

Mathematics C (Graduated Assessment)

General Certificate of Secondary Education

Unit **B282**: Terminal Paper (Higher Tier)

Mark Scheme for January 2011

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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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Marking instructions for examiners (January 2011)**GCSE Mathematics C (Graduated Assessment) – J517
Units B271 to B282****Marking instructions**

1. Mark strictly to the mark scheme.
2. Make no deduction for omission of units except as indicated on the mark scheme (although if this leads to a later error this will of course be penalised).
3. Work crossed out but not replaced should be marked.
4. **M** (method) marks are not lost for purely numerical errors.
A (accuracy) marks depend on preceding M (method) marks. Therefore M0 A1 cannot be awarded.
W (workless) marks are independent of M (method) marks and are awarded for a correct final answer or a correct intermediate stage.
5. Subject to 4, two situations may be indicated on the mark scheme conditioning the award of A marks or independent marks:
 - i) Correct answer correctly obtained (no symbol)
 - ii) Follows correctly from a previous answer whether correct or not (“FT” on mark scheme and on the annotations tool).
6. 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).
7. Always mark the greatest number of significant figures seen, even if this is then rounded or truncated on the answer line, unless the question asks for a specific degree of accuracy.
8.
 - i) Allow full marks if the correct answer is seen in the body and the answer given in the answer space is a clear transcription error, unless the mark scheme says ‘mark final answer’ or ‘cao’.
 - ii) Allow full marks if the answer is missing but the correct answer is seen in the body.
 - iii) Accuracy marks for an answer are lost if the correct answer is seen in the working but a completely different answer is seen in the answer space. Method marks would normally be given.
9. 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 **W** marks. Deduct 1 mark from any **A** or **W** marks earned and record this by using the **MR** annotation. **M** marks are not deducted for misreads.
10. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work.
11. For answers scoring no marks, you must either award NR (no response) or 0, as follows:

Award NR if:

- Nothing is written at all in the answer space
- There is a comment which does not in any way relate to the question being asked (“can’t do”, “don’t know”, etc.)
- There is any sort of mark that is not an attempt at the question (a dash, a question mark, etc.)

Award 0 if:

- There is any attempt that earns no credit. This could, for example, include the candidate copying all or some of the question, or any working that does not earn any marks, whether crossed out or not.

12. Where a follow through (FT) mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question.
13. In cases where there is clear evidence that a calculator has been used in section A, mark the script as normal then raise an exception.
14. 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.

Abbreviations

The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- Where you see **oe** in the mark scheme it means **or equivalent**.
- Where you see **cao** in the mark scheme it means **correct answer only**.
- Where you see **soi** in the mark scheme it means **seen or implied**.
- Where you see **www** in the mark scheme it means **without wrong working**.
- Where you see **rot** in the mark scheme it means **rounded or truncated**.
- Where you see **seen** in the mark scheme it means that you should award the mark if that number/expression is seen anywhere in the answer space, including on the answer line, even if it is not in the method leading to the final answer.
- Where you see **figs 237**, for example, this means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2·37, 2·370, 0·00237 would be acceptable but 23070 or 2374 would not.

* = common with B281

Section A

1 *	£7.14	3 M2 for 1.26 or digits 714 Or M1 for [10% =] 0.84 or 84[p] or digits 126 with wrong dp Or M1 for $\frac{15}{100} \times 8.40$ or $\frac{15}{100} \times 840$ or 0.15×8.4 or 0.15×840 or 0.85×8.4 or 0.85×840 oe seen	Or M1 for 1% = 0.084 or 8.4[p]. 1% may be implied by ÷ by 100 shown.
2	(a) 52° ∠BDA = 52 isosceles triangle x and ∠BDA are alternate angles	1 1 Accept BA = BD or 2 sides equal instead of isosceles triangle. If ∠BDA is shown as 52° on diagram accept isosceles triangle (or BA = BD or 2 sides equal) for 1 mark. 1 Condone Z angles If ∠BDA is shown as 52° on diagram accept alternate angles for 1 mark.	<u>Alternative:</u> ∠CBA = 128° supplementary angles for 1 mark ∠ABC = 76° isosceles Δ and angle sum 180 for 1 mark If ∠BDA = 52° not stated or identified on diagram, award SC1 if both isosceles triangle or BA = BD and alternate angles stated clearly
	(b) No with reason eg ∠BCD = 60, not equal to ∠BAD	1	<u>Alternative eg:</u> ∠BAD + ∠CDA ≠ 180 (or = 172)

3 *	<p>(a) Complete ordered stem and leaf table</p> <table border="1" style="margin-left: 20px;"> <tr><td>5</td><td>2 8</td></tr> <tr><td>6</td><td>1 4 9</td></tr> <tr><td>7</td><td>2 2 3 5 6 7 7</td></tr> <tr><td>8</td><td>2 3 5 6 7 8</td></tr> <tr><td>9</td><td>0 2</td></tr> </table> <p>with completed Key eg 6 1 represents 61[bpm]</p>	5	2 8	6	1 4 9	7	2 2 3 5 6 7 7	8	2 3 5 6 7 8	9	0 2	<p>3 M2 for 1 or 2 errors or omissions</p> <p>Or M1 for 3 errors or omissions or for table not ordered and/or just key completed</p> <p>Allow eg 6 1 = 61</p>	<p>Condone commas. Condone 50 etc as stem with appropriate key. Condone order of stem reversed, (ie 9 0 2 at top) If order within rows reversed, count that as one error. If key incomplete, count that as one error.</p> <p>Allow SC1 for correctly ordered table with double digit leaves [ignoring any stems or key].</p>
5	2 8												
6	1 4 9												
7	2 2 3 5 6 7 7												
8	2 3 5 6 7 8												
9	0 2												
	<p>(b) (i) 76.5 40</p>	<p>2 M1 for 76 and/or 77 [as answer or identified in table or working] 1 or for 6·5 as answer</p>	<p>Eg accept 6 and /or 7 ringed in 70 row in table</p>										
	<p>(ii) One comment about median and one comment about range. eg at end pulse rates faster spread of rates the same</p>	<p>Comments must FT from <i>their</i> median and range [so 0 in this part if relevant value[s] missing in (b)(i)] 1 Condone 'on average' omitted from comment, as in this example. 1 Allow range the same.</p>	<p>See exemplar responses.</p> <p>Since demand refers to context, condone lack of context in comments</p> <p>Do not penalise extra wrong comments</p>										
4	<p>(a) $4x + 7$</p>	<p>2 M1 for $2x$ and $x + 7$ seen</p>	<p>Condone for M2 $T = 4x + 7$ Condone for M1 $x = 2x + x + 7$ Allow M1 for $4x + 21$ or $x + x + 7 + 2x + 14$ or for $5x + 7$ or $x + 2x + 2x + 7$ M1 only scored for eg $x = 4x + 7$ or $4n + 7$, $x = 4n + 7$</p>										
	<p>(b) <i>their</i> $4x + 7 = 55$ or <i>their</i> $4x = 48$ $x = 12$ 12, 19, 24</p>	<p>M1 A1 Equation may be given in a flow diagram FT <i>their</i> $4x + 7 = 55$ W1</p>	<p>If M0 A0, then SC1 allowed for numeric method of solution of 'their(a)' = 55 seen where 'their(a)' is in the form $ax + b$. (a and b non zero).</p>										

5 *	(a)	25 40 40 25	2	M1 for 2 entries correct	
	(b)	(i) Points plotted, correct or FT their (a), tolerance 1 mm Correct curve, tolerance 2mm	1 1	condone 1 error or 2 symmetrical errors ie within 2mm of correct positions for points	eg 1 for plotting if both (0, 0) and (6, 0) omitted but other points correct Use overlay and allow plots within circles No FT for curve from wrong (a) Use overlay and allow curve within circles Curve 0 if any section ruled Condone two sections with doubling and / or feathering [deleted work may still show up in scoris]
		(ii) 0.8 and 5.2	2	1 each solution – correct or FT from <i>their</i> graph, solutions ± 0.1	Tolerance ± 0.1 of examiner's reading of their graph Condone a range given if in tolerance eg '0.7 – 0.8'
6	(a)	$16 \times 3 = 48$ and $48 \times 5 = 240$	1	oe eg $16 \times 3 \times 5 = 240$	Accept prime factorisation shown Accept eg $24 \times 3 = 48$ and $240 \div 5 = 48$
	(b)	$2 \times 3 \times 5^2$ or $2 \times 3 \times 5 \times 5$	2	M1 for 2, 3, 5 seen	
	(c)	30	1		
7	(a)	1/36	2	M1 for $\frac{1}{6} \times \frac{1}{6}$	1 for incorrect notation (1in 36, 1 out of 36, 1:36)
	(b)	Amar [is more likely] Amar probability 4/36 and Gopal probability 3/36 or Amar 4 ways and Gopal 3 ways	2	M1 for Amar and 1 probability or listing correct or for Amar and 'more ways' (condone incomplete listing seen but do not accept eg (8,1).	Condone for 2 marks both listings correct and then Amar and 'more ways'. Condone 4/12 and 3/12. Allow SC1 for equally likely .. both 4 ways (or 4 ways listed)

8		3	<p>M2 for mixed number answer from addition with 1 arithmetical error.</p> <p>M2 for $6\frac{17}{12}$ or $\frac{89}{12}$ or $1\frac{5}{12}$</p> <p>Or M1 for attempt to add with common denominator and either $\frac{8}{12}$ or $\frac{9}{12}$ oe or $\frac{56}{12}$ or $\frac{33}{12}$</p>	Allow M2 for error in one of the two fractions, then correctly added and converted to mixed number.
9	(a) $n \leq 3$ or $3 \geq n$	2	<p>M1 for $8n \leq 24$ or $8n = 24$ or $8n < 24$ or $8n \geq 24$ or $8n > 24$ or $n = 3$ or $n < 3$ or $n \geq 3$ or $n > 3$ or 3 or any 'reversed statement' eg $24 > 8n$</p>	
	(b) $y = 8x + 17$	3	<p>M1 for $y + 3 = 4(2x + 5)$ ie mult by 4 and</p> <p>M1 for $y + 3 = 8x + 20$ ie expansion bracket and</p> <p>M1 for $y = 8x + 17$ ie completion in simplified form</p>	<p>Condone $y = 8x + 17$ and then rearranged to $x = \dots$</p> <p>For $y = 8x + 17$ and then $y = 25x$ only M1M1 scored</p>
10	(a) 3	1		Ignore wrong working
	(b) $19 + 8\sqrt{3}$	2	<p>M1 for 16 [+] $4\sqrt{3}$ [+] $4\sqrt{3}$ [+] 3 [Accept 3 of 4 terms correct]</p>	For M1 condone $\sqrt{3}\sqrt{3}$ or $\sqrt{9}$ for 3 $16 + 8\sqrt{3}$ scores M1 as from 3 terms correct.

11	(a)	$125x^6y^3$	2	M1 for 125 or x^6 in final answer	Condone for M1 $125x^6 + y^3$ as final answer
	(b)	$3(x + 2)$ or $3x + 6$ www	3	M2 for $\frac{3x(x-2)(x+2)}{x(x-2)}$ Or M1 for factorisation of numerator or denominator	$\frac{3x(x^2-4)}{x(x-2)}$ or $\frac{(x^2-2x)(3x+6)}{x^2-2x}$ Condone incomplete fact'n eg $\frac{3(x^3-4)}{x(x-2)}$ or $\frac{3(x^3-4x)}{x^2-2x}$ or $\frac{3x(x^2-4)}{x^2-2x}$ NB $3x - 6$ without fact'n scores 0

Section A Total: 50

* = common with B281

Section B

12		-26	3	M2 for $-26.1[111]$ Or M1 for $-235/9$ SC1 26 or $26.1[111]$	
13	*	34 or 34.4.. to 34.5	3	M2 for 0.655 to 0.656 or 0.66 or for 65.5 to 65.6 or 66 [%] or for $(55700 - 36500)/55700 [= 19200/55700]$ or for 0.34 or 0.344 to 0.345 Or M1 for 19200 seen or for 36500/55700 if M0 then allow SC1 for 35 (from truncated 0.65)	0 for just 55700 – 36500 shown or calculated incorrectly [they can get M2 as shown above for full method]
14	(a)	440m www	3	M2 for 439.6 to 439.9 Or M1 for $\pi \times 140$	
*	(b)	170	2	M1 for $(51/6) \times 20$ oe SC1 for answer of 153 or 204 or 160 or 180	eg M1 for 8.5×20

	(c) (i) 14, 34, 54, 68, 74, 80 seen or used plots at correct heights (tolerance < 2mm of correct points) plots at end of intervals (tolerance < 2mm of correct points) curve or straight line segments	1 1 1 1	FT <i>their</i> CF if given	Condone 1 error in plotting Condone 1 point missed, eg (0, 0) Bar chart from cumulative frequencies can score 1 1 0 0
	(ii) Reading from their cumulative frequency graph (35 or 36 from correct graph)	2	M1 for 45 or 44 or reading from their graph Accept 36 from table for 2 marks. SC1 for 'correct' non integer solution from graph.	When reading from their graph: (from 50 or 51) for non-integer readings accept integer above or below, for integer reading only accept this reading
15 *	29·2(...) or $\sqrt{69^2 + 54^2}$ 87·6(...) or 87 or 88	M3 A1	Accept 29 if correct method seen Or M2 for $\sqrt{23^2 + 18^2}$ or $\sqrt{853}$ or $69^2 + 54^2$ or 7677 Or M1 for $23^2 + 18^2$ or 853 W4 for 87·6(...) www	Allow W4 for 87·6(...) from scale drawing, allow SC2 for 87 to 88 from scale drawing

16	$20x - 15y = 120$ and $18x + 15y = 51$ $38x = 171$ $x = 4.5$ $y = -2$	M1 multiplication by eg 5 and 3 attempted to equate coefficients , condone 1 arithmetical error. and M1 addition to eliminate y seen, condone 1 arithmetical error. 1 1	<u>Alternative:</u> multiplication by 6 and 4 (or by 3 and 2) M1 $24x - 18y = 144$ ($12x - 9y = 72$) and $24x + 20y = 68$ ($12x + 10y = 34$) Subtraction to eliminate x. M1 for $-38y = 76$ ($-19y = 38$) <u>Alternative:</u> substitution M1 for $6\left(\frac{3y + 24}{4}\right) + 5y = 17$ condone 1 error and M1 for simplifying and collecting terms to form 3 term equation $ay + b = c$ eg $38y + 144 = 68$ or better.
17	(a) $20/\sin 40 = 31.1..$	2 M1 for $\sin 40 = 20/AB$ or better (accept eg $\sin 40 = 20/x$ without x identified)	<u>Alternative:</u> M1 $AC = 20/\tan 40$ or $20\tan 50$ [=23.8...] A1 for $AB = \sqrt{(20^2 + 23.8^2)} = 31.1..$ SC1 $31\sin 40 = 19.9..$ or 20 or $\sin A = \frac{20}{31}$, A = 40 or 40.1 to 40.2
	(b) 6.9 to 7.1 www	3 M2 for $31\sin 10/\sin 130$ Or M1 for $AD/\sin 10 = 31/\sin 130$	<u>Alternative:</u> M1 for $DC = 20 \tan 40$ [=16.7..] and M1 for $AC = 20\tan 50$ or $20/\tan 40$ or $\sqrt{(31^2 - 20^2)}$ [=√561 or 23.6..]
18	18.8... to 18.9	3 M2 for $85/450$ Or M1 for 5×5 [+] 6×10 A1 for 19	<u>Alternative:</u> M2 for $17/90$ or M1 for 17 [squares]

19	(a) 108 www	4	M2 for 184 to 184.33 Or M1 for $\pi \times 4 \times 4 \times 11/3$ AND M1 for 20000/ <i>their</i> 184.3 AND W1 for their division rounded down OR W3 for 108.5... or 109 www	M1 for $0.33 \times \pi \times 4 \times 4 \times 11$ [=182 -182.5]
	(b) (i) (L=) $\sqrt{137}$ or $\sqrt{4^2 + 11^2}$	2	M1 for $(L^2 =) 4^2 + 11^2$ A1 for 11.704...	
	(ii) 123.0 to 123.1° www	4	M1 for sector area = $\frac{x}{360} \times \pi \times 11.7^2$ M1 for curved surface area = $\pi \times 4 \times 11.7$ [=147.0] M1 for sector area = CSA A1 for 123.0 to 123.1(...) ^o FT <i>their</i> 11.7 for M3	<u>Alternative:</u> M1 for arc length $\frac{x}{360} \times \pi \times 11.7 \times 2$ M1 for circumference of cone $\pi \times 8$ [=25.1] M1 for arc length = circumference of cone
20	$y = 100/x^2$	3	M1 for $y = k/x^2$ or $4 \propto 1/25$ OR M2 for $4 = k/25$ or $k = 100$	Condone \propto (for =) for M1 and M2 SC1 for $y = 20/x$ or $y = 4x^2/25$
21	255 seen 4.5 seen 255/4.5 used 56.66 to 56.7	M1 M1 M1 A1	Allow 4.499(..) Their lower distance (d) / their upper time (t) where $250 \leq d < 260$ and $4 < t \leq 5$	lsw

Section B Total: 50

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