GCSE MARKING SCHEME

SUMMER 2024

GCSE
MATHEMATICS
UNIT 2 – HIGHER TIER
3300U60-1

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

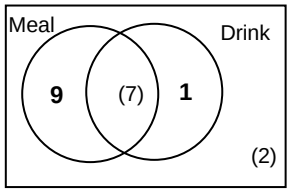
This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCSE MATHEMATICS

SUMMER 2024 MARKING SCHEME

Unit 2: Higher Tier	Mark	Comments
1.(a) 0·27 or equivalent.	B2	Mark final answer. Allow ±0·27 OR (+)0.27 'and/or' –0.27. Award B1 for sight of one of the following: • 0·27 (or equivalent) followed by subsequent working • –0·27 • 0·0729.
1.(b) 8	B1	Answer line takes precedence. Allow embedded answer in working space provided not contradicted on answer line.
1.(c) 7	B1	Answer line takes precedence. Allow embedded answer in working space provided not contradicted on answer line.
2.(a) 4	B1	Answer in table takes precedence.
2.(b) At least 6 correct plots and no incorrect plot	P1	FT 'their (1,4)'. Allow ± '½ a small square'. Ignore any additional points plotted on the curve.
A smooth curve drawn through their plots	C1	FT 'their 7 plots' OR a curve through the 6 given points **AND** (1,4). Allow intention to pass through their plots (± '1 small square horizontally **or** vertically)'.
2.(c) −3·7 AND 1·2	B2	Answer line takes precedence. May be seen in any order. Allow ± '1 small square' i.e. ± 0.1. FT intersection of 'their curve' with $y = 6$ only if exactly two points of intersection. Award B1 for one of the following: • line $y = 6$ drawn (must be at least 5 small squares long) • −3·7 • 1·2 • one correct intersection of 'their curve' with $y = 6$ two correct intersections of 'their curve' with 'their $y = 6$' only if exactly two points of intersection.

Unit 2: Higher Tier	Mark	Comments
3.(a)  	B2	Answers on diagram take precedence. For 9 AND 1 in correct position. Do not award B2 if more than one number is shown in the same section. Ignore 2 and 7 duplicated (in the correct place) for this B2. If B2 not awarded, award B1 for one of the following, provided no sections are blank and values are whole numbers: • 'their 9' + 'their 1' = 10 • 7 + 'their 9' = 2 × (7 + 'their 1'). A B1 may be awarded even if more than one number is shown in the same section as long as the total for awarding a B1 is correct.
3.(b) $\frac{16}{19}$ or equivalent. ISW	B2	FT $\frac{\text{'their 9'} + 7}{19}$ in a fraction < 1, provided Meal only not blank. If not B2, award B1 for one of the following in a fraction < 1: • a numerator of 16 • a numerator of 'their 9' + 7, provided Meal only section not blank • a denominator of 19 • a denominator of 'their 9' + 'their 1' + 9. An answer of $\frac{16}{19}$ gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '16 in 19') −1.

Unit 2: Higher Tier	Mark	Comments
4. (Volume of tank =) $70 \times 40 \times 30$	M1	Answer line takes precedence. May be seen in stages.
$= 84000\ (cm^3)$	A1	
(Volume of cylinder =) $\pi \times 10^2 \times 30$	M1	May be seen in stages.
$= 9424(\cdot 7\ldots cm^3)$ or $3000\ \pi\ (cm^3)$	A1	Accept answers between 9420 and 9426 inclusive.
(Capacity = 84000 – 9424(·7 =) $74575(\cdot\ldots cm^3)$	B1	Accept answers between 74574 and 74580 inclusive. FT 'their derived volume of tank'– 'their derived volume of cylinder', provided: • M1 previously awarded • π used when calculating the volume of the cylinder • 'their derived volume of tank' > 'their derived volume of cylinder'.
74·575(…litres)	B1	FT 'their volume/capacity in cm^3' ÷ 1000. Award B1 for a final answer of • 74·6 (litres) • 74·5 (litres) • 74·58 (litres) • 74·57 (litres) • 75 (litres) • 74 (litres) provided from correct workings. This final B1 can be awarded if the volume of the cylinder and tank are converted to litres correctly before the subtraction. An unsupported final answer of $74575(\cdot\ldots cm^3)$ is awarded M1A1M1A1B1B0. Unsupported answers in the above list is awarded M1A1M1A1B1B1.
4. <u>Alternative method</u>		
(Interior base area of container =) $70 \times 40 - \pi \times 10^2$	*M2*	*Award M1 for an appropriate 70×40 OR $\pi \times 10^2$* ***<u>within a subtraction</u>***
$= 2485(\cdot 8\ldots cm^2)\ (cm^2)$ or $2800 - 100\pi$	*A1*	*CAO Accept answers between 2485·8 and 2486 inclusive.*
(Capacity of container =) $2485(\cdot 8\ldots) \times 30$	*M1*	*FT 'their derived base area', provided at least M1 previously awarded.*
$74575(\cdot\ldots cm^3)$	*A1*	*Accept answers between 74574 and 74580 inclusive.*
74·575(…litres)	*B1*	*FT 'their volume/capacity in cm^3' ÷ 1000.* *Award B1 for a final answer of* • *74·6 (litres)* • *74·5 (litres)* • *74·58 (litres)* • *74·57 (litres)* • *75 (litres)* • *74 (litres) provided from correct workings.*

Unit 2: Higher Tier	Mark	Comments
Organisation and Communication.	OC1	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
Accuracy of writing	W1	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.
5.(a) −3	B1	
5.(b) (0, 7)	B1	

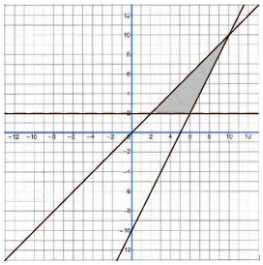
Unit 2: Higher Tier	Mark	Comments
6. $13{\cdot}8^2 = BD^2 + 7{\cdot}3^2$ OR $(BD^2 =)\ 13{\cdot}8^2 - 7{\cdot}3^2$ or equivalent	M1	Check diagram for answers. Note: 190·44 – 53·29 = 137·15
$(BD =)\ \sqrt{13.8^2 - 7.3^2}$ or equivalent	m1	Note: $(BD =)\ \sqrt{137{\cdot}15}$ FT √'their 137·15' for m1 only, provided M1 previously gained.
$(BD =)$ 11·7(1…..) (cm)	A1	CAO. Final answer of *BD* = 137·15 is M1m0A0. Accept an answer rounded or truncated to at least 1 decimal place. If √137.15 is used correctly for *BD* in subsequent work, then award this A1 retrospectively. An unsupported answer of 11·7(1…..) (cm) is awarded M1m1A1.
$y = \sin^{-1}\left(\frac{5.5}{11.7}\right)$ or $\sin^{-1}\ \frac{5{\cdot}5 \times \sin 90}{11{\cdot}7}$ or equivalent	M2	Check diagram for answers. FT 'their stated *BD*' (may be on diagram), provided > 5·5. Award M1 for one of the following: • $\sin y = \left(\frac{5.5}{11.7}\right)$ (= 0·47(0..)) • $\frac{\sin y}{5{\cdot}5} = \frac{\sin 90}{11{\cdot}7}$ or equivalent
y = 28(·0..)	A1	Accept an answer rounded or truncated. An unsupported answer of 28(·0..) is awarded M1m1A1M2A1. Allow correct angles given in radians or gradians:

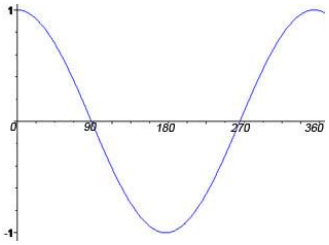
Method	Radians	Gradians
$\sin^{-1}\ \frac{5{\cdot}5}{11{\cdot}7}$	0·4893…	31·155….
$\sin^{-1}\ \frac{5{\cdot}5 \times \sin 90}{11{\cdot}7}$	0·4337…	30·738….

6. Alternative method ***for first 3 marks*** ***Correct*** *use of a 'two-step' method.*	*M2*	*A partial trigonometric method is M0.*
(BD =) 11·7(1…..) (cm)	*A1*	
6. Alternative method ***for final 3 marks*** ***Correct*** *use of a 'two-step' method.*	*M2*	*A partial trigonometric method is M0.*
(y =) 28(·0)	*A1*	*Allow correct angles given in radians or gradians.*

Unit 2: Higher Tier	Mark	Comments
7.(a) $\frac{x}{13.3} = \frac{5.2}{3.8}$ or $\frac{x}{5.2} = \frac{13.3}{3.8}$ or equivalent x = 18·2	M1 A1	M1 for <u>correct</u> use of scale factor 3·5 or equivalent e.g. $x = 5{\cdot}2 \times \frac{7}{2}$ An unsupported answer of 18·2 is awarded M1A1.
7.(b) A and C Valid **correct** reason e.g. • For each (of A and C) the length is 1·5 times the width • For each (of A and C) the length is 3/2 times the width • For each (of A and C) the width is 2/3 times the length • The scale factor (of enlargement from A to C) is 2·5 (or equivalent) • The scale factor (of enlargement from C to A) is 0·4 (or equivalent) • The sides are in equal ratios e.g. <u>15</u> = <u>10</u> (= 2·5) OR <u>6</u> = <u>15</u> (= 1·5) 6 4 4 10 or equivalent inverse ratios shown to be equal • The (corresponding) lengths and widths are in the same ratio of 5 : 2 • The ratio of the length to the width is 3 : 2 (for each of the rectangles A and C) • 6 × 2·5 = 15cm 4 × 2·5 =10cm.	B1 E1	Answer line takes precedence. Dependent on B1. Allow: Both width and height increase by a factor of 2·5 Do not allow: They have the same scale factor The scale factor is 1·5 The scale factor is 3 : 2.
8. $(x + 8)(x - 5)$ $(x =) -8$ AND $(x =) 5$	B2 B1	Award B1 for one of the following: • $(x \ldots 8)(x \ldots 5)$ • two brackets which multiply to give $x^2 + 3x + k$ • two brackets which multiply to give $x^2 + mx - 40$. **<u>Strict FT</u>** from their <u>brackets.</u> If no factorising shown, allow the following. B2 for $x + 8 (=0)$ AND $x - 5 (=0)$ (B1) $(x =) -8$ AND $(x =) 5$ (B1) OR B1 for $x - 8 (=0)$ AND $x + 5 (=0)$ (B0) $(x =) 8$ AND $(x =) -5$ (B1) FT OR B1 if only $(x =) -8$ AND $(x =) 5$ seen. (B1)

Unit 2: Higher Tier	Mark	Comments
9. $\frac{a+b}{2} = b - a$ $a + b = 2(b - a)$ $a + b = 2b - 2a$ or $a + 2a = 2b - b$ $(= 3a = b)$	B1 B1 B1	Award B0 for $a + b \div 2 = b - a$ unless brackets are implied in later correct workings. May be implied by correct further work (e.g. $a + b = 2b - 2a$). Award final B1 only from convincing work. If no marks, award SC1 for one of the following: • $a + b \div 2 = b - a$ • $\frac{a+b}{2} = a - b$ • sight of $\frac{a+b}{2}$ **AND** $b - a$ • showing the result is true (mean = range) for a pair of values a and b (where $3a = b$) e.g. stating that $a = 3$ and $b = 9$ and that $(9 + 3) \div 2 = 6$ and $9 - 3 = 6$.
9. Alternative method: *Assuming $b = 3a$* *(Mean =) $\frac{a+3a}{2}$* *$= 2a$* *Range = $3a - a = 2a$*	*M1* *A1* *B1*	*Working must be shown.* *Working must be shown.*
10.(a) (Berwyn = £) $0{\cdot}6x$ or equivalent	B1	CAO. Must be in terms of x e.g. award B0 for (£)0·6.
10.(b) Sight of (Carys = £)$0{\cdot}3x$ AND (Delyth = £)$0{\cdot}7x$ or equivalent (£)$0{\cdot}3x$ + (£)$0{\cdot}4x$ or equivalent (£)$0{\cdot}7x$ or Delyth or equivalent	B1 B1 B1	Must be seen and in terms of x e.g. award B0 for (£)0·3 and (£)0·7. Final answer of (£)$0{\cdot}7x$ or Delyth must be clearly identified, convincing and from correct working. If no marks awarded or if only the first B1 awarded, then award an additional SC1 for one of the following: • (£)0·3 + (£)0·4 = (£)0·7 (or Delyth) • (£)30 + (£)40 = (£)70 (or Delyth) or equivalent • Carys + Aled = Delyth. Carys + Aled = (£)$0{\cdot}7x$ is awarded full marks provided the first B1 is awarded. If first B1 not awarded, award SC1 for sight of Carys + Aled = (£)$0{\cdot}7x$.

Unit 2: Higher Tier	Mark	Comments
11. 2^{398}	B1	Mark final answer. Allow (n=) 398.
12.(a) $\sqrt{(113^2 - 72^2 - 84^2)}$	M3	May be seen in stages. *(If the answer is completed in stages, then any arithmetic errors in intermediate answers can be ignored, allowing for a FT for any remaining M marks).* M2 for $113^2 - 72^2 - 84^2$ (= 529). M1 for the correct method of finding a length in a triangle, which may be embedded in incorrect working, e.g.: • $84^2 + 72^2$ (= 12240) ($\sqrt{12240}$ = 110·63…) • $113^2 - 84^2$ (=5713) ($\sqrt{5713}$ = 75·58…) • $113^2 - 72^2$ (= 7585) ($\sqrt{7585}$ = 87·09…) • $113^2 + 84^2 + 72^2$ • $113^2 + 84^2 - 72^2$ • $113^2 - 84^2 + 72^2$
= 23 (cm)	A1	CAO Allow answers in the range 22·6(cm) to 23·2(cm) provided OA^2 is in the range 510·76 to 538·24.
12(a) Alternative method *A correct multi-step method, involving a trigonometric method leading to a correct answer.*	*M3*	*M2 for a correct multi-step method leading to OA^2 (= 529).* *M1 for a method leading to:* • *(AC =) 110·63…(cm) OR (AC^2 =) 12240* • *(OB =) 75·58…(cm) OR (OB^2 =) 5713* • *(OD =) 87·09…(cm) OR (OD^2 =) 7585*
= 23 (cm)	*A1*	*CAO* *Allow answers in the range 22·6(cm) to 23·2(cm) provided OA^2 is in the range 510·76 to 538·24.*
12.(b). 84×72×23÷3	M1	May be seen stages. Or equivalent. FT 'their derived height' from 12(a).
= 46 368(cm^3)	A1	
13. Correct region identified. 	B3	Accept indication by 'shading out'. B2 for two lines drawn correctly OR three lines drawn correctly with no region or an incorrect region identified. B1 for one line drawn correctly. If there are more than three lines drawn, only award B2 or B1 if the correct lines are clearly identified. If $y = 2$ shown and any other vertical or horizontal line shown e.g. $x = \pm 2$ or $y = -2$, unless $y = 2$ is selected for the region or clearly labelled, do not consider this as a correct line. *Minimum length of a line must be 2 cm.* *For a line to be considered correct, it must be so for the entirety of its drawn length.*
14. 1/2×24·1×17·9×sin37 = 129·8(08… cm^2) OR 129·81(cm^2) OR 130 (cm^2)	M1 A1	Accept a complete alternative correct method. CAO. Not from premature approximation. | | Radians | Gradians | | Area | -138·807… | 118·421…. |

Unit 2: Higher Tier	Mark	Comments
15. $\frac{7\cdot15}{73\cdot85-65\cdot75}$ or $\frac{7\cdot15}{8\cdot1}$	M2	If many attempts are offered without a method/answer being identified then mark final attempt. Award M2 for sight of 143/162 if clearly identified as 'their final attempt'. Accept 7·14999… or 65·74999… (or using recurring dot notation). Do not accept truncated values of 7·149 or 7·1499 or 65·749 or 65·7499. Award M1 for correct use of values 7·1 < e ≤ 7·2, 73·8 ≤ f < 73·9 and 65·7 < g ≤ 65·8 OR award M1 for correct use of 2 of the 3 correct bounds, 7·15, 73·85 and 65·75.
= 0·8827	A1	CAO. Must be correct to 4 decimal places. Only award A1 if M2 gained. If no marks gained award SC1 for an unsupported answer of 0·8827(16…).
16.(a) Cosine curve with appropriate orientation and position AND passing through (0°,1), (90°,0) and (270°,0) and approximately (180°,-1) and (360°,1) AND 90(°), 180(°), 270(°), 360(°) indicated on the x-axis AND -1 and 1 indicated on the y-axis.  	B2	Ignore curve shown for values x< 0° or x> 360°. Accept 180° as mid-way between 0° and 360° if unlabelled. Accept 360° as unlabelled provided the sketch does not exceed 360°. B1 for: • General cosine curve with appropriate orientation and appropriate position (ignore missing or incorrect labelling) **OR** • A continuous graph passing through (0°,1), (90°,0) and (270°,0) and approximately (180°,-1) and (360°,1) AND 90(°),-270(°), indicated on the x-axis AND -1 and 1 indicated on the y-axis. Accept 180° as mid-way between 0° and 360° if unlabelled. Accept 360° as unlabelled provided the sketch does not exceed 360°.
16.(b) 60(°) AND 300(°)	B2	Ignore any angle outside of the range 0° < x < 360°. Note B2 for 60(°) AND 300(°) and no other angle within the range 0° < x < 360°. Allow embedded answers. If not B2, award B1 for either of the following: • 60(°) **AND** 300(°) and one incorrect angle within the range 0° < x < 360° • 60(°) **OR** 300(°) and up to one incorrect angle within the range 0° < x < 360° If B2 or B1 awarded, penalise -1 for each further incorrect answer.
17. $3\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}$ or equivalent	M2	M1 for sight of $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\left(=\frac{1}{216}\right)$(one correct product).
$=\frac{3}{216}\left(=\frac{1}{72}\right)$ ISW	A1	Accept decimal answer of 0·0138(8…) OR 0·0139.

	Radians	Gradians
60°	π/3 or 1·047…	66·666…
300°	358·952…	293·333…

Unit 2: Higher Tier	Mark	Comments
18. Area scale factor: $\left(\sqrt[3]{3821/569}\right)^2$ (= 3·559…) OR $\left(\sqrt[3]{569/3821}\right)^2$ (= 0·280…) or equivalent.	M2	May be seen in parts. Allow $\left(\sqrt[3]{3821}\right)^2 : \left(\sqrt[3]{569}\right)^2$, or equivalent (written as a ratio). Award M1 for: • $\sqrt[3]{3821/569}$ (= 1·886…) • $\sqrt[3]{569/3821}$ (= 0·530…) • (3821/569)^2 (= 45·095…) • (569/3821)^2 (= 0·022...) • $\left(\sqrt[3]{3821}\right)^2$ (= 244·409…) AND $\left(\sqrt[3]{569}\right)^2$ (= 68·665…)
Cross-sectional area of larger solid = $29 \times \left(\sqrt[3]{3821/569}\right)^2$ OR $29 \div \left(\sqrt[3]{569/3821}\right)^2$ or equivalent.	m1	Must be from M2.
103·2(…cm^2)	A1	CAO. Accept answers in the range 103·2(cm^2) to 103·3(cm^2). Allow 103 provided not from premature approximation.
18. Alternative method *Height of larger solid:* $569/29 \times \sqrt[3]{3821/569}$ *OR* $569/29 \div \sqrt[3]{569/3821}$ *(= 37·017…)*	*M2*	*May be seen in parts.* *Award M1 for a linear scale factor:* $\sqrt[3]{3821/569}$ *(= 1·886…) OR* $\sqrt[3]{569/3821}$ *(= 0·530…) or equivalent.*
Cross-sectional area of larger solid = *3821÷ 37·017…*	*m1*	*Award using 'their 37·017…'* Must be from M2.
103·2(…cm^2)	*A1*	*CAO.* *Accept answers in the range 103·2(cm^2) to 103·3(cm^2).* *Allow 103 provided not from premature approximation.*
19. $6x^2 + 19x + 1 = 0$	B2	'= 0' required, but may be implied by an attempt to use the quadratic formula or if $a = 6, b = 19, c = 1$ used in the quadratic formula. Award B1 for sight of $7x^2 + 21x(+1)$ AND $x^2 + 2x$
$x = \frac{-(19) \pm \sqrt{(19)^2 - 4 \times 6 \times 1}}{2 \times 6}$	M1	**This substitution into the formula must be seen for M1, otherwise award M0A0A0.** FT 'their derived quadratic equation equated to zero' provided of equivalent difficulty (a, b and c must be non-zero). No FT from $7x^2 + 21x + 1 = 0$. Allow one slip in substitution **for M1 only**, but must be correct formula. This can be awarded as a single attempt which may be seen anywhere in the solution for solving their quadratic equation equated to zero.
$x = \frac{-19 \pm \sqrt{337}}{12}$	A1	Can be implied from at least one correct value of x evaluated (not necessarily rounded to 2dp), provided M1 awarded.
x = –0·05 with x = –3·11 (answers to 2dp)	A1	CAO for their quadratic equation.

Unit 2: Higher Tier	Mark	Comments
20. Complete strategy to calculate x, e.g. first an attempt to use the cosine rule to calculate BD and then an attempt to use the cosine rule by rearrangement to calculate x **using BD**.	S1	Stating the formulae is insufficient. Both stages must be seen. If many attempts are offered for both stages and they are not clearly identified as being used to evaluate BD and then x, then mark final attempt.
$(BD^2 =)\ 13^2 + 17^2 - 2\times13\times17\times\cos43$	M1	Allow an alternative complete correct method for M1.
$(BD^2 =)\ 134{\cdot}7(\ldots)$ OR $(BD =)\ 11{\cdot}6(\ldots\text{cm})$	A1	<table><tr><th></th><th>Radians</th><th>Gradians</th></tr><tr><td>BD^2</td><td>212·639…</td><td>113·049….</td></tr><tr><td>BD</td><td>14·582…</td><td>10·632….</td></tr></table>
$\cos x = \dfrac{11^2 + 19^2 - 11{\cdot}6(\ldots)^2}{2\times11\times19}$	M2	FT 'their stated or derived BD', provided $8 <$ 'their BD' < 30 M1 for $11{\cdot}6(\ldots)^2 = 11^2 + 19^2 - 2\times11\times19\times\cos x$ Allow an alternative complete correct method for M2.
$(x =)\ 33{\cdot}8(\ldots°)$	A1	Accept an answer which rounds to 33·8(°) Allow an answer of 34(°) from correct working. An answer of 36(·039…) from BD=12 is: S1M1A0M2A1. Note: The first A1 is only withheld if 12 (rounded from 11.6) is used in the subsequent cosine rule to find the angle *x* AND only if the work is worthy of any further marks.