GCSE MARKING SCHEME

AUTUMN 2019

GCSE
MATHEMATICS – UNIT 1
HIGHER TIER
3300U50-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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

AUTUMN 2019 MARK SCHEME

GCSE MATHEMATICS **Unit 1: Higher Tier**	**Mark**	**Comments**
1.(a) (Number of sides =) $\frac{360}{36}$ = 10	M1 A1	
1.(b) (180 – 36) × 10 or equivalent = 1440(°)	M1 A1	F.T. 'their number of sides' if >2.
Alternative method. *(10 – 2) × 180 or equivalent* *= 1440(°)*	*M1* *A1*	*F.T. 'their number of sides' if >2.*
2.(a) Reflection in (the line) x = −2	B2	B1 for 'reflection' or 'reflected'. B1 for sight of 'x = −2' or equivalent e.g. x + 2 =0 (**written**, not simply drawn).
2.(b) (i) Correct translation.	B2	B1 for translation '5 right'. B1 for translation '6 down'. SC1 for 2 correct vertices.
2.(b) (ii) $\begin{pmatrix}-5\\6\end{pmatrix}$	B1	B0 for −5 (missing brackets) OR (−5,6) 6 B0 for $-\frac{5}{6}$ with or without brackets. No FT from part (b)(i).
3.(a) −5 −2 3	B2	B1 for two correct (in correct position) OR B1 for −6, −5, −2
3.(b) 6n – 1 or equivalent	B2	B1 for sight of 6n. Mark final answer.
4.(a) 3^4	B1	
4.(b) 40·84101	B1	
4.(c) 3·6	B1	
5.(a) Correct construction of PQR = 60°. Correct triangle PQR drawn.	M1 A1	Correct construction arcs must be seen and angle drawn. PQ = 7 cm (±2mm) and triangle drawn. Allow non labelling of point P (unless position contradicted). Ignore extension of line QP if correct triangle drawn.
5.(b) Arc, centre A, intersecting LM at two points AND Intersecting arcs (equal radii) using the above two points as centres. Line drawn	M1 A1	[Note to markers: These arcs may be identified by the fact that they will 'cross the line LM at an acute angle'. Arcs 'crossing the line at 90°' is evidence of an inappropriate method.]
Alternative method. *Using the properties of a kite.* *Intersecting arcs whose centres are any two points on the line LM and respective radii equal in length to the distance from the points to the point A.* *Line drawn.*	*M1* *A1*	*[Note to markers: The arcs will always intersect at a point that is a 'reflection of point A' in the line LM.]*

6.(a) 0·3 shown for 'Does not visit '*Erddig Gardens*'. Use of 0·7 × …… = 0·28 P(goes to '*Bersham Heritage Centre*') = 0.4 Second set of branches 0·4, 0·6, 0·4, 0·6	B1 M1 A1 A1	 Implied by sight of 0·4 (on 'top branch' of the four on the right) F.T. 'their 0·4' BUT **dependent** on M1 gained. (i.e. M0A0A0 for 0·28 and 0·72 on branches.)
6.(b) 0·7 × 0·6 = 0·42 ISW	M1 A1	F.T. 0·7 × 'their 0·6' only if 0 < 'their 0·6' < 1 0·42 gains M1A1.
7. (area) Volume Length Volume None Area	B3	*Must use the terminology given in the question.* B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.
8.(a) $(x + 7)(x - 3)$ $(x =) -7$ AND $(x =) 3$	B2 B1	B1 for $(x \ldots 7)(x \ldots 3)$. Strict F.T. from their brackets. Allow the following. B2 for x + 7 (=0) AND x − 3 (=0) (B1) (x =) −7 AND (x =) 3 (B1) B1 for x − 7 (=0) AND x + 3 (=0) (B0) (x =) 7 AND (x =) −3 (B1) FT B1 if only (x =) −7 AND (x =) 3 seen. (B1)
8.(b) Correct method for clearing all three fractions. Accurate clearing of fractions AND expansion of brackets on lhs. 24x = 36 or equivalent. x = $\frac{36}{24}$ or equivalent	M1 A1 A1 A1	FT until 2nd error. May be seen in stages. Allow if all over a common denominator. May be seen in stages For collection of terms. FT from 'their ax = b' ONLY if M1 gained AND no more than one previous error. If no marks, allow SC1 for sight of $\frac{2(2x - 3) + 5(4x + 5)}{(10)}$ or equivalent. If FT answer is a whole number then it must be shown as an integer. Allow a correct embedded answer of 1·5 or 1½ BUT penalise −1 if followed by x ≠ 1·5 or 1½. Note : An answer of 1·5 that is found without gaining M1 OR that is not embedded is zero marks.
9.(a) 40·5	B1	
9.(b) (25·5 + 25·5 =) 51	B1	
9.(c) (11·5 + 11·5=) 23	B1	

10. (Slant height of cone =) $\sqrt{(12^2 + 9^2)}$	M1	Method for finding hypotenuse. Accept use of (3,4,5) x 3.
= 15 (cm)	A1	
(Curved surface area of cone =) $\pi \times 9 \times 15$	M1	F.T. 'their derived slant height' (not 12).
= 135 π (cm^2)	A1	ISW. [For reference, 135 π = 423.9]
		SC1 for an answer of 108 π (cm^2) [= 339.1(2)] (from taking 12 cm as the slant height)
		An answer of 216 π (cm^2) [= 678.2(4)] (from including area of circle) gains M1 A1 SC1
(Curved surface area of hemisphere =) $\frac{1}{2} \times (4 \times \pi \times 8^2)$ or equivalent	M1	
= 128 π (cm^2)	A1	ISW. [128 π = 401.9(2)]
		SC1 for an answer of 256 π (cm^2) [= 803.8(4)] (from omitting ½) or for an answer of 192 π (cm^2) [= 602.8(8)] (from including area of circle).
		Penalise -1 once only if any A or SC marks have previously been awarded for (correct) <u>decimal</u> answers.
Cone (has the greater curved surface area)	B1	Do not accept an unsupported statement. F.T. 'their areas' provided at least M1 or SC1 awarded for <u>each</u> solid (regardless of any penalty for decimal answers). (For the cone, either M1 mark can contribute to this FT.)
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 • write a conclusion that draws together their results and explains what their answer means
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

11. $I \propto 1/d^2$ OR $I = k/d^2$ or equivalent $5 = k/2^2$ OR $k = 20$ $I = 20/d^2$ OR $I = 20/0{\cdot}5^2$ or equivalent $I = 80$ (lux)	B1 M1 M1 A1	Allow $I \propto k/d^2$ M1 implies B1. F.T. (for possible B0 M2 A0) for use of $I \propto d^2$ or $I \propto 1/d^n$ with $n > 0$ and $n \neq 2$. CAO. Use of $I \propto 1/d$, leading to $I = 10/d$ (or an answer of $I = 20$ (lux)) is awarded B0 FT M2 A0. Use of $I \propto d^2$, leading to $I = 1{\cdot}25\,d^2$ (or an answer of $I = 0{\cdot}3125$ (lux)) is awarded B0 FT M2 A0. Use of $I \propto 1/\sqrt{d}$, leading to $I = 5\sqrt{2}/\sqrt{d}$, (or an answer of $I = 10$ (lux)) is awarded B0 FT M2 A0.
12. $CAD = 2x$ (Reason =) Alternate segment (theorem) $BCD = 180 - 3x$ OR $BCD = 3(60 - x)$ (Reason =) Opposite angles in a cyclic quadrilateral (add up to 180°)	B1 E1 B1 E1	Check diagram. (If this is the only B mark awarded, then $2x$ marked on diagram must be unambiguous. Otherwise, ignore spurious angles on diagram.) Dependent on B1. Allow 'opposite segments'. Do not accept 'alternate angles' or 'opposite angles'. F.T. $180 - (x +$ 'their CAD'). Must be in simplest form. Mark final answer e.g. do not accept $60 - x$ or $x = 60$ If B0, E mark may be awarded provided there is a clear attempt to apply the circle theorem.
13.(a) $48x^2 + 6x - 48x^2 + 12x - 12x + 3$ OR $48x^2 + 6x - 48x^2 + 3$. $6x + 3$	B2 B1	Accept $48x^2 + 6x - (48x^2 - 12x + 12x - 3)$ or $48x^2 + 6x - (48x^2 - 3)$ B1 for $16x^2$ [$- 4x + 4x$] $- 1$ or $48x^2$ [$- 12x + 12x$] $- 3$ or $- 48x^2$ [$+ 12x - 12x$] $+ 3$. OR B1 if one error or incorrect (or extra or missing) term within entire expression. (An incorrect term may be implied e.g. $- 24x$ implies $- 12x - 12x$). Must be convincing. For last B1, do not accept $48x^2 + 6x - (48x^2 - 12x + 12x - 3)$ or $48x^2 + 6x - (48x^2 - 3)$ without further correct work seen before final $6x + 3$. If <u>no work</u> seen in (a), allow marks in (a) for work shown in (b)
13.(b) $-\frac{1}{2}$ or $-\frac{3}{6}$ or -0.5 or equivalent	B1	Mark final answer.

14.(a) x = 0·4757575.....100x = 47·5757575..... with an attempt to subtract 471/990 or 157/330 ISW	M1 A1	Or correct values 1000x and 10x, or equivalent. M0 for use of x = 0·475475475..... An answer of 47·1/99 gains M1 only.
Alternative method *(0·4 + 0·07575....=) 4/10 + 75/990 or equivalent* *471/990 or equivalent ISW*	*M1* *A1*	
14.(b) $\frac{1}{8}$	B1	
15. $9 + 4\sqrt{5}$ (–) 2 $7 + 4\sqrt{5}$ AND irrational	B2 B2 B1	If not B2, award B1 for 3 or 4 correct terms within $4 + 2\sqrt{5} + 2\sqrt{5} + 5$ or $4 + 2\sqrt{5} + 2\sqrt{5} + \sqrt{25}$ (without subsequent correct collection of terms) ($4\sqrt{5}$ is equivalent to 'two correct terms') B1 for (numerator of) $10\sqrt{5}$ or B1 for (denominator of) $5\sqrt{5}$ or $\sqrt{125}$ or B1 for appropriate factorisation of both numerator and denominator e.g. $\frac{\sqrt{5} \times \sqrt{100}}{\sqrt{5} \times \sqrt{25}}$ or $\frac{\sqrt{5} \times \sqrt{5} \times \sqrt{5} \times \sqrt{4}}{\sqrt{5} \times \sqrt{5} \times \sqrt{5}}$ Mark final answer. FT for equivalent difficulty (requiring collection of terms) AND either B2 awarded AND final answer is irrational.
16.(a) (Area=) ½×1×[16+0+2(15+12+7)] or equivalent = 42	M2 A1	Award M1 if only one y-value incorrect. F.T. from M1. If no marks, SC1 for an answer of 420 (from mis-reading horizontal scale).
Alternative method *$\frac{(16+15)}{2} + \frac{(15+12)}{2} + \frac{(12+7)}{2} + \frac{(7+0)}{2}$* *= 42*	*M2* *A1*	*Individual areas are: 15·5, 13·5, 9·5, 3·5.* *M1 if only one y-value incorrect* *or* *M1 for any 2 (out of 4) correctly evaluated areas (of a complete 'strip').* *(Each area of a trapezium may be seen as the sum of the area of a rectangle and a triangle.)* *F.T. from M1 (provided 4 'strips' considered).* If no marks, SC1 for an answer of 420 (from mis-reading horizontal scale).
16.(b) 'Greater than' WITH valid reason e.g. trapezium rule gives an underestimate in this case and increasing the number of strips improves accuracy; less (shaded area) left out; more of the area (under curve) included; tops of strips are closer to the curve.	E1	Allow e.g. increasing the number of strips improves accuracy.

17. (Numerator) $(2x - 5)(x - 4)$ (Denominator) $2(x - 4)$ $\frac{2x-5}{2}$ or $x - \frac{5}{2}$ or equivalent.	B2 B1 B1	B1 for $(2x \ldots 5)(x \ldots 4)$ Mark final answer. F.T. provided no more than 1 previous error and provided simplification required.
Alternative method: *(Numerator) $(x - 5/2)(2x - 8)$* *$\frac{2x-5}{2}$ or $x - \frac{5}{2}$ or equivalent.*	*B2* *B2*	*B1 for $(x \ldots 5/2)(2x \ldots 8)$* *Mark final answer.* *F.T. provided at least B1 awarded, no more than 1 previous error and provided simplification required.*
18. (P[same colour] =) 10/16 × 9/15 + 6/16 × 5/15 or equivalent OR (P[different colours] =) 10/16 × 6/15 + 6/16 × 10/15 or equivalent. = 120/240 or equivalent 'Yes' with explanation (must refer to the 'other' probability)	M2 A1 E1	M1 for sight of any correct product. Award for the answer to either probability (total). Mark final answer. Do not ignore incorrect cancelling. If both probabilities are evaluated, accept 240 written as 16 × 15. If M0A0, award SC1 for an answer of 136/256 or 120/256 (method 'without replacement'). If M2A0 or SC1 awarded, then award E1 for 'No', provided only one answer evaluated (from calculating products), and a valid explanation given based on P[same colour] + P[different colours] = 1 or E1 for 'Yes' if both probabilities (incorrectly) evaluated and 'their P[same colour]' = 'their P[different colours]' E0 if both probabilities evaluated and 'their P[same colour]' + 'their P[different colours]' ≠ 1 with 'their P[same colour]' ≠ 'their P[different colours]'.