GCSE MARKING SCHEME

AUTUMN 2021

GCSE
MATHEMATICS
UNIT 1 – HIGHER TIER
3300U50-1

INTRODUCTION

This marking scheme was used by WJEC for the 2021 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 2021 MARK SCHEME

Unit 1: Higher Tier	Mark	Comments
1. $(a + b = 180 - 25) = 155$ $(a =) \frac{155}{5} \times 2$ OR $(b =) \frac{155}{5} \times 3$ or equivalent $a = 62(°)$ AND $b = 93(°)$	B1 M1 A1	B1 for sight of 155. FT 'their stated 155'. Allow M1A0 if the angles are reversed and <u>not</u> corrected.
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
2.(a) 360	B2	Mark final answer. B1 for $2^3 \times 3^2 \times 5$ OR B1 for any other common multiple e.g. 720, 1080 etc. unambiguously identified as a final answer OR B1 for sight of correct <u>prime factors</u> e.g. $60 = 2^2 \times 3 \times 5$ or equivalent <u>AND</u> $72 = 2^3 \times 3^2$ or equivalent OR Accurate Venn diagram showing correct prime factors OR B1 for sight of 60, 120, 180, 240, 300, 360, …. <u>AND</u> 72, 144, 216, 288, 360 with no further numbers.
2.(b) For a single method that produces 2 prime factors from the set {2, 3, 3, 7, 7} before the 2nd error. 2, 3, 3, 7, 7 $2 \times 3^2 \times 7^2$	M1 A1 B1	Must be a method of 'repeated division'. C.A.O. for sight of the five correct factors. (Ignore 1s) F.T. 'their primes' provided at least one index form used with at least a square. Do not F.T. non-primes. Allow $(2)(3^2)(7^2)$ and $2.3^2.7^2$ Do not allow $2,3^2,7^2$. Inclusion of 1 as a factor gets B0.

3. 6 −2 At least 5 correct plots and no incorrect plot. A smooth curve drawn through their plots.	B2 P1 C1	B1 for each. F.T. 'their (−1,6)' AND 'their (3,−2)'. Allow ±'$\frac{1}{2}$ a small square'. F.T. 'their 7 plots' OR a curve through the 5 given plots AND (−1,6) AND (3,−2). Allow for the intention to pass through their plots (within 1 small square, either horizontally **or** vertically of the point).
4. (Curved length =) 3·14 × 4 or equivalent = 12·56 (cm) (Perimeter =) 20·56 (cm)	M1 A1 B1	Do not allow M1 if subsequently divided by 2. Allow 4π for M1A1. Allow SC1 for an answer of 25·12 (whole circle). (If 12·56 shown, but then doubled, only award the SC1.) FT 'their derived 12·56' + 8 (even 'an area' + 8). Allow $4\pi + 8$.
5.(a) $3k = p - 2$ or $p - 2 = 3k$ or $-3k = -p + 2$ $k = \frac{p-2}{3}$ or $\frac{p-2}{3} = k$ or $k = \frac{-p+2}{-3}$	B1 B1	F.T. only from $\pm 3k = \pm p \pm 2$, stated or implied. ($3k = p - 2$ will have already gained the previous B1.) B1B0 for $-k = \frac{-p+2}{3}$ or equivalent. Mark final answer. *Note* *Allow B1B0 for $k = (p - 2) \div 3$ with or without brackets.* *Allow B1B0 for $\frac{p-2}{3}$ ('k' missing)*
5.(b) (Midpoint =) (5, 17) Showing that 17 = 3 × 5 + 2 (convincing) AND 'Yes'	B2 B1	B1 for each coordinate. May be given as $x = 5$ and $y = 17$. Accept use of $x = 5$ and $y = 17$ in $y = 3x + 2$. Allow B1 for sight of $\frac{3+7}{2}$ or $\frac{7-3}{2} + 3$ OR $\frac{15+19}{2}$ or $\frac{19-15}{2} + 15$ Allow SC1 for unsupported (17, 5). FT 'their stated midpoint', but not (3,15) nor (7,19), with consequent calculation AND decision.
6.(a) $5{\cdot}8 \times 10^{-3}$	B1	
6.(b) 7×10^{5}	B2	B1 for sight of correct value not in standard form e.g. $0{\cdot}7 \times 10^{6}$ or 700000. Mark final answer.
7.(a) P(South Wales =) 1 − 0·3 − 0·25 = 0·45 AND shown on relevant branch. 0·2 and 0·8 shown on all relevant branches.	 M1 A1 B1	
7.(b) 0·45 × 0·2 or equivalent = 0·09 or equivalent	M1 A1	FT 'their completed tree diagram' for values 0<p<1.

8. Showing $4x + 3y = 19$ or equivalent. Showing $6x - y = 12$ or equivalent. A correct method to eliminate one variable e.g. 'equal coefficients AND appropriate addition or subtraction'. OR ' method of substitution'. First variable found , x = 2½ or y = 3. Second variable found	B1 B1 M1 A1 A1	2x + 2x + 3y = 19 is an equivalent answer. *Workings must be shown for M1A1A1.* FT to solve for simultaneous equations if of equivalent difficulty. Allow one error in one term (not the term with equal coefficients.) C.A.O. for 'their equations'. FT substitution of their '1st variable' if M1 gained. If NO (i.e. none of the five) marks gained, allow SC1 for <u>both</u> answers of x = 2½ AND y = 3
9. <u>Enlargement</u> with scale factor $-\frac{1}{2}$ and centre (<u>1, 0</u>)	B3	Award B2 for reference to any two of 'enlargement', '$-\frac{1}{2}$' and 'centre (1, 0)'. Award B1 for reference to any one of 'enlargement', '$-\frac{1}{2}$' and 'centre (1, 0)'. If B0, award 1 mark for reference to 'enlargement' within a multi-stage transformation.
10. Sight of $20x^2 + 15x - 8x^2 + 4x$ or equivalent. Sight of denominator of $(2x - 1)(4x + 3)$ $\frac{12x^2+19x}{(2x-1)(4x+3)}$ or $\frac{12x^2+19x}{8x^2+2x-3}$	B2 B1 B1	Award B1 for sight of $5x(4x + 3) - 4x(2x - 1)$ OR three of the four terms correct. Must be seen or stated as the denominator. FT from one error in numerator. Note the numerator may be factorised as $x(12x + 19)$ Mark final answer.
11. (Area scale factor =) Sight of $(\frac{7}{5})^2$ $(=\frac{49}{25})$ OR $1{\cdot}4^2$ (= 1·96) $\frac{49}{25}$ (< 2) or 1·96 (< 2) AND 'No (Mari is not correct)'	B1 B1	Or equivalent Accept a method based on ratios e.g. $5^2 : 7^2 = 25 : 49 = 1 : \frac{49}{25}$ Accept any equivalent statement. Accept $(\frac{7}{5})^2 < 2$ or $1{\cdot}4^2 < 2$ or equivalent. B0 if evaluation of $(\frac{7}{5})^2$ or $1{\cdot}4^2$ is incorrect.
<u>Alternative method</u> (using scale factor 2) *$5^2 \times 2$ (= 50)* *(7^2 =) 49 < 50 AND 'No (Mari is not correct)'*	*B1* *B1*	*Accept a method based on ratios* *e.g. $5^2 : 7^2 = 25 : 49 = \frac{25}{49} : 1$* *Accept any equivalent statement e.g. $\sqrt{49}<\sqrt{50}$* *B0 if evaluation of 5^2 or 7^2 is incorrect.*
12. $xw + 8w = 3y - 4$ or $4 - 3y = -xw - 8w$ $w(x + 8) = 3y - 4$ or $4 - 3y = w(-x - 8)$ $w = \frac{3y-4}{x+8}$ or $w = \frac{4-3y}{-x-8}$ or equivalent	B1 B1 B1	Collecting w terms. F.T. until 2nd error provided equivalent difficulty Factorising. Accept $4 - 3y = -w(x + 8)$ Dividing. Mark final answer. $\frac{4-3y}{x+8} = -w$ only gains B1B1B0

13. $(4x + 3)(x - 1)$ (=0) $(x =) -\frac{3}{4}$ AND $(x =) 1$	B2 B1	B1 for $(4x$ ….. 3) $(x$ ….. 1) Strict FT from their brackets provided equivalent difficulty. (Both solutions are required for this B1.) B1 if only $(x =) -\frac{3}{4}$ AND $(x =) 1$ seen.
Alternative method (using quadratic formula) *$(x =) \frac{1 \pm\sqrt{[(-1)^2 - 4(4)(-3)]}}{2(4)}$* *$x = \frac{1 \pm\sqrt{49}}{8}$* *$x = -\frac{3}{4}$ AND 1 (or equivalent)*	*M1* *A1* *A1*	*Allow one error, in sign or substitution, but not in the formula for M1 A0 A0.*
14. *(a)* $\frac{1}{8}$	B2	B1 for 8^{-1} or $\frac{1}{2^3}$ or $(\frac{1}{2})^3$ or $\frac{1}{\sqrt{64}}$ or $\sqrt{\frac{1}{64}}$ or $\frac{1}{64^{\frac{1}{2}}}$ or $(\frac{1}{64})^{\frac{1}{2}}$
14. *(b)* $x = 0{\cdot}02222.....$ $10x = 0{\cdot}2222.....$ with an attempt to subtract $(\frac{1}{3} +) \frac{2}{90}$ OR $(\frac{1}{3} +) \frac{1}{45}$ $x = \frac{32}{90} (= \frac{16}{45})$	M1 A1 B1	Or $10x$ and $100x$, or equivalent. Or an alternative method. Sight of $\frac{0{\cdot}2}{9}$ gains M1 only. FT 'their $\frac{2}{90}$' provided equivalent difficulty. Mark final answer. Do not ignore incorrect cancelling.
Alternative method 1 *$x = (\frac{1}{3} +) \frac{0{\cdot}2}{9}$* *$= \frac{3{\cdot}2}{9}$* *$= \frac{32}{90} (= \frac{16}{45})$*	*B1* *M1* *A1*	*Mark final answer*
Alternative method 2 *$x = 0{\cdot}35555…...$* *$10x = 3{\cdot}5555.....$ with an attempt to subtract $x = \frac{32}{90} (= \frac{16}{45})$*	*B1* *M1* *A1*	*Or $10x$ and $100x$, or equivalent.* *'FT 'their 0.35555…' provided equivalent difficulty'.* *Sight of $\frac{3{\cdot}2}{9}$ gains B1 M1 only* *Mark final answer*
Alternative method 3 *$x = 0{\cdot}35555…... (= 0{\cdot}3 + 0{\cdot}05555)$* *$= \frac{3}{10} + \frac{0{\cdot}5}{9}$ or equivalent* *$= \frac{32}{90} (= \frac{16}{45})$*	*B1* *M1* *A1*	*Mark final answer*

15. $\pi \times 3^2 \times h + \frac{2}{3} \times \pi \times 3^3 = 63\pi$ or equivalent Allow $\frac{\frac{4}{3} \times \pi \times 3^3}{2}$ for $\frac{2}{3} \times \pi \times 3^3$.	M2	(Using 'h' as height of cylinder) M1 for summing 2 terms and equating to 63π, with 1 term being correct M1 may be implied by a subtraction or seen in stages e.g. $9\pi h = 27\pi$ from $63\pi - 36\pi$ or $9\pi h = 36\pi$ from $63\pi - 27\pi$ or $9\pi h = 57\pi$ from $63\pi - 6\pi$ (using incorrect evaluations for volume of hemisphere) Allow the use of $\pi = 3{\cdot}14$.
$9\pi h = 63\pi - 18\pi$ or $h = \frac{63\pi - 18\pi}{9\pi}$ or equivalent e.g. $\frac{45\pi}{9\pi}$ = 5 (cm) (Total height =) 8 (cm)	m1 A1 B1	Isolating the term in h. FT from M1 or M2. C.A.O. FT 'their 5' + 3 provided M1m1 or M2m1 awarded If no marks, award SC1 for 18π for the volume of the hemisphere (but NOT from a calculation for surface area) OR SC2 for 45π for the volume of the cylinder.
Alternative method *$\pi \times 3^2 \times (H - 3) + \frac{2}{3} \times \pi \times 3^3 = 63\pi$ or equivalent* Allow $\frac{\frac{4}{3} \times \pi \times 3^3}{2}$ for $\frac{2}{3} \times \pi \times 3^3$.	*M2*	*(Using 'H' as total height of object)* *M1 for summing 2 terms and equating to 63π, with 1 term being correct.* *M1 may be implied by a subtraction or seen in stages.* *Allow the use of $\pi = 3{\cdot}14$.*
$9\pi(H - 3) = 63\pi - 18\pi$ *or equivalent e.g $9\pi H = 63\pi - 18\pi + 27\pi$* *(H =) $\frac{63\pi - 18\pi + 27\pi}{9\pi}$ or equivalent e.g. $\frac{72\pi}{9\pi}$* *(Height of object =) 8 (cm)*	*m1* *A1* *A1*	*Isolating the term in (H – 3). FT from M1 or M2.* *FT from M1m1 or M2m1.* *C.A.O.* *If no marks, award SC1 for 18π for the volume of the hemisphere (but NOT from a calculation for surface area)* *OR* *SC2 for 45π for the volume of the cylinder* *OR* *SC2 for an appropriate volume of 72π.*
16. *(a)* $3\sqrt{2}$	B1	
16. *(b)* 2	B1	
16. *(c)* $9\sqrt{3}$	B1	

17. 218° and 322° with no other values	B2	B1 for either angle. Check diagram. Ignore extra (correct or incorrect) values outside the required range. Penalise -1 for each extra value within range (beyond 2 attempts). If no marks, SC1 for accurate evaluations from consistent use of 180+n AND 360-n (with n acute). Method must be seen for this mark.
18. *(a)* $\frac{4}{7} \times \frac{1}{6} \times \frac{2}{5}$ or equivalent 8/210 (= 4/105)	M1 A1	Penalise once only throughout for a repeated error in calculating the denominator (of 210) ISW
18. *(b)* 1 – P (3, 3, 3) $1 - \frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}$ $\frac{186}{210}$ $(= \frac{93}{105} = \frac{62}{70} = \frac{31}{35})$	M1 M1 A1	 ISW If no other marks, award SC1 for an answer of $\frac{279}{343}$ (from working 'with replacement') OR SC1 for sight of $\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}$
Alternative method *(P(total10)+P(total11)+P(total12)+P(total13)+P(total14)=)* *P(3,3,4) × 3 + P(3,3,5) × 3 + P(3,4,5) × 6 + P(3,5,5) × 3 + P(4,5,5) × 3* $= \frac{4}{7} \times \frac{3}{6} \times \frac{1}{5} \times 3 + \frac{4}{7} \times \frac{3}{6} \times \frac{2}{5} \times 3 + \frac{4}{7} \times \frac{1}{6} \times \frac{2}{5} \times 6 + \frac{4}{7} \times \frac{2}{6} \times \frac{1}{5} \times 3 + \frac{1}{7} \times \frac{2}{6} \times \frac{1}{5} \times 3$ $\frac{186}{210}$ $(= \frac{93}{105} = \frac{62}{70} = \frac{31}{35})$	*M1* *M1* *A1*	*M0 if orderings are not considered* *ISW* If no marks awarded, award SC1 for the correct method for calculating any individual total, e.g. P(total 10) = $\frac{4}{7} \times \frac{3}{6} \times \frac{1}{5} \times 3$ or equivalent For information only: *P(10)*= $\frac{36}{210}$ $(= \frac{6}{35})$ *P(11)*= $\frac{72}{210}$ $(= \frac{12}{35})$ *P(12)*= $\frac{48}{210}$ $(= \frac{8}{35})$ *P(13)*= $\frac{24}{210}$ $(= \frac{4}{35})$ *P(14)*= $\frac{6}{210}$ $(= \frac{1}{35})$ OR award SC1 for a calculation leading to an answer of $\frac{54}{210}$ (from adding probabilities without accounting for different ordering) OR award SC1 for an answer of $\frac{279}{343}$ (from working 'with replacement').