GCSE MARKING SCHEME

AUTUMN 2021

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

INTRODUCTION

This marking scheme was used by WJEC for the 2021 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.

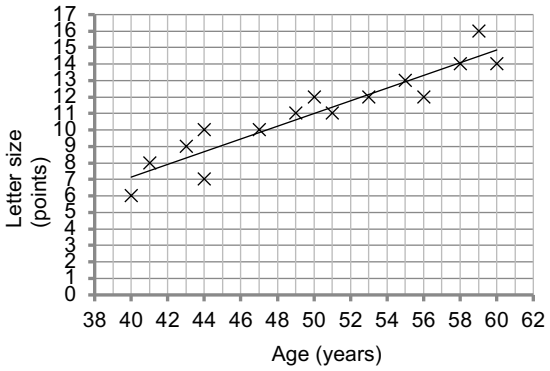
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

EDUQAS GCSE MATHEMATICS

AUTUMN 2021 MARK SCHEME

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
1.* An appropriately worded question with an appropriate set of response options e.g. 'Which method do you use most often to learn about recent national political events? Social Media Newspaper Radio Other None'	B2	Question must include at least 'recent' or 'national' as well as 'politics' or 'political events' and at least 4 response options, covering a full range of answers, including e.g. 'other' or 'none' B1 for an appropriately worded question or for an appropriate set of response options
	(2)	

2.* (a) Correct, ruled, single line of best fit drawn, passing through the point (50, 11)	B2	Must have some points above and some points below the line and follow the trend of the data; if more than one line is drawn, mark the worst; must extend at least from age 42 to 58, may be longer but not shorter; For B2 or B1: **if a point is plotted** at (50, 11) mark **clear** intent to pass through (50, 11), **if no point plotted** must pass exactly through this point; B1 for a ruled, single line of best fit with some points above and some points below the line and following the trend of the data and extending at least from age 42 to 58 but not passing through (50, 11) or a ruled, single line of best fit with positive gradient passing through (50, 11) but not fitting criterion for points above and below and/or trend and/or length 
2.(b)(i) Between 11 and 13 inclusive	B1	If not in this range allow FT of 'their line of best fit' providing it is an attempt at a single line, ruled or unruled; allow answers in this range even if no line drawn; allow decimal answers; allow FT values to be rounded or truncated to the nearest integer
2.(b)(ii) No indicated and a valid reason e.g. 'There is no data for 30 years old' or 'Younger people often have better eyesight than older people.'	E1	Any reason that indicates Jared is outside the data set e.g. Accept: 'His age is not on the scatter graph.' Allow: 'The lowest age on the graph is 38' or '30 wasn't listed'. Do not accept 'Different ages, vision can vary between people.' (too vague) Allow extra irrelevant comments providing they are not contradictory.
	(4)	

3.*(a) $8\sqrt{7}$	B1	Accept $8^2\sqrt{7}$ or $8 \times \sqrt{7}$
19.(b) 26	B1	
19.(c) 9	B2	final answer; **not from wrong working** B1 for final answer of 3^2
	(4)	
4.*(a)(i) Similar	B1	Allow poor spelling; do not allow proportional
4.(a)(ii) $\frac{5}{2}$ or $2\frac{1}{2}$ or 2.5	B1	
4.(b) $\frac{2}{5} \times 7.5$ or 2×1.5 or $7.5 \div 2.5$ oe	M1	FT 'their $\frac{5}{2}$' providing it is a single value; method must be seen if FT;
3 (cm)	A1	CAO; Allow embedded in ratio 7.5 : 3
	(4)	
5.* OR $\frac{21}{125}$	B4 B1	Mark to the candidate's advantage Award B4 if 21 is in the cell for Junior middle distance runners and there are no incorrect entries in the table OR B2 for the given information correctly placed (shaded cells) or B1 for any 3 of these correct and B2 for the necessary unshaded cells correct or B1 for any 2 of these correct; ignore entries in the empty cells Allow 125 omitted but do not ignore an error if the value written in this cell is wrong FT $\frac{\text{'their derived 21'}}{125}$; denominator must be 125; and in a fraction <1; ignore attempts to convert to other forms e.g. decimal or ratio;
	(5)	

	Sprint	Middle	Long	Total
S	14	28	40	82
J	17	21	5	43
Tot			45	125

	Sprint	Middle	Long	Total
S	14	28	40	82
J	17	21	5	
Tot	31	49	45	125

6.* $40 \div (1 + 3 + 4)$ or (egg, cheese, meat =) 5, 15, 20	M1	Allow for $8 \times 5 = 40$ but not for $40 \div 5 = 8$ 5, 15, 20 may be in a ratio or may be implied by e.g. tallying
$0.2 \times 5 + 0.1 \times 3 \times 5 + 0.25 \times 4 \times 5$ si (= 1 + 1.5 + 5) oe	M2	FT $40 \div$ 'their (1 + 3 + 4)'; may be in stages; sight of 1, 1.5 and 5 followed by an answer of 7 or 8 implies M2 M1 for 2 terms out of 3 correct in the sum si or for (egg, cheese, meat =) 1, 1.5, 5
7.5 or $7\frac{1}{2}$	A1	CAO; Allow $\frac{15}{2}$; ignore rounding to e.g. 7 or 8 once correct answer seen; *an answer of 32.5 is a misinterpretation not a misread of the figures*
Alternative method		
$0.2 \times 40 \times 1 + 0.1 \times 40 \times 3 + 0.25 \times 40 \times 4$ *(= 8 + 12 + 40 = 60) oe*	*M2*	*May be in stages;* *M1 for sight of 8, 12 and 40*
$\div (1 + 3 + 4)$	*M1*	*FT 'their 8 + 12 + 40' ;*
7.5 or $7\frac{1}{2}$	*A1*	*CAO; Allow $\frac{15}{2}$; ignore rounding to e.g. 7 or 8* *once correct answer seen;* *final answer of e.g. $\frac{60}{8}$ is A0*
	(4)	

7.*(a) 0.35 identified as the appropriate relative frequency for 400 customers	B1	and no other relative frequency
$0.35 \times 400 \times 3$ or 140×3 si	M2	FT 'their 0.35', provided it is 0.31, 0.43 or 0.38 or 0.34 or 0.36 for M2 or M1; no FT if e.g. a sum of relative frequencies has been used M1 for 0.35×400 si; not just for e.g. '0.35 of 400'
(£)420(.00)	A1	CAO
7.(b) Yes and valid explanation involving (1000 being) the **largest** number of customers e.g. 'It is the relative frequency from the largest sample.'	E1	Do not allow 'Out of 1000 customers 0.38 were sent a free box.' or 'Yes as the average relative frequency to customer ratio is higher'
	(5)	
8.*(a)(i) Answer in range 0.8 to 0.9	B1	Allow answer in range 0.8 to 0.9 **and** $\frac{5}{6}$ but do **not** allow $\frac{5}{6}$ only (question requires use of graph); must be the only answer not for coordinates as final answer
8.(a)(ii) $y = 3x + 2$ only indicated	B1	
8.(b) $y = 4x$ only indicated	B1	
	(3)	
9.(a) $1.35 \leq s < 1.45$	B2	Allow e.g. $1.35 \leq \text{speed} < 1.45$ or $1.35 \leq x < 1.45$ B1 for sight of 1.35 and 1.45 or for appropriate sight of one of these in an inequality of the form ... $\leq s <$ ... NB 1.35 ≤ 1.4 < 1.45 is B1 only
9.(b) $\frac{15}{25} \times 60$ or equivalent	M2	May be in stages; Accept a correct and complete build-up method for M2 e.g. 25 mins for 15 miles ÷5 ÷5 5 mins for 3 miles ×12 ×12 M1 for a correct distance ÷ speed calculation e.g. $\frac{15}{25}$ seen or for one correct stage in a build-up method e.g. 25 mins for 15 miles ÷5 ÷5 5 mins for 3 miles
36 (mph)	A1	
	(5)	

10.(a) Correct perpendicular bisector construction with appropriate arcs	B2	(± 2°,± 2mm) B1 for perpendicular bisector within tolerance without arcs or with invalid arcs or for a correct set of arcs
Correct angle bisector construction with appropriate arcs	B2	(± 2°) B1 for angle bisector within tolerance without arcs or with invalid arcs or for a correct set of arcs
Correct point indicated	B1	FT provided at least B1, B1 awarded; may be implied by intersecting loci
10.(b) *F* marked correctly at the midpoint of *AB*	B1	STRICT FT 'their labelled *E*'(± 2°)
	(6)	
11.(a) 0.5 or ½	B1	
11.(b) $1-7 \le 5x-2x$ or $2x-5x \le 7-1$	B1	or better; collects terms
$x \ge -2$ or $-2 \le x$ as final answer	B1	FT from $k \le 3x$ oe or $ax \le 6$, $a \ne 1$ oe; answer of e.g. $-x \le 2$ is B0 **Maximum of 1 mark if not fully correct**
11.(c)(i) $-3 \le n \le 3$ or $n \in [-3, 3]$	B2	Accept $-3 \le n$ and $n \le 3$ or $-3 \le n$, $n \le 3$ or the interval $[-3, 3]$ for 2 marks. B1 for each correct end or for $-3 \le n$ or $n \le 3$ or for 'their -3' $\le n \le$ 'their 3', FT 'their $\sqrt{9}$' or for $-3 < n < 3$
11.(c)(ii) –3, –2, –1, 0, 1, 2, 3	B1	FT 'their (c)(i) provided a finite list or allow e.g. 3, 2, 1, 0, –1,.... following an answer of $n \le 3$ in (i); must go into negative values in this case
	(6)	
12.(a) $\frac{x}{360} \times 2(\times\pi\times r) = \frac{1}{6}(\times\pi\times r)$ or $\frac{\frac{1}{6}\times\pi\times r}{2\times\pi\times r}$ oe	M1	
$x = \frac{1}{6}\times 360 \div 2$ or $\frac{1}{12}\times 360$ oe	M1	
$x = 30$	A1	If no marks award SC1 for a final answer of 60 obtained from use of $\frac{x}{360}(\times\pi\times r) = \frac{1}{6}(\times\pi\times r)$
12.(b) $24 \times 13\pi$ or $\pi \times 6 \times 4 \times 13$ oe	B2	Must involve π for B2 or B1; allow B2 for e.g. $13(24\pi)$ or for $312\pi \div 13\pi = 24$ B1 for (surface area cone =) $\pi \times 6 \times 52$ or 312π
12.(c) $4\pi(7 \times 10^4)^2$ si	B1	Missing brackets may be recovered in further correct work
$4\pi(49 \times 10^8)$ or $4\pi(4\,900\,000\,000)$ oe	M2	M1 for $4\pi(49 \times 10^n)$, $n \ne 8$ or for $4\pi(m \times 10^8)$, $m \ne 49$
$(1.96 \times 10^{10})\pi$	A1	Allow $1.96\pi \times 10^{10}$ If no marks, award SC1 for $k\pi(49 \times 10^8)$, $k \ne 4$
	(9)	

13. $3(x+y)=wy+7$ or $3x+3y=wy+7$ oe $3y-wy=7-3x$ or $3x-7=wy-3y$ oe $y(3-w)=7-3x$ or $3x-7=y(w-3)$ oe $y=\frac{7-3x}{3-w}$ or $y=\frac{3x-7}{w-3}$ oe	 B1 B1 B1 B1	FT if of equivalent difficulty until 2nd error Clears the fraction FT; collects terms FT; factorises; allow omission of closing bracket FT; divides
	(4)	
14.(a) Answer in range 2 to 2.2 inclusive	B1	
14.(b) 0.64	B3	B2 for $\frac{16}{25}$ or equivalent fraction or B1 for $\left(\frac{4}{5}\right)^2$ or $\left(\frac{25}{16}\right)^{-1}$ oe
14.(c) 343	B2	B1 for sight of 7^3 or $7\times7\times7$ or $\left(\sqrt{49}\right)^3$ or $\sqrt{49^3}$
14.(d) $1000x = 83.\dot{8}\dot{3}$ and $10x = 0.\dot{8}\dot{3}$ or $100x = 8.3\dot{8}\dot{3}$ and $x = 0.0\dot{8}\dot{3}$ and attempt to subtract $\frac{83}{990}$	M1 A1	or equivalent ISW
	(8)	
15.(a) 23 41 50	B1	
15.(b) 5 points plotted correctly: (20, 0) (30, 8) (40, 23) (50, 41) (60, 50) All points joined with a smooth curve or with line segments	B2 B1	FT 'their cf ' provided cumulative; tolerance ± 1mm B1 for 3 or 4 correct plots dep on at least B1 for plots; last point must not be joined to the axis; tolerance ± 1mm
15.(c)(i) Gold bonus: Answer in range 53 000 to 55 000 inclusive Silver bonus: Answer in range 45 000 to 47 000 inclusive	B2	FT their cf graph for 'their *s*' when cf is 45 and 35 B1 FT for each If no marks, award SC1 for **both** Gold bonus in range 53 to 55 **and** Silver bonus in range 45 to 47
15.(c)(ii) Valid explanation e.g. 'The data may not be evenly spread through each group.' or 'All the sales in the group 50 to 60 may be 60 000.' or 'The raw data is not used.'	E1	Allow e.g. 'It is estimated because the data is grouped.' or 'Because you do not know what each salesperson got.'
15.(d) September and valid evidence/comment e.g. 'The median sales are lower.'	E1	Evidence must be based on the mathematics and with no contradictions
	(8)	

16. $A\hat{D}C$ = 156(°) $A\hat{E}C$ = (156 ÷ 2 =) 78(°) (Angle at the centre) At least 'Tangent perpendicular to radius' and 'Angle at centre is twice that at the circumference' oe stated	 B1 B1 E1	 Allow on diagram or e.g. angle *D* = 156 but must be clear FT 'their derived 156'; allow on diagram or e.g. angle *E* = 78 but must be clear Accept equivalent wording; must be linked to relevant calculations or angles
	(3)	
17. –2	 B2	 B1 for $\frac{16--4}{-5-5}$ with at most one arithmetic error oe, si; may be implied by a right-angled triangle drawn with dimensions 'their 20' and (–)10 or 20 and 'their (–)10' marked and 'their $\frac{y\text{ diff}}{x\text{ diff}}$', which must be negative, calculated; If no marks, award SC1 for a derived answer of 2.
(0, 6)	B2	May be on diagram B1 for each correct coordinate or for sight of $\left(\frac{-5+5}{2}, \frac{16-4}{2}\right)$
y = ½x + 6 leading to $2y = x + 12$	B2	FT 'their 6' and 'their –2' for B1 B1 for y = ½x + c or for $y = kx + 6$ $k \neq 0$ If B2 B2 B0, award SC1 for showing $2y = x + 12$ is the same as y = ½x + 6 **and** that $-2 \times \frac{1}{2} = -1$ **and** that (0, 6) is on the line y = ½x + 6
	(6)	
18.(a) $V \propto \frac{1}{P}$ or $P \propto \frac{1}{V}$ or $V = \frac{k}{P}$ $4 = \frac{k}{1020}$ oe or k = 4 ×1020 (= 4080) $(V =) \frac{4 \times 1020}{1360}$ $(V =)$ 3 (m^3)	 B1 M1 M1 A1	 si; allow e.g. $V \propto \frac{k}{P}$ FT 'their 4 ×1020' CAO
Alternative method: $P_1V_1 = P_2V_2$ *oe; soi* *4 × 1020 = V × 1360 seen, or implied in later working* *Forms* $(V =) \frac{4 \times 1020}{1360}$ $(V =)$ *3(m^3)*	 *B1* *M1* *M1* *A1*	 *FT 'their 4 × 1020'* *CAO*

18.(b) $(P=)\frac{4080}{1\cdot 2}$ or $(P=)\frac{4\times 1020}{1\cdot 2}$	M1	FT 'their 4 × 1020' ÷ 1.2
3400 (N/m^2)	A1	CAO
	(6)	
19.(a) Acceleration	B1	Accept rate of change of velocity
19.(b) $\frac{1}{2}\times 60\times k+210\times k+\frac{1}{2}\times 120\times k$ = 2400 or $\frac{1}{2}\times(210+390)\times k$ = 2400 or $\frac{1}{2}\times(1)\times k+3.5\times k+\frac{1}{2}\times 2\times k$ = 2400 or $\frac{1}{2}\times(3.5+6.5)\times k$ = 2400	M2	If unit conversion attempted, allow 1 consistent error for M2 Ignore errors in unit conversion for M1 M1 for an attempt to sum at least 2 out of 3 areas with at most one error or for an attempt to find the area of a trapezium with at most one error in the structure of the formula, si
8 (m/s)	A1	CAO Final answer of 480 (metres per minute) implies M2
	(4)	
20.(a)(i) sin30	M1	or $fg(x)$ = sin $(x - 90)$
½ or 0.5	A1	
20.(b) Reflection in the x-axis	B1	Mark intent
(–2, 1) and (–6, –0.5) indicated	B1	CAO
20.(c) $\left[k^{-1}(x)=\right]\sqrt[3]{x+23}$	B2	Award B1 for $x=\sqrt[3]{y+23}$ oe, unless x and y interchanged later or SC1 for $\left(y \text{ or } k^{-1}(x)=\right)\sqrt[3]{x-23}$ oe
$x+23=5^3$ or better	M1	FT 'their inverse function' if possible; must be of equivalent difficulty; M0 for e.g. $\frac{1}{x^3-23}=5$
x = 102	A1	CAO
Alternative method: *$k^{-1}(x)=5$ means $x=k(5)$ si* *$k(5)=5^3-23$* *x = 102*	*B2* *M1* *A1*	 *CAO*
	(8)	

21.(a) $(3x+2)^3=(3x+2)(3x+2)(3x+2)$ **and** attempting to multiply out one pair of brackets	S1	$27x^3+8$ is S0
$27x^3+54x^2+36x+8$ or simplified equivalent	B2	Mark final answer B1 for $(9x^2+6x+6x+4)(3x+2)$ or better or for a final answer with at most one incorrect coefficient NB: Correct unsimplified equivalent for B1 may be $27x^3+18x^2+18x^2+12x+18x^2+12x+12x+8$
21.(b) $(2x+1)(2x-1)$	B2	Allow for $4\left(x^2-\frac{1}{4}\right)=4\left(x-\frac{1}{2}\right)\left(x+\frac{1}{2}\right)$ B1 for sight of $(2x)^2-1^2$; allow for sight of $(2x)^2-1$
$6x^2-13x+5=(2x-1)(3x-5)$ soi	B2	B1 for $6x^2-13x+5$= (2x … 1)(3x … 5)
$\frac{2x+1}{3x-5}$	B1	CAO; mark final answer
	(8)	
22.(a) $11\sqrt{5}$	B2	B1 for sight of $7\sqrt{5}$ or $4\sqrt{5}$
22.(b)(i) $\sqrt{2}$: $5+\sqrt{2}$	B1	
22.(b)(ii) $(17\times)\frac{\sqrt{2}}{5+2\sqrt{2}}\times\frac{5-2\sqrt{2}}{5-2\sqrt{2}}$	M1	
$(17\times)\frac{5\times\sqrt{2}-2(\sqrt{2})^2}{25-10\sqrt{2}+10\sqrt{2}-(2\sqrt{2})^2}$ si	m1	
$(17\times)\frac{5\times\sqrt{2}-4}{25-8}$ oe, si	A2	A1 for either the numerator or denominator correct
$5\sqrt{2}-4$	A1	Accept b = 5, c = –4
	(8)	