GCSE MARKING SCHEME

METHODS IN MATHEMATICS
(LINKED PAIR PILOT)

JANUARY 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 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.

METHODS UNIT 1
FOUNDATION TIER

Methods in Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
1. (a) 9608 fifteen million (b) 135 27 63 6 (c) 10,11,20,30 (d) 850	B1 B1 B1 B1 B1 B1 B2 B1 9	 Accept 15 million B1 for 2 or 3 correct answers with no incorrect factors of 24, or B1 for 4 correct with 1 incorrect
2. B D A C E	B1 B1 B1 B1 B1 5	
3. (a) A(3,2) plotted B(-3,-4) plotted (b) (0, -1)	B1 B1 B1 3	Reverse coordinates no marks FT for A and B in their diagram
4. (a) A at 0 (b) B at or near $^1/_3$ (c) $^1/_{200}$ (d) 1 - x	B1 B1 B1 B1 4	
5. (a) For 2 correct in a form which allows comparison. For all 3 correct in a form which allows comparison ¾, 70/100, 0.6 (b) total ticket cost (£)18.4(0) Each ticket 18.4(0) ÷ 4 = (£)4.6(0) total from friends = (£)13.8(0)	B1 B1 B1 B1 M1 A1 A1 7	 CAO FT their 18.4(0) FT their correct evaluation of 3 × their 4.6(0) or 18.40 – 4.60
6. (a) 33 (b) 30 Subtract three (from previous term) (c) (i) 68 (ii) 7 (d) (31 – 7) × 4 = 16	B1 B1 B1 B1 B1 M1 A1 7	 Accept subtract 3 (from previous term). B0 for -3.

Methods in Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
7. (a) $x = 46(^{o})$ (b) $360 – 110 – 153 – 54$ $= 43$ $m = 137\ (^{o})$ (c) 90 (rectangle) + $(180 – 30 – 90=60)$ $= 150(^{o})$ (d) sight of $60(^{o})$ Attempt to use $180 – 72 - 60$ $= 48\ (^{o})$	B1 M1 A1 B1 E2 S1 M1 A1 9	 180 – 'their 43' E2 for full explanation, E1 for partial.
8. (a) $21y$ $13x + 18$ (b) $a = 11$ (c) $95x$(pence)	B1 B2 B1 B1 5	 B1 for $13x$. B1 for +18. Penalise further work -1 if B2 awarded.
9. (a) 9 11 12 8 10 11 7 9 10 (b) $^{13}/_{24}$ (c) Sight of $^{3}/_{24}$ $^{3}/_{24} \times 480$ 60	B2 B2 B1 M1 A1 7	B1 for correct row or column B1 for denominator 24 or B1 for numerator 13 in a fraction less than 1. FT their table FT 'their $^{3}/_{24}$'
10. 2 more hexagons drawn with at least one that meets given hexagon. At least 4 hexagons tessellating correctly. Yes & reason given, e.g. shapes fit together with no gaps	M1 A1 E1 3	
11. a = 55 b = 55 c = 85 d = 85	B1 B1 B1 B1 4	NO FT in this question
12. (a) The numbers 1 to 8 placed correctly (b) $^{2}/_{8}$ ($=^{1}/_{4}$) $^{1}/_{8}$	B2 B1 B1 4	B1 for 6 of the 8 placed correctly, hence up to 2 omitted or incorrectly positioned FT from their Venn diagram. Ignore incorrect cancelling FT from their Venn diagram. Ignore incorrect cancelling *Penalise incorrect notation once only, -1*

Methods in Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
13. Strategy to start to find factors, e.g. at least 2 for one of the square numbers given	S1	
Complete set of factors for a sq. number other than 1, seen or implied	B1	E.g. 1, 2 and 4 or 1, 3 and 9 (or 1, 5, 25) E.g. 1, 2, 4, 8, 16 (or 1, 2, 3, 4, 6, 9, 12, 18, 36)
Complete set of factors for a sq. number with more than 3 factors, seen or implied	B1	*SC1 if neither B1 award due to forgetting 1 and itself as factors*
Conclusion from working that the square numbers (given) have an odd number of factors	E1	Not FT, correct conclusion needed, i.e. odd number of factors
A complete set of factors for a square number >16	B1	
Explanation of why, e.g. "middle factor used twice" or "pairs of factors but also the square root of the number'	E1	
Must be relevant work for the problem given, otherwise QWC0 However, for an incorrect strategy but well expressed, then maximum QWC1 Look for • relevance • spelling • clarity of text explanations, • the use of notation (watch for the use '=' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	Q W C 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
	8	

Methods in Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
14. (a) Method of finding a prime factor 2, 2, 3, 3, 7 and 7 $2^2 \times 3^2 \times 7^2$ (b) 6n + 7	M1 A1 B1 B2 5	Need to see two correct prime factors before an error Ignore ones FT provided at least one index>1 B1 for 6n + …

METHODS UNIT 1
HIGHER TIER

Methods Unit 1 January 2011 Higher Tier Mark scheme		Post Conference
1.(a)(i) 9(5 - -3) / 3 = 72/3 or 3×8 = 24 (ii) 9 (b) q = u – 5t (c) 7(p + 3) (d) -3f (e) 6x + 12	M1 M1 A1 B1 B1 B1 B1 B1 8	Allow an error in signs, maybe implied by an answer of 18/3 Correct substitution, with one correct step in evaluation CAO. (*M1 M0 A0 is awarded for an answer of 18/3 or 6)*
2. a = 55 b = 55 c = 85 d = 85	B1 B1 B1 B1 4	NO FT in this question
3.(a) (i) The numbers 1 to 8 placed correctly (ii) 2/8 (=1/4) 1/8 (b) (15+20) / (50+50) = 35/100 E.G. "Improved by more throws"	B2 B1 B1 M1 A1 E1 7	B1 for 6 of the 8 placed correctly, hence up to 2 omitted or incorrectly positioned FT from their Venn diagram. Ignore incorrect cancelling FT from their Venn diagram. Ignore incorrect cancelling *Penalise incorrect notation once only, -1* Ignore incorrect cancelling Allow SC1 for an answer of 35/100 from 15/50 + 20/50, i.e. correct answer from incorrect notation. 35/100 without working is M1 A1, 35/100 from 15/50 and 20/50 is M1 A1
4.(a) 1760/8 = 220 Ruth (£) 440 and Joanne (£)1100 (b) 0.25 and 0.3 entered as terminating decimals $1/9 = 0.11(111\ldots.) \text{ or } 0.\dot{1}$ $5/6 = 0.83(333..) \text{ or } 0.8\dot{3}$ 0.11(111…) and 0.83(333…) entered as recurring decimals	M1 A1 A2 B1 B1 B1 B1 8	A1 for either correct. If answers reversed A1 Must be written as decimals Accept as fraction notation

Methods Unit 1 January 2011 Higher Tier Mark scheme		Post Conference
5. Strategy to start to find factors, e.g. at least 2 for one of the square numbers given	S1	
Complete set of factors for a sq. number other than 1, seen or implied	B1	E.g. 1, 2 and 4 or 1, 3 and 9 (or 1, 5, 25) E.g. 1, 2, 4, 8, 16 (or 1, 2, 3, 4, 6, 9, 12, 18, 36)
Complete set of factors for a sq. number with more than 3 factors, seen or implied	B1	*SC1 if neither B1 award due to forgetting 1 and itself as factors*
Conclusion from working that the square numbers (given) have an odd number of factors	E1	Not FT, correct conclusion needed, i.e. odd number of factors
A complete set of factors for a square number >16	B1	
Explanation of why, e.g. "middle factor used twice" or "pairs of factors but also the square root of the number'	E1	
Must be relevant work for the problem given, otherwise QWC0 However, for an incorrect strategy but well expressed, then maximum QWC1	Q W C 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
Look for • relevance • spelling • clarity of text explanations, • the use of notation (watch for the use '=' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	8	QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
6. Initial strategy, e.g. an appropriate diagram or considering 360° or 168°	S1	
360/12	M1	OR M1 for angle at centre is $180 - 2\times168/2$ followed by 360/12
= 30 (or equivalent)	A1	
Explanation, e.g. repeated 30 times, 30 sides, 30 angles, regular polygon	B1	FT their findings. This must be an interpretation, not implied
Conclusion, "Yes" it will from suitable working	B1 5	FT Yes or No from logic of working
7. (a) Method of finding a prime factor 2, 2, 3, 3, 7 and 7	M1 A1	Need to see two correct prime factors before an error Ignore ones
$2^2\times3^2\times7^2$	B1	FT provided at least one index>1
(b) 6n + 7	B2	B1 for 6n + …
(c) n^2 + … n^2 + 1	M1 A1 7	Second difference of 2
8. (a) 0.3, 0.4, 0.4 and 0.6 on the correct branches	B2	B1 for one correct entry
(b) 0.7×0.6	M1	
= 0.42	A1	
(c) Walking to work, bus home	B1	FT most unlikely from their tree. Accept sight of 0.3×0.4 or 0.12
Statement, e.g. '0.3×0.4 (= 0.12) which is the smallest (probability)' or 'only 0.12'	E1 6	FT most unlikely probability <1 from their tree. For E1 accept they are the smaller (or smallest) probabilities (in each case). 0.3×0.4 or 0.12 without a statement is E0

Methods Unit 1 January 2011 Higher Tier Mark scheme		Post Conference
9.(a) 5	B1	
(b) 9.3×10^{-5}	B1	
(c) 4×10^{7}	B2	B1 for 40 000 000 or …. $\times 10^{7}$
(d) 2	B3	B2 for sight of $4^{-2} = 1/16$ and $8^{1/3} = 2$ OR B1 for either of these
	7	
10. (a) Attempt substitution of one value of x between 0 & 4	M1	
Two correct points on the line given (or plotted)	A1	
Correct straight line drawn	A1	CAO *SC1 for a straight line with correct gradient of 5*
(b) For rearrangement $y = -6x/3 + 8/3$ or other strategy to find m	M1	
Gradient of given line is -2 (or -6/3)	A1	Do not award A1 if M1 awarded but rearrangement is incorrect
Any equation equivalent to $y = -2x \pm c$ where $c \neq 8/3$	A1	FT from their gradient provided M1 awarded
(c) C	B1	
(d) Appropriate sketch, in the two required quadrants	B2	B1 for sketch correct in one quadrant
	9	
11. (a) $k \times 15 = 5 \times 24$	M1	**All E marks are dependent on M1 or B1 mark in each section**
$k = 8$ (cm)	A1	
Intersecting chords	E1	Accept "rectangle property of a circle"
(b) $m = 60°$	B1	
Alternate segment theorem	E1	Or similar description
(c) Angle at A is 40°	B1	
$n = 80°$	B1	FT $2 \times$ angle A
Cyclic quadrilateral AND angle at the centre twice that at the circumference	E1	Or full description of an alternative method
	8	
12.(a) $15x^2 + 21x - 10x - 14$	B1	
$= 15x^2 + 11x - 14$	B1	FT from one error in the 4 terms
(b) $(11d + 5)(11d - 5)$	B2	B1 for $(11d \ldots 5)(11d \ldots 5)$
(c) $(4y + 3)(5y - 2)$	B2	B1 for $(4y - 3)(5y + 2)$ or split mid term and 1st step factor
-3/4 and 2/5	B1	FT from a pair of brackets
(d) $(x + 7)^2 - 2$	B2	B1 for a=7 and B1 for b=-2
(e) Numerator $8(3f - 2) - 5(f - 4)$	M1	
Denominator $(f - 4)(3f - 2)$	M1	
$\frac{19f + 4}{(f - 4)(3f - 2)}$	A2	FT 1 error to allow A1 or for incorrect expansion of the denominator. If A2, penalise further incorrect work -1 *SC1 for sight of 19f + 4 if no other marks awarded*
(f) Attempt to use a common denominator	M1	Or $\times$ both sides by 66
$3 \times 2 \times 3x + 22(x-3) + 3 \times 11(4x+5)$ (/66)	A1	
$(\frac{18x+22x-66+132x+165}{66})$ Convincing $\frac{172x + 99}{66}$	A2	A1 for 1 slip or no conclusion to the identity
	17	
13.(a) 0.8 x 1 or equivalent, AND an attempt to consider the other 20%	M1	Not for sight of 80% alone
0.2 x 0.25 or equivalent	M1	
Showing the need to add (0.8 + 0.05)	M1	Method considers 80% + 25% of 1/4
0.85 or equivalent	A1	
(b)Probability from part (a)$\times$40	M1	FT from part (a), apart from 80% giving an answer of 32, this is M0 A0
34	A1	FT from part (a), apart from 80%
	6	

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