GCSE MARKING SCHEME

AUTUMN 2024

GCSE
MATHEMATICS
UNIT 1 – HIGHER TIER
3300U50-1

About this marking scheme

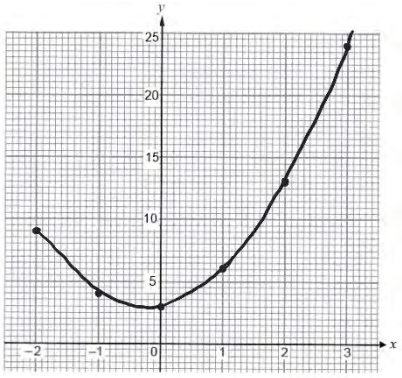
The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

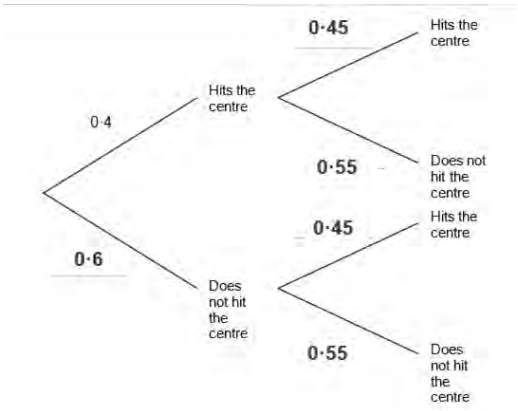
Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCSE MATHEMATICS

AUTUMN 2024 MARKING SCHEME

GCSE Mathematics **Unit 1: Higher Tier**	Mark	Comments
1.(a) 9 13	B2	Answers in table take precedence. B1 for each
1.(b) At least 4 correct plots and no incorrect plot.	P1	FT 'their (–2,9)' and 'their (2,13)' OR (–2,9) and (2,13) plotted (even when not shown in the table or contradicted). Allow ± '½ a small square'.
A smooth curve drawn through their plots.	C1	FT 'their 6 plots' OR a curve through the 4 given points **AND** (–2,9) and (2,13). Clear intention to draw a curve through 'their plotted points' (± 1 small square horizontally or vertically). 
2. (Number of Year 9 pupils in Ysgol Afon =) 127	B1	*Answers may be seen on diagram* Do not award B1 if 127 is clearly labelled as Year 7 Ysgol Afon.
(Number of Year 9 pupils in Ysgol Twyn =) $\frac{60}{360} \times 480$ or equivalent (e.g 480 ÷ 2 ÷ 3, 240 ÷ 3…)	M1	May be seen in stages.
80	A1	An answer of 80 implies M1A1.
(Total number of pupils = 508 + 480 =) 988 or (Total number of pupils = 494 + 287 + 207 =) 988	B1	CAO
(Probability from Year 9 =) $\frac{207}{988}$ ISW	B1	Sight of 207 implies the first B1 M1 A1. The numerator and denominator must both be integers for B1. FT 'their 127' + 'their 80' , provided 'their 988' • fraction <1 • 'their 988' from 'total for Ysgol Afon' + 480 • 'their numerator' is a sum of two values (but NOT 90 + 60 (angles)) Penalise incorrect notation -1 e.g. '207 in 988' If no marks awarded, SC1 for engaging with the total number of pupils in Ysgol Afon. This could be sight of 508 or 254 + 254 or equivalent (seen or implied).

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
3. For a correct method that produces 2 prime factors from the set {3,3,3,5,7} before 2nd error. 3, 3, 3, 5 , 7 $3^3 \times 5 \times 7$	M1 A1 B1	Must be a method that involves only division. Check for errors in the method before checking the 2 prime factors from the set. CAO. For sight of the five correct factors (Ignore 1s) with no other terms (if tree method used, use ends of branches). FT 'their primes' provided at least one index form used with at least a square. Do not FT non-primes. Allow $(3^3)(5)(7)$ or $3^3.5.7$ Do not allow $3^3,5,7$. Inclusion of 1 as a factor gets B0.
4. $2x + 3(x + 6) = 78$ or equivalent $5x + 18 = 78$ $5x = 60$ $(x =)$ 12 12 and 18	M2 A1 A1 A1 B1	Answer lines take precedence. Brackets may be implied by later correct work. Award M1 for one of the following: • Sight of $2x + 3(x + 6)$ or equivalent • $2x + 3x + 6 = 78$ (brackets omitted or incorrect). CAO. May be implied in later working. FT from M2 or M1, 'their $5x + 18 = 78$'. FT from M2 or M1, 'their $5x = 60$'. FT 'their algebraically derived 12' and 'their 12 + 6' correctly evaluated. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise accept a fraction. If M2 is awarded as the first step (forming an equation), then award the following A1A1A1B1 for 12 and 18 clearly identified as final answers (even if trial and improvement is then used).

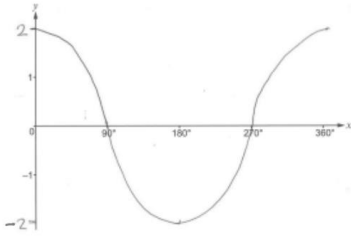
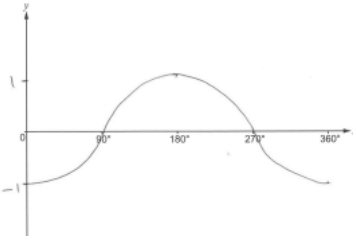
5. $(w =)\ 18{\cdot}9 \times \frac{6}{9}$ OR $\frac{w}{18{\cdot}9} = \frac{6}{9}$ or equivalent OR $(w =)\ 18{\cdot}9 \div \frac{9}{6}$ OR $\frac{18{\cdot}9}{9} = \frac{w}{6}$ or equivalent $w = 12{\cdot}6$	M1 A1	May be seen in stages. M1 for <u>correct use</u> of scale factor $\frac{2}{3}$ or equivalent. An unsupported answer of 12·6 is awarded M1A1.
6.(a) 0·6 or equivalent on correct Evan branch. 0·45 and 0·55 or equivalent correctly shown on both pairs for Jane.  	B1 B2	Award B1 for one of the following: • 0·45 and 0·55 or equivalent correctly shown on one pair of Jane's branches only • 0·45 and 0·55 or equivalent consistently reversed on all Jane branches.
6.(b) 0·4 × 0·45 or equivalent 0·18 or equivalent ISW	M1 A1	FT 0·4 × 'Jane's probability of hitting the centre' provided less than 1
7.(a) Sight of $x^2 + 8x + 15 = 120$ (leading to $x^2 + 8x - 105 = 0$)	B2	Must be convincing. Award B1 for one of the following • $(x+5)(x+3) = 120$ • $x^2 + 5x + 3x + 15$ • $x^2 + 8x + 15$ • $x^2 + kx + 15 = 120\ (k \neq 0)$ • $x^2 + 8x + k = 120\ (k \neq 0$ or $-105)$.
7.(b) $(x + 15)(x - 7)$ $(x =) -15$ AND $(x =) 7$	 B2 B1	May be seen in part (a) or (c), provided not contradicted in (b). Award B1 for one of the following: • $(x \ldots 15)(x \ldots 7)$ • two brackets which multiply to give $x^2 + 8x + k$ but not $(x+5)(x+3)$ • two brackets which multiply to give $x^2 + kx - 105$. Mark final answer. **<u>Strict FT</u>** from their <u>brackets</u>, provided not from $(x+5)(x+3)$. If no factorising shown, allow the following: B2 for $x + 15\ (=0)$ AND $x - 7\ (=0)$ (B1) $(x =) -15$ AND $(x =) 7$ (B1) B1 for $x - 15\ (=0)$ AND $x + 15\ (=0)$ (B0) $(x =) 15$ AND $(x =) -7$ (B1) FT B1 if only $(x =) -15$ AND $(x =) 7$ seen. (B1)

7.(c) Length = 12 (cm), width = 10 (cm) Statement about ignoring $x = -15$ **as it leads to negative lengths** or that x must be > –3	 B1 E1	Allow dimensions and/or justification to be seen in part (a) or (b), provided not contradicted in (c). Answer lines take precedence. FT 'their 7' + 5 and 'their 7' + 3 provided • one x value from (b) > -3 **AND** one x value from (b) < -3 • both length and width are positive. If not on answer line, must clearly be length and width. Unsupported answers are awarded B1 Allow "you can't have a negative length (on the rectangle)" "the width can't be negative" Do not accept incorrect or vague explanations e.g. "x can't be negative" "x must be positive" "it can't be negative".
8. $3{\cdot}2 \times 10^4 \div 1000 \div 8 \times 5$ or equivalent 20 or equivalent	 M2 A1	Answer space takes precedence. Operations can be made in any order Award M1 for sight of one of the following • $3{\cdot}2 \times 10^{(1)}$ (km) • $3{\cdot}2 \times 10^4 \div 1000$ or answer of 32 • $3{\cdot}2 \times 10^4 \div 1000 \div 8$ or answer of 4 • $3{\cdot}2 \times 10^4 \div 1000 \times 5$ or answer of 160 • $3{\cdot}2 \times 10^4 \div 8 \times 5$ or answer of 20 000 • $3{\cdot}2 \times 10^4 \div 1{\cdot}6$ or answer of 20 000 • One place value error (e.g. 2×10^x, $3{\cdot}2 \div 1{\cdot}6$). CAO.
9.(a) 125°	B1	
9.(b) (Obtuse $B\hat{O}D$ =) 110(°) (y =) $\frac{180 - 110}{2}$ or equivalent 35(°)	 B1 M1 A1	*May be seen on the diagram.* FT 360 – 2 × 'their value of x in part (a)'. FT $\frac{180 - \text{'their 110'}}{2}$ (may be stated or derived, provided 'their 110°' is not 55° and <180°).
10.(a) All three lines correct $(y - x = 1,\ y = \frac{x}{2},\ x = 3)$ Correct region identified	B2 B1	B1 for any two correct lines If $y = 3$ and any other vertical or horizontal line shown e.g. y = ± 3 or x = -3, do not award a mark unless $x = 3$ is selected for the region or clearly labelled. Strict FT provided B1 awarded. Accept indication by 'shading out'.
10.(b) (i) (x =) –2	B1	FT from their graph, where possible. Allow tolerance of ½ a small square.

Value of x in part (a)	$B\hat{O}D$
55°	250(°)
70°	220(°)
110°	140(°)
135°	90(°)

10.(b) (ii) (y =) 4	B1	FT from their graph, where possible. Allow tolerance of ½ a small square.
11.(a) Showing that **two** pairs of data values lead to different values of k for 'their $y = kx$' OR a valid statement e.g. 4 × 20 = 80, 8 × 20 ≠ 320. 4 × 20 = 80, 8 × 20 = 160. 8/4 ≠ 320/80 4 × 20 = 80, 245/20 = 12.25 ≠ 7, 320/20 = 16 ≠ 8 4 × 2 = 8, 80 × 2 = 160 ≠ 320 (reading across)	B2	k = 20 (from (4, 80)) k = 35 (from (7, 245)) k = 40 (from (8, 320)) Or correctly finding a second (contradictory) value of k. Award B1 for using $y = kx$ *to* correctly calculate the value of k from a correct substitution.
11.(b) $y \propto x^2$ OR $y = kx^2$ 80 = k × 4^2 OR 245 = k × 7^2 OR 320 = k × 8^2 OR k = 5 $y = 5x^2$	B1 M1 A1	Allow $y \propto kx^2$ M1 implies B1. FT from $y \propto x^n$ with n > 1 or n = –2 Use of n = –2 leads to k = 1280 or k = 12005 or k = 20480
12. (Slant height of cone =) $\sqrt{6^2 + 8^2}$ = 10 (cm) (Curved surface area of cone =) π × 6 × 10 = 60π (cm^2) or equivalent (πr^2 = π × 6 × 10) r^2 = 60 or $r = \sqrt{60}$ or equivalent (r =) $2\sqrt{15}$	M1 A1 M1 A1 M1 A1	Method for finding hypotenuse. Accept use of (3,4,5) x 2. FT 'their derived slant height' (not 8). CAO [For reference, 60π = 188.4] 60π may be implied by later working (e.g. sight of r^2 = 60) For calculating the total surface area of the cone, award M1 A1 SC1 for an answer of 96π (cm^2) [= 301(.44)] (from including the area of the base of the cone) Isolating r^2 or r. FT for 'their r^2 = 60' or 'their $r = \sqrt{60}$' from πr^2 = 'their 60π' FT from $r^2 = k$, provided equivalent difficulty (with r in the form $a\sqrt{b}$, where a and b are integers, and b is as small as possible'). SC1 for r = $\sqrt{6L}$ (where *L* = slant height) Note: after M0A0M0A0 for use of 8 as the slant height r^2 = 48 or $r = \sqrt{48}$ M1 (r =) $4\sqrt{3}$ A1

13. $64n^2 + 8n + 8n + 1$ [– 3] or equivalent $64n^2 + 16n - 2$ AND concluding statement OR $2(32n^2 + 8n - 1)$	 B2 E1	No marks for only trialling numbers. Correct expansion of brackets. B1 for 3 correct terms in an expression (and 1 incorrect or missing term). Factorisation is not explicitly required for this mark, provided statement is convincing e.g. all terms are even <u>If no other marks</u>, award SC1 for a concluding statement (or factorisation) resulting from an (incorrect) expansion e.g. $64n^2 - 2$, $16n^2 + 32n - 2$ <u>If no marks awarded</u>, SC2 for a <u>complete</u> non-algebraic proof *$8n + 1$ is odd* *odd² = odd* *odd – odd = even (and concluding statement)*
14. ($\frac{3}{4} + \frac{1}{8}$ =) $\frac{7}{8}$ or 0·875 or equivalent	B3	If not B3: • B2 for $\frac{1}{8}$ or 0·125 • B2 for sight of $\frac{3}{4}$ **<u>AND</u>** 8^{-1} or $\frac{1}{2^3}$ or $\left(\frac{1}{2}\right)^3$ or $\frac{1}{\sqrt[4]{4096}}$ or $\sqrt[4]{\frac{1}{4096}}$ or $\frac{1}{4096^{\frac{1}{4}}}$ or $\left(\frac{1}{4096}\right)^{\frac{1}{4}}$ • B1 for sight of $\frac{3}{4}$ **<u>OR</u>** 8^{-1} or $\frac{1}{2^3}$ or $\left(\frac{1}{2}\right)^3$ or $\frac{1}{\sqrt[4]{4096}}$ or $\sqrt[4]{\frac{1}{4096}}$ or $\frac{1}{4096^{\frac{1}{4}}}$ or $\left(\frac{1}{4096}\right)^{\frac{1}{4}}$ Note: $\frac{1}{\frac{4}{3}}$ is insufficient for $\frac{3}{4}$.
15. $5 - 5\sqrt{3} + \sqrt{3} - 3$ $(= 2 - 4\sqrt{3})$ $(-)\ 9\sqrt{3}$ $2 - 13\sqrt{3}$	B2 B1 B1	Correct expansion of brackets. B1 for 3 correct terms in an expression (and 1 incorrect or missing term) but not if there is subsequent incorrect evaluation of a term e.g. if $5\sqrt{3}$ is given as $\sqrt{15}$. $\sqrt{9}$ is insufficient for 3 (unless 3 implied by further working). Mark final answer. FT for equivalent difficulty (requiring collection of constants and terms in $\sqrt{3}$).
16. (Numerator) $(4c + d)(4c - d)$ (Denominator) $2c\,(4c + d)$ $\frac{4c-d}{2c}$ or $2 - \frac{d}{2c}$ or equivalent.	B2 B1 B1	B1 for $(4c \ldots d)(4c \ldots d)$ Mark final answer. FT provided no more than 1 previous error and provided simplification required. Do not accept an unsupported answer of $2 - \frac{d}{2c}$.

17. (Probability =) 0·7 + 0·3 × 0·7 OR 1 − 0·3 × 0·3 = 0·91 AND Yes ticked or implied.	M2 A1	Accept 0·7 × 0·7 + 0·7 × 0·3 + 0·3 × 0·7 M1 for sight of 0·3 × 0·7 or 0·7 × 0·3 or 0·3 × 0·3. May be seen alongside tree diagram.
18.(a) 122° and 238° with no other values	B2	Check diagram. If B2, penalise –1 for each extra value within range (beyond 2 attempts). Allow embedded answers. B1 for one of the following: • 122° • 238° • sight of both 180 – 58 and 180 + 58 or equivalent. Ignore extra (correct or incorrect) values outside the required range.
18.(b)(i) Vertical stretch (by a factor of 2) Maxima at (0, 2) and (360, 2), Minimum at (180, –2).  	B2	Mark clear intention. Must be the correct shape (including curvature), i.e. a single cycle of a cosine curve, with y = 0 at x = 90° and x = 270°. Accept any clear indication of y-coordinates. If not B2, award B1 for one of the following: • Fully correct shape and position (for $0 \le x \le 360°$) without correct coordinates indicated OR • Correct shape and position either for $0 \le x \le 180°$ or for $180° \le x \le 360°$ AND indication of y = 2 and y = –2. OR • A graph which is fully correct (including labelling) other than having pointed minimum and maximum (formed from straight lines).
18.(b)(ii) Reflection in x-axis Minima at (0, –1) and (360, –1), Maximum at (180, 1).  	B2	Mark clear intention. Must be the correct shape (including curvature), i.e. a single cycle of a negative cosine curve, with y = 0 at x = 90° and x = 270°. Accept any clear indication of y-coordinates. If not B2, award B1 for one of the following: • Fully correct shape and position (for $0 \le x \le 360°$) without correct coordinates indicated OR • Correct shape and position either for $0 \le x \le 180°$ or for $180° \le x \le 360°$ AND indication of y = 1 and y = –1. OR • A graph which is fully correct (including labelling) other than having pointed minimum and maximum (formed from straight lines).