GCSE MARKING SCHEME

AUTUMN 2019

GCSE
MATHEMATICS – UNIT 2
HIGHER TIER
3300U60-1

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

AUTUMN 2019 MARK SCHEME

<table>
<tr><th>GCSE Mathematics
Unit 2: Higher Tier</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1.

One correct evaluation $3 \le x \le 4$
2 correct evaluations $3{\cdot}55 \le x \le 3{\cdot}75$,
one < 37, one > 37.
2 correct evaluations $3{\cdot}55 \le x \le 3{\cdot}65$,
one < 37, one > 37.

$x = 3{\cdot}6$</td><td>

B1
B1

M1

A1</td><td>Correct evaluation regarded as enough to identify if <37 or >37. If evaluations not seen accept 'too high' or 'too low'.
Look out for testing $x^3 - 3x - 37 = 0$
$\underline{x}$ $\quad$ $\underline{x^3 - 3x}$
3 $\quad$ 18
3·1 $\quad$ 20·491
3·2 $\quad$ 23·168
3·3 $\quad$ 26·037
3·4 $\quad$ 29·104
3·5 $\quad$ 32·375 $\quad$ 3·55 $\quad$ 34·08....
3·6 $\quad$ <u>35·856</u> $\quad$ 3·65 $\quad$ <u>37·67..</u>
3·7 $\quad$ <u>39·553</u> $\quad$ 3·75 $\quad$ 41·48...
3·8 $\quad$ 43·472
3·9 $\quad$ 47·619
4 $\quad$ 52</td></tr>
<tr><td>2.(a)

<table><tr><td>Throws</td><td>20</td><td>40</td><td>60</td><td>80</td><td>100</td></tr><tr><td>Heads</td><td>11</td><td>18</td><td>24</td><td>30</td><td>37</td></tr><tr><td>Rel. Fq.</td><td>0·55</td><td>0·45</td><td>0·4</td><td>0·375</td><td>0·37</td></tr></table></td><td>

B1
B1</td><td></td></tr>
<tr><td>2.(b) (Mid-points are) 4·5, 14·5 and 24·5.
(Estimated total =)
$3 \times 4{\cdot}5 + 5 \times 14{\cdot}5 + 2 \times 24{\cdot}5$ (= 135)
$\div 10$
(Estimated mean =) $\quad = 13{\cdot}5$

(Difference = 15·2 – 13·5 =) 1·7</td><td>B1

M1
m1
A1

B1</td><td>F.T. 'their mid-points' if within group.

C.A.O.

F.T. for difference between 15·2 and 'their derived estimated mean (≠15·2)'. Allow −1·7.</td></tr>
<tr><td>Organisation and Communication.

Accuracy of writing.</td><td>OC1

W1</td><td>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.</td></tr>
</table>

3.(a) −5	B1	
3.(b) At least 7 correct plots and no incorrect plot. A smooth curve drawn through their plots.	P1 **C1**	F.T. 'their (1,−5)' Allow ± '½ a small square'. F.T. 'their 8 plots'. OR a curve through the 7 given points and (1,−5) Allow intention to pass through their plots. (± 1 small square horizontal or vertical.)
3.(c)(i) Line y + x = 4 drawn.	B2	B1 for a straight line going through(0,4) or (4,0) BUT NOT line y = 4 nor line x = 4
3(c)(ii) −2·4 AND 3·4	B1	F.T. intersection of 'their curve' with 'their y + x = 4 ' (even for line y = 4) only if exactly two points of intersection. Must be seen to intersect their curve at two points. Allow ± '1 small square'.
4. Sight of 1·25 or 125(%) $\frac{n}{1·25n}$ (×100) = 80(%)	B1 M1 A1	Accept sight of n and 1·25n where n may be any numerical value e.g. '18 and 22·5'. $\frac{1}{1·25}$ (n =1) OR 0·8 implies B1M1. An answer of 80(%) gains B1M1A1.
5. MN = 13·5 × cos 27 = 12(·0…) (cm) ISW	M2 A1	M1 for cos 27 = $\frac{MN}{13·5}$ *A correct and complete method (e.g. using two trigonometric relationships.) M2* *MN = 12(·0..)(cm) ISW A1*
6. Method to eliminate variable e.g. equal coefficients with intention to appropriately add or subtract' First variable found x = 4 or y = −3. Substitute to find the 2nd variable. Second variable found.	 M1 A1 m1 A1	*No marks for 'trial and improvement'.* *No marks for an unsupported answer.* Allow 1 error in one term, not one with equal coefficients. C.A.O. F.T. their '1st variable'.
7.(a) $20 × 15 – π × 4^2$ × 10 2497(·….) OR 3000 − 160 π	M1 m1 A1	Accept an answer between 2497 and 2498 inclusive OR 2500. SC1 for sight of $π × 4^2 × 10$ OR 160 π (accept 502 to 503 inclusive).
7.(b) (Mass =) 2497·(..) × 2·4 OR 2497·(..) × 0·0024 = 5993·6(..)(g) OR 5·9936..(kg) 6(kg)	M1 A1 A1	F.T. 'their volume in (a)' Accept value truncated or rounded to a whole number. Ignore units. F.T. from 'their 5993·6..g' or 'their 5·9936..kg' ONLY if M1 awarded AND 'their 5993·6..g' > 500g or 'their 5·9936..kg' > 0.5kg If no marks awarded, allow SC1 for (Mass =) 'their volume' × density, where density may have incorrect place value e.g. '2497·(..) × 0·024'
8. 8	B1	

9. $\frac{24 \times AC}{2}$ = 84 or equivalent. AC = 7 (cm) $(BC^2 =)\ 7^2 + 24^2$ $BC^2 = 625$ or $(BC =)\ \sqrt{625}$ $(BC =)$ 25(cm) (Perimeter = 24 + 7 + 25 =) 56(cm)	M1 A1 M1 A1 A1 B1	 F.T. 'their AC'. Final answer of BC = 625 is M1A0A0. F.T. $\sqrt{}$'their 625' provided M1 gained. F.T. 24 + 'their AC' + 'their BC' provided at least one M1 mark gained AND 'their BC' > 24. *Alternative method to find BC* *A correct and complete method (e.g.using two trigonometric relationships.)* *M2* *BC = 25(cm)* *A1*
10. $9k^2 - 25n^2$ $(3k + 5n)(3k - 5n)$	B1 B2	Allow $9k^2 - k + k - 25n^2$ ISW. B1 for $(3k \ldots 5n)(3k \ldots 5n)$ Mark final answer. Ignore $(3k - 5n)(3k + 5n) = 0$, but penalise -1 for further work e.g. $(3k - 5n) = 0$ or $(3k + 5n) = 0$.
11(a)(i). $\frac{x+1+x+2}{2} \times x \ \ (= 25)$ $x^2 + x + x^2 + 2x = 50$ OR $x(2x + 3) = 50$ OR $\frac{2x^2+3x}{2} = 25$ OR $x^2 + 1.5x = 25$ $2x^2 + 3x - 50 = 0$	M1 m1 A1	Missing brackets in the expression $\frac{x(x+1+x+2)}{2}$ may be implied later from correct working. Must be convincing. If m1 awarded for $\frac{2x^2+3x}{2} = 25$, a further rearrangement, e.g. $2x^2 + 3x = 50$, must be seen before A1 is awarded.
11(a)(ii). $x = \frac{-(3) \pm \sqrt{(3)^2 - 4 \times 2 \times (-50)}}{2 \times 2}$ $= \frac{-3 \pm \sqrt{409}}{4}$ $x = 4.3(059 \ldots)$, $(x = -5.8(059 \ldots))$ (AB=) 5.3(cm) AND (DC=) 6.3(cm)	M1 A1 A1 B1	Maybe seen in a(i). Allow one slip in substitution **for M1 only**, but must be correct formula. CAO. Answers must be to 1 d.p. FT 'their positive x' provided M1 awarded.
11.(b) $7^2 \times 36{\cdot}8$ OR $(7 \times \sqrt{36.8})^2$ = 1803·2 (cm^2)	M1 A1	 Allow 1803 (cm^2)
12. $\frac{42}{360} \times 2 \times \pi \times 7$ = 5·1(…) OR $\frac{49}{30}\pi$ (Perimeter =) 19·1(…cm) OR $14 + \frac{49}{30}\pi$(cm)	M1 A1 A1	 Or equivalent. Allow 5 from correct working. Mark final answer. FT 'their 5·1(…cm)'. Allow 19 (cm) from correct working.

13. Enlargement with scale factor -2 and centre (4, 4)	B3	Penalise -1 for further incorrect steps. Award B2 for reference to any two of 'Enlargement', scale factor '-2' and 'centre (4, 4)'. Award B1 for reference to any one of 'Enlargement', scale factor '-2' and 'centre (4, 4)'. SC2 awarded for the correct two step transformation from shape A to B, e.g. enlargement SF 2 centre (4, 4), rotation 180° about (4, 4).
14.(a) $\frac{3}{12}\times\frac{2}{11}\times\frac{1}{10}$ $=\frac{6}{1320}\left(=\frac{1}{220}\right)$ ISW	M1 A1	 Accept decimal answer of 0.0045(45…)
14.(b) (1−'three vowels'−'three consonants') $=1-\frac{3}{12}\times\frac{2}{11}\times\frac{1}{10}-\frac{9}{12}\times\frac{8}{11}\times\frac{7}{10}$ $=\frac{810}{1320}\left(=\frac{27}{44}\right)$ ISW	M2 A1	M1 for $\frac{3}{12}\times\frac{2}{11}\times\frac{1}{10}+\frac{9}{12}\times\frac{8}{11}\times\frac{7}{10}$ OR $1-\frac{3}{12}\times\frac{2}{11}\times\frac{1}{10}$ OR $1-\frac{9}{12}\times\frac{8}{11}\times\frac{7}{10}$ Accept decimal answer of 0.61(36…) If no marks award SC1 for an answer of $\frac{972}{1728}\left(=\frac{36}{64}\text{ or }\frac{9}{16}\right)$ ISW from working with replacement.
Alternative method *P(Two vowels, one consonant) +* *P(One vowel, two consonants =)* $3\times\frac{3}{12}\times\frac{2}{11}\times\frac{9}{10}+3\times\frac{3}{12}\times\frac{9}{11}\times\frac{8}{10}$ *OR* $3\times\frac{9}{12}\times\frac{3}{11}\left(\times\frac{10}{10}\right)$ $=\frac{810}{1320}\left(=\frac{81}{132}\ or\ \frac{27}{44}\right)$ *ISW*	*M2* *A1*	*M1 for* $3\times\frac{3}{12}\times\frac{2}{11}\times\frac{9}{10}$ *OR* $3\times\frac{3}{12}\times\frac{9}{11}\times\frac{8}{10}$ *OR* $\frac{3}{12}\times\frac{2}{11}\times\frac{9}{10}+\frac{3}{12}\times\frac{9}{11}\times\frac{8}{10}$ *NB: sight of* $\frac{9}{12}\times\frac{3}{11}\times\frac{10}{10}$ *gains M1, but* $\frac{9}{12}\times\frac{3}{11}$ *gains M0.* *Accept decimal answer of 0.61(36…)* *If no marks, award SC1 for an answer of* $\frac{972}{1728}\left(=\frac{36}{64}\ or\ \frac{9}{16}\right)$ *ISW from working with replacement.*

15.		FT until 2nd error for equivalent level of difficulty. Allow sight of multiplication signs within expressions and allow multiplication by 1 at any stage.
$2a^2 - b = a^2b$	B1	
$2a^2 - a^2b = b$ OR $-b = a^2b - 2a^2$	B1	FT a formula with three or more terms AND with at least two terms in a^2.
$a^2(2 - b) = b$ OR $-b = a^2(b - 2)$	B1	
$a^2 = \frac{b}{2-b}$ OR $\frac{-b}{b-2} = a^2$	B1	
$a = (\pm)\sqrt{\frac{b}{2-b}}$ OR $a = (\pm)\sqrt{\frac{-b}{b-2}}$	B1	
16. (y =) –f(x)	B1	
(y =) f(x) – 1	B1	
(y =) 2f(x)	B1	
17. For an attempt to subtract the area of a triangle from the area of square, with use of cosine rule and area of a triangle formula (½absinC).	S1	
(Area of square or CD^2 =) $8^2 + 9^2 – 2×8×9×\cos75°$	M1	Allow (CD =) √[$8^2 + 9^2 – 2×8×9×\cos75°$]
CD^2 = 107.7(30…) OR CD = 10.37(9…cm) OR CD = 10.38(…cm) OR CD = √[107.7(30…)]	A1	Allow CD = 10.4 (cm)
Area of square = 107.7(30…cm^2)	A1	Allow an answer in the range 107.5(cm^2) to 108.2(cm^2). May be implied in further working.
(Area of triangle =) ½×8×9×sin75°	M1	
= 34.77(…cm^2) OR 34.8(cm^2) OR 9√6+9√2(cm^2)	A1	Accept an answer in the range 34.6(cm^2) to 35(cm^2).
(Area of the shaded region=) answer in the range of 72.9 (cm^2) to 73 (cm^2)	B1	CAO.