

GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2011 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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GCSE METHODS IN MATHEMATICS

UNIT 1 - FOUNDATION TIER

Methods in Mathematics	Mark	Comments
June 2011 Unit 1 Foundation Tier	D1	Post Conference
1. (a) (1) 0047	D1	
(ii) twenty eight million (b) (c) $22 \text{ s} 28$	D1	
(b) (1) $32 & 28$ (ii) $52 & 22$	BI D1	
(11) 53 & 23	BI D1	
(111) 39	BI	
(1V) 54	BI	D1 G = 2 = 2 = month G = 4 = month in a final second
(c) 1, 3, 9, 27	B2	B1 for 2 or 3 correct factors with no incorrect
		factors OR 4 correct factors and only 1 incorrect,
	D1	Ignore duplicates.
(d) multiple	BI	
	9	
2. Square	B1	
Rhombus	B1	
Parallelogram	B1	
Kite	B1	
Trapezium	B1	
	5	
3. (a) Eg. Unequal number of boys and girls	E2	E1 for partial explanation or eg just 11/30
and		Do not award E1 for statement incorrect only
Conclusion incorrect (stated or implied)		Do not usual ET for succinent incorrect only.
conclusion method (stated of miphed)		
(b) Λ at or near $1/2$	B 1	For position of 'A' accept >0 but <1/4
$\frac{1}{16}$	DI DI	Tor position of A accept > 0 but <1/4
D at /2	DI D1	
(a) (i) (II 1) (II 2) (II 2) (II 4) (II 5) (II 6)		D1 for 7 correct Order unimportant Ignore
$(C) (I) (\Pi, I) (\Pi, 2) (\Pi, 3) (\Pi, 4) (\Pi, 3) (\Pi, 0)$ (T, 1) (T, 2) (T, 2) (T, 4) (T, 5) (T, 6)	D2	durlicates
(1,1)(1,2)(1,3)(1,4)(1,3)(1,0)	D1	duplicates.
(1) $/_{12}$ of equivalent	DI M1	
(d) $1 - (0.2 + 0.5)$ of equivalent		for mash shills
= 0.3 or equivalent	AI	for probability.
	10	
	10	
4. (a) 29	B1	
(b) 64	B1	
Multiply (previous term) by 2 (to get	B1	Accept times by 2, doubling or $\times 2$
the next term)		Award B0 for 'it's the 2 times table'
(c) Subtract 1, multiply by 3	B1	Accept -1×3
(d) (i) correct pattern drawn	B1	
(ii) 5, 9, 13, 17	B2	B1 for 3 correct entries
(iii) 33	B1	
(e) $a = 21 + 5$	M1	Accept $3 \times 7 + 5$ for M1 if an attempt to
		multiply. For 37 + 5 award M0.
= 26	A1	
(f) 13v	B1	
(g) $4x + 7y$	B2	Award B1 for either $4x$ or $+7y$ within an
		expression
(h) (i)Point plotted at $(-2, -3)$	B1	Award B0 if reversed coordinates
(ii) (i) (iii) protect at (2, 5) (ii) (3 -1)	R1	Award B0 if reversed coordinates
	15	

Methods in Mathematics	Mark	Comments Bost Conformas
5 (a) For 2 correct in a form which allows	B1	Post Conference
comparison.	21	
For all 3 correct in a form which allows	B1	
$\frac{1}{70} \cos \theta = 0.65^{-3}/\epsilon$	B 1	CAO
(b) 200×12	M1	CAU
= 2400	Al	
60 imes 4	M1	
= 240	Al	TT from 1 and if had Margala and and
2640	8	F1 from 1 error 11 both M marks are awarded.
	0	
$(6, (a), (180, 00) \div 2)$	M1	
$(100 - 90) \div 2$ = $45(^{\circ})$	A1	
(b) 39°	B1	Look at diagram.
360 - 115 - 142 - 39	M1	FT 'their 39(°)' but not given 141(°)
y = 64 (°)	Al	
	3	
7. (a) 225	B2	B1 for either 9 or 25
(b) 4 (c) Explanation on multiplication comind and	B1 E2	Award B0 for $4 \times 4 \times 4$ or 4° or 16×4
(c) Explanation eg multiplication carried out	E2	Award E1 for statements such as Carly has done them in the wrong order
And		Do not award E1 for 'Simon' only.
Simon is correct or implied by their calculations	_	
	5	
$x = 135^{\circ}$	R1	
	B2	B1 for sight of 180–135. FT $y = 180 - x$
$z = 45^{\circ}$	B1	FT z = y or $z = 180 - x$
	4	
9. Any 3 comparisons and conclusions, e.g.	B3	B1 for each comparison and conclusion,
• For comparison of numbers asked with		maximum B3
implication that sample size matters.		For B marks, ignore extra information given
• For place survey carried out with		provided it is not contradicting.
biased		A conclusion maybe flagged by the word 'but'.
• For may not be quite the same question		If no conclusions, but comparisons given then:
asked with implication that answers		B2 for any 3 reasonable comparisons, or
cannot be compared.		B1 for all 1 of 2 reasonable comparisons
• For Jasmine asked women, implication survey biased to gender		Do not penalise 'no conclusion' in QWC
Survey chuben to gender.	OWG	
QWC	Qwc	QWC2 Presents relevant material in a coherent
• Relevance to surveys	2	acceptable mathematical form, and with few if
 spelling clarity of text explanations 		any errors in spelling, punctuation and grammar.
		OWICI Drogonto restarial in a selector d
QWC2: Candidates will be expected to		QwC1 Presents material in a coherent and logical manner but with some errors in use of
• present relevant work clearly, with		mathematical form, spelling, punctuation or
AND		grammar
• make few if any mistakes in spelling		OR avident week needed in examination of metari-1
punctuation and grammar		but using acceptable mathematical form with
OWC1. Condidates with the same of the		few if any errors in spelling, punctuation and
wut: Undidates will be expected to		grammar.
relevant, with words explaining process		OWCO Evident weaknesses in organisation of
or steps		material, and errors in use of mathematical form.
OR		spelling, punctuation or grammar.
• make rew if any mistakes in spelling, punctuation and grammar and include		Notor
units in their final answer		• If very little text (e.g. 2 lines)
		insufficient to check/award SPG. hence
		check the flow for meaning, if okay
		then QW1 if not QWC0.
		• Ignore some change in tense if
		 Mutations in Welsh: follow the same
	5	guidance as tense in English medium

Methods in Mathematics	Mark	Comments
June 2011 Unit 1 Foundation Tier		Post Conference
10. Method to find primes	M1	At least 1 prime found before second error
3, 5, 5, 7	A1	Ignore 1s
$3 \times 5^2 \times 7$	B1	Correct FT with no 1s and at least one power >1
		Allow inclusion of power 1 shown
	3	1
11. All numbers 1 to 24 correctly placed	B5	First look for duplicates, then cross out the
	20	correct ones.
		B4 4 or 5 of the 6 regions which should contain
Set A Set B		numbers are correct, ignore the other regions, OR
$\begin{pmatrix} 6 \\ 2 & 10 & 14 & 22 \\ 18 \end{pmatrix}$ 3 9 15 21		B3 3 of the 6 regions which should contain
		numbers are correct, ignore the other regions, OR
4 8 24		
16 20		B2 2 of the 6 regions which should contain
		numbers are correct, ignore the other regions, OR
		B1 1 of the 6 regions which should contain
		numbers is correct, ignore the other regions.
Set C		
1 5 7 11 13 17 19 23		If B5 awarded and zero placed in an empty region
		then -1
	5	
12 (0) = 245 OP 245 : (0)) M1	
12. $09 \times = 343$ OK $343 \div 09$		
$\overline{\mathbf{Z}}$ in a 150 (las) and $\overline{\mathbf{T}}$ in 5 (las)		ET movided M1 encended
Z_{Inc} 150 (kg) and T_{In} 5 (kg)	AI	F I provided MI awarded
		Answer only with reversed answers, then allow M1,
	2	AI
12. Strategy a g to look at equations is the same	5	I doo to fo ous on a torre more not house no list 1 to
15. Sualegy, e.g. to look at equations in the same	51	Idea to locus on x term, may not nave realised to
IOFM		consider like with like with y coefficient
OK focus on coefficient of x School $x = 2\pi + 2\pi$	D1	
Selecting $y = 3x + 8$ and $2y = 6x + 15$ as parallel	BI	
Explanation, e.g. the coefficient of x is the same in	BI	Only award if the correct lines selected
2 equations, so these 2 lines are parallel		Only accept 'same gradient' if the correct lines are
	-	selected
	3	

UNIT 1 - HIGHER TIER

Methods in Mathematics		Comments
June 2011 Unit 1Higher Tier		Post conference
1. (2, n) where $n \neq 1$ nor $n \neq 8$ (but must be on the grid given)	B2 2	B1 for an unambiguous correct plot(s) (irrespective of coordinates given or no coordinates given)
2. (a) $x = 135^{\circ}$	B1	
$y = 45^{\circ}$	B2 B1	B1 for sight of $180-135$. FT y = $180 - x$
$Z = 45^{-1}$ (b) Fither 360+5 or 3×180 or equivalent appropriate first step	BI B1	F I Z = Y OF Z = 180 - X
(b) Entre 500+5 of 5×100 of equivalent appropriate first step	B1	
Interior angle sum 540() 540 $(110 \pm 120 \pm 170)$	M1	FT their 540 provided this follows from 1 arithmetic error only
340 - (110 + 120 + 170)		Intention maybe implied by the answer
= 140	Al	ET provided M1 awarded
70(*)	A1 9	F 1 provided wit awarded
3. Any 3 comparisons and conclusions, e.g.	B3	B1 for each comparison and conclusion, maximum B3
• For comparison of numbers asked with implication		For B marks, ignore extra information given provided it is not
that sample size matters.		contradicting.
• For place survey carried out with implication that Harry's survey maybe biased		A conclusion maybe flagged by the word 'but'
 For may not be quite the same question asked with 		If no conclusions, but comparisons given then:
implication that answers cannot be compared.		B2 for any 3 reasonable comparisons, or
• For Jasmine asked women, implication survey biased		B1 for an 1 or 2 reasonable comparisons
to gender.		Do not penalise 'no conclusion' in QWC
QWC		OWC2 Presents relevant material in a coherent and logical
Relevance to surveys	QWC	manner, using
 spennig clarity of text explanations 	2	acceptable mathematical form, and with few if any errors in
e clarity of text explanations		spelling, punctuation and grammar.
QWC2: Candidates will be expected to		OWC1 Presents relevant material in a coherent and logical
• present relevant work clearly, with words explaining		manner but with some errors in use of mathematical form,
process or steps		spelling, punctuation or grammar
• make few if any mistakes in spelling nunctuation		OR
and grammar		acceptable mathematical form, with few if any errors in spelling,
QWC1: Candidates will be expected to		punctuation and grammar.
 present work clearly which is mostly relevant, with 		OWC0 Evident weaknesses in organisation of material, and errors
words explaining process or steps		in use of mathematical form, spelling, punctuation or grammar.
OK • make few if any mistakes in spalling punctuation		
and grammar and include units in their final answer		Notes:
		• If very fittle text (e.g. 2 fines) insufficient to check/award SPG, hence check the flow for meaning, if
		okay then QW1 if not QWC0.
		okay.
		• Mutations in Welsh: follow the same guidance as tense
	5	in English medium.
4. (a) 15	B1	
(b) 72	B2	B1 for finding some multiples for both numbers, or for working
(a) True frequencies of a situation of the H of	D1	with products of factors for both numbers
(c) I wo fractions correctly written in a form that allows for	ВІ	Allow reasonably accurate diagrammatic form
For all three correctly written in a form that allows for	B1	E.g. 8/30, 5/30, 12/30 or 1/3.75, 1/6, 1/ 2.5. or
comparison		· · · · · · · · · · · · · · · · · · ·
2/5, 4/15 and 1/6 in this order or equivalent	B1	CAO. Answer only allow final B1 only
(d) Method to find primes 2557	M1	At least 1 prime found before second error
3, 5, 5, 7 $3 \times 5^2 \times 7$	AI B1	1 gnore 1s Correct FT with no 1s and at least one power >1
	9	Allow inclusion of power 1 shown

Methods in Mathematics		Comments
June 2011 Unit 1Higher Tier		Post conference
5.(a) All numbers 1 to 24 correctly placed	B5	First look for duplicates, then cross out the correct ones.
		B4 4 or 5 of the 6 regions which should contain numbers are
Set A Set B		correct, ignore the other regions, OR
		B3 3 of the 6 regions which should contain numbers are correct
		ignore the other regions OR
		B2 2 of the 6 regions which should contain numbers are correct,
		ignore the other regions, OR
		D1 1 of the 6 regions which should contain numbers is correct
		ignore the other regions
		If B5 awarded and zero placed in an empty region then -1
1 5 7 11 13 17 19 23		FT from their Venn diagram or as if restarted a fresh
		Do not accept incorrect notation.
(b)(i) $8/24$ (=1/3) or equivalent	B1	An answer of 0.3 is incorrect cancelling of fractions Accent 0.33
(ii) $12/24$ (=0.5) or equivalent	B1	
(iii) $12/24$ (=0.5) or equivalent	B1	
	8	
6. $69 \times = 345$ OR $345 \div 69$	M1	
5 Zing 150 (kg) and Tin 5 (kg)	Al	ET provided M1 enverded
	3	Γ I provided MT awarded Answer only with reversed answers, then allow M1 Δ 1
7. Strategy, e.g. to look at equations in the same form	<u>S1</u>	Idea to focus on x term, may not have realised to consider like
OR focus on coefficient of x	~ -	with like with y coefficient
Selecting $y = 3x + 8$ and $2y = 6x + 15$ as parallel	B1	
Explanation, e.g. comparing m in $y = mx + c$	B1	Only award if the correct lines selected
	2	Only accept 'same gradient' if the correct lines are selected
8(a)(i) = 60	3 B2	B1 any 2 terms correct in correct position or for 5, 6, 9, or for
0.(a) (1) 0, 7, 14	D2	$1^2 + 5, 2^2 + 5, 3^2 + 5$
(ii) 10th (term) or 105	B1	Do not accept '10'
(b) $x(x + 4)$	B1	FT until 2nd error in parts (c) and (d)
(c) $3y = h + 4$	B1	
y = (h + 4)/3 ISW (d) $24y + 18 + 15y = 40$	BI B1	
(d) 24y + 18 + 15y - 40 = 39y - 22	B1 B1	
(e) $3w^4 - 5w$	B2	B1 for each term
(f) 23	B2	B1 for 20 or +3
(g) $(x-5)(x+2)$	B2	B1 for $(x 5)(x 2)$
x = 5 and $x = -2$	B1	FT from their pair of brackets
9 Initial strategy e.g. multiplying hours by pay per hour	15 \$1	Sight of $8 \times r$ or $2 \times 8 \times t$ or $16 \times t$
The idea of algebraic form which equates	51	516H 01 0/2 01 2/0/1 01 10/1
rate of pay \times hours + different rate of pay \times different hours =	M1	Or equivalent, maybe rearranged from this.
total pay		Needs to be in terms of x , t and W
$8 \times x + 2 \times 8 \times t = W$	A1	
$2 \times 8 \times t = W - 8 \times x$	A1	This maybe implied by rearranged form
		Some candidates may start with this form if algebra incorrect
		possible S1 M1, algebra correct S1 M1 A1 A1 so far
$t = (W - 8 \times x) / 16$	A1	CAO
	5	
10. $5(.0) \times 10^4$	B2	B1 for $0.5 \times 10^{\circ}$ or 50000, i.e. correct answer but incorrect format
11 Strategy e.g. Square + number (maybe numeric) OP	2 S1	OR break down into square + number of rectangles for a counter
attempt to look at second difference	51	of patterns.
		Maybe implied by $n^2 + \dots$
$(n + 1)^2 + \dots$ OR second difference 2	M1	
$(n + a)^2 + n$ OR $n^2 + + 1$ or $n^2 + 3n +$	M1	
$(n+1)^2 + n \text{ OR } n^2 + 3n + 1$	A1	CAO. Mark their final answer
	4	Allow 3 marks for $n+1 \times n+1 + n$

Methods in Mathematics		Comments
June 2011 Unit 1Higher Tier		Post conference
12. (a) $((n+1)^2 =)$ $n^2 + 2n + 1$ or $n^2 + n + n + 1$ Conclusion that $n^2 + 2n + 2$ greater	M2 A1	In (a) & (b) answer only without working gets no marks M1 if 1 error in expansion. $n^2 + 1$ is 2 errors CAO If no marks, then SC1 for correct choice based on 1 trial value correctly evaluated
(b) $x = 0.121212$ and $100x = 12.1212$ with intention to subtract x = 12/99 Conclusion that 0.1212 (120/990) is greater	M1 M1 A1 6	Or 119/990 = 0.120 (final zero needs to be shown) Or 119/990 = 0.1202()
13. (a) (i) 4 (ii) 1/5 or 0.2 (b) 70 -10\pi - 7 $\pi + \pi^2$ (c) $\sqrt{32} = \sqrt{(2 \times 16)}$ or $4\sqrt{2}$ { $(\sqrt{32} - \sqrt{2})^2$ } = $(4\sqrt{2} - \sqrt{2})^2$ {= $(3\sqrt{2})^2$ } = 18 (d) 77 $\sqrt{2}$	B2 B2 B1 M1 M1 A1 B2 12	B1 for correct first stage of working, e.g. 2^2 or $\sqrt{8}^2$ B1 for correct first stage of working, e.g. $1/25^{1/2}$, 5^{-1} , sight of (±)5 B1 for 3 of the 4 terms correct CAO. Penalise further incorrect simplification. OR M2 for 32 - $\sqrt{2}\sqrt{32}$ - $\sqrt{2}\sqrt{32}$ + 2, or award M1 for 3 of the 4 terms correct CAO B1 for 154=2×7×11 or correct partial simplification
14.		Allow E marks as independent marks
(a) $8 \times 12 = 6 \times w$ w = 16 (cm) Intersecting chords (b) $x = 45^{\circ}$ Alternate segment theorem (c) $y = 62^{\circ}$ Cyclic quadrilateral sum of opposite angles 180° (d) $z = 33^{\circ}$ Angle at the centre is twice the angle at the circumference	M1 A1 E1 B1 E1 B1 E1 B1 E1 9	Calculation alone without reason does not gain E1 Accept 'product of chords (is equal)' Calculation alone without reason does not gain E1 Accept 'angle in opposite segment (is equal)', 'angle between tangent and chord is equal to the angle opposite' Calculation alone without reason does not gain E1 Do not accept 'opposite angles sum 180' Calculation alone without reason does not gain E1
15. (a) 1 - P (even, even) OR "only 1 even, other must be odd" 1 (b) P(odd, even) + P(even, odd) $= 4/5 \times 1/4 + 1/5 \times 4/4$ = 8/20 (= 2/5) (c) P(odd, odd) $= 4/5 \times 3/4$ = 12/20 (= 3/5)	M1 A1 M1 M1 A1 M1 A1	Penalise incorrect cancelling of fractions once only,-1 Accept 20/20 or 10/10, or only if not incorrectly cancelled. Accept "certain" as M1 only For correct answers, check it comes from a correct method SC1 for a correct answer from 10 possibilities SC1 for a correct answer from 10 possibilities

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