

# GCE 2004

## *November Series*



# Mark Scheme

## Mathematics A

### *(MAD1 )*

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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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*Dr Michael Cresswell Director General*

### Key to Mark Scheme

<b>M</b> .....	mark is for .....	method
<b>m</b> .....	mark is dependent on one or more M marks and is for.....	method
<b>A</b> .....	mark is dependent on M or m marks and is for .....	accuracy
<b>B</b> .....	mark is independent of M or m marks and is for .....	method and accuracy
<b>E</b> .....	mark is for .....	explanation
<b>✓ or ft or F</b> .....	follow through from previous	incorrect result
<b>CAO</b> .....	correct answer only	
<b>AWFW</b> .....	anything which falls within	
<b>AWRT</b> .....	anything which rounds to	
<b>AG</b> .....	answer given	
<b>SC</b> .....	special case	
<b>OE</b> .....	or equivalent	
<b>A2,1</b> .....	2 or 1 (or 0) accuracy marks	
<b>-x EE</b> .....	deduct x marks for each error	
<b>NMS</b> .....	no method shown	
<b>PI</b> .....	possibly implied	
<b>SCA</b> .....	substantially correct approach	
<b>c</b> .....	candidate	
<b>SF</b> .....	significant figure(s)	
<b>DP</b> .....	decimal place(s)	

### Abbreviations used in Marking

<b>MC – x</b> .....	deducted x marks for mis-copy
<b>MR – x</b> .....	deducted x marks for mis-read
<b>ISW</b> .....	ignored subsequent working
<b>BOD</b> .....	given benefit of doubt
<b>WR</b> .....	work replaced by candidate
<b>FB</b> .....	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

MAD1

Q	Solution	Marks	Total	Comments		
1	$\begin{array}{cccccccc} 21 & 13 & 35 & 46 & 7 & 12 & 49 & 25 \\ 13 & 21 & 35 & 46 & 7 & 12 & 49 & 25 \\ 13 & 21 & 35 & 46 & 7 & 12 & 49 & 25 \\ 7 & 13 & 21 & 35 & 46 & 12 & 49 & 25 \\ 7 & 12 & 13 & 21 & 35 & 46 & 49 & 25 \\ 7 & 12 & 13 & 21 & 35 & 46 & 49 & 25 \\ 7 & 12 & 13 & 21 & 25 & 35 & 46 & 49 \end{array}$	M1 A1 A1  A1 A1		SCA 1 <sup>st</sup> interchange Pass with no change  Pass with no change All correct		
	<b>Total</b>			<b>5</b>		
	2(a)	$x \geq 7, y \geq 7$	B1		Both  OE; M1 for – ve gradient OE; M1 for – ve gradient	
		$y \leq 2x$	B1			
		$y \geq \frac{1}{3}x$	B1			
		$2y + x \leq 40$	M1A1	7		
		$3x + 4y \geq 60$	M1A1			
(b)	Max at (8, 16)	M1A1	3	M1 Considering extremes		
	= 96	A1				
<b>Total</b>			<b>10</b>			
3(a)		M1 A1	2	Correct graph 4 vertices		
	(b)(i)	15	B1		1	
	(ii)	5	B1		1	
	(iii)	No, order of vertices is odd	E1		1	
	(c)(i)	$\frac{n(n-1)}{2}$	B1		1	OE
		(ii) $n-1$	B1			
		(iii) $n$ ODD	B1			
<b>Total</b>			<b>8</b>			

**MAD1 (cont)**

<b>Q</b>	<b>Solution</b>	<b>Marks</b>	<b>Total</b>	<b>Comments</b>
<b>4(a)(i)</b>	odd vertices	E1	1	
<b>(ii)</b>	$C, D, E, F$ $CD + EF = 200 + 150 = 350$ $CE + DF = 200 + 200 = 400$ $CF + DE = 325 + 50 = 375$ Repeat $CGD$ & $EF$ Tour with $A2, B2, C2, D2, E2, F2, G3$ Distance = $1500 + 350$ = 1850	M1 A2,1,0  B1 M1 A1  B1F	7	
<b>(b)</b>	$1 \times 3 \times 5 = 15$	M1A1	2	
	<b>Total</b>		<b>10</b>	



**MAD1 (cont)**

Q	Solution	Marks	Total	Comments																
6(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td><i>E</i></td> <td><i>P</i></td> <td><i>T</i></td> </tr> <tr> <td><i>E</i></td> <td>-</td> <td>130</td> <td>150</td> </tr> <tr> <td><i>P</i></td> <td>130</td> <td>-</td> <td>100</td> </tr> <tr> <td><i>T</i></td> <td>150</td> <td>100</td> <td>-</td> </tr> </table>		<i>E</i>	<i>P</i>	<i>T</i>	<i>E</i>	-	130	150	<i>P</i>	130	-	100	<i>T</i>	150	100	-	B3,2,1,0	3	
	<i>E</i>	<i>P</i>	<i>T</i>																	
<i>E</i>	-	130	150																	
<i>P</i>	130	-	100																	
<i>T</i>	150	100	-																	
(b)	$C \rightarrow P \rightarrow T \rightarrow A \rightarrow E \rightarrow C$ 40 100 145 95 90  $= 470$	M1 M1 A1 B1	4	Tour starts and finishes at <i>C</i> Visits every vertex All correct																
(c)	Actual route <i>CPCTCAEC</i> Once each <i>A, E, P, T</i> $2(+2)C$	M1  A1	2																	
<b>Total</b>			<b>9</b>																	
7	$x \geq 10$ $y \geq 10$ $z \geq 10$ $x + y + z \geq 100$ $2x + 5y + 3z \leq 400$ $y \geq \frac{2}{5}(x + y + z)$ $\Rightarrow 3y \geq 2x + 2z$  $z \leq \frac{3}{5}(x + y)$	B1 B1 B1 M1 A1  M1A1	7	all three    Any inequality with 3 terms i.e. $0.4x - 0.6y + 0.4z \leq 0$																
<b>Total</b>			<b>7</b>																	
<b>Total</b>			<b>60</b>																	