GCSE MARKING SCHEME

SUMMER 2019

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

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 (3310U50-1)

SUMMER 2019 MARK SCHEME

<table>
<tr><th>GCSE Mathematics – Numeracy
Unit 1: Higher Tier</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1. (Value sum dimensions) 40+25+30 (S = 95)

(Value area largest face) 30 × 40 (F = 1200)

For sight of any 1 of the following:
• (Sum of values S + F =) 1295
• ⅕ × (95 + 1200) × 0(.)02
• ⅕ × 95 × 0(.)02
• ⅕ × 1200 ×0(.)02

Any correct substitution into the given formula, e.g.
(Cost) 1/5 × (95 + 1200) × 0.02 (= 259 × 0.02)
or ⅕ × 95 × 0.02 + ⅕ × 1200 ×0.02 (= 0.38 + 4.8(0))

(=) (£) 5.18</td><td>B1

B1

B1

M1

A1</td><td>Not a FT mark

FT ‘their derived S’ + ‘their derived F’
(‘derived’ meaning not taken from the diagram)
Allow intention of brackets, provided not contradicted
For a single calculation or may be seen in stages

Allow M1 for ⅕ × 1295 × 2 or
⅕ × 95 × 2 + ⅕ × 1200 ×2

Examples of possible FT answers:
<table><tr><th>Sum of values</th><th>Cost in £</th></tr><tr><td>680</td><td>2.72</td></tr><tr><td>740</td><td>2.96</td></tr><tr><td>755</td><td>3.02</td></tr><tr><td>820</td><td>3.28</td></tr><tr><td>1080</td><td>4.32</td></tr><tr><td>1095</td><td>4.38</td></tr><tr><td>1160</td><td>4.64</td></tr><tr><td>1280</td><td>5.12</td></tr><tr><td>1360</td><td>5.44</td></tr></table></td></tr>
<tr><td>2(a)
Correct position indicated</td><td>B3</td><td>Allow ±2 mm and ±2° throughout
Irrespective of any indication of construction correct or otherwise
If not indicated, allow for the correct and unambiguous intersection of the perpendicular bisector and the arc

If not B3, award:
B1 for an arc of radius 4cm in the correct position AND
B1 for perpendicular bisector between Block 1 and Block 2 drawn (accept bisector indicated as a short vertical indication at the midpoint between Block 1 and Block 2)</td></tr>
<tr><td>2(b) Answer in the range 102 to 110 (metres)</td><td>B1</td><td></td></tr>
</table>

3(a) (Cost to Sam) 200 × 25 (= £ 5000) (Number of trees Sam expects to sell is) 200 – 0.22 × 200 or 200 × 0.78 (=) 156 (trees) (Money from sales of trees is 40 × 156 = £) 6240 (Expected profit is £6240 - £5000 =) (£) 1240	M1 M1 A1 B1 B1	 Depends only on previous M1 FT the number of trees sold, i.e. 40 × 'their 156' FT 'their (40 × 'their 156')' – 5000 correctly evaluated
3(a) Alternative method: *(Number of trees Sam expects to sell is)* *200 – 0.22 × 200 or 200 × 0.78* *(=) 156 (trees)* *(Expected profit)* *156 × (40 – 25)* *- (200 – 156) × 25* *(£) 1240*	 *M1* *A1* *M2* *A1*	 *FT 'their 156'* *M1 for 156×(40-25) - ..... or* *.... - (200 – 156) × 25)* *CAO*
3(b) A suitable diagram with at least 3 hexagons (or 2 extra hexagons) shown to tessellate OR Sight of 3 × 120° = 360° or equivalent	E1	ISW A suitable diagram will involve 3 hexagons meeting at a point at least once, the 6 sides of the hexagons must be shown Allow if a correct diagram given with angles unlabelled or incorrectly labelled Do not accept if only the exterior angles (labelled correctly or incorrectly) of the given hexagon shown, need to show further hexagons

4(a) Sight of (Milford Haven to Ruabon) 90 × 1⅓ OR (Ruabon to Swansea) 80 × 1¼	M1	For the appropriate idea of speed × time. Allow sight of • 90 × 80 (minutes) • 80 × 75 (minutes) • 90 × 1.3(3) • 90 × 1.2(0) • 80 × 1.15
(Milford Haven to Ruabon) 120 (miles) AND (Ruabon to Swansea) 100 (miles)	A2	CAO A1 for 90 + 30 or 80 + 20 or equivalent **only** provided there is no evidence of any misconception, e.g. (80 + 35)
(Total distance) 220 (miles)	B1	FT provided at least M1, A1 previously awarded
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.

4(b) (Total time is) 155 (minutes), or for sight of 80 (minutes) and 75 (minutes)	B1	
(Total fuel needed would be) 155 × 0.4 × 4.55, or 80 × 0.4 × 4.55 + 75 × 0.4 × 4.55	M2	FT 'their number of minutes' provided both parts of the journey are considered and both parts take > 60 minutes Use of '÷2.5' is equivalent to '×0.4' (referred to as 'a product' in the details for M1 and A1) M1 for sight of • product of any two of 155, 0.4 and 4.55 seen, OR • product of any two of 80, 0.4 and 4.55 seen AND product of any two of 75, 0.4 and 4.55 seen AND intention to sum these two products
282(.1) (litres)	A2	CAO, accept 280 (litres) only if 282(.1) seen A1 for sight of any one of the following, provided at least M1 previously awarded: • 0.4 × 705.25 • 0.4 × 364 • 0.4 × 341.25 • 4.55 × 32 • 4.55 × 30 • 4.55 × 62 • 1.82 × 155 • 1.82 × 80 • 1.82 × 75 OR A1 for one of the two stages of evaluating products calculated accurately

5(a)(i) 2.5×10^7	B1	
5(a)(ii) 9600 m^3	B1	
5(b) (Volume seen or implied) 59 700 000 (m^3) or 60 000 000 (m^3) OR (Surface area seen or implied, used as) 4.5(4) or 5	B1	Accept using index notation or standard form, e.g. 59.7×10^6, 5.97×10^7, 60×10^6, 6×10^7 Accept exact or correctly rounded volume written in m^3, i.e. do not accept, e.g. 59 000 000 Ignore any units given
Average depth calculation, e.g. • 59 700 000 ÷ 4 540 000 • 60 000 000 ÷ 4 500 000 • 6000 ÷ 450 • 600 ÷ 45 • 60 000 000 ÷ 5 000 000 • 60 ÷ 5 OR sight of a trial and improvement method with suitable correct calculation(s): • 4.54 × 12 = 54.48 and 4.54 × 13 = 59.02 • 4.54 × 13 = 59.02 and 4.54 × 14 = 63.56 • single calculation (not × 13) between 4.54 × 12.1 = 54.934 and 4.54 × 13.1 = 59.474 • 4.5 × 12 = 54 and 4.5 × 13 = 58.5 • 4.5 × 13 = 58.5 and 4.5 x 14 = 63 • single calculation between 4.5 × 13.1 = 58.95 and 4.5 × 13.4 = 60.3 • 5 × 12 = 60	M1	FT e.g. 'their volume' ÷ 4 540 000 Accept written as a fraction Accept exact or rounded values provided estimates are reasonable *Watch for compensating errors, which is M0 and A0*
Answer in the range 12 (m) to 13.5 (m)	A1	CAO, answer must be in this range, no FT

6(a)(i) Maesystrad AND 46 (minutes)	B1	
6(a)(ii) Rhewlteg AND gives decision used unambiguously as <u>median</u>	B1	Accept decision based on median without the use of the term 'median', e.g. 'half of them took more than 39 minutes' Allow, e.g. • Rhewlteg as median is 38 (minutes) (from misreading the scale correct median is 39 minutes) • Rhewlteg as average is 39 (minutes) Do not accept contradictions, decision needs to be solely based on the median
6(a)(iii) Rhewlteg AND 25 (minutes)	B1	
6(a)(iv) 'Don't know' indicated or unambiguously implied AND reason, e.g. 'not told', 'it doesn't say (on the diagam)', 'doesn't give you the number of students/pupils', 'doesn't tell you how many were asked', 'it is about travel times (not number of students)', 'only gives the timings', 'it shows distribution of travel times, not number of students', 'only shows proportions of the students'	E1	Allow, e.g. 'doesn't give you the frequency (of students)', Do not accept, e.g. 'can't tell', 'not enough data', 'shows only median, range and measures of spread'
6(b)(i) 120 (students)	B1	
6(b)(ii) 23 (minutes)	B1	
7(a) Austria	B1	
7(b) United Kingdom	B1	
7(c) Argentina with appropriate working, e.g. Sight of 13 to 16 (for Argentina) AND 3 to 4 (for Canada)	B2	Accept unlabelled population density, provided not ambiguous or from incorrect working B1 for approximate population /km^2 (for Argentina) 13 to 16 OR (for Canada) 3 to 4 B0 for unsupported answer 'Argentina' or if inappropriate working given, e.g. • 4 × 10 000 000 • 'Canada 34 000 000, Argentina 40 000 000'
8(a) 401 (cm^2)	B1	
8(b) A correct evaluation of ($4^{7/2}$ =) 128 OR ($4^{5/2}$ =) 32 $(400 + 4^{7/2}) - (400 + 4^{5/2})$ OR $4^{7/2} - 4^{5/2}$ or equivalent = 96 (cm^2)	B1 M1 A1	or sight of appropriate 528 OR 432 (528 – 432 OR 128 – 32) CAO

9. Use of 275 (volts) AND 285 (volts) OR Use of 0.15 (amps) AND 0.25 (amps) $\frac{V}{I} = R$ (Least possible value of R =) $\frac{275}{0.25}$ = 1100 (ohms) (Greatest possible value of R =) $\frac{285}{0.15}$ = 1900 (ohms)	 B1 B1 M1 A1 M1 A1	Accept use of $0.24\dot{9}$ and $284.\dot{9}$ throughout, but do not accept use of 0.249 and 284.9 May be implied in further working FT 'their 275' provided 270 ≤ V < 280 AND 'their 0.25' provided 0.2 < I ≤ 0.3 CAO FT 'their 285' provided 280 < V ≤ 290 AND 'their 0.15' provided 0.1 ≤ I < 0.2 CAO
10. $AO^2 = 100^2 - 80^2$ or (AO =) $\sqrt{100^2 - 80^2}$ $AO^2 = 3600$ or (AO =) $\sqrt{3600}$ or (AO =) 60 (cm) $AE^2 = 110^2 + 3600$ or equivalent OR (AE =) $\sqrt{110^2 + 60^2}$ or equivalent AE = $\sqrt{15700}$ (cm) ISW	M1 A1 M1 A1	Allow use of $20 \times \sqrt{(5^2 - 4^2)}$ If $\sqrt{3600}$ evaluated, mark final answer FT 'their derived 3600' or 'their derived 60' but not use of 100 or 80 for AO Or $10\sqrt{157}$
Alternative method: *$AO^2 = 100^2 - 80^2$ or (AO =) $\sqrt{100^2 - 80^2}$* *(AE =) $\sqrt{100^2 - 80^2 + 110^2}$* *AE = $\sqrt{15700}$ (cm) ISW*	*M1* *M2* *A1*	*M1 for $100^2 - 80^2 + 110^2$* *Or $10\sqrt{157}$* *If no marks awarded,* *SC2 for $\sqrt{100^2 + 80^2 + 110^2}$ leading to an answer of $\sqrt{28500}$ ISW, or* *SC1 for $100^2 + 80^2 + 110^2$*

11(a) (Area =) $\frac{1}{2} \times 2 \times (0 + 0 + 2(2 + 4 + 4.4 + 4 + 2.6))$ OR $\frac{1}{2} \times 2 \times (4 + 8 + 8.8 + 8 + 5.2)$ $= 34\ (mm^2)$	M2 A1	Award M1 if only one reading incorrect FT from M1
(Volume =) $34 \times 3 \quad (\times 2)$ $= 204\ (mm^3)$	M1 A1	FT from M1 or M2 for a possible M1A1 If no marks previously awarded, FT 'their 34' provided an attempt made to use the trapezium rule for a possible M1 only
Alternative method: $\frac{(0 + 2)}{2} \times 2 + \frac{(2 + 4)}{2} \times 2 + \frac{(4 + 4.4)}{2} \times 2 +$ $\frac{(4.4 + 4)}{2} \times 2 + \frac{(4 + 2.6)}{2} \times 2 + \frac{(2.6 + 0)}{2} \times 2$ *[2 + 6 + 8.4 + 8.4 + 6.6 + 2.6]* $= 34\ (mm^2)$	*M2* *A1*	*Each area may be seen as the sum of the area of a rectangle and a triangle* *M1 for the sum of these 6 areas with one error (maybe repeated) in reading the scale OR with 1 incorrect term* *FT from M1 or M2*
(Volume =) 34 × 3 (× 2) $= 204\ (mm^3)$	*M1* *A1*	*FT from M1 or M2 for a possible M1A1* *If no marks previously awarded, FT 'their 34' provided an attempt made to sum the 6 areas for a possible M1 only*
11(b) 30 × (number of pendants made) ÷ 240 or equivalent (Number of circular pendants in sample =) 12 Sight of any 2 of 6.5, 3.7(5), 7.7(5) or equivalents (Number in sample =) 6, 12, 4, 8	M1 A1 A1 B1	e.g. (number of pendants made) ÷ 8 Sight of this calculation for any shaped pendant Accept mixed numbers Needs to be from correct working Can come from M1A1A0 An unsupported 6, 12, 4, 8 is awarded M1A1A0B1 An unsupported 7, 12, 4, 8 is awarded M1A1A0B0

11(c) (Volume of sphere =) $\frac{4}{3} \times \pi \times 30^3$ (= 36000π)	B1	
$\pi \times \text{radius}^2 \times 40$ (× 5) = $\frac{4}{3} \times \pi \times 30^3$	M1	FT 'their derived volume of sphere'
$\text{radius}^2 = \frac{4 \times \pi \times 30^3}{3 \times \pi \times 40 (\times 5)}$ or equivalent	m1	e.g. $\text{radius}^2 = \frac{36000\pi}{\pi \times 40 (\times 5)}$
$\text{radius}^2 = 180$ or (radius =) $\sqrt{180}$	A1	CAO
$= 6\sqrt{5}$ (mm)	B2	For B2, FT 'their derived 180' provided their 'b' is as small as possible and that 'their derived 180' can be simplified If 'their derived 180' is a square number, then B1 only can be awarded for the correct square root of 'their 180' For B1, FT 'their derived 180' B1 for writing 180 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. 4 × 45, 3 × 3 × 20, OR B1 for writing $\sqrt{180}$ as a product of 2 or more factors where one of the factors OR the product of a pair of their factors is a whole number e.g. $\sqrt{5} \times \sqrt{12} \times \sqrt{3}$

12(a)(i) e.g. $100x = 8.333\ldots$, $1000x = 83.333\ldots$ AND an attempt to subtract both sides $= \frac{75}{900}$ or $\frac{825}{9900}$ or $\frac{8325}{99900}$ or equivalent $= \frac{1}{12}$	M1 A1 A1	 Allow A1 for e.g. 7.5/90 FT from M1A0 provided of equivalent difficulty
12(a)(ii) (Area =) $\frac{1}{12} \times \pi \times 120^2$ or equivalent $= 1200\pi$ (cm^2)	 M1 A1	FT 'their 1/12' from (i) throughout If no marks awarded, SC1 for ($11/12 \times \pi \times 120^2$ or equivalent =) 13200π (cm^2)
12(b) Sight of $\frac{x}{360} \times 2 \times \pi \times 36$ or equivalent $\frac{x}{360} \times 2\times\pi\times36 + 90 = 200$ or equivalent $\frac{x}{360} \times 2\times\pi\times36 = 200 - 90$ or equivalent $\frac{x}{5} \times \pi = 200 - 90$ OR $(x =) \frac{(200 - 90) \times 360}{2\times\pi\times36}$ $x = \frac{550}{\pi}$	B1 M1 m1 m1 A1	e.g. $\frac{x}{5} \times \pi$. Accept any symbol for x These two m1 marks can be done in any order For isolating the x term For fully simplifying the fraction correctly OR for isolating x Needs to come from convincing work from M1m1m1 e.g. $\frac{39600}{72\pi}$ or $\frac{110 \times 360}{72\pi}$ If no marks awarded or B1 only awarded, then SC1 for $\frac{550}{360\pi} \times 2 \times \pi \times 36$ or equivalent AND possibly another SC1 for convincing work showing that this simplifies to 110, and that 110 + 90 = 200