GCE 2004
November Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics A
(MAM1/W)

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 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
CAO ..... correct answer only
AWFW ..... anything which falls within
AWRT ..... anything which rounds to
AG ..... answer given
SC ..... special case
OE ..... or equivalent
A2,1 ..... 2 or 1 (or 0) accuracy marks
-*x* EE ..... deduct *x* marks for each error
NMS ..... no method shown
PI ..... possibly implied
SCA ..... substantially correct approach
c ..... candidate
SF ..... significant figure(s)
DP ..... decimal place(s)

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 ..... given benefit of doubt
WR ..... work replaced by candidate
FB ..... formulae booklet

Application of Mark Scheme

No method shown:
Correct answer without working ..... mark as in scheme
Incorrect answer without working ..... zero marks unless specified otherwise

More than one method/choice of solution:

2 or more complete attempts, neither/none crossed out	mark both/all fully and award the mean mark rounded down
1 complete and 1 partial attempt, neither crossed out	award credit for the complete solution only

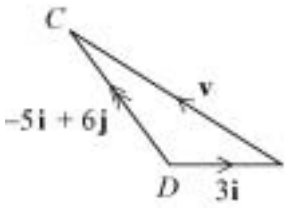
Crossed out work — do not mark unless it has not been replaced

Alternative solution using a correct or partially correct method — award method and accuracy marks as appropriate

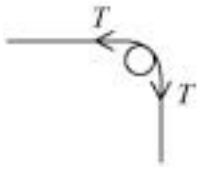
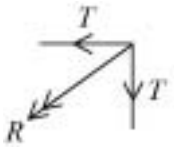
MAM1/W

Q	Solution	Marks	Total	Comments
1(a)	a = change in velocity / time or $v = u + at$ $a = 2\,\text{m s}^{-2}$	M1 A1	2	used
(b)	distance = $\frac{1}{2}\times 5\times 6$ 15 metres	M1 A1F A1F	3	Full method
(c)	acceleration not likely to be constant initial acceleration unrealistic change in velocity at $t = 3$ will be smoother	B1	1	
	Total		**6**	
2	$\underset{\rightarrow}{v}$ A $\underset{\rightarrow}{2}$ B C $\underset{\rightarrow}{1.5}$			
(a)	$3mv + 2m = 4m\times 1.5$ $v = \frac{4}{3}$	M1A1 A1	3	
(b)	$v^2 = u^2 + 2as$ $0 = (1.5)^2 + 2\times a\times 3$ retardation $= 0.375\,\text{m s}^{-2}$	M1A1 A1	3	Full method, accept ± Magnitude required
	Total		**6**	
3(a)	Sum of vertical forces = zero $4\cos 60^\circ + 8\cos 60^\circ - q = 0$ $q = 6$	M1 M1 A1 A1	4	used M1 for equation, 3 forces cao
(b)	horizontal: $R = 3 + 8\cos 30° - 4\cos 30°$ $R = 6.46$ or 6.47	 M1A1 A1F	3	
	Total		**7**	

MAM1/W (cont)

Q	Solution	Marks	Total	Comments
4(a)	$\mathbf{r} = \int (4\mathbf{i} - 2t\mathbf{j})\,\mathrm{d}t$	M1		attempted
	$= 4t\mathbf{i} - t^2\mathbf{j} \quad (+c)$	A1		
	$t = 0,\ \mathbf{r} = 8\mathbf{j}$	m1		used
	$\mathbf{r} = 4t\mathbf{i} + (8 - t^2)\mathbf{j}$	A1F	4	
(b)	$t = 2,\ \mathbf{r} = 8\mathbf{i} + 4\mathbf{j}$	B1F	1	
(c)	$8 - t^2 = 0$	M1		
	$t = 2\sqrt{2}$ or $t = 2.83$	A1	2	
	Total		**7**	
5(a)	$\mathbf{v}_1 = 5\mathbf{i} - 6\mathbf{j}$	B1	1	
(b)(i)	$\mathbf{v}_2 = -5\mathbf{i} + 6\mathbf{j}$	B1F	1	
(ii)		B1F		Diagram possibly implied
	$\mathbf{v} = -8\mathbf{i} + 6\mathbf{j}$	M1 A1F		
	$\lvert\mathbf{v}\rvert = 10\ \mathrm{m\,s^{-1}}$	M1 A1F	5	
	Total		**7**	

MAM1/W (cont)

Q	Solution	Marks	Total	Comments
6(a)(i)	B: $T = mg \ = 0.1\times 9.8 \ = 0.98\text{N}$	B1	1	cao
(ii)	A: $F = T(=0.98)$ $R = 0.5\times 9.8$	B1		
	$\mu\times 0.5\times 9.8 = 0.98$	M1		Condone inequality
	$\mu = 0.2$	A1	3	cao
(iii)		B1	1	Must label T or 0.98 N
(iv)				
	$R = \sqrt{(T^2+T^2)}$ or $2T\cos 45^\circ$	M1		
	$R = 1.39\text{N}$	A1	2	
(b)(i)	A: $T - 0.98 = 0.5a$	M1A1		Either equation for M1
	B: $2\times 0.1\times 9.8 - T = 0.2a$	A1		
	$0.98 = 0.7a$	m1		
	$a = 1.4$	A1	5	cao
(ii)	$T = 0.98 + 0.5\times 1.4,$ $T = 1.68$	A1F	1	ft accuracy error in equation
(iii)	$s = ut + \frac{1}{2}at^2$			
	$0.7 = 0 + \frac{1}{2}\times 1.4t^2$	M1		
	$t = 1$	A1	2	
	Total		**15**	

MAM1/W (cont)

Q	Solution	Marks	Total	Comments
7(a)(i)	vertical: $s = ut + \frac{1}{2}at^2$			
	$0 = 7t - 4.9t^2$	M1		Full method
	$0 = t(7 - 4.9t)$			
	$0 = 7 - 4.9t$	m1		
	$t = \frac{10}{7}$ sec (1.43)	A1	3	
(ii)	$OF = 21 \times \frac{10}{7}$	M1		
	$= 30$ m	A1F	2	
(b)	vert : $0 = 3.5t - 4.9t^2$	M1		Full method required
	$t = \frac{3.5}{4.9}$	m1		
	$FG = 21 \times \frac{3.5}{4.9}$	M1		
	$= 15$ m	A1	4	
(c)	$GH = \frac{1}{2} \times 15 = 7.5$	B1F		
	$OH = 30 + 15 + 7.5$	M1		
	$= 52.5$ m	A1F	3	
	Total		**12**	
	Total		**60**	