GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Applying Mathematics 2
(UOM4/2)

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.

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Key to Mark Scheme

M	mark is for	method
m	mark is dependent on one or more M marks and is for	method
A	mark is dependent on M or m mark and is for	accuracy
B	mark is independent of M or m and is for	method and accuracy
E	mark is for	explanation
√ **or ft**		follow through from previous incorrect result
cao		correct answer only
cso		correct solution only
awfw		anything which falls within
awrt		anything which rounds to
acf		any correct form
ag		answer given
sc		special case
oe		or equivalent
sf		significant figure(s)
dp		decimal place(s)
A2,1		2 or 1 (or 0) accuracy marks
– ***x*** **ee**		deduct *x* marks for each error

Abbreviations used in marking

MC – ***x***	deducted *x* marks for mis-copy
MR – ***x***	deducted *x* marks for mis-read
isw	ignored subsequent working
bod	gave benefit of doubt
wr	work replaced by candidate

Application of mark scheme

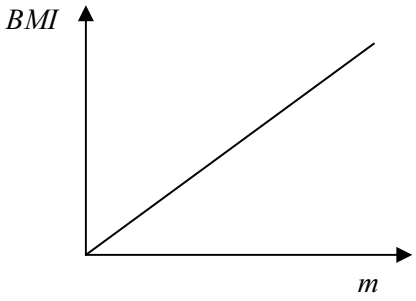
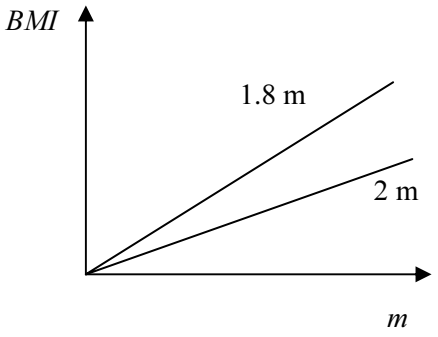
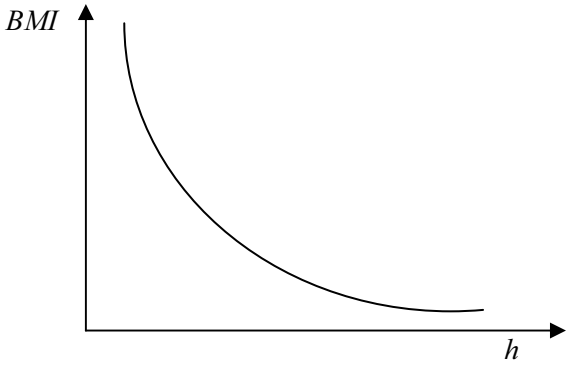
Correct answer without working	**mark as in scheme**
Incorrect answer without working	**zero marks unless specified**

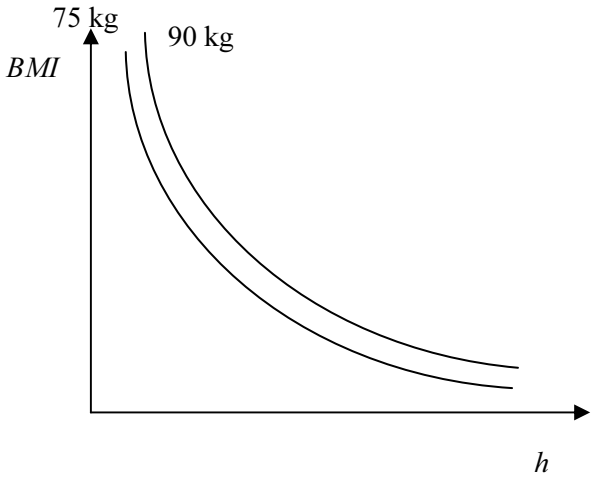
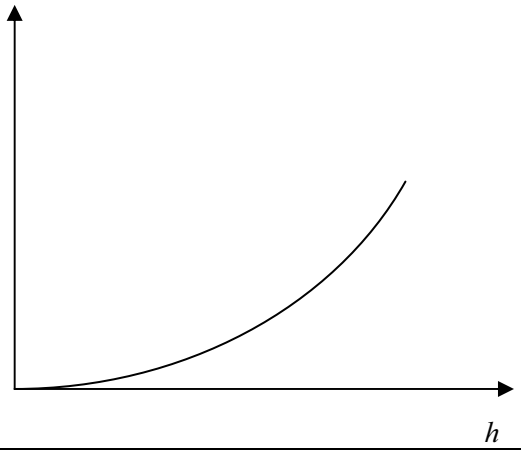
Award method and accuracy marks as appropriate to an alternative solution using a correct method **or partially correct method.**

GCE Use of Mathematics
Advanced Subsidiary: Applying Mathematics Paper 2 (UOM4/2)
June 2004

Answers and Marking Scheme

Question 1

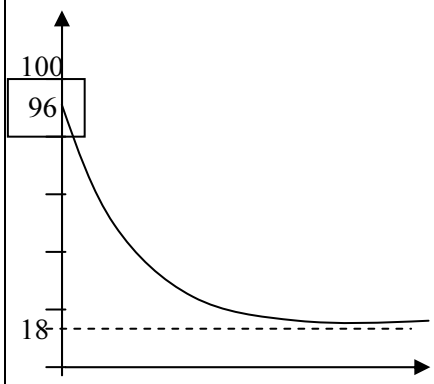
(a)(i)		B1 B1	Straight line Passing through origin (within 1 square) and stops at origin Allow axes reversed
(ii)		B2	Line for 2 metres – below line for 1.8m must be clearly indicated Account for reversed axes stopping at origin (penalise once per question)
(b)(i)		B1 B1	Curve generally correct Clear indication of asymptotic nature

(ii)		B2	
(c)	*m* 	M1 A1	General shape of curve Passing through origin and only $h \geq 0$ Accept reversed axes with labelling
(d)	$h = \frac{h_1}{100}$ so $BMI = \frac{m}{h^2} = \frac{m}{\left(\frac{h_1}{100}\right)^2} = \frac{100^2 m}{h_1^2} = \frac{10000m}{h_1^2}$	M1 A1	
	TOTAL	**12**	

Question 2

(a)	$v^2 = 20\mu d$ $100 = 20\mu \times 17.5$ $\mu = \frac{100}{20 \times 17.5} = \frac{100}{350} = 0.286$	 M1A1 A1	 M1 for 10^2 or 100 OR 17.5 Accept 0.29
(b)	$v = \sqrt{20\mu d}$ $= \sqrt{20 \times 0.286 \times 28}$ = 12.7	M1 A1 A1√	Formula Accept 12.6…
(c)	$\frac{12.7}{0.447} =$ 28.3 mph Was not breaking the speed limit – less than 30 mph	M1 A1√ A2√	 Allow 28.18 – 28.52
(d)	Value of μ would be smaller therefore value of v would be smaller leading to confirming that driver should not be prosecuted	 B2 E2√	(B1 if not gain B2 for v smaller)
	TOTAL	**14**	

Question 3

(a)	$T = 78e^{-0.02 \times 0} + 18 = 78 + 18 = 96$	M1A1	(M1 for inserting $t = 0$)
(b)	$T = 18$	B2	B1 room temperature
(c)		M1 A1√ A1√	General shape Intercept with vertical axis indicated and horizontal asymptote indicated with value given
(d)	Stretch in the vertical direction, scale factor 78 Followed by Translation in vertical direction by 18 units	B1 B1 B1 B1	 SC3 incorrect order of operations
(e) (i)	*A* temperature of surroundings *B* initial temperature of cup of tea above room temperature	B2 B2	 B1 initial temperature
	TOTAL	**15**	

Question 4

<table>
<tr><td>(a)</td><td>Allocating 2, 3 and 5 of the digits 0 to 9 to A, B and C respectively</td><td>M1A1</td><td>M1 for any of 2, 3, 5 correct</td></tr>
<tr><td>(b)</td><td>Allocating 1, 2 and 7 of the digits 0 to 9 to Gold, Silver and Bronze</td><td>M1A1</td><td>M1 for any of 1, 2, 7 correct</td></tr>
<tr><td>(c)</td><td>Gold: Silver: Bronze

1:1:3 (oe)</td><td>B2</td><td>Or equivalent

Accept $\frac{2}{10},\frac{2}{10},\frac{6}{10}$ oe
or decimals</td></tr>
<tr><td>(d)</td><td>8 = Silver</td><td>M1 A1</td><td>M1 for some attempt to rationalise information.</td></tr>
<tr><td>(e)</td><td><table><tr><th>Random pair
(x, y)</th><th>Type of chocolate bar</th><th>Token</th></tr><tr><td>(0, 9)</td><td>A</td><td>Bronze</td></tr><tr><td>(5,0)</td><td>C</td><td>Bronze</td></tr><tr><td>(6, 7)</td><td>C</td><td>Silver</td></tr><tr><td>(7, 1)</td><td>C</td><td>Bronze</td></tr><tr><td>(4, 1)</td><td>B</td><td>Gold</td></tr></table></td><td>B1√
B1√
B1√
B1√</td><td>for one row correct
for further row correct
for further row correct
for final 2 rows correct

all marks dependent on M marks in (a), (b)
full ft

OR ordering 1,2,3…9,0 gives
C gold
B gold
C silver
C bronze
B gold</td></tr>
<tr><td>(f)</td><td>Increase the number of integers assigned to Silver or Gold tokens

or

Enclose two tokens in each bar</td><td>B2</td><td>Or anything sensible</td></tr>
<tr><td></td><td>TOTAL</td><td>14</td><td></td></tr>
</table>

Question 5

<table>
<tr><td>(a)(i)</td><td>$A_{n+1} = A_n + A_1$
$\therefore A_2 = A_1 + A_1 = 2\,A_1$</td><td>M1 A1</td><td>M1 use of A_1 for A_n</td></tr>
<tr><td>(ii)</td><td>$A_3 = A_2 + A_1 = 3\,A_1$
$A_4 = A_3 + A_1 = 4\,A_1$
$\therefore A_n = n\,A_1$</td><td>B1
B1
B1</td><td></td></tr>
<tr><td>(b)(i)</td><td>$A_2 = 2\,A_1$
$\therefore \frac{1}{4}\pi\, d_2^2 = 2\times\frac{1}{4}\pi\, d_1^2$
$d_2^2 = 2\,d_1^2$</td><td>M1
A1</td><td>M1 substitution $\frac{1}{4}\pi d^2$ in either side</td></tr>
<tr><td>(ii)</td><td>$A_{n+1}=A_n+A_1$
$\frac{1}{4}\pi\, d_{n+1}^2 = \frac{1}{4}\pi\, d_n^2 + \frac{1}{4}\pi\, d_1^2$
$d_{n+1}^2 = d_n^2 + d_1^2$
$d_{n+1} = \sqrt{d_n^2 + d_1^2}$</td><td>M1
A1</td><td></td></tr>
<tr><td>(iii)</td><td><table><tr><th>n</th><th>d_n cm</th></tr><tr><td>1</td><td>8.00</td></tr><tr><td>2</td><td>11.31</td></tr><tr><td>3</td><td>13.86</td></tr><tr><td>4</td><td>16.00</td></tr><tr><td>5</td><td>17.89</td></tr><tr><td>6</td><td>19.60</td></tr></table></td><td>B1
B1
B1</td><td>SC2 correct to 1 dp
SC1 correct to integer
condone 15.99 for 16</td></tr>
<tr><td>(iv)</td><td>Variations in natural conditions such as lack of or too much water
or more sunshine or reaches natural limits</td><td>B2
B1</td><td>first reason
second reason
(max B3)</td></tr>
<tr><td></td><td>TOTAL</td><td>15</td><td></td></tr>
</table>