



GCSE MARKING SCHEME

AUTUMN 2021

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

INTRODUCTION

This marking scheme was used by WJEC for the 2021 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.

WJEC GCSE MATHEMATICS - NUMERACY

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Unit 1: Higher Tier	Mark	Comments
1(a) 20 000 ft ³	B1	
1(b) 1.55×10^8	B1	
2(a)(i) Explanation, e.g. 'data is grouped', 'not raw data', 'table only gives group information' '15 days with less than 6mm of rain, but we don't know if there was no rain on any of these days', 'only results between 0 – 6mm', 'doesn't give days of 0mm rain, it has 0 – 6mm'	E1	Allow, e.g. 'because it shows $0 \leq r < 6$ is equal to 15', 'doesn't say if the 15 belongs to 0 or to less than 6', 'the table doesn't give you exactly how many mm in the days' Do not accept, e.g. 'Can't tell' without further explanation as to why, 'doesn't give you enough information', 'it's not accurate enough', 'no column with daily rainfall with no rain option', 'table only shows daily rainfall, not the number of days without rain', 'doesn't show if it actually rained or not', 'no section for 0 rainfall', 'doesn't show a day in the table when there is no rain', 'doesn't say if the 15 belongs to 0 or to the 6' 'no record of the number of days it did not rain'
2(a)(ii) Mid points 3, 9, 15, 21 $\begin{array}{ccccccc} 3 \times 15 & + & 9 \times 11 & + & 15 \times 3 & + & 21 \times 1 \\ (45 & + & 99 & + & 45 & + & 21 & = & 210) \end{array}$ $\begin{array}{ccc} & \div 30 & \\ & & 7 \text{ (mm)} \end{array}$	B1 M1 m1 A1	Note: Check the table FT their midpoints provided they fall within the classes including both bounds. FT if 1 slip in one of 'their midpoints', used outside the tolerance of bounds for M1, m1 only FT from M1 for intention 'their 210/30' Following correct working On FT from incorrect mid points allow rounding or truncation of 'their final answer'
2(b) 25×4.4 (= 110) $\div 30$ 3.67 (mm)	M1 m1 A2	CAO A1 for $3\frac{2}{3}$ (mm) or 3.6(66...mm) which allows 3.6(...), 3.7 (mm) Allow A1 for a correct FT from an error in calculating 25×4.4 provided rounding to give 3 significant figures required and correct (e.g. 25×4.4 as 120 leading to an answer of 4 is A0)

3.	For all methods		<u>If an evaluation is given with incorrect units, award A0 on the first occasion then FT</u>
3. (Cost to make 150 boxes)	$(150 \div 25) \div 2$ or 6×50 or equivalent (£)3 or 300(p)	M1 A1	
(Cost of the chocolates)	$150 \times 4 \times 7$ or 600×7 or equivalent 4200(p) or (£) 42	M1 A1	
(Profit)	$0.2 \times (3 + 42)$ or equivalent (£) 9 or 900(p)	M1 A1	FT $0.2 \times$ ('their cost of boxes + their cost of chocolates') ISW
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3. Alternative method 1:			
(Each box of chocolates costs)	$4 \times 7 + 50 \div 25$ 30(p)	M1 A1	
(Each box of chocolates sells for)	30×1.2 36(p)	M1 A1	FT 'their derived 30p' (including omitting the box)
(Profit)	$(36 - 30) \times 150$ (£)9 or 900(p)	M1 A1	FT $150 \times$ 'individual (sales – cost)' ISW
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3. Alternative method 2:			
(Each box of chocolates costs)	$4 \times 7 + 50 \div 25$ 30(p)	M1 A1	
(Profit for one box of chocolates)	30×0.2 6(p)	M1 A1	FT 'their derived 30p' (including omitting the box)
(Profit)	6×150 (£)9 or 900(p)	M1 A1	FT $150 \times$ 'their profit per box' ISW
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3. Alternative method 3:			
(25 boxes of chocolates cost)	$4 \times 7 \times 25 + 50$ 750 (p) or (£)7.50	M1 A1	
(Profit for 25 boxes of chocolates)	$7(.).50 \times 0.2$ (£)1.50 or 150(p)	M1 A1	FT 'their derived 7(.).50' (including omitting the box)
(Profit)	$1(.).50 \times 150 \div 25$ (£)9 or 900(p)	M1 A1	FT 'their profit for 25 boxes' $\times 150 \div 25$ ISW
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3. Alternative method 4:			
(25 boxes of chocolates cost)	$4 \times 7 \times 25 + 50$ 750 (p) or (£)7.50	M1 A1	
(Total cost to make)	$7(.).50 \times 150 \div 25$ (£)45 or 4500(p)	M1 A1	FT 'their derived 7(.).50' (including omitting the box)
(Profit)	45×0.2 or 4500×0.2 (£)9 or 900(p)	M1 A1	FT $0.2 \times$ 'their total cost to make' ISW
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3. Alternative method 5:			
(Each box of chocolates costs)	$4 \times 7 + 50 \div 25$ 30(p)	M1 A1	
(Total cost to make)	$(0.)30 \times 150$ (£)45 or 4500(p)	M1 A1	FT 'their derived 30p' (including omitting the box)
(Profit)	45×0.2 or 4500×0.2 (£)9 or 900(p)	M1 A1	FT $0.2 \times$ 'their total cost to make' ISW

<p>Organisation and communication</p> <p>Writing</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • 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.
<p>4. $4.2 \times (3 \div 2)$ or 4.2×1.5 or $4.2 \div \frac{2}{3}$ (Hight) 6.3 (cm)</p> <p>$3.9 \div (3 \div 2)$ or $\frac{3.9}{1.5}$ or $3.9 \times \frac{2}{3}$ (Pin length) 2.6 (cm)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Do not penalise any answers reversed in the answer space</p>

5(a)	<table border="1"> <tr> <td>$t \leq 12$</td> <td>$t \leq 16$</td> <td>$t \leq 20$</td> </tr> <tr> <td>46</td> <td>52</td> <td>54</td> </tr> </table>	$t \leq 12$	$t \leq 16$	$t \leq 20$	46	52	54	B1	
$t \leq 12$	$t \leq 16$	$t \leq 20$							
46	52	54							
5(b) Correct cumulative frequency diagram drawn, with points joined with a straight line or a curve		B2	<p>FT only cumulative entries from (a) B1 for either</p> <ul style="list-style-type: none"> correct plots (but not joined or with spurious or incorrect straight line or curve), or 'their plots' joined provided 5 or 6 plots are correct 						
5(c) 23 (patient appointments)		B2	<p>STRICT FT 'their cumulative graph', i.e. correctly evaluated '60 – their 37'</p> <p>B1 for sight of 60 – 'their 37'</p> <p>If 'their graph' is not cumulative or shows bars, FT for '60 – their 37' provided a unique reading for 10 minutes (60 – 'their reading at 10 minutes) but award B1 only (not B2)</p> <p>If no marks, award SC1 for 23 (patient appointments) calculated or unsupported, when not from 'cumulative frequency graph', e.g. $(18/2 + 6 + 2 + 6 =) 23$</p>						
5(d) $\frac{6}{60} (\times 100)$ or $(100 \times) 1 - \frac{54}{60} (\times 100)$ 10 (%)		M1 A1	<p>FT 'their 54' (reading for $t \leq 20$) provided > 28</p> <p>Do not accept an answer with incorrect units, e.g. '10 people'</p>						
5(e) Difference in medians	3 (minutes)	B2	<p>Allow if calculated from the information in the table</p> <p>Must be correct to the nearest minute for 'their cumulative frequency graph'</p> <p>FT 'their cumulative frequency graph' Do not accept an answer from incorrect working, including without a cumulative graph seen</p> <p>B1 for either</p> <ul style="list-style-type: none"> sight of Monday median 8.3 to 8.7 (minutes), or an answer for the difference in the medians in the range 2.8 to 3.2 (minutes) (from working with Monday median in the range 8.3 to 8.7 minutes) <p>Apply the same tolerance of ± 0.2 (minutes) when following through from 'their graph'</p> <p>On FT, if 'their answer' \neq whole number of minutes, it must be rounded to the nearest minute</p>						

<p>5(f) Sight of any one of:</p> <ul style="list-style-type: none"> • $\frac{4 + 24 + 18}{60} (\times 100)$ • $\frac{46}{60} (\times 100)$ • 0.8×60 or equivalent • 0.2×60 or equivalent <p>Conclusion, 'no (target not met)' AND a correct evaluation:</p> <ul style="list-style-type: none"> • 76.666(%) rounded or truncated • 48 (appointments) • 12 and $(60 - 12 =) 48$ (appointments) <p>OR</p> <p>12 and $(6 + 2 + 6 =) 14$ (appointments)</p>	<p>M1</p> <p>A2</p>	<p>FT 'their 46' from an incorrect cumulative total in (a) (i.e. 'their value in the table for $t \leq 12$')</p> <p>FT for correctly evaluated use of 'their 46' Allow for sight of $46 \div 60 = 0.76(\dots)$ or $100 \times 46 \div 60 = 76(\%)$ Allow, e.g. 'over 0.7' or 'over 70(%)' only provided the correct conclusion 'no' is given</p> <p>If 48 is not evaluated, accept the time from 'their graph' for 48 appointments instead</p> <p>A1 for a correct evaluation:</p> <ul style="list-style-type: none"> • 76.(66...%) rounded or truncated • 'over 70%' or 'over 0.7' • 0.76(...) or 0.77 • 48 (appointments) • 12 (appointments)
<p>6(a) (Volume of cylinder =) $\pi \times 20^2 \times 1000$ (= 400 000π)</p> <p>(Volume of sphere =) $\frac{4}{3} \times \pi \times 5^3$</p> <p>(Number of spheres made =)</p> $\frac{\pi \times 20^2 \times 1000}{\frac{4}{3} \times \pi \times 5^3} \quad \text{or equivalent}$ <p>= 2400 (spheres)</p>	<p>B1</p> <p>B1</p> <p>M2</p> <p>A1</p>	<p>(= 1256000 to 1257000) May be implied in further work Or $\frac{500\pi}{3}$. (= 523 to 524)</p> <p>e.g. $\frac{400\,000\pi}{166.6(6)\pi}$ or $\frac{100\,000\pi}{41.6(6)\pi}$ or equivalent</p> <p>M1 for $\frac{4}{3} \times \pi \times 5^3 \times \text{number of spheres} = \pi \times 20^2 \times 1000$</p> <p>CAO</p>
<p>6(b) $4 \times \pi \times r^2 = 320\pi$ $r^2 = \frac{320\pi}{4\pi}$</p> <p>or $(r =) \sqrt{\frac{320\pi}{4\pi}}$ or equivalent $(r =) \sqrt{80}$ $= 4\sqrt{5}$ (mm)</p>	<p>M1 m1</p> <p>A1</p> <p>B2</p>	<p>May be implied in further working</p> <p>May be implied in further working</p> <p>For B2, FT 'their derived 80' if possible</p> <p>For B1, FT 'their derived 80' if possible B1 for writing 80 as a product of 2 or more factors where one of the factors OR the product of 2 of their factors is a square number e.g. 16×5, 4×20, $2 \times 8 \times 5$, OR B1 for writing $\sqrt{80}$ as a product of 2 or more factors where one of the factors OR the product of 2 of their factors is a whole number e.g. $\sqrt{16} \times \sqrt{5}$, $\sqrt{4} \times \sqrt{20}$, $\sqrt{2} \times \sqrt{8} \times \sqrt{5}$</p>

<p>7(a)</p> $250 \times 0.8 + 100 \times 2 + 50 \times 2.8 + 50 \times 4 + 200 \times 0.7$ $= 200 + 200 + 140 + 200 + 140$ $= 880 \text{ (batteries)}$	<p>M1</p> <p>A1</p>	<p>Allow M1 for the sum of 5 products with any 3 correct</p> <p>CAO</p>
<p>7(b)</p> <p>Search for lower quartile in the 550 – 650 group</p> $2x = 880 \div 4 - 250 \times 0.8 \quad \text{OR} \quad \frac{880 \div 4 - 250 \times 0.8}{200} \times 100$ <p>or</p> $2x = 20 \quad \text{OR} \quad \frac{20}{200} \times 100$ $(x =) 10$ <p>(lower quartile = 550 + 10 =) 560 (hours)</p>	<p>S1</p> <p>M1</p> <p>A1</p> <p>A1</p>	<p>FT 'their 880' \div 4 and 'their 250\times0.8' for all marks provided their lower quartile is in the 2nd group, i.e. 'their 250\times0.8' < 'their 880' \div 4 < 'their 250\times0.8'+200</p> <p>May be seen on the diagram</p> <p>If no marks awarded, SC2 for an answer of 730 (hours) from using the upper quartile e.g. 750 – 80/200\times50 OR 700 + 120/200\times50 SC1 for searching in the 700 – 750 group provided sight of 880 \div 4 (\times3)</p>
<p>7(b) Alternative method:</p> <p>Search for lower quartile in the 550 – 650 group</p> $2x = (250 \times 0.8 + 200) - 880 \div 4 \quad \text{OR} \quad \frac{(250 \times 0.8 + 200) - 880 \div 4}{200} \times 100$ <p>or</p> $2x = 180 \quad \text{OR} \quad \frac{180}{200} \times 100$ $(x =) 90$ <p>(lower quartile = 650 – 90 =) 560 (hours)</p>	<p>S1</p> <p>M1</p> <p>A1</p> <p>A1</p>	<p>FT 'their 880' \div 4 and 'their 250\times0.8' for all marks provided their lower quartile is in the 2nd group, i.e. 'their 250\times0.8' < 'their 880' \div 4 < 'their 250\times0.8'+200</p> <p>May be seen on the diagram</p> <p>If no marks awarded, SC2 for an answer of 730 (hours) from using the upper quartile e.g. 750 – 80/200\times50 OR 700 + 120/200\times50 SC1 for searching in the 700 – 750 group provided sight of 880 \div 4 (\times3)</p>

<p>8(a) Tangent drawn at $t = 2$ seconds</p> <p>Idea of increase in $y \div$ increase in x</p> <p>Correctly evaluated gradient for their tangent</p> <p style="text-align: center;">m/s^2 or ms^{-2}</p>	<p>M1</p> <p>m1</p> <p>A1</p> <p>U1</p>	<p>Attempt to draw a tangent at time $t = 2$ seconds</p> <p>Allow one error in counting squares or in reading the scale for m1 only</p> <p>Accept the gradient as an improper fraction or decimal or percentage If their answer is a fraction, it needs to be in its lowest terms Mark final answer</p>
<p>8(b)(i)</p> <p>(Area =) $\frac{1}{2} \times 1 \times (0+0 + 2(14+24+30+32+30+24+14))$</p> <p>OR $\frac{1}{2} \times 1 \times (28+48+60+64+60+48+28)$</p> <p style="text-align: center;">or equivalent = 168 (m)</p>	<p>M2</p> <p>A1</p>	<p>Award M1 for at most one repeated error</p> <p><i>FT from M1</i></p>
<p>8(b)(i) <i>Alternative method:</i></p> <p>$\frac{(0 + 14) \times 1}{2} + \frac{(14 + 24) \times 1}{2} + \frac{(24 + 30) \times 1}{2} +$ $\frac{(30 + 32) \times 1}{2} + \frac{(32 + 30) \times 1}{2} + \frac{(30 + 24) \times 1}{2} +$ $\frac{(24 + 14) \times 1}{2} + \frac{(14 + 0) \times 1}{2}$ or equivalent $[= 7 + 19 + 27 + 31 + 31 + 27 + 19 + 7]$ = 168 (m)</p>	<p>M2</p> <p>A1</p>	<p><i>Each area may be seen as the sum of the area of a rectangle and triangle</i> <i>M1 for the sum of these 8 areas with 1 one (possibly repeated) error in reading the scale</i></p> <p><i>FT from M1</i></p>
<p>8(b)(ii) (Average velocity in mph =)</p> <p style="text-align: center;">144</p> <p style="text-align: center;">$\div 6$</p> <p style="text-align: center;">$\div 1000$</p> <p style="text-align: center;">$\times 60 \times 60$</p> <p style="text-align: center;">$\frac{\times 5}{8}$ or $\div 1.6$ or equivalent</p> <p style="text-align: center;">= 54 (mph)</p>	<p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>These M1 marks may be awarded in any order (144 \div 6 = 24) (144 \div 1000 = 0.144) (144 \times 60 \times 60 = 518400)</p> <p>(144 \times 5 \div 8 = 90)</p> <p>CAO</p>

<p>9. (Total SA of pillars =) $14 \times 4 \times 18$ (=1008)</p> <p>(Total SA of other flat faces =) $100 \times 12 \times 2 - \frac{\pi \times 10^2}{2} \times 8$ or equivalent (=2400 - 400π)</p> <p>(Total curved SA =) $\frac{\pi \times 20}{2} \times 4 \times 4$ or equivalent (=160π)</p> <p>(Total surface area =) $14 \times 4 \times 18 + 100 \times 12 \times 2 + \frac{\pi \times 20}{2} \times 4 \times 4 - \frac{\pi \times 10^2}{2} \times 8$ or equivalent = 3408 - 240π (m²)</p>	<p>B1</p> <p>B2</p> <p>B1</p> <p>M2</p> <p>A1</p>	<p>B1 for $100 \times 12 - \frac{\pi \times 10^2}{2} \times 4$ (=1200 - 200π) OR B1 for $\frac{\pi \times 10^2}{2} \times 8$ (=400π)</p> <p>M1 for the addition/subtraction of at least 3 correct terms</p> <p>CAO. ISW</p>
<p>9. <i>Alternative method:</i> (Area of front and back faces =) $100 \times 26 \times 2 - 4 \times (\frac{\pi \times 10^2}{2} + 14 \times 20) \times 2$ or equivalent (= 5200 - 400π - 2240)</p> <p>(Total curved SA =) $\frac{\pi \times 20}{2} \times 4 \times 4$ or equivalent (=160π)</p> <p>(Inside of pillars =) $14 \times 4 \times 8$ (=448)</p> <p>(Total surface area =) $100 \times 26 \times 2 - 4 \times (\frac{\pi \times 10^2}{2} + 14 \times 20) \times 2 + \frac{\pi \times 20}{2} \times 4 \times 4$ + $14 \times 4 \times 8$ or equivalent = 3408 - 240π (m²)</p>	<p>B2</p> <p>B1</p> <p>B1</p> <p>M2</p> <p>A1</p>	<p>B1 for $100 \times 26 - 4 \times (\frac{\pi \times 10^2}{2} + 14 \times 20)$ OR B1 for $4 \times (\frac{\pi \times 10^2}{2} + 14 \times 20) \times 2$</p> <p>M1 for the addition/subtraction of at least 4 correct terms</p> <p>CAO. ISW</p>