GCSE MARKING SCHEME

AUTUMN 2016

MATHEMATICS (NEW)
UNIT 1 - HIGHER TIER

3300U50-1

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.

GCSE MATHEMATICS Unit 1 : Higher Tier Autumn 2016	✓	Mark	Comment
1.(a) 12		B1	
1.(b) $\frac{1}{12}$		B1	F.T. 1/'their (a)'
1.(c) $\frac{1}{6}$		B1	
2.(a) 6 −3		B2	B1 for each.
2.(b) 7 correct plots. Curve drawn.		P1 C1	**Use overlay.** F.T. 'their (−1,6)' and 'their (2,−3)'. Allow ± '½ a small square'. F.T. 'their plots'. At least 6 plots required. Clear intention to draw a curve through 'their plotted points'.
2.(c) −0·9 and 3·4		B2	B1 for each. Allow (−0·9, 5) and (3·4, 5). F.T. intersection of 'their curve' with $y = 5$ provided exactly 2 intersections seen on graph. Allow ± '½ a small square'. If no marks gained then SC1 for either of the following. $y = 5$ drawn correctly, OR *Two* correct F.T. values given for 'their straight line' and 'their curve' provided exactly 2 intersections seen on graph.
2.(d) $2x^2 - 5x - 6 = 0$		B1	
3.(a) $\frac{360}{45}$ = 8 (sides)		M1 A1	For a clear intention of finding how many 45s in 360. Accept embedded answer e.g. 360/8 = 45 or $45 \times 8 = 360$ for M1A1.
3.(b) Correct construction of 90°. Correct bisector of 90°. AB = 7cm AND BC = 7cm		 B2 B1 B1	Do not penalise if they use their own point A. **Use overlay** but arcs required for the 3 'angle marks'. With sight of accurate 'method arcs'. For this B2 the construction need not be at point B. (Final B1 will not then be awarded) B1 for sight of 'method arcs' but perpendicular line not drawn (unless intersection of construction arcs for 90° are correctly used to construct the 45° angle. In this case the B2 and B1 are gained). With sight of accurate 'method arcs'. F.T. 'their 90°'. Allow ± 0·2cm. Do not penalise if the line AB is extended as long as the position of point B is unambiguous. (Allow labelling of points B and C to be missing if end points are unambiguously identifiable.) *If all marks gained but angle ABC = 45°, penalise −1.*

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4. (a) $6m = y - 7$ or $y - 7 = 6m$ or $-6m = 7 - y$ $m = \frac{y-7}{6}$ or $m = \frac{7-y}{-6}$ or $m = (y - 7) \div 6$		B1 B1	F.T. only from $6m = y + 7$. B1B0 for $-m = \frac{7-y}{6}$ or equivalent. *Note* Unsupported $m = y - 7 \div 6$ is B0B0. Unsupported $\frac{y-7}{6}$ is B1BO ('m' missing)
4.(b) $6x(x - 2)$		B2	B1 for any partial correct factorisation. OR B1 for $6x(x - \ldots)$ OR B1 for $6x(\ldots. - 2)$
5.(a) $1{\cdot}5 \times 10^3$		B2	If B2 not awarded, B1 for sight of 1500 OR B1 for $1{\cdot}5 \times 10^n$ from a denominator of 5×10^3 seen OR B1 for $a \times 10^3$ with $1 \leq a < 10$ from a denominator of 5×10^3 seen.
5.(b) $6{\cdot}63 \times 10^4$		B2	B1 for $6{\cdot}6(\ldots.) \times 10^4$. B1 for any correct value but not in standard form
6. (Perimeter of square =) $4 \times (2x + 3y) = 62$	✓	B1	Sight of $8x + 12y = 62$ or equivalent e.g. $2x + 3y = 15{\cdot}5$
(Perimeter of octagon =) $8 \times (x + 2y) = 72$	✓	B1	Sight of $8x + 16y = 72$ or equivalent e.g. $x + 2y = 9$
Correct method to solve simultaneous equations, as far as attempt at subtraction	✓	M1	F.T. 'their equations'. Allow 1 'slip', if multiplication used, but not in 'equated variable' for M1 only.
$y = 2{\cdot}5$	✓	A1	
$x = 4$	✓	A1	F.T. from their 1st variable. (Substitution in any relevant equation.)
Organisation and Communication.	✓	OC1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical
Accuracy of writing.	✓	W1	For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

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7.(a) 0·3 on 'Hereford' branch.	✓	B1	
0·7 × P(Yes) = 0·42	✓	M1	Allow their notation for P(Yes).
P(Yes) = 0·6	✓	A1	
0·6, 0·4, 0·6 and 0·4 correctly placed.	✓	A1	F.T. 'their P(Yes)', if between 0 and 1 but not 0·5
7.(b) 0·3 × 0·4		M1	F.T. 'their values' if both between 0 and 1.
= 0·12		A1	
8. $4n - 23 > n$ OR $n < 4n - 23$	✓✓	B2	B1 for $4n \pm \ldots > n$ OR B1 for $4n - 23 > an + b$ $a \neq 0$ OR B1 for $4n - 23 \geq n$ B0 for $4n - 23 < n$.
(least number of marbles =) 8	✓✓	B2	F.T. from 'their inequality', if of equivalent difficulty. (e.g. $4n - 23 > n + 23$ giving an answer of 16) B1 for sight of $n > \frac{23}{3}$ or equivalent. (With similar F.T. answer e.g. $n > 46/3$ from above example of $4n - 23 > n + 23$) OR allow B1 for $n > 7$ OR $n \geq 8$ (With similar F.T. answer e.g. $n > 15$ from above example of $4n - 23 > n + 23$)
9.(a) $\frac{1}{3}$		B1	
9.(b) 4		B1	
10. $\frac{2}{3}\pi r^3 = \pi r^2 h$ or equivalent		M1	
$\frac{2r}{3} = h$ or equivalent.		A1	Must be in terms of r, h. Allow inclusion of π, e.g. $2\pi r = 3\pi h$.
(Height cyl. : Radius cyl. =) 2 : 3 or equivalent.		A1	If no other marks awarded allow SC1 for 3 : 2 If working with a whole sphere, award SC2 for 4 : 3 OR SC1 for 4r/3 = h
11.(a) $y \propto 1/x$ OR $y = k/x$		B1	Allow $y \propto k/x$
$4 = k/3$ OR $k = 12$		M1	Must be in correct form, not a F.T. M1 implies B1.
$y = 12/x$		A1	May be seen in part (b). Allow equivalent e.g. x = 12/y
11.(b)			F.T. non-linear only.

x	3	0·25	**60**
y	4	**48**	1/5

B2 B1 for each value.

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12. $3x(2x + 7) – 2x(3x + 2)$ as a numerator within a single fraction $(3x + 2)(2x + 7)$ as a denominator. $17x / (3x + 2)(2x + 7)$		M1 M1 A1	Accept intention of brackets when working not shown e.g. $6x^2 + 21x – 6x^2 + 4x$. C.A.O. If M1M1A1 awarded penalise further incorrect work −1. If no marks awarded then SC1 for sight of $17x$.
13. RPQ = x (Reason =) Alternate segment (theorem) PQR = $90 – x$ (Reason =) Angle in a semicircle is 90° (and angles in a triangle add up to 180°)	✓ ✓ ✓ ✓	B1 E1 B1 E1	Check diagram. Dependent on B1. F.T. 90 – 'their RPQ'. *Accept correct alternative methods e.g.* *(i) PRA = 90 – x B1* *(Reason =) Angle in a semicircle is 90°* *(and angles on a straight line add up to 180°) E1* *PQR =90 –x FT PQR ='their PRA' B1* *(Reason =) Alternate segment (theorem) E1* *(ii) ORQ = 90 – x B1* *'radius and tangent meet at 90°' E1* *PQR = 90 – x B1* *Isosceles triangle E1*
14. (a) $2x^2 + x + 1 = 7$ OR $x^2 + x^2 + x + 1 = 7$ leading to $2x^2 + x − 6 = 0$		B1	Must be seen. Accept $1(x +1)$ for $x + 1$.
14.(b) $(2x – 3)(x + 2)$ (=0)	✓✓	B2	B1 for $(2x …. 3)(x ….. 2)$
(Length of each side =) 1·5 (metres)	✓	B1	F.T. from 'their two brackets'. (If both F.T. solutions are of the same sign, then both are required for this B1.) Ignore presence of $x = –2$. *Using quadratic formula.* *$(x =) \frac{-1 \pm \sqrt{[1^2 – 4(2)(-6)]}}{2(2)}$ M1* *Allow one error, in sign or substitution, but not in the formula.* *$= \frac{-1 \pm \sqrt{49}}{4}$ A1* *$x = 1·5$ (metres) [ignore $x = -2$] A1* *Using trial and improvement* *Award B3 for a method leading to both solutions, namely $x = 1·5$ and $x = -2$, otherwise B0.*
Statement about ignoring $x = – 2$ as would be a negative length.	✓	E1	F.T provided one solution is positive and the other is negative.

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15.(a) Concave down curve with *y*-coordinate of maximum = 7 *x*-coordinate of maximum = 5 Points (2,0) AND (8, 0) shown.		 B1 B1 B1	*Allow appropriate marking of axes if coordinates not given.*
15.(b) Cosine curve Correct cosine curve with 2 shown on the y-axis and 180° and 360° shown or implied.		M1 A1	Intention to sketch a portion of a cosine curve with minimum period of 360°.
16. AB = AC because ABC is an isosceles triangle. AP = AQ AND angle Â common. (So triangles ABQ and ACP are congruent because of) 'two sides and the included angle' or 'SAS'.	✓✓ ✓ ✓	B2 B1 B1	B1 for *AB* = *AC* alone.
17. $(5\sqrt{3})^2 = 25 \times 3$ (= 75) $\frac{2\sqrt{18}}{\sqrt{2}} = 2 \times \sqrt{9}$ (= 2 × 3 = 6) $\sqrt{32} \times \sqrt{2} = \sqrt{64}$ (= 8) (Answer =) 69/8 or equivalent. Rational	✓ ✓ ✓ ✓ ✓	B1 B1 B1 B1 B1	For first three marks, accept a correct product of integers in each case, e.g. 2 × 2 × 2 (=8). C.A.O. Equivalent answer must be simplified. So B0 for (75 – 6) / 8. ISW. F.T. 'their final answer' provided at least 2 out of first 3 B1s are awarded.
18. (Probability success at 1st attempt = 0·8) (Probability 1st success at 2nd attempt =) 0·2 × 0·8 = 0·16 Convincing statement that 0·8 = 5 × 0·16		 M1 A1 A1	 Must show 0·2 × 0·8 for M1. A convincing statement must refer to 0·8 and 0·16 *Alternative method* *(Probability 1st success at 2nd attempt =) 0·2 × 0·8* *M1* *Indicates that this is 1/5th of probability of success at 1st attempt.* *A1* *'So 5 times more likely to succeed 1st time.* *A1* *(Only convincing if 0·2 stated to be 1/5)*