GCSE MARKING SCHEME

AUTUMN 2020

GCSE
MATHEMATICS - NUMERACY
UNIT 2 – HIGHER TIER
3310U60-1

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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 2020 MARK SCHEME

GCSE Mathematics Numeracy **Unit 2: Higher Tier**	Mark	Comments
1.		*Sight of, for example, 3500 or 0.0405 are treated as MR-1 (from first accuracy mark) in addition to any place value error in 'their 3.4 million'*
(35000 acres ≈) 35000 × 0.00405	M1	
141.75 (km^2)	A1	Allow 141.8 May be implied by further working
(Food per km^2) 3 400 000 ÷ 141.75	M1	Allow 3.4 (million) ÷ 141.75 Allow place value error in 'their 3.4 million' FT 'their 141.75', provided derived from a calculation involving 35000 and 0.00405
Following correct working, answers in the range 23975 (tonnes) to 24 000 (tonnes)	A1	(Actual answer is 23985.89… tonnes) Do not FT from place value error in 'their 3.4 million' FT for equivalent range, e.g. use of 141.8 gives 23977(.433 tonnes)) so accept answers in the range 23977 to 24000 tonnes
1. Alternative method 1: *(tonnes / acre) 3 400 000 ÷ 35000*	*M1*	*Allow 3.4 (million) ÷ 35000* Allow place value error in 'their 3.4 million'
97.1(428….)	*A1*	*Do not FT from place value error in 'their 3.4 million'* *May be implied by further working*
(per km^2) 97.1(428….) ÷ 0.00405	*M1*	*FT from place value error in 'their 3.4 million'* *FT 'their 97.1(428….)' provided derived from a calculation involving 3 400 000 and 35 000*
Following correct working, answers in the range 23975 (tonnes) to 24 000 (tonnes)	*A1*	*(Actual answer is 23985.89… tonnes)* *Note: Accuracy for place value error in 'their 3.4 million' must be penalised once only on first occurrence*
1. Alternative method 2: *3 400 000 ÷ 0.00405*	*M1*	*Allow 3.4 (million) ÷ 0.00405* *Allow place value error in 'their 3.4 million'*
839506172.8(….)	*A1*	*Do not FT from place value error in 'their 3.4 million'* *May be implied by further working*
839506172.8(….) ÷ 35000	*M1*	*FT from place value error in 'their 3.4 million'* *FT 'their 839506172.8(….)' provided derived from a calculation involving 3 400 000 and 0.00405*
Following correct working, answers in the range 23975 (tonnes) to 24 000 (tonnes)	*A1*	*(Actual answer is 23985.89… tonnes)* *Note: Accuracy for place value error in 'their 3.4 million' must be penalised once only on first occurrence*

Organisation & 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.
2. (Aged 75 or over who used internet) (0.4 × 286 500 =) 114 600 (Population who used the internet) (0.85 × 3 150 000 =) 2 677 500 $\frac{114\,600}{2\,677\,500}$ (× 100) 4.3 (%)	B1 B1 M1 A2	May be implied in further working. May be implied in further working. FT provided both 0.4 × 286 500 and 0.85 × 3 150 000 attempted Must be correct to 2 significant figures. A1 for 4.28(0...%) or from correct working 4(%) or 4.2(%) If no marks, award SC1 for an answer of 9.1(%) from $\frac{286\,500}{3\,150\,000} \times 100$ If B1 awarded, also award SC1 for *3.638...(%) or 10.7...(%) or with appropriate rounding or truncation OR SC2 for 3.6 (%) or 11 (%),* *from:* $\frac{114600}{3150000} \times 100 = 3.638...(\%) = 3.6\ (\%)$ *or* $\frac{286500}{2677500} \times 100 = 10.7...(\%) = 11\ (\%)$
3(a) 375 ÷ 1.6 or 375 × 5 ÷ 8 or equivalent 234(.375 mph)	M1 A1	Allow use of ÷1.6 to ÷1.613, ×0.62 to ×0.625 Accept 234.4 (mph) Allow 234.3(…mph)
3(b) 260.5 ÷ 78 ÷ 155.552 × 60 1.288(.... minutes)	 M1 M1 M1 A1	<u>Method marks can be awarded in any order but the operation must be unique (not contradicted or repeated in the working)</u> (Lap distance km) (Average lap time in hours) (Average lap time in minutes) Award M3 for sight of $\frac{260.5 \times 60}{78 \times 155.552}$ CAO, accept rounded to 1.29 (minutes) or 1.3 (minutes) or 1 minute 17(.29...) seconds If no marks, award SC1 for equivalent operations used without 260.5 or with use of an incorrect 260.5, i.e. $\frac{60}{78 \times 155.552}$, 60 ÷ 78 ÷ 155.552 or equivalent
3(c) 250	B1	

3(d) 250 ÷ 1.38 × 1.14 ÷ 12 17(.21... million €)	 M1 M1 M1 A1	<u>Method marks can be awarded in any order but the operation must be unique (not contradicted or repeated in the working)</u> Ignore place value errors in working with 'millions' for M marks (= £181.1594... million) (= €206.5217... million) Award M3 for sight of $\frac{250 \times 1.14}{1.38 \times 12}$ CAO. Allow final answer written in full. Allow 'millions' not written in the answer If no marks, award SC1 for equivalent operations used without 250, i.e. $\frac{1.14}{1.38 \times 12}$ or 1.14 ÷ 1.38 ÷ 12 or equivalent
4. (Greatest total length of pictures) 21.5 + 22.5 + 23.5 + 24.5 + 26.5 or 21 + 22 + 23 + 24 + 26 + 5 × 0.5 (=) 118.5 (cm) (Lower bound of shelf) 117.5(cm) Difference of 1 cm stated or sight of 118.5 – 117.5 = 1(cm)	 M1 A1 B1 B1	Allow 0.4999(....) for 0.5 throughout, must clearly be a recurring 9 digit Allow for **sight** of upper bounds of pictures: 21.5(cm), 22.5(cm), 23.5(cm), 24.5(cm), 26.5(cm) CAO from use of appropriate correct upper bounds and lower bound Accept FT from clearly **recurring** 9s, as 0.9999999…. is considered as equivalent to 1 Accept 117.5 – 118.5 = -1(cm) Allow 117.5 – 118.5 = 1(cm difference) If no marks, award SC1 for correct **sum** of 'their upper bounds' provided they are all increased but less than 0.5cm greater than the measurements given in the question
5(a) 6 550 000 000 × 0.02 or 6 550 000 000 ÷ 50 (£) 1.31×10^8	M1 A2	 A1 for (£)131 million or (£)131 000 000 or equivalent (e.g. 131×10^6) If no marks, award SC1 for sight of (£)1.31×10^{10} (from 6 550 000 000 × 2)
5(b) $\pi \times (25.9 \div 2)^2 \times 2.03$ Answer in the range 1068 (mm^3) to 1070 (mm^3)	M2 A1	Allow M1 for sight of any of the following: • $\pi \times 25.9^2 \times 2.03$ • 4275.8 to 4279 • 1361.7(...) π • $\pi \times ((25.9)^2 \div 2) \times 2.03$ • 2137.9(...) to 2139.(...) • 680.8π to 680.9π CAO. ISW Accept an answer of 340.4(….)π

6(a) $\tan x = \frac{3.9}{56.7}$ $(x =)$ $\tan^{-1} 3.9/56.7$ or $(x =) \tan^{-1} 0.06878....$ $(x =)$ 3.93(°)	M1 m1 A2	A1 for $(x =)$ 3.9(3...°) from correct working An unsupported answer of 3.9 is M0, m0, A0
6(a) Alternative method *(slant height^2 = 3.9^2 + 56.7^2, s = √3230.1, leading to) slant height 56.8(33... m)* ***and*** *either* $\sin x = \frac{3.9}{56.8(33...)}$ *or* $\cos x = \frac{56.7}{56.8(33...)}$ *(x =)* $\sin^{-1}(3.9/56.8(33...))$ *or* $\cos^{-1}(56.7/56.8(33...))$ *(x =) 3.93(°)*	*M1* *m1* *A2*	*A1 for (x =) 3.9(3...°) to 3.9(7...°) from correct working* *An unsupported answer of 3.9 is M0, m0, A0*
6(b) 56.7 × 9.36 ÷ 3.9 or 56.7 × 2.4 or equivalent 136(.08 cm)	M1 A1	Ignore place value errors due to change of units for M1 only If units are given they must be correct, accept answer in metres Allow answers from premature approximation in the range 136 (cm) to 136.1 (cm)
6(b) Alternative method *(Height of poster =)* $\frac{9.36}{\tan 3.9(.....°)}$ *Answer in the range 136 (cm) to 137.3 (cm)*	*M1* *A1*	*FT from (a)* *M0 for* $\tan 3.9(.....°) = \frac{9.36}{\text{Height of poster}}$ *If units are given they must be correct, accept answer in metres*
7(a) 45 (cars)	B1	
7(b) Range correct (07:21 and 07:44) UQ and LQ correct (07:22.5 and 07:35) Median correct (07:25)	B1 B1 B1	Allow 07:21 to 07:22 and 07:44 to 07.45 Accept seen in working if not given on the box-and-whisker Accept seen in working if not given on the box-and-whisker Penalise -1 if the structure of the box-and-whisker plot is not correct, ignore if end vertical lines not shown for whiskers

8(a) (Amount in account =) $2000 \times (1 + 0.0438/365)^{30}$ OR 2000×1.00012^{30}	M2	Allow use of 365.25 or 366 Use of 365.25 leads to 1.0001199… Use of 366 leads to 1.00011967… M1 for 1 error (not omission) e.g. • a place value error e.g. 4.38 instead of 0.0438, or M1 for $(1 + 0.0438/365)^{30}$ Note: Use of 12 with a power of 1, instead of 365 with a power of 30, would not be considered as 1 error as it is not of equivalent difficulty, and is M0
= (£) 2007.21(…)	A1	CAO Use of 365.25 leads to (£) 2007.20(7…) Use of 366 leads to (£) 2007.19(…) If no marks awarded, SC1 for answers of: • (£)2007.41(…) from use of 4.5%, 365 or • (£)2007.40(5…) from use of 4.5%, 365.25 or • (£)2007.39(…) from use of 4.5%, 366
8(b) (AER =) $\left(1 + \frac{0.045}{12}\right)^{12} - 1$	M1	
= 4.59 (%)	A2	A1 for 0.0459(39…%) or 4.59(39…)%, or A1 for 0.046 or 4.6% or 5% from correct working If no marks awarded, SC1 for 4.47 (%) (from use of nominal annual rate of 4.38%. Must be to 2d.p.)
9(a) (Width of rectangle/Base of triangle =) 1.3 (m)	B1	May be implied by use of 0.65 in further work
(Sloping length^2 =) $1.5^2 + 0.65^2$	M1	FT 'their 1.3/2'
Sloping length^2 = 2.6725 or (Sloping length =) $\sqrt{2.6725}$	A1	
(Sloping length =) 1.63(…) (m)	A1	FT from M1 for the correctly evaluated square root of 'their 2.6725' provided their answer > 1.5 If trigonometry used to calculate the sloping length, M1 for base angle = $\tan^{-1}(1.5/(1.3\div2))$ (= 66.5(71…°)) or apex angle = $\tan^{-1}((1.3\div2)/1.5)$ (= 23.4(28…°)) m1 for correct rearrangement of a sin or cos equation using their base or apex angle with 1.5 or 1.3÷2 A1 for (Sloping length =) 1.63(…) (m)
(Cost of wire mesh =) (2×0.5×1.3 (1.95 m^2, (£)10.92) ×1.5 + 2×1.63(…) (13.69 to 13.73(…) m^2, (£)76.66(…) to (£)76.91) ×4.2) (× 5.6(0))	M2	FT 'their 1.63(…)' provided Pythagoras or trigonometry attempted and 'their 1.3' M1 for • 0.5×1.3×1.5 + 1.63(…)×4.2 or • …… + 2×1.63(…)×4.2 or • 2×1.63(…)×4.2 × 5.6(0) OR M1 for • 2×0.5×1.3×1.5 + …… or • 2×0.5×1.3×1.5 × 5.6(0) where Pythagoras or trigonometry may not have been attempted
= (£)87.58 to (£)87.83	A1	FT from previous M2 only Note: A sloping length of 1.6 (m) leads to an answer of (£)86.18(4)

9(b) $\sqrt[3]{\frac{27}{8}}$ or $\sqrt[3]{\frac{8}{27}}$ OR $\left(\frac{27}{8}\right)^2$ or $\left(\frac{8}{27}\right)^2$ or 3:2 or 2:3 or equivalent	B1	(= 1.5 or 0.666… OR 11.3(9…) or 0.08(7…))
$\left(\sqrt[3]{\frac{27}{8}}\right)^2$ OR $\left(\sqrt[3]{\frac{8}{27}}\right)^2$ or $3^2:2^2$ or $2^2:3^2$ or equivalent	B1	(= 2.25 OR 0.444…)
(Area of wire mesh =) $3 \times \left(\sqrt[3]{\frac{27}{8}}\right)^2$ or equivalent	M1	
= 6.75 (m^2)	A1	Accept 6.8 (m^2)
10. (Remaining balance =) $18000(1 + 0.0025)^{60} - 237.84\left(\frac{(1+0.0025)^{60}-1}{0.0025}\right)$	M2	(= (£)20 909.10(…) – (£)15 375.57(…)) Each expression may be seen in stages M1 for a subtraction involving 1 correct expression, OR for a subtraction with only one consistently substituted incorrect value
= (£)5533.52(7…) AND e.g. 'No, Dafydd would not have enough to pay off the loan'	A2	CAO Accept rounded answers e.g. (£)5533 or (£)5534 A1 for (£)5533.52(7…) or rounded answers without a correct conclusion, OR A1 for a correct calculation of (£)15 375.57(…)
11(a) (Distance travelled =) $\frac{85}{360} \times 2 \times \pi \times 110$	M1	
= 163 to 163.21 (cm)	A1	Or $\frac{935\pi}{18}$ or equivalent
11(b) (Length of rod =) $\sqrt{(110^2 + (110 - 16)^2 - 2\times110\times(110 - 16)\times\cos85(°))}$ $(=\sqrt{19133.6(192…)})$	M2	M1 for length^2 = $110^2+(110–16)^2 -2\times110\times(110–16)\times\cos85(°)$
= 138(.324…) (cm)	A1	
(Angle =) $\sin^{-1}\left(\frac{\sin 85(°)}{138(.324…)} \times (110 - 16)\right)$ OR	M2	FT 'their derived 138(.324…)' M1 for • $\frac{\sin(\text{angle})}{(110 – 16)} = \frac{\sin 85(°)}{138(.324…)}$ or equivalent or • $\sin(\text{angle}) = \frac{\sin 85(°)}{138(.324…)} \times (110 – 16)$
(Angle =) $\cos^{-1}\left(\frac{110^2+138(.324…)^2-(110-16)^2}{2\times110\times138(.324…)}\right)$ OR		OR M1 for • $(110−16)^2 = 110^2+138(.324…)^2 –2\times110\times138(.324…)\times\cos(\text{angle})$ or • $\cos(\text{angle}) = \frac{110^2 + 138(.324…)^2 – (110–16)^2}{2 \times 110 \times 138(.324…)}$
full complete method using the sine rule to find the angle at the top of the triangle and then use of angles in a triangle		OR M1 for finding the angle at the top of the triangle (52·2(6…) to 53 (°))
= 42·6 to 42·7(3…) (°)	A1	Accept 43 (°) from correct working

12(a) (Area of triangle AOB =) $\frac{1}{2} \times 30.9^2 \times \sin 150(^\circ)$ or equivalent full method = 238.7(025) or 239 (cm^2)	M1 A1	
12(b) Adding two equal sectors to the area of the triangle (Area of 2 sectors =) $(2 \times) \frac{(180 - 150)/2}{360} \times \pi \times 30.9^2$ = 249.8 to 250(.00…) (cm^2) (Number of litres that can be added =) (249.9(686…) + 238.7(025)) × 600 (÷1000) or (488.5 to 489) × 600 (÷1000) = 293 to 293.4 (litres)	S1 M1 A1 M2 A2	 May be embedded in a volume calculation i.e.× 600 Or $31827\pi/400$ (cm^2) May be implied by 488.5 to 489 (cm^2) (total area) May be implied by volume of 149800 to 150001 (cm^3) FT 'their 238.7(025)' and 'their 249.9(686…)' provided M1 previously awarded M1 (may be embedded within incorrect work) for • (249.9(686…) + 238.7(025)) or • (249.9(686…) + ……) × 600 OR M1 (may be embedded within incorrect work) for • (…… + 238.7(025)) × 600 where previous M1 may not have been awarded FT from M2 only A1 for 293 000 to 293 400 (cm^3)
Alternative method: *Area of semicircle subtract (area of the large sector – area of triangle)* *(Area of large sector =) $\frac{150}{360} \times \pi \times 30.9^2$ or equivalent* *= 1249 to 1250 (cm^2)* *(Number of litres that can be added =)* *($\pi \times 30.9^2 \div 2 - (1249.8(\ldots) - 238.7(025))) \times 600$ (÷1000)* *or ((1499 to 1500.01) – (1010…to 1011.3)) × 600 (÷1000)* *= 293 to 293.4 (litres)*	*S1* *M1* *A1* *M2* *A2*	 *May be embedded in a volume calculation i.e.× 600* *Or $31827\pi/80$ (cm^2)* *749 400 to 750 000 (cm^3) if volumes considered* *FT 'their 238.7(025)' and 'their 1249.8(…)' provided M1 previously awarded* *M1 (may be embedded within incorrect work) for* • *$\pi \times 30.9^2 \div 2 - (1249.8(\ldots) - 238.7(025))$ or* • *(1249.8(…) – 238.7(025)) × 600 or* • *($\pi \times 30.9^2 \div 2 - (1249.8(\ldots) - \ldots)) \times 600$* *OR* *M1 (may be embedded within incorrect work) for* • *($\pi \times 30.9^2 \div 2 - (\ldots - 238.7(025))) \times 600$* *where previous M1 may not have been awarded* *FT from M2 only* *A1 for 293 000 to 293 400 (cm^3)*