



GCSE MARKING SCHEME

SUMMER 2024

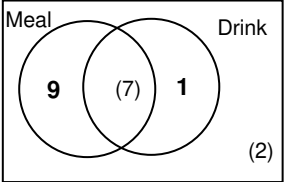
**GCSE
MATHEMATICS
UNIT 2 – HIGHER TIER
3300U60-1**

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.

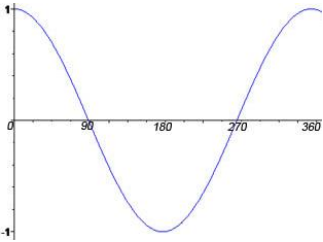
Unit 2: Higher Tier	Mark	Comments
3.(a) <div style="text-align: center; margin: 10px 0;">  </div>	B2	<p>Answers on diagram take precedence.</p> <p>For 9 AND 1 in correct position. Do not award B2 if more than one number is shown in the same section. Ignore 2 and 7 duplicated (in the correct place) for this B2.</p> <p>If B2 not awarded, award B1 for one of the following, provided no sections are blank and values are whole numbers:</p> <ul style="list-style-type: none"> • 'their 9' + 'their 1' = 10 • 7 + 'their 9' = 2 × (7 + 'their 1'). <p>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.</p>
3.(b) <div style="text-align: center; margin: 10px 0;"> $\frac{16}{19} \text{ or equivalent. ISW}$ </div>	B2	<p>FT $\frac{\text{'their 9' + 7}}{19}$ in a fraction < 1, provided Meal only not blank.</p> <p>If not B2, award B1 for one of the following in a fraction < 1:</p> <ul style="list-style-type: none"> • 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. <p>An answer of $\frac{16}{19}$ gains B2 regardless of 'their Venn diagram'.</p> <p>Penalise incorrect notation (e.g. '16 in 19') –1.</p>

Unit 2: Higher Tier	Mark	Comments
<p>4.</p> <p>(Volume of tank \Rightarrow) $70 \times 40 \times 30$ $= 84000 \text{ (cm}^3\text{)}$</p> <p>(Volume of cylinder \Rightarrow) $\pi \times 10^2 \times 30$ $= 9424(\cdot 7 \dots \text{cm}^3)$ or $3000 \pi \text{ (cm}^3\text{)}$</p> <p>(Capacity $= 84000 - 9424(\cdot 7 \Rightarrow)$ $74575(\cdot \dots \text{cm}^3)$</p> <p>$74\cdot 575(\dots \text{litres})$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p>	<p>Answer line takes precedence. May be seen in stages.</p> <p>May be seen in stages.</p> <p>Accept answers between 9420 and 9426 inclusive.</p> <p>Accept answers between 74574 and 74580 inclusive. FT 'their derived volume of tank'– 'their derived volume of cylinder', provided:</p> <ul style="list-style-type: none"> • M1 previously awarded • π used when calculating the volume of the cylinder • 'their derived volume of tank' > 'their derived volume of cylinder'. <p>FT 'their volume/capacity in cm^3' \div 1000.</p> <p>Award B1 for a final answer of</p> <ul style="list-style-type: none"> • 74·6 (litres) • 74·5 (litres) • 74·58 (litres) • 74·57 (litres) • 75 (litres) • 74 (litres) provided from correct workings. <p>This final B1 can be awarded if the volume of the cylinder and tank are converted to litres correctly before the subtraction.</p> <p>An unsupported final answer of $74575(\cdot \dots \text{cm}^3)$ is awarded M1A1M1A1B1B0.</p> <p>Unsupported answers in the above list is awarded M1A1M1A1B1B1.</p>
<p>4. <u>Alternative method</u></p> <p>(Interior base area of container \Rightarrow) $70 \times 40 - \pi \times 10^2$</p> <p>$= 2485(\cdot 8 \dots \text{cm}^2)$ (cm²) or $2800 - 100\pi$</p> <p>(Capacity of container \Rightarrow) $2485(\cdot 8 \dots) \times 30$</p> <p>$74575(\cdot \dots \text{cm}^3)$</p> <p>$74\cdot 575(\dots \text{litres})$</p>	<p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>Award M1 for an appropriate 70×40 OR $\pi \times 10^2$ <u>within a subtraction</u></p> <p>CAO Accept answers between 2485·8 and 2486 inclusive.</p> <p>FT 'their derived base area', provided at least M1 previously awarded.</p> <p>Accept answers between 74574 and 74580 inclusive.</p> <p>FT 'their volume/capacity in cm^3' \div 1000.</p> <p>Award B1 for a final answer of</p> <ul style="list-style-type: none"> • 74·6 (litres) • 74·5 (litres) • 74·58 (litres) • 74·57 (litres) • 75 (litres) • 74 (litres) provided from correct workings.

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<p>6.</p> $13.8^2 = BD^2 + 7.3^2 \quad \text{OR} \quad (BD =) \sqrt{13.8^2 - 7.3^2} \quad \text{or equivalent}$ $(BD =) \sqrt{13.8^2 - 7.3^2} \quad \text{or equivalent}$ $(BD =) 11.7(1.....) \text{ (cm)}$ $y = \sin^{-1} \left(\frac{5.5}{11.7} \right) \quad \text{or}$ $\sin^{-1} \frac{5.5 \times \sin 90}{11.7} \quad \text{or equivalent}$ $y = 28(.0..)$	<p>M1</p> <p>m1</p> <p>A1</p> <p>M2</p> <p>A1</p>	<p>Check diagram for answers. Note: $190.44 - 53.29 = 137.15$</p> <p>Note: $(BD =) \sqrt{137.15}$ FT 'their 137.15' for m1 only, provided M1 previously gained.</p> <p>CAO. Final answer of $BD = 137.15$ is M1m0A0. Accept an answer rounded or truncated to at least 1 decimal place. If $\sqrt{137.15}$ is used correctly for BD in subsequent work, then award this A1 retrospectively. An unsupported answer of $11.7(1.....)$ (cm) is awarded M1m1A1.</p> <p>Check diagram for answers. FT 'their stated BD' (may be on diagram), provided > 5.5.</p> <p>Award M1 for one of the following:</p> <ul style="list-style-type: none"> $\sin y = \left(\frac{5.5}{11.7} \right) (= 0.47(0..))$ $\frac{\sin y}{5.5} = \frac{\sin 90}{11.7}$ or equivalent <p>Accept an answer rounded or truncated.</p> <p>An unsupported answer of $28(.0..)$ is awarded M1m1A1M2A1. Allow correct angles given in radians or gradians:</p> <table border="1" data-bbox="858 1126 1437 1294"> <thead> <tr> <th>Method</th> <th>Radians</th> <th>Gradians</th> </tr> </thead> <tbody> <tr> <td>$\sin^{-1} \frac{5.5}{11.7}$</td> <td>0.4893...</td> <td>31.155....</td> </tr> <tr> <td>$\sin^{-1} \frac{5.5 \times \sin 90}{11.7}$</td> <td>0.4337...</td> <td>30.738....</td> </tr> </tbody> </table>	Method	Radians	Gradians	$\sin^{-1} \frac{5.5}{11.7}$	0.4893...	31.155....	$\sin^{-1} \frac{5.5 \times \sin 90}{11.7}$	0.4337...	30.738....
Method	Radians	Gradians									
$\sin^{-1} \frac{5.5}{11.7}$	0.4893...	31.155....									
$\sin^{-1} \frac{5.5 \times \sin 90}{11.7}$	0.4337...	30.738....									
<p>6. <u>Alternative method for first 3 marks</u> Correct use of a 'two-step' method.</p> $(BD =) 11.7(1.....) \text{ (cm)}$	<p>M2</p> <p>A1</p>	<p><i>A partial trigonometric method is M0.</i></p>									
<p>6. <u>Alternative method for final 3 marks</u> Correct use of a 'two-step' method.</p> $(y =) 28(.0)$	<p>M2</p> <p>A1</p>	<p><i>A partial trigonometric method is M0.</i></p> <p><i>Allow correct angles given in radians or gradians.</i></p>									

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7.(a) $\frac{x}{13.3} = \frac{5.2}{3.8} \quad \text{or} \quad \frac{x}{5.2} = \frac{13.3}{3.8} \quad \text{or equivalent}$ $x = 18.2$	M1 A1	M1 for <u>correct</u> use of scale factor 3.5 or equivalent e.g. $x = 5.2 \times \frac{7}{2}$ An unsupported answer of 18.2 is awarded M1A1.
7.(b) <p style="text-align: center;">A and C</p> Valid correct reason e.g. <ul style="list-style-type: none"> • 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. $\frac{15}{6} = \frac{10}{4} (= 2.5)$ OR $\frac{6}{4} = \frac{15}{10} (= 1.5)$ 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) • $6 \times 2.5 = 15\text{cm}$ $4 \times 2.5 = 10\text{cm}$. 	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: <ul style="list-style-type: none"> • $(x \dots 8)(x \dots 5)$ • two brackets which multiply to give $x^2 + 3x + k$ • two brackets which multiply to give $x^2 + mx - 40$. Strict FT 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)

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<p>9. $\frac{a+b}{2} = b - a$</p> <p style="text-align: center;">$a + b = 2(b - a)$</p> <p>$a + b = 2b - 2a$ or $a + 2a = 2b - b$ ($= 3a = b$)</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>Award B0 for $a + b \div 2 = b - a$ unless brackets are implied in later correct workings.</p> <p>May be implied by correct further work (e.g. $a + b = 2b - 2a$).</p> <p>Award final B1 only from convincing work.</p> <p>If no marks, award SC1 for one of the following:</p> <ul style="list-style-type: none"> • $a + b \div 2 = b - a$ • $\frac{a+b}{2} = a - b$ • 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 $9 - 3 = 6$.
<p>9. <u>Alternative method:</u> Assuming $b = 3a$ (Mean =) $\frac{a + 3a}{2}$ $= 2a$ $Range = 3a - a = 2a$</p>	<p>M1</p> <p>A1</p> <p>B1</p>	<p><i>Working must be shown.</i></p> <p><i>Working must be shown.</i></p>
<p>10.(a) (Berwyn = £) $0.6x$ or equivalent</p>	<p>B1</p>	<p>CAO. Must be in terms of x e.g. award B0 for (£)0.6.</p>
<p>10.(b) Sight of (Carys = £) $0.3x$ AND (Delyth = £) $0.7x$ or equivalent</p> <p style="text-align: center;">(£) $0.3x + (\text{£})0.4x$ or equivalent</p> <p style="text-align: center;">(£) $0.7x$ or Delyth or equivalent</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>Must be seen and in terms of x e.g. award B0 for (£)0.3 and (£)0.7.</p> <p>Final answer of (£) $0.7x$ or Delyth must be clearly identified, convincing and from correct working.</p> <p>If no marks awarded or if only the first B1 awarded, then award an additional SC1 for one of the following:</p> <ul style="list-style-type: none"> • (£) $0.3 + (\text{£})0.4 = (\text{£})0.7$ (or Delyth) • (£)30 + (£)40 = (£)70 (or Delyth) or equivalent • Carys + Aled = Delyth. <p>Carys + Aled = (£) $0.7x$ is awarded full marks provided the first B1 is awarded. If first B1 not awarded, award SC1 for sight of Carys + Aled = (£) $0.7x$.</p>

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<p>15. $\frac{7 \cdot 15}{73 \cdot 85 - 65 \cdot 75}$ or $\frac{7 \cdot 15}{8 \cdot 1}$</p> <p style="text-align: right;">= 0.8827</p>	<p>M2</p> <p>A1</p>	<p>If many attempts are offered without a method/answer being identified then mark final attempt.</p> <p>Award M2 for sight of 143/162 if clearly identified as 'their final attempt'.</p> <p>Accept 7.14999... or 65.74999... (or using recurring dot notation).</p> <p>Do <u>not</u> accept truncated values of 7.149 or 7.1499 or 65.749 or 65.7499.</p> <p>Award M1 for correct use of values $7 \cdot 1 < e \leq 7 \cdot 2$, $73 \cdot 8 \leq f < 73 \cdot 9$ and $65 \cdot 7 < g \leq 65 \cdot 8$</p> <p>OR award M1 for correct use of 2 of the 3 correct bounds, 7.15, 73.85 and 65.75.</p> <p>CAO. Must be correct to 4 decimal places.</p> <p>Only award A1 if M2 gained.</p> <p>If no marks gained award SC1 for an unsupported answer of 0.8827(16...).</p>									
<p>16.(a) Cosine <u>curve</u> with appropriate orientation and position</p> <p>AND</p> <p>passing through $(0^\circ, 1)$, $(90^\circ, 0)$ and $(270^\circ, 0)$ and approximately $(180^\circ, -1)$ and $(360^\circ, 1)$</p> <p>AND</p> <p>90°, 180°, 270°, 360° indicated on the x-axis</p> <p>AND</p> <p>-1 and 1 indicated on the y-axis.</p> 	<p>B2</p>	<p>Ignore curve shown for values $x < 0^\circ$ or $x > 360^\circ$.</p> <p>Accept 180° as mid-way between 0° and 360° if unlabelled.</p> <p>Accept 360° as unlabelled provided the sketch does not exceed 360°.</p> <p>B1 for:</p> <ul style="list-style-type: none"> General cosine curve with appropriate orientation and appropriate position (ignore missing or incorrect labelling) OR A continuous graph passing through $(0^\circ, 1)$, $(90^\circ, 0)$ and $(270^\circ, 0)$ and approximately $(180^\circ, -1)$ and $(360^\circ, 1)$ AND $90^\circ, -270^\circ$, indicated on the x-axis AND -1 and 1 indicated on the y-axis. <p>Accept 180° as mid-way between 0° and 360° if unlabelled.</p> <p>Accept 360° as unlabelled provided the sketch does not exceed 360°.</p>									
<p>16.(b)</p> <p style="text-align: center;">60° AND 300°</p>	<p>B2</p>	<p><u>Ignore any angle outside of the range $0^\circ < x < 360^\circ$.</u></p> <p>Note B2 for 60° AND 300° and no other angle within the range $0^\circ < x < 360^\circ$.</p> <p>Allow embedded answers.</p> <p>If not B2, award B1 for either of the following:</p> <ul style="list-style-type: none"> 60° AND 300° and one incorrect angle within the range $0^\circ < x < 360^\circ$ 60° OR 300° and up to one incorrect angle within the range $0^\circ < x < 360^\circ$ <p>If B2 or B1 awarded, penalise -1 for <u>each</u> further incorrect answer.</p> <table border="1" data-bbox="858 1731 1437 1899"> <thead> <tr> <th></th> <th>Radians</th> <th>Gradians</th> </tr> </thead> <tbody> <tr> <td>60°</td> <td>$\pi/3$ or 1.047...</td> <td>66.666...</td> </tr> <tr> <td>300°</td> <td>358.952...</td> <td>293.333...</td> </tr> </tbody> </table>		Radians	Gradians	60°	$\pi/3$ or 1.047...	66.666...	300°	358.952...	293.333...
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300°	358.952...	293.333...									
<p>17. $3 \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ or equivalent</p> <p style="text-align: right;">= $\frac{3}{216}$ ($= \frac{1}{72}$) ISW</p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ ($= \frac{1}{216}$) (one correct product).</p> <p>Accept decimal answer of 0.0138(8...) OR 0.0139.</p>									

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<p>18. Area scale factor: $(\sqrt[3]{3821/569})^2 (= 3.559\dots)$ OR $(\sqrt[3]{569/3821})^2 (= 0.280\dots)$ or equivalent.</p> <p>Cross-sectional area of larger solid = $29 \times (\sqrt[3]{3821/569})^2$ OR $29 \div (\sqrt[3]{569/3821})^2$ or equivalent.</p> <p>103.2(...cm²)</p>	<p>M2</p> <p>m1</p> <p>A1</p>	<p>May be seen in parts.</p> <p>Allow $(\sqrt[3]{3821})^2 : (\sqrt[3]{569})^2$, or equivalent (written as a ratio).</p> <p>Award M1 for:</p> <ul style="list-style-type: none"> • $\sqrt[3]{3821/569} (= 1.886\dots)$ • $\sqrt[3]{569/3821} (= 0.530\dots)$ • $(3821/569)^2 (= 45.095\dots)$ • $(569/3821)^2 (= 0.022\dots)$ • $(\sqrt[3]{3821})^2 (= 244.409\dots)$ AND $(\sqrt[3]{569})^2 (= 68.665\dots)$ <p>Must be from M2.</p> <p>CAO. Accept answers in the range 103.2(cm²) to 103.3(cm²).</p> <p>Allow 103 provided not from premature approximation.</p>
<p><i>18. Alternative method</i> <i>Height of larger solid:</i> $569/29 \times \sqrt[3]{3821/569}$ OR $569/29 \div \sqrt[3]{569/3821}$ (= 37.017...)</p> <p><i>Cross-sectional area of larger solid =</i> $3821 \div 37.017\dots$</p> <p>103.2(...cm²)</p>	<p>M2</p> <p>m1</p> <p>A1</p>	<p><i>May be seen in parts.</i></p> <p><i>Award M1 for a linear scale factor:</i> $\sqrt[3]{3821/569} (= 1.886\dots)$ OR $\sqrt[3]{569/3821} (= 0.530\dots)$ or equivalent.</p> <p><i>Award using 'their 37.017...' Must be from M2.</i></p> <p>CAO. Accept answers in the range 103.2(cm²) to 103.3(cm²).</p> <p>Allow 103 provided not from premature approximation.</p>
<p>19. $6x^2 + 19x + 1 = 0$</p> $x = \frac{-(19) \pm \sqrt{(19)^2 - 4 \times 6 \times 1}}{2 \times 6}$ $x = \frac{-19 \pm \sqrt{337}}{12}$ <p>$x = -0.05$ with $x = -3.11$ (answers to 2dp)</p>	<p>B2</p> <p>M1</p> <p>A1</p> <p>A1</p>	<p>'= 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.</p> <p>Award B1 for sight of $7x^2 + 21x(+1)$ AND $x^2 + 2x$</p> <p>This substitution into the formula must be seen for M1, otherwise award M0A0A0.</p> <p>FT 'their derived quadratic equation equated to zero' provided of equivalent difficulty (a, b and c must be non-zero). No FT from $7x^2 + 21x + 1 = 0$.</p> <p>Allow one slip in substitution for M1 only, but must be correct formula.</p> <p>This can be awarded as a single attempt which may be seen anywhere in the solution for solving their quadratic equation equated to zero.</p> <p>Can be implied from at least one correct value of x evaluated (not necessarily rounded to 2dp), provided M1 awarded.</p> <p>CAO for their quadratic equation.</p>

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<p>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.</p> <p>(BD² =) $13^2 + 17^2 - 2 \times 13 \times 17 \times \cos 43$ (BD² =) 134.7(...) OR (BD =) 11.6(...cm)</p> <p>$\cos x = \frac{11^2 + 19^2 - 11.6(\dots)^2}{2 \times 11 \times 19}$</p> <p>($x =$) 33.8(...°)</p>	<p>S1</p> <p>M1</p> <p>A1</p> <p>M2</p> <p>A1</p>	<p>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.</p> <p>Allow an alternative complete correct method for M1.</p> <table border="1" data-bbox="858 376 1437 539"> <thead> <tr> <th></th> <th>Radians</th> <th>Gradians</th> </tr> </thead> <tbody> <tr> <td>BD²</td> <td>212.639...</td> <td>113.049....</td> </tr> <tr> <td>BD</td> <td>14.582...</td> <td>10.632....</td> </tr> </tbody> </table> <p>FT 'their stated or derived BD', provided $8 < \text{'their BD'} < 30$ M1 for $11.6(\dots)^2 = 11^2 + 19^2 - 2 \times 11 \times 19 \times \cos x$ Allow an alternative complete correct method for M2.</p> <p>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.</p> <p><u>Note:</u> 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.</p>		Radians	Gradians	BD ²	212.639...	113.049....	BD	14.582...	10.632....
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