GCSE

Mathematics C (Graduated Assessment)

General Certificate of Secondary Education **B282**

Terminal Paper (Higher Tier)

Mark Scheme for June 2010

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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 (June 2010)

GCSE Mathematics C (Graduated Assessment) – J517

Units B271 to B282

Please ensure you familiarise yourself with the mark scheme before you complete your practice scripts.

You will be required to complete **ten** practice scripts and **ten** standardisation scripts for each section (A and B) of the unit.

Make sure you turn on the comments box when working on the practice scripts. You should do the practice scripts before attempting the standardisation scripts. If you are unsure why the marks for the practice scripts have been awarded in the way they have, please consult your team leader.

Marking instructions

1. Mark strictly to the mark scheme. If in doubt, consult your team leader using the messaging system within *scoris*, e-mail, or by telephone.

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. If in doubt, consult your team leader.

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.)

    The hash key [#] on your keyboard will enter NR.

    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 if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-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 (malpractice) in *scoris*. <u>All suspected malpractice should be flagged using exceptions</u>.

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.

15. Holding the F2 key on your keyboard displays the annotations toolbar next to your cursor. The following annotations are available:

✓and ✗	
▢	Highlighter
BOD	Benefit of doubt
FT	Follows through
ISW	Ignore subsequent working (after correct answer obtained)
M0, **M1**, **M2**	Method mark awarded 0, 1, 2
A1	Accuracy mark awarded 1
W1, **W2**	Workless mark awarded 1, 2
SC	Special case
^	Omission
MR	Misread

    These should be used whenever appropriate during your marking. **The A, M and W 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.

16.   The comments box will be used by the Principal Examiner to explain his or her marking of the practice scripts for your information. Please refer to these comments when checking your practice scripts. **Please do not type in the comments box yourself.** Any questions or comments you have for your team leader should be communicated using the *scoris* messaging system, e-mail, or by telephone.

17.   As far as possible you should mark roughly equal numbers of RIGs from sections A and B. It is helpful to mark some in each section as you go, rather than marking all RIGs in one section, then all RIGs from the other.

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		$\dfrac{13}{35}$ oe (eg 26/70)	2	**M1** for evidence of equivalent fractions attempted: two fractions with a correct common denominator with at least one of the numerators correct Eg $\dfrac{28}{35}$ or $\dfrac{15}{35}$ oe allow **SC1** for an answer which is completely correct except for a consistent error in the denominator eg $\dfrac{28}{30} - \dfrac{15}{30} = \dfrac{13}{30}$
2	(a)	3, 8, 13	2	**M1** for two correct terms in correct position or 3 terms increasing by 5 eg ⁻2, 3, 8
	(b)	$4n + 3$ oe	2	**M1** for $4n \pm k$ for any k
3		-4 www	3	**M1** for $3n + 7 = -5$ or $5n = 2n - 12$ **M1** for $3n = -12$ ft *their* 1st step to reach $kn = b$ **M1** for $n = -4$ ft *their* 2nd step (from $kn = b$ with $k \neq 1$)
4	(a)	48 www	3	**M1** for 1200 used (or 0.025) **M1** for division *their* 1200/25 oe
	(b)	**(i)** 37.5	2	**M1** for $\dfrac{1 + 2}{2}$ (×) 25 or correct complete method involving triangles and/or rectangle.
		(ii) 375 000 or *their* (b)(i) × 10 000	2	**M1** for *their* (b)(i) × 10 × 1000 seen isw **A1** ft *their* (b)(i) × 10 000 OR **M1** for *their* (b)(i) × 10 evaluated isw or (b)(i) × 1000 evaluated isw. or *their* volume in m^3 × 1000 evaluated
	(c)	[Using exterior angles] 360 /10 (= 36) 180 – 36 (= 144) oe	1 1	<u>Alternative method:</u> **M1** for 8 × 180 or equivalent eg adding 180 on 6 times to 360 **M1** for 1440 soi divided by 10 after 1st M1 earned. <u>Alternative method (starting from 144):</u> **M1** for 180 −144 = 36 **M1** for 36 × 10 = 360 or 360/36 = 10 oe

5	(a)	reflection B correct (1, −2) (1, −4) (2, −2)	1	condone unlabelled (but not labelled C)
	(b)	rotation C correct (−2, 1) (−2, 2) (−4, 1)	2	condone unlabelled (but not labelled B) **M1** for clockwise 90° about (0, 0) or anticlockwise 90° wrong centre
	(c)	reflection ft	1	transformation must ft *their* B and C
		$y = x$ oe ft	1	full description must ft *their* B and C
6	(a)	⁻2 10	1 1	

	(b)	6 points plotted correctly
		    smooth curve through correct
		    points
			1
			1
				2mm tolerance ft *their* (a)
				2mm tolerance from correct points; must be
				space between min point and (⁻1.5, ⁻2)

	(c)	0.2 to 0.4 ⁻3.2 to ⁻3.4	1 1	or ft *their* graph ±0.1 or ft *their* graph ±0.1 mark solutions on answer line. if 0 scored, **SC1** for evidence of attempt to read from $y = 1$
7	(a)	18/48 then simplified or 8 × 6 = 48 and 3 × 6 =18 oe or 3/8 of 48 = 18	1	condone 18/48 only condone 18/48 seen with subsequent errors
	(b)	150 www or accept answers in range 140 – 162 if supported by sensible working	2	**M1** for 50 seen or for $\underline{18}$ × 400 oe 48 **OR** **M1** for 8 to 9 [boxes] seen or used, but not just for 8 from denominator of 3/8
	(c)	$\dfrac{3}{800}$ oe	2	**M1** for $\dfrac{3}{8}$ × $\dfrac{1}{100}$ oe

8	(a)	$(x-7)(x+2)$	**M2**	**M1** for $(x \pm 7)(x \pm 2)$ or $(x+a)(x+b)$ where $ab = -14$ or $a+b=-5$
		7, −2	**A1**	ft *their* factors If **M0**, then **W1** for 7, −2
	(b)	multiplication (to eliminate x or y) eg $12x + 2y = 32$ addition to eliminate y (condone 1 error) $17x = 51$	**M1** **M1**	condone 1 error or $30x - 12y = 114$ and $30x + 5y = 80$ subtraction to eliminate x (condone 1 error) $-17y = 34$
		$x = 3, y = -2$	**A1**	**A1** is dependent on M2 scored If **M0**, then **W1** for 3 and −2 only
9		4 statements with reasons correct AB = DC : opposite sides of a parallelogram ∠ABD = ∠BDC : alternate angles ∠BAE = ∠FCD : 3rd angle of right-angled triangle congruent: 2 angles and corresponding side	**3**	**2** marks for 2 or 3 statements with reasons **1** mark for 1 statement with reason either opposite sides or parallelogram may be omitted condone z angles Accept .... ASA
10	(a)	**(i)** 1	**1**	
		(ii) $\dfrac{1}{25}$ or 0.04 www	**3**	**M1** for evaluating cube root, eg $(\sqrt[3]{125}) = 5$ or $(\sqrt[3]{15625}) = 25$ **M1** for evaluating square, eg $5^2 = 25$ or $(125^2) = 15625$ **M1** for interpreting reciprocal, eg 1/25
	(b)	$\dfrac{47}{111}$	**3**	**M2** for r = 423/999 or better eg 141/333 Or **M1** for 1000r = 423.(4...)

Section A Total: 50

Section B

11		mark or line indicating correct bearing measured from P or Q	M1	± 2°
		correct lines drawn from P and Q	M1	± 2°
		B marked in correct position or ft *their* lines	A1	dep on at least M1 gained if **0**, allow **SC1** for B marked at intersection of lines coming from P and Q but wrong bearings (eg using protractor E/W) condone absence of label B if position clearly indicated eg with cross
12		3.04	2	**M1** for 3.04... or 3.0 or 3.05 or *their* 'answer' rounded correct to 2dp
13	(a)	$5x - 20$	1	mark final answer (but ignore $x = 4$ after $5x - 20$)
	(b)	$x(x + 3)$	1	mark final answer
	(c)	$(x =) \dfrac{y + 2}{5}$ oe	2	**M1** for $y + 2 = 5x$ oe (eg $y/5 = x - 2/5$) Or **SC1** for answer of $y + 2 \div 5$ or $\dfrac{y}{5} + 2$ or $\dfrac{y - 2}{5}$ oe

14		Veggie burger with
		
		B 17.1 – 17.2 or 17 (%)
		
		C 16.7 – 16.8 or 16 or 17(%)
		
		V 21.4 – 21.5 or 21(%)
		
		<u>or alternative method:</u>
		Veggie burger with
		B 5.8 to 5.9
		C 5.9 to 6.0
		V 4.6 to4.7
			3	Accept equivalent decimals for full marks or for part marks.
				
				Labels B, C V not required as long as working clear
				
				M2 any two of 17.1 – 17.2 or 17,
				        16.7 – 16.8 or 16 or 17,
				        21.4 - 21.5 or 21 seen
				OR
				M1 any one of 47/274 or 29/173 or 54/252 seen
				
				<u>alternative method</u>
				Allow **SC1** for all of
				B 5.8 to 5.9,
				C 5.9 to 6.0,
				V 4.6 to 4.7
				with wrong/no choice made

15	**(a)**	4 : 3 : 5	1	
	(b)	17500	2	**M1** for 42000 / *their* (4 + 3 + 5) (= 3500) or 42000 / *their* (16 + 12 + 20) (=875) or figs 175 seen in answer
16		8.06 to 8.1 www	3	**M2** for √65 or √(9² − 4²) Or **M1** for a correct Pythagoras statement **A1** for 8 or 8.06 to 8.1
17	**(a)**	correct reason	1	eg 'all 5 miles wide would give too many groups' eg 'not many people travel long distances' see exemplars
	(b)	9.6 or 9.65 or 9.7 isw	4	**M1** for midpoints 2.5, 7.5, 15, 30 soi; condone 1 error **M1** for attempt at $\sum fx$ [= 482.5] **M1** for *their* $\sum fx$ ÷ *their* $\sum f$ or 50 **A1** for 9.6 or 9.65 or 9.7
	(c)	Frequency densities: 4.4, 2.6, 0·8, 0·35 all bars correct width all heights correct from histogram attempt	1 1 1	Condone 1 error. ± 1mm
18	**(a)**	38.(0...)www	3	**M2** for $40\sin 72$ or $40\cos(90 − 72)$ Or **M1** for trig statement involving sin 72 or cos *their* 90 – 72
	(b)	34.4 to 34.5 www	3	**M2** for 1189 Or **M1** for 40² + 15² − 2 × 40 × 15 cos 58
19	**(a)**	15(·14...)	2	**M1** for figs 53 ÷ figs 35
	(b)	4 104 320 or 4 100 000 4.1... × 10⁶	2	**M1** for × 0.88 or equivalent
	(c)	2027	2	**M1** for 2026, 2028, 21, 22 or 23 years or 2009 with 3.1... × 10⁶ seen (or 31(78385))
20	**(a)**	4840 4840 plotted (± 2mm tolerance)	1 1	ft *their* 4840 from Σ /4
	(b)	(i) reading 4840 to 4900	1	
		(ii) (4 × *their* reading) – (4870 +2260 + 4370) evaluated	2	**M1** for method correct with an arithmetic error eg $\frac{4870 + 2260 + 4370 + n}{4}$ = *their* (b)(i)

21	(a)	(4.2, 0) (0, −4.2)	1 1	**M1** for $3\sqrt{2}$ or $(\pm)\sqrt{18}$ www
	(b)	(i) $x^2 + x^2 + 6x + 9 = 18$	2	**M1** for $x^2 + 3x + 3x + 9$ or $x^2 + (x + 3)^2 = 18$ or better
		(ii) (−4.1, −1.1) www	3	**M2** for $(-6 - \sqrt{108})/4$ Or **M1** for substitution into quadratic formula; condone 2 errors <u>Alternative method:</u> **M2** for $\sqrt{6.75} - 1.5$ **M1** for $(x + 1.5)^2 - .....$.

Section B Total: 50

Exemplar responses for Question 17(c)

Comments need to relate either to
- bigger class widths related to smaller frequency or vice versa

or
- group widths of 5 miles give too many classes

Mark the best part of the comment and ignore subsequent work.

Exemplar responses scoring 1 mark

(To make it more simple and) less people travel further	*Second part earns the mark*
(Because it gives a higher frequency of results because) the higher distances may not have many people in if the range is only 5 miles	
As distances travelled are so varied there will not be many employees in the smaller groups.	
As you get further distances the frequency reduces. More people are likely to travel 0 < d ≤ 5 than 20 < d ≤ 40.	*First part is enough*
As the distances increase the frequency decreases, (so more class widths are unnecessary.)	*First part is enough*
Not many people live far away so don't need so many	
The class width increases as frequency decreases so it keeps the chart short	
Because people normally live close to work and less distance in miles would have a higher frequency (density)	*Ignore density*
Because then the distances increase there is only a small number of people at end of scale so smaller class widths would be pointless	
All 5 miles wide would give too many groups	
(There may have been people who travelled between the distances if the groups were even.) Or as distances increase there may have been an insufficient amount of people.	*Second sentence is enough*
Many people travel short distances	
Not many people travelling long distances	

Exemplar responses scoring 0 marks

To make the measurements more accurate e.g less than 5 miles is more accurate than a 10 mile class width.	*Ref to accuracy is not enough*
There may not be an urbanised area 30 miles away or may not be enough people that live there.	*Not linked to groups*
To keep the frequency more simple	
So the data is more direct and it shows more accurately the information.	
So you don't have to have loads of different classes.	*Not specific*
To be able to see the mode faster.	
Means there are no classes with no employees in them.	
It changes the distances where people live. So there's more variety.	*Not enough*
To show the difference in frequency of how far employees travel to work.	*No reference to low frequency / further distance*
Because the smaller groups are very popular.	*Too vague*
As accuracy is not as important it keeps chart short	*Reference to accuracy is not enough*
Easier to complete with a few groups	*Not relevant*
More accurate groups	
To decrease the size of the table, quicker to construct and work out	
As the data can be summarised easier ...it shows the data clearer	
This makes displaying results easier	
Because there are less and more people in different class widths so to make the results equal there are unequal classes	*Not clear*
Accuracy	
To make the mean more precise	*This is a reason for smaller class widths not unequal class widths*

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