

GCE 2004

June Series



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.

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.

Further copies of this Mark Scheme are available from:

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Dr. Michael Cresswell Director General

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
\surd 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

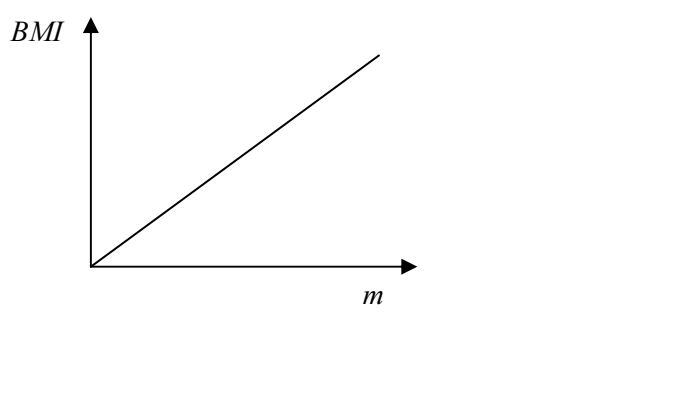
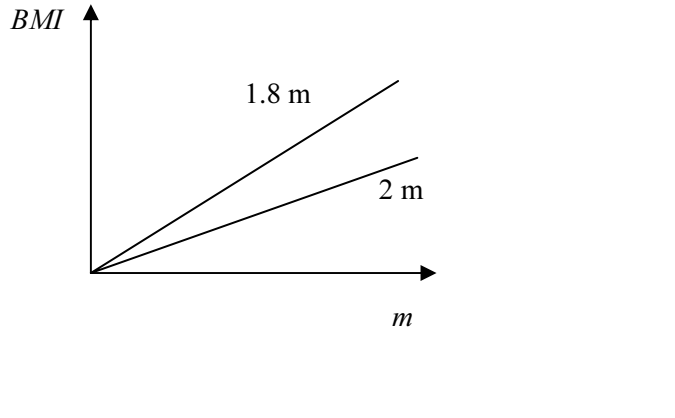
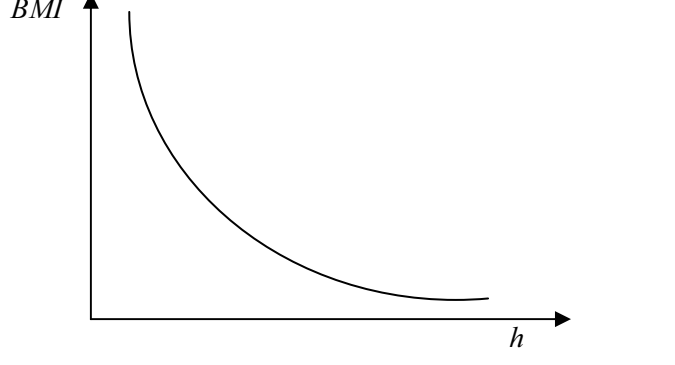
Correct answer without working	mark as in scheme
Incorrect answer without working	zero marks unless specified

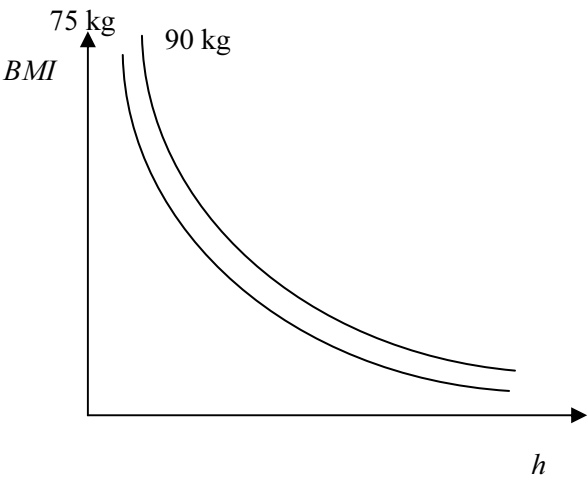
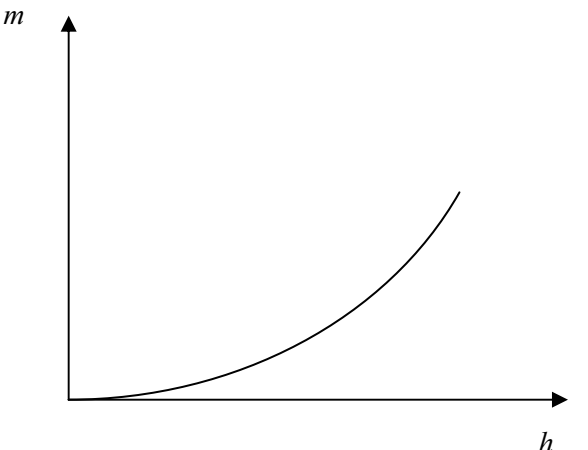
Award method and accuracy marks as appropriate to an alternative solution using a correct method or partially correct method.

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

Answers and Marking Scheme

Question 1

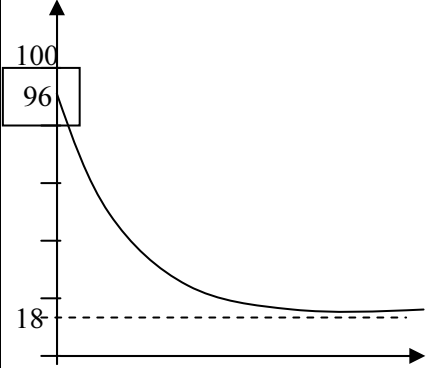
(a)(i)		B1	Straight line
(ii)		B2	Line for 2 metres – below line for 1.8m must be clearly indicated
(b)(i)		B1	Curve generally correct
		B1	Clear indication of asymptotic nature

(ii)		B2	
(c)		M1 A1	<p>General shape of curve</p> <p>Passing through origin and only $h \geq 0$</p> <p>Accept reversed axes with labelling</p>
(d)	$h = \frac{h_1}{100}$ <p>so</p> $BMI = \frac{m}{h^2} = \frac{m}{\left(\frac{h_1}{100}\right)^2} = \frac{100^2 m}{h_1^2} = \frac{10000m}{h_1^2}$	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)	$\frac{12.7}{0.447} =$ <p>28.3 mph</p> <p>Was not breaking the speed limit</p> <p>– less than 30 mph</p>	M1 A1✓ A2✓	Allow 28.18 – 28.52
(d)	<p>Value of μ would be smaller</p> <p>therefore value of v would be smaller</p> <p>leading to confirming that driver should not be prosecuted</p>	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

(a)	Allocating 2, 3 and 5 of the digits 0 to 9 to <i>A</i> , <i>B</i> and <i>C</i> respectively	M1A1	M1 for any of 2, 3, 5 correct																		
(b)	Allocating 1, 2 and 7 of the digits 0 to 9 to Gold, Silver and Bronze	M1A1	M1 for any of 1, 2, 7 correct																		
(c)	Gold: Silver: Bronze 1:1:3 (oe)	B2	Or equivalent Accept $\frac{2}{10} \frac{2}{10} \frac{6}{10}$ oe or decimals																		
(d)	8 = Silver	M1 A1	M1 for some attempt to rationalise information.																		
(e)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Random pair (<i>x</i>, <i>y</i>)</th> <th>Type of chocolate bar</th> <th>Token</th> </tr> </thead> <tbody> <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> </tbody> </table>	Random pair (<i>x</i> , <i>y</i>)	Type of chocolate bar	Token	(0, 9)	A	Bronze	(5, 0)	C	Bronze	(6, 7)	C	Silver	(7, 1)	C	Bronze	(4, 1)	B	Gold	B1✓ B1✓ B1✓ B1✓	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
Random pair (<i>x</i> , <i>y</i>)	Type of chocolate bar	Token																			
(0, 9)	A	Bronze																			
(5, 0)	C	Bronze																			
(6, 7)	C	Silver																			
(7, 1)	C	Bronze																			
(4, 1)	B	Gold																			
(f)	Increase the number of integers assigned to Silver or Gold tokens or Enclose two tokens in each bar	B2	Or anything sensible																		
	TOTAL	14																			

Question 5

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

