GCSE MARKING SCHEME

AUTUMN 2022

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

INTRODUCTION

This marking scheme was used by WJEC for the 2022 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

AUTUMN 2022 MARK SCHEME

Unit 1: Higher Tier	Mark	Comments
1(a) (North orchard, number of pear trees is) $3 \times 35 \div (4 + 3)$ or 3×5 or equivalent 15 (pear trees)	M1 A1	
(West orchard number of pear trees is 2×15) 30 (pear trees)	B1	FT 'their derived 15'
(West orchard number of cherry trees is) $11 \times 30 \div 5$	M1	FT 'their derived number of pear trees' Allow M1 for a final answer of 88 (cherry trees from use of 40 apple trees as pear trees), but A0
66 (cherry trees)	A1	FT answer must be evaluated correctly and lead to a whole number
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 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
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.
1(b) (Mass of apples to make juice) 5280 $\div 6$ $\div 2.2$ 400 (kg)	 M1 M1 A2	Method may be seen in either order M0 for statement '1/6 of 5280' without calculation Ignore incorrect units given May be seen or implied in later working A1 for any one of the following: • (5280 ÷ 2.2 =) 2400 • (5280 ÷ 6 =) 880 • a correct evaluation of 'their 2400' ÷ 6 • a correct evaluation of 'their 880' ÷ 2.2
(Number of litres of juice produced) $400 \times 2 \div 5$ or $2 \div (5 \div 400)$ or $2 \times \frac{400}{5}$	M1	FT 'their derived 400(kg)' (not 5280) If 'their derived 400' is used as g (rather than kg) allow M1 for 'their derived 400' × 2 ÷ 5000 or 2 ÷ (5000 ÷ 'their derived 400'), but A0
160 (litres)	A1	
1(b) Alternative method *(Mass of apples used to make juice) 5280 ÷ 6* *880 (lbs)*	*M1* *A1*	
(Mass of apples in 2 litres) 5 × 2.2 *11 (lbs)*	*M1* *A1*	
(Number of litres of juice produced) 2 × 880 ÷ 11 *160 (litres)*	*M1* *A1*	*FT 'their derived 880' and 'their derived 11'*

1(c) $3 \times 48 \div 8$ or equivalent 18 (cm)	M1 A1	
2(a) Whale indicated or implied on bearing 010° from Aberporth and 280° from Aberystwyth. Region in the sea inside a circle, centred at the whale, of correct (4cm) radius ± 2mm	B2 B2	Accept indication from one bearing line drawn with the second bearing shown on this line, including one line terminating at the correct intersection point B1 for either of the bearings correctly shown or unambiguously indicated, e.g. by an unambiguous mark on the correct bearing FT 'their position of the whale' For B2 the region must be entirely within the sea or on FT indicated as a region within the sea Allow intention of circle provided it lies completely within the tolerance given by the overlay B1 for (intention of a) circle, radius out of tolerance but within ± 4 mm, centred at the whale including any region on the land
2(b) $20 \times 12 \times 2.5 \div 100$ 6 (m)	M2 A1	M1 for any 3 of these 4 terms correct in a calculation which may be shown in stages CAO Answer given within the statement takes precedence Sight of 600 is awarded M1 and also SC1 provided not from incorrect working
2(c)(i) $\frac{13}{20} (\times 100)$ or $\frac{12.5}{20} (\times 100)$ or $\frac{12.8}{19} (\times 100)$ or $\frac{12}{20} (\times 100)$ or $\frac{12}{19} (\times 100)$ or $\frac{12.8}{20} (\times 100)$ or $\frac{13}{19} (\times 100)$ or equivalent OR A trial and improvement method, considering percentages or decimals of 19 or 20 with a correct calculation shown between (60% of 19) $0.6 \times 19 (= 11.4)$ and (70% of 20) $0.7 \times 20 (= 14)$ inclusive An answer in the inclusive range 60(%) to 70(%)	B1 B1	Allow: • fraction written as division, e.g. $13 \div 20$ • inclusion of consistent change of place value • a similar suitable fraction, e.g. 12/18 Only award if B1 previously awarded, however allow B2 for an unsupported answer in this range. If no marks, award SC1 for any of the following answers: • 50(%) from $\frac{10}{20} (\times 100)$ or equivalent • 52(%) to 53(%) from $\frac{10}{19} (\times 100)$ or equivalent

2(c)(ii)	$(19 – 0.1 \times 19) \times 1000\,000\,000$ or $(19 – 0.1 \times 19) \times (1) \times 10^9$ or $0.9 \times 19 \times 1000\,000\,000$ or $1.9 \times 10^{10} \times 9 \times 10^{-1}$ or equivalent	M2	Must have engaged with at least one stage of interpretation of the size of 'billion' in figures M1 for any one of the following: • for sight of digits 171 irrespective of place value • $19 – 0.1 \times 19$ • 19 billion $– 0.1 \times 19$ billion • $(19 – 0.1 \times 19) \times 1000$ million • 0.9×19 • 1.9×10^{10} (19 billion in standard form) • 1.9×10^9 only if clearly calculated from 10% of 19 billion
	1.71×10^{10}	A2	A1 for any of the following: • 17 100 000 000 • 1.71×10^4 million • equivalent correct value not given correctly in standard form, e.g. 17.1×10^9 • an answer of 1.7×10^{10} OR A1 for FT from M1 or M2 • 'their number' given correctly in standard form provided it is $> 1.71 \times 10^6$ (including for the number in the last bullet point listed for M1) A0 for 17.1 billion or 17 100 million (M1 A0) Treat use of an estimate of 19 as a MR-1 from an accuracy mark, e.g. use of 20 gives an answer of 1.8×10^{10}, award (M2 A2 MR-1) 3 marks

3(a) Whiskers at 3 m and 22 m Unambiguous values or box with LQ 5 m and UQ 20 m Median at 15 m	B1 B1 B1	Ignore if lines omitted from the ends of the whiskers Must be the least and greatest values shown May be seen in working, must be clearly LQ and UQ Check cumulative frequency diagram If not clearly labelled in working or on the graph, they must be no other values given between • the least and the LQ, and • the greatest and the UQ May be seen in working, must be clearly the median Check cumulative frequency diagram If not an unambiguous unique line or point, i.e. not clearly labelled in working or on the graph, allow for a line (or point) indicated that is not the least or greatest value shown Only if B1 B1 B1 awarded, <u>penalise -1</u> if a correct format for a box-and-whisker diagram is not shown
3(b)(i) 0.75 × 68 or equivalent 51 (yachts)	M1 A1	Answer space takes precedence If no marks, award SC1 for sight of 17 (from 0.25 × 68)
3(b)(ii) Conclusion 'Eog' with sight of (Eog IQR 20 – 5 =) 15 (m) AND (Clwyd IQR 18 – 10 =) 8 (m)	B2	FT 'their UQ – LQ' from (a) box-and–whisker diagram B1 for either IQR correct
3(b)(iii) Conclusion 'Can't tell' with reason, e.g. 'only know that 25% of yachts in Clwyd Marina are greater than 18m' 'we don't know if any of the yachts in Clwyd Marina are greater than 22(metres, the longest in Eog Marina)' 'we don't know if a yacht in Clwyd Marina is greater than 22(metres)' 'it doesn't say maximum length of Clwyd Marina's results'	E1	Ignore any additional incorrect or spurious statements Allow 'Can't tell' with a reason, e.g. 'no raw data' 'don't know this information' 'doesn't show anywhere the biggest yacht in Clwyd Marina' 'we are only given some of the lengths of the yachts in the marinas' 'doesn't show Clwyd Marina's results' 'not specified' 'not specific' 'range not given for the Clwyd Marina (so can't identify the longest yacht)' Do not accept, e.g. 'don't know how many yachts in the marinas' 'not mentioned for either marina'
4(a) $\sqrt{\frac{25}{\pi}}$ or $\frac{5}{\sqrt{\pi}}$ or $\frac{\sqrt{25}}{\sqrt{\pi}}$ or equivalent	B2	ISW Accept √(25 ÷ π) or 5 ÷ √π or √25 ÷ √π For B1 accept π given as 3.1(4...) B1 for sight of any of the following: • π × radius^2 = 25 • r^2 = 25 / π • πr^2 = 25 • √25 / π • √25 ÷ π • 5/π
4(b)(i) 500 × 60 ÷ 4 or equivalent 7500 (cm^3 per minute)	M1 A1	May be seen in stages Answer given within the statement takes precedence

4(b)(ii) 500 ÷ (2 × 25) or equivalent 10 (cm)	M1 A1	May be seen in stages
5(a) (Total number of pebbles =) 40×1 + 40×1.5 + 20×3.7 + 20×1.8 + 80×0.5 (40 + 60 + 74 + 36 + 40) = 250 (pebbles) (Number of pebbles < 70g = 40×1 + ¾ of 40×1.5 =) 85 (Percentage < 70g =) $\frac{85}{250}$ (×100) = 34 (%)	M1 A1 B1 M1 A1	Allow M1 for the sum of 5 products with any 3 correct CAO FT 'their 40×1' and ¾ of 'their 40×1.5' FT 'their 85' provided > 40 and < 100 but not 70 (if not derived) AND FT 'their derived 250' On FT, the whole number part of their answer needs to be calculated correctly
5(b)(i) Uniform scale in blocks of 4	B2	Complete numbering of the scale needed up to 16 B1 for • Incomplete scale with at least 1 correct value and no incorrect values • 3 correct values and 1 incorrect • Frequency of 40 (for the 1st bar) and 80 (for the 2nd bar). May be seen on diagram. May be seen as frequency of 20 for each 5×5 block • 20 × x + 10 × 4x = 120 or equivalent (x being the height of the 1st bar) Accept use of trials for x, with minimum of 2 trials getting closer to 120 OR Evidence that x = 2 • 20 × y/2 + 10 × 2y = 120 or equivalent (y being the first value on the y-axis) Accept use of trials for y, with minimum of 2 trials getting closer to 120 OR Evidence that y = 4
5(b)(ii) 40 g	B1	

6. (Area of floor =) length × width + ½ × base × height	M1	Must be from working with bounds If lower bounds used, they must be in a similar range to those shown for M1 below Use of any formula to calculate the complete area of the floor
$4.5 \times 8.1 + \frac{5.1 \times (5.5 - 4.5)}{2}$ (36.45) (2.55)	M2	M1 for 'their $4.5 \times 8.1 + \frac{5.1 \times (5.5 - 4.5)}{2}$' where 4.4 < 'their 4.5' ≤ 4.6 and 8 < 'their 8.1' ≤ 8.2 and 5(.0) < 'their 5.1' ≤ 5.2 and 5.4 < 'their 5.5' ≤ 5.6 If using ½ × base × height, allow 0.8 ≤ height ≤ 1.2
= 39 (m^2)	A1	CAO
(Amount of flooring needed =) 39 + 0.1 × 39 or equivalent	M1	FT 'their 39' provided 1 mark previously awarded Accept 39/3 + 0.1×39/3
= 42.9 (m^2) AND 15 packs needed	A1	Accept 43 (m^2) AND 15 packs needed Accept 14.3 AND 15 packs needed On FT, accept the amount of flooring correct to 1 d.p. or rounded up to the nearest whole number for 'their 39 + 0.1 × 39' Allow M1A1 for an answer of 15 packs from an area of 39 (m^2) provided no incorrect work seen FT 'their 39' If no marks awarded, SC1 for sight of 4.5, 8.1, and 5.1
Alternative method for first 4 marks: *(Area of floor =)* *length × width + ½×(sum of parallel sides)×height*	*M1*	*Must be from working with bounds* *If lower bounds used, they must be in a similar range to those shown for M1 below* *Use of any formula to calculate the complete area of the floor*
$4.5 \times (8.1 - 5.1) + \frac{(5.5 + 4.5) \times 5.1}{2}$ *(13.5) (25.5)*	*M2*	*M1 for 'their $4.5 \times (8.1-5.1) + \frac{(5.5 + 4.5) \times 5.1}{2}$'* *where* *4.4 < 'their 4.5' ≤ 4.6 and 8 < 'their 8.1' ≤ 8.2* *and* *5(.0) < 'their 5.1' ≤ 5.2 and 5.4 < 'their 5.5' ≤ 5.6* *Allow width of rectangle to be 2.8 ≤ width ≤ 3.2*
= 39 (m^2)	*A1*	*CAO*

7. Use of $\frac{240}{360} \times \pi \times 2 \times 4.5$ OR $\frac{120}{360} \times \pi \times 2 \times 4.5$ or their equivalents (Length of metal sheet needed =) $4 \times \frac{240}{360} \times \pi \times 2 \times 4.5$ + $2 \times \frac{120}{360} \times \pi \times 2 \times 4.5$ or equivalent OR $5 \times \frac{240}{360} \times \pi \times 2 \times 4.5$ or equivalent + 5 × 6.6 = 30π + 33 or $3(10\pi + 11)$ (cm)	B1 M2 m1 A1	Allow use of π = 3.1 to 3.142 for B and M marks only 6π OR 3π Implies the previous B1 Could come from adding all the angles (=1200) M1 for • $4 \times \frac{240}{360} \times \pi \times 2 \times 4.5$ OR • …… + $2 \times \frac{120}{360} \times \pi \times 2 \times 4.5$ Depends on at least M1 previously awarded CAO Mark final answer Answer space takes precedence If no marks awarded, SC2 for an answer of 15π + 33 (cm) from using a diameter of 4.5 (cm) or SC1 for a full method that would arrive at an answer of 15π + 33 (cm) from using a diameter of 4.5 (cm), but with error/s in accuracy
8. (Area =) $\frac{1}{2} \times 3 \times (1 + 3.4 + 2(3.2 + 5.4 + 6.2))$ = 51 (m^2) (Volume of water =) 51 × 1.2 = 61.2 (m^3)	M2 A1 m1 A1	M1 for 1 slip in substitution of width values FT from M1 FT 'their 51' provided M1 or M2 previously awarded Condone further multiplication by 2 for m1A0
Alternative method for the first 3 marks: $\frac{(1 + 3.2)}{2} \times 3 + \frac{(3.2 + 5.4)}{2} \times 3 + \frac{(5.4 + 6.2)}{2} \times 3 + \frac{(6.2 + 3.4)}{2} \times 3$ *or equivalent* *[6.3 + 12.9 + 17.4 + 14.4]* *= 51 (m^2)*	*M2* *A1*	*M1 for the sum of these 4 areas with one error (may be repeated) in the substitution of width values* *FT from M1*

9.(a) $400 \times \frac{5}{4} \times \frac{3}{2}$ OR $400 \times 1.25 \times 1.5$ OR $50 \times 5 \times 3$ = 750 (ice creams)	 M2 A1	<u>A table method altering all 3 at the same time is M0</u> M1 for $400 \times 5/4$ (= 500) or $400 \times 3/2$ (= 600) or equivalent e.g. <u>Ice creams</u> <u>Hours</u> <u>Shops</u> 500 5 2 or 600 4 3 or 50 1 1 CAO
9(b) (Volume of half cone =) $\frac{1}{6} \times \boldsymbol{\pi} \times 3^2 \times h$ (Volume of half hemisphere =) $\frac{1}{3} \times \boldsymbol{\pi} \times 3^3$ $\frac{1}{6} \times \boldsymbol{\pi} \times 3^2 \times h = \frac{1}{3} \times \boldsymbol{\pi} \times 3^3$ or equivalent h = 6 (m) $(x^2 =) 6^2 + 3^2$ $x^2 = 45$ or $(x =) \sqrt{45}$ $(x =) 3\sqrt{5}$ (m)	B1 B1 M1 A1 M1 A1 B2	or equivalent e.g. $\frac{9\boldsymbol{\pi}}{6} \times h$ or equivalent e.g. $9\boldsymbol{\pi}$ FT their volumes provided B1 previously awarded and the incorrect volume is a multiple of the correct one Note: An equation using <u>consistent multiples</u> of these expressions that, when correctly solved, would give the answer of 6(m) implies the previous B1 marks e.g. a cone equated to a hemisphere, $\frac{1}{3}\pi \times 3^2 \times h = \frac{2}{3}\pi \times 3^3$ is awarded B1B1M1 and possible A1, but a cone equated to a sphere, $\frac{1}{3}\pi \times 3^2 \times h = \frac{4}{3}\pi \times 3^3$ is awarded B0B0M0A0 Allow an unsupported answer of h = 6 (m) for B1B1M1A1 May be seen in further working FT 'their derived 6' For B2, FT 'their derived 45 (their x, not their h)' provided their surd can be written in the form $a\sqrt{b}$ B1 for writing 45 as a product of 2 or more factors where one of the factors OR the product of a pair of their factors is a square number e.g. 9×5, $3 \times 3 \times 5$, OR B1 for writing $\sqrt{45}$ as a product of 2 or more factors where one of the factors OR the product of a pair of their factors <u>gives</u> a whole number e.g. $\sqrt{3} \times \sqrt{3} \times \sqrt{5}$, $\sqrt{9} \times \sqrt{5}$
10. $H = 8 \times 0{\cdot}83^n$ or $H = 8 \times \left(\frac{83}{100}\right)^n$ or equivalent	B3	B2 for $8 \times (1 - 0.17)^n$ or equivalent or $H = 8 \times \frac{83^n}{100}$ OR B1 for sight of $0{\cdot}83^n$ or equivalent, or B1 for $H = (8 \times 0{\cdot}83)^n$ or equivalent If no marks awarded: SC1 for $H = 8 \times 0.17^n$ or equivalent