Mark Scheme (Results)

November 2012

GCSE Mathematics Linked Pair Pilot
Methods in Mathematics (2MM01)
Foundation (Calculator) Paper 2F

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		44.24	1	B1 cao
	(b)		26.01	1	B1 cao
	(c)		21.12	1	B1 cao
	(d)		13.02	1	B1 accept $\dfrac{651}{50}$
	(e)		−19.6	1	B1 cao
2			15 cm^3	3	M1 for 5 × 3 or answer of 11 A1 cao B1 (indep) for cm^3
3	(i)		Pentagon	2	B1 for pentagon or regular pentagon
	(ii)		Heptagon		B1 for heptagon or regular heptagon
4	(a)		25	1	B1 cao
	(b)		0.3	1	B1 cao
	(c)		$\dfrac{37}{100}$	1	B1 cao
	(d)		$\dfrac{7}{10}$	2	M1 for $\dfrac{70}{100}$ oe A1 cao

5MM2F/01					
Question		Working	Answer	Mark	Notes
5	(a)	20 × 1.6 =	32	1	B1 cao
	(b)	80 ÷ 1.6 =	50	2	M1 for 80 ÷ 1.6 A1 cao
6	(a)	$\frac{40}{100} \times 600 =$	240	2	M1 for $\frac{40}{100} \times 600$ or 4 × 60 oe A1 cao
	(b)		20	1	B1 cao
	(c)	150 ÷3 × 2 =	100	2	M1 for 150 ÷ 3 × 2 or 150 × 2 ÷ 3 A1 cao
7	(a)		2	1	B1 for 2 or –2
	(b)		20	2	M1 for identifying –13 and 7 A1 for 20 or –20
	(c)		–13	1	B1 cao

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8*	(a)		Parallel lines marked	1	B1 for a clear indication that the two parallel lines have been selected
	(b)		Correct tessellation	2	B2 for at least 6 shapes (including initial shape) correctly tessellating (B1 for at least 4 shapes (including initial shape) correctly tessellating)
	(c)		108 and explanation	3	M1 for $360 \div 5$ (= 72) or 3×180 (= 540) A1 for 108 C1 for explanation e.g. 108 is not a factor of 360 or $360 \div 108$ is not a whole number or diagram drawn with sizes of angles shown and explanation of why they won't fit **SC** B1 for 3 pentagons drawn at a point with gap identified QWC: Explanation should be clear with working clearly presented
9	(a)	$\sqrt{12.25} = 3.5$ $3.5 - 1.97 =$	1.53	2	M1 for $3.5 - 1.97$ or $\frac{7}{2} - 1.97$ A1 cao
	(b)(i)		100	2	B1 for 100, accept 10^2
	(ii)		1000		B1 for 1000, accept 10^3
	(c)	$48.7 - 48.3 = 0.4$ $16.95 - 16.81 = 0.14$ $0.4 + 0.14 = 0.54$	0.54	2	M1 for $48.7 - 48.3$ or 0.4 seen **and** $16.95 - 16.81$ or 0.14 seen A1 cao Or M1 for $48.7 + 16.95 - (48.3 + 16.81)$ or 65.65 **and** 65.11 seen A1 cao

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		70	1	B1 cao
	(b)	(63 + 18) ÷ 3 =	27	2	M1 for 63 + 18 or 81 seen or 63 + 18 ÷ 3 seen in working or $3x - 18 = 63$ or first step correct of a reversed flow chart. A1 cao
11			0.6 0.62 $\frac{13}{20}$ $\frac{2}{3}$ 70%	2	M1 for conversion to decimals or conversion to percentages or correct order with one error or correct order but largest first A1 for correct order
12*		$DAB = 144 - 90$ (= 54) Or $ABD = 180 - 144$ (= 36) $DAB = 180 - 36 - 90 =$	54	3	M1 for 144 – 90 (i.e. a complete method) A1 cao C1 (dep on M1 earned) for <u>exterior angle</u> of triangle is <u>equal</u> to <u>sum of interior opposite angles</u> Or M1 for 180 – (180 – 144) – 90 (i.e. a complete method) A1 cao C1 (dep on M1 earned) for <u>angles</u> on a straight <u>line</u> add up to <u>180</u> **and** <u>angles</u> in a <u>triangle</u> add up to <u>180</u> QWC: Reasons written out clearly with correct geometrical language

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		$\dfrac{12}{30}$	1	B1 for $\dfrac{12}{30}$ oe
	(b)	30 – 12 = 18 12 : 18 = 2 : 3	2 : 3	2	M1 for 12 : "30 – 12" oe e.g. 12 : 18 , 6 : 9 , 4 : 6 or 3 : 2 A1 cao
	(c)	18 ÷ 2 = 9 12 – 9 = 3	3	3	M1 for "(30 – 12)" ÷ 2 or 9 seen M1(dep) for 12 – "9" A1 cao
14		360 – (130 + 45 + 85) =	100	2	M1 for 360 – (130 + 45 + 85) or 180 – (360 – ("50" + "135" + "95")) A1 cao
15			$\dfrac{1}{6}$ and explanation	2	B1 for $\dfrac{1}{6}$ B1 (indep) for explanation e.g. 6 doesn't divide into 1 exactly or the other four fractions do not recur or states $\dfrac{1}{6}$ and links it with $0.16^{\dot{6}}$
16	(a)	4 – 6 =	–2	1	B1 cao
	(b)	3 × 2 + 4 × 5 =	26	2	M1 for 3 × 2 + 4 × 5 A1 cao
	(c)	3 × (8 – 2) =	18	2	M1 for 3 × (8 – 2) or 3 × 8 – 3 × 2 or 3 × 6 A1 cao

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$200 \div 4 = 50$ $200 \div 5 \times 2 = 80$ $200 - 50 - 80 =$ Or $\dfrac{1}{4} + \dfrac{2}{5} = \dfrac{13}{20}$ $\dfrac{13}{20} \times 200 = 130$ $200 - 130 =$	70	4	M1 for $200 \div 4$ or 50 seen M1 for $200 \div 5 \times 2$ or 80 seen M1 (dep on one previous M1) for $200 - "50" - "80"$ A1 cao Or M1 for $0.25 + 0.4 = (0.65)$ M1 for $1 - 0.65 \ (= 0.35)$ or $200 \times 0.65 \ (= 130)$ M1(dep on M1) for 200×0.35 or $200 - "130"$ A1 cao Or M1 for $\dfrac{1}{4} + \dfrac{2}{5}$ or $\dfrac{13}{20}$ oe M1 for $"\dfrac{13}{20}" \times 200$ or 130 seen or $1 - "\dfrac{13}{20}"$ or $\dfrac{7}{20}$ oe seen M1 (dep on one previous M1) for $200 - "130"$ or 70 seen or $"\dfrac{7}{20}" \times 200$ A1 cao

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18*			110 with reasons	4	M1 for 180 – 90 – 20 or an angle correctly identified as 70 (could be on the diagram) M1 for 180 – "70" oe (could be on the diagram) C2 for 110 and all reasons clearly given **e.g.** *ABG* = 90 (<u>corresponding angles</u> are <u>equal</u>) *AGB* = 180 – 90 – 20 = 70 (<u>angles</u> in a <u>triangle</u> add to <u>180</u>) *BGD* = 180 – 70 = 110 (<u>angles</u> on a straight <u>line</u> add to <u>180</u>) *x* = *BGD* = 110 (<u>corresponding angles</u> are <u>equal</u>) Or *ABG* = 90 (<u>corresponding angles</u> are <u>equal</u>) *AGB* = 180 – 90 – 20 = 70 (<u>angles</u> in a <u>triangle</u> add to <u>180</u>) *FGD* = 70 (<u>vertically opposite</u> angles <u>equal</u>) *x* = 180 – 70 (<u>allied angles</u> or <u>co-interior angles</u>) add to <u>180</u> Or *ADC* = 180 – 90 – 20 = 70 (<u>angles</u> in a <u>triangle</u> add to <u>180</u>) *FGD* = 70 (<u>alternate angles</u> are <u>equal</u>) *x* = 180 – 70 (<u>allied angles</u> or <u>co-interior angles</u>) add to <u>180</u> (C1 for one appropriate reason for candidates working) QWC: Reasons written out clearly with correct geometrical language used

Question		Working	Answer	Mark	Notes
19		$1.85 \div 5 \times 9 =$	3.33	2	M1 for $1.85 \div 5$ or 1.85×9 or 0.37 or 16.65 or 333 seen A1 cao **NB** Working can be in £ or p
20	(a)	$64 \div (8 \times 2)$	4	2	M1 for $64 \div (8 \times 2)$ A1 cao
	(b)	$150 \div 6$ (=25) $\sqrt{25} = 5$ $5 \times 5 \times 5 =$	125	3	M1 for $150 \div 6$ (=25) (area of 25 may be seen on one face of a cube or side lengths of 5 may be marked on a diagram) M1 for $\sqrt{"25"} \times \sqrt{"25"} \times \sqrt{"25"}$ A1 cao
21	(a)	$4 \times 2 \times 2 \times 2 = 32$	32	1	B1 cao
	(b)	$a - b = 5c$ $\dfrac{a-b}{5} = c$	$\dfrac{a-b}{5}$	2	M1 for an intention to subtract b from both sides as a first step or to divide all items by 5 as a first step A1 for $\dfrac{a-b}{5}$ oe **SC** 1 for $a - b \div 5$
22		$\dfrac{84}{240} \times 100 =$	35	2	M1 for $\dfrac{84}{240} \times 100$ oe A1 cao
23		$\pi \times 12 \div 2 = 18.849\ldots$ $18.849 + 12 + 5 + 5 =$	40.8	4	M1 for $\pi \times 12$ or $37.6 - 37.7$ seen M1 for $\pi \times 12 \div 2$ or for $18.8 - 18.9$ seen for arc length, can be implied by answer in range $40.8 - 40.9$ M1 (dep on M1 earned) for "18.8" + 12 + 5 + 5 A1 ft or $40.8 - 40.9$

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)		−1, 0, 1, 2, 3	2	B2 for all 5 values and no extras (ignore repeats) (B1 for 4 correct values and no extras or all 5 correct values and one incorrect value)
	(b)	$x + x + 9 < 60$ $2x < 51$ $x < 25.5$	25	3	M1 for $x + x + 9$ oe A2 cao (A1 for 25.5) Or M1 for $60 \div 2$ (=30) and $9 \div 2$ (=4.5) A2 cao (A1 for 25.5) Or M1 for $60 - 9$ (=51) and "51" $\div 2$ (=25.5) A2 cao (A1 for 25.5) Or M1 for at least 2 trials with correct totals A2 cao (A1 for correct trial of 25 and 26)

5MM2F/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		2, –2, –4, 8	2	B2 for all correct (B1 for 2 or 3 correct)
	(b)		Correct graph	2	B2 for fully correct graph Or M1 ft for 6 or 7 of their points plotted correctly A1 for correct curve
	(c)		3.6, –0.6	2	B1ft graph for 3.6 ± 0.2 B1ft graph for –0.6 ± 0.2 **SC:** B1 ft for (3.6, 0), (–0.6, 0)
26		$6^2 + 9^2 = 117$ $\sqrt{117} =$	10.8	3	M1 for $6^2 + 9^2$ M1 for $\sqrt{36 + 81}$ or $\sqrt{117}$ A1 for 10.8 – 10.82