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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
In Mathematics Modular (2MB01)
Unit 3: (5MB3H_01) Higher (Calculator)

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

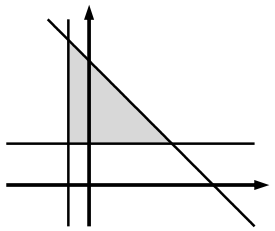
PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, –2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, –2)
2		1263	4	M1 for a correct method to find 65% (= 5473) of the customers M1 for a correct method to find $\frac{1}{5}$ (= 1684) of the customers M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao OR M1 for a correct method of adding 65% and $\frac{1}{5}$ when both correctly written as percentages (= 85%) or decimals (= 0.85) or fractions (= $\frac{85}{100}$ oe) M1 ft for a correct method to find the percentage or decimal or fraction of the customers (= 7157) M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao OR M1 for a correct method of adding 65% and $\frac{1}{5}$ when both correctly percentages (= 85%) or decimals (= 0.85) or fractions (= $\frac{85}{100}$ oe) M1 ft for a correct method to find the remaining percentage (= 15%) or

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
				decimal (= 0.15) or fraction ($\frac{15}{100}$ oe) of the customers M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao
3	$x = 3$ gives 39 $x = 4$ gives 80 $x = 3.1$ gives 42.(191) $x = 3.2$ gives 45.(568) $x = 3.3$ gives 49.(137) $x = 3.4$ gives 52.(904) $x = 3.5$ gives 56.(875) $x = 3.6$ gives 61.(056) $x = 3.7$ gives 65.(453) $x = 3.8$ gives 70.(072) $x = 3.9$ gives 74.(919) $x = 3.55$ gives 58.9(38875) $x = 3.56$ gives 59.3(58016) $x = 3.57$ gives 59.7(79293)	3.6	4	B2 for a correct trial in the range $3.5 \leq x \leq 3.6$ evaluated (B1 for a correct trial in the range $3 \leq x \leq 4$ evaluated) B1 for a different correct trial in the range $3.55 \leq x < 3.58$ evaluated B1 (dep on at least one previous B1) for 3.6 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but to 1 dp (rounded or truncated) if the value of x is to 2 dp NB: If no working shown, no marks can be awarded, even if the answer is correct.
4		480	2	M1 for using a correct ratio of $\frac{800}{150}$ oe or $\frac{150}{800}$ oe or $\frac{90}{150}$ oe or $\frac{150}{90}$ oe A1 cao [SC: B1 for $477 \leq$ answer < 480 if no working and M0 scored]

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*5	Key ring: 1.6 × 9 = 14.4 Purse : 3.2 × 8 = 25.6	Key ring £1.60 Purse £3.20	4	M1 for $9x$ or $8 \times 2x$ (where x is the price of a key ring) M1 for equation $9x + 8 \times 2x = 40$ oe A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M1 for $(8\times2) : 9$ (= 16 : 9) M1 for $40 \div (16 + 9)$ A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M2 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 < x < £2 (M1 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 ≤ x ≤ £4) A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation [SC: B2 for both £1.60 cao and £3.20 cao clearly identified for correct items with correct money notation if no working shown]

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
6		58.05	4	B1 for identifying 19.5(0) and 15(.00) M1 for a correct method to find the total cost of their identified tickets for the family, or for a correct method to find the discounted cost of at least one of the identified tickets M1 for a correct method to find the total discounted cost of their identified tickets A1 cao
7		Correct region shaded	3	B1 for perpendicular bisector within guidelines B1 for arc of circle, centre A, within guidelines B1 ft for a correct region shaded or otherwise indicated from their perpendicular bisector of AB and their arc drawn, centre A

PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*8		179 ÷ 70 = 2.5(571.....) 275 ÷ 100 = 2.7(5) 399 ÷150 = 2.6(66....) 70 ÷ 179 = 0.39(11....) 100 ÷ 275 = 0.36(36...) 150 ÷399 = 0.37(59....)	70 m*l* tube with reason	4	**Using pence per m*l*** M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc) for one of the sizes M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc. must be consistent) for each of the sizes A1 for 2.5(571.....) (70 m*l*) and 2.7(5) (100 m*l*) and 2.6(66....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values. OR **Using m*l* per 1p** M1 for a correct method of finding the volume per pence (or £) for one of the sizes M1 for a correct method of finding the volume per pence (or £) for each of the sizes, with consistent units A1 for 0.39(11....) (70 m*l*) and 0.36(36...) (100 m*l*) and 0.37(59....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values.
9	(a)	x –1 0 1 2 3 4 5 y **9** 3 –1 **–3** –3 **–1** 3	9, –3, –1	2	B2 for a fully correct table of values (B1 for at least one correct extra entry)
	(b)		Correct graph	2	B1 (dep on at least B1 in (a)) for all of their points correctly plotted B1 (dep on previous B1) for smooth curve through all 7 of their points
	(c)		0.7, 4.3	2	B1 for an answer rounding to 0.7 or ft their graph B1 for an answer rounding to 4.3 or ft their graph

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
10 (a)		10.25	2	M1 for an attempt to expand the bracket or divide both sides by 4 as a first step. A1 for 10.25 oe
(b)		$t = \frac{P+3}{4}$	2	M1 for a correct first step of either adding 3 to both sides or dividing both sides by 4 A1 for $t = \frac{P+3}{4}$ oe [SC: B1 for $P + 3 \div 4$ if M0 scored]
11		66.7	3	M1 for tan (y =) $\frac{86}{37}$ (= 2.3243..) M1 (dep) for $\tan^{-1}$ "2.32(43..)" = or $\tan^{-1}(\frac{86}{37})$ (accept 'shift tan' or 'inv tan' for $\tan^{-1}$) A1 for answer in the range 66.6° to 66.8° [SC: B1 for an answer in the range 23.2 to 23.3 if M0 scored]
12		Region identified	4	B1 for $x + y = 6$ or $x = -1$ or $y = 2$ drawn B1 for $x + y = 6$ and $x = -1$ and $y = 2$ drawn M1 for consistent shading (in or out) for any two of the lines $x + y = 6$, $x = -1$, $y = 2$ A1 lines drawn, and correct region identified by either shading in, or shading out; the letter R is not required, but necessary if no shading. Note: Lines may be solid or dotted/dashed etc

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
13		32.2	4	M1 for $BC = \frac{10}{4} \times 5$ (= 12.5) M1 for $EC = \frac{10}{4} \times 5.8 - 5.8$ (=8.7) M1(dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for $BC = \frac{5}{4} \times 10$ (= 12.5) M1 for $EC = \frac{5.8}{5} \times$ '12.5' – 5.8 (= 8.7) M1 (dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for $BC = \frac{5}{4} \times 10$ (= 12.5) M1 for $EC = \frac{6}{4} \times 5.8$ (= 8.7) M1 (dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for 4 + 5 + 5.8 (= 14.8) M1 for $\frac{10}{4} \times$ '14.8' (= 37) M1 (dep on at least M1) for '37' – 4 – 5.8 + 5 A1 cao

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
14	$4x - 5y = 33$ $15x + 5y = 5$ $19x = 38$ $x = 2, \quad 3\times2 + y = 1$ $y = -5$ $12x - 15y = 99$ $12x + 4y = 4$ $-19y = 95$ $y = -5, \quad 3x - 5 = 1$ $x = 2$ OR $4x - 5(1 - 3x) = 33$ $x = 2, \quad 3\times2 + y = 1$ $y = -5$	$x = 2, y = -5$	3	M1 for a fully correct process to eliminate one variable (condone one arithmetical error) M1 (dep on M1) for a correct substitution of their value (of x or y) into one of the equations, or for starting again with a fully correct process to eliminate the second variable A1 for $x = 2$ and $y = -5$ OR M1 for a correct rearrangement of one of the equations to make either x or y the subject and a correct method of substitution into the other equation. (condone one arithmetical error) M1 (dep on M1) for the substitution of their value (of x or y) into one of the equations. A1 for $x = 2$ and $y = -5$ [Note: No marks for trial and improvement methods unless a fully correct solution is found]
15 (a)(i)		3.202(17….)	3	B2 for for 3.202(17.....) (B1 for 5.357 .. or 1.673... seen)
(a)(ii)		3.20		B1 for 3.20 or ft from "(a)" [Note: 3.2 only gets B0]
(b)		1.17×10^{10}	2	M1 for $2.34 \times 5 \times 10^{(5+4)}$ or $11.7 \times 10^{(5+4)}$ or 234000×50000 (= 11700000000) A1 for 1.17×10^{10}

PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60^o or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.
17		$(x^2 - 7)y = (x^2 + 9)$ $x^2y - 7y = x^2 + 9$ $x^2y - x^2 = 9 + 7y$ $x^2(y - 1) = 9 + 7y$	$x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ oe	4	M1 for correctly removing the fraction or $(x^2 - 7)y$ oe seen M1 for a correct rearrangement, isolating terms in x^2 on one side of an equation M1 for the fully correct factorisation of their $x^2y - x^2$ oe A1 for $x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ or $x = (\pm)\sqrt{\frac{-7y-9}{1-y}}$ oe

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*18		128^o	4	M1 for 180 – 116 (= 64), when clearly attempting to find angle *ADC* M1 (indep) for their angle *ADC* × 2 C2 (dep on M2) for $x = 128(^o)$ and fully correct reasons supported by method: eg. "opposite angles of a cyclic quadrilateral add up to 180°" and "the angle at the centre of a circle is twice the angle at the circumference" [C1 (dep on the relevant M1) for one correct reason] OR M1 for 116 × 2 (= 232), when clearly attempting to find reflex angle *AOC* M1 (dep) for 360 – '232' C2 (dep on M2) for $x = 128(^o)$ and fully correct reasons: eg. "the angle at the centre of a circle is twice the angle at the circumference" and "angles at a point add up to 360^o" [C1 (dep on the relevant M1) for one correct reason] [SC: B2 for 128 seen identified as angle *x*, if M0 scored]
19 (a)		$\mathbf{b} - \mathbf{a}$	1	B1 for $\mathbf{b} - \mathbf{a}$ oe
(b)		$\frac{4}{5}\mathbf{a} + \frac{1}{5}\mathbf{b}$ oe	3	M1 for a fully correct vector statement for $\overrightarrow{OX}$ eg.($\overrightarrow{OX}$ =) $\overrightarrow{OA}$ (or $\mathbf{a}$) + $\overrightarrow{AX}$ (or $\frac{1}{5}\overrightarrow{AB}$) or ($\overrightarrow{OX}$ =) $\overrightarrow{OB}$ (or $\mathbf{b}$) + $\overrightarrow{BX}$ (or $\frac{4}{5}\overrightarrow{BA}$ or $-\frac{4}{5}\overrightarrow{AB}$) M1 (indep) for $\pm\frac{1}{5}(\mathbf{b} - \mathbf{a})$ or $\pm\frac{4}{5}(\mathbf{a} - \mathbf{b})$, ft their (a) A1 for $\mathbf{a} + \frac{1}{5}(\mathbf{b} - \mathbf{a})$ or $\mathbf{b} + \frac{4}{5}(\mathbf{a} - \mathbf{b})$ oe

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
20		4.5, –0.75 oe	3	M2 for $(2x – 9)(4x + 3)$ oe (M1 for $(2x \pm 9)(4x \pm 3)$) oe A1 for 4.5, –0.75 oe [SC: B1 for 4.5 and –0.75 oe, found by any other method]

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q1	(a)	2cm grid	
	(b)	2cm grid. Triangle A to be rotated about the point (0,1).	
Q6		July peak / off peak in a different format. Information the same.	Standard mark scheme
Q7		Dashed line to join Alford and Bancroft. A to B – 7.5cm.	Standard mark scheme
Q9		1 ½ cm grid.	Standard mark scheme
Q12		2cm grid.	Standard mark scheme
Q13		Measurement arrows taken out.	Standard mark scheme
Q16		Model and diagram	Standard mark scheme

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