OCR
RECOGNISING ACHIEVEMENT

GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education

Unit **B392/02:** Higher Tier

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations used in the detailed Mark Scheme.

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

1. **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.

2. 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.

3. 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.

4. 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.

5. 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 and applies as a default.
   - **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**.

6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

   (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

8. In questions with a final answer line:

   (i) If one answer is provided on the answer line, mark the method that leads to that answer.

   (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

   (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.

9. In questions with no final answer line:

   (i) If a single response is provided, mark as usual.

   (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

10. 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.

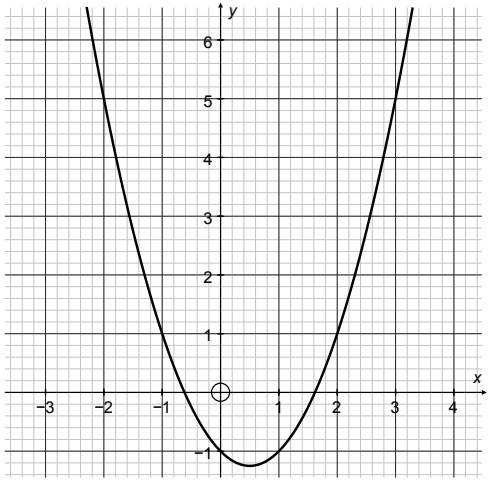
11. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

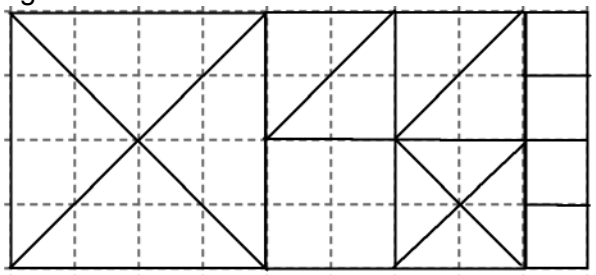
12. Ranges of answers given in the mark scheme are always inclusive.

13. 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.

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

Question			Answer	Marks	Guidance	
1	(a)	(i)	8.192	1		Allow $8\frac{24}{125}$ NOT $\frac{1024}{125}$
		(ii)	3.12	3	**B2** for 3.11[8…] or 3.119 seen **OR** **B1** for 30.33 soi **OR** **SC1** for 2.72....	implied by 16.52..... (3 x √30.33) from use of 6.1 x (5.3 – 2)
	(b)	(i)	$\frac{2}{3}$	1	Allow equivalent fractions eg 6/9, 66/99, etc.	
		(ii)	$0.\dot{9}5\dot{1}$	1	Condone $0.\dot{9}5\dot{1}$ or $0.\dot{9}51$	Allow other ways of indicating what recurs as long as it is clear eg condone 0.951951..... but NOT 0.951.....
2	(a)		7.5	2	**M1** for 1.5 x 5 **or** 3 x 2.5 **or** for 1 kg fruit means1.5 kg sugar	
	(b)		45[.00]	2	**M1** for 9 or 27 or 5 x 18/2	
3	(a)		8 64	1 1		
	(b)		10 28	1 1		
4	(a)		[5],1, [–1], –1, 1, 5	2	**B1** 2 values correct	

Question			Answer	Marks	Guidance	
	(b)			2	**B1** for at least four points correctly plotted (may be **FT** *their* table) **AND** **B1** for smooth curve through correct points (below $y = -1$ at vertex)	Half small square tolerance Need to see daylight between turning point of curve and $y = -1$ Ignore curve before x = –2 and after x = 3
	(c)		–0.6, 1.6 (± 0.1)	2	**B1, B1** or **FT** *their* graph After 0 scored **M1** for evidence of reading a value from $y = 0$	Could come from one value only
5	(a)		3	1		
	(b)		56[.25] oe	4	**M1** Area 64 or 16 (if using a quarter of shape) or 32 (if using half of shape) **AND** **M1** area shaded 36 (or 9 or 18) **AND** **M1** $\frac{\textit{their}\ 36}{\textit{their}\ 64}$ **oe**	*Their* 36 **bod** (for shaded area) but *their* 64 area must be justified (by eg 8 x 8 = 62) 36/64 or 9/16 or 18/32 implies M3 NB 64, 30, ans = 47[%] scores M1,M0,M1

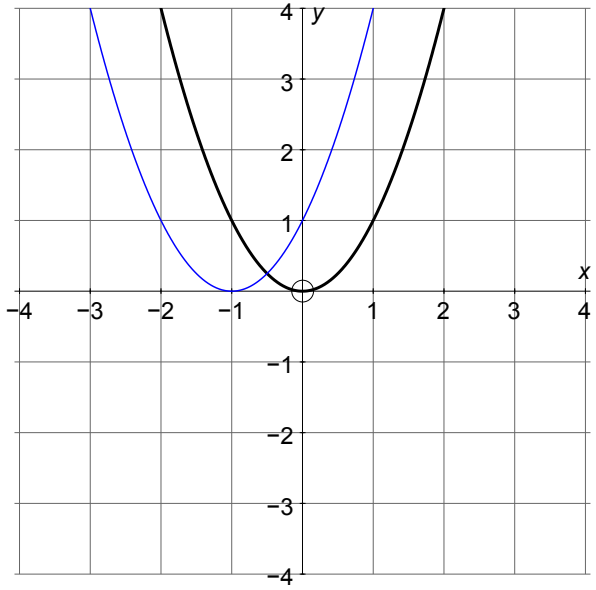
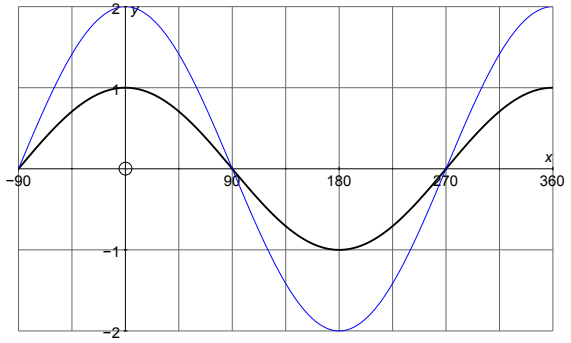
Question			Answer	Marks	Guidance	
	(c)		2.83	4	**M2** for $\sqrt{8}$ or $\sqrt{2^2+2^2}$ or $2\sqrt{2}$ or 2 x 1.41... **OR** **M1** for any Pythagoras statement **AND** **A1** for 2.82[8427…] **B1** for rounding *their* answer correctly to 2dp	Answer of 2.8 only without working scores 0 marks 2.82[84.....] may imply M2A1
	(d)		All shapes drawn in with no overlap, none missing and no extras. eg 	3	**B2** for all five shapes used within the rectangle with a maximum of four missing "repeats" in total. **OR** **B1** for 4 of one shape **and** at least one of each of three or four of the other shapes drawn.	If several attempts, mark to candidate's best advantage For B2 and B1 shapes do not have to be joined For 3 marks, condone missing lines for small squares
6	**(a)**		–9	3	**M1** for $3x - 6$ **AND** **M1** for correctly "collecting" *their x* terms or *their* numbers	Allow –9 fully embedded in answer space Could be eg *x* = ... (number)
	(b)		$y = 3 - 1.5x$ or $y = \frac{6-3x}{2}$ **oe**	2	**M1** for $2y = 6 - 3x$ **oe** **OR** **SC1** for $x = \frac{6-2y}{3}$ **oe**	
	(c)		[*x* =] 0 and [*x* =] 5 final answer	3	**M1** for $x(x-5)$ or $(5 \pm \sqrt{25})/2$ **oe** **B1** for one correct value	

Question			Answer	Marks	Guidance	
7			[2 x 3 x 3 =] 18 nfww	3	**M1** one correct set of numbers with product (not already in table) **AND** **M1** a different set of numbers with product 15 **OR** **SC2** for 2 x 3 x 3 in answer but 18 not seen	If answer space is blank then 18 must be clearly identified as maximum elsewhere for 3 marks. Negative numbers do not score Allow 2 x 3 x 3 on answer line for 3 marks if 18 given in table.
8	(a)		51.5[…] or 51 or 52	3	**M2** for $\cos^{-1}\frac{12.2}{19.6}$ soi by 51.[....] or **M1** for $\cos[P=]\frac{12.2}{19.6}$ **OR** **M2** for correct method reaching inverse function or **M1** for correct method without reaching inverse ($^{-1}$)	**Alt. Methods (examples)** **M2** for $90 - \sin^{-1}\frac{12.2}{19.6}$ or **M1** for $\sin[R=]\frac{12.2}{19.6}$ soi by 38.495 **OR** after RQ found **M2** for $\tan^{-1}\frac{\textit{their}\ \text{RQ}}{12.2}$ or **M1** for $\tan[P]=\frac{\textit{their}\ \text{RQ}}{12.2}$
	(b)		75	3	**M1** for 5 x 5 x 9 soi **AND** **M1** for *their* (5 x 5 x 9) x ⅓	eg 5 x 5 x 9 [= 225] x ½ scores M1
9	(a)		3	2	**M1** for 0.25 x 9 oe	
	(b)		13.30	3	**M2** for 13.3 or 3.99 x 10/3 **oe** **OR** **M1** for 3.99÷figs3 or 30%=3.99 **oe** **OR** **SC1** for 5.7 or 5.70 as final answer	Condone use of 10/3 = 3.3 for M2 soi by 13.17 or better From 30% off

Question			Answer	Marks	Guidance	
10*			Finding correct simplified expression, $\frac{3\pi r^2}{2}$ or $1.5\pi r^2$ or $1\frac{1}{2}\pi r^2$ clearly showing **all** working.	4	$\frac{\pi r^2}{2}+\frac{\pi(2r)^2}{4}=\frac{2\pi r^2}{4}+\frac{4\pi r^2}{4}=\frac{6\pi r^2}{4}=\frac{3\pi r^2}{2}$	
				3	$\frac{2\pi r^2}{4}+\frac{4\pi r^2}{4}=\frac{3\pi r^2}{2}$ oe $\frac{2\pi r^2}{4}+\frac{4\pi r^2}{4}=\frac{6\pi r^2}{4}$ oe	
				2	$\frac{2\pi r^2}{4}$ and $\frac{\pi(2r)^2}{4}$ seen or $\frac{4\pi r^2}{4}$ seen	
			Correct simplified total with incomplete, unclear or no working **or** correct unsimplified **total** with complete working	1	or $\frac{\pi r^2}{4}+\frac{\pi 2r^2}{4}$ (no brackets) seen or $\frac{\pi r^2}{4}$ or $\frac{\pi(2r)^2}{4}$ or $\frac{\pi 2r^2}{4}$ seen	
				0	No relevant work	
11	**(a)**		$2x^2+5x-3$	3	**M2** for three of the following terms: $2x^2-x+6x-3$ **OR** **M1** for two terms	5*x* could be two terms Could be 5*x* For M2 or M1 Terms selected from a maximum of four seen
	(b)		$3(x-2)(x+2)$	2	**M1** for $(3x-6)(x+2)$ or $(3x+6)(x-2)$ or $3(x^2-4)$	
	(c)		$\frac{2x}{(x-3)(x+3)}$ or $\frac{2x}{x^2-9}$ **isw**	2	**M1** for correct <u>denominator</u> seen	Denominator can be factors or multiplied out

Question			Answer	Marks	Guidance
12	(a)*		Triangle ABC is equilateral shown correctly and clearly with justifications	3	• Angle DCA or angle DAC = 45° with "isosceles" oe • Kite [is symmetrical] oe can be implied by 105° • Angle BCA or BAC = 60° with angles of quadrilateral • Statement of all angles are equal [60°] **OR** • BA=BC with kite • Angle BAC or angle BCA = 60° with angles of a triangle • Statement of all angles are equal [60°]
				2	Complete, correct working, as above (could be on diagram), with statement but without all the relevant reasons or with reasons but no final statement eg angle DCA or angle DAC = 45° angle BCD or angle BAD 105° angle BCA or angle BAC = 60° With reasons missing but statement of all angles are equal **or** all reasons included but no final statement.
				1	Some relevant work (could be on diagram) eg BA = BC Angles of 45° given Mention of either triangle being isosceles Mention of Symmetry Angles of 105° given Two pairs of equal sides in a kite Etc.
				0	No relevant work

Question			Answer	Marks	Guidance	
					Content	Levels of response
	(b)		85.5 to 88	5	**M1** for area of triangle ADC = 32 or 31.96[.....] from trig. **M1** for [AC =] $\sqrt{128}$ or 11.3... or $\sqrt{(8^2 + 8^2)}$ **M1** for any full, correct method to find area of triangle ABC **A1** for area of 54 to 56	**Alt method:** **M1** use of sin rule to find another side in ABD or BCD **A1** for 11.3[137…] or 15.5 or 15.45 **M1** for any full, correct method to find area of triangle ABD **A1** for area of 43.7[128…]
13			$x^2 + 4x = -4$ oe $x^2 + 4x + 4$ [= 0] $(x + 2)(x + 2)$ [=0] or correct formula $x = -2$ attempt to substitute $y = -1$	**B1** **M1FT** **M1FT** **B1** **M1** **B1**	For correctly eliminating y or x For getting all terms to 1 side Factorise (or use formula) Correct value for x or y Second value correct	Condone not simplified From *their* quadratic From *their* quadratic Final M1 not from T&I

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
14	**(a)**			2	**M1** for horizontal translation	For both parts, we are looking for a sketch of the appropriate graph – be reasonably generous regarding accuracy (probably within 5 mm of correct positions)
	(b)			2	**M1** for vertical stretch	For 2 marks passes through –90, 90, 270, on *x*-axis Generous tolerance for M1

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
15			Possible pair of points where A is the point (0, *a*), B is the point (2, *b*) with $a + b = 4$ $(b \neq 0)$	3	**B1** for *x*-coord of A **B1** for *x*-coord of B **B1** for $a + b = 4$	
16			49 and 61	4	**B1** for [length sf =] $\sqrt{6}$ soi **M1** width or height times *their* $\sqrt{6}$ **A1** for one correct measurement (need not be rounded) OR (after **M0**) **SC1** for rounding at least one measurement to nearest cm.	NOT eg width = 50 height = 60 from area of 3000 (need same SF for w & h) If correct $20\sqrt{6}$ or $25\sqrt{6}$ 48.989...or 61.237... (implies M1) Must come from value of 3sf or better

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