GCSE MARKING SCHEME

AUTUMN 2020

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

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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.

EDUQAS GCSE MATHEMATICS

AUTUMN 2020 MARK SCHEME

GCSE (9-1) Mathematics **Component 1: Higher Tier**	**Mark**	**Comment**
1.*(a) Valid error comment e.g. 'The vertical scale from 1 to 174 is missing.'	E1	Accept an indication on the graph e.g. the scale break circled or a comment such as 'it is not accurately drawn especially next to the 0'. Do not allow e.g. 'The points have been connected' or 'Part of the scale is missing' (without further comment e.g. part of the vertical scale would be ok) Ignore embellishments to a correct statement provided they are not contradictory Accept an indication on the graph e.g. the scale break circled
1.(b) Valid impact comment e.g. 'It looks like there is a peak time at 10 am (when there is not).' or 'It makes the difference (at 10am) look greater.'	E1	They may have included some information in (a) to support their answer here, take the two parts together for this part if necessary and not contradictory but must have attempted an answer for (b) Allow e.g. 'They might not look at the y axis to see how small the difference really is.' Do not allow e.g. 'People will think there are less cars, like 2 instead of 176'.
	(2)	
2.*(a) $\frac{7}{12}$	B1	Allow for any equivalent fraction e.g. $\frac{84}{144}$
2.(b) $\frac{300}{12}\times 2$ oe	M1	FT 'their 2 + 3 + 7' from part (a); allow recovery of 12 here even if a different denominator in (a)
50 (ml)	A1	FT 600 ÷ (their 2 + 3 + 7)
	(3)	
3. $\frac{11}{4}\times\frac{8}{5}$ or $\frac{22}{8}\div\frac{5}{8}$	M1	Do not accept $\frac{11}{4}\div\frac{5}{8}$ without further working
$\frac{22}{5}$ oe	A1	
$4\frac{2}{5}$	B1	FT conversion of 'their improper fraction' to a mixed number in its simplest form
	(3)	

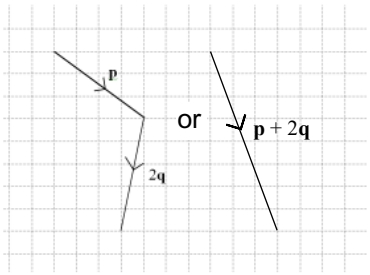
4.*(a) 2	B1	
4.(b) $\pi\times6^2-\pi\times5^2$ or $36\pi-25\pi$ si	M2	For M2 or M1, π could be 3.14 or better or $\frac{22}{7}$ etc M1 for $\pi\times6^2$ or $\pi\times5^2$
11π	A1	Mark final answer; not from wrong working; allow $\pi\times11$ or $11\times\pi$ but do not allow $\pi11$ If no marks, award SC1 for an answer of 44π or $\pi\times44$ or $44\times\pi$ (from $\pi\times12^2-\pi\times10^2$)
	(4)	
5.* (Total Force =) 54 (newtons) si	B1	
(Total area = 3×6 =) 18 (cm^2) si	B2	B1 for $3\times2\times3$ or $6(cm^2)$ si or for sight of 'their area of one foot' $\times3$
(Pressure =) $54\div18$	M1	May be seen in stages e.g. $54\div3\div6$ FT 'their 54' and 'their 18', providing at least 34 + 20 and $3\times2\times3$ attempted NB $54\div6\div3$ also implies B2 (Common answer $54\div6=9$ earns B1 B1 M0 A0, 2 marks)
3 (N/cm^2)	A1	FT
	(5)	

6. (a)(i) Valid criticism of method e.g. 'He should have used the ratio 5 : 8' or 'He should have divided by 8 and multiplied by 5' or 'He has forgotten to subtract it from 36.'	E1	Do not accept e.g. 'Because the answer should be £22.50' or 'That is not 36 decreased by $\frac{3}{8}$.' Allow e.g. 'He has (only) found $\frac{3}{8}$' or '36 – 13.50 = 22.50, 13.50 is only the amount of the decrease.'
6.(a)(ii) Valid description of what £13.50 is e.g. 'He has found the amount of the reduction.' or 'He has found the amount decreased by $\frac{5}{8}$,	E1	Allow e.g.'He has found what $\frac{3}{8}$ is, he needs to subtract it,' (as implying the 'reduction') or 'How much he needs to take off.' or 'How much he saves each week.' or 'It is $\frac{3}{8}$,
6.(b) (a =) 135 (b =) 30 (c =) 35	B3	B1 for each correct value OR B1 for $a : b : c = 27 : 6 : 7$, oe si; and B1 FT for $\frac{200}{27+6+7} \times 27$ or $\frac{200}{27+6+7} \times 6$ or $\frac{200}{27+6+7} \times 7$; FT 'their $27 : 6 : 7$' OR B1 for $2a = 9b$ and $7b = 6c$ and finding e.g. $a = \frac{9}{2}b$ and $c = \frac{7}{6}b$ and B1 for solving e.g. $\frac{9}{2}b + b + \frac{7}{6}b = 200$ OR B1 for trials leading to 3 values in the ratio 27 : 6 : 7 and B1 for at least 2 further trials to attempt find 3 values in this ratio that sum to 200
	(5)	

7.*		Mark whichever method is to the candidate's advantage
Attempts to find a common factor of at least two of 140, 56 and 280	S1	Allow slips if the intention is clear. e.g. May list some of the factors of e.g. both 140 and 56 or 280, or all list factors of all 3 values or calculations, using factors, such as 140 ÷ 14 = … **and** 56 ÷ 14 = … or 28 × 5 = 140 **and** 28 × 2 = 56 or 280 ÷ 56 = 5 or 280 ÷ 140 = 2 or attempt to find the prime factorisation of two of the numbers 140 = $2^2 \times 5 \times 7$, 56 = $2^3 \times 7$, 280 = $2^3 \times 5 \times 7$ or draw a Venn diagram with the prime factors of any two numbers correctly positioned
Finds at least one common factor, greater than 1, of all three numbers	M1	2, 4, 7, 14, 28; may be embedded in calculations e.g. 28 × 5 = 140, 28 × 2 = 56, 28 × 10 = 280
28 (bags)	A1	CAO
Uses a common factor that is greater than 4 to find the number of each item	M1	NB 7: 20, 8, 40 14: 10, 4, 20
5 (vouchers), 2 (pencils), 10 (sweets)	A1	CAO
Alternative method: *Forms the ratio 140 : 56 : 280 and attempts to simplify*	*S1*	*Values in ratio could be in any order.* *e.g. finds a simplified form with 2 values correct*
Finds a simplified form of 140 : 56 : 280	*M1*	*e.g. 70 : 28: 140*
(5 : 2 : 10 therefore) 5 (vouchers), 2 (pencils), 10 (sweets)	*A1*	*CAO*
Finds 140 ÷ 5 or 56 ÷ 2 or 280 ÷ 10	*M1*	*FT 20: 8: 40 or 10: 4: 20 only; may be in stages*
28 (bags)	*A1*	*CAO*
	(5)	
8.* $y = k - 4x$ with $k \neq 12$	B1	Accept the equation of a different parallel line in any form e.g. $2y = -8x$
	(1)	

9.*(a)(i) Valid explanation e.g. 'There is no value for which 0 × .... = 1' or '1 cannot be divided by 0' or 'Because if one of them is zero, the product would be zero not 1'.	E1	Allow e.g. '$x=\frac{1}{y}$, $y=\frac{1}{x}$ if *x* or *y* can be zero these have no value' Do not allow e.g. 'Because then the value could not be 1' without further explanation
9.(a)(ii) Correct graph: One branch in 1st quadrant, not touching either axis and correct shape One branch in 3rd quadrant, not touching either axis and correct shape	B2	For 2 marks, must be 2 distinct curves; allow some slight curving back at ends B1 for either branch correct If no marks, SC1 for both branches correct but joined e.g. with a straight line.
9.(a)(iii) inversely	B1	allow poor spelling; allow 'inverse' or 'not directly' or 'not in direct' or 'not direct' or 'not' or 'indirectly' Do not allow e.g. 'invertional' or 'inversamental'
9.(b) 5×0.1^2 oe, si	M1	Substitutes and rearranges; may be in stages; implied by e.g. $\frac{V}{0.1^2}=5$, $\frac{V}{0.2}=5$, $V=5\times0.2$ (must be clear that '0.2' is what they think is 0.1^2)
0.05 oe	A1	Implies M1
	(6)	

10. (a) $10x-10-7x-9=x$	B1	FT until 2nd error Expands both brackets
$10x-7x-x=10+9$ oe	B1	FT; collects terms
$(x=)\frac{19}{2}$ oe	B1	FT; ignore attempts to convert to a decimal
10.(b) $(x-3)(x+6)$ oe	B2	If not B2, award B1 for $(x \ldots 3)(x \ldots 6)$
$x=3, x=-6$	B1	**STRICT FT** from 'their $(x \ldots a)(x \ldots b)$' where a and b are constants; accept '$x=3$ or $x=-6$', which is correct, allow for e.g. '$x=3$ and $x=-6$'
	(6)	
11.(a) 0.3×0.4	M1	
0.12	A1	Ignore attempts to convert to a different form Allow 12%; not from wrong working
11.(b) 0.7×0.6	M1	
0.42	A1	Ignore attempts to convert to a different form Allow 42%; not from wrong working
	(4)	
12.(a) $\frac{243}{32}$	B2	B1 for a numerator of 243 or a denominator of 32 or for $-\frac{81}{16}\times-\frac{3}{2}$ si; implied by e.g. $-\frac{81^{x-3}}{16\times 2}$
12.(b) $24\sqrt{3}$	B2	B1 for $2^3\times(\sqrt{3})^3$ or better
12.(c) $\frac{n^2}{2}+1$ oe	B2	B1 for $\frac{n^2}{2}+k, \quad k\neq 1$
	(6)	

13. (a) Correct completion of diagram e.g.  	B2	B1 for the vector $\begin{pmatrix}3\\-8\end{pmatrix}$ seen or $\begin{matrix}3\\-8\end{matrix}$ seen or for a line representing $\begin{pmatrix}3\\-8\end{pmatrix}$ without an arrow or for an arrow with only one component correct; applies to 2**q** in the left-hand diagram or the single vector in the right-hand diagram allow complete diagram redrawn; may be unlabelled for B2 or B1, provided unambiguous; allow arrow at end of vector; allow good freehand
13.(b) (**AB** =) $6\mathbf{b} - 3\mathbf{a}$ (**CD** =) $2\mathbf{b} - \mathbf{a}$ Parallel indicated and e.g. $6\mathbf{b} - 3\mathbf{a} = 3(2\mathbf{b} - \mathbf{a})$, (one is a scalar multiple of the other)	 B1 B1 B1	 may be on diagram; must be seen may be on diagram; must be seen dependent on all previous marks awarded Allow e.g. Parallel indicated and 'They are multiples.'
	(5)	
14.(a) x^6	B2	B1 for sight of $\frac{x^9}{x^3}$ or x^{2+7-3} attempted, may be in stages
14.(b)(i) 2	B1	Not from wrong working
14.(b)(ii) 81	B2	B1 for sight of 3^4 oe or $\left(\sqrt[3]{27}\right)^4$ or $\sqrt[3]{(27^4)}$
14.(c) $4^3 \times 10^{6\times3}$ 64×10^{18} 6.4×10^{19}	 M1 A1 B1	Allow dot for multiplication Allow for $4\,000\,000^3$ implies M1; allow for 64 000 000 000 000 000 000 FT 'their 64×10^{18}' converted to standard form, provided of equivalent difficulty
14.(d) $7\sqrt{6}$	B2	B1 for $\frac{42}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$ oe seen
	(10)	

15. (a)(i) 14	B1	
15.(a)(ii) <table><tr><th>M</th><th>LQ</th><th>UQ</th><th>IQR</th></tr><tr><td>36</td><td>30</td><td>43</td><td>13</td></tr></table>	B3	B1 Correct median B1 Correct LQ & UQ B1 Correct FT IQR
15.(b)(i) Correct box plot: Whiskers from 22 to 49 Box from 30 to 43 Median at 36	B2	FT 'their values from (a)(ii)' if possible B1 for 2 out of 3 correct or correct FT from whiskers, box, median
15.(b)(ii) *Firebird Marigold* and correct reason e.g. '75(%) of these plants were more than 30 cm tall whereas less than 75(%) of the Marvel ones were.'	E1	Allow e.g. 'More of the Firebird are taller than 30 cm' or '75(%) of the Firebird are taller than 30 cm' or 'Because the lower quartile of the Firebird marigolds is higher being equal to 30.' Do not accept e.g. 'More of the Firebird are taller.' or 'It has the closest range to 30.' or 'It has a higher lower quartile.' Must not have any incorrect justification e.g. 'More of the Firebird are taller than 30 and the interquartile range is higher.' is E0
	(7)	

16.

	S	M	J	
A			24	110
B	25	29	6	60
C		40	0	
	75	135	30	240

or

	S	M	J	
A	20	66	24	110
B	25		6	60
C	30	40	0	70
	75		30	240

$\frac{135+60-29\times 2}{240}$ or $\frac{25+6+66+40}{240}$ oe

$\frac{137}{240}$ oe, CAO

B3

Method 1: Using 135, 60, 29

B1 for the given 240, 110, 30, 25, 0, 40 (shaded) correctly placed; allow e.g. an X in the 0 cell

B1 for the 75, 135 and 60 correctly placed;

B1 for 24, 6, 29 correctly placed

or

Method 2: Using 25, 40, 6, 66

B1 for the given 240, 110, 30, 25, 0, 40 (shaded) correctly placed; allow e.g. an X in the 0 cell

B1 for the 75, 60, 70, 30 and 20 correctly placed;

B1 for 24, 66, 6 correctly placed

May be probabilities or frequencies; If values not in table then they must be clearly identified

M2

FT 'their 135, 60, 29' or 'their 6, 66' for M1 or M2 providing they are non-zero

M1 for sight of either $\frac{135+60}{240}\left(=\frac{13}{16}\right)$ oe ,

$\frac{25+6+66+40+2\times 29}{240}\left(=\frac{13}{16}\right)$ oe or sight of 137

A1

If B2 M2 allow SC1 for an answer of

$\frac{163}{240}$ (uses 0.1×110)

	S	M	J	
A	20	79	11	110
B	25	16	19	60
C	30	40	0	70
	75	135	30	240

OR $\frac{179}{240}$ (uses 0.1×30)

	S	M	J	
A	20	87	3	110
B	25	8	27	60
C	30	40	0	70
	75	135	30	240

OR $\frac{167}{240}$ (uses 45 instead of 75)

	S	M	J	
A			24	110
B	25	29	6	60
C		40	0	
	45	165	30	240

(6)

17. Rotation 180° (about) (2, −1) OR enlargement scale factor −1 centre (2, −1)	B3	Marks can only be awarded for description of a **single** transformation. B2 for rotation about (2, −1) or for rotation, 180°, about 'their (2, −1)', provided 'their (2, −1)' is not (0, 0) OR for enlargement centre (2, −1) or for enlargement, scale factor −1, centre 'their (2, −1)' provided 'their (2, −1)' is not (0, 0) or B1 for rotation about 'their (2, −1)' provided 'their (2, −1)' is not (0, 0) OR for enlargement, centre 'their (2, −1)' provided 'their (2, −1)' is not (0, 0) If no marks award SC2 for a final answer Translation $\begin{pmatrix} -4 \\ -10 \end{pmatrix}$ (following an initial reflection in y = 4) or SC1 for a correct diagram following an initial reflection in y = 4, and the word translation or SC1 for any clear diagram showing a complete **correct** transformation of an appropriate L shape. (one side longer than the other)
	(3)	

18. (a) $P\hat{Q}R = A\hat{B}C$ (= 90°) (angle in a semi-circle) $PQ = AB$ (given) $PR = AC$ (both are diameters) Therefore $ABC \cong PQR$, RHS, with at least two reasons stated	B1 B1 B1	Allow e.g. angle B = angle Q dependent on all previous marks; allow the omission of 'given'; allow 'angle on a diameter'oe.
Alternative method 1: *$P\hat{Q}R = A\hat{B}C$ (= 90°) (angle in a semi-circle)* *$PQ = AB$ (given)* *$PR = AC$ (both are diameters)* *$QR = BC$ (Pythagoras' theorem)* *Therefore $ABC \cong PQR$, SAS, or* *$ABC \cong PQR$, SSS,* with at least two reasons stated	*B1* *B1* *B1*	*dependent on all previous marks; allow the omission of 'given'*
Alternative method 2: *$P\hat{Q}R = A\hat{B}C$ (angle in a semi-circle)* *$PQ = AB$ (given)* *$PR = AC$ (both are diameters)* *$R\hat{P}Q = C\hat{A}B$ (equal cosines) OR* *$P\hat{R}Q = A\hat{C}B$ (equal sines)* *Therefore $ABC \cong PQR$, ASA,* with at least two reasons stated	*B1* *B1* *B1*	*dependent on all previous marks; allow the omission of 'given'*
18.(b) Yes indicated and valid explanation e.g. 'Angles in a quadrilateral sum to 360 therefore the both opposite pairs of angles sum to 180 and this type of kite is a cyclic quadrilateral.' or 'The long diagonal would be the diameter of the circle and angles in a semicircle are always 90°'	E1	Allow for Yes indicated and e.g. 'This is a cyclic quadrilateral as both pairs of opposite angles sum to 180' or 'Angle in a semicircle is 90°' Must not contain any incorrect or contradictory statements.
	(4)	
19. (7)341·$\dot{3}4\dot{1}$ – (7)·$\dot{3}4\dot{1}$oe $\frac{7334}{999}$ oe or $7\frac{341}{999}$	M1 A1	 ISW
	(2)	
20.(a) 720	B2	B1 for $10 \times 9 \times 8$ oe
20.(b) 144	B2	B1 for $9 \times 2 \times 8$ oe or 'their 720' ÷ 5 oe
	(4)	

21.(a) $f^{-1}(x) = x^2 + 1$	B2	Allow for $y = x^2 + 1$ B1 for $x = y^2 + 1$ oe, seen, unless x and y interchanged later or SC1 for $\left(y \text{ or } f^{-1}(x) =\right) x^2 - 1$ oe
Valid explanation e.g. 'The smallest value of x^2 is 0, so $x^2 + 1$ cannot be less than 1' or '$x^2 + 1 < 1$ means $x^2 < 0$ and a square number cannot be negative.'	E1	Allow for '$x^2 < 0$ is impossible' or '$x^2 < 0$, $x < 0$ there are no real solutions.'
Alternative method: *The range of $f^{-1}(x)$ is the domain of $f(x)$* *(which is $x \geq 1$)* *Therefore $f^{-1}(x) \geq 1$*	*E2* *E1*	*NB there is no E1 by this method.*
21.(b) $gh(x) = 5^{x+3}$	B1	
$5^{x+3} = 5^{-2}$ or $5^2 \times 5^{x+3} = 5^0$ or $5^x \times 5^3 = \frac{1}{5^2}$ or better	M1	Writes equation in powers of 5; implies B1; must be using correct expression for gh
$x + 3 = -2$ or $x + 5 = 0$ si	m1	Interprets the equation
$(x =) -5$	A1	Implies 4 marks if not from wrong working
	(7)	
22. $\cos 60° = \frac{1}{2}$ si	B1	
(AC^2 =) $4^2 + 12^2 - 2\,(4)(12)\cos 60$	M1	Allow even if AC =
(AC^2 =) 112	M1	FT 'their cos 60' provided $-1 <$ 'their cos 60' < 1
$AC = \sqrt{112}$	A1	FT 'their cos 60' provided 'their 112' > 0
$AC = 4\sqrt{7}$	A1	CAO
	(5)	

23. $(x^2 + y^2 = \frac{25}{4})$ $r^2 = \frac{25}{4}$ si	M1	Allow for $x^2 = \frac{25}{4}$ or $x = \pm\frac{5}{2}$ but not for $x + y = \frac{5}{2}$
$r = \frac{5}{2}$ (cm) si	A1	
Justifies each congruent triangle being equilateral e.g. 'The 6 triangles are congruent so the hexagon is regular and the 6 triangles are equilateral.' or 'The 6 triangles are congruent, so each angle at *O* is 60° and as they are all isosceles triangles (each side from *O* is a radius) then they must be equilateral.'	E1	Allow if e.g. *OA* and *OB* are indicated as being the same length on the diagram and the two base angles calculated as 60 after e.g. *OAB* or an exterior angle found as 360 ÷ 6
$\left(6 \times \frac{5}{2} =\right) 15$ (cm)	B1	FT 'their derived $\frac{5}{2}$' provided it is not $\frac{25}{4}$
	(4)	
24. (a) Sight of tangent at $t = 6$	S1	
Uses $\frac{\text{vertical diff}}{\text{horizontal diff}}$ oe	M1	
Correct evaluation (m/s^2 or ms^{-2})	A1	FT 'their $\frac{\text{vertical diff}}{\text{horizontal diff}}$'; must be negative; allow improper fractions *NB allow full marks if calculus method used.*
24.(b)(i)		
Summation of areas of strips	S1	e.g. trapezium rule or equivalent attempted with trapezia/triangles/rectangles
(v values =) (0) 16, 24, (24, 16, 0) si	B1	Ignore extra correct v values for this mark; accept mid-ordinates 9, 21, 25, (21, 9)
Correct calculation for the area using 5 strips	M1	FT 'their v-values' e.g. $2\left(\frac{1}{2} \times 2 \times 16 + \frac{1}{2} \times 2 \times (16 + 24)\right) + 2 \times 24$ or $2\left(\frac{1}{2} \times 2 \times 16 + 2 \times 20 + 1 \times 24.5\right)$ or $2\left(\frac{1}{2} \times 2 \times 16 + \frac{1}{2} \times 2 \times (16 + 24)\right) + 2 \times 25$ (using mid-ordinates) $2(9 \times 2) + 2(21 \times 2) + 25 \times 2$ M0 if only using rectangles except for use of mid-ordinate rule approaches
160 or 161 or 162 (square units)	A1	FT; mid-ordinates give 170
24.(b)(ii) Distance (travelled in metres)	E1	
	(8)	

25.(a) $(x+4)^2+2$ or $a=4, b=2$	B3	B2 for sight of $\left(x+\frac{8}{2}\right)^2-4^2$ or $(x+4)^2-4^2$ oe or B1 for sight of $\left(x+\frac{8}{2}\right)^2$ or $(x+4)^2$ Ignore '= 0' if seen.
25.(b) (–4, –16)	B2	FT –'their a' and 'their b'–18; B1 for each provided not from wrong working
	(5)	