GCSE MARKING SCHEME

AUTUMN 2019

GCSE
MATHEMATICS – COMPONENT 1 (HIGHER TIER)
C300UA0-1

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.

GCSE MATHEMATICS

COMPONENT 1 - HIGHER TIER

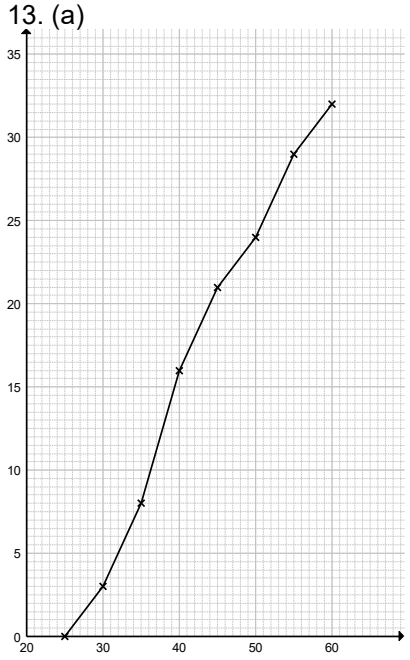
AUTUMN 2019 MARK SCHEME

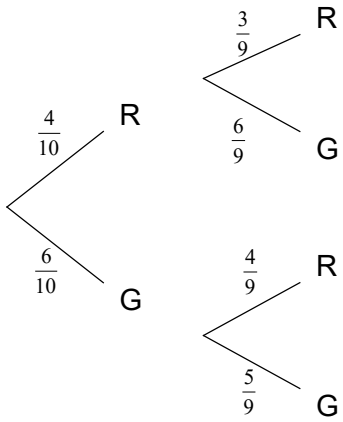
GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
1.* For the plan: draws a circle, radius 3 cm and for the side elevation: draws a 4 cm by 6 cm rectangle	B3	Circle must be drawn with compasses and rectangle must be ruled. B2 for either the plan or elevation correct or for good freehand sketches of both the correct circle and the correct rectangle or B1 for a circular plan with incorrect radius or for a rectangular side elevation with incorrect dimensions or for a good freehand circle for the plan or a good freehand rectangle for the elevation; may also have incorrect dimensions
	(3)	
2.*(a) Two distinct reasons based on sample size, location, time or bias. e.g. 'She needs to ask more than 20 people.' or 'She needs to vary the time that she asks people' or 'People at the bus station may be biased against cars'	E2	E1 for each valid reason; reasons need to be distinct; comments made regards time could be 'hours spent' or 'time of day' or 'days of the week attended' and these can be considered as distinct Allow e.g. 'It's only the first 20 people.' (sample size) or 'People might have to get on the bus.' (location) or 'It will be all school children at that time of day.' (time or bias) Do not allow e.g. 'People might lie' or 'People might not want to talk.'
(b) Two distinct criticisms based on time frame **and** response boxes. e.g. 'She has not said per day, per week etc' or 'The times are too vague' or 'There is nowhere to answer if you do not have a car' or ' 4 is repeated'	E2	E1 for each valid criticism; criticisms need to be distinct (one comment only on response boxes and one on time frame omitted) Allow e.g. 'It is not specific enough.' (BOD time) or 'People might not have a car.' (Response boxes)
	(4)	
3. $(3 \times 10^6) \div (2 \times 10^6)$ oe 1.5 km	M1 A1 B1	Allow for $(3 \times 10^6) \div (1.8 \times 10^6)$ FT 'their estimate' If M0 then allow SC1 for sight of $(2.99 \times 10^6) \div (1.799 \times 10^6)$ Appropriate unit for their answer e.g. 1500 m gets M1 A1 B1; allow for 'km' even if no calculation attempted
	(3)	

4.* (a) $2x = 5$ $x = \frac{5}{2}$ oe, ISW	 B1 B1	 FT from 'their $ax = b$' provided $a \neq b$ or 0 or 1 and $b \neq 0$; accept $\frac{b}{a}$ but if on FT $\frac{b}{a}$ simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1.
(b) $x = 3$ $y = 2$	 B1 B1	
(c) Line with solid circles at both ends starting at –2 and ending at 3	B1	
(d) $2x < 4 \times 3$ $x < 6$	 M1 A1	 No marks for use of "=", unless finally replaced to give $x < 6$ then award M1 A1. $x <= 6$ is A0
	(7)	
5. (a) 34.50 × 2 + (34.50 × 2) ÷ 4 oe si (£)86.25	 M2 A1	 e.g. for 69 + 17.25 or $\frac{3450 \times 2 \times 1\frac{3}{12}}{100}$ or $\frac{3450 \times 2\frac{1}{2}}{100}$ oe M1 for 34.50 × 2 oe si or for 3450 × 1.02 – 3450 (= 3519 – 3450) or for sight of (£)69 or for sight of 2.5% oe
(b) $\frac{65 \times r \times 5}{100} = 9.75$ or $\frac{65 \times r}{100} = \frac{9.75}{5}$ or 1.95 (per year interest) oe (r =) $\frac{9.75 \times 100}{5 \times 65}$ oe 3 ISW	 M1 M1 A1	 e.g. $\frac{1.95}{65} \times 100$ or sight of $\frac{3}{100}$ Allow 3%
Alternative method 1: $\frac{65 \times 5}{100}$ $(= 3.25)$ *oe* *9.75 ÷ 3.25* *3 ISW*	 *M1* *M1* *A1*	 *FT 'their 3.25'* *Allow 3%*
Alternative method 2: *9.75 ÷ 0.65 (=15) oe* *15 ÷ 5* *3 ISW*	 *M1* *M1* *A1*	 *May be found using a build-up method* *FT 'their 15'* *Allow 3%*
	(6)	

6.* $7+\frac{5}{20}+\frac{9}{20}$ or $\frac{105}{20}+\frac{49}{20}$ oe; si **and** $3+\frac{5}{20}-\frac{9}{20}$ or $\frac{105}{20}-\frac{49}{20}$ oe; si $7\frac{7}{10}$ and $2\frac{4}{5}$	M2 A2	equivalents may be decimals 5.25 + 2.45 and 5.25 – 2.45 M1 for $5\frac{5}{20}+2\frac{9}{20}$ oe or $5\frac{5}{20}-2\frac{9}{20}$ oe or 5.25 + 2.45 or 5.25 – 2.45 CAO A1 for either or for a pair of correct, but unsimplified, answers
	(4)	
7.* (*BD* =) $\sqrt{6^2+8^2}$ 10 45	M1 A1 A1	Allow for comment e.g. 'Pythagorean triple is 6, 8, 10.' or '6, 8, 10 is a right-angled triangle.' (must be clear it is a triple and not just listing the 3 values from the diagram) Allow poor use of notation if intent is clear. does not imply M1 unless it is clear that *BD* = 10 (either in a statement, on the diagram or from $\tan x = \frac{10}{10}$). dep on all previous marks being awarded
	(3)	
8.*(a) (752 – 27 =) 725 725 ÷ 25 29	 B1 M1 A1	 FT 'their 752 – 27'
Alternative method 1: *752 ÷ 25* *30 remainder 2 or 30.08* *29*	 *M1* *A1* *A1*	
Alternative method 2: *At least two trials of 25 × n or 752 ÷ n, where n is greater than 20* *25 × 29 = 725* *29*	 *M1* *A1* *A1*	 *implies M1*
(b)(i) Valid explanation e.g. 'There are more guests so the food should not last longer.' or 'He has halved instead of doubling.' or 'The food will last for less time if there are more people.'	 E1	 'It is impossible' without further explanation is E0 Allow e.g. 'If you divide one side you have to multiply the other,' Do not allow e.g. 'You have to multiply not divide.' (too vague)
(b)(ii) 4 (days)	 B2	 B1 for a correct intermediate step e.g. 10 guests and 12 days or for $\frac{20\times 6}{30}$ oe si
	(6)	

9.* $\frac{1}{8}$ oe; ISW	B2	B1 for $\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$ oe If no marks awarded, then SC1 for evidence of the only possible score being 1, 1, 1 e.g. in a partially complete list of possible scores with all other scores even and $1 \times 1 \times 1$ listed as odd
	(2)	
10. (length of hedge = 11 × 1.2 ÷ 2 =) 6.6 (m) or (width of garden = 13 × 1.2 ÷ 2 =) 7.8 (m)	B1	Check diagram for either
(pond is) 8 (m) by 3.5 (m)	B2	B1 for use of 28 and 8 in an attempt to calculate the width of the pond.
(flowerbed is) 10 (m) by 1.5 (m)	B1	FT 'their 8' + 2 by 'their 3.5' – 2
(area of grass =) $10 \times (6.6 + 1.2) - 10 \times 1.5 - 28$ or $3.5 \times 2 + 10\,(6.6 + 1.2 - 1.5 - 3.5)$ or $(3.5 + 2.8) \times 2 + 8 \times 2.8$ oe	M1	FT 'their derived 10, 6.6, 7.8, 1.5 and 3.5'
35 (m^2)	A1	CAO
	(6)	
11. (Proportion of tagged coots in sample is) $\frac{20}{48}\left(=\frac{5}{12}\right)$ oe or (Proportion of sample tagged is) $\frac{20}{30}\left(=\frac{2}{3}\right)$ oe	M1	
$\frac{5}{12}=\frac{30}{72}$ or $\frac{2}{3}=\frac{48}{72}$ or	M1	Implies the first M1;
$\frac{1}{12}$ (of population) is 6 (coots) oe		allow $\frac{30}{x}=\frac{20}{48}$ or $\frac{48}{x}=\frac{20}{30}$ or $\frac{30\times48}{20}$ oe to score M1 M1
72	A1	CAO
	(3)	

12. (a) m = 2 si c = 1 si $y = 2x + 1$	 B1 B1 B1	 could be gradient = 2 could be y-intercept = 1 Implies all 3 marks
(b) $m = -0.5$ si (midpoint =) (1, 3) $3 = -0.5(1) + c$ $y = -0.5x + 3.5$ ISW	 B1 B1 M1 A1	 FT 'their gradient *AB*'; must be clear indication of being the gradient FT 'their -0.5' provided $\neq 2$; Accept other full methods e.g. $\frac{y-3}{x-1} =$ 'their -0.5' or $y - 3 =$ 'their -0.5'$(x-1)$ Accept any correct form e.g. $\frac{y-3}{x-1} = -0.5$ or $y - 3 = -0.5(x-1)$
	(7)	
13. (a)  	B2	 40 | 45 | 50 | 55 | 60 16 | 21 | 24 | 29 | 32 B1 for remaining points plotted correctly B1 for all remaining correctly-plotted points joined correctly with straight lines or a smooth curve and no extension beyond (60, 32) If no marks, award SC1 for at least 4 points plotted correctly and joined with straight lines or a smooth curve and no extension beyond (60, 32)
(b)(i) 8	 B1	 or FT 'their CF diagram'
(b)(ii) 35 40	 B1	 or FT 'their CF diagram'
(c) (i) Box plot with ends of whiskers at 26 and 60 LQ 35 Median 40 UQ 50	 B1 B1 B1 B1	 or FT 'their CF diagram' or FT 'their CF diagram' or FT 'their CF diagram'
(c)(ii) Valid explanation e.g. 'The slowest time could be anything between 55 and 60.' or 'The slowest time could be 58 seconds.'	 E1	 Must include idea of 'less than'. Allow 'The slowest time could be less than 60.' Do not allow e.g. 'We do not know that anyone took 60 seconds.' (no idea of less than)

(c)(iii) Valid effect on the range e.g. The (actual) range will be smaller. Valid effect on the IQR e.g. The IQR will not change.	E1 E1	Allow e.g. 'It will be smaller.' or 'Eddie's range is bigger than it should be'. Do not allow e.g. 'It makes it bigger.' without reference to this being a comment about Eddie's range.
	(11)	
14. (a) 125	B2	B1 for sight of 5^3 or for $\left(\frac{1}{125}\right)^{-1}$; allow for sight of $\frac{1}{5^3}=\frac{1}{125}$
(b) 64	B2	not from wrong working; B1 for 4^3 or for $\left(\sqrt[4]{256}\right)^3$
(c) 7	B1	Accept 7 to 7.2 inclusive
	(5)	
15.(a) Correct tree diagram  	B3	B1 for left hand branches correct B1 for top right branches correct B1 for bottom right branches correct Allow equivalent fractions or exact decimals in all cases. If no marks then SC1 for two correct probabilities
(b) $\frac{4}{10}\times\frac{6}{9}+\frac{6}{10}\times\frac{5}{9}$ oe $\frac{54}{90}$ oe; ISW	M2 A1	FT 'their probability tree' M1 for either product CAO; Ignore any attempts to cancel or decimalise after a correct answer seen $\frac{54}{90}$ implies 3 marks but an answer of $\frac{6}{10}$ or $\frac{3}{5}$ without working earns 3 marks **only** if a correct tree seen in part (a).
	(6)	

16. (a) $y \propto \frac{1}{\sqrt[3]{x}}$ OR $y = \frac{k}{\sqrt[3]{x}}$ oe	B1	Allow $y \propto \frac{k}{\sqrt[3]{x}}$;
$2 = \frac{k}{\sqrt[3]{27}}$ OR $2 = \frac{k}{3}$ OR $k = 6$	M1	M1 implies B1 FT (for possible B0 M1 A0) for use of $y \propto x^{\frac{1}{3}}$ or $y \propto \frac{1}{x^n}$ with $n > 0$ and $n \neq \frac{1}{3}$
$y = \frac{6}{\sqrt[3]{x}}$	A1	CAO; may be seen (explicitly) in part (b)
(b)(i) (y =) 0.6 oe	B1	FT 'their derived k' or use of $y \propto x^{\frac{1}{3}}$ or $y \propto \frac{1}{x^n}$ with $n > 0$ and $n \neq \frac{1}{3}$
(b)(ii) $\sqrt[3]{x} = \frac{6}{3}$ oe	M1	FT 'their derived k' or use of $y \propto x^{\frac{1}{3}}$ or $y \propto \frac{1}{x^n}$ with $n > 0$ and $n \neq \frac{1}{3}$
(x =) 8	A1	FT
	(6)	
17. (a)(i) $V_1 = 0.8 \times 10000$ (= 8000)	B1	
(a)(ii) $V_2 = 0.8 \times V_1 = 6400$ si	B1	Allow poor use of notation
$V_3 = 0.8 \times V_2 = 0.8 \times 6400$ si	M1	FT 'their $V_2 = 0.8 \times V_1$'
$V_3 = 5120$	A1	Implies all 3 marks
(b) $V_0 = 240000$ $V_{n+1} = 1.02V_n$ where $n \geq 0$	B1	Accept 1.02 × V_n
	(5)	
18. (a) $y = 2(x+1)(x-4)$ oe; ISW	B3	B2 for $y = k(x+1)(x-4)$, where k is –2 or any non-zero positive value e.g. 1 or B1 for a factor of $(x+1)$ or $(x-4)$ seen or implied If no marks then SC2 for an answer of $y = 2(x-1)(x+4)$ or equivalent or SC1 for an answer of $y = k(x-1)(x+4)$ oe, where k is –2 or any non-zero positive value e.g. 1
(b) Substitutes a pair of co-ordinates with non-zero x co-ordinate into $y = k^x$	S1	
4	B1	not from wrong working; implies S1
	(5)	
19. (a) 243	B2	B1 for 3^5 oe
(b) $\frac{2}{3}$ oe	B2	B1 for p × 'their m' = 2×3^4 oe or for sight of $\frac{3^4 \times 2}{3^5}$ or $\frac{3^5 \times 2}{3}$ oe
	(4)	

20. (a) $7\sqrt{11}$	B2	Allow k = 7; B1 for $2\sqrt{11}$ or $5\sqrt{11}$ seen
(b) $\frac{3-\sqrt{3}-\sqrt{3}+1}{\sqrt{3}}$ or better $\frac{3-\sqrt{3}-\sqrt{3}+1}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}$ or $\frac{4}{\sqrt{3}}-2$ $\frac{4}{3}\sqrt{3}-2$	 M1 M1 A1	M marks may be awarded in reverse order For squaring the numerator with at least 3 terms out of 4 correct; may be implied by e.g. $\frac{3-2\sqrt{3}-1}{\sqrt{3}}$ For rationalising the denominator or writing as a simplified binomial For correct completion to given form
Alternative method: $\frac{3-\sqrt{3}-\sqrt{3}+1}{\sqrt{3}}$ $(=c\sqrt{3}+d)$ $4-2\sqrt{3}=3c+d\sqrt{3}$ *and e.g. compares appropriate terms* $c=\frac{4}{3}$ $d=-2$	 *M1* *M1* *A1*	
(c) Any values such that x and y are not square and $y = 4x$	B2	B1 for values x and y such that $y = 4x$ oe, si
	(7)	
21. (a) 14	B2	B1 for $2\times\sqrt{49}$ or for radius = 7 si
(b) (–7, 7)	B2	FT 'their derived radius' from part (a) B1 for $T\left(-\sqrt{49},\sqrt{49}\right)$ or equations of tangents stated as $x = -7$ and $y = 7$ or clear sketch with correct intersecting tangents marked and axes appropriately numbered. NB Sketch may be in answer space for part (a).
	(4)	

22.(a)(i) Valid explanation e.g. '7 divided by 0 is not defined.'	E1	Accept e.g. 'You cannot divide by 0.' 'The denominator is 0.' is not sufficient
(a)(ii) Swop variables and change subject or vice versa	M1	Allow one sign or arithmetic slip
$y = \frac{7}{x} + 1 \left(f^{-1}(x) = \frac{7}{x} + 1 \right)$	A1	CAO
(b) $(hg(x) =)\ 9(x + 1)$	B2	B1 for $9(\sqrt[3]{x+1})^3$
$9(x + 1)(x - 1) = 7$	M1	FT 'their hg' if of equivalent difficulty
$x^2 = \frac{7}{9} + 1$ oe	M1	
$x = \pm\frac{4}{3}$ oe	A1	CAO
	(8)	
23. (a) Summation of areas of 4 vertical strips	S1	e.g. trapezium rule or equivalent attempted with trapezia or triangles and rectangles Do not allow for 'counting squares and adding', even if by strip
(y values =) 17, 5, 1, [5, 17] si	B1	ignore extra correct y values for this mark;
Correct calculation for the area using 4 trapezia oe	M1	FT 'their y-values' e.g. $2\left(\frac{1}{2} \times 2 \times (17 + 5) + \frac{1}{2} \times 2 \times (5 + 1)\right)$
56 (square units)	A1	CAO
(b) Overestimate with valid reason e.g. '(The curve is convex so) the area of under the curve for each strip is less than the area of the trapezium estimating that area.'	E1	Allow e.g. 'The trapeziums are above the curve' or 'The curve is convex' Comments must be based on an attempt to find the area using 4 vertical strips in (a)
	(5)	