

# **Mathematics C (Graduated Assessment)**

General Certificate of Secondary Education

Unit **B278**: Module M8 (Sections A&B)

## **Mark Scheme for March 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 (March 2011)****GCSE Mathematics C (Graduated Assessment) – J517  
Units B272 to B280**

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.

## Section A

1	$3\frac{19}{20}$ www	3 M2 for $\frac{79}{20}$ or $\frac{44}{20} + \frac{35}{20}$ or $[3]\frac{4}{20} + \frac{15}{20}$ or 3.95 or correct answer seen then spoiled or M1 for $\frac{44}{20}$ or $\frac{35}{20}$ or [...] $\frac{4}{20}$ or [...] $\frac{15}{20}$ or 2.2 + 1.75	Common denominator could be other multiples of 20 – all method marks available  e.g. $8\frac{4}{20} + 5\frac{15}{20}$ gets M1 only
2	(a) $r + 4 = \frac{p^2}{3}$ or $3r = p^2 - 12$ $p^2 = 3(r + 4)$ or better  $(p =) \sqrt{3(r + 4)}$ or better final answer	M1 M1 FT multiplies by 3 after incorrect (+ 4) <u>written</u> first step or FT adds 12 after incorrect multiply by 3 <u>written</u> first step  M1 square roots at final stage FT previous written step or implied from first written step if second step not shown  2 marks only for correct answer seen then spoilt W3 for correct answer www	e.g. $r - 4 = p^2/3$ M0, then $3(r - 4) = p^2$ M1FT or e.g. $3r = p^2 - 4$ M0, then $3r + 4 = p^2$ M1FT  Mark final answer for final M1FT mark e.g. 1 <sup>st</sup> step $r - 4 = \frac{p^2}{3}$ then no second step and answer is $\sqrt{3(r - 4)}$ gets M0 M1FT M1FT After 0 scored SC1 for correct reverse flow diagram but incorrect or no final answer e.g. $[p] \leftarrow \text{sq rt} \leftarrow x3 \leftarrow + 4 \leftarrow [r]$
	(b) $x^2 - 3x - 10$ cao final answer	2 M1 for three of $x^2$ , $-5x$ , $+ 2x$ , $-10$ shown in working or part of 4 term answer or 2 of $x^2$ , $-3x$ , $-10$ in 3 term final answer	Condone notation e.g. $-x3$ or $-x \times 3$ for $-3x$ for 1 or 2 marks Condone double signs for 1 mark only $x^2 - 10$ alone as final answer gets 0

3	(a) 3	1	Do not accept 3x	Accept 3/1, ignore any units given
	(b) $(y =) -4$	1	Accept (0, -4) with or without brackets	
	(c) $y = 3x + k$	1	Any real value of $k$ ( $k \neq -4$ )	
4	$\pi a^2(a + b)$  three dimensional o.e. with no incorrect comment or incorrect working shown for the correct expression	<b>M1</b>  <b>A1</b>	Clear reference to multiplication of 3 lengths or area times length Ignore reference to the other expressions	Condone omission of $\pi$  e.g. $l \times l \times l$ , $l \times l^2$ , $l^2 \times (l + l)$ , - all could be written next to correct expression in question rather than in answer space. Condone use of other variable e.g. $a$ used instead of $l$ [ $a^2$ = area and] area times length = volume.  <b>Not for</b> 'It has 3 lengths' alone
5	rotation $180^\circ$ o.e. [centre] (2, 0) www	4	<b>W3</b> for rotation and one other correct element ( $180^\circ$ or (2, 0)) and no other transformation www  or <b>W2</b> for rotation and one other correct element ( $180^\circ$ or (2, 0)) and no other transformation but with an error(s) on the grid or rotation omitted/or alternate word for rotation used with the 2 other elements correct e.g. turn and $180^\circ$ and (2, 0) provided no other transformation or original triangle transformed to correct final image at (0, -1), (2, -1), (2, -4) www with no description or incorrect description  or <b>W1</b> for original triangle translated by $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$  or triangle rotated $180^\circ$ about the origin ft their translation	Allow freehand provided intention clear For 4 or 3 marks there must be <u>no errors</u> in transformations seen on the grid unless the final correct positions are clearly labelled or indicated (blank grid is fine) Condone centre given in alt. form e.g. vector

6	(a)	(i) 92 cao	1		
		(ii) 18 cao www	2	<b>M1</b> for clear attempt to read LQ and UQ at 25 <sup>th</sup> and 75 <sup>th</sup> value on the graph e.g. 82 and 100 shown or lines drawn across on graph at 25 <sup>th</sup> and 75 <sup>th</sup> values (1 mm tolerance)	Not for just marking the vertical scale at 25 and 75 – must attempt to relate to the curve
	(b)	Makes one <u>general</u> comparison [using the median]  Makes second <u>general</u> comparison [using the IQR]	1FT  1FT	STRICT FT <i>their</i> (a)(i) e.g. Sparks is cheaper o.e. [because the median/average is smaller]  STRICT FT <i>their</i> (a)(ii) e.g. Sparks prices were more varied/spread/less consistent o.e. [because the IQR is larger]	Bracketed parts of statements does not have to be present in the reason but do not accept if there is any incorrect part of each statement but ignore any incorrect values given  Do not accept 'lower range' alone
7		3	3	<b>M2</b> for $1.8 \div 0.6$ o.e. implied by figs 3 provided no further incorrect method steps after this or <b>M1</b> for 60 [%] or 0.6 seen	

Section A Total: 25

## Section B

8	(a)	completes the tree correctly with 0.7 for £10 and 0.3 for £5	2	<b>W1</b> for correctly placing 0.7 in one case	Accept equiv fractions or percentages
	(b)	0.49 o.e. isw	2FT	<b>FT</b> the correct product for <i>their</i> probabilities for £10 branches with probabilities $0 < p < 1$ <b>M1FT</b> for ' <i>their</i> $0.7 \times \text{their } 0.7$ ' o.e. with probabilities $0 < p < 1$	isw conversion/attempts to simplify after correct answer is given
9		11.2 www	3	<b>M2</b> for $8/5 \times 7$ o.e. e.g. $8 \times 7/5$ or <b>M1</b> for $8/5$ or $5/8$ seen or $7/5$ or $5/7$ seen	Beware $5/3 = 1.6$ then $\times 7 = 11.2$ – gets <b>0</b> marks Incorrect methods leading to answer 11.2 get <b>0</b> marks e.g. false use of trig
10	(a)	$5x - 1 = 3(x + 2)$ or better  $5x - 3x = 6 + 1$ or better  3.5 o.e. isw www	<b>M1</b> <b>M1</b> <b>M1</b>	or $5x/3 - 1/3 = x + 2$  correct or <b>FT</b> from error in first step e.g. incorrect bracket expansion or $5x/3 - x = 2 + 1/3$ or better  <b>M1</b> <b>M1</b> for correct answer or for <b>FT</b> from <i>their</i> $ax = b$ , with $a \neq 1$ or $a \neq b$ or $b \neq 0$ allow <b>W3</b> for 3.5 obtained from trials	Ms are for correct <b>FT</b> steps  <b>2nd M1</b> is for correct collection of numbers and unknowns <b>FT</b> <i>their</i> eqn  <b>3<sup>rd</sup> M1</b> is for correctly obtaining $x$ isw, <b>FT</b> <i>their</i> $ax = b$ ; do not accept $b/a$ unsimplified if it is equiv to an integer allow <b>W3</b> for $\frac{5 \times 3.5 - 1}{3} = 3.5 + 2$
	(b)	$(x - 6)(x - 5)$  6 and 5	<b>M2</b> <b>A1FT</b>	<b>M1</b> for $(x \pm 6)(x \pm 5)$ or $(x + a)(x + b)$ where $ab = 30$ or $a + b = -11$  <b>FT</b> <i>their</i> factors <b>dep on M1</b> <b>W1</b> only for 6 and 5 from no working or other method (not factors) but not from incorrect working	Condone omission of brackets if clear factors used leading to solutions. Accept factors on a 'product table'  e.g. $(x + 10)(x + 3)$ then answers -10 and -3 gets <b>M1 A1FT</b> Condone for <b>3</b> marks $(x - 6)(x - 5)$ as answers if $x = 6$ and $x = 5$ are stated in working without any other choice

11	(a)	$8.64 \times 10^5$ cao	1		
	(b)	$3.3 \times 10^5$ cao www	3	<b>M2</b> for 333221.7013 o.e. rounded or truncated to 2sf or more or <b>M1</b> for $(1.99 \times 10^{30}) \div (5.972 \times 10^{24})$ implied by answer with figs 33...	e.g. <b>M2</b> for $0.33 \times 10^6$
12	(a)	$m = 0.98$ o.e. $n = 3$ cao	1 1	Could be written as index after 0 scored, allow <b>SC1</b> if values reversed	For <b>2</b> or <b>1</b> mark accept [figs 25 ×] $0.98^3$ provided no [numeric] contradiction in answer space
	(b)	£221 460.59 or £221 460.60	2	Accept rounded or truncated to 3 sig figs or better <b>M1</b> for $250\,000 \times 0.98^6$ o.e. <b>FT</b> their $m$	e.g. accept 221 460; 221 461; 221 000; 221500 <b>but not</b> 220 000 For <b>M1</b> the calculation could be in 6 stages
13		112.6 to 113 www	4	<b>W3</b> for 67 to 67.4 or 22.6 to 23  or <b>M1</b> for $\tan [x] = \frac{6}{2.5}$ oe or $\tan [x] = \frac{2.5}{6}$ oe  and indep <b>M1FT</b> for Inv their trig function or inv tan(a value) seen or used	Not from scale drawing  Must be correct notation but <b>M1</b> could be implied by next step  Allow clear intent e.g. invtan (a value), 2 <sup>nd</sup> function tan (a value), shift tan (a value)  Accept longer correct methods for <b>M1</b> and <b>M1FT</b> if hypotenuse found first

Section B Total: 25

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