



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 $39 \times 2 - 17^3$ 1.34×232 0.82×4530 -4835 and 310.88 and 3714.6	B1 B1 B1 B1 (4)	Do not accept $134\% \times 232$ CAO. Independent mark <i>Misreads: e.g. $5 \times 13 - 17^3 = -4848$ is B0, but FT as misread for possible final B1</i>
2*(a)(i) Mid points: 15, 25, 35, 45 $15 \times 5 + 25 \times 20 + 35 \times 23 + 45 \times 52$ (= $75 + 500 + 805 + 2340 = 3720$) $\div 100$ $37(.2\text{mm})$	B1 M1 m1 A1	FT provided 'their midpoints' within the 'bounds' inclusive Unsupported 37.2, award all 4 marks
2*(a)(ii) $40 \leq x < 50$	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 1 st 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*. $\sin f = 8.4/12.3$ $(f =) 43(.07\dots^\circ)$	M1 A2 (3)	A1 for $(f =) \sin^{-1}0.68(29\dots)$

<p>4*(a) 2500×0.84^n with any value of n from n=1 to n=10 or equivalent</p> <p>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</p> <p style="text-align: center;">6 (years)</p>	<p>M1</p> <p>m1</p> <p>A1</p>	<p>($2500 \times 0.84 = \text{£}2100$) ($2500 \times 0.84^2 = \text{£}1764$) ($2500 \times 0.84^3 = \text{£}1481.76$) ($2500 \times 0.84^4 = \text{£}1244.6784$) ($2500 \times 0.84^5 = \text{£}1045.529\dots$) ($2500 \times 0.84^6 = \text{£}878.245\dots$) ($2500 \times 0.84^7 = \text{£}737.725\dots$) ($2500 \times 0.84^8 = \text{£}619.689\dots$) ($2500 \times 0.84^9 = \text{£}520.539\dots$) ($2500 \times 0.84^{10} = \text{£}437.253\dots$)</p> <p>CAO If no working, award SC2 for an answer of 6 (years)</p>
<p>4(b) $500 \times (1 + 325/100)^3$</p> <p style="text-align: center;">(£) 38 382.81(25)</p>	<p>M2</p> <p>A1</p> <p>(6)</p>	<p>M1 for $500 \times (1 + 325/100)$ (= £2125) or equivalent M1 implied by sight of $a \times 500 \times 3.25 + b \times 500$ or $a \times 1625 + b \times 500$, or 5375, or 6375, where $a \neq 0$ and $b \neq 0$</p> <p>Accept (£)38382 or 38383 If no marks, award SC1 for sight of $(325/100)^3$ or equivalent or sight of 17164.0625 (= $3.25^3 \times 500$)</p>
<p>5*(a) $3x^2 + 18xy + 5xy + 30y^2$ $3x^2 + 23xy + 30y^2$</p>	<p>B2</p> <p>B1</p>	<p>B1 for any 2 terms correct FT for equivalent level of difficulty, providing at least 3 terms to consider and like terms to collect</p>
<p>5*(b) $(x - 9)(x - 4)$</p>	<p>B2</p>	<p>B1 for $(x \dots 9)(x \dots 4)$</p>
<p>5*(c) $(w + 9)(w - 2) = 0$ $w = -9$ with $w = 2$</p>	<p>B2</p> <p>B1</p>	<p>B1 for $(w \dots 9)(w \dots 2)$ STRICT FT from 'their pair of brackets' <i>Alternative:</i> $(w =) \{-7 \pm \sqrt{(7^2 - 4 \times 1 \times -18)}\} / 2$ M1 $(=) (-7 \pm \sqrt{121}) / 2$ A1 $w = -9$ with $w = 2$ A1</p> <p>Accept trial & improvement method only if both solutions are found correctly for B3</p>
<p>5(d) $(y - 11)(y + 11)$</p>	<p>B1</p>	
<p>5(e) $c = 16$</p> <p>$0 = (-2)^2 + b \times -2 + c$ $0 = (-2)^2 + b \times -2 + 16$</p> <p style="text-align: center;">$b = 10$</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>(13)</p>	<p>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</p>
<p>6*. (First distance) $45 \times 40 \div 60$ (Second distance) $60 \times 25 \div 60$ (Total distance) 55 (miles)</p> <p>(Overall average speed) $55 \div (65/60)$ or equivalent in stages 50.7(69...mph) or 50.8(mph) or 51(mph)</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>m1</p> <p>A1</p> <p>(5)</p>	<p>(30 miles) (25 miles) CAO. May be implied in further working</p> <p>FT 'their 55' depends on M1 previously awarded and 'their total distance' is the sum of two derived distances</p> <p>If no marks, award SC2 for an answer of 50.7(69...) from $(45 \times 40 + 25 \times 60) / (40 + 25)$ or equivalent</p>

<p>7(a) (Volume sphere) $\frac{4}{3} \times \pi \times 2.7^3$ (Volume of cuboid) $14.2 \times \text{height} = \frac{4}{3} \times \pi \times 2.7^3$</p> <p>Height = $\frac{4}{3} \times \pi \times 2.7^3 \div 14.2$</p> <p>Answer in the range 5.8 to 5.81 (cm³)</p>	<p>M1</p> <p>M1</p> <p>m1</p> <p>A1</p>	<p>($\approx 82.4\dots \text{cm}^3$)</p> <p>FT for 'their volume of sphere'</p> <p>FT for 'their volume of sphere'</p> <p>CAO</p>						
<p>7(b) $86 = \pi \times \text{Diameter}$, or $86 = 2 \times \pi \times \text{Radius}$</p> <p>Diameter = $86 \div \pi$ or Radius = $86 \div 2\pi$</p> <p>Perimeter semi-circle $86 \div 2 + \text{Diameter}$, or $86 \div 2 + 2 \times \text{Radius}$</p> <p>70.4 (cm) or 704 mm</p>	<p>M1</p> <p>m1</p> <p>M1</p> <p>A2</p> <p>(9)</p>	<p>(Diameter = 27.37 to 27.4 cm) (Radius = 13.68 to 13.7 cm)</p> <p>FT 'their derived diameter' or 'their derived 2 × radius', independent of previous marks</p> <p>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)).</p>						
<p>8*. $7a + 2g = 6(.)15$ AND $5a + 8g = 9(.)19$</p> <p>Method to eliminate variable, e.g. equal coefficients and method to find second variable</p> <p>First variable</p> <p>Second variable</p> <p>(£)4.99</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>B1</p> <p>(5)</p>	<p>Both equations are required for the award of B1</p> <p>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</p> <p>a = 67(p) or a = (£ 0).67 or g = 73(p) or g = (£ 0).73</p> <p>FT their first variable provided M1 previously awarded</p> <p>CAO, not FT</p>						
<p>9(a) 86 AND 140</p>	<p>B1</p>							
<p>9(b)</p> <table border="1" data-bbox="159 1355 622 1451"> <tbody> <tr> <td>(0)</td> <td>-273.15</td> </tr> <tr> <td>(100)</td> <td>-173.15</td> </tr> <tr> <td>(200)</td> <td>-73.15</td> </tr> </tbody> </table>	(0)	-273.15	(100)	-173.15	(200)	-73.15	<p>B2</p>	<p>B1 for 1 correct entry or for all 3 negative entries with correct differences</p>
(0)	-273.15							
(100)	-173.15							
(200)	-73.15							
<p>9(c) 320 kelvin to Celsius: working with 100 difference in both kelvin and Celsius</p> <p>46.85 (degrees Celsius)</p> <p>Answer for Fahrenheit <u>between 104 and 122</u> exclusive</p> <p>Suitable calculation, e.g.</p> <ul style="list-style-type: none"> $104 + (6.85/10) \times 18$ $122 - \frac{(10 - 6.85)}{10} \times 18$ 116(.33 Fahrenheit) 	<p>M1</p> <p>A1</p> <p>B1</p> <p>m1</p> <p>A1</p> <p>(8)</p>	<p>e.g. sight of 20 + 26.85, 126.85 – 80, 320-273.15</p> <p>Look for response in the table Accept 46.8, 46.9, 47 Look for evidence in the table</p> <p>CAO, independent of all other marks Look for evidence in the table</p> <p>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</p> <p>Accept 116 (Fahrenheit) from correct working</p>						

<p>10(a) $y \propto 1/x$ OR $y = k/x$ $124.5 = k/18$ or $k = 2241$ $y = 2241/x$</p>	<p>B1 M1 A1</p>	<p>Allow $y \propto k/x$ 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 $y \propto 2241/x$</p>								
<p>10(b)</p> <table border="1" data-bbox="220 409 660 477"> <tbody> <tr> <td>x</td> <td>$\frac{1}{2}$</td> <td>18</td> <td>24.9</td> </tr> <tr> <td>y</td> <td>4482</td> <td>2241</td> <td>90</td> </tr> </tbody> </table>	x	$\frac{1}{2}$	18	24.9	y	4482	2241	90	<p>B2 (5)</p>	<p>FT their non linear expression B1 for each value Allow 24.9 given as 25 provided $k = 2241$ seen in (a) or (b)</p>
x	$\frac{1}{2}$	18	24.9							
y	4482	2241	90							
<p>11. $100g = 0.22$ pounds or 1 pound = $(1 \div 2.2 =) 0.4545...kg$</p> <p>$\frac{1}{2}$ pound or 8 ounces \approx $(100 \div 0.22) \times 0.5$ (g) or $(1 \div 2.2) \div 2$ (kg)</p> <p>$227(.2727....)$ g) or $0.227(27...)$ kg)</p> <p>(£) $227(.2727....) \times 11 \div 100$ or (£) $0.227(27...) \times 11 \times 1000 \div 100$</p> <p>Answer in the range (£)24.97 to (£)25.00</p>	<p>B1 M1 A1 M1 A1 (5)</p>	<p>May be embedded in working</p> <p>Or equivalent Award of M1 implies award of B1 previously</p> <p>FT use of 'their $227(.2727...)$' provided at least 1 mark previously awarded</p> <p>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</p> <p><i>Alternative 1:</i> (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) $8 \times 11 \div 3.52$ M1 (FT 16×0.22) $= (£)25$ A1</p> <p><i>Alternative 2:</i> (For) £110 gets 2.2 lbs (of steak) B1 $110 \div 2.2$ M1 $= (£)50$ (per lb) A1 (8 ounces costs) $50 \div 2$ M1 $= (£) 25$ A1</p>								
<p>12. $x + x + 40 + 2x - 30 + 3x - 120 + 3x$</p> <p>(Interior angle sum) $3 \times 180(^{\circ})$ or alternative FULL method 540(^{\circ})</p> <p>$10x - 110 = 540$ or $10x = 540 + 110$ or $10x = 650$ $x = 65(^{\circ})$</p> <p>($65(^{\circ})$, $105(^{\circ})$, $100(^{\circ})$, $75(^{\circ})$,) $195(^{\circ})$ (so this angle is greater than 180°)</p>	<p>B1 M1 A1 M1 A1 E1 (6)</p>	<p>$3(x - 40) = 3x - 120$ may be seen in later working</p> <p>FT 'their $10x - 110 = n$ where $n \geq 360$</p> <p>CAO</p> <p>FT provided similar outcome</p>								
<p>13. $n^2 - 8$</p>	<p>B2 (2)</p>	<p>Award B1 for $(1)n^2 \pm$ 'any number', provided this number $\neq 0$ If no marks, award SC1 for $n^2 - 8n$</p>								

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 =) $135 \div 0.36$ or $(135 \div 3600) \times 100^2$ $375 \text{ (N/m}^2\text{)}$	M2 A1 (5)	or equivalent full method which may be seen in stages M1 for $135 \div 3600$ or $135 \div$ '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) $\frac{1}{2} \times 3.6 \times 4.1 \times \sin 67^\circ$ $6.79(\dots\text{m}^2)$ 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) $AD^2 = 18.2(356\dots)$ $AD = 4.27(\dots\text{m})$ (Perimeter) $(4.1 + 3.6 + 2.64 + 4.27)$ $14.6(1 \text{ m})$ AND No	M1 A1 M2 A1 B1 (11)	Accept 2.63(...m) M1 for $AD^2 = 4.1^2 + 3.6^2 - 2 \times 4.1 \times 3.6 \times \cos 67^\circ$ 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 $-\frac{1}{2}$, 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 $x + 1 = \sqrt{133.48}$ $x = 10.55\dots(\text{cm})$ or $10.6(\text{cm})$ (Volume =) $\frac{1}{3} \times \pi \times 10.55\dots^2 \times 12.55\dots$ 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.

<p>19(a) 0.78×1 or equivalent, AND an attempt to consider the other 22%</p> <p>$0.22 \times \frac{1}{4}$ or equivalent</p> <p>Showing the need to add $(0.78 + 0.055)$</p> <p>0.835 or 83.5%</p>	<p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>Not for sight of 78% alone</p> <p>Method considers 78% + 22% of $\frac{1}{4}$</p> <p><i>Alternative:</i> <i>(Number of questions)</i> $0.78 \times 50 + (50 - 0.78 \times 50) \times 0.25$ M1 $(= 39 + 2.75 =)$ 41.75 A1 <i>(Probability)</i> 41.75/50 (FT from M1) M1 $= 0.835$ A1</p>
<p>19(b) Probability from part (a) $\times 50$</p> <p>41.75 with interpretation 'No'</p>	<p>M1</p> <p>A1</p> <p>(6)</p>	<p>FT from part (a), apart from 78% giving an answer of 39, this is M0 A0</p> <p>FT from part (a), apart from 78%, with appropriate interpretation ≥ 43 as 'yes' or <43 as 'no'</p> <p>Award M1 A1 for an appropriate conclusion without working only if the alternative method is used in (a)</p> <p><i>Alternative 1:</i> <i>(43/50 as) 86% compared with probability 83.5%</i> M1 <i>Interpretation 'No'</i> A1</p> <p><i>Alternative 2:</i> <i>(With 83.5% seen in (a)) 41 or 42 questions correct</i> M1 <i>Interpretation 'No'</i> A1</p>
<p>20(a) Correct sketch</p>	<p>B1</p>	
<p>20(b) 23.578...($^{\circ}$) and 156.42...($^{\circ}$) alone</p>	<p>B2</p> <p>(3)</p>	<p>B1 for either angle</p> <p>Accept rounding and truncation of angles</p>

