GCSE MARKING SCHEME

SUMMER 2019

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

SUMMER 2019 MARK SCHEME

	Mark	Comment
1.*(a) Valid comment e.g. 'Some of the data is lost' or 'There are too many categories for a pie chart' or 'It does not show coffee and green tea'	E1	Allow e.g. 'It does not show the value of sales'
(b) Valid comment e.g. 'The number of visitors seems to be decreasing' or 'The annual number is going down.'	E1	Ignore embellishments/superfluous comments about seasons. Allow e.g. 'From 2015 to 2018 the numbers have decreased.'
	(2)	
2.*(a) $-4x = 11 - 19\ (= -8)$ or $4x = 19 - 11\ (= 8)$ $x = 2$	 B1 B1	FT until 2nd error si FT; mark final answer allow 2 marks for 19 – 4(2) = 11 oe
(b) $2x - 3 = 4 \times 3x$ or $\frac{2}{4}x - 3x = \frac{3}{4}$ oe, si $10x = -3$ oe $x = -\frac{3}{10}$ oe; ISW	 B1 B1 B1	FT until 2nd error or separates fractions **and** collects terms FT; allow for $-\frac{10}{4}x = \frac{3}{4}$ FT 'their expression of the form $ax = b$, where $a \neq \pm 1$ and $b \neq 0$'
(c)(i) $3x > 5 - 2$ oe $x > 1$ oe	M1 A1	 No marks for use of "=", unless finally replaced to give x >1 then award M1 A1; mark final answer
(ii) Empty circle at 1 with arrow right	B1	STRICT FT 'their (*c*)(i)' provided an inequality; if a line drawn rather than an arrow then there must be no idea of termination and it must extend as far as the end of the number line
	(8)	

3.* (a) $40\times5-40$ or 40×4 (=160)	M1	
160×0.3 or $160 - 160 \times 0.7$ oe	M1	FT 'their $40 \times 5 - 40$' or 'their 40×4'
(£) 48	A1	CAO; implies M1 M1 If no marks then SC1 for an answer of (£)20 or for an answer of (£)9.6(0)
Alternative method: *(social life =) 0.3 × 0.8 = 24%* *20% is (£)40 4% is (£)8* *(£) 48*	*M1* *M1* *A1*	*CAO; implies M1 M1*
(b) $\frac{48}{200}(\times100)$ or 0.3×0.8	M1	FT $\frac{\text{'their 48'}}{\text{'their 200'}}(\times100)$ provided of equivalent difficulty
24(%)	A1	FT
	(5)	
4.*(a) 1	B1	May be embedded
(b) Method to find prime factors with two correct prime factors seen before the second error	M1	Ignore 1's; the two prime factors may be correct or correct FT after one error
$2 \times 2 \times 2 \times 3 \times 7$ oe	A1	ISW
(c) Attempts to find a common factor of 168 and 120	S1	e.g. May list some of the factors of both 168 and 120 or draw a Venn diagram with the factors of 168 and 120 correctly positioned
Finds at least one common factor of 168 and 120 greater than 3	M1	FT 'their (a) and their (b)' 4, 6, 8, 12, 24
24	A1	CAO; mark final answer
	(6)	

5.*(a) 50 inches = 127 cm Might possibly be safe and use of the limit of accuracy e.g. 'she could be only 126.9 cm tall' or 'Her height could be anywhere between 126.5 and 127.5.'	B2 B1	B1 for e.g. 50.8 + 50.8 + 25.4 NB bounds are not required, though could be used. Candidates must indicate they have interpreted the given limit of accuracy correctly in some way. Must not contain contradictions or errors.
(b)(i) Valid assumption eg 'Jenna has not grown since she was last measured' or 'Jenna is **still** 127 cm' or Jenna has not had a growth spurt.' or 'Jenna is wearing the same shoes that she was when she was measured.'	E1	Any valid assumption that indicates that Jenna may no longer be the same height Not for comments assuming her height is 127 or a rounded version of this, as this is given information
(b)(ii) Valid impact based on their assumption and decision in part *(a)* e.g. 'Jenna may now be definitely tall enough to ride.'	E1	Comments such as 'My answer would be different' are not acceptable
	(5)	
6.*(a) x : -2, -1, -0.5, 0, 1 y : 1, -1, -1.25, -1, 1	B2	B1 for any two correct
(b) All 5 correct points plotted correctly and joined with a smooth curve	B2	Mark intent B1 for a smooth curve at least through 3 correct pairs of coordinates or for all of their 5 pairs of coordinates plotted correctly Allow 2 marks here if curve correct even if there is a slip in their table
(c) $x = -\frac{1}{2}$ oe	B1	Equation must be stated; check graph; not for $x = -\frac{1}{2}$ $y = -1.25$
(d) (x =) 0.5 to 0.7 , -1.5 to -1.7	B2	or FT 'their curve' B1 for one correct root If their curve has more than 2 roots, they must give all their solutions for B2 and may omit one solution only for B1.
	(7)	

7.* $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$	B2	Mark final answer for B2 B1 for each element or for (½**p** =) $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ oe seen or for $\left(\frac{5}{-1}\right)$ or for $\frac{5}{-1}$ in working space without brackets; allow $\frac{2}{1}$ seen for B1.
	(2)	
8. Use of 80% (of original price) is 7680	S1	
Finds an appropriate percentage of the original price e.g.10% (of original price) is $\frac{7680}{8}$ or 1% (or original price) is $\frac{7680}{80}$ or attempts to find $\frac{7680}{0.8}$ oe	M1	An appropriate percentage is any factor of 100 Need not evaluate calculation but the calculation stated must be the correct one for the % claimed; may be in stages
9600	A1	CAO; implies S1 M1
	(3)	
9. $6x + 6y = 8x - 5$	B1	FT until 2nd error; Expands brackets
$6y + 5 = 8x - 6x$	B1	FT; collects terms; implies first B1
$x = \frac{6y+5}{2}$	B1	FT; divides; mark final answer; final answer may be unsimplified e.g. $x = \frac{-5-6y}{6-8}$
	(3)	
10.(a) Correctly completes the tree diagram (0.6), 0.4, 0.8, 0.2, 0.3, 0.7	B2	B1 for any two pairs of branches correct
(b) 0.6×0.8	M1	FT 'their 0.8' from their tree diagram provided it is greater than 0 and less than 1
0.48 oe	A1	FT
(c) $(0.6 \times 0.2) + (0.4 \times 0.7)$	M2	M1 for either (0.6×0.2) or (0.4×0.7) seen For M1 or M2, FT 'their probabilities from their tree' provided they are greater than 0 and less than 1
0.4 oe	A1	FT
	(7)	

11. (a) 2.4×10^{27}	B2	B1 for 24×10^{26} oe
(b) $\frac{5.4\times10^{11}}{6000}$ $\frac{5.4\times10^{11}}{6\times10^{3}}$ or $\frac{540\,000\,000\,000}{6000}$ 9×10^{7}	M1 M1 A1	si oe, si CAO; accept trailing zeros e.g. 9.0×10^{7}; mark final answer Award M1 M1 A0 for answers of 0.9×10^{8} or 90 000 000
	(5)	
12. (a)(i) $\frac{5}{4}$ oe	B1	Accept e.g. 1.25, $\frac{10}{8}$ etc
(a)(ii) 5	B1	Accept ± 5
(a)(iii) Sight of $\left(\frac{1}{4}\right)^2$ or $\frac{1}{\sqrt[3]{4096}}$ oe $\frac{1}{16}$	B1 B1	 Ignore attempts to convert the fraction to a decimal
(b) $3^4 \times \frac{3^0}{(3^3)^2}$ oe, si 3^{-2}	B1 B1	 a final answer of $\frac{1}{9}$ or $\frac{1}{3^2}$ without wrong working implies first B1 only
(c) $125ab^{12}$	B3	Mark final answer B2 for any two elements of $125ab^{12}$ correct in their final answer e.g. 5^3ab^{12} or $\frac{125a^3b^{12}}{a^2}$ or B1 for any one element of $125ab^{12}$ correct in their final answer or for $\frac{5^3a^3b^{12}}{a^2}$ seen at some stage
	(9)	

13. (a)(i) Valid reason e.g. 'The parts of the ratio should be cubed' or '4 : 9 is the area factor not the volume factor' or 'Because the correct ratio is $2^3 : 3^3$.'	E1	Allow e.g. 'Squaring does not find the volume.'
8 : 27 oe	B1	ISW
(a)(ii) 36	B2	B1 for 3×3 ($\times 4$) oe seen
(b) (945 ÷ 9 =) 105 (litres per month)	B1	
105 × 120 (p) or 105 × (£)1.2(0) (=12600 (p) or (£)126)	M1	FT 'their 105'
(15% of (£)126 =) 12.6(0) + ½ × 12.6(0) oe	M1	FT 'their (£)126' provided M1 previously awarded; may been seen in stages
(£)18.9(0) or 1890 (p) ISW	A1	FT 'their 105'; If units are given, they must be correct
Alternative methods could increase 120p, 945, 105 or by 15%:		
(945 ÷ 9 =) 105 (litres per month)	*B1*	
12 + ½ × 12	*M1*	
'their 105' × 'their 18(p)' oe	*M1*	
(£)18.9(0) or 1890 (p)	*A1*	
OR		
94.5 + ½ × 94.5	*M1*	
(141.75 ÷ 9 =) 15.75 or *(141.75 × 20 =) 17010*	*B1*	
'their 15.75' × 120 (p) oe or *'their* 17010' ÷ 9	*M1*	
(£)18.9(0) or 1890 (p)	*A1*	
OR		
(945 ÷ 9 =) 105 (litres per month)	*B1*	
10.5 + ½ × 10.5	*M1*	
'their 15.75' × 120 (p) oe	*M1*	
(£)18.9(0) or 1890 (p)	*A1*	
	(8)	

14. (a) 70 (cm)	B1	
(b) 58 (cm)	B1	
(c) Left whisker 26 and right at 72 UQ 62 LQ 42, median 46 and UQ 62 in a box plot	B1 B1 B1	 si Must be seen in a correct box plot, FT 'their stated 62'
(d) Black and White indicated with valid reason e.g. 'no more than half the red and white koi are greater than 48 whereas ¾ of the black and white are greater than 50'.	E1	Justification must be complete and if using e.g. lower quartiles they must interpret these as being 25% oe Allow e.g. 'less than half the red and white koi are greater than 48 whereas ¾ of the black and white are greater than 50'.
	(6)	
15. 245 CAO 24.5 (%)	B2 B1	B1 for (1 $\times$) 140 + 3 $\times$ 35; allow if one error in reading the values from the graph e.g. 1 $\times$ 140 + 2 $\times$ 35 or 1 $\times$ 140 + 3 $\times$ 40 FT provided at least B1 awarded.
	(3)	
16. (*BCA* =) 51° $2w+w+51=180$ oe (w =) 43	B1 B1 B1	May be seen in diagram. If correct, implies first B1; FT 'their 51' CAO
	(3)	

17. (a) $3+11\sqrt{3}$	B3	B2 for $k+11\sqrt{3}$ or for any two correct terms in $3+7\sqrt{3}+4\sqrt{3}$ or B1 for $\frac{\sqrt{7}\sqrt{9}}{\sqrt{7}}$ oe si or $7\sqrt{3}$ or $4\sqrt{3}$ seen
(b) $\frac{1}{2}\times(7-2\sqrt{2}+5+\sqrt{2})\times h=6\sqrt{2}-1$ or $\frac{1}{2}\times h\times(3\sqrt{2}-2)+(7-2\sqrt{2})\times h=6\sqrt{2}-1$	B1	
$(h=)\frac{2(6\sqrt{2}-1)}{12-\sqrt{2}}$ or $(h=)\frac{12\sqrt{2}-2}{12-\sqrt{2}}$	M1	FT $'\text{their}(\frac{12-\sqrt{2}}{2})'h=6\sqrt{2}-1$; $'\text{their}(\frac{12-\sqrt{2}}{2})'$ must be of the form $a+b\sqrt{2}$ where a and b are non-zero; solves for h; allow for ½h
$(h=)\frac{2(6\sqrt{2}-1)}{12-\sqrt{2}}\times\frac{12+\sqrt{2}}{12+\sqrt{2}}$ or $(h=)\frac{12\sqrt{2}-2}{12-\sqrt{2}}\times\frac{12+\sqrt{2}}{12+\sqrt{2}}$	M1	FT $\frac{2(6\sqrt{2}-1)}{'\text{their}(12-\sqrt{2})'}$; rationalises their expression for h or ½h
$h=\frac{2(72\sqrt{2}+12-12-\sqrt{2})}{144-2}$ or better	M1	FT $\frac{2(6\sqrt{2}-1)}{'\text{their}(12-\sqrt{2})'}\times\frac{'\text{their}(12+\sqrt{2})'}{'\text{their}(12+\sqrt{2})'}$ multiplies out their expression for h or ½h
$(h=)\sqrt{2}$	A1	CAO
Alternative method: $\frac{1}{2}\times(7-2\sqrt{2}+5+\sqrt{2})\times h=6\sqrt{2}-1$ or $\frac{1}{2}\times h\times(3\sqrt{2}-2)+(7-2\sqrt{2})\times h=6\sqrt{2}-1$	*M1*	
$(h=)\frac{2(6\sqrt{2}-1)}{12-\sqrt{2}}=\frac{12\sqrt{2}-2}{12-\sqrt{2}}$	*M1*	
Factorises: $\frac{\sqrt{2}(12-\sqrt{2})}{12-\sqrt{2}}$	*M2*	
$(h=)\sqrt{2}$	*A1*	
	(8)	

18.(a) 2520	B2	B1 for $7 \times 6 \times 5 \times 4 \times 3$ oe
(b) 60 or $\frac{5\times4\times3}{7\times6\times5\times4\times3}$ or $\frac{1}{7}\times\frac{1}{6}$ $\frac{60}{2520}$ oe; ISW;	B2 B1	B1 for $(1\times)\ 5 \times 4 \times 3\ (\times1)$ oe seen FT $\frac{\text{'their derived 60'}}{\text{'their derived (a)'}}$ NB an answer of $\frac{120}{5040}$ following an answer of 5040 in (a) earns B0 B1FT here, so not from wrong working
	(5)	
19. (a) $8 \div \frac{8}{x}$ oe x	M1 A1	
(b) Valid explanation e.g. 'They are the same function.'	E1	allow e.g. '$f(x)$ is a self-inverse function'; allow the inverse function found and the explanation stated
(c) $\left(g^{-1}(x) =\right) x - 5$ $\left(g^{-1}f(x) =\right) \frac{8}{x} - 5$ $\frac{8}{x} = 16$ or better $(x =) \frac{1}{2}$ oe	B1 B1 M1 A1	 CAO
Alternative method: $f(x) = g(11)$ $f(x) = 16$ $\frac{8}{x} = 16$ *or better* $(x =) \frac{1}{2}$ *oe*	*M1* *M1* *M1* *A1*	
	(7)	

20. Use of 225(g) and 7.5(g)	B1	
225 ÷ 7.5 si	M1	FT provided 220 < 'their 225' ≤ 225 and 7.5 ≤ 'their 7.5' < 8; may be implied by build up method finding e.g. 225g makes 360 biscuits
Any non-calculator method for division of 225 ÷ 7.5 seen	M1	e.g. $\frac{2250}{75}$ or 90 ÷ 3 or build up method using 15
30 (batches of biscuits)	A1	CAO; si; implied by 360 biscuits
30 × 12 ÷ 3 × 2 oe	M1	FT 'their 30' provided it has been derived using both bounds (which need to be in the ranges above); allow rounded or truncated if following through
(£) 240	A1	FT ; use of 220 and 8 scores 0
	(6)	
21. (a) $(p=)\,5$ oe	B1	
(b) $(m_{radius}=)\,\frac{5}{5}$ or 1	M1	FT $\frac{\text{'their } p\text{'}}{5}$
$(m_{\tan}=)\,-1$	m1	FT 'their 1'
$5=-1\times5+c$ oe	M1	FT 'their gradient of tangent' and 'their p': $\text{'their } p\text{'}=\text{'their}(-1)\text{'}\times5+c$ Allow for e.g. $y-5=-1(x-5)$ or $\frac{y-5}{x-5}=-1$
$y=10-x$ oe	A1	Allow for $y=-x+c$ $5=-1\times5+c$ $c=10$
Candidates starting with the answer and working back score 2, 3 or 4 SC marks for: $5=5m+10$ or $\frac{5-0}{5-10}=-1$ leading to $m=-1$ and $\left(m_{radius}=\frac{5}{5}=\right)\,1$	*SC2*	
1 × –1 = –1 (therefore OP ⊥ PR)	*SC1*	
Conclusion including tangent is perpendicular to radius and therefore $y=-x+10$ is the equation of the tangent (at P).	*SC1*	*NB For final SC1, the equation $y=-x+10$ must be stated at some point.*
(c) $10-\sqrt{50}$ or $10-5\sqrt{2}$ ISW	B2	or exact equivalent B1 for *R*(10, 0) or *OR* = 10 or *Q*($\sqrt{50}$, 0) or *OQ* = $\sqrt{50}$ or exact equivalent
	(7)	

22.(a) Correct vector route for **OD** e.g. **OA** + $\frac{1}{3}$**AB**	B1	
OD = **4a** + 2**b**	B1	Accept unsimplified e.g. 6**a** + $\frac{1}{3}$(6**b** – 6**a**); implies first B1
Compares **OE** = 4*n***a** + 2*n***b** and **OE** = 6**a** + *k***b** to find *n* = 1.5	B1	
Finds (2*n* =) *k* = 3 or shows that 1.5(4**a** + 2**b**) = 6**a** + 3**b**	B1	NB Answer is given so only award this mark following a complete argument
(b) Valid deduction e.g. '*E* is the mid-point of *AC*'	E1	
	(5)	