GCSE MARKING SCHEME

AUTUMN 2018

GCSE
MATHEMATICS
UNIT 2 - HIGHER TIER
3300U60-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2018 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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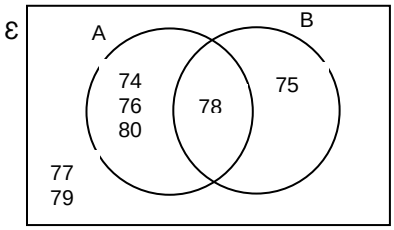
WJEC GCSE MATHEMATICS (3300U60-1)

AUTUMN 2018 MARK SCHEME

GCSE MATHEMATICS **Unit 2: Higher Tier**	**Mark**	**Comments**
1.(a) $\times 0{\cdot}88^3$	B1	
1.(b) $\frac{45{\cdot}9 - 42{\cdot}5}{42{\cdot}5}$ (= 0·08) OR $\frac{45{\cdot}9}{42{\cdot}5}$ (= 1·08) 0·08 × 100 OR (1·08 × 100) – 100 8(%)	M1 m1 A1	May be seen in parts. C.A.O. If no marks awarded allow SC1 for −8(%).
2.  	B2 B1	Correct groupings of all 7 numbers within and outside the two circles (with or without a rectangle). B1 for 5 or 6 correctly placed numbers. No credit for a number shown in more than one section. Penalise −1, once only, if a number not in the universal set is noted. Ignore labelling for this B2 or B1. (i.e. ignore missing, conflicting or incorrect labels.) *Allow intent of drawing circles and a rectangle.* Two intersecting circles correctly labelled A and B OR 'even numbers' and 'multiples of 3' (but not conflicting labels or labels that conflict number placements) within a rectangle. Allow missing 'Ɛ' symbol.
3.(a) −5 11	B2	B1 for each. Table takes precedence if conflicting values given.
3.(b) At least 6 correct plots and no incorrect plot. A smooth curve drawn through their plots.	P1 C1	F.T. 'their (−2,−5)' and 'their (2,11)' OR (−2,−5) and (2,11) plotted. Allow ± '½ a small square'. Ignore any plots that can not be shown e.g. (−2,−13). F.T. 'their plots'. OR a curve through the 6 given points and (−2,–5) and (2,11). Allow intention to pass through their plots. (± 1 small square horizontal or vertical.)
3.(c) Line y = 2 drawn −4·65 AND 0·65	L1 B1	Must be at least 2cm long. F.T. intersection of 'their curve' with 'their *y* = 2' only if exactly two points of intersection. Allow ± '1 small square'.
4. 70	B3	B2 for 77 OR 80 B1 for any number between 65 and 79 inclusive, apart from 70(B3) and 77(B2) B1 for 56, 60 OR 63

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5. One correct evaluation $5 \le x \le 6$ 2 correct evaluations $5{\cdot}55 \le x \le 5{\cdot}75$, one < 107, one > 107. 2 correct evaluations $5{\cdot}65 \le x \le 5{\cdot}75$, one < 107, one > 107. $x = 5{\cdot}7$	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if 'too high' or 'too low'. If evaluations not seen accept 'too high' or 'too low'.* x — $x^3 - 13x$ (or check $x^3 - 13x - 107=0$) 5 — 60 5·1 — 66·351 5·2 — 73·008 5·3 — 79·977 5·4 — 87·264 5·5 — 94·875 **5·6 — 102·816 — 5·55 — 98·803...** **5·7 — 111·093 — 5·65 — 106·912...** 5·8 — 119·712 — 5·655 — 107·326... 5·9 — 128·679 — 5·75 — 115·359... 6 — 138
6.(a) $\frac{1}{2}$	B1	
6.(b) −3	B1	
6.(c) (5, 2)	B1	
7. (Length of side = $\frac{76{\cdot}4}{4}$ =) 19·1(m) (diagonal^2 =) $19{\cdot}1^2 + 19{\cdot}1^2$ diagonal^2 = 729·6(2) or (diagonal =) √729·6(2) (diagonal =) 27·0(..)(m) or 27(m)	 B1 M1 A1 A1	 F.T. 'their derived length of side' (not 76·4) Diagonal = 729·6(2) is A0 unless corrected in further work F.T. 'their 729.6' provided M1 awarded and their answer is greater than 19·1. Award SC2 for a final answer of 108(·0…)(m) (from using 76·4(m) as side length) BUT In this case there is no credit given for sight of 19·1.
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 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.

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8.(a) 0·92 written on the 'Not a Saturday' branch. Sight of 1 − 0·15 − 0·45 OR 0·4 or 0·40 0·4(0) <u>on</u> both 'car' branches AND 0·15 AND 0·45 correctly shown <u>on</u> lower branches.	B1 B1 B1	 Allow this B1 if shown on working lines.
8.(b) Sight of 0·08 × 0·15 OR 0·08 × 0·4 or equivalent. (P(Sat and 'plane or car') =) 0·08 × 0·15 + 0·08 × 0·4 or equivalent = 0·044 or equivalent. ISW	 B1 M1 A1	 FT 'their P(car)' if <1. 0·08 × 0·55 implies previous B1.
<u>Alternative method</u> (P(Sat and 'plane or car') =) 1 – (0·92 + 0·08 × 0·45) or equivalent = 0·044 or equivalent. ISW	 M2 A1	 FT 'their 0·92'. M1 for intent P(Sat and 'plane or car') = 1 – P('not Saturday') – P('Saturday and train')
9.(a) Tan x = $\frac{6·4}{8·2}$ (x =) $\tan^{-1}$ 0·78(0..) or $\tan^{-1}\frac{6·4}{8·2}$ = 38(°) OR 37·9(...°)	M1 A1 A1	 Implies previous A1.
<u>Alternative method.</u> ***Correct** use of 'two-step' method.* *(x) = 38(°)*	 M2 A1	 *A partial trigonometric method is M0.* *Accept an answer that rounds to 38(°)*
9.(b) (PAQ = 90 – 38 =) 52(°) AQ = $\frac{7·9}{\sin 52(°)}$ (AQ) = 10(cm) OR 10·0(…cm)	B1 M2 A1	FT 90° − 'their 38°'. May be seen on the diagram. FT 'their clearly defined PAQ' BUT <u>not</u> if PAQ = 'their x'. M1 for sin52(°) = $\frac{7·9}{AQ}$
<u>Alternative method.</u> PQA =*38(°)* AQ = $\frac{7·9}{\cos 38(°)}$ (AQ) = 10(cm) OR 10·0(…cm)	 B1 M2 A1	 FT 'their 38°'. May be seen on the diagram. FT 'their clearly defined PQA' M1 for cos 38(°) = $\frac{7·9}{AQ}$
<u>Alternative method.</u> *(PAQ = 90 – 38 =) 52(°)* ***Correct** use of 'two-step' method.* *(AQ) = 10(cm)*	 *B1* *M2* *A1*	 *FT 90° − 'their 38°'.* *A partial trigonometric method is M0.* *FT 'their clearly defined PAQ'* *BUT <u>not</u> if PAQ = 'their x'.* *Accept an answer that rounds to 10(cm)*
10. 1×9^{100} 1×10^{90} 1×9^{90} 9×10^{90} 9×10^{99}	B1	

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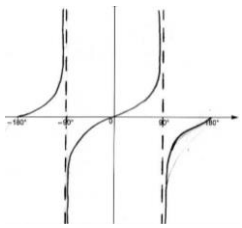
11. Correct sketch, with inflection points at (-180,0), (0,0) and (180,0) AND graph tending towards the vertical asymptotes at $x = -90$ and $x = 90$. 	B2	If vertical asymptotes are not seen, they may be implied by a break in the curve of 'their sketch' at $x = -90$ and $x = 90$ provided there is asymptotic behaviour. Graph must be attempted from $x = -180$ to $x = 180$. *Ignore continuation of sketch for x<-180 and x>180.* B1 for a sketch with inflection points at (-180,0), (0,0) and (180,0) only OR vertical asymptotes seen at $x = -90$ and $x = 90$ only.
12. (Curved surface area of hemisphere=) $2 \times \pi \times 29^2$ o.e. (Area of base of hemisphere=) $\pi \times 29^2$ (Total surface area=) Answer in the range: 7922(cm^2) to 7927.3(cm^2) or 2523π (cm^2)	M2 M1 A1	1682π or values between 5281.48 and 5284.844 M1 for sight $4 \times \pi \times 29^2$ or 3364π or values between 10562.96 and 10569.688. 841π or values between 2640.7 and 2642.422 Sight of $3 \times \pi \times 29^2$ implies M2 M1. CAO. Unsupported correct answer is awarded full marks. SC2 for an unsupported $5 \times \pi \times 29^2$ (4205π or 13210.3…).
13.(a) $c(c+d)(c-d)$	B3	Mark final answer for B3. Award B2 for $(c+d)(c^2-cd)$ or $(c-d)(c^2+cd)$ OR allow B2 for $c(c \ldots d)(c \ldots d)$ OR for sight of $(c+d)(c-d)$. Award B1 for sight of $c(c^2-d^2)$.
13.(b) $(e-1)(5e-2)$	B2	B1 for $(e-1)(5(e-1)+3)$ or $(e-1)(5e+k)$ with $k \neq 0$.
Alternative method $5(e-1)^2 + 3(e-1) = 5e^2 - 7e + 2$ $= (e-1)(5e-2)$	*B2*	*No mark for the expansion and collection of terms.* *B1 for $(e \ldots 1)(5e \ldots 2)$ from collection of terms.* *Award B1 for a correct factorisation, if possible, on FT of 'their derived quadratic expression', provided no more than one error.* *SC1 for an answer of* $(e-1)(5e+k)$ with $k \neq 0$.
14. Attempt to find a [face diagonal]^2. $\sqrt{3^2+5^2+7^2} (= \sqrt{83})$ = 9.11(cm)	S1 M2 A1	E.g. $3^2 + 5^2 = 34$ OR $3^2 + 7^2 = 58$ OR $5^2 + 7^2 = 74$ M1 for $3^2 + 5^2 + 7^2$. May be seen in stages. This mark implies S1. CAO (must be correct to 2 decimal places). Unsupported answer of $\sqrt{83}$ gains S1 M2 A0.

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15.(a) $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}$ $= \frac{1}{216}$ or equivalent. ISW	M1 A1	 Allow decimal equivalents 0.004(6…) OR 0.005 OR corresponding percentage values. Unsupported decimal answer of 0.0046(…) gains both marks.
15.(b) Sight of $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}$ $\left(=\frac{1}{1296}\right)$ Sight of $\frac{5}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times 4$ $\left(=\frac{20}{1296}\ or\ \frac{5}{324}\right)$ $\left(\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}+\frac{5}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times 4=\right)$ $\frac{21}{1296}$ $\left(=\frac{7}{432}\right)$ ISW.	B1 B2 B1	 B1 for sight of $\frac{5}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}$ $\left(=\frac{5}{1296}\right)$ CAO. NB: sight of $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{6}{6}$ $\left(=\frac{6}{1296}\right)$ gains B1B1, but $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\left(=\frac{1}{216}\right)$ gains B0.
16. (Area=) ½×[18+0+2(20+20+18+14+8)] = 89	M2 A1	Award M1 for 5 or more values correct and up to 1 incorrect OR all values correct but h incorrect. FT from M1. Condone 89^2 if offered as the final answer.
<u>Alternative method:</u> $\frac{(18+20)}{2}+\frac{(20+20)}{2}+\frac{(20+18)}{2}+\frac{(18+14)}{2}+\frac{(14+8)}{2}+\frac{(8+0)}{2}$ *(Individual areas are: 19, 20, 19, 16, 11, 4.)* *= 89*	*M2* *A1*	*Each area may be seen as the sum of the area of a rectangle and a triangle.* *M1 for the correct calculation for any 4 trapezia (not necessarily added together) OR if an incorrect h is used throughout.* *FT from M1.* *Condone 89^2 if offered as the final answer.* *Treat splitting area into 12 parts as MR-1.*
17. (sin ABE =) $\frac{11\times\sin 37°}{13}$ (ABE =) 30.6(…°) (CBD =) 30.6(…°) (CD =) √[10² + 7² – 2×10×7×cos30.6(…°)] (CD =) 5.3(...cm)	M2 A1 B1 M2 A1	M1 for $\frac{\sin ABE}{11}=\frac{\sin 37°}{13}$ or equivalent. Allow 31°. FT from their derived angle ABE stated or seen on the diagram. Use of 30.6(…°) or 'their 30.6(…°)' in subsequent calculation gains B1. M1 for (CD^2 =) 10² + 7² – 2×10×7×cos30.6(…°) FT 'their CBD' from either B0 or B1. Allow an answer of 5.4(cm) from the use of 31°.

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18. $(7x+1)(x+3)=5x+2$	B1	
Sight of $7x^2+21x+x+3$	B1	Or equivalent.
$7x^2+17x+1=0$	B1	'= 0' required, but may be implied by an attempt to use the quadratic formula or if $a=7, b=17,$ $c=1$ used in the quadratic formula. FT from B1B0 from one error only.
$x=\dfrac{-17\pm\sqrt{17^2-4\times7\times1}}{2\times7}$	M1	This substitution into the formula must be seen for M1. FT 'their derived quadratic equation' of equivalent difficulty (a, b and c must be non-zero). Award M1A0A0 for only one slip in substitution, but must be correct formula.
$x=\dfrac{-17\pm\sqrt{261}}{14}$	A1	Can be implied from at least one correct value of x evaluated.
$x=-0.06$ with $x=-2.37$ (answers to 2dp)	A1	CAO for their quadratic equation. If trial and improvement used, then award: SC3 for <u>both</u> correct solutions given, correct to 2 decimal places: x = -0.06 with x = –-2.37, OR SC2 for <u>both</u> correct solutions given, but correct to 3 (or more) decimal places: x = -0.060(3…) with x = –2.368(2…) Note: no marks to be awarded for 1 correct solution from trial and improvement.

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