GCSE MARKING SCHEME

SUMMER 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

SUMMER 2019 MARK SCHEME

GCSE MATHEMATICS **Unit 1: Higher Tier**	**Mark**	**Comments**
1.(a) For a method that produces 2 prime factors from the set {3, 3, 5, 7} before the 2nd error.	M1	
3, 3, 5, 7	A1	C.A.O. For sight of the four correct factors (Ignore 1s)
$3^2 \times 5 \times 7$	B1	FT 'their primes' provided at least one index form used with at least a square. Allow $(3^2)(5)(7)$ and $3^2.5.7$ Inclusion of 1 as a factor gets B0.
1.(b) $42 = 2 \times 3 \times 7$ or equivalent correct strategy.	M1	M1 for sight of 2, 3, 7 'together'. (Not for 2x21, 3x14 and 6x7.) (Not for <u>just</u> listing all factors 1,2,3,6,7,14,21.)
(HCF =) 21	A1	M1A0 for 3×7. FT 'their answer to 1(a)' only if of equivalent difficulty (at least two common prime factors).
2. −13	B1	
Scale on y-axis '2cm square ≡ 10 units'.	B1	
At least 7 correct plots and <u>no incorrect</u> plots.	P1	FT 'their (−2, −13)' AND 'their uniform scale' if possible. Allow ± '½ a small square'.
A smooth <u>curve</u> drawn through their plots.	C1	FT 'their 8 plots'. (Only if an uniform scale used.) OR a curve through the 7 given plots and (−2, −13). Allow intention to pass through their plots (within 1 small square, either horizontally **<u>or</u>** vertically of the point).

3. (Angle AÔB or exterior angle =) $\frac{360}{8}$(°) = 45(°) (OÂB =) $\frac{180 - 45}{2}$ = 67·5(°)	 M1 A1 M1 A1	*Answers/working may be seen on diagram.* Sight of 45 (even e.g. OÂB = 45) gains M1A1. FT 'their 45' (but not 60°).
3. Alternative method 1 *(Sum of interior angles =)(8 – 2)×180° or equivalent* *= 1080(°)* *(OÂB =) ½ × (1080 ÷ 8)* *= 67·5(°)*	*M1* *A1* *M1* *A1*	 *(Interior angle =) 135(°) implies M1A1* *FT 'their interior angle sum' (≠ 1440)*
3. Alternative method 2 *(Using 16 right-angled triangles)* *(Angle at O =) 360 / 16* *= 22·5(°)* *(OÂB =) 180 – 90 − 22·5* *= 67·5(°)*	 *M1* *A1* *M1* *A1*	 *FT 'their 22·5'.*
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 • write a conclusion that draws together their results and explains what their answer means 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

4. Correct construction <u>method</u> for perpendicular bisector with line drawn. Correct construction <u>method</u> for 60° at point A. Correct construction <u>method</u> for bisecting an angle with line drawn. Point P clearly identified	 B1 B1 B1 B1	*Correct construction arcs must be seen for the first three B1 marks.* Two pairs of intersecting arcs (centres at A and B). Allow if drawn at point B. Allow B1 for correct method (tolerance will be penalised with final B0). FT 'their angle of 60°' drawn at point A or point B. C.A.O. within tolerance. Intersecting lines alone with no indication that this is point P is <u>not sufficient</u> for this B1. Do not penalise if both possible positions shown. Final B1 may be awarded after B0B0B0.
<u>4. Alternative method</u> *Correct construction method for 60° at point A (or B).* *Correct construction method for bisecting the angle at A (or B) with line drawn.* *Repeating the above two stages at B (or A)* *Point P clearly identified*	 *B1* *B1* *B1* *B1*	*Correct construction arcs must be seen for the first three B1 marks* *Allow B1 for correct method (tolerance will be penalised with final B0).* *C.A.O. within tolerance.* *Intersecting lines alone with no indication that this is point P is <u>not sufficient</u> for this B1.* *Do not penalise if both possible positions shown.* *Final B1 may be awarded after B0B0B0.*
5. Sight of any TWO of 30, 2 or 0·5 OR Sight of any TWO of 30, 8 or 0·5 as appropriate approximations. $\frac{30 \times 8}{0{\cdot}5}$ or equivalent. = 480	B1 M1 A1	Allow 30·2 for 30. Equivalent e.g. $\frac{30 \times 2 \times 2 \times 2}{\frac{1}{2}}$ or $\frac{30 \times 2^3}{0{\cdot}5}$ Must be seen, but allow if attempted calculation done in steps. M0 for exact calculation. C.A.O. Allow 483·2 if 30·2 used.
6.(a) 0·32	B1	
6.(b) Sample number from Anglesey on 2nd day = 3000 × 0·42 = 1260 (Rel.Fqu. for two days =) $\frac{640 + 1260}{2000 + 3000}$ = 0·38	 M1 A1 M1 A1	 Allow M1A1 for sight of 1260 e.g. 1260/3000 FT 'their 1260'.
6.(c) 'Answer to part (b)' noted AND Valid explanation e.g. 'more people sampled'	E1	Explanation must refer to the sample being the largest. Allow e.g 'from both days', 'number of people added', 'frequencies are added'. Do <u>not</u> accept 'relative frequencies are added'.

7.(a)(i) 425 kg	B1	
7.(a)(ii) 21·5 s	B1	
7.(a)(iii) 83 people	B1	
7.(b) $2{\cdot}38 \times 10^{-2}$	B2	B1 for sight of a correct answer but not in standard form e.g. $23{\cdot}8 \times 10^{-3}$ or 0·0238.
8.(a) 0·7 shown for 'Does not go on tour bus'. Use of 0·3 × …… = 0·24 P(sees show) = 0.8 Second set of branches 0·8, 0·2, 0·8, 0·2	B1 M1 A1 A1	 Allow M1A1 if 0·8 seen on one of the 'sees show' branches. FT 'their 0·8' **only** if M1 awarded. (0·24, 0·76, 0·24, 0·76 is M0A0A0)
8.(b) 0·7 × 0·2 = 0·14 ISW	M1 A1	FT 'their values' if both between 0 and 1.
9.(a) 5n < 3n + 7 or equivalent ISW	B2	2n < 7 OR n < 7/2 implies B2. Ignore use of a different letter e.g. 5x < 3x + 7. Use of '≤' is B1. B1 for sight of 3n + 7 in an inequality.
9.(b) 2n < 7 OR n < 7/2 (Greatest amount =) (£)3	B1 B1	FT 'their inequality' if of equivalent difficulty. May be seen in part (a). FT 'their n < k'. B0 if they have 'n>k'. B0 if it leads to n<1. An answer of (£)3 gains B1B1 (unless from incorrect algebra work).
10. Lines $x = -2$, $y + x = 1$ and $2y = x$ all correct. Correct region identified.	B2 B1	B1 for any 2 correct lines. If $x = -2$ and any other vertical or horizontal line shown e.g. y = ± 2 or x = 2, do not award a mark unless $x = -2$ is selected for the region or clearly labelled. FT provided region is closed and B1 awarded. Accept indication by 'shading out'.
11. $cx - 4x = d + 3$ or $-3 - d = 4x - cx$ $x(c-4) = d + 3$ or $-3 - d = x(4 - c)$ $x = (d+3)/(c-4)$ or $x = (-3-d)/(4-c)$ or equivalent	 B1 B1 B1	FT until 2nd error provided equivalent difficulty. Collecting x terms. Factorising. Dividing. Mark final answer.
12. Values given for any **two** missing angles. Explanation that the triangles are congruent due to angle, side, angle or ASA or equivalent.	B1 E1	(Check diagrams) Missing angle(s) is/are 32° or 83° and 65° If all three angles are given, they must all be correct. Or equivalent. No FT from incorrect angles. Dependent on at least one correct angle found.
13. *(a)* x = 0·2488888..... $10x$ = 2·488888..... with an attempt to subtract 224/900 or 112/450 or 56/225 or equivalent e.g. 2464/9900	M1 A1	Or $1000x$ and $100x$, or equivalent. An answer of 2·24/9 or 22·4/90 gains M1 only. ISW.
Alternative method *(0·24 + 0·00888..=) 24/100 + 8/900 or equivalent* *224/900 (= 56/225)*	*M1* *A1*	 *ISW*
13. *(b)* 9	B2	B1 for $729^{\frac{1}{3}}$ or $\sqrt[3]{729}$ or $(729/1)^{\frac{1}{3}}$ or 3^2 or $(1/9)^{-1}$ or 1/(1/9) Allow B1 for 1/9 or –9.

14. *EBC* or *ECB* = (180 – 58) / 2 = 61(°)	 M1 A1	Check diagram. Angles in an isosceles triangle.
BAC = 61(°)	B1	Alternate segment theorem. FT 'their *EBC* or *ECB*'.
ABC (= 180 – 35 – 61) = 84(°)	B1	FT 180 – 35 – 'their *BAC*'.
Alternate method 1 *EBC or ECB = (180 – 58) / 2* *= 61(°)*	 *M1* *A1*	*Check diagram.* *Angles in an isosceles triangle.*
DBA = 35(°)	*B1*	*Alternate segment theorem.*
ABC (= 180 – 35 – 61) = 84(°)	*B1*	*Angles on a straight line* *FT 180 – 'their EBC' – 'their DBA'.*
Alternate method 2 *EBC or ECB = (180 – 58) / 2* *= 61(°)*	 *M1* *A1*	*Check diagram.* *Angles in an isosceles triangle.*
ACF (=180 – 35 – 61) = 84(°)	*B1*	*Angles on a straight line.* *FT 180 – 35 – 'their ECB'.*
ABC = 84(°)	*B1*	*Alternate segment theorem.* *FT 'their ACF'.*
Alternate method 3 *(using isosceles triangle BOC, where O is the centre of the circle)* *BOC = 360 – 90 – 90 – 58* *= 122*	 *M1* *A1*	*Check diagram.* *Angles in kite BOCE*
BAC = 61	*B1*	*Use of angle in the centre* *FT 'their BOC' ÷ 2*
ABC (= 180 – 35 – 61) = 84(°	*B1*	*FT 180 – 35 – 'their BAC'*
15. *(a)* $3\sqrt{5}$	B1	
15. *(b)* $4 \times \sqrt{49} - 2\sqrt{7 \times 3} - 2\sqrt{7 \times 3} + \sqrt{9}$ or $4 \times 7 - 2\sqrt{21} - 2\sqrt{21} + 3$ or equivalent $31 - 4\sqrt{21}$	M1 A1	Allow one incorrect term. $\sqrt{7}\sqrt{7}$ is insufficient for $\sqrt{49}$. $\sqrt{3}\sqrt{3}$ is insufficient for $\sqrt{9}$. Allow $\sqrt{7}\sqrt{3}$ or $\sqrt{3}\sqrt{7}$ for $\sqrt{21}$. $\sqrt{7}\sqrt{3}$ or $\sqrt{3}\sqrt{7}$ is insufficient for $\sqrt{21}$.
16. $\frac{4\pi R^3}{3} = \frac{\pi r^3}{6}$ $24R^3 = 3r^3$ or $R = \sqrt[3]{(\pi r^3/6)/(4\pi/3)}$ or $R^3 = (\pi r^3/6)/(4\pi/3)$ or equivalent $R = \frac{r}{2}$	M2 m1 A1	Equating volumes Award M1 for sight of: (Volume of cylinder =) $\pi r^2 \times r/6$ or equivalent $\frac{4\pi r^3}{3} = \frac{\pi r^3}{6}$ is awarded M1. Award m1 for clearing fractions AND cancelling π or for isolating R or for isolating R^3. FT if M1 awarded and if equivalent difficulty CAO
17. *(a)* $y = f(x) + 2$	B1	
17. *(b)* $y = f(-x)$	B1	

18. *(a)* 4/10 × 3/9 × 6/8 or equivalent 72/720 (= 1/10) or equivalent	M1 A1	Accept e.g. 6/10 × 4/9 × 3/8 or (6 × 4 × 3)/(10 × 9 × 8) ISW
18. *(b)* 1 – P(three red) or 1 – P(no yellow) = 1 – [6/10 × 5/9 × 4/8] (= 1 – 120/720 or 1 – 1/6) = 600/720 (= 5/6) or equivalent	S1 M1 A1	May be implied by subsequent working. Complete method. ISW FT from part *(a)* consistent use of a wrongly calculated denominator. If no other marks awarded, SC1 for sight of 784/1000 or equivalent (from a method 'with replacement')
Alternative method *P(YRR or RYR or RRY or YYR or YRY or RYY or YYY) or equivalent (allow up to two of these terms to be missing or incorrect for this mark)* *= 4/10×6/9×5/8×3 + 4/10×3/9×6/8×3 + 4/10×3/9×2/8 or equivalent* *(complete method required for this mark)* *= 600/720 (= 5/6) or equivalent ISW*	*S1* *M1* *A1*	 FT *4/10×6/9×5/8×3 + 'their part (a)' × 3 + 4/10×3/9×2/8*
19. *(a)* $\frac{a}{x(x-a)}$ or $\frac{a}{x^2-ax}$	B2	B1 for correct numerator - not from incorrect work – use of brackets may be implied. B1 for correct denominator in a single fraction (accept equivalent) If B2, penalise -1 for incorrect subsequent work
19. *(b)* $x - 1 + 2x(4x + 3)$ [= 0] or $x - 1 + 8x^2 + 6x$ [= 0] or $x - 1 = -2x(4x + 3)$ $8x^2 + 7x - 1$ [= 0] $(8x - 1)(x + 1)$ [= 0] $x = \frac{1}{8}$ or $x = -1$	M1 A1 B2 B1	Clearing fraction Allow e. g. $\frac{x - 1 + 2x(4x + 3)}{x(4x + 3)} = 0$ Allow M1 for $x - 1 = 2x(4x + 3)$ Collecting terms and re-arranging quadratic equation Ignore presence of denominator (provided correct). B1 for $(8x \ldots. 1)(x \ldots. 1)$ FT their quadratic equation, provided of equivalent difficulty. Both answers required. Strict FT 'their derived brackets'. *Using quadratic formula FT their quadratic equation, provided of equivalent difficulty.* *$(x =) \quad \frac{-7 \pm \sqrt{[7^2 - 4(8)(-1)]}}{2(8)}$ M1* *For M1, allow one error, in sign or substitution, but not in formula.* *$x = \frac{-7 \pm \sqrt{81}}{16}$ A1* *$x = \frac{1}{8}$ or $x = -1$ (both answers required) A1* *No marks for a trial and improvement method.*