GCSE MARKING SCHEME

AUTUMN 2021

GCSE
MATHEMATICS
UNIT 2 – HIGHER TIER
3300U60-1

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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.

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WJEC GCSE MATHEMATICS

AUTUMN 2021 MARK SCHEME

Unit 2: Higher Tier	Mark	Comments
1. 4(3a – 7) + 2(5a + 4) or equivalent. = 12a – 28 + 10a + 8 or equivalent. = 22a – 20 (cm) or 2(11a – 10) (cm)	B1 B1 B1	For a correct expression for the perimeter. For removal of brackets FT only from 2(3a – 7) + (5a +4) or equivalent OR 2(3a – 7) + 2(5a +4) or equivalent. For collection of terms FT if of equivalent difficulty. Mark final answer.
Alternative approach *2[2(3a −7) + (5a + 4)]* *= 12a − 28 + 10a + 8 or 2(6a – 14 + 5a +4)* *= 22a – 20 (cm) or 2(11a – 10) (cm)*	 *B1* *B1* *B1*	. *For a correct expression for the perimeter.* *For removal of brackets (within 'square brackets')* *FT only from* *2 [2(3a – 7) + 2(5a +4)] or equivalent.* For collection of terms *FT only from* *2 [2(3a – 7) + 2(5a +4)] or equivalent.* *FT if of equivalent difficulty.* *Mark final answer*
2. (number of part-time in North Wales =) $\frac{90}{360} \times 96$ OR (number of full-time in North Wales =) $\frac{144}{360} \times 150$ (number of part-time in North Wales =) 24 (number of full-time in North Wales =) 60 (Probability from North Wales =) $\frac{84}{246}$ or equivalent ISW	M1 A1 A1 A1	Or equivalent *Answers may be seen on the diagram.* An answer (or sight) of 24 implies M1. An answer (or sight) of 60 implies M1. FT ('their 24' + 'their 60') /246 provided M1 gained and ('their 24' + 'their 60') < 246. Penalise incorrect notation −1. e.g. '84 in 246'.
3. One correct evaluation $2 \le x \le 3$ 2 correct evaluations $2{\cdot}25 \le x \le 2{\cdot}45$, one < 20, one > 20. 2 correct evaluations $2{\cdot}25 \le x \le 2{\cdot}35$, one < 20, one > 20. $x = 2{\cdot}3$	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if <20 or >20. If evaluations not seen accept 'too high' or 'too low'.* *Look out for testing $x^3 + 3x – 20 = 0$* *<u>x</u> <u>$x^3 + 3x$</u>* 2 14 2·1 15·561 2·2 17·248 2·25 18·140…. **2·3 19·067 2·35 20·027….** **2·4 21·024** 2·45 22·056…. 2·5 23·125 2·6 25·376 2·7 27·783 2·8 30·352 2·9 33·089 3 36 *<u>Note</u>* *Evidence for M1 must be **<u>seen</u>** before A1 can be awarded.*

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4. $5x - 17 + 2x + 9 + x + 20 = 180$ $8x = 168$ $x = 21$ Substituting x = 21 into at least one expression. (5x – 17 =) 88(°) (2x + 9 =) 51(°) (x + 20 =) 41(°) (So not a right-angled triangle)	M1 A1 A1 M1 A1	 F.T. from ax = b. Allow all 3 marks for x = 21. If x ≠ 21 FT 'their <u>derived</u> value of x'. F.T. for this A1 if x ≥ 4. Any **two** of these expressions correctly evaluated with no incorrect evaluation, provided the sum of the two found is > 90. (statement not required). <u>Note</u> ***If further work indicates that the values found are not treated as angles (e.g. showing $51^2 + 41^2 \neq 88^2$) then award final M0A0.***
<u>Alternative method</u> *5x − 17 = 90 OR 2x + 9 = 90 OR x + 20 = 90* *x = 21·4 AND x = 40·5 AND x = 70* *Then verifying:* *If x = 21·4: 5x − 17 + 2x + 9 + x + 20 = 183.2* *AND* *If x = 40·5: 5x − 17 + 2x + 9 + x + 20 = 336* *AND* *If x = 70: 5x − 17 + 2x + 9 + x + 20 = 572* *(So not a right-angled triangle)*	*M1* *A2* *A2*	 *Award A1 for any one of these:* *x = 21·4 OR x = 40·5 OR x = 70* *Award A1 for any one of these:* *If x = 21·4: 5x − 17 + 2x + 9 + x + 20 = 183.2* *OR* *If x = 40·5: 5x − 17 + 2x + 9 + x + 20 = 336* *OR* *If x = 70: 5x − 17 + 2x + 9 + x + 20 = 572*
5. (AB =) 13·8 × cos 41 OR 13·8 × sin 49 = 10·4(…) (cm)	M2 A1	M1 for cos 41 = $\frac{AB}{13·8}$ OR sin 49 = $\frac{AB}{13·8}$
<u>Alternative method:</u> ***Correct** use of 'two-step' method.* *(AB) = 10·4(…)(cm)*	*M2* *A1*	*A partial trigonometric method is M0.* *Accept an answer that rounds to 10·4(cm)*
6.a(i) $x^3 + 7x$	B2	B1 for sight of x^3 + ……. OR ……+ 7x. Do not accept x×x×x + x×7 etc. Mark final answer.
6(a)(ii) $3x^2 - 4x - 15x + 20$ $3x^2 - 19x + 20$	B1 B1	Must be an expression. FT from an error in only one term (out of 4) only if of the form $ax^2 \pm bx \pm cx \pm d$.
6.(b)(i) 5n – 27 < n OR n > 5n − 27	B2	Allow B2 for an equivalent correct inequality. e.g. 4n – 27 < 0. B1 if ≤ or ≥ used in a 'correct' inequality. OR B1 for 5n – 27 > n OR n < 5n − 27
6.(b)(ii) 4n < 27 $n < \frac{27}{4}$ (Greatest number of clocks =) 6	B1 B1 B1	FT 'their inequality' if of equivalent difficulty. FT only from an < b OR an ≤ b OR an > b OR an ≥ b. FT only from n < c where c is positive OR n ≤ d where d is positive and not an integer An answer of 6 gains all 3 marks.
7.(a) N ÷ 1·04	B1	
7.(b) 248·832	B2	Allow B2 if 248·832 <u>seen</u> then corrected to a <u>final answer</u> of 249 or 248·8(..). If B2 not awarded, B1 for <u>final answer</u> of 249 or 248·(…) i.e. 248·832 not seen. B1 for sight of $100 \times 1·2^5$ or for equivalent calculations, e.g. $144 \times 1·2^3$ or 100×1·2×1·2×1·2×1·2×1·2 (may be seen in stages) B1 for a final answer of 298·5984.

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8. (x – 6)(x + 2) (x =) 6 AND (x =) −2	B2 B1	B1 for (*x* ... 6)(*x* ... 2). Strict F.T. from their <u>brackets.</u> Penalise change of letter −1. Allow the following. B2 for x − 6 (=0) AND x + 2 (=0) (B1) (x =) 6 AND (x =) −2 (B1) B1 for x + 6 (=0) AND x − 2 (=0) (B0) (x =) −6 AND (x =) 2 (B1) FT B1 if only (x =) 6 AND (x =) −2 seen. (B1) Use of quadratic formula would only lead to this B1. Mark final answer.
9. (Arc length =) $\frac{212}{360} \times 2 \times \pi \times 7{\cdot}3 =$ 26·99 to 27·0143 (cm) or $\frac{3869\pi}{450}$ (Perimeter = their arc length + 2 × 7·3) = 42 or 41·6 (cm)	M1 A1 B1	 Seen or implied. Accept 41·59 to 41·6143 (cm). FT 'their derived arc length' + 14.6, provided M1 awarded.
<u>Alternative version</u> $\frac{212}{360} \times 2 \times \pi \times 7{\cdot}3 + 2 \times 7{\cdot}3 =$ *= 42 or 41·6 (cm)*	 *M2* *A1*	 *Accept 41·59 to 41·6143 (cm).*
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
10. *(a)(i)* $y \propto 1/\sqrt{x}$ OR $y = k/\sqrt{x}$ $65 = k/\sqrt{51{\cdot}84}$ OR $65 = k/7{\cdot}2$ OR $k = 65\times\sqrt{51{\cdot}84}$ OR $k = 65\times7{\cdot}2$ OR $k = 468$ $(y =)\ 468/\sqrt{x}$	B1 M1 A1	Allow $y \propto k/\sqrt{x}$ M1 implies B1 F.T. for B0 M1 from $y \propto 1/x^n$ with $n > 0$ and $n \neq 1/2$ No F.T. from direct proportion May be seen explicitly in part *(ii)*.
10. *(a)(ii)* $\begin{array}{\|c\|c\|c\|c\|}\hline x & 51{\cdot}84 & 15{\cdot}21 & \mathbf{36} \\ \hline y & 65 & \mathbf{120} & 78 \\ \hline \end{array}$	B2	Check working space (if table left blank). B1 for one correct value. F.T. for consistent use of 'their expression' for inverse proportion only, but not for $y = 1/x$
10. (b) *c* is multiplied by 4	B1	

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11.		If many attempts are offered without a method/answer being identified, then mark the final attempt.
$\frac{63 \cdot 5^2}{8.65}$	M2	If M2 not gained, award M1 for correct use of values $63 \le d < 64$ AND $8 \cdot 6 < e \le 8 \cdot 7$
= 466(·156…) or 466·16 or 466·2	A1	Mark final answer. M2 required for A1. Fractional equivalent 466(·156…) = 80645/173 Allow this A1 for an answer of 470 only from correct unambiguous working seen. If no marks gained, award SC1 for sight of 63·5 and 8·65 used within the same calculation.
12. Use of cosine rule followed by sine rule	S1	
(EG =) $\sqrt{(2 \cdot 7^2 + 3 \cdot 2^2 - 2 \times 2 \cdot 7 \times 3 \cdot 2 \times \cos 79(°))}$	M2	M1 for (EG^2 =) $2 \cdot 7^2 + 3 \cdot 2^2 - 2 \times 2 \cdot 7 \times 3 \cdot 2 \times \cos 79(°)$ or for (EG^2 =) 14·2(3…..)
(EG =) 3·77…. (cm)	A1	Accept 3·8 cm Allow √14.2(3...) if used in this form in subsequent work, provided not evaluated as a decimal (at any stage)
sin EFG = EG × sin 65(°) / 6·4 OR EFG = $\sin^{-1}$(EG × sin 65(°) / 6·4)	M2	F.T. 'their derived EG' (not 2·7, 3·2, 6·4 or spurious EG). Award M1 for sin EFG / EG = sin 65(°) / 6·4 OR EG / sin EFG = 6·4 / sin 65(°)
F = 32(·29…..°)	A1	Dependent on previous M2.
13. (Numerator) Sight of $3x(2x - 3)$ (Denominator) Sight of $(2x - 3)(2x + 3)$ $\frac{3x}{2x + 3}$	B1 B2 B1	B1 for ($2x$ ….. 3) ($2x$ ….. 3) Mark final answer. F.T. provided at least one previous B1 awarded AND provided simplification required.
14. *(a)* ½ × (x – 1) × ($2x$ + 3) × sin 30° [= 6] OR ½ × ($2x^2 + 3x - 2x - 3$) × sin 30° [= 6]	B1	Use of 'Area = ½ ab sinC'.
$2x^2 + x - 3$ (= 6 × 2 × 2)	B1	Correct expansion of brackets and correct collection of x terms. May be implied within equation.
$2x^2 + x - 27 = 0$	B1	Must be convincing.
14. *(b)* (x =) $\frac{-1 \pm \sqrt{[(1)^2 - 4(2)(-27)]}}{2(2)}$	M1	**This substitution into the formula must be seen for M1, otherwise award M0A0A0.** Allow one slip in substitution **<u>for M1 only</u>**, but must be correct formula.
(x =) $\frac{-1 \pm \sqrt{217}}{4}$	A1	Can be implied from at least one correct value of x evaluated, provided M1 awarded.
(x =) –3·93 AND 3·43	A1	Both solutions required. *<u>Using trial and improvement</u>* *Award B3 for a method leading to <u>both</u> solutions, namely x = –3·93 AND x = 3·43, otherwise B0.* An unsupported answer gains zero marks.
14. *(c)* (AC =) 2·43 (cm)	B1	F.T. 'their derived x' provided one positive and one negative solution.
Length cannot be negative / must be positive.	E1	Accept any valid explanation, e.g. x–1>0, so x>1, x cannot be negative (as x - 1 must be > 0)
15. *(a)* $y = f(x) - 3$	B1	
15. *(b)* $y = -f(x)$	B1	
15. *(c)* $y = f(x - 10)$	B1	

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