GCSE MARKING SCHEME

AUTUMN 2020

GCSE
MATHEMATICS – UNIT 2 (HIGHER TIER)
3300U60-1

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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.

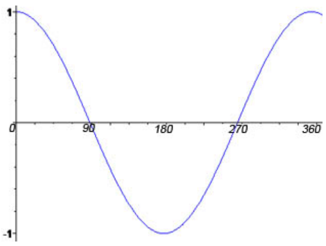
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE Mathematics Unit 2 Higher Tier	Mark	Comments
1.(a) $\frac{1}{6} \times \frac{1}{4}$ or equivalent $= \frac{1}{24}$ ISW	M1 A1	 Accept 0·0416… or 0·0417 or 0·042 for M1A1 M1A0 for '1 in 24', '1:24'.
1.(b) $\frac{1}{5} + \frac{1}{10}$ or equivalent. $= \frac{3}{10}$ or equivalent. ISW	M1 A1	
2. $(AC^2 =)\ 10{\cdot}8^2 + 14{\cdot}4^2$ $AC^2 = 324$ or $(AC =)\ \sqrt{324}$ $(AC =)$ 18(cm) (Area ACD =) $\frac{24 \times 18}{2}$ = 216 (cm^2)	M1 A1 A1 M1 A1	Accept equivalent of using cos rule (as cos 90 = 0). F.T. √'their 324' provided M1 gained. Final answer of AC = 324 is M1A0A0. *<u>Alternative method to find AC</u>* *A correct and complete method (using two trigonometric relationships) M2* *AC = 18(cm) A1* FT 'their stated AC'. (May be shown on the diagram) Accept equivalent of using ½ × 24 × 18 × sin 90 (as sin 90 = 1).
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. One correct evaluation $7{\cdot}2 \le x \le 7{\cdot}3$ 2 correct evaluations $7{\cdot}275 \le x \le 7{\cdot}295$, one < 0, one > 0. 2 correct evaluations $7{\cdot}275 \le x \le 7{\cdot}285$, one < 0, one > 0. $x = 7{\cdot}28$	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* *Look out for equating $x^3 - 5x = 350$* <u>x</u> <u>$x^3 - 5x - 350$</u> 7·2 –12·75(2) 7·21 –11(·2..) 7·22 – 9(·7…) 7·23 – 8(·2…) 7·24 – 6(·6…) 7·25 –5(·1...) 7·26 – 3(·6…) 7·275 −1(·3….) 7·27 – 2(·1…) 7·284 0(·04..) **7·28 −0·5(7..) 7·285 0·1(9..)** **7·29 0·9(7..)** 7·295 1(·7….) 7·3 2·5(17)

4.(a) an expression	B1	
4.(b) an equation	B1	
5. (Mid-points) 2·5, (7·5), 12·5 and 17·5. $8 \times 2{\cdot}5 + (0 \times 7{\cdot}5) + 7 \times 12{\cdot}5 + 5 \times 17{\cdot}5$ $(20 + 0 + 87{\cdot}5 + 87{\cdot}5 = 195)$ $\div 20$ = 9.75	B1 M1 m1 A1	Allow for sight of mid-points. F.T. 'their mid-points' including bounds, provided they fall within the classes (including lower and upper bounds and used consistently). C.A.O.
6. $(x =)\ \frac{360}{15}$ or $180 - \frac{(15-2) \times 180}{15}$ or equivalent = 24(°) (BR =) $8 \times \cos 24$ or $8 \times \sin(90 - 24)$ = 7·3(0…)(cm) or 7·31(cm)	M1 A1 M2 A1	May be seen in parts. FT 'their stated value for x' (x < 90°) M1 for $\frac{BR}{8} = \cos 24$ or $\frac{BR}{8} = \sin(90-24)$ Accept equivalent of using sin rule (as sin 90 = 1). *Alternative method to find BR* *A correct and complete method (using two trigonometric relationships and possibly Pythagoras's theorem)* *M2* *BR = 7·3(0…)(cm) or 7·31(cm)* *A1*
7. $2{\cdot}656 \times 10^{6}$	B2	B1 for a correct value but not in standard form. Mark final answer. B1 for sight of 2 656 000. SC1 for $2{\cdot}66 \times 10^{6}$ or $2{\cdot}7 \times 10^{6}$ or $2{\cdot}6 \times 10^{6}$ or $2{\cdot}65 \times 10^{6}$
8. Sight of 24·5 AND 15·5 OR Sight of 23·5 AND 14·5 2(24·5 + 15·5) – 2(23·5 + 14·5) or equivalent = 4(cm)	B1 M1 A1	Sight of (Greatest =) 80 OR (Least =) 76 implies B1 FT only for upper bounds of 24·4 AND 15·4 or 24·49 AND 15·49 (lower bounds must be 23·5 AND 14·5 else M0) CAO If M0, award B1 and an SC1 for sight of (Greatest =) 80 AND (Least =) 76
Alternative method. *Difference between least and greatest length for each side = 1(cm)* *4 × 1* *= 4(cm)*	 *B1* *M1* *A1*	 *FT only for differences of 0·9 or 0·99* *CAO*
9. Method to eliminate variable e.g. equal coefficients with appropriate addition or subtraction. First variable found, x = 4 or y = −1. Substitute to find the 2nd variable. Second variable found	 M1 A1 m1 A1	*No marks for trial and improvement.* Allow 1 error in one term, not the term with equal coefficients. C.A.O. F.T. their '1st variable'. Award no marks for unsupported correct answers.

10.(a)(i) Correct reason given. e.g. 'An angle at the circumference subtended by a diameter is a right angle'. ' line AC is a diameter'	E1	Accept any correct unambiguous wording. The key word is '<u>diameter</u>'. Allow eg 'angle in a semicircle is 90°', 'line AC goes through the centre'. 'opposite a diameter' Do not accept 'because it's a right angle'.
10.(a)(ii) $\tan x = \frac{7{\cdot}5}{4{\cdot}7}$ $x = \tan^{-1}(7{\cdot}5 / 4{\cdot}7)$ or $\tan^{-1} 1.6$ or $\tan^{-1} 1.59(\ldots)$ = 57·9(…)(°) or 57·8(…)(°) or 58(°)	M1 m1 A1	 Implies M1. C.A.O. *<u>Alternative method to find x</u>* *A correct and complete method (using Pythagoras's theorem and a trigonometric relationship). M2* x = *57·9(…)(°)* or 57·8(…)(°) *or 58(°) CAO A1*
10.(b) (y =) 58(°) Correct circle theorem given. e.g. 'angles (at the circumference) subtended by the same chord (or arc) are equal', 'angles in the same segment (are equal)'.	B1 E1	<u>Strict</u> FT of 'their x'. Accept any correct unambiguous wording. Allow eg 'angles on the same chord (are equal)' Do not accept e.g. 'they are equal' on its own.
11. 2^{400}	B2	B1 for $(2^{100})^4$ OR sight of 2^4
12. (Height =) $\frac{3\times5533}{825}$ OR $\frac{5533}{\frac{1}{3}\times825}$ = 20·1(2 cm)	M2 A1	M1 for $5533 = 1/3 \times \text{height} \times 825$ or equivalent. Allow an answer of 20(cm) from correct working.
Alternative method (finding the radius first): *Use A = π r² to evaluate r or r².* *(Height =)* $\frac{3\times5533}{\pi\times16.2(05\ldots)^2}$ *OR* $\frac{5533}{\frac{1}{3}\times\pi\times16.2(05\ldots)^2}$ *OR* $\frac{3\times5533}{\pi\times262.6(\ldots)}$ *OR* $\frac{5533}{\frac{1}{3}\times\pi\times262.6(\ldots)}$ *= 20·1(2… cm)*	 *M2* *A1*	 *Allow use of π = 3·14, 3·142 or 3·14(59…).* *When using the π button on the calculator,* *r = 16·2(05…) OR r² = 262·6(…).* *There will be no FT for any radius other than r = 16cm, from working seen.* *M1 for* $5533 = 1/3 \times \textit{height} \times \pi \times 16.2(05\ldots)^2$ *or equivalent.* *Allow M1 for use of r = 16 (cm)* Allow an answer of 20(cm) from correct working. *Accept an answer in the range 20·10 to 20·143(cm)* *<u>FT base radius = 16 cm</u>: Allow an answer in the range 20·6(cm) to 20·65(cm) OR 21(cm) from correct working.*
13.(a) $(2x+9)(2x-9)$	B2	B1 for $(2x \ldots 9)(2x \ldots 9)$
13.(b) $(7x-4)(x+2)$	B2	B1 for $(7x \ldots 4)(x \ldots 2)$
13.(c) $(x+2)^2(x+7)$ OR $(x+2)(x+2)(x+7)$	B2	B1 for $(x+2)^2(x+2+5)$ OR $(x+2)[(x+2)^2+5(x+2)]$ OR $(x+7)(x^2+4x+4)$ OR $(x+2)(x^2+9x+14)$. Allow B1 for $(x+2)^2(x+k)$ where $k \neq 0$, 2 or 7.
14. – ½ or equivalent	B2	B1 for – 2 or ½.
15. $2n^2+1$ or equivalent = 20 001	B2 B1	B1 for sight of $2n^2$ OR for sight of consistent 2nd difference 4. FT from their $2n^2 \pm k$, where $k \neq 0$ OR from their $2n^2 \pm an$, where $a \neq 0$ OR from their $2n^2 \pm an \pm k$, where $a \neq 0, k \neq 0$. An unsupported answer of 20 001 gains all 3 marks. If no marks, award SC1 for an unsupported answer of 20 000.

16. Use of 7175 AND (1)·2345 or (1)23·45(÷100) 7175 × 1·2345 = (£)8858	B1 M1 A1	 Or equivalent complete method. FT for ‘their 7175’ provided 7170 ≤ x < 7180 and ‘their 1·2345’ provided 1·234 ≤ y < 1·235 Sight of (£)8857·53(75) or (£)8857·54 implies B1M1. CAO.
17.(a) General cosine <u>curve</u> with appropriate orientation and position. Correct sketch with curve passing through (0°,1), (90°,0) and (270°,0) and approximately (180°,-1) and (360°,1) AND 90(°), 180(°), 270(°), 360(°) indicated on the x-axis AND -1 and 1 indicated on the y-axis. 	M1 A1	Ignore curve shown for values x< 0° or x> 360°. Accept 180° as mid-way between 0° and 360° if unlabelled. Accept 360° as unlabelled provided the sketch does not exceed 360°.
17.(b) 46(°) AND 314(°) OR 45·6(°) AND 314·4(°) OR 45·57(29…°) AND 314·4(27…°).	B2	B1 for sight of one correct angle. Allow embedded answers. If more than two answers offered award B1 for sight of one correct angle. If no marks, awarded SC1 for truncated answers 45(°) AND 315(°) OR 45·5(°) AND 314·5(°).
18. 0·7×0·2×0·1×6 = 0·084 or equivalent	M2 A1	M1 for sight of 0·7×0·2×0·1 OR 0·014 OR 7/500 or equivalent. Fractional answer: 21/250 or equivalent. (ISW)
19. Sight of $25x^2 + 15x - 15x - 9$ $25x^2 - 19x - 9 = 0$ $x = \frac{-(-19) \pm \sqrt{(-19)^2 - 4 \times 25 \times (-9)}}{2 \times 25}$ $x = \frac{19 \pm \sqrt{1261}}{50}$ x = 1·09 with x =–0· 33 (answers to 2dp)	B1 B1 M1 A1 A1	Or equivalent. '= 0' required, but may be implied by an attempt to use the quadratic formula or if $a = 25, b = -19$, $c = -9$ used in the quadratic formula. **This substitution into the formula must be seen for M1, otherwise award M0A0A0.** FT ‘their derived quadratic equation’ of equivalent difficulty (a, b and c must be non-zero). Allow one slip in substitution **<u>for M1 only</u>**, but must be correct formula. Can be implied from at least one correct value of x evaluated, provided M1 awarded. CAO for their quadratic equation.

20.		A correct and complete method involving multiple trigonometric relationships leading to the correct answer may be seen at any stage to gain the method mark(s).
$(x =)\frac{12}{\sin 46} \times \sin 34$	M2	M1 for $\frac{x}{\sin 34} = \frac{12}{\sin 46}$ or equivalent.
$(x =)$ 9·3(28…cm) OR 9·32(cm)	A1	
(Area of sector ACB=) $\frac{46}{360} \times \pi \times 9{\cdot}3(28\ldots)^2$	M1	FT 'their derived 9·3(28…)'.
= 34·9(3…cm^2)	A1	Answers in the range 34·7(cm^2) to 35(cm^2) or equivalent range on FT.
(Area of ACE=) ½×9·3(28…)×12×sin(100) = 55·1(2…cm^2)	M1 A1	FT 'their derived 9·3(28…cm) Answers in the range 54·95(cm^2) to 55·13(cm^2) or equivalent range on FT.
(Area of the shaded region BCE = 55·1… – 34·9…) = 20·18(8…cm^2) OR 20·2(cm^2)	B1	FT 'their 34·9(…cm^2)' and 'their 55·1(…cm^2)' provided previous M1, M1 (from area calculations) awarded AND 'area of the shaded region' > 0. This answer must be derived from the subtraction of 'their areas'.