENT

1(a)(ii) or (b)(i)	equation and see solution
	eg $0 = h - 5\,(0.699)^2$

2(b) clear presentation and easy to follow

3(e) trying to solve

	TOTAL MARK FOR PAPER	**70**	