GCSE MARKING SCHEME

SUMMER 2018

GCSE (NEW)
MATHEMATICS – UNIT 1 (HIGHER TIER)
3300U50-1

INTRODUCTION

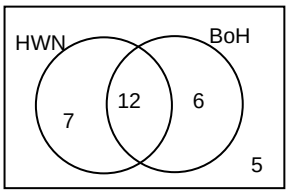
This marking scheme was used by WJEC for the 2018 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' 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.

WJEC GCSE MATHEMATICS (NEW)

SUMMER 2018 MARK SCHEME

GCSE MATHEMATICS Unit 1: Higher Tier Summer 2018	Mark	Comments
1.(a) 12	B1	
1.(b) × 1·04^{7}	B1	
1.(c) $3^{1}/_{5}$	B1	
2.(a)  12 AND 5 in correct position. Total of 18 for '*Bread of Heaven*' Overall total of 30.	 B1 B1 B1	Any 'blank space' to be taken as 0. If 'notches/tallies' are used, penalise −1 once. B0 if any other number written in the same section. Allow more than one number in the same section. Allow more than one number in the same section.
2.(b) $\frac{19}{30}$ or equivalent. ISW	B2	B1 for a numerator of 19 OR FT 'their total for *HWN*' in a fraction < 1. B1 for a denominator of 30 OR FT 'their total' in a fraction < 1. An answer of 19/30 gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '19 in 30') −1.
3.(a) $5x^2 - 2x - 3x^2 + 6x - 21$ $= 2x^2 + 4x - 21$	B2 B2	B1 for sight of $5x^2 - 2x$. B1 for sight of $-3x^2 + 6x - 21$. Brackets must be removed. Allow both of the above B marks even if not part of a single expression. *FT for B2 if at least two x^2 terms AND at least two x terms to be simplified.* *FT for B1 if at least two x^2 terms OR at least two x terms to be simplified.* If B2 not awarded, allow B1 for correct collection of 'x^2 terms' ($2x^2$) OR B1 for correct collection of 'x terms' (+4x). This 2nd B2 (or B1) is for their **final** answer. Any compensating errors leading to a 'correct' answer is B0. Penalise −1 for any attempt to equate their expression to zero (and attempting to solve) OR incorrectly factorising.

3.(b) $22 - f = 3 \times 6$ or equivalent. $22 - 18 = f$ OR $-f = 18 - 22$ $f = 4$	M1 A1 A1	CAO. Accept 4 = f. M1A1A0 for –f = –4. Mark final answer. Allow all 3 marks for $\frac{22-4}{3} = 6$ with no further work. Allow 2 marks for $\frac{22-4}{3} = 6$ followed by 'f ≠ 4'. If no marks gained, Allow SC1 for an unsupported f = −4. Allow SC1 for sight of 18 from 3 × 6.
4.(a) $1/6 \times 1/6$ $= 1/36$	M1 A1	
4(b)(i) P(Caernarfon) = ¼ or equivalent P(Newtown) AND P(Ebbw Vale) = 1/8 or equivalent	B1 B1	*Penalise incorrect notation −1 once only in 4(b)* CAO. CAO. Do not allow 0·5/4 for 1/8.
4(b)(ii) ½ + 1/8 = 5/8 or equivalent.	M1 A1	FT ½ + 'their P(Eb.V.)'. Provided P(Eb.V)<1 for M1. FT answer must be < 1 for A1. Mark final answer Allow 2·5/4 for 5/8 if answer to 4(b)(i) is 0·5/4.
5.(a) $1{\cdot}56 \times 10^6$	B2	Mark final answer. B1 for sight of $15{\cdot}6 \times 10^5$ OR 1 560 000 OR equivalent correct value but not in standard form.
5.(b) $1{\cdot}3 \times 10^5$	B2	Mark final answer. B1 for sight of 13×10^4 OR 130 000 OR equivalent correct value but not in standard form.
6. $3x(4x + y)$	B2	Accept 3x(4x + 1y) B1 for 3x(4x ± ….) or 3x(…..+ y) B1 for $3(4x^2 + xy)$ or x(12x + 3y).
7. (ADC =) 109(°) x = 180 −26 – 109 = 45(°)	 B1 M1 A1	*Answers may be written on the diagram.* Allow for sight of 109(°). FT 'their 109°' (may be clearly indicated on the diagram) provided ≠ 71 and ≠ 26. An answer of 45(°) gains all 3 marks.

8. Correct construction of perpendicular bisector of line AB.	B2	*Allow ± 2° and ± 2 mm*. B1 for a perpendicular bisector with no arcs or only one pair of intersecting arcs (above or below) shown. B1 for two sets of correct arcs, with no line or an incorrect line.
Correct construction of 60° at A.	B1	Must show relevant arcs.
Arc of radius 6 cm, centre A.	B1	Must be of sufficient length so as not to be considered a 'point' or a 'notch'.
Correct region identified.	B1	FT for similar viable region (*a straight line intersecting AB, an angle at point A and an arc with centre A*) even if no previous marks gained.
9. ∠BXC = 80(°) Reason: 'BX = BC' OR 'Isosceles triangle'	B1	*Angles shown on the diagram take precedence.* If any angle is not named then it must be unambiguously identified either on the diagram, from a given reason or in further work. (e.g. must be convincing that X = 80 is referring to BXC and not AXB.) If initial incorrect assumptions are made then allow correct FT methods to calculate other relevant angles.
∠AXB (= 180 – 80) = 100(°) Reason: 'Angles on a straight line'.	B1	FT 180 – 'their ∠BXC'
∠ABX (= 180 – 40 – 100) = 40(°) Reason: 'Angles in a triangle'.	B1	FT 180 – 40 − 'their ∠AXB'.
Statement 'So AX = BX', Reason: 'Two equal angles (in a triangle)' OR ∠ ABX = ∠BAX OR 'Isosceles triangle' .	B1	Only available if ∠ABX **<u>stated or shown</u>** to be 40(°)
Sight of at least TWO of the above reasons.	E1	Reasons must be appropriate AND are dependent on associated B1 gained.
<u>Alternative method 1.</u> *∠BXC = 80(°)* *Reason: 'BX = BC' OR 'Isosceles triangle'.*	*B1*	
∠CBX (= 180 – 80 − 80) = 20(°) *Reason: 'Angles in a triangle'.*	*B1*	*FT 180 – 80 − 'their ∠BXC'.*
∠ABX (= 180 – 80 – 40 – 20) = 40(°) *Reason: 'Angles in a triangle'.*	*B1*	*FT 180 – 80 − 40 − 'their ∠CBX'.*
Statement 'So AX = BX'. *Reason: 'Two equal angles (in a triangle)'* OR ∠ABX = ∠BAX OR 'Isosceles triangle'	*B1*	*Only available if ∠ABX **<u>stated or shown</u>** to be 40(°)*
Sight of at least TWO of the above reasons.	*E1*	*Reasons must be appropriate AND are dependent on associated B1 gained.*
<u>Alternative method 2.</u> <u>(Assumption that AX = BX).</u>		

∠ABX = 40(°) *Reason: 'AX = BX' OR 'Isosceles triangle'.*	*B1*	
∠AXB (= 180 – 40 − 40) = 100(°) *Reason: 'Angles in a triangle'.*	*B1*	*FT 180 – 40 − 'their ∠ABX'.*
∠BXC = 80(°) *Reason: 'Angles on a straight line'.*	*B1*	*FT 180 − 'their ∠AXB'.*
Statement 'So BX = BC' (as given) *Reason: 'Two equal angles (in a triangle)' OR '∠BXC = ∠BCX' OR 'Isosceles triangle'.*	*B1*	*Only available if ∠BXC **stated or shown** to be 80(°)*
Sight of at least TWO of the above reasons.	*E1*	*Reasons must be appropriate AND are dependent on associated B1 gained.*
Alternative method 3. (Assumption that AX = BX). *∠ABX = 40(°)* *Reason: 'AX = BX' OR 'Isosceles triangle'.*	*B1*	
∠CBX (= 180 – 80 – 40 − 40) = 20(°) *Reason: 'Angles in a triangle'.*	*B1*	*FT 180 – 80 – 40 − 'their ∠ABX'.*
∠BXC (= 180 – 80 – 20) = 80(°) *Reason: 'Angles in a triangle'.*	*B1*	*FT 180 – 80 − 'their ∠CBX'.*
Statement 'So BX = BC' (as given) *Reason: 'Two equal angles (in a triangle)' OR '∠BXC = ∠BCX' OR 'Isosceles triangle'.*	*B1*	*Only available if ∠BXC **stated or shown** to be 80(°)*
Sight of at least TWO of the above reasons.	*E1*	*Reasons must be appropriate AND are dependent on associated B1 gained.*
Organisation and Communication. Accuracy of writing.	OC1 W1	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 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

10. Correct enlargement	B2	B1 for triangle enlarged with scale factor -2 in incorrect position (within correct quadrant) OR correct enlargement with scale factor 2 (using correct centre) OR consistent use of an incorrect **negative** scale factor (using correct centre) OR two (or three) correct vertices (not necessarily joined) B0 for using scale factor +1/2.
11.(a) $y = k\sqrt{x}$ OR $y^2 = cx$ 30 = k x 6 OR 30 = k x $\sqrt{36}$ OR k = 5 OR c = 25 (y =) 5 $\sqrt{x}$	B1 M1 A1	Allow $y \propto k\sqrt{x}$. ($y \propto \sqrt{x}$ is insufficient.) FT from expressions of the form k x x^n $(n \neq 1)$ (equivalent difficulty only) M1 implies B1 May be seen (explicitly) in part *(b).* Do not allow equivalent e.g. $y^2 = 25x$ unless (y =) 5 $\sqrt{x}$ seen in part (b)
(b) x: 36, 49, **64** y: 30, **35**, 40	B2	B1 for one correct value. FT from any non-linear
12. In either order: A and G (in either order) Condition: SAS OR 2 sides and <u>included</u> angle D and E (in either order) Condition: SSS OR 3 sides	 B1 E1 B1 E1	E marks depend on B marks
13. (a) $4 = 1 + 8t - 5t^2$ or $1 + 8t - 5t^2 = 4$ leading to $5t^2 - 8t + 3 = 0$	B1	Must be convincing.
13. (b) $(5t - 3)(t - 1)$ (=0) (t =) 3/5 AND 1	B2 B1	B1 for $(5t\ldots. 3)(t \ldots.. 1)$ Strict FT from 'their two brackets'. (Both solutions are required for this B1.) *<u>Using quadratic formula.</u>* *(t =) $\frac{8 \pm\sqrt{[(-8)^2 - 4(5)(3)]}}{2(5)}$* *M1* *Allow one error, in sign or substitution, but not in the formula.* *$t = \frac{8 \pm\sqrt{4}}{10}$* *A1* *t = 3/5 AND 1* *A1* *<u>Using trial and improvement</u>* *Award B3 for a method leading to <u>both</u> solutions, namely t = 3/5 AND t = 1, otherwise B0.*

13. (c) Valid statement	E1	e.g. 2 different values of *t* representing the ball on its way up and on its way down OR e.g. the ball reaches its highest point after 4/5 s. FT provided both solutions are positive.
14. (a) 27	B1	
14. (b) $\frac{1}{10}$	B1	
15. (a) $x = 0{\cdot}2454545.....$ and $100x = 24{\cdot}54545....$ with an attempt to subtract 243/990 or 27/110 or equivalent.	M1 A1	Or $10x$ and $1000x$, or equivalent. Or a complete alternative method. An answer of $24{\cdot}3/99$ gains M1 only. ISW
Alternative method *$0{\cdot}2 + 0{\cdot}0454545.....$ = 1/5 + 45/990 or equivalent* *243/990 or 27/110 or equivalent*	*M1* *A1*	*ISW*
15. (b) $8 \times 5 + 8\sqrt{7} - 5 \times 3\sqrt{7} - 3(\sqrt{7})^2$ or equivalent $= 19 - 7\sqrt{7}$	M1 A1	Mark final answer. If no marks awarded, SC1 for 3 of the 4 terms correct.
16. (a) x: –2, –1, 0, 1, 2 y: $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4 Suitable choice of uniform scales through the origin, x from – 2 to 2 and y from 0 to 4, AND plotting at least 3 points correctly. Joining with a curve.	B1 B1 C1	Any 3 correct pairs of coordinates (need not be for integer values of x.) Must include one negative value of x. FT their evaluations of y if shown (provided they do not produce a straight line). Must include one negative value of x. Tolerance for accuracy $\pm \frac{1}{2}$ a small square. CAO. Exponential curve which passes through $(-2, \frac{1}{4})$, (0, 1) and (2, 4). Must not intercept x axis anywhere, including beyond the required range of x values. Tolerance for accuracy $\pm \frac{1}{2}$ a small square. If no table or evaluations of coordinates are given (for at least 3 pairs of values, including one negative value of x), then B1 B1 may be implied by C1 or if C0, B1 B1 may be implied by 3 correctly plotted points for $y = 2^x$ (including one negative value of x).

16. (b) Reading from their graph for $x = 1{\cdot}4$ ($y \approx 2{\cdot}6$)	B1	FT 'their curve'. (No FT for a straight line.) Tolerance for accuracy $\pm \frac{1}{2}$ a small square.
16. (c) Reading from their graph for $y = 1{\cdot}4$ ($x \approx 0{\cdot}5$)	B1	Accept an embedded answer. FT 'their curve'. (No FT for a straight line.) Must include all relevant readings if 'their graph' is not one-to-one. Tolerance for accuracy $\pm \frac{1}{2}$ a small square.
17. (a) Either 8/12 × 7/11 or 3/12 × 2/11 8/12 × 7/11 + 3/12 × 2/11 with no incorrect additional terms 62/132 (=31/66)	B1 M1 A1	 ISW. If no other marks awarded, SC1 for an answer of 73/144 (from working 'with replacement', without allowing for 2 books)
17. (b) 11/12 × 10/11 × 9/10 or equivalent 990/1320 (= 3/4) or equivalent	M1 A1	Or P(PPP) + 3 × P(PPK) + 3 × P(PKK) + P(KKK) (or an alternative full method) ISW FT consistent use of 'their 12 × 11'. If no other marks awarded, SC1 for an answer of 1331/1728 (from working 'with replacement') OR SC1 for this method and related answer, having omitted up to two (out of eight) products OR SC1 for 11/12 × 10/11 × 9/10 × 1/9 = 990/11880 (= 1/12) (for the 4th prize being the book)
18. (a) 159° and 201° with no other values	B2	B1 for either angle. Check diagram. Penalise -1 for each extra value (beyond 2 attempts). Ignore extra (correct) values outside the required range.
18. (b) (i) Vertical enlargement upwards and downwards Scale factor of 2	B1 B1	Mark clear intention. Must be the correct shape, i.e. a single cycle of a cosine curve, with x-intercepts at x = 90°and x = 270°, minimum at x = 180°, maxima at x = 0 and x = 360°. Accept any clear indication. Must have correct x and y-intercepts, correct minimum and correct point for x = 360°.
18. (b) (ii) Vertical translation Vertical –1	B1 B1	Mark clear intention. Must be the correct shape, i.e. a single cycle of a cosine curve, with x-intercepts at x = 0°and x = 360°, minimum at x = 180°, maxima at x = 0 and x = 360°. Accept any clear indication. Must have correct x and y-intercepts, correct minimum and correct point for x = 360°. Award SC1 for a fully labelled sketch of y = cos x + 1.