

Mathematics C (Graduated Assessment)

General Certificate of Secondary Education

Unit **B281/01**: Terminal Paper

Mark Scheme for January 2012

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
✓	Correct
✗	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A**, **B** etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.

It is vital that you annotate these scripts to show how the marks have been awarded.

It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-specific Marking Instructions

- i. **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.
- ii. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

- iii. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

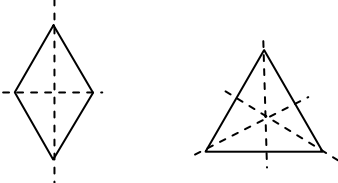
Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT $180 \times (\textit{their} '37' + 16)$, or FT $300 - \sqrt{(\textit{their} '5^2 + 7^2')}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \textit{their} (a)$.

For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

- iv. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.
- v. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
 - **isw** means **ignore subsequent working** (after correct answer obtained).
 - **nfw** means **not from wrong working**.
 - **oe** means **or equivalent**.
 - **rot** means **rounded or truncated**.
 - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
 - **soi** means **seen or implied**.
- vi. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
- vii. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).
- viii. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

- ix. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.
- x. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.
- If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.
- If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.
- xi. Ranges of answers given in the mark scheme are always inclusive.
- xii. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
- xiii. Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.

♠ = common with B282

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	9.2 to 9.6	1		
		(ii)	Tangent drawn	1	Mark intent; ignore radius or diameter drawn (used in 1ai)	Condone 1mm 'daylight' or very slightly going inside circle Condone unruled
	(b)	Perpendicular line drawn	1	Mark intent; need not meet given line	Overlay to show limits of acceptability; Condone line unruled	
2	(a)	rhombus trapezium	2	1 mark for each correct answer Condone 'parallelogram' for 'rhombus'	Condone misspelling if intent clear	
	(b)	'The sides are not all the same length' oe	1	Allow 'it has only 2 lines of symmetry, not 4'	Ignore extra comments about eg parallel lines Condone eg 'the sides are not equal'	
	(c)		2	1 each shape; 0 for a shape if extra lines	bod intent when accuracy poor, especially on triangle	
(d)	4	1				
3	(a)	(i)	14	1		
		(ii)	11	1		
		(iii)	9	1		
		(iv)	5, 11 and 13	2	M1 for 2 correct, with 3 rd omitted or replaced by a non-prime or for all 3 correct and 1 extra	5, 9, 11 gets 1 here

Question	Answer	Marks	Part marks and guidance																																															
(b)	1188 with correct working	3	<p>M1 complete method attempted A1 for at least one row of multn correct</p> <p>Or B1 for 880 or 308 or 1080 or 108 seen or complete row or column of grid method correct, ignoring final totals</p> <p>B1 only, for answer of 1188 with no working</p> <ul style="list-style-type: none"> Working: be convinced that calculator not used M1: a complete method which, if no arithmetic errors were made, would lead to the correct solution Standard multiplication methods (other correct possibilities exist): <table style="margin-left: 20px;"> <tr> <td style="padding: 0 10px;"> $\begin{array}{r} 4\ 4 \\ \times 2\ 7 \\ \hline 8\ 8 \\ 3\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$ </td> <td style="padding: 0 10px;">or</td> <td style="padding: 0 10px;"> $\begin{array}{r} 2\ 7 \\ \times 4\ 4 \\ \hline 1\ 0\ 8 \\ 1\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$ </td> </tr> </table> <p>eg MOB1 for 308 + 88 without correct placing [=496] grid methods:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr><td>×</td><td>20</td><td>7</td><td></td></tr> <tr><td>40</td><td>800</td><td>280</td><td>1080</td></tr> <tr><td>4</td><td>80</td><td>28</td><td>108</td></tr> <tr><td></td><td></td><td></td><td>1188</td></tr> </table> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr><td>×</td><td>2</td><td>7</td><td></td></tr> <tr><td></td><td>0</td><td>2</td><td>4</td></tr> <tr><td>1</td><td>8</td><td>8</td><td></td></tr> <tr><td>1</td><td>0</td><td>2</td><td>4</td></tr> <tr><td>1</td><td>8</td><td>8</td><td></td></tr> <tr><td>1</td><td></td><td></td><td></td></tr> <tr><td>8</td><td>8</td><td></td><td></td></tr> </table> <p>Or 27, listed 44 times (or vv) with addition attempted or chunked into the equivalent etc</p>	$\begin{array}{r} 4\ 4 \\ \times 2\ 7 \\ \hline 8\ 8 \\ 3\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$	or	$\begin{array}{r} 2\ 7 \\ \times 4\ 4 \\ \hline 1\ 0\ 8 \\ 1\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$	×	20	7		40	800	280	1080	4	80	28	108				1188	×	2	7			0	2	4	1	8	8		1	0	2	4	1	8	8		1				8	8		
$\begin{array}{r} 4\ 4 \\ \times 2\ 7 \\ \hline 8\ 8 \\ 3\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$	or	$\begin{array}{r} 2\ 7 \\ \times 4\ 4 \\ \hline 1\ 0\ 8 \\ 1\ 0\ 8 \\ \hline 1\ 1\ 8\ 8 \end{array}$																																																
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Question		Answer	Marks	Part marks and guidance	
4	(a)	Thursday	1	Accept Th etc	Or clear indication on diagram 0 for just T
	(b)	26	1		Accept 26, Saturday 0 for just Saturday
	(c)	10	1		
	(d)	22	2FT	Or FT <i>their</i> (b) – 4 evaluated M1 for 26 and 4 or for <i>their</i> (b) and 4 used	eg M1 for 26 to 4
5	(a)	Two squares shaded	1		
	(b)	45	2	M1 for 15 seen or for attempt at $\frac{60}{4} \times 3$ oe	M1 may be implied by answer with digits 45 eg M1 for 4.5 M0 for just $\frac{3}{4} \times 60$
	(c)	Correct conversion of at least one number to comparable form $\frac{2}{10}$ 27% 0.3 $\frac{1}{3}$ oe	M1 B2	eg $0.3 = \frac{3}{10}$ or 30%; B1 if one number out of order or SC1 for all correct but reversed NB for full marks, M1 must be earned explicitly	Condone lack of % symbol if clear x 100 and 20 seen, for example If eg 27% = 27/100 used, then conversion of another number needed to hundredths for comparability Use the 'cover-up' test – 'if you cover up the first wrong number, are the rest in the correct order? – if so, B1 earned'
6	(a)	Two correct crosses	2	B1 for each correct cross or for both correct + one extra	Overlay to assist examiners Mark intent – condone within 2 mm of vertex

Question			Answer	Marks	Part marks and guidance	
	(b)		30	2	M1 for sides 5, 3 and 2 identified (may be on diagram)	
7	(a)	(i) ▲	5 9 13	2	M1 for 2 terms correct in correct position or M1 for 1, 5, 9	eg 0 for 5, 21, 85
		(ii) ▲	No with valid reason	1	For example: <ul style="list-style-type: none"> • numbers in sequence are all odd • 4 goes into 32 but doesn't into the sequence numbers • 33 is in the sequence • 31 is not divisible by 4 • $4 \times 8 + 1 = 33$ 	See exemplars
	(b)		$[a =] 2C + 5$ or $2(C + 2.5)$ oe	2	M1 for correct first step of multiplying by 2 or adding $5/2$ oe or for correct reverse flow chart (correct reverse operations in correct order, but outcomes not necessary) If 0, allow SC1 for $[a =] (C + 5) \times 2$ or $2C + 10$	eg M1 for $2C = a - 5$ or $C + \frac{5}{2} = \frac{a}{2}$ oe ie for correct operations in reverse order. 0 for $[a =] C + 5 \times 2$

Question			Answer	Marks	Part marks and guidance	
8	(a)	♠	M Triangle (-1, 2) (-1, 4) (-2, 2)	2	M1 for correct reflection in $y = 0$ or in $x = a, a \neq 0$	On overlay, 2 marks for blue, 1 mark for green or for a translation of blue parallel to the x-axis Condone label missing
	(b)	♠	N Triangle (1, 0) (3, 0) (1, -1)	2	M1 for rotation 90° anticlockwise about (0, 1) [at (-1, 2) (-1, 3) (-3, 2)] or rotation 90° clockwise wrong centre MR 'M' rotated, not 'L' : allow M1 for a fully correct rotation of 'M'	On overlay, 2 marks for blue, 1 mark for green or purple (MR) or for a translation of blue Condone label missing
	(c)	♠	Reflection	1	May be earned independent of <i>their</i> M and N	
9	(a)	♠	$2x + 3 + x + 5 + 2x + 3 + x + 5 [= 43]$ oe	1		
	(b)	♠	$x = 4.5$ length 12 width 9.5 oe	2 1FT 1FT	M1 for $6x = 27$ or $[x =] \frac{27}{6}$ or $27 \div 6$ and A1 for $\frac{9}{2}$ or 4.5 or $4\frac{1}{2}$ or $4\frac{3}{6}$ isw FT <i>their</i> 'x' $\times 2 + 3$ FT <i>their</i> 'x' $+ 5$ FT only if x is non integer condone length and width reversed	A0 for just $\frac{27}{6}$ eg after $4\frac{3}{6}$, $x = 4.3$, length = 11.6, width = 9.3 earns the last two marks but in such cases do not award isw as well

Question			Answer	Marks	Part marks and guidance	
10		♣	$a = 70$	1		
			alternate angles	1	Condone z angles	Condone wrong /no angles mentioned Condone alternative, alternating etc 0 for alternate segment 0 for just opposite
			isosceles triangle	1	Or [sum of the] angles of a triangle is 180° (and 180 may be omitted if 70° correct)	1 for triangle adds to 180 0 for sides of triangle add to 180 0 for angles add to 180 0 for just a list of angle facts

Question			Answer	Marks	Part marks and guidance	
11	(a)	(i)	(4, 0)	1		
		(ii)	B plotted at (1, 3)	1	Mark intent	Condone no label if no confusion / choice;
		(iii)	C plotted at (-3, 4)	1	Mark intent Allow SC1 here if coords consistently reversed in all three parts	Condone no label if no confusion / choice
	(b)		24.5 oe	1		
12	(a)		paint 14.97 wood 12.15 total 28.82 or FT	M1 M1 A1	FT only if one previous error	
	(b)	(i)	79	2	M1 for one or both of 71 and 87 identified	Or M1 for ordered list and arrow between 71 and 87 oe
		(ii)	106	3	M1 for attempt to add soi [=848] M1 for $\div 8$ soi If M0 , allow SC2 for 785.875 or 666.875 rot to 3 sf or more	May be implied by answer (These SC numbers obtained by forgetting to press = before dividing)
	(c)	(i)	Top of ladder in correct position Bottom of ladder in correct position	1 1	11.1 to 11.3 cm up wall (not a different wall) on ground, 3.5 to 3.7 cm from wall SC1 for both positions marked correctly and ladder not drawn	Overlay to assist examiners; if in doubt, use ruler

Question			Answer	Marks	Part marks and guidance	
		(ii)	70 to 74	1	Or FT <i>their</i> ladder $\pm 2^\circ$; No FT for 0° or 90° Accept 106 to 110 or FT	No FT if ladder not drawn, but allow FT if ladder drawn eg with a different wall
13	(a)		(ACP) APC CAP CPA PAC PCA	2	Condone their also doing ACP; B1 if all there with other repeats/extras or for at least 4 of 6 correct	
	(b)		$\frac{2}{6}$ oe FT <i>their</i> table	2FT	isw wrong cancelling Accept 0.33 or 33% or better, FT; M1 for numerator or denominator correct, FT <i>their</i> table	Must FT table – look for ‘* P C’ and/or ‘P C *’ Deduct 1 from marks earned for wrong notation such as ‘2 in 6’ FT
	(c)		0.6 oe	1		
14	(a)	(i)	$a + 14$ as final answer	2	B1 for $a + *$ or for other $ka + 14$ Or SC1 for $a + 14$ found then spoilt	Allow $1a$, A etc
		(ii)	$30p^2$ as final answer	2	B1 each ‘term’ ; condone $30 \times p^2$	
	(b)		$\bar{7}$	2	M1 for $\bar{10}$ seen	
15	(a)	(i)	32	1	Accept $\bar{3}2$	
		(ii)	$\bar{1}2$	1		

Question			Answer	Marks	Part marks and guidance	
17			210/4 [or 52 to 53] 297/32 [or 9 to 10] ans in range 468 to 530	M1 M1 A1	<p><u>Alternative orientation:</u> M1 for 210/32 [or 6 to 7] M1 for 297/4 [or 74 to 75] A1 for answer in range 444 to 525</p> <p><u>Alternative Method:</u> M1 for 4×32 [or 128] M1 for 210×297 [or 62370] A1 for ans in range 487 to 488 or 490 or 500</p> <p>If no method shown, then B1 only for answer in range 444 to 530</p>	
18	(a)	♣	26455 to 26456	3	<p>M2 for 1.27×20831 Or M1 for 1.27 or 0.27×20831 oe or $5624(-.37)$</p> <p>If M0, allow SC2 for figs 2645537</p>	eg M1 for $2083 \cdot 1 + 2083 \cdot 1 + 1458 \cdot 17$
	(b)	♣	24500 or 24501 and 25499 or 25500	1 1	<p>Their lower boundary Their upper boundary Accept answers in either order</p>	But 0 for eg 23500 and 24500
19	(a)	♣	418 to 419	3	<p>M1 for $\pi \times 60$ or 188... or equiv for semicircle [$(\pi \times 60)/2$ or 94...]</p> <p>M1 for <i>their</i> '188' + 230</p>	<p>Allow even if later doubled or halved</p> <p>For any number + 230 oe eg M0M1 for $120 + 230$ or 350 Area + 230 M0M1 $418 + 120$ M1M1 188 then $377 + 230$ M1M1 But $377 + 230$ with no working M0M1</p>

Question		Answer	Marks	Part marks and guidance	
	(b) ♣	Groups, eg	1	For 20 – 24, 25 – 29 etc frequencies are 0, 4, 2, 2, 4, 6, 2, 4, 2, 4 for 25 – 34, 35 – 44 etc: 6, 6, 8, 6, 4	May be implied by attempt at freq polygon or bar graph with these heights correct; condone eg 20 – 30, 30 – 40 etc if freqs correct
		20 – 29 4			
		30 – 39 4			
		40 – 49 10		Allow for groups seen in stem and leaf form or tallied with or without totals	
		50 – 59 6			
		60 – 69 6			
		Points plotted at correct heights FT <i>their</i> frequencies if shown	1	Condone one error	Allow bars of the 'correct' height
		Plots at midpoints and points joined with ruled lines	1	For groups 20 – 29, 30 – 39 etc allow plots at 24 – 26.	Ignore lines from endpoints to axes; if bars and polygons, ignore bars

APPENDIX 1

Exemplar responses for question 7(a)(ii)

Response	Mark awarded
No, the n th term means it becomes larger than 32	0
No, $5 \times 4 + 1 = 21$ and then multiplying 21, 32 is skipped. As it equals 85	0
No, you would have to change the sequence to fit it in	0
32 is an even number	0 not sufft
Nothing adds up to make 32 in the sequence given or used in it	0 not sufft
No, it is an even number and doesn't fit the sequence	0 not sufft
No, each n th term goes up in fours and 32 is even	0 not quite enough
No, although 32 is a multiple of 4 you add 1 each time which means the closest it gets to 32 is 29 or 34	1bod condone slip at end
No, although 32 is a multiple of 4 you add 1 each time	1
If you keep adding 4 it doesn't get to 32	1
No, the 7 th number in the sequence is 29 and plus 4 would give 33	1
No, $32 - 1 = 31$, $31 \div 4 = 17.7$ is the reverse of $4n+1$ and 31 does not go into 4x table and all numbers are odd	1
No, it's going up in odd numbers and 32 is even	1
No, $4 \times 7 + 1$ is too low and $4 \times 8 + 1$ is too high	1
No, the sequence is going up in fours and it started on an odd number	1
No, the 7 th term is 29 and the 8 th term is 33	1
No, the sequence goes up in 4s and in the sequence is 5, 9, 13, 17, 21, 25, 29 and 33	1

Exemplar responses for question 16(b)

Response	Mark awarded
It goes up more in Fahrenheit	0 not sufft
The graph is increasing more than double	0
For every 5°C there are 10°F	0
They increase at different levels	0
For every 5°C there are nearly 10°F	1 bod
140, the difference between 30° and 15° is 27°F and $86°F + 27°F + 27°F = 140°F$	2
140, your adding 18° for every 10° you get $104° + 18° + 18° = 140$	2
140, between 30°C and 40°C fahrenheit goes up by 18 so I times that by 3 which equals 54 then added it to the fahrenheit of 30°C	2
140, at 20°C = 68°F at 40°F its 104°F difference = 36 add 36 to 104 = 140	2
140, the line on the graph is continuous and $40° + 20° = 60°$ so I found the difference in °F and added it onto 40°C which is 104°	2
143, for every 10 it goes up 19	1 + 0

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