



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 $9.9 \text{ (m)} \leq x < 10 \text{ (m)}$ and $99.9 \text{ (m)} \leq y < 100 \text{ (m)}$ 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 $(9.95 + 9.95 + 99.5 =) 119.4 \text{ (m)}$
<i>1. Alternative method:</i> $100 + 10 + 10 - 3 \times 0.05$ 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 (cm³) to 378.7 (cm³) or 379 (cm³)	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) $9.3 \times 4.2 \div 3.6$ or $1.16666... \times 9.3$ or $9.3 \div (3.6 \div 4.2)$ or equivalent 10.85 (cm)	M1 A1	Allow M1 for 1.16×9.3 or 1.17×9.3 or $9.3 \div 0.85(7...)$ Allow answers in the inclusive range 10.78 (cm) to 10.95 (cm)

3(a) (Number of units is) 800 (Electricity cost is) 800×0.23 or 800×23 (£)184 or 18400(p) (Standing charge + electricity) (£) 208 or 20800(p) (Total bill including VAT at 5%) 1.05×208 or 1.05×20800 or equivalent (£)218.4(0) or 21840(p) (Budget per month $\text{£}218.40 \div 3 =$) (£)72.8(0) or 7280(p)	B1 M1 A1 B1 M1 A1 B1	FT 'their 20950 – 20150', must be from attempting this subtraction If units are given they must be correct Accept £184.00p, do not accept £184p FT 24 + 'their 184' provided units are consistent May be in implied or embedded in further work, e.g. if $184 \times 1.05 + 24$ seen and calculated correctly to (£)217.2(0) 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 CAO FT 'their total bill' $\div 3$ 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 $(\text{£})201.6(0) \div 3 = (\text{£})67.2(0)$ - standing charge omitted $(\text{£})193.2(0) \div 3 = (\text{£})64.4(0)$
3(a) Alternative method: (Number of units is) 800 (Electricity cost is) 800×0.23 or 800×23 (£)184 or 18400(p) (Budget before VAT $184 \div 3 + 24 \div 3 =$) (£) 69.33(3..) (Total bill including VAT at 5%) $1.05 \times (184 \div 3 + 24 \div 3)$ or equivalent (Budget per month) (£)72.8(0) or 7280(p)	B1 M1 A1 B1 M2 A1	Watch for stages in other orders, check for embedded equivalent stages FT 'their 20950 – 20150', must be from attempting this subtraction If units are given they must be correct Accept £184.00p, do not accept £184p FT 'their 184' + 8 provided units are consistent May be implied or embedded in further work, e.g. if $(184 \div 3) \times 1.05 + 8$ seen and calculated correctly to (£)72.4(0) FT 'their $184 \div 3 + 24 \div 3$' M1 for either of the following: $1.05 \times \text{'their } 184 \div 3 \text{'}$ (no standing charge included) $1.05 \times \text{'their } 184 \div 3 \text{' } + 8$ (no VAT on standing charge) 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) $500 \times 1.022^5 \times 1.016^{15}$ ($500 \times 1.022^5 = 557.473\dots$) ($500 \times 1.016^{15} = 634.418\dots$ or 634.42) 		

4(b) (Discount cost of bricks) $(516 - 8 \times 22.5(0) =)$ (£) 336 $100 \times 336 \div 80$ or $100 \times \frac{336}{80}$ (£) 420	B1 M1 A1	FT 'their $516 - 8 \times 22.5(0)$' provided $\neq 516$ and $\neq 180$ for M1 and possible A1 If no marks, award SC2 for $(516 \div 0.8 - 180 =)$ (£) 465 OR SC1 for $(516 \div 0.8 =)$ (£) 645 or $(100 \times 180 \div 80 =)$ (£) 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 $\left(1 + \frac{0.0492}{12}\right)^{12} - 1$ $= 0.0503(\dots)$ or $5.03(\dots)\%$ Banc Gwynedd $\left(1 + \frac{0.0492}{4}\right)^4 - 1$ $= 0.0501(\dots)$ or $5.01(\dots)\%$ (Answer =) 0.02%	M1 A1 M1 A1 B1	Do not accept $0.0503(\dots)\%$ unless corrected in further work Do not accept $0.0501(\dots)\%$ unless corrected in further work FT 'their $0.0503(\dots)$ or $5.03(\dots)\%$' AND FT 'their $0.0501(\dots)$ or $5.01(\dots)\%$' provided at least one M1 mark awarded and final answer written correct to 2 d.p
<i>Alternative method:</i> $Amount \times 1.0041^{12} - amount \times \left(1 + \frac{0.0492}{4}\right)^4$ $= \text{correct difference}$ $\frac{\text{difference}}{\text{amount}} (\times 100)$ $= 0.02\%$	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) $10 \times 0.8 + 10 \times 1.1 + 20 \times 0.1$ $= 21$	M1 A2	Allow for $x \times 0.8 + 10 \times 1.1 + 20 \times 0.1$, 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 $10 \times 1.1 + 20 \times 0.1$, 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 $80 \times 8 + 95 \times 5 + 105 \times 8 + 115 \times 11 + 130 \times 2$ or equivalent $(640 + 475 + 840 + 1265 + 260 = 3480)$ $\div 34$ $= 102.3(529...) \text{ or } 102.4$	B1 B1 M1 m1 A1	May be seen on the graph May be seen on the graph or in (c) FT 'their 8, 11, 2' from (c) 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) Allow FT for the sum of their frequencies CAO Allow an answer of 102 from correct working
8(a) (radius =) $15 \times 33 \div (22 + 33)$ or $15 \times \frac{3}{5}$ (= 9) or equivalent Sight of $\frac{1}{3} \times \pi \times 15^2 \times 55$ OR $\frac{1}{3} \times \pi \times 9^2 \times 33$ $\frac{1}{3} \times \pi \times 15^2 \times 55 - \frac{1}{3} \times \pi \times 9^2 \times 33$ $= 4125\pi - 891\pi (= 3234\pi \text{ (cm}^3\text{)})$	B2 B1 M1 A1	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 $\frac{33}{55}$ or equivalent OR $\frac{55}{33}$ or equivalent (12952 to 12961 OR 2797.7 to 2800) Accept values in the range 10154.7 to 10161.2 (cm³)

8(b) (Scale factor =) $\frac{28.6}{22}$ (=1.3) OR $\frac{22}{28.6}$ (=0.769...) (Volume factor =) $(28.6/22)^3$ or 1.3^3 OR $(22/28.6)^3$ or $0.769...^3$ 3234π $\times (28.6/22)^3$ or $\div (22/28.6)^3$ OR $\frac{3234\pi \times 1.75}{8 \times 1000}$ = 22309 to 22324.3 (or $7105(.098)\pi$ to 7105.1π) OR = 2.22 to 2.26 (or 0.707π to 0.719π) $\frac{\times 1.75}{8 \times 1000}$ OR $\times (28.6/22)^3$ or $\div (22/28.6)^3$ = 4.8(8...) to 4.96(...) (gallons)	B1 B1 M1 A1 M1 A1	Or 2.197 Or 0.455... Accept numerical values for 3234π (10154.7 to 10161.2) Allow use of the conversion 1 litre = 1.75 to 1.76 pints 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 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 $\frac{1 \text{ pint} = 567 \text{ to } 570 \text{ ml}}{\div 8 \div (567 \text{ to } 570)}$ $\frac{1 \text{ gallon} = 4.5 \text{ to } 4.55 \text{ litres}}{\div 1000 \div (4.5 \text{ to } 4.55)}$ $\frac{1 \text{ litre} = 0.219 \text{ to } 0.22 \text{ gallons}}{\div 1000 \times (0.219 \text{ to } 0.22)}$
<i>Alternative method:</i> (Scale factor =) $\frac{28.6}{22}$ (=1.3) Dimensions of 19.5, 71.5, 11.7, 42.9 $1/3 \times \pi \times 19.5^2 \times 71.5 - 1/3 \times \pi \times 11.7^2 \times 42.9$ = 22 309 to 22 324.3 (cm^3) $(22\,309 \text{ to } 22\,324.3) \times \frac{1.75}{8 \times 1000}$ = 4.8(8...) to 4.96(...) (gallons)	B1 B1 M1 A1 M1 A1	Allow B1 for any 3 correct dimensions (28456 to 28475) – (6146 to 6151) Or $7105(.098)\pi$ to 7105.1π Allow use of the conversion 1 litre = 1.75 to 1.76 pints FT 'their derived 22309 to 22324.3' 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 $\frac{1 \text{ pint} = 567 \text{ to } 570 \text{ ml}}{\div 8 \div (567 \text{ to } 570)}$ $\frac{1 \text{ gallon} = 4.5 \text{ to } 4.55 \text{ litres}}{\div 1000 \div (4.5 \text{ to } 4.55)}$ $\frac{1 \text{ litre} = 0.219 \text{ to } 0.22 \text{ gallons}}{\div 1000 \times (0.219 \text{ to } 0.22)}$

9. Use of cosine rule followed by sine rule Distance of Alpha from Aberwyn $(\text{distance} =) \sqrt{5.5^2 + 2.4^2 - 2 \times 5.5 \times 2.4 \times \cos 76(^{\circ})}$ or (dist =) $\sqrt{29.623\dots}$ (distance =) 5.4(427...) (km) Distance of Beta from Aberwyn $(\text{distance} =) \frac{5.4(427\dots)}{\sin 118(^{\circ})} \times \sin 32(^{\circ})$ = 3.2(4...) to 3.3 (km)	S1 M2 A1 M2 A1	M1 for (distance² =) $5.5^2 + 2.4^2 - 2 \times 5.5 \times 2.4 \times \cos 76(^{\circ})$ or (dist² =) 29.623... CAO FT 'their derived 5.4(427...)' M1 for $\frac{\text{distance} = 5.4(427\dots)}{\sin 32(^{\circ}) \quad \sin 118(^{\circ})}$ FT from M2 for their sine rule only
10(a) $0.035 \times (250\,000 - 180\,000)$ $+ 0.05 \times (255\,000 - 250\,000)$ (= 2450 + 250 = 2700)	B2	B1 for $0.035 \times (250\,000 - 180\,000)$ (= 2450) OR B1 for $0.05 \times (255\,000 - 250\,000)$ (= 250)

10(b) Sight of $0.05 \times (x - 250\,000)$ $= 0.05x - 12\,500$ $x + 2450 + 0.05x - 12\,500 = 327\,000$ or equivalent $1.05x - 10\,050 = 327\,000$ OR $1.05x = 337\,050$ $x = (£)321\,000$	B1 B1 M1 m1 A1	May be embedded in their equation May be embedded in their equation <u>No further marks unless an appropriate equation seen</u> FT 'their $0.035(250\,000 - 180\,000)$' AND 'their $0.05 \times 250\,000$' 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 $1.05x + 180\,000 + (1.035 \times 70\,000) = 327\,000$ or equivalent A1 for $x = (£) 71\,000$ A1 for (£) 321 000
<i>Alternative method:</i> Sight of $0.05 \times (x - 255\,000)$ $= 0.05x - 12\,750$ $x + 2700 + 0.05x - 12\,750 = 327\,000$ $1.05x - 10\,050 = 327\,000$ OR $1.05x = 337\,050$ $x = (£)321\,000$	B1 B1 M1 m1 A1	May be embedded in their equation May be embedded in their equation <u>No further marks unless an appropriate equation seen</u> FT 'their 2700' AND 'their $0.05 \times 255\,000$' 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