



GCSE MARKING SCHEME

AUTUMN 2023

**GCSE
MATHEMATICS – COMPONENT 2
(HIGHER TIER)
C300UB0-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

4.*(a) 40 (circles)	B1	
4.*(b) $60 \times 96 - 40 \times \pi \times 6^2$ Answer in the range 1235.5 to 1238.4(cm ²)	M3 A1	May be seen in stages. FT their 40 provided between 6 and 50 inclusive M2 for $40 \times \pi \times 6^2$ M1 for $60 \times 96 - k\pi$ sight of $\pi \times 6^2$ or 113(.09..) CAO. <i>If no marks, allow M1 for sight of $\pi \times 6^2$ or 113(.09..) seen in (a) or by the diagram</i>
(5)		
5.*(a) $x^2 + 10x + 21$	B2	Mark final answer B1 for sight of. $x^2 + 3x + 7x + 21$ or a final answer of either <ul style="list-style-type: none"> • $x^2 + kx + 21$, $k \neq 0$ or 10 • $x^2 + 10x + c$, $c \neq 0$ or 21
5.*(b) $3x = 1$ $(x =) \frac{1}{3}$ oe, ISW	B1 B1	Accept 0.33 or 0. $\dot{3}$ but not 0.3. FT from $ax = 1$, $a \neq 1$ or $3x = b$ accept $\frac{1}{a}$ or $\frac{b}{3}$ but if on FT either simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1.
5.*(c) $(y + 20)(y - 20)$	B1	Allow $(x + 20)(x - 20)$ oe
5.*(d) Method to eliminate an unknown e.g. equal coefficients AND appropriate addition or subtraction or rearranges one equation and substitutes into the other Finds one unknown Finds the other unknown	M1 A1 A1	No marks for T&I; no marks for an unsupported answer. Allow one error in one term, not in the equated coefficients CAO; $x = 3.5$, $y = -0.5$ FT 'their x' or 'their y' used in one of their equations
(8)		

<p>6.*</p> $(r =) 7.6 \times \frac{15.6}{10.4} \text{ or } 7.6 \div \frac{10.4}{15.6}$ $= 11.4$ $(t =) 19.5 \div \frac{15.6}{10.4} \text{ or } 19.5 \times \frac{10.4}{15.6}$ $= 13$	<p>M1 A1 M1 A1</p>	<p>Or equivalent calculation that could lead to the correct answer.</p> <p>Or equivalent calculation that could lead to the correct answer.</p> <p>Note: If answers are reversed award M1 A0 M1 A0 SC1</p>
(4)		
<p>7.*(a)</p> <p>Use of trigonometry in a right-angled triangle with an angle of 48(°) or 42(°) and a side of 800 (m)</p> $(h =) \frac{800}{\cos(42)} \text{ or } (h =) \frac{800}{\sin(48)}$ <p>(h =) 1076(.5....) or 1077 (feet)</p>	<p>S1 M2 A1</p>	<p>Trig ratio used may not be correct at this stage.</p> <p>Or alternative full method M1 for $\cos(42) = \frac{800}{h}$ or $\sin(48) = \frac{800}{h}$</p> <p>Allow 1076 (feet) from correct working</p>
<p>7.*(b)(i)</p> <p>A correct assumption e.g.</p> <p>'The (surface of) the slope is smooth (and he cycles the shortest distance).'</p>	<p>E1</p>	<p>Allow e.g. 'He rode in a straight line.' 'It was a straight line.' 'The track wasn't bumpy.' 'He cycled straight from the top to the bottom.' 'He didn't do any jumps.' 'There are no obstructions.' 'The surface is flat.' 'He cycled the shortest distance.' 'That it was 48° the whole way down'. 'That it is a right-angled triangle' 'The track is level' (assume they mean not bumpy) Do not allow: 'That it was 48°'</p>
<p>7.*(b)(ii)</p> <p>A correct effect of assumption e.g.</p> <p>'If the surface of the slope is not smooth then Vaughan will have cycled further than the calculated value in (a).'</p>	<p>E1</p>	<p>If no valid assumption is made, then this mark cannot be awarded. Cannot award E0 E1.</p> <p>Allow e.g. 'He cycled further.' 'The answer would be bigger.'</p> <p>Do not allow: 'The answer would be different'</p>
(6)		

<p>12.</p> <p>No indicated or implied with</p> <p>$(2 \times 1.81^3 - 3 \times 1.81^2 - 2 =) 0.03(1\dots)$ AND $(2 \times 1.82^3 - 3 \times 1.82^2 - 2 =) 0.1(19\dots)$ AND</p> <p>a correct explanation e.g ‘one should be positive, and one should be negative’. ‘0 is not between 0.119.. and 0.03..’ ‘0.119... and 0.03.. are both positive’</p> <p><u>Alternative Method</u> No indicated or implied with</p> <p>$(2 \times 1.81^3 - 3 \times 1.81^2 =) 2.03(1\dots)$ AND $(2 \times 1.82^3 - 3 \times 1.82^2 =) 2.1(19\dots)$ AND</p> <p>a correct explanation e.g</p> <p>‘one should be more than 2, and one should be less than 2’. ‘0 is not between 0.119.. and 0.03..’ ‘0.119... and 0.03.. are both positive’</p>	<p>B2</p> <p>B2</p> <p>(2)</p>	<p>Allow for 0.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative.</p> <p>Award B1 for one of the following:</p> <ul style="list-style-type: none"> • 0.03(1....) and 0.1(19...) seen with a correct explanation but with yes indicated. • a correct explanation following an error in their substitution. • 0.03(1....) and 0.1(19...). <p>Allow for 2.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative.</p> <p>Award B1 for one of the following:</p> <ul style="list-style-type: none"> • 2.03(1....) and 2.1(19...) seen with a correct explanation but with yes indicated. • a correct explanation following an error in their substitution. • 2.03(1....) and 2.1(19...).
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13.(a)(i) A value between 39 and 40 (mins) inclusive	B1	
13.(a)(ii) Intention UQ – LQ using readings for 37.5 and 12.5 (pupils) 50 to 51 (minutes) and 30 to 31 (minutes) Answers in the range 19 to 21 (minutes) inclusive.	M1 A1	If no marks and a median of 43 to 44 seen in (a) award SC2 answers of 33 to 34 (from LQ and UQ at frequencies of 15 and 45 respectively)
13(a)(iii) $\frac{7}{50} (\times 100)$ = 14 (%)	M1 A1	If no marks, award SC1 for an answer of 86 (%) If use of 60 as total frequency already penalised award SC2 for an answer of 28(.33...%) or SC1 for $\frac{17}{60} (\times 100)$ or an answer of 71.66.. or 72%
13(b) Left whisker at 12 and right at 65 UQ 55 UQ 55, median 45 and LQ 31 in a box plot	B1 B1 B1	 Seen or implied. Must be seen in a correct box plot, FT their UQ; if no UQ is stated and it is not at 55 allow this mark provided $45 < UQ < 65$.
13.(c) Valid comment comparing medians e.g. 'On average, School A were quicker than School B as the median was 39.5 in school A and 45 in School B.' 'On average, School B were slower than School A as the median was 39.5 in school A and 45 in School B.'	E1	FT their median and IQR from (a) Must be a comparison not simply a comment about one school. Allow e.g. 'School A had a lower median (so were quicker on average)'. 'The average of School A is 5.5 minutes faster'. 'School A had a lower average of 39.5' as clearly using the median as the average. Do not allow e.g. 'School A had a median of 39.5 and School B had a median of 45' (no comparison). 'On average School A were quicker', (no reference to median or comparison of values).
Valid comment comparing IQRs or range e.g. 'School A's results were less varied than School B's as the IQR was 20 which was less than School B's (which was 24)' 'School A's results were more consistent than School B's as the IQR was 20 which was less than School B's (which was 24)' 'School A's results were more varied than School B's as the range is bigger than School B's (which was 53)'	E1	FT "their IQR" from (a)(ii) Must be a comparison not simply a comment about one school. Allow e.g. 'School A's marks were more consistent as the IQR is smaller'. Do not allow e.g. 'School A had an IQR of 20 and School B had an IQR of 24' (no comparison). 'School B's results are more spread out than School A's' (need to mention IQR since range for School A is greater)
	(10)	

<p>14.</p> $(x^2 =) 12^2 - (9 \div 2)^2$ $x^2 = 123.75 \quad \text{or} \quad (x =) \sqrt{123.75}$ $(x =) 11(.12\dots) \text{ or } \frac{3\sqrt{55}}{2} \text{ (cm)}$ $(\text{Volume} =) \frac{1}{3} \times 9 \times 9 \times 11(.12\dots)$ <p>Answers in the range 299.7 to 300.4 inclusive.</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Where x represents the perpendicular height. Accept other notation.</p> <p>FT their height provided M1 awarded.</p> <p>FT</p>
(5)		
<p>15.(a)</p> $\frac{8}{17} \times \frac{7}{16}$ $= \frac{56}{272} \text{ or } \frac{7}{34} \text{ oe}$	<p>M1</p> <p>A1</p>	<p>Allow 0.205 to 0.206 from correct working</p>
<p>15.(b)</p> $\frac{8}{17} \times \frac{7}{16} + \frac{9}{17} \times \frac{8}{16}$ $= \frac{128}{272} \text{ or } \frac{8}{17} \text{ oe}$	<p>M1</p> <p>A1</p>	<p>FT Their answer to (a) + $\frac{9}{17} \times \frac{8}{16}$</p> <p>Allow 0.47 or 0.471 from correct working</p>
(4)		
<p>16.</p> $(\text{Area} =) \frac{1}{2}(x + 1 + 2x)(2x - 3)$ $(3x^2 - 3.5x - 1.5 = 59.5) \times 2 \text{ oe}$ <p>convincingly leading to</p> $6x^2 - 7x - 3 = 119$ $(x =) \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 6 \times -122}}{2 \times 6}$ $(x =) \frac{7 \pm \sqrt{2977}}{12}$ <p>(x =) 5.1(30...) (and -3.963...)</p> <p>(Height =) 7.26.... (cm)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>m1</p> <p>A1</p> <p>B1</p>	<p>The substitution into the formula must be seen for M1, otherwise award M0A0A0. FT 'their $6x^2 - 7x + c = 0$' where $c \neq -3$ for M1 and possible m1 Allow one slip in substitution for M1 only but must be correct formula.</p> <p>Can be implied from at least one correct value of x evaluated.</p> <p>CAO</p> <p>Accept answers in the range 7.2 to 7.3 inclusive Allow this B1 if the correct value given following sight of $6x^2 - 7x - 122 = 0$ otherwise, FT provided 2nd M1 awarded. If their equation has two positive solutions, then two correct FT heights must be given for the B1.</p>
(6)		

17.(a) $\frac{131}{360} \times \pi \times 11^2$ $=138.3(\dots) \text{ (mm}^2\text{)}$	M1 A1	Allow 136.26 or 138 (mm ²) from correct working
17.(b) $\frac{21}{60} \times \pi \times 2y$ or $\frac{126}{360} \times \pi \times 2y$ oe $= \frac{7\pi y}{10}$ or $0.7\pi y$	M1 A1	
	(4)	
18.(a) $t \propto \frac{1}{m^2}$ OR $t = \frac{k}{m^2}$ $38 = \frac{k}{3^2}$ or $k = 342$ $t = \frac{342}{m^2}$	B1 M1 A1	FT from B0 for a correct calculation of k from $t \propto \frac{1}{m}$ or $t \propto m^2$ or $t \propto \frac{1}{\sqrt{m}}$ CAO <i>Note: This may be seen in 18(b).</i>
18.(b) $m^2 = \frac{342}{12}$ or $m = (\pm)\sqrt{28.5}$ or $m = (\pm)5.3(3..)$ 6 (mechanics)	M1 A1	No marks for unsupported answers, work must follow from (a). FT provided at least M1 awarded in (a). CAO
	(5)	
19. $(BC =) \sqrt{6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)}$ $(BC =) 8.67(5 \dots)$ or 8.7 (cm) $\sin(BDC) = \frac{\sin(68)}{11.1} \times 8.6(75 \dots)$ $(BDC =) 46.4 \text{ to } 46.6 \text{ (}^\circ\text{)}$ $(CBD =) 65.4 \text{ to } 65.6 \text{ (}^\circ\text{)}$	M2 A1 M2 A1 A1	Allow alternative full methods throughout M1 for $(a^2) = 6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)$ (=75.26...) Allow A1 for an answer of 8.6 from correct working not from premature rounding FT 'their derived BC' provided it is a length. M1 for $\frac{\sin(BDC)}{8.6(75\dots)} = \frac{\sin(68)}{11.1}$ Allow 47(°) from correct working. Allow answers of 65(°) or 66(°) from correct working. FT provided both cosine and sine rule attempted and at least M1 awarded for each.
	(7)	

22.(a) $(y =) (x - 2)^2 - 5$	B2	B1 for either $a = -2$ or $b = -5$
22.(b)(i) Translation through $\begin{pmatrix} k \\ 0 \end{pmatrix}$ where $k > 0$	B1	Ignore coordinates for this mark.
Correct coordinates seen or scale marked, (0,0) may be implied.	B1	Correct curve through (0, 0) and (4, 0)
22.(b)(ii) The correct reflection in the y axis intersecting the y axis at (0,4) AND (-5,0) indicated on the x axis	B2	B1 for a correct reflection in the y-axis but (-5, 0) not marked or incorrect.
	(6)	
23.(a) $x^2 + y^2 = 25$ or $x^2 + y^2 = 5^2$	B1	
23.(b) (1,5)	B2	Allow $x = 1$ and $y = 5$ B1 for $5 = 2x + 3$ or better
	(3)	