GCSE MARKING SCHEME

SUMMER 2016

**GCSE MATHEMATICS LINEAR PAPER 1
HIGHER TIER**

4370/05

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was 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 conference was to ensure that the marking scheme was 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' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

Summer 2016 Linear Paper 1 **Higher Tier**	**Marks**	**Comments**
1. 105(°)	B3	Allow even if contradicted on the diagram B2 for sight of 75(°) (including as a final response or incorrectly placed on the diagram) B2 for sight of 105(°) in working not as an answer or contradicted as a final response in the answer space B2 for working: 38 + 67 or 180 – 75, or the intention of either calculation, allowing missing brackets 180 – (180 – 38 - 67) (= 38 + 67) or 180 – (180 – 38 – (180 – 113) (= 180 – 75), or OR B1 for any further unambiguous correct angle indicated on the diagram: 113(°), 67(°), 38(°) or 142(°), or B1 for working: 180 – 38 – 67 or 113 – 38 or 180 – 38 –(180 -113), or equivalent
2. 400×7÷10 or 400 - 400×3÷10 or equivalent 280(cm) 280 ×³⁄₅ or 280 – 280×2÷5 or 280 – 112 168(cm) 56 (cm)	M1 A1 M1 A1 B1	May be implied in further calculation *Incorrect working leading to 280 is M0 A0, e.g.* *3/10 × 400 + 2/5 × 400 = 120 + 160 = 280* FT 'their 280' provided < 400 May be implied in further calculation FT 'their 168' ÷ 3 correctly evaluated (rounded or truncated) provided **either** at least M1 previously awarded **or** 'their two stages of calculations' previously attempted (However if 3/10 & 2/5 used throughout SC marks may be awarded instead of possible B1 if a higher mark can be awarded) *For consistent use of 3/10 and 2/5 award:* *SC3 for an answer of 16(cm from 400 × 3/10 × 2/5 ÷3), or* *SC2 for workings equivalent to 400 × 3/10 × 2/5 ÷3 (may be in stages), or* *SC1 for an answer of 48(cm from 400 × 3/10 × 2/5)*
3(a) Descriptions of no correlation, e.g. 'no relationship', 'no correlation', 'none', 'no connection'	B1	Do not accept '(all) scattered (about)', or 'random', or 'neutral', 'no pattern' Allow if a correct response is given with one of the phrases listed above. Do not allow a correct response with an incorrect response, e.g. 'none but slightly positive'
3(b) <table><tr><td>Name</td><td>Height (cm)</td><td>Mark</td></tr><tr><td>Dewi</td><td>145</td><td>80</td></tr><tr><td>Charlotte</td><td>163</td><td>80</td></tr><tr><td>Henri</td><td>176</td><td>92</td></tr><tr><td>Gareth</td><td>145</td><td>34</td></tr></table>	B3	All entries correct Accept mark entries as a fraction of 100, or written as a percentage B2 for any 5, 6 or 7 entries correct, or if the correct entries in the table but they are in reversed columns, OR B1 for any 3 or 4 entries correct, or for any 5, 6 or 7 reversed entries in the table

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
4(a) Correct reflection	B2	B1 for the sight of the line x = 1, or a reflection in any vertical line or in the line y = 1 B0 if more than one triangle drawn, unless all are reflections in a vertical line
4(b) Correct enlargement Correct position	B2 B1	B1 for any 2 adjacent lines or any 3 points correct in appropriate positions Intention of correct placement, i.e. with appropriate rays seen, or correct positioning of at least two vertices *Penalise consistent incorrect scale factor -1*
5(a)(i) $6n + 9$	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of 6n
5(a)(ii) $-4n + 34$ or $34 - 4n$	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of -4n or '+34'
5(a)(iii) $n^2 - 2$	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of n^2 (that is $1n^2$) or showing second difference of 2 at least twice
5(b) 103	 B3	**Look at the answer space first for the candidate's response** Only award B3 if the candidate is indicating 103 as their response Accept 'n = 22 gives a <u>value</u> of 103' in the answer space, or in working and not contradicted in the answer space B2 for n > 85/4, or **response** (n =) 22 (sight of 103 is not required), or for trial n=21 with 99 seen, or for trial n=23 with 107 seen. Trial or selection of (n=) 22 **and** 103 in working, without stating 103 as the answer (e.g. in the answer space), is awarded B2 OR B1 for sight of 4n + 15 > 100, or for sight of (n =) 21.25 or (n=) 85/4, or for at least 2 trials of n ≥ 10 with terms calculated correctly, or for any 2 of the values 59, 63, 67, 71, 75, 79, 83, 87, 91, 95, 99 seen within a sequence
6. Accurate perpendicular bisector constructed with all necessary arcs Accurate bisection with evidence of all necessary arcs and an angle 45° (±2°)	B1 B2	*No marks if no arcs or spurious arcs* Accept 1 pair of arcs with a correct midpoint Accept a construction of 90° with arcs from a measured midpoint Tolerance is ±2mm and ±2° B1 for pair of arcs on appropriate lines with an attempt at the next step, but some inaccuracy

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
7. (% of daily calories 25% of 1920 =) 480 (calories)	B1	
(Number of bags needed) 480÷160	M1	FT 'their 480' provided attempt at 1920×25÷100 or 1920÷4 or equivalent is seen or implied
(=) 3	A1	May be implied in later working
(Number of almonds eaten 3 × 20) ×20	m1	
60 (almonds)	A1	FT 'their 3'×20 evaluated provided attempt to find 25% of 1920 and M1, m1 previously awarded

__Alternatives__
(% of daily calories 25% of 1920 =)   480 (calories)   __B1__

160÷20   __M1__
= 8 (calories per almond)   __A1__
(May be implied in later working)

(Number of almonds)   480÷8   __m1__
(FT 'their 25% of 1920'÷ 'their 160÷20')
60 (almonds)   __A1__
(FT provided attempt to find 25% of 1920 and M1, m1 previously awarded)

__or__

(Number of bags in a full daily allowance is)
1920÷160   __M1__
= 12 (bags)   __A1__
(May be implied in later working)

(Number of bags 25% of allowance is ¼×12=) 3 (bags) __B1__
(FT 'their ¼ × 1920÷160 provided M1 previously awarded)

(Number of almonds eaten)   3 × 20   __m1__
(FT 'their ¼ × 1920÷160'×20 provided M1 previously awarded)
(Previous B1 & m1 calculations may be seen in either order)
60 (almonds) __A1__
(FT provided attempt to find 25% of 1920÷160 and M1, m1 previously awarded)

__or__

20 (almonds) with 160 (calories) used as a ratio   __M1__
e.g. sight of 40 almonds is 320 calories or similar
Use of ratio or multiples that lead to 1920 (calories)   __m1__
240 (almonds is 1920 calories)   __A1__

(Number of almonds is) ¼ × 240   __M1__
(FT provided M1, m1 previously awarded)
60 (almonds)   __A1__
(FT provided M1, m1 previously awarded AND attempt to find the number of almonds in 1920 calories)

If no marks, and no incorrect logic seen, then award SC2 for an answer of 60 almonds

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments

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 and include units 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 and include units in their final answer
	QWC 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(a) $5x - 3x = 65 - 17$
        $2x = 48$
          $x = 24$
	B1
	B1
	B1
		FT until 2nd error, then stop marking
		
		Must be simplified if possible for this final B1 mark

8(b) $x/4 = 28 - 12$ or $x/4 = 16$ or $x + 12 \times 4 = 28 \times 4$ $x = 64$	M1 A1	Mark final answer *Accept embedded answer, e.g. 64/4 + 12 = 28*
8(c) $y^2 + 8y$	B2	$y \times y$ must be written as y^2 & $8 \times y$ as $8y$ for B2 B1 for $y \times y + 8 \times y$, or B1 for 1 correct term, e.g. $2y + \textbf{8y} = 10y$ or $y + \textbf{8y} = 9y$ BUT do not accept from incorrect working, e.g. B0 for '$y + 8 = 8y$' Mark final answer, e.g. B1 only for '$y^2 + 8y = 8y^3$'
8(d) $y(3y - 1)$	B1	Mark final answer
8(e) $10x < 34$ or $10x < 42 - 8$ $x < 34/10$ or $x < 3.4$ or $x < 3\frac{4}{10}$ or $x < 3\frac{2}{5}$ or equivalent	B1 B1	Do not accept '=' FT from 1 error only. ISW *If '=' used but replaced by '<' to give final correct answer, allow B2* *Note: $10x < 42 + 8$ must lead to $x < 5$ to be awarded B0,B1*

9(a) Method with at least 2 correct prime factors
     Sight of correct factors (2, 2, 3, 3, 11)
          $2^2 \times 3^2 \times 11$ or $2^2 . 3^2 . 11$
	M1
	A1
	B1
		2 correct primes before 2nd error
		Ignore 1s seen
		FT their factors (with at least one index >1 used).
		Do not ignore 1s.

9(b) $(y =)$ 66	B2	FT from (a), provided equivalent difficulty B1 for $2 \times 3 \times 11$ or for 4356 or for 11 in the box or answer space
10(a) 1/8	B1	
10(b) 3.6×10^5	B1	
10(c) 0.0054	B1	

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
11(a) 5w = h - t w = $\underline{h-t}$ or equivalent 5	B1 B1	FT from 5w = h + t or similar 1 error made *Award B1, B0 for an answer of w = h − t ÷ 5*
11(b) aw + 3 = 4bw + 20 aw - 4bw = 20 – 3 OR 3 – 20 = 4bw – aw w(a – 4b) = 17 OR -17 = w(4b – a) w = $\underline{17}$ OR $\underline{-17}$ = w a – 4b 4b - a	B1 B1 B1 B1	Includes correct expansion FT until 2nd error Mark final answer. Do not accept a numerator 20 - 3

12(a)(i) Using 0.7 ×… = 0.63 or
                sight of 0.63÷0.7 or 0.63/0.7
        P(necklace) = 0.9 or equivalent
	M1
	
	A1	

12(a)(ii) Tree completed correctly (0.3, 0.9, 0.1, 0.9, 0.1 on appropriate branches)	B2	FT their '0.9', this could be 0.63 and 0.37 on second pairs of branches B1 for 0.3 with at least one other pair of branches total of 1
12(b) 0.3 × 0.1 = 0.03	M1 A1	FT attempt to multiply appropriate probabilities, provided no probability >1 FT for correct evaluation, provided not >1
13(a) 225 (people)	B1	Allow 224 (people)
13(b) (100 ×) 50÷400 or equivalent 12½(%) or 12.5(%)	M1 A1	 *If no marks allow SC1 for an answer of 87.5(%), i.e. percentage less than 15 seconds*
13(c) (Median) Answers in the range 9.4 to 9.5 (seconds) (Interquartile range) 13.25 to 13.35 - 6.75 to 6.8 6.45 to 6.6 (seconds)	B1 M1 A1	 *Check working, do not assume correct calculation from sight of an answer in the given range*

14.
Sight of x(x – 6) = - 5
 	
x^2 – 6x + 5 = 0
 	
        (x – 1)(x – 5)   (= 0)
 	
    x = 1   AND   x = 5   or equivalent
	
	B2
	
	B1
	
	M2
	
	A1
		Allow choice of a variable other than x
		Accept intention of brackets (invisible but used later)
		B1 for sight of x(x – 6) or x^2 – 6x
		Implies previous B2. Must be an equation
		
		Accept as an expression.
		See* below. M1 for (x … 1)(x … 5)
		FT from their pair of brackets, equivalent level of difficulty
		Do not FT from incorrect working that leads to (x − 1)(x − 5)
		
		If M0 A0, allow SC1 for answers 1 **and** 5 from trial & improvement or inspection
		
		If formula used, then M1 for correct substitution (allowing 1 slip in substitution), M1 for simplification of 'b^2-4ac' to 16, finally A1 for correct solutions simplified but surds not required
		
		*For final M2 & A1, FT from their quadratic equation (or expression) provided equivalent difficulty and has been derived from '… = -5'.

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
15. DÂB = 180(°) – w(°), stated or indicated on the diagram	B1	Allow w(°) = 180(°) - DÂB
Cyclic quadrilateral (opposite angles sum is 180°)	E1	Depends on previous B1
XÂY = DÂB =180(°) – w(°), stated or indicated, OR a statement 'vertically opposite angles' or 'equal angles with intersecting lines'	B1	Accept indication by arcs, or both angles indicated by the same 'value' or expression.
XÔY = 2(180(°) – w(°)) or XÔY = 360(°) – 2w(°)	B1	Implies award of previous B1 ISW working towards reflex XÔY Do not accept $2 \times 180(°) – w(°)$ (with missing brackets) or equivalent FT 'their angle at the centre' being indicated as twice 'their angle at the circumference' provided equivalent level of difficulty, i.e. at least 2 terms multiplied by 2 involved with any brackets required shown Only accept 'reflex XÔY = 2w(°)' if stated as reflex without contradiction on the diagram, or 2w(°) indicated as reflex XÔY on the diagram
Angle at centre is twice angle at circumference	E1	Allow FT from a response of $2 \times 180(°) – w(°)$ (missing brackets) or where FT has been similar giving B0, or correct rearrangement of the correct response, otherwise depends on previous B1 *Award B3 for a correct unambiguous XÔY without working, or from correct working.*
16(a) 4(x+6) + 8(2x-3) as a <u>numerator</u>	M1	
(2x-3)(x+6) as a <u>denominator</u>	M1	
20x / (2x-3)(x+6)	A1	CAO, mark final answer If (2x-3)(x+6) expanded, must be correct (Note: $(2x -3)(x+6) = 2x^2 + 9x – 18$) *If no marks then award SC1 for sight of 4(x+6) + 8(2x-3) = 20x in working*
16(b) (3x + 5)(3x - 5)	B2	B1 for (3x … 5)(3x … 5) including being written as either $(3x – 5)^2$ or $(3x + 5)^2$
2(3x + 5)	B1	
(3x − 5)/2	B1	FT provided no more than 1 previous error and provided simplification required. Mark final answer. Accept 1.5x – 2.5 Award B4 for sight of a correct answer
17. ($\sqrt{(2\times25)}$ - $3\sqrt{2}$)^2 or ($\sqrt{(2\times5\times5)}$ - $3\sqrt{2}$)^2 or sight of $\sqrt{50} = 5\sqrt{2}$ in working	M1	OR M1 50 - 3√50√2 -3 √50√2 + 18 any 3 terms correct (accept as terms given in table)
$(5\sqrt{2}$ - $3\sqrt{2})^2$ $(= (2\sqrt{2})^2)$	m1	m1 50 - 30 -30 + 18 any 3 terms correct or 50 - 60 + 18 with -60 correct and 1 other term (accept as terms given in table)
8	A1	CAO A1 8

Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
18(a) Correct sketch in 4 quadrants with -9 on the y-axis AND 3 & -3 on the x-axis	B3	B2 for an appropriate sketch in 4 quadrants with either -9 indicated (allow shown between -8 & -10) on the y-axis OR 3 & -3 indicated on the x-axis (ignore additional incorrect points indicated), or B2 for sketch only in 2 quadrants with -9 indicated on the y-axis AND -3 or 3 indicated on the x-axis OR B1 for an appropriate sketch in 4 quadrants without points indicated or with incorrect points indicated, or B1 for sketch only in 1 quadrant with -9 indicated (allow shown between -8 & -10) on the y-axis AND -3 or 3 indicated on the x-axis , or B1 for sketch only in 2 quadrants with -9 indicated on the y-axis *Penalise -1 if 'points' are joined with straight lines*
18(b) Move horizontal (Translate) to the left 2	B2	Alone, with no other movements Allow descriptions such as 'move to the left 2', or 'move left along x-axis 2', 'shift -2 horizontally' B1 for move (translate) horizontally (left or right), allow use of descriptions such as 'sideways' or 'along x-axis' Allow B1 translation shown graphically, provided it is not derived from plotted points with -5 and 1 indicated on the x-axis
19. **225**(°) or **315**(°)	B1	Allow an answer in the range 224(°) to **225**(°) or **315**(°) to 316(°) inclusive. (*Answers are actually 224.4(°) or 315.6(°) but, for a non calculator paper, such accuracy would be suspicious*)
The other angle, with no other values	B1	FT 540 – first answer, however only FT for reflex angles and be a unique second angle Accept embedded answers