



GCSE MARKING SCHEME

SUMMER 2024

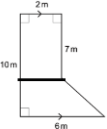
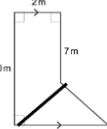
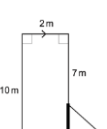
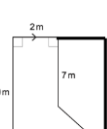
**GCSE
MATHEMATICS – NUMERACY
UNIT 1 – HIGHER TIER
3310U50-1**

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 1: Higher Tier	Mark	Comments																																				
<p>2(a) (Total area of the driveway)</p>  <ul style="list-style-type: none"> • $\frac{1}{2} \times (10 - 7) \times (2 + 6) + 2 \times 7$ • $\frac{1}{2} \times 3 \times 8 + 2 \times 7 \quad (= 12 + 14)$  <ul style="list-style-type: none"> • $\frac{1}{2} \times 2 \times (7 + 10) + \frac{1}{2} \times 6 \times (10 - 7)$ • $\frac{1}{2} \times 2 \times 17 + \frac{1}{2} \times 6 \times 3 \quad (= 17 + 9)$  <ul style="list-style-type: none"> • $\frac{1}{2} \times (10 - 7) \times (6 - 2) + 2 \times 7 + 2 \times 3$ • $\frac{1}{2} \times 3 \times 4 + 2 \times 10 \quad (= 6 + 20)$  <ul style="list-style-type: none"> • $6 \times 10 - \frac{1}{2} \times (6 - 2) \times (7 + 10)$ • $6 \times 10 - \frac{1}{2} \times 4 \times 17 \quad (= 60 - 34)$ 	M2	<p>M1 for one of the following appropriate areas:</p> <ul style="list-style-type: none"> • $\frac{1}{2} \times (10 - 7) \times (2 + 6)$ (= 12m² area of trapezium) • $\frac{1}{2} \times 2 \times (7 + 10)$ (= 17m² area of trapezium) • $\frac{1}{2} \times 6 \times (10 - 7)$ (= 9m² area of a triangle) • $\frac{1}{2} \times (10 - 7) \times (6 - 2)$ (= 6m² area of the triangle) • $\frac{1}{2} \times (6 - 2) \times (7 + 10)$ (= 34m² area 'extra' trapezium) 																																				
26 (m ²)	A1	CAO																																				
Cost in the inclusive range (£)1780 to (£)1860	B1	<p>FT '20 ≤ their derived composite area ≤ 30' for a suitable cost from the scatter diagram, within a range (shown below); must be for a composite area</p>																																				
		<p>Do not FT from the perimeter or with the missing side, 25(m)</p> <p>Allow an answer in a range, provided 'their range of answers' is inclusively within the stated range</p> <p>On FT cost in the inclusive range:</p>																																				
		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Area (m²)</th> <th style="padding: 5px;">Least estimated cost (£)</th> <th style="padding: 5px;">Greatest estimated cost (£)</th> </tr> </thead> <tbody> <tr><td style="padding: 5px;">20</td><td style="padding: 5px;">1410</td><td style="padding: 5px;">1460</td></tr> <tr><td style="padding: 5px;">21</td><td style="padding: 5px;">1460</td><td style="padding: 5px;">1510</td></tr> <tr><td style="padding: 5px;">22</td><td style="padding: 5px;">1520</td><td style="padding: 5px;">1570</td></tr> <tr><td style="padding: 5px;">23</td><td style="padding: 5px;">1590</td><td style="padding: 5px;">1650</td></tr> <tr><td style="padding: 5px;">24</td><td style="padding: 5px;">1650</td><td style="padding: 5px;">1710</td></tr> <tr><td style="padding: 5px;">25</td><td style="padding: 5px;">1700</td><td style="padding: 5px;">1780</td></tr> <tr><td style="padding: 5px;">26</td><td style="padding: 5px;">1780</td><td style="padding: 5px;">1860</td></tr> <tr><td style="padding: 5px;">27</td><td style="padding: 5px;">1850</td><td style="padding: 5px;">1930</td></tr> <tr><td style="padding: 5px;">28</td><td style="padding: 5px;">1920</td><td style="padding: 5px;">2010</td></tr> <tr><td style="padding: 5px;">29</td><td style="padding: 5px;">1970</td><td style="padding: 5px;">2060</td></tr> <tr><td style="padding: 5px;">30</td><td style="padding: 5px;">2030</td><td style="padding: 5px;">2130</td></tr> </tbody> </table>	Area (m ²)	Least estimated cost (£)	Greatest estimated cost (£)	20	1410	1460	21	1460	1510	22	1520	1570	23	1590	1650	24	1650	1710	25	1700	1780	26	1780	1860	27	1850	1930	28	1920	2010	29	1970	2060	30	2030	2130
Area (m ²)	Least estimated cost (£)	Greatest estimated cost (£)																																				
20	1410	1460																																				
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27	1850	1930																																				
28	1920	2010																																				
29	1970	2060																																				
30	2030	2130																																				

Unit 1: Higher Tier	Mark	Comments
4(a)(i) 200 – 80 or 90 + 30 120 (customers)	M1 A1	
4(a)(ii) 32 seconds	B1	
4(a)(iii) $\frac{200-170}{200}$ or $\frac{30}{200}$ or $\frac{15}{100}$ $\frac{3}{20}$	M1 A1	Award M1 for 0.15 or 15% Only ignore further working if written as 0.15 or 15% If no marks, award SC1 for an answer of $\frac{17}{20}$ (from 40 seconds or less)
4(b)(i) 36	B1	
4(b)(ii) 46 – 20 26	M1 A1	Allow 20 – 46
4(c) 'No' unambiguously stated or implied AND a reason, e.g. 'upper quartile is higher this year' '75% reading higher this year' 'interval was 37 (or 38) to 50 seconds last year, this year it is 46 to 50 seconds'	E1	Do not ignore incorrect values for the upper quartiles given, E0 if 'upper quartile' or '75%' stated with incorrect upper quartile readings Allow 'No' with a reason, e.g. '(last year) 38, (this year) 46' '(last year) 37.(...), (this year) 46' Do not accept, e.g. 'range greater this year' 'lower quartile is lower this year' 'median higher this year' 'customers still waiting at 50 seconds'

Unit 1: Higher Tier	Mark	Comments
5(a)(i) 1×10^5	B1	
5(a)(ii) A suitable calculation, including an <u>appropriate</u> approximation, e.g. $\frac{3\,100\,000}{21\,000}$ or $\frac{3\,100\,000}{20\,000}$ or $\frac{3\,000\,000}{20\,000}$ or $\frac{3\,000\,000}{21\,000}$ or equivalent Answer in the range 142 (people/km ²) to 155 (people/km ²)	M2 A1	Place value must be correct Must include an approximation M1 for the idea to divide (in the correct order), that may also include one place value error, e.g. $\frac{3.1\,million}{20\,735}$, $\frac{31\,000\,000}{20\,000}$, $\frac{3\,100\,000}{20\,700}$ ISW. Allow 142.8, 142.9 and 143 rounded to 140 Accept equivalents, e.g. 150 written as 1.5×10^2
5(b) Idea that 360 000 is 120% 360 000 ÷ 1.2 or equivalent 300 000 (people)	B1 M1 A1	Accept from sight of trial to increase 'their value' by 20% provided 'their value' <360 000 Award of M1 also implies previous B1
5(c) (Length) $6.6 \div (4.2 \div 1.4)$ or $6.6 \div 3$ or equivalent Length 2.2 (cm) (Height) $4.2 \times (9.9 \div 6.6)$ or 4.2×1.5 or $1.4 \times (9.9 \div 2.2)$ or equivalent Height 6.3 (cm)	M1 A1 M1 A1	FT $1.4 \times (9.9 \div \text{'their derived length'})$ Note: Length (from $9.9 - 6.6 =$) 3.3(cm) M0 A0 Height (from $1.4 \times (9.9 \div 3.3) =$) 4.2(cm) M1 A1 (FT) Allow answers reversed in the answer space
5(c) <u>Alternative method</u> (Height) $4.2 \times (9.9 \div 6.6)$ or 4.2×1.5 or equivalent Height 6.3 (cm) (Length) $6.6 \div (4.2 \div 1.4)$ or $6.6 \div 3$ or $9.9 \div (6.3 \div 1.4)$ or equivalent Length 2.2 (cm)	M1 A1 M1 A1	FT $9.9 \div (\text{'their derived height'} \div 1.4)$ Allow answers reversed in the answer space

Unit 1: Higher Tier	Mark	Comments
<p>6(a)(i)</p> <p>(Total volume =)</p> $\frac{2}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9 \quad \text{or equivalent}$ <p>(= 144π) (= 81π)</p> $= 225\pi \text{ (mm}^3\text{)}$	<p>M2</p> <p>A2</p>	<p>Allow values of π from 3.14 to 3.142 for M marks only</p> <p>M1 for $\frac{2}{3} \times \pi \times 6^3$ (+)</p> <p>Allow M1 for $\frac{4}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9$ or equivalent</p> <p>CAO</p> <p>A1 for sight of 144π OR</p> <p>A1 for an answer of 369π (from use of $\frac{4}{3} \times \pi \times 6^3$) OR</p> <p>A1 for a fully correct method but with an answer of 225 (omitting π)</p> <p>If no marks awarded,</p> <p>SC2 for an answer of 1476π from <u>consistent</u> use of diameters as their radii</p> <p>OR</p> <p>SC1 for $\frac{2}{3} \times \pi \times 12^3 + \pi \times 6^2 \times 9$ or equivalent</p> <p>OR</p> <p>SC1 for $(\frac{1}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9 =) 153\pi$</p>
<p>6(a)(ii) (Reduction in volume =) 9π (mm³)</p> <p>(Fractional reduction =)</p> $\frac{9(\pi)}{225(\pi)} \text{ or } \frac{1}{25} \text{ or equivalent}$	<p>B1</p> <p>B1</p>	<p>from $\pi \times 3^2 \times (9 - 8)$</p> <p>OR $\pi \times 3^2 \times 9 - \pi \times 3^2 \times 8$ or $81\pi - 72\pi$</p> <p>Implies previous B1</p> <p>ISW</p> <p>FT 'their 225π' and 'their $\pi \times 3^2 \times 9 - \pi \times 3^2 \times 8$' and both are multiples of π</p> <p>If no marks awarded,</p> <p>SC1 for a numerator of 'their 225π' - 9π, which may be embedded in a final answer of e.g. 216/225 or 24/25 if correct work seen in part (a)(i)</p> <p>Must be from a reduction of 9π in their volume. ISW</p>
<p>6(b) Complete method</p> <p>e.g. 100x = 16.111..., 1000x = 161.111... AND an attempt to subtract both sides</p> $\frac{145}{900} \text{ or } \frac{1595}{9900} \text{ or } \frac{16095}{99900} \text{ or equivalent}$ $\frac{29}{180}$	<p>M1</p> <p>A1</p> <p>A1</p>	<p>Allow A1 for</p> <p>e.g. (10x - x =) 1.45/9, (100x - x =) 15.95/99 etc</p> <p>FT from M1A0 provided at least 1 stage of simplification required</p>

Unit 1: Higher Tier	Mark	Comments
7(a)(i) Correct method to calculate a frequency density for any 2 groups Frequency densities of 4, 1.6, 1.2, 0.2	M1 A2	A1 for any 2 correct frequency densities
7(a)(ii) Fully correct histogram drawn	B2	FT their frequency densities throughout provided they fit on the given scale B1 for at least 3 correct bars drawn
7(b)(i) Working from the left of the graph $\frac{120 - 34}{2}$ or equivalent OR (from the right) $4 + 18 + 24 + 40 - \frac{120}{2}$ or equivalent = 26 (pupils needed from the 10-20 group) (Median =) $(10 +) \frac{26}{40} \times 10$ or equivalent = 16.5 (mins)	M1 A1 m1 A1	Allow use of $\frac{120+1}{2}$ for $\frac{120}{2}$ for M1A0, but final m1A1 still available CAO FT 'their 26' Or 16 minutes 30 seconds
7(b)(i) <u>Alternative method:</u> Working from the right of the graph $\frac{120 - 4 - 18 - 24}{2}$ or equivalent OR (from the left) $34 + 40 - \frac{120}{2}$ = 14 (people needed from the 10-20 group) (Median =) $(20 -) \frac{14}{40} \times 10$ or equivalent = 16.5 (mins)	M1 A1 m1 A1	Allow use of $\frac{120+1}{2}$ for $\frac{120}{2}$ for M1A0, but final m1A1 still available CAO FT 'their 14' Or 16 minutes 30 seconds
7(b)(ii) 20 (minutes)	B1	FT the upper limit of the group their median is in from (b)(i)

Unit 1: Higher Tier	Mark	Comments
9(a) Use of Volume = $\frac{\text{Mass}}{\text{Density}}$ (Maximum possible volume =) $\frac{155}{2.5}$ $= 62 \text{ (cm}^3\text{)}$	B1 M1 A1	FT 'their 155' provided $150 < \text{mass} \leq 160$ AND 'their 2.5' provided $2 \leq \text{density} < 3$ CAO If no marks awarded, SC1 for use of 155 AND 2.5
9(b)(i) Identification of correct right-angled triangle $(AD^2 =) 40^2 - (12 - 2)^2$ or $(AD^2 =) 40^2 - 10^2$ $AD^2 = 1500$ OR $(AD =) \sqrt{1500}$ AND $(AD =) 10\sqrt{15} \text{ (cm)}$	B1 M1 A1	May be implied by sight of 40 AND $(12 - 2)$ or 10 in working Sight of $AD^2 = 1500$ OR $(AD =) \sqrt{1500}$ AND $10\sqrt{15}$ need to be seen
9(b)(ii) (Total arc length =) $\frac{150 \times 2 \times \pi \times 2}{360} + \frac{210 \times 2 \times \pi \times 12}{360}$ $(= 5\pi/3 \text{ or } 1^{2/3}\pi)$ $(= 14\pi \text{ or } 42\pi/3)$ $= 15\frac{2}{3}\pi$ or $\frac{5640\pi}{360}$ or $\frac{47\pi}{3}$ (cm) or equivalent (Total length of chain =) $20\sqrt{15} + \frac{5640\pi}{360}$ (cm) or equivalent	M2 A2 B1	Allow values of π from 3.14 to 3.142 for M marks only Or equivalent M1 for $\frac{150 \times 2 \times \pi \times 2}{360}$ OR $\frac{210 \times 2 \times \pi \times 12}{360}$ or equivalents A2 CAO. Allow 15.66π , 15.67π or 15.7π A1 for any one of the following: <ul style="list-style-type: none"> • $AB = 600\pi/360$ or equivalent $(= 5\pi/3 \text{ or } 1^{2/3}\pi)$, allowing 1.66π, 1.67π or 1.7π • $CD = 5040\pi/360$ or equivalent $(= 14\pi \text{ or } 42\pi/3)$ • On FT from M1 for a correct evaluation of 'their $\frac{150 \times 2 \times \pi \times 2}{360} + \frac{210 \times 2 \times \pi \times 12}{360}$' with 1 correct term, accepting similar notation possibilities as A2 B1 ISW Accept use of $15\frac{2}{3}\pi$ Allow use of 15.66π , 15.67π or 15.7π FT 'their $\frac{5640\pi}{360}$ ' provided at least 2 marks previously awarded If no marks awarded, and from using $\pi \times \text{radius}$ in their calculations, i.e. using the method $2 \times 10\sqrt{15} + \frac{150 \times \pi \times 2}{360} + \frac{210 \times \pi \times 12}{360}$ SC3 for an answer of $20\sqrt{15} + \frac{5640\pi}{720}$ (cm) or equivalent, allowing use of $7.83(\dots)\pi$ OR SC2 for $\dots + \frac{5640\pi}{720}$ (cm) or equivalent, allowing use of $7.83(\dots)\pi$ OR SC1 for use of $2 \times 10\sqrt{15} + \frac{150 \times \pi \times 2}{360} + \frac{210 \times \pi \times 12}{360}$

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<p>10.</p> <p>(3 +) 12</p> <p style="padding-left: 40px;">$\times \frac{9}{12}$ or $\times 0.75$ or equivalent</p> <p style="padding-left: 120px;">$\times \frac{7}{5}$ or $\times 1.4$ or equivalent</p> <p style="text-align: right;">= 15 hours 36 minutes</p>	<p>M1</p> <p>M1</p> <p>A2</p>	<p>A table method altering all 3 in the same manner at the same time is M0</p> <p>M marks may be seen in either order Allow 12 – 3 e.g. <table style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;"><u>Time</u></td><td style="text-align: center;"><u>To fill</u></td><td style="text-align: center;"><u>Pumps</u></td></tr><tr><td style="text-align: center;">9</td><td style="text-align: center;">9/12</td><td style="text-align: center;">7</td></tr></table> or <table style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">63</td><td style="text-align: center;">9/12</td><td style="text-align: center;">1</td></tr></table></p> <p>FT from M0 previously awarded Must be from use of 12 or (12 × 9/12 =) 9 e.g. if this calculation is performed first <table style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;"><u>Time</u></td><td style="text-align: center;"><u>To fill</u></td><td style="text-align: center;"><u>Pumps</u></td></tr><tr><td style="text-align: center;">16.8</td><td style="text-align: center;">(Full)</td><td style="text-align: center;">5</td></tr></table> or <table style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">1.4</td><td style="text-align: center;">1/12</td><td style="text-align: center;">5</td></tr></table></p> <p>CAO A1 for any one of the following:</p> <ul style="list-style-type: none"> • $\frac{63}{5}$ or $12\frac{3}{5}$ or 12.6 (hours) or 12 hours 36 min • $\frac{78}{5}$ or $15\frac{3}{5}$ or 15.6 (hours) • FT from M1M1 for their time + 3 hours correct to the nearest minute provided of equivalent difficulty 	<u>Time</u>	<u>To fill</u>	<u>Pumps</u>	9	9/12	7	63	9/12	1	<u>Time</u>	<u>To fill</u>	<u>Pumps</u>	16.8	(Full)	5	1.4	1/12	5
<u>Time</u>	<u>To fill</u>	<u>Pumps</u>																		
9	9/12	7																		
63	9/12	1																		
<u>Time</u>	<u>To fill</u>	<u>Pumps</u>																		
16.8	(Full)	5																		
1.4	1/12	5																		
<p>10. <u>Alternative method 1 (using pump-hours):</u></p> <p>Sight of 7×12 AND 7×3</p> <p>(3 +) $\frac{7 \times 12 - 7 \times 3}{5}$</p> <p style="text-align: right;">= 15 hours 36 minutes</p>	<p>B1</p> <p>M1</p> <p>A2</p>	<p>CAO A1 for any one of the following:</p> <ul style="list-style-type: none"> • $\frac{63}{5}$ or $12\frac{3}{5}$ or 12.6 (hours) • $\frac{78}{5}$ or $15\frac{3}{5}$ or 15.6 (hours) • FT from M1 for their time + 3 hours correct to the nearest minute provided of equivalent difficulty 																		
<p>10. <u>Alternative method 2 (using pump-hours):</u></p> <p>Sight of 7×12 AND 2×3</p> <p>$\frac{7 \times 12 - 2 \times 3}{5}$</p> <p style="text-align: right;">= 15 hours 36 minutes</p>	<p>B1</p> <p>M1</p> <p>A2</p>	<p>CAO A1 for any one of the following:</p> <ul style="list-style-type: none"> • $\frac{78}{5}$ or $15\frac{3}{5}$ or 15.6 (hours) • FT from M1 for their time correct to the nearest minute provided of equivalent difficulty 																		