GCSE MARKING SCHEME

SUMMER 2019

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

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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 (3310U60-1)

SUMMER 2019 MARK SCHEME

GCSE Mathematics – Numeracy **Unit 2: Higher Tier**	**Mark**	**Comments**
1. Sight of 9.95 (m) or 99.95(m) or 995 (cm) or 9995 (cm) (Least length) 9.95 + 99.95 + 9.95 or equivalent in cm 119.85 (m)	B1 M1 A1	If units are given they must be correct FT 'their least measurements' x and y, provided 9.9 (m) ≤ x <10(m) and 99.9 (m) ≤ y <100(m) as appropriate CAO Award all 3 marks for a correct response If no marks, award SC1 for an answer of 118.5(m) or 119.985(m) or (9.95 + 9.95 + 99.5 =) 119.4(m)
1. Alternative method: *100 + 10 + 10 – 3 × 0.05 or equivalent in cm* *119.85 (m)*	*M2* *A1*	*M1 for sight of - 5 cm or -0.05 (m) used* *CAO* *If no marks, award SC1 for an answer of 119.7.(m)*
2(a)(i) (Volume) $\pi \times 3.6^2 \times 9.3$ Answer in the range 378.4 (cm^3) to 378.7 (cm^3) or 379 (cm^3)	M1 A1	Mark final answer
2(a)(ii) 189 (g) or an answer in the range 189.2 (g) to 189.5 (g)	B1	Allow rounding or truncation to whole number or a number of decimal places FT, for a similar range, 'their 379' accurately divided by 2
2(b) (Height is) 9.3 × 4.2 ÷ 3.6 or 1.16666... × 9.3 or 9.3 ÷ (3.6 ÷ 4.2) or equivalent 10.85 (cm)	M1 A1	Allow M1 for 1.16 × 9.3 or 1.17 × 9.3 or 9.3 ÷ 0.85(7...) Allow answers in the inclusive range 10.78 (cm) to 10.95 (cm)

2(c) Comparison of salt and sugar, e.g. • (Salt) $\frac{6}{1.85}$ AND (Sugar) $\frac{90}{11.7}$ • (Salt)(100×) $\frac{1.85}{6}$ AND (Sugar)(100×) $\frac{11.7}{90}$ • (Recommend) 1 : 15 AND (Beans)1 : 11.7÷1.85 Conclusion SALT and an accurate calculation of comparison, e.g. 3(.24...) AND 7(.69...), 0.3(083...) AND 0.13, 30(.83....%) AND 13(%), 31(%) AND 13(%), 0.31 AND 0.13 1 : 15 AND 1 : 6(.32...)	B1 B2	Or equivalent Ignore any units given Ignore any units given and any additional statements if SALT unambiguously concluded with appropriate calculations evaluated correctly Accept rounded or truncated answers Ignoring units, B1 for an accurate calculation of comparison, e.g. 3(.24...) AND 7(.69...), 0.3(083...) AND 0.13, 30(.83....%) AND 13(%), 31(%) AND 13(%) 1 : 15 AND 1 : 6(.32...) OR B1 for SALT with one of the two comparative values correct (i.e. as above with 'OR')
2(c) Alternative method 1: *Conclusion SALT with evidence of a full method looking at the same number of portions, including ratio methods, e.g.* *1.85 × 3 (portions) ≈ 6 (g)* *AND 11.7 × 8 (portions) ≈ 90 (g)*	*B3*	*Allow approximately or similar words for '≈'* *B2 for evidence of, e.g.* *1.85 × 3(portions) ≈ 6(g)* ***and*** *11.7 × 8(portions) ≈ 90(g)* *OR* *B1 for evidence of, e.g.* *1.85 × 3 (portions) ≈ 6 (g)* ***or*** *11.7 × 8 (portions) ≈ 90 (g)*
2(c) Alternative method 2: *Full method with one calculated proportion, compared with same proportion of the other ingredient, e.g.* • *31% salt with 0.31 × 90* • *13% sugar with 0.13 × 6* *Conclusion SALT and an accurate calculation of comparison, e.g.* • *27.9 (g) (sugar which is > 11.7 g in a portion)* • *0.78 (g) (salt which is < 1.85 g in a portion)*	*B1* *B2*	 *Ignore any units given and any additional statements if SALT unambiguously concluded with appropriate calculations evaluated correctly* *B1 for appropriate calculations evaluated correctly, with no or incorrect conclusion*

3(a) (Number of units is) 800	B1	
(Electricity cost is) 800 × 0.23 or 800 × 23	M1	FT 'their 20950 – 20150', must be from attempting this subtraction
(£)184 or 18400(p)	A1	If units are given they must be correct Accept £184.00p, do not accept £184p
(Standing charge + electricity) (£) 208 or 20800(p)	B1	FT 24 + 'their 184' provided units are consistent May be in implied or embedded in further work, e.g. if 184 × 1.05 + 24 seen and calculated correctly to (£)217.2(0)
(Total bill including VAT at 5%) 1.05 × 208 or 1.05 × 20800 or equivalent	M1	FT 'their (£)208' or 'their 20800(p)', including if the standing charge is omitted (i.e. (£)184 used) Allow if standing charge is added after adding VAT to the electricity cost
(£)218.4(0) or 21840(p)	A1	CAO
(Budget per month £218.40 ÷ 3 =) (£)72.8(0) or 7280(p)	B1	FT 'their total bill' ÷ 3 provided at least 2 marks previously awarded Allow rounded up to the nearest £ On FT allow rounding to 10p, or rounding up to the nearest £ (Note: FT answers from • one month standing charge (£)201.6(0))÷ 3 = (£)67.2(0) • standing charge omitted (£)193.2(0))÷ 3 = (£)64.4(0))
3(a) Alternative method:		*Watch for stages in other orders, check for embedded equivalent stages*
(Number of units is) 800	*B1*	
(Electricity cost is) 800 × 0.23 or 800 × 23	*M1*	*FT 'their 20950 – 20150', must be from attempting this subtraction*
(£)184 or 18400(p)	*A1*	*If units are given they must be correct* *Accept £184.00p, do not accept £184p*
(Budget before VAT 184÷3 + 24÷3 =) (£) 69.33(3..)	*B1*	*FT 'their 184'+ 8 provided units are consistent* *May be implied or embedded in further work, e.g. if (184÷3)×1.05 + 8 seen and calculated correctly to (£)72.4(0)*
(Total bill including VAT at 5%) *1.05 × (184 ÷ 3 + 24 ÷ 3) or equivalent*	*M2*	*FT 'their 184 ÷ 3 + 24 ÷ 3'* *M1 for either of the following:* • *1.05 × 'their 184 ÷ 3'* *(no standing charge included)* • *1.05 × 'their 184 ÷ 3' + 8* *(no VAT on standing charge)*
(Budget per month) (£)72.8(0) or 7280(p)	*A1*	*FT from M2 or M1* *Allow rounded up to the nearest £* *On FT allow rounding to 10p, or rounding up to the nearest £*

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.
3(b) $500 \times 1.022^5 \times 1.016^{15}$ $(500 \times 1.022^5 = 557.473...)$ $(500 \times 1.016^{15} = 634.418...$ or $634.42)$	M3	OR equivalent method to increase by 2.2% and to increase by 1.6% on different amounts for appropriate number of years M2 for sight of either $\times 1.022^5$ or $\times 1.016^{15}$ or equivalent calculations OR M1 for sight of either $\times 1.022$ or $\times 1.016$ or equivalent calculations
(£) 707.34	A1	Mark final answer, CAO, accepting answers in the range (£) 707.33 to (£) 707.35 (Note: Sight of (£)511 or (£)555 implies 500×1.022, from working with 2.2% of £500, M1 is awarded)
4(a)(i) $(Support1^2 =) 0.9^2 + 1.1^2$ $Support1^2 = 2.02$ or $(Support1 =) \sqrt{2.02}$ (Support 1 =) 1.4(2... m)	 M1 A1 A1	*Scale drawings are not accepted* Do not accept rounded to 2, unless final answer is 1.42(1... m)** FT from M1 for the correctly evaluated square root of 'their 2.02' provided 'their answer' > 1.1 (m) ***Note, award as follows:* *$(Support1^2 =) 0.9^2 + 1.1^2$ M1* *$Support1^2 = 2$ or $(Support1 =) \sqrt{2}$ A0* *(Support 1 =) 1.4(1... m) A1 FT* *$(Support1^2 =) 0.9^2 + 1.1^2$ M1* *$Support1^2 = 2$ or $(Support1 =) \sqrt{2}$ Allow A1 if ...* *(Support 1 =) 1.42(... m) A1 FT*
4(a)(ii) sin base angle = $\frac{1.1 + 0.8}{2.6}$ $\sin^{-1} \frac{1.1 + 0.8}{2.6}$ or $\sin^{-1} 0.73(0769....)$ (Base angle =) 46.95(...°) or 47(°)	M1 m1 A1	OR alternative full method using Pythagoras' theorem then cos or tan OR FT correct statement for 'their inverse trig ratio' Allow 46.88(...°) or 46.9(°) ISW unless subtracted from 90° If no marks, award SC1 for an answer of 50.7(°) or 51(°) from working with Support 1

4(b) (Discount cost of bricks) (516 – 8 × 22.5(0) =) (£) 336 100 × 336 ÷ 80 or 100 × $\frac{336}{80}$ (£) 420	B1 M1 A1	 FT 'their 516 – 8 × 22.5(0)' provided ≠ 516 and ≠ 180 for M1 and possible A1 If no marks, award SC2 for (516 ÷ 0.8 - 180 =) (£) 465 OR SC1 for (516 ÷ 0.8 =) (£) 645 or (100 × 180 ÷ 80 =) (£) 225
5(a)(i) $1800 \leq x < 2000$	B1	Accept '(£)1800 to (£)2000', or '(£)1800 – (£)2000'
5(a)(ii) Reason based on agreement due to the 4 people earning £5800 to £7800 per month or the majority of lower wages, e.g. 'the data is skewed', 'only a few of the employees will earn more than the mean wage', 'because most people employed are in the lowest 2 groups of the monthly wage' 'as the majority earn between 1800 and 2100'	E1	Allow, e.g. 'because there is a great difference between the monthly wages', 'the big numbers would affect the mean', 'more than half are in the first group' Do not accept, e.g. 'she doesn't know the exact values', 'using the median would be better', 'because there are no employees that have between 2400 and 5800 monthly wage', 'there are 64 in the first group'
5(b)(i) (2200, 48) joined to (2400, 72) joined to (3000, 80)	B2	Joined with a curve or a straight line B1 for a cumulative graph with either of the following: • correct plots but not joined, • 'their 2 plots' joined provided 1 plot 'correct' including FT plot at (3000, $48 < y \leq 80$)
5(b)(ii) £2160	B1	
5(b)(iii) 22.5(%) OR answer from correct working in the range 21(.25%) to 23.75(%) or 24(%)	B2	Working $\frac{17}{80} \times 100$ to $\frac{19}{80} \times 100$ B1 for sight of $\frac{17}{80}$ to $\frac{19}{80}$

6. Morgannwg bank $1.0041^{12} - 1$ OR $\left(1 + \frac{0.0492}{12}\right)^{12} - 1$ = 0.0503(…) or 5.03(…)% Banc Gwynedd $\left(1 + \frac{0.0492}{4}\right)^{4} - 1$ = 0.0501(…) or 5.01(…)% (Answer =) 0.02%	M1 A1 M1 A1 B1	 Do not accept 0.0503(…) % unless corrected in further work Do not accept 0.0501(…) % unless corrected in further work FT 'their 0.0503(…) or 5.03(…)%' AND FT 'their 0.0501(…) or 5.01(…)%' provided at least one M1 mark awarded and final answer written correct to 2 d.p
Alternative method: *Amount × 1.0041¹²* – *amount* × $\left(1 + \frac{0.0492}{4}\right)^{4}$ *= correct difference* $\frac{\text{difference}}{\text{amount}}$ *(× 100)* *= 0.02%*	*M2* *A1* *M1* *A1*	*M1 for a subtraction with 1 correct product* *From M2 only* *FT 'their values' provided at least M1 previously awarded* *Needs to be correct to 2 d.p. on FT*
7(a) Frequency density	B1	
7(b) 'No' OR 'You cannot tell' AND e.g. 'The heaviest player could have been 140 kg and the lightest player could have been 70 kg, but we cannot tell', 'It doesn't give you the mass of any player', 'You cannot tell exact weights because it is grouped data' OR No AND e.g. 'The lightest and heaviest players could not be 70kg and 140kg because of how groups are written'	E1	Do not accept reasons e.g. 'Because it is grouped data' without further explanation about how the data could be distributed in the groups, or 'The graph is not accurate enough'
7(c) 10×0.8 + 10×1.1 + 20×0.1 = 21	M1 A2	Allow for x×0.8 + 10×1.1 + 20×0.1, where $6 \leq x < 10$ May be seen on the diagram CAO A1 for 17.8, possibly rounded to 17 or 18 If no marks, SC1 for sight of 10×1.1 + 20×0.1, or 11 + 2, or 13 May be seen on the diagram

7(d) (Mid-points) 80, 95, 105, 115, 130 (Frequencies of) 8, 5, 8, 11, 2	B1 B1	May be seen on the graph May be seen on the graph or in (c) FT 'their 8, 11, 2' from (c)
$80\times8 + 95\times5 + 105\times8 + 115\times11 + 130\times2$ or equivalent $(640 + 475 + 840 + 1265 + 260 = 3480)$	M1	FT their frequencies (but not use of frequency densities 0.4, 0.5, 0.8, 1.1 and 0.1) AND FT their mid-points provided they are within the groups (inclusive of the boundaries)
$\div 34$	m1	Allow FT for the sum of their frequencies
$= 102.3(529\ldots)$ or 102.4	A1	CAO Allow an answer of 102 from correct working
8(a) (radius =) $15 \times 33 \div (22 + 33)$ or $15 \times {}^{3}/_{5}$ $(= 9)$ or equivalent	B2	Working MUST be shown here May be seen with appropriate tangent ratios If Pythagoras used, appropriate use of the scale factor would be needed Allow B1 for sight of ${}^{33}/_{55}$ or equivalent OR ${}^{55}/_{33}$ or equivalent
Sight of $1/3\times\pi\times15^2\times55$ OR $1/3\times\pi\times9^2\times33$	B1	(12952 to 12961 OR 2797.7 to 2800)
$1/3\times\pi\times15^2\times55 - 1/3\times\pi\times9^2\times33$ $= 4125\pi - 891\pi$ $(= 3234\pi$ $(cm^3))$	M1 A1	Accept values in the range 10154.7 to 10161.2 (cm^3)

8(b) (Scale factor =) $\frac{28.6}{22}$ (=1.3) OR $\frac{22}{28.6}$ (=0.769…)	B1	
(Volume factor =) $(28.6/22)^3$ or 1.3^3 OR $(22/28.6)^3$ or $0.769…^3$	B1	Or 2.197 Or 0.455…
3234π × $(28.6/22)^3$ or ÷ $(22/28.6)^3$ OR $\frac{3234\pi}{8 \times 1000} \times 1.75$	M1	Accept numerical values for 3234π (10154.7 to 10161.2) Allow use of the conversion 1 litre = 1.75 to 1.76 pints
= 22309 to 22324.3 (or 7105(.098)π to 7105.1π) OR = 2.22 to 2.26 (or 0.707π to 0.719π)	A1	
$\frac{\times 1.75}{8 \times 1000}$ OR × $(28.6/22)^3$ or ÷ $(22/28.6)^3$	M1	Allow use of the conversion 1 litre = 1.75 to 1.76 pints FT 'their derived 22309 to 22324.3' OR FT 'their 2.2(2…)' from use of 3234π
= 4.8(8…) to 4.96(…) (gallons)	A1	Allow an answer of 5 (gallons) from correct working Allow 1.55π to 1.58π (gallons). Do not accept 1.6π Allow the conversion into gallons for the M1 mark from any of the following also 1 pint = 567 to 570 ml ÷ 8 ÷ (567 to 570) 1 gallon = 4.5 to 4.55 litres ÷ 1000 ÷ (4.5 to 4.55) 1 litre = 0.219 to 0.22 gallons ÷ 1000 × (0.219 to 0.22)
Alternative method: *(Scale factor =)* $\frac{28.6}{22}$ *(=1.3)*	*B1*	
Dimensions of 19.5, 71.5, 11.7, 42.9	*B1*	*Allow B1 for any 3 correct dimensions*
$1/3\times\pi\times19.5^2\times71.5 - 1/3\times\pi\times11.7^2\times42.9$	*M1*	*(28456 to 28475) – (6146 to 6151)*
= 22 309 to 22 324.3 (cm^3)	*A1*	*Or 7105(.098)π to 7105.1π*
(22 309 to 22 324.3) $\frac{\times 1.75}{8 \times 1000}$	*M1*	Allow use of the conversion 1 litre = 1.75 to 1.76 pints *FT 'their derived 22309 to 22324.3'*
= 4.8(8…) to 4.96(…) (gallons)	*A1*	*Allow an answer of 5 (gallons) from correct working* *Allow 1.55π to 1.58π (gallons). Do not accept 1.6π* *Allow the conversion into gallons for the M1 mark from any of the following also* *1 pint = 567 to 570 ml ÷ 8 ÷ (567 to 570)* *1 gallon = 4.5 to 4.55 litres ÷ 1000 ÷ (4.5 to 4.55)* *1 litre = 0.219 to 0.22 gallons ÷ 1000 × (0.219 to 0.22)*

9. Use of cosine rule followed by sine rule Distance of Alpha from Aberwyn (distance =) $\sqrt{5.5^2 + 2.4^2 - 2 \times 5.5 \times 2.4 \times \cos 76(^\circ)}$ or (dist =) $\sqrt{}$29.623… (distance =) 5.4(427…) (km) Distance of Beta from Aberwyn (distance =) $\frac{5.4(427\ldots)}{\sin 118(^\circ)} \times \sin 32(^\circ)$ = 3.2(4…) to 3.3 (km)	S1 M2 A1 M2 A1	 M1 for (distance^2 =) $5.5^2 + 2.4^2 - 2\times5.5\times2.4\times\cos76(^\circ)$ or (dist^2 =) 29.623… CAO FT 'their derived 5.4(427…)' M1 for $\frac{\text{distance}}{\sin32(^\circ)} = \frac{5.4(427\ldots)}{\sin118(^\circ)}$ FT from M2 for their sine rule only
10(a) 0.035 × (250 000 – 180 000) + 0.05 × (255 000 – 250 000) (= 2450 + 250 = 2700)	B2	B1 for 0.035 × (250 000 – 180 000) (= 2450) OR B1 for 0.05 × (255 000 – 250 000) (= 250)

10(b) Sight of 0.05 × (x – 250 000) = 0.05x – 12 500	B1 B1	May be embedded in their equation May be embedded in their equation
		<u>No further marks unless an appropriate equation seen</u>
x + 2450 + 0.05x – 12 500 = 327 000 or equivalent	M1	FT 'their 0.035(250 000 – 180 000)' AND 'their 0.05 × 250 000'
1.05x – 10 050 = 327 000 OR 1.05x = 337 050	m1	
x = (£)321 000	A1	CAO
		If no marks awarded, award SC2 for x = (£)321 000 If B1 only previously awarded, replace with SC2 for x = (£)321 000
		Note: If a candidate uses x as being the amount over £250 000, then award B0B0 followed by M1 for 1.05x + 180 000 + (1.035 x 70 000) = 327 000 or equivalent A1 for x = (£) 71 000 A1 for (£) 321 000
Alternative method: *Sight of 0.05 × (x – 255 000)* *= 0.05x – 12 750*	*B1* *B1*	*May be embedded in their equation* *May be embedded in their equation*
		<u>No further marks unless an appropriate equation seen</u>
x + 2700 + 0.05x – 12 750 = 327 000	*M1*	*FT 'their 2700' AND 'their 0.05 × 255 000'*
1.05x – 10 050 = 327 000 OR 1.05x = 337 050	*m1*	
x = (£)321 000	*A1*	*CAO*
		If no marks awarded, award *SC2 for x = (£)321 000* *If B1 only previously awarded, replace with* *SC2 for x = (£)321 000*
		Note: If a candidate uses x as being the amount over £255 000, then award B0B0 followed by *M1 for 1.05x + 180 000 + 75 000 + 2700 = 327 000* *A1 for x = (£) 66 000* *A1 for (£) 321 000*