GCSE

Mathematics C (Graduated Assessment)

General Certificate of Secondary Education

Unit **B279:** Module M9 (Sections A&B)

Mark Scheme for March 2011

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	(a)	(i) 1	1		
		(ii) $(\pm)\,8$	1		
		(iii) $1\cdot8 \times 10^{-4}$	2	**M1** 18×10^{-5} or $1\cdot8 \times 10^{k}$ or $0\cdot00018$	
	(b)	4	1		do not accept 3^{4}
2	(a)	$\frac{5}{8},\quad \frac{1}{3},\ \frac{2}{3},\ \frac{1}{3}$	1		accept decimal equivalents to a minimum of two decimal places, rounded or truncated.
	(b)	$\frac{13}{24}$ o.e.	3	**M2 ft** for their $\frac{3}{8} \times \frac{1}{3} + \frac{5}{8} \times \frac{2}{3}$ or better **or** **M1 ft** for their $\frac{3}{8} \times \frac{1}{3}$ or $\frac{5}{8} \times \frac{2}{3}$ or better	+ needs to be seen or correct follow through addition accept final answer of $0\cdot54(\ldots)$ or $54(\cdot\ldots)\%$

3	(a)	$3y(4x - 3y)$ or $-3y(-4x + 3y)$
		      as final answer
			2	**W1** $y(12x - 9y)$ or $3(4xy - 3y^2)$ or
				     $ky(4x - 3y)$ or $3y(ax + by)$ or
				     correct answer seen then spoiled
					condone missing final bracket
					 condone $(3y + 0)(4x - 3y)$

	(b)	$(2x - 3)(x + 5)$	**M2**	**M1** for $(2x \pm 3)(x \pm 5)$ or for two factors giving two terms of $2x^2 + 7x - 15$	condone • $2x(x + 5) - 3(x + 5)$ or $x(2x - 3) + 5(2x - 3)$ followed by correct answers for all 3 marks condone for **M2** or **M1** • factors seen as headings in a grid
		$1\frac{1}{2}$ o.e. and $^{-}5$	**A1**	dep on **M2** **or** **W1** f.t. their factors dep on **M1** **or** **W1** for $x = 1\frac{1}{2}$ o.e. and $x = {}^{-}5$	• $2x - 3 = 0$ and $x + 5 = 0$ etc. as evidence of factorisation • $2x - 3 \times x + 5$, etc. ie brackets omitted correct answers (both) from formula/ no factors/ no or wrong working score **W1** only

4	140	3	**M2** for $10 × 1{\cdot}6 + 10 × 2{\cdot}8 + 10 × 3{\cdot}9 +$ $10 × 4{\cdot}5 + 10 × 0{\cdot}6 + 10 × 0{\cdot}6$ implied by $16 + 28 + 39 + 45 + 12$ **or** **M1** for one of 16, 28, 39, 45, 12 unless clearly from wrong working If **M0**, **SC1** for answer 135 – 145	For M2, $20 × 0{\cdot}6$ or 12 (or 6 + 6) must be seen but condone one error or omission in other intervals Look for evidence of working on diagram

5	$$\sqrt{\dfrac{2E + mu^2}{m}} \quad \text{o.e.}$$
	 as final answer www
		3	**M2** for $2E + mu^2 = mv^2$ or $\dfrac{2E}{m} = v^2 - u^2$
			    or better
			or
			M1 for $2E = mv^2 - mu^2$
			    or $E + \tfrac{1}{2}mu^2 = \tfrac{1}{2}mv^2$
			or
			M1ft for correctly isolating kmv^2 following error in elimination of the fraction.
			
			and
			M1ft for correctly reaching their v from their kmv^2 or their $v^2 - u^2$
				For three marks the square root sign must extend below fraction line.
				
				 $$\sqrt{\dfrac{E + \tfrac{1}{2}mu^2}{\tfrac{1}{2}m}} \quad \text{scores } \textbf{M1 M1}$$
				
				 SC1 for completely correct reversed flow chart.

| 6 | (a) | $15x^2 + 4x - 4$ final answer | 3 | **M2** $15x^2 - 6x + 10x - 4$
 or final answers of
 $15x^2 + 4x + c$,   c may be 0 or absent <br> or $15x^2 + bx - 4$,   b ≠ 0 <br> or $ax^2 + 4x - 4$,   a ≠ 0

 or
 M1 for any 2 correct from
 $15x^2$, $- 6x$, $10x$, $- 4$ | Condone clear transcription error after correct answer
 Accept double signs, eg +– 4, for **M1** or **M2** only
 Condone $15x^2 + 4x - 4 = 0$ for 3 marks

 For 1 or 2 marks accept terms seen in grid or list
 $4x$ in the answer implies **M1**
 Do not penalise if attempts to refactorise having reached $15x^2 + 4x - 4$. |
| | (b) | $(3x + 5y)(3x - 5y)$ final answer | 2 | **M1** $(3x \pm 5y)(3x \pm 5y)$ or
 $3x + 5y(3x - 5y)$ or $(3x + 5y)3x - 5y$ | Condone clear transcription error after correct answer

 NB $(3x - 5y)^2$ or $(3x + 5y)^2$ scores **M1** |

Section A Total: 25

Section B

7		109·0125 or 109·013 or 109·012 or 109·01 isw	2	**M1** either 8·55 or 12·75 used in a product (implied by 109 or 109.0)	eg 8·55 × 12·85 scores **M1**
8	(a)	11·18(…) or 11·2	3	**M2** for $\sqrt{(10^2 + 5^2)}$ or better **or** **M1** for $10^2 + 5^2$ or $\sqrt{(10^2 - 5^2)}$ or $\sqrt{(a^2 + 5^2)}$ or $\sqrt{(10^2 + b^2)}$	Allow slip in one value
	(b)	½ × ⁻2 = ⁻1 o.e. with mention of gradient	3	**W1** for (gradient of AB =) ½ oe isw (can be implied by the equation $y = \frac{1}{2}x + 6$) **W1** for (gradient of AC =) ⁻2 If **0** then **SC1** for (gradients given as) ½x and ⁻2x.	eg gradient of ½ is the negative reciprocal of ⁻2. Accept for 3 marks 'product of gradients is ⁻1' provided **W1** and **W1** earned.
9		∠BED = 42° **or** ∠BDE = 80 Alternate segment theorem ∠BCD = 38° Exterior angle of a triangle	1 1 1 1	accept marked on diagram dep on ∠BED or ∠BDE correct (reason must be associated with correct angle) dependent on correct method If **0** so far then **SC1** for taking their ∠BDE and correctly working out ∠BCD (42 less than ∠BDE) with full reasons.	Condone single letters for each angle. All alternative ways involve using the alternate segment theorem (condone angles in opposite segments). Alternative methods must list angles and reasons for each step, eg E = 42 (alternate segment theorem) B = 58 (angles on a line) C = 38 (angles in a triangle)
10		23 or 24 www	2	**M1** $\dfrac{119}{their\ 200} \times 40$ or 23·8	

| 11 | (a) | $\dfrac{3\cdot6}{1\cdot2^2} = 2\cdot5, \quad \dfrac{10}{2^2} = 2\cdot5, \quad \dfrac{19\cdot6}{2\cdot8^2} = 2\cdot5$

 or all three inverted and equal to $0\cdot4$
 or equivalent statements such as
 $10 = 2\cdot5 \times 2^2$, $3\cdot6 = 2\cdot5 \times 1\cdot2^2$,
 $3\cdot6 = 2\cdot5 \times 1\cdot2^2$ | 3 | **M2** for any two ratios evaluated or any two of the statements

 or
 M1 for one ratio evaluated or one of the statements <br> or $y = 2\cdot5x^2$
 or all of $1\cdot2^2$, 2^2, $2\cdot8^2$ or better

 Alternative

 M2 for $3\cdot6 \times \left(\dfrac{2}{1\cdot2}\right)^2 = 9\cdot99 - 10\cdot01$

 or $10 \times \left(\dfrac{2\cdot8}{2}\right)^2 = 19\cdot59(\ldots)$ or $19\cdot6$

 or $3\cdot6 \times \left(\dfrac{2\cdot8}{1\cdot2}\right)^2 = 19\cdot59(\ldots)$ or $19\cdot6$
 or

 M1 for $3\cdot6 \times \left(\dfrac{2}{1\cdot2}\right)^2$ or one of the other two | Allow **M1** for $y = 2\cdot5x^2$.
 To pick up final marks would need to show all values satisfied by this equation.

 Working across the rows

 Accept any of these reversed.

 Any two of these evaluated correctly will score all 3 marks. |
| | (b) | 14.4 | 1 | | |

12	62·4	3	**M2** $97 \cdot 5 \times \left(\dfrac{12}{15}\right)^2$ or better **or** **M1** $\left(\dfrac{12}{15}\right)^2$ or 0·64 or $0 \cdot 8^2$ or $\left(\dfrac{15}{12}\right)^2$ or $1 \cdot 25^2$ or 1·5625 or $5^2 : 4^2$ or $15^2 : 12^2$ or better	Accept ratios reversed
13	19·2(…) or 19·21 or √369 or 9·6 or 9·6(0…) or √92·25 www tan (OCP =) $\dfrac{18}{\textit{their PC}}$ 61·91 - 61·93 must be seen	2 **M1** **A1**	**M1** for $15^2 + 12^2$ or $7 \cdot 5^2 + 6^2$ provided their PC is not 15, 12, 7·5, 6, 18 or 9 or their AC	Accept via Pythagoras and sin or cos subject to same restrictions on PC Use of 61·9 to calculate PC or OC followed by trig to find ∠OCP scores 0

Section B Total: 25