OCR
Oxford Cambridge and RSA

GCSE

Methods in Mathematics (Pilot)

Unit **B392/02:** Methods in Mathematics 2 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2014

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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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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 – $\sqrt{}$(*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.

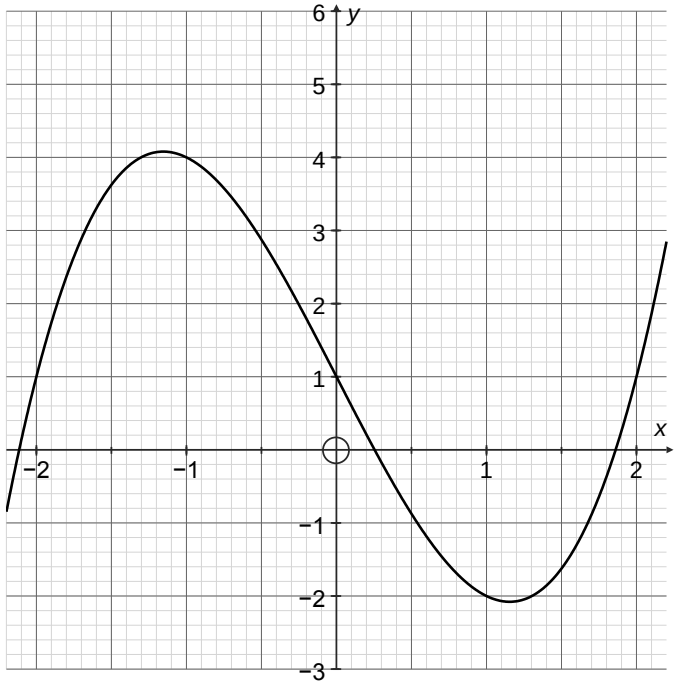
13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

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)		$0.1\dot{3}$	2	**M1** for 2 ÷ 15 **or** 0.13 **or** 0.133	Condone 0.133.... or 0.1333[3.....] for 2 marks
	(b)		$\frac{7}{40}$	2	**M1** for $\frac{175}{1000}$ oe	
	(c)		0.181 final answer	3	**M2** for 0.181[05...] **OR** **M1** for $\frac{\sqrt{11.05}}{18.36}$ After 0 marks scored: **SC1** for correctly rounding their final answer to 3sf	$\frac{3.324...}{18.36}$
2	(a)		$\frac{2}{3}$ **oe**	3	**M2** for comparing area of hexagons and area of whole shape eg 18 and 27 **OR** **M1** for splitting a hexagon into 6 triangles (on diagram or stated in working)	For 3 marks must be exact answer, can be decimal or percentage. Allow M2 for ratio clearly stated eg area triangles : area hexagon is 3 : 6 or 9 : 18
	(b)		1:3	1		
2	(c)*		Clear explanation with conclusion that hexagons run out first	2	Explanation is likely to start with either multiplying 15 by 3 or dividing 50 by 3 **1** for either multiplying 15 by 3 or dividing 50 by 3 (leading to their conclusion) See exemplars in appendix 1	

Question			Answer	Marks	Part Marks and Guidance	
3	(a)	(i)	34.8% or 35% nfww	3	**M2** for 0.347[826...] oe **OR M1** for $\frac{8}{23}$ **SC1** for $\frac{8}{15}$ = 53[.3..]%	No more than 2dp Allow eg 34.5% as evidence of M1
		(ii)	One of the following: 4 women, 1 man 8 women, 2 men 12 women, 3 men	3	**M2** for no of women = 4 × number of men **SC1** for no of women = 5 × number of men	Whole numbers only
	(b)		60.48	3	**M1** for 64 x 0.9 oe (= 57.6) **M1** for 1.05 x *their* 57.6 oe	Condone £60.48p
4	(a)	(i)	$2(x+3)$ oe isw	2	**M1** for x + 3 **or** 2x + 3 used	
		(ii)	-6	4	**M1** for *their* 2(x + 3) = x **M1** for correct expansion (eg 2x + 6 = x) **M1** for (a – 1)x + b = 0 or (a – 1)x = -b Must be from *their* ax + b = x	Must come from equation containing brackets eg x + 3 = 0 or x = -3 from 2x + 3 = x
	(b)		$n(n-1)$ oe	3	**M2** for second difference constant **or** for writing terms as products of consecutive numbers **or** writing out square numbers **OR** **M1** for finding three correct first differences	
5	(a)		6.5	3	**M2** for $\sqrt{42.25}$ OR $\sqrt{5.6^2+3.3^2}$ **OR M1** for a Pythagoras statement	
	(b)		Isosceles triangle sketched (by eye) Base = 6.6 cm **or** 11.2 cm Sloping side = *their* (a) or stated area of 18.48 for larger triangle	**B1** **B1** **B1**	 If no marks scored… **SC1** for stated area 9.24 **or** 18.48	If three different side lengths labelled on triangle then B0

Question			Answer	Marks	Part Marks and Guidance	
6	(a)*		Clear and correct explanation of the inequality that covers all of the following points… • Explanation of LHS formula • Explanation of RHS formula • Explanation of direction of inequality Explanation with two of the above points made One point made or one correct substitution that works	3 2 1	Explanation includes statements such as "people with a card pay £4 for each film so £4x for x films and an extra £10 for the card".	
6	(b)		$x > 5$	2	**M1** for $2x > 10$ **OR** **SC1** for $x = 5$ **or** $x \geq 5$ **or** $x \leq 5$ **or** $x < 5$ **or** 5 as answer	
7	(a)		25.18 to 25.32 cm^2	3 1	**M1** for rectangle area = 5 x 7 **AND** **M1** for $\frac{\pi \times 2.5^2}{2}$ or $\pi \times 2.5^2$ **B1** for units	Rectangle area = 35 cm^2 Circle area = 19.63 ...cm^2 Semicircle area = 9.817... cm^2 Final area = 25.182.... cm^2 Allow in working if not contradicted in answer
	(b)		Three positive numbers which multiply to give 60	3	**M2** for three positive numbers which multiply to give 30 **OR** **M1** for $\frac{1}{2}whd = 30$	

Question			Answer	Marks	Part Marks and Guidance	
8	(a)		$x = \bar{1}, y = \bar{3}$	3	**M1** for correctly eliminating one variable or correct expression for x in terms of y or y in terms of x **M1** for correctly substituting first variable found **OR** **B1** for a correct answer for x or y	
	(b)		$6x^2 - 5x + 1$	3	**M2** for three of the following terms : $6x^2 - 3x - 2x + 1$ **OR M1** for two terms	$-5x$ may count as two terms
9	(a)		3.625, 4, 1 , -1.625, 1	2	**B1** for at least two correct	
	(b)			2	**B1** for at least six of *their* points correctly plotted **AND** **B1** correct smooth curve	Within half a small square Joining correct points within half a small square Condone turning points at x = -1 and x = 1 **B0** for ruled, multiple or "hairy" curves

Question			Answer	Marks	Part Marks and Guidance	
10	(a)		24.59[41....] or 24.6	4	**M1** for 18º **then** **M2** for $\frac{7.6}{\sin 18°}$ **OR** **M1** for $\sin 18° = \frac{7.6}{PQ}$	Allow 25 with working
	(b)		14.01 to 14.2	3	**M2** for $\frac{33.2}{360} \times \pi \times 7^2$ **OR** **M1** for $\pi \times 7^2$ **or** $\frac{33.2}{360}$	At least one dp 14.1978... Allow answer of 14 if more accurate value seen? (14.00855…. from π = 3.1)
11			P_A at 90º P_B between 115º and 155º P_C between 185º and 225º	1 1 1		**SC1** All three marked correctly but not labelled **or** labelled incorrectly
12	(a)		49.4 π	2	**M1** for $\frac{4}{3}\pi \times 4.2^3 \div 2$ soi by eg 153.1 to 155.2 **or** 49.3 π **OR** **SC1** for 49π or 98.8π or 310.3[…….]	49.39[2] π scores 2 marks
	(b)		13.28[…….] or 13.3	3	**M2** for $\sqrt{10} \times 4.2$ **OR** **M1** for length sf **=** $\sqrt{10}$	**eg for alternate method**: **M2** for R^2 = 1662.53… ÷ 3π or complete method leading to R^2 = 176.4 **OR** **M1** for SA (large) = 1662.53...

Question			Answer	Marks	Part Marks and Guidance	
13	(a)		-0.3, 3.3	4	**B3** for -0.3028, 3.303 **OR** **M2** for $\frac{3 \pm \sqrt{13}}{2}$ **OR** $(x - 1.5)^2 - 3.25 = 0$ **OR** **M1** for correct substitution (allow one error) into quadratic formula **or** $(x - 1.5)^2$ **AND** **A1** for at least one correct rounded answer from *their* formula dep on M1 or M2	By T&I **M2** for at least two correct trials between 3.2 and 3.4 inclusive or between -0.2 and -0.4 inclusive **OR** **M1** for one correct trial **AND** **B1** for at least one correct rounded answer
	(b)		$\frac{x+2}{x+3}$	4	**M2** for factorising $x^2 + x - 6$ **OR** **M1** for incorrect factorisation of $x^2 + x - 6$ which gives two correct terms when multiplied out **AND** **M1** for factorising $x^2 - 4$	$\frac{(x-2)(x+2)}{(x+3)(x-2)}$
14			8.88[....] or 8.9	5	**M2** for 45.7... for AD^2 **or** 6.76 for AD **OR** **M1** for $8.3^2 + 3.4^2 - 2 \times 8.3 \times 3.4 \times \cos 52$ then **M2** for $BD^2 = 78.91...$ **OR** **M1** for $5.1^2 + 45.7 - 2\times\sqrt{45.7} \times 5.1 \times \cos 96$ with *their* 45.7	Allow **MR** for use of shape as 2D then: **M2** for 35.78... for angle ACB **OR** **M1** for complete, correct method leading to angle ACB **then** **M2** for complete, correct method leading to BD **OR** **M1** for angle BCD = 52 + *their* 35.78….
15			Quadratic equation for graph with positive x^2 Quadratic through (0, -2) Quadratic through (2, 0)	**B1** **B1** **B1**	Must contain y =	$y = ax^2 + (1 - 2a)x - 2$ gains full marks e.g. $y = x^2 - x - 2$

APPENDIX 1

Exemplar responses for question **2c**

Response	**Mark awarded**
Hexagons 15 × 3 = 45. You still have [5] triangles left	2
Runs out of hexagons first because each hexagon needs 3 triangles. 15 × 3 = 45	2
50 ÷ 3 = 16.6. 15 patterns with hexagons. She will run out of hexagons first. I know this 50÷3 because its 3 triangles to every pattern is more than the amount of hexagons.	2
9 18 27 36 45 54 3 6 9 12 15 Hexagons because its 3:9 and you will run out of hexagons quicker. You get to 45 with hexagons before you get to 50 with triangles	2
She runs out of hexagons first because she will use 45 triangles to 15 hexagons in the ratio 3:9	2
Runs out of hexagons first because 15 x 3 = 45 which means too many triangles	2
9 18 27 36 45 54 3 6 9 12 15 Hexagons run out first	1
15 ÷ 3 = 5 50 ÷ 3 = 16.6666666… She runs out of hexagons	1
Runs out of hexagons first because ratio is 1:3. After using 15 hexagons she still has triangles left	1
3 + 9 = 12 12 ÷ 3 = 4 12 ÷ 9 = 1.33 15 × 3 = 45 9 × 50 = 450 None both would run out at same time.	0

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