GCSE MARKING SCHEME

SUMMER 2019

MATHEMATICS – COMPONENT 2 (HIGHER TIER)
C300UB0-1

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.

GCSE MATHEMATICS

COMPONENT 2 – HIGHER TIER

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	Mark	Comment
1*. $13 \times 6 - 17^3$ or $26 \times 3 - 17^3$ or $39 \times 2 - 17^3$	B1	
1.34×232	B1	Do not accept 134% × 232
0.82×4530	B1	
-4835 and 310.88 and 3714.6	B1 (4)	CAO. Independent mark *Misreads: e.g. $5\times13 - 17^3 = -4848$ is B0, but FT as misread for possible final B1*
2*(a)(i) Mid points: 15, 25, 35, 45	B1	
$15\times5 + 25\times20 + 35\times23 + 45\times52$ (= 75 + 500 + 805 + 2340 = 3720)	M1	FT provided 'their midpoints' within the 'bounds' inclusive
÷100	m1	
37(.2mm)	A1	Unsupported 37.2, award all 4 marks
2*(a)(ii) $40 \le x < 50$	B1	Accept any unambiguous indication
2(b) Explanation such as: 'the mean doesn't tell you about the spread of the data', 'all the depths could be very close to 37.2 mm (whilst Marie's table shows her display is spread out)'	E1 (6)	Do not accept indication of 'Yes' or an explanation implying 'Yes' Do not accept contradictions Allow if range of Marie's display is used, with lower and upper values considered at 10 mm and 50 mm, or within 1st and last groups Do not accept arguments based on shapes or styles of frames, reasoning and validity of argument must be based only on the depth of lens
3*. $\sin f = 8.4/12.3$	M1	
(f =) 43(.07...°)	A2 (3)	A1 for (f =) $\sin^{-1}0.68(29...)$

4*(a) 2500×0.84^n with any value of n from n=1 to n=10 or equivalent 2500×0.84^n with a second value of n from n=1 to n=10 or n = 6 or equivalent leading to an answer closer to £1000 than the previous trial 6 (years)	M1 m1 A1	(2500 × 0.84 = £2100) (2500×0.84^2 = £1764) (2500×0.84^3 = £1481.76) (2500×0.84^4 = £1244.6784) (2500×0.84^5 = £1045.529...) (2500×0.84^6 = £878.245...) (2500×0.84^7 = £737.725...) (2500×0.84^8 = £619.689...) (2500×0.84^9 = £520.539...) (2500×0.84^{10} = £437.253...) CAO If no working, award SC2 for an answer of 6 (years)
4(b) $500 \times (1 + 325/100)^3$ (£) 38 382.81(25)	M2 A1 (6)	M1 for 500 × (1 + 325/100) (= £2125) or equivalent M1 implied by sight of a×500×3.25 + b×500 or a×1625 + b×500, or 5375, or 6375, where a≠0 and b≠0 Accept (£)38382 or 38383 If no marks, award SC1 for sight of $(325/100)^3$ or equivalent or sight of 17164.0625 ($= 3.25^3 \times 500$)
5*(a) $3x^2 + 18xy + 5xy + 30y^2$ $3x^2 + 23xy + 30y^2$	B2 B1	B1 for any 2 terms correct FT for equivalent level of difficulty, providing at least 3 terms to consider and like terms to collect
5*(b) (x – 9)(x - 4)	B2	B1 for (x ... 9)(x ... 4)
5*(c) (w + 9)(w – 2) = 0 w = -9 with w= 2	B2 B1	B1 for (w ...9)(w ... 2) STRICT FT from 'their pair of brackets' *Alternative:* *(w=) {-7 ±√(7^2 - 4×1×-18)}/ 2* *M1* *(=) (-7 ±√121)/2* *A1* *w = -9 with w = 2* *A1* *Accept trial & improvement method only if both solutions are found correctly for B3*
5(d) (y – 11)(y + 11)	B1	
5(e) c = 16 $0 = (-2)^2 + b \times -2 + c$ $0 = (-2)^2 + b \times -2$ `+ 16 b = 10	B1 M1 M1 A1 (13)	 Allow $-2^2 + b \times -2 + c$ FT 'their derived 16'. Do not allow $-2^2 + b \times -2 + 16$ unless -2^2 seen or implied later as 4
6*. (First distance) 45 × 40 ÷ 60 (Second distance) 60 × 25 ÷ 60 (Total distance) 55 (miles) (Overall average speed) 55 ÷ (65/60) or equivalent in stages 50.7(69...mph) or 50.8(mph) or 51(mph)	M1 M1 A1 m1 A1 (5)	(30 miles) (25 miles) CAO. May be implied in further working FT 'their 55' depends on M1 previously awarded and 'their total distance' is the sum of two derived distances If no marks, award SC2 for an answer of 50.7(69...) from (45×40 + 25×60)/(40 + 25) or equivalent

7(a) (Volume sphere) $4/3 \times \pi \times 2.7^3$ (Volume of cuboid) $14.2 \times \text{height} = 4/3 \times \pi \times 2.7^3$ Height = $4/3 \times \pi \times 2.7^3 \div 14.2$ Answer in the range 5.8 to 5.81 (cm^3)	M1 M1 m1 A1	($\approx 82.4...\ cm^3$) FT for 'their volume of sphere' FT for 'their volume of sphere' CAO
7(b) $86 = \pi \times$ Diameter, or $86 = 2 \times \pi \times$ Radius Diameter = $86 \div \pi$ or Radius = $86 \div 2\pi$ Perimeter semi-circle $86 \div 2$ + Diameter, or $86 \div 2 + 2 \times$ Radius 70.4 (cm) or 704 mm	M1 m1 M1 A2 (9)	 (Diameter = 27.37 to 27.4 cm) (Radius = 13.68 to 13.7 cm) FT 'their derived diameter' or 'their derived 2 × radius', independent of previous marks CAO. For A2 if units are given they must be correct A1 for a correct answer given to the wrong level of accuracy (70.37 to 70.39 or 70(cm)).
8*. $7a + 2g = 6(.)15$ AND $5a + 8g = 9(.)19$ Method to eliminate variable, e.g. equal coefficients and method to find second variable First variable Second variable (£)4.99	B1 M1 A1 A1 B1 (5)	Both equations are required for the award of B1 FT provided at least one equation is correct and the other is of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients **a = 67(p)** or **a = (£ 0).67** or **g = 73(p)** or **g = (£ 0).73** FT their first variable provided M1 previously awarded CAO, not FT
9(a) 86 AND 140	B1	
9(b) (0) **-273.15** (100) **-173.15** (200) **-73.15**	B2	B1 for 1 correct entry or for all 3 negative entries with correct differences
9(c) 320 kelvin to Celsius: working with 100 difference in both kelvin and Celsius 46.85 (degrees Celsius) Answer for Fahrenheit <u>between 104 and 122</u> exclusive Suitable calculation, e.g. • $104 + (6.85/10) \times 18$ • $122 - (\underline{10 - 6.85}) \times 18$ 10 116(.33 Fahrenheit)	M1 A1 B1 m1 A1 (8)	e.g. sight of 20 + 26.85, 126.85 – 80, 320-273.15 Look for response in the table Accept 46.8, 46.9, 47 Look for evidence in the table CAO, independent of all other marks Look for evidence in the table FT from rounding or truncation of 46.85 (Celsius) e.g. 7 tenths of 18 FT 'their derived 46.85 °C' provided M1 previously awarded Accept 116 (Fahrenheit)) from correct working

10(a) y α 1/x OR y = k/x 124.5 = k/18 or k = 2241 y = 2241/x	B1 M1 A1	Allow y α k/x FT non linear only May be seen in part (b), must be sight of y = 2241/x, not for the implied use of this Do not accept y α 2241/x
10(b) x: ½ | 18 | **24.9** y: **4482** | 2241 | 90	B2 (5)	FT their non linear expression B1 for each value Allow 24.9 given as 25 provided k = 2241 seen in (a) or (b)
11. 100g = 0.22 pounds or 1 pound = (1 ÷ 2.2 =) 0.4545...kg ½ pound or 8 ounces ≈ (100 ÷ 0.22) × 0.5 (g) or (1 ÷ 2.2) ÷ 2 (kg) 227(.2727.... g) or 0.227(27... kg) (£) 227(.2727....) × 11 ÷ 100 or (£) 0.227(27...) × 11 × 1000 ÷ 100 Answer in the range (£)24.97 to (£)25.00	B1 M1 A1 M1 A1 (5)	May be embedded in working Or equivalent Award of M1 implies award of B1 previously FT use of 'their 227(.2727...)' provided at least 1 mark previously awarded FT for a similar range from rounding or truncation to a whole number If final M0, A0 due to 200g or 300g considered following otherwise correct working, award SC1 for answers of £22 or £33 respectively *Alternative 1:* *(For) £11 gets 0.22 lbs (of steak) B1* *(Which is) 16 × 0.22 M1* *= 3.52 oz A1* *(may be embedded)* *(8 oz costs) 8 × 11 ÷ 3.52 M1 (FT16 × 0.22)* *= (£)25 A1* *Alternative 2:* *(For) £110 gets 2.2 lbs (of steak) B1* *110 ÷ 2.2 M1* *= (£)50 (per lb) A1* *(8 ounces costs) 50 ÷ 2 M1* *= (£) 25 A1*
12. x+ x + 40+ 2x - 30 +3x – 120+ 3x (Interior angle sum) 3 × 180(°) or alternative FULL method 540(°) 10x -110 = 540 or 10x = 540 + 110 or 10x = 650 x = 65(°) (65(°), 105(°), 100(°), 75(°),) **195**(°) (so this angle is greater than 180°)	B1 M1 A1 M1 A1 E1 (6)	3(x -40) = 3x - 120 may be seen in later working FT 'their 10x – 110' = n where n ≥ 360 CAO FT provided similar outcome
13. n^2 - 8	B2 (2)	Award B1 for (1)n^2 ± 'any number', provided this number ≠0 If no marks, award SC1 for n^2 – 8n

14(a) Method to find the rate, e.g. 7.5 cm per hour, or 1.25 cm per 10 minutes 0.125 (cm/min)	M1 A1	
14(b)(i) 20 (cm) or 200 (mm)	B1	CAO. If units are given they must be correct
14(b)(ii) Statement, e.g. 'container might overflow', 'may not continue at the same rate', 'cross section of the container might change'	E1 (4)	
15*(a) (Mass =) 2.4 × 13.4 32.16 (g)	M1 A1	CAO, accept 32.2(g) from correct working
15(b) (P =) 135 ÷ 0.36 or (135 ÷ 3600) × 100^2 375 (N/m^2)	M2 A1 (5)	or equivalent full method which may be seen in stages M1 for 135 ÷ 3600 or 135 ÷ 'digits 36 with incorrect place value' CAO
16(a) Area of sector $\frac{42}{360} \times \pi \times 3.6^2$ Answer in range 4.748 (m^2) to 4.75... (m^2) (Area ACD) ½× 3.6 × 4.1 ×sin 67(°) 6.79(...m^2) Total area 11.53(8..m^2) to 11.54(...m^2) **AND** Yes	M1 A1 M1 A1 B1	 May be implied later May be implied later FT provided at least M2 A1 previously awarded (with appropriate conclusion)
16(b) (Arc length) $2 \times \frac{42}{360} \times \pi \times 3.6$ 2.64 (m) (Triangle ACD) AD^2 = 18.2(356...) AD = 4.27(...m) (Perimeter) (4.1 + 3.6 + 2.64 + 4.27) 14.6(1 m) **AND** No	M1 A1 M2 A1 B1 (11)	 Accept 2.63(...m) M1 for $AD^2 = 4.1^2+3.6^2-2\times4.1\times3.6\times\cos67(°)$ Accept 4.3(m) FT correct evaluation of 'their arc' + 'their AD' + 4.1 + 3.6 provided at least M2 and A1 previously awarded

17(a) Reflection in the x-axis (0, 2)	M1 A1	Accept 2 indicated correctly on the y-axis
17(b) Horizontal translation Correct translation with (1, 0) and (3,0) indicated on the x-axis	B1 B2	Any horizontal translation without including any other transformation Accept indication of 1 and 3 on the x-axis with the correct translation B1 for a correct translation with only one of the values 1 and 3 indicated, or for a horizontal translation with (-1, 0) and (1, 0) indicated on the x-axis as intersections, or for a horizontal translation to show y = g(x) with (0, 0) and (2, 0) indicated on the x-axis as intersections
17(c) Correct negative enlargement	B2 (7)	B1 an enlargement with scale factor -½, with correct orientation with incorrect placement.
18. Showing $x^2 + 2x - 132.48 = 0$ or $2x^2 + 4x - 264.96 = 0$ $x = \frac{-4 \pm \sqrt{(4^2 - 4 \times 2 \times -264.96)}}{2 \times 2}$ or $x = \frac{-2 \pm \sqrt{(2^2 - 4 \times 1 \times -132.48)}}{2 \times 1}$ or $(x + 1)^2 - 133.48 = 0$ $x = \frac{-4 \pm \sqrt{2135.68}}{4}$ or $x = \frac{-2 \pm \sqrt{533.92}}{2}$ or $x + 1 = \sqrt{133.48}$ x = 10.55....(cm) or 10.6(cm) (Volume =) ⅓ × π × $10.55...^2$ × 12.55... Answer in the range 1462 (cm^3) to 1483 (cm^3)	B2 M1 A1 A1 M1 A1 (7)	B1 for $x^2 + (x + 2)^2 = 16.4^2$ FT for equivalent level of difficulty Allow 1 slip in substitution, not use of incorrect formula Either negative x-value not given or ignored in further working Candidate must not show working with negative x-value FT provided at least 2 marks previously awarded Must be from correct working FT for an answer in a similar range, not allowing truncation of 'their x' to a whole number or 1 d.p.

19(a) 0.78 x 1 or equivalent, AND an attempt to consider the other 22% 0.22 x ¼ or equivalent Showing the need to add (0.78 + 0.055) 0.835 or 83.5%	M1 M1 M1 A1	Not for sight of 78% alone Method considers 78% + 22% of ¼ *Alternative:* *(Number of questions)* *0.78 × 50 + (50 – 0.78 × 50) × 0.25* *M1* *(= 39 + 2.75 =)* *41.75* *A1* *(Probability) 41.75/50* *(FT from M1)* *M1* *= 0.835* *A1*
19(b)Probability from part (a)×50 41.75 with interpretation 'No'	M1 A1 (6)	FT from part (a), apart from 78% giving an answer of 39, this is M0 A0 FT from part (a), apart from 78%, with appropriate interpretation ≥ 43 as 'yes' or <43 as 'no' Award M1 A1 for an appropriate conclusion without working only if the alternative method is used in (a) *Alternative 1:* *(43/50 as) 86% compared with probability 83.5%* *M1* *Interpretation 'No'* *A1* *Alternative 2:* *(With 83.5% seen in (a)) 41 or 42 questions correct* *M1* *Interpretation 'No'* *A1*
20(a) Correct sketch	B1	
20(b) 23.578....(°) and 156.42...(°) alone	B2 (3)	B1 for either angle Accept rounding and truncation of angles