



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.

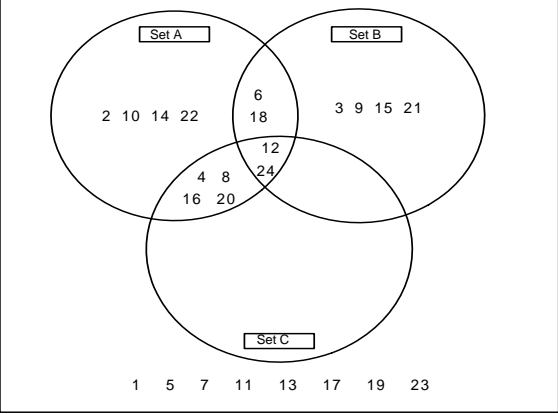
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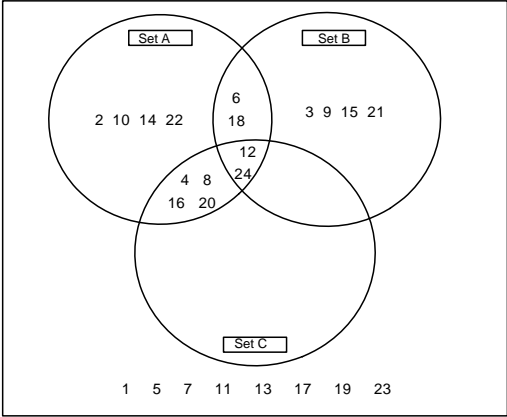
GCSE METHODS IN MATHEMATICS

UNIT 1 - FOUNDATION TIER

Methods in Mathematics June 2011 Unit 1 Foundation Tier	Mark	Comments Post Conference
1. (a) (i) 6047 (ii) twenty eight million (b) (i) 32 & 28 (ii) 53 & 23 (iii) 39 (iv) 54 (c) 1, 3, 9, 27 (d) multiple	B1 B1 B1 B1 B1 B2 B1 9	B1 for 2 or 3 correct factors with no incorrect factors OR 4 correct factors and only 1 incorrect, Ignore duplicates.
2. Square Rhombus Parallelogram Kite Trapezium	B1 B1 B1 B1 B1 5	
3. (a) Eg. Unequal number of boys and girls and Conclusion incorrect (stated or implied) (b) A at or near $\frac{1}{6}$ B at $\frac{1}{2}$ C at 0 (c) (i) (H,1) (H,2) (H,3) (H,4) (H,5) (H,6) (T,1) (T,2) (T,3) (T,4) (T,5) (T,6) (ii) $\frac{1}{12}$ or equivalent (d) $1 - (0.2 + 0.5)$ or equivalent = 0.3 or equivalent	E2 B1 B1 B1 B2 B1 M1 A1 10	E1 for partial explanation or eg just 11/30 Do not award E1 for statement incorrect only. For position of 'A' accept >0 but $<1/4$ B1 for 7 correct. Order unimportant. Ignore duplicates. Accept only fractions, decimals or percentages for probability.
4. (a) 29 (b) 64 Multiply (previous term) by 2 (to get the next term) (c) Subtract 1, multiply by 3 (d) (i) correct pattern drawn (ii) 5, 9, 13, 17 (iii) 33 (e) $a = 21 + 5$ = 26 (f) 13y (g) $4x + 7y$ (h) (i) Point plotted at (-2,-3) (ii) (3, -1)	B1 B1 B1 B1 B1 B2 B1 M1 A1 B1 B2 B1 B1 B1 15	Accept times by 2, doubling or $\times 2$ Award B0 for 'it's the 2 times table' Accept -1×3 B1 for 3 correct entries Accept $3 \times 7 + 5$ for M1 if an attempt to multiply. For $37 + 5$ award M0. Award B1 for either $4x$ or $+ 7y$ within an expression Award B0 if reversed coordinates Award B0 if reversed coordinates

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5. (a) For 2 correct in a form which allows comparison. For all 3 correct in a form which allows comparison $\frac{70}{100}, 0.65, \frac{3}{5}$ (b) 200×12 $= 2400$ 60×4 $= 240$ 2640	B1 B1 B1 M1 A1 M1 A1 B1 8	CAO FT from 1 error if both M marks are awarded.
6. (a) $(180 - 90) \div 2$ $= 45^\circ$ (b) 39° $360 - 115 - 142 - 39$ $y = 64^\circ$	M1 A1 B1 M1 A1 5	Look at diagram. FT 'their 39° ' but not given 141°
7. (a) 225 (b) 4 (c) Explanation eg multiplication carried out 1st followed by addition And Simon is correct or implied by their calculations	B2 B1 E2 5	B1 for either 9 or 25 Award B0 for $4 \times 4 \times 4$ or 4^3 or 16×4 Award E1 for statements such as Carly has done them in the wrong order. Do not award E1 for 'Simon' only.
8. $x = 135^\circ$ $y = 45^\circ$ $z = 45^\circ$	B1 B2 B1 4	B1 for sight of 180–135. FT $y = 180 - x$ FT $z = y$ or $z = 180 - x$
9. Any 3 comparisons and conclusions, e.g. <ul style="list-style-type: none"> • For comparison of numbers asked with implication that sample size matters. • For place survey carried out with implication that Harry's survey maybe biased. • For may not be quite the same question asked with implication that answers cannot be compared. • For Jasmine asked women, implication survey biased to gender. QWC <ul style="list-style-type: none"> • Relevance to surveys • spelling • clarity of text explanations QWC2: Candidates will be expected to <ul style="list-style-type: none"> • present relevant work clearly, with words explaining process or steps AND <ul style="list-style-type: none"> • make few if any mistakes in spelling, punctuation and grammar QWC1: Candidates will be expected to <ul style="list-style-type: none"> • present work clearly which is mostly relevant, with words explaining process or steps OR <ul style="list-style-type: none"> • make few if any mistakes in spelling, punctuation and grammar and include units in their final answer 	B3 QWC 2 5	B1 for each comparison and conclusion, maximum B3 <i>For B marks, ignore extra information given provided it is not contradicting.</i> A conclusion maybe flagged by the word 'but'. If no conclusions, but comparisons given then: B2 for any 3 reasonable comparisons, or B1 for an 1 or 2 reasonable comparisons Do not penalise 'no conclusion' in QWC 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 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. Notes: <ul style="list-style-type: none"> • 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 generally the text flows okay. • Mutations in Welsh: follow the same guidance as tense in English medium.

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10. Method to find primes $3, 5, 5, 7$ $3 \times 5^2 \times 7$	M1 A1 B1 3	At least 1 prime found before second error Ignore 1s Correct FT with no 1s and at least one regions >1 Allow inclusion of power 1 shown
11. All numbers 1 to 24 correctly placed 	B5 5	<u>First look for duplicates, then cross out the correct ones.</u> B4 4 or 5 of the 6 regions which should contain numbers are 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 B1 1 of the 6 regions which should contain numbers is correct, ignore the other regions. <i>If B5 awarded and zero placed in an empty region then -1</i>
12. $69 \times \dots = 345$ OR $345 \div 69$ 5 Zinc 150 (kg) and Tin 5 (kg)	M1 A1 A1 3	FT provided M1 awarded Answer only with reversed answers, then allow M1, A1
13. Strategy, e.g. to look at equations in the same form OR focus on coefficient of x Selecting $y = 3x + 8$ and $2y = 6x + 15$ as parallel Explanation, e.g. the coefficient of x is the same in 2 equations, so these 2 lines are parallel	S1 B1 B1 3	Idea to focus on x term, may not have realised to consider like with like with y coefficient Only award if the correct lines selected Only accept 'same gradient' if the correct lines are selected

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

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12. (a) $((n+1)^2 =) n^2 + 2n + 1$ or $n^2 + n + n + 1$ Conclusion that $n^2 + 2n + 2$ greater (b) $x = 0.121212\dots$ and $100x = 12.1212\dots$ with intention to subtract $x = 12/99$ Conclusion that $0.1212\dots$ ($120/990$) is greater	M2 A1 M1 M1 A1 6	<i>In (a) & (b) answer only without working gets no marks</i> 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 Or $119/990 = 0.120$ (final zero needs to be shown) Or $119/990 = 0.1202(\dots)$
13. (a) (i) 4 (ii) $1/5$ or 0.2 (b) $70 - 10\pi - 7\pi + \pi^2$ $= 70 - 17\pi + \pi^2$ (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 B2 B1 M1 M1 A1 B2 12	B1 for correct first stage of working, e.g. 2^2 or $\sqrt[3]{8^2}$ B1 for correct first stage of working, e.g. $1/25^{1/2}$, 5^{-1} , sight of $(\pm)5$ 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 $154 = 2 \times 7 \times 11$ or correct partial simplification
14. (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	<u>Allow E marks as independent marks</u> 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" $\frac{1}{1}$ (b) $P(\text{odd, even}) + P(\text{even, odd})$ $= \frac{4}{5} \times \frac{1}{4} + \frac{1}{5} \times \frac{4}{4}$ $= \frac{8}{20} (= \frac{2}{5})$ (c) $P(\text{odd, odd})$ $= \frac{4}{5} \times \frac{3}{4}$ $= \frac{12}{20} (= \frac{3}{5})$	M1 A1 M1 M1 A1 M1 M1 A1 8	<u><i>Penalise incorrect cancelling of fractions once only, -1</i></u> 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 <i>SC1 for a correct answer from 10 possibilities</i> <i>SC1 for a correct answer from 10 possibilities</i>



WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk