OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics C (Graduated Assessment)

General Certificate of Secondary Education

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

Mark Scheme for January 2012

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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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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 × (*their* '37' + 16), or FT 300 – √(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *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).
- **nfww** 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.

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.

ix. 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.

x. Ranges of answers given in the mark scheme are always inclusive.

xi. 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.

xii. 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.

Question			Answer	Marks	Part marks and guidance	
1	(a)		$6\frac{17}{21}$	3	**M2** for $6 + \frac{3}{21} + \frac{14}{21}$ or $\frac{66}{21} + \frac{77}{21}$ or $\frac{143}{21}$ or $\frac{17}{21}$ Or **M1** for $\frac{3}{21}$ or $\frac{14}{21}$ or $\frac{66}{21}$ or $\frac{77}{21}$	
1	(b)		$\frac{6}{7}$	3	**M1** for $\frac{22}{7} \times \frac{3}{11}$ oe **and** **M1** for multiplying numerators and denominators of *their* fractions following attempt at converting mixed numbers to top-heavy fractions **and** inverting second fraction (only) or **M1** for $\frac{66}{21} \div \frac{77}{21}$ without further correct progress	Unsimplified answers e.g. $\frac{66}{77}$ oe imply **M2**
2	(a)		$^{-}3$ oe	3	**M1** for $10x + 5 = 6x - 7$ or $2x + 1 = 1{\cdot}2x - 1{\cdot}4$ **M1** for $4x = {}^{-}12$ oe or $0{\cdot}8x = {}^{-}2{\cdot}4$; FT *their* first step **M1** for $x = \frac{b}{a}$ correct FT *their* $ax = b$ for $a \neq 1$, $b \neq 0$. Accept simplified improper fractions isw (not $\frac{-3}{1}$)	Check answer nfww eg $10x + 1 = 6x - 7$ **M0** $4x = {}^{-}8$ **M1** $x = {}^{-}2$ **M1** eg $10x + 1 = 6x - 7$ **M0** $4x = 8$ **M0** $x = 2$ **M1**

Question			Answer	Marks	Part marks and guidance	
2	(b)		$(x + 4)(x + 2)$ $[x =]\ {}^{-}4$ or ${}^{-}2$	M2 A1	**M1** for factors giving two terms correct or for other versions of $(x \pm 4)(x \pm 2)$ or **B1** correct solutions following **M0** or **B1** for solutions FT *their* $(x \pm a)(x \pm b)$	eg **M1** for $(x + 8)(x + 1)$ Inner brackets essential Both solns required
3	(a)		0·4 on first journey branch 0·4. 0·6 and 0·4 on second journey branches	1 1		Allow % or fractional equivs
	(b)		0·16 oe	2	**M1** for 0·4 × 0·4 or FT *their* P(Tim, Tim) Marks may be earned at ends of branch	Allow % or fractional equivs but allow only **M1** for ans of $\frac{1{\cdot}6}{10}$ or other 'mixtures'
4	(a)		Triangle drawn with vertices at (3, 1) (4·5, 1) and (3, 4)	3	**B2** for two vertices correct or **B1** for enlargement s.f. 1·5 drawn in wrong place or **B1** for enlargement centre (0, 1) but wrong scale factor or **SC2** for enlargement s.f. 1·5 from (1, 0)	Tolerance a generous 2mm – mark intent; (condone unruled lines) Not ${}^{-}1{\cdot}5$

Question			Answer	Marks	Part marks and guidance	
4	(b)		Translation (of shape, not mirror lines) of $\begin{pmatrix} -8 \\ 0 \end{pmatrix}$ or '8 to the left'	B2 B2	**B1** for 'shift' or 'slide' **B1** for '8' and **B1** for 'left' **If 0, M1** for correct reflection of *their* object in $x = 3$ and **M1** for correct reflection of *their* image in $x = {}^{-}1$	Not move eg $({}^{-}a, 0)$ $a \neq 4$ implies 'left', (8, 0) implies '8'. $({}^{-}8, 0)$ scores **B1** Even if just a line, condone unlabelled, bod of which is object, eg **M2** if intermediate missing
5			$1{\cdot}7(2) \times 10^5$	2	**M1** for final answer of $17(\cdot 2) \times 10^4$ or 172 000 oe (e.g. 172×10^3) or 170 000 oe or $1{\cdot}7(2) \times 10^n$, $n \neq 5$, or $a \times 10^5$, $a \neq 1{\cdot}7(2)$	
6	(a)		$x > 2$	**2**	**M1** for $5x > 10$ or for 2 found with equation or wrong inequality or for $x > \frac{2}{1}$	For **2** marks condone > 2 or 2 on ans line if $x > 2$ seen in body Condone $x \geq 2$ **SC1** for $x > \frac{10}{3}$ or 3.33…following $3x > 10$

Question			Answer	Marks	Part marks and guidance	
6	(b)		$4x + 6y = 12$ or $10x + 15y = 30$	M1	1st eqn mult by 2 or 5	Allow other multiples, even fractional. eg $5x + 7.5y = 15$ scores **M2**
			$15x - 6y = 102$ or $10x - 4y = 68$	M1	2nd eqn mult by 3 or 2 (dep equal coeffts)	
			$19x = 114$ or $19y = {}^{-}38$	M1	Allow one error in each step for M marks dep on at least one previous **M1**	Mark their best attempt
			$x = 6$, $y = {}^{-}2$	A1	SC1 for correct answer and no supporting working.	Allow alt methods: e.g. **M1** for making subject, **M1** for subst and **M1** dep for simplifying equation to x or y = … (allow one error at each stage)
7	(a)		C or $\frac{1}{2}(c + b)a$	1		
7	(b)		A or πab^2	1		
8			1·5 oe	2	**M1** for evidence of $\frac{y \text{ difference}}{x \text{ difference}}$ used – implied by $1.5x$, possibly seen in equation	eg $\frac{4}{2}$ seen if 4 & 2 clear from diagram
9	(a)		5716 to 5717 or 5720	3	**M2** for $4800 \times 1{\cdot}06^3$ or **M1** for at least one of 5088 and 5393 to 5494 or $1{\cdot}06^3$	Ans of 5664 implies M1 (for 5088) Ans of 6059 to 6060 implies M2 (4 years not 3) **SC1** for $4800 \times 1{\cdot}6^3$ seen
9	(b)		4528 to 4529 or 4530	3	**M2** for $4800 \div 1{\cdot}06$ oe or **M1** for division by 1.06 oe	For **M1** or **M2** condone use of their mult factor (mf) from (a) provided $1 < \text{mf} < 2$

Question			Answer	Marks	Part marks and guidance	
10	(a)		Min at 1·0 to 1·02**,** max at 2·0 indicated	1		Condone unruled
			LQ 1·3 to 1·32 , UQ 1·68 to 1·70	1	Vertical lines	
			Median 1·49 to 1.51 within completed box	1		
10	(b)	(i)	Yes, median (for K) is higher (than median for CT)	1	Accept Yes and quoted values: K 1·52 to 1·54, CT 1·49 to 1·51 or FT condone average = 1·5 etc (but not mean / mode)	See exemplars. **In both (i) and (ii)** ignore extra comments / figures unless contradictory / clearly incorrect
10	(b)	(ii)	Yes, IQR (for K) greater (than IQR for CT)	1	Accept Yes and quoted values: K IQR = 0·49 to 0·53, CT IQR = 0·36 to 0·40	eg Yes, 0·51 > 0·37 scores **1** Accept "box is longer" Accept “spread” throughout
			<u>or</u> Yes, K range greater than CT range		K range = 1.05, CT range = 1	Accept “box plot is longer”
			<u>or</u> No / can’t say as ranges (about) the same			Accept “box plots (about) the same”

Question			Answer	Marks	Part marks and guidance	
11			21·2 to 21·3	4	Allow answer of 21 if **M3** earned **M1** for 0·7 seen (accept on diagram) **M1** for $\tan\theta = \frac{0\cdot7}{1\cdot8}$ **M1** for use of inverse trig fn soi [FT *their* trig fn]; may be implied by FT answer – must use lengths from diagram or calculation.	If scale drawing **M1** max for 0·7 oe for Pythagoras and sin / cos eg sin = $\frac{0.7}{1.8}$, ans of 22·9 implies this M1 as 22·9 is FT (but needs checking) eg sin = $\frac{0.7}{1.8}$, $\sin^{-1}\frac{0.7}{1.8}$ scores this M1 without checking Allow **M3** as implied by answers of 23·6(…) or 24 (from grads) or 0·37(…) (from radians)

APPENDIX

Exemplar responses for Q.10b(i)

Response	Mark
N – the median is lower in CT than K	**0**
Y – they had the bigger range	**0**
Y – the median height is higher	**1**
Y – Highest in K > highest in CT, 2.2 > 2	**0**
Y – IQR in K > IQR in CT	**0**
Y – K avg is 1.52, CT avg is 1.5	**1**
Y – CT is 1.5, K is 1.52 (no mention of median or average)	**1**
Y – spread of box plot is wider	**0**
N – the median is higher	**0** should be Y
Y – the overall average is higher	**0** no values

Exemplar responses for Q.10b(ii)

Response	Mark
Y – they were higher tides	**0**
Y – there is a bigger diff in the heights of waves	**1** accept for range
Y – in K they had higher tides where in CT they were less scattered	**1** accept for spread – ignore higher
Y – in K each quartile is a diff length showing variety, in C they are equal	**0**
Y – there is a bigger range in the size of the waves	**1** ignore wrong context
N – CT is more equal when K has a bigger UQ	**0**
Y – K had a larger width	**1**
Y – has a higher U / L quartile range	**1** bod
N – both have a range of 1	**1**
Y – the UQ is far away from the median	**0**
Y – K ranged from 1.18 to 2.2 CT from 1 to 2	**1**

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