EDUQAS GCSE MATHEMATICS

AUTUMN 2023 MARK SCHEME

Component 2: Higher Tier	Mark	Comment
1.*(a) $\frac{2}{9}$ ISW	B1	
1.*(b) 1400 ÷ 4 × 3 = 1050	M1 A1	May be seen in stages.
	(3)	
2.* 12 250 × (1 − 0·18) × (1 − 0.15)^8 An answer in the range (£)2737.15 to (£)2737.20 (£)9512.80 to (£)9512.85 or (£)9513 *Allow answers not rounded or truncated*	M2 A1 B1	M1 for 12 250 × (1 − 0·18) (= 10 045) OR 12 250 × (1 − 0·15)^8 (= 3338.0…) OR …..× (1 − 0·18) × (1 − 0·15)^8 Allow an answer of (£)2737 from correct working *(Year 8 value 3220.18 to 3220.20)* FT 'their car value' provided M2 awarded. Award M1 SC2 for an answer of (£)9923 or (£)9923.40 or (£)9923.41 OR M1 SC1 for an answer of (£)2326.59 from use of 12 250 × (1 – 0·18) × (1 – 0.15)^9
	(4)	
3.*(a) Mid-points 62.5 67.5 72.5 77.5 82.5 62.5 × 19 + 67.5 × 17 + 72.5 × 23 + 77.5 × 10 + 82.5 × 1 ÷ 70 = 69.4(2…) (cm)	B1 M1 m1 A1	May be implied from correct totals, see below FT 'their mid-points' provided at least 4 of these are at the bounds or within the groups 1187.5 + 1147.5 + 1667.5 + 775 + 82.5 (= 4860) If mid-points are **not** given, then no marks except for the following cases: • B1 M0 for five correct products not added • B1 M1 for five correct products in an addition • B0 M1 for four correct products in an addition FT Accept 69 (cm) from correct working.
3.*(b) No indicated or clearly implied and a suitable explanation e.g. 'The median is in the group 65 ≤ *l* < 70.' 'The median is the 35th (or 35.5th) term and in the group 65 ≤ *l* < 70.'	B1	Allow 'No' with an explanation e.g. '(In group) 65 – 70' Do not allow 'No' and explanation based on 69(.42) or 'their 69(.42)' e.g. 69 is not between 70 and 75 (use of mean) or '70 to 75 is the modal length'
	(5)	

4.*(a) 40 (circles)	B1	
4.*(b) $60\times96 - 40\times\pi\times6^2$ Answer in the range 1235.5 to 1238.4(cm^2)	M3 A1	May be seen in stages. FT their 40 provided between 6 and 50 inclusive M2 for $40\times\pi\times6^2$ M1 for $60\times96 - k\pi$ sight of $\pi\times6^2$ or 113(.09..) CAO. *If no marks, allow M1 for sight of $\pi\times6^2$ or 113(.09..) seen in (a) or by the diagram*
	(5)	
5.*(a) $x^2 + 10x + 21$	B2	Mark final answer B1 for sight of. $x^2 + 3x + 7x + 21$ or a final answer of either • $x^2 + kx + 21$, $k \neq 0$ or 10 • $x^2 + 10x + c$, $c \neq 0$ or 21
5.*(b) $3x = 1$ $(x =) \frac{1}{3}$ oe, ISW	B1 B1	 Accept 0.33 or $0.\dot{3}$ but not 0.3. FT from $ax = 1$, $a \neq 1$ or $3x = b$ accept $\frac{1}{a}$ or $\frac{b}{3}$ but if on FT either 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.
5.*(c) $(y + 20)(y - 20)$	B1	Allow $(x + 20)(x - 20)$ oe
5.*(d) Method to eliminate an unknown e.g. equal coefficients AND appropriate addition or subtraction or rearranges one equation and substitutes into the other Finds one unknown Finds the other unknown	 M1 A1 A1	No marks for T&I; no marks for an unsupported answer. Allow one error in one term, not in the equated coefficients CAO; $x = 3.5$, $y = -0.5$ FT 'their x' or 'their y' used in one of their equations
	(8)	

6.* (r =) 7.6 × $\frac{15.6}{10.4}$ or 7.6 ÷ $\frac{10.4}{15.6}$ = 11.4 (t =) 19.5 ÷ $\frac{15.6}{10.4}$ or 19.5 × $\frac{10.4}{15.6}$ = 13	M1 A1 M1 A1	Or equivalent calculation that could lead to the correct answer. Or equivalent calculation that could lead to the correct answer. Note: If answers are reversed award M1 A0 M1 A0 SC1
	(4)	
7.*(a) Use of trigonometry in a right-angled triangle with an angle of 48(°) or 42(°) and a side of 800 (m) $(h =) \frac{800}{\cos(42)}$ or $(h =) \frac{800}{\sin(48)}$ (h =) 1076(.5….) or 1077 (feet)	S1 M2 A1	Trig ratio used may not be correct at this stage. Or alternative **full** method M1 for $\cos(42) = \frac{800}{h}$ or $\sin(48) = \frac{800}{h}$ Allow 1076 (feet) from correct working
7.*(b)(i) A correct assumption e.g. 'The (surface of) the slope is smooth (and he cycles the shortest distance).'	E1	Allow e.g. 'He rode in a straight line.' 'It was a straight line.' 'The track wasn't bumpy.' 'He cycled straight from the top to the bottom.' 'He didn't do any jumps.' 'There are no obstructions.' 'The surface is flat.' 'He cycled the shortest distance.' 'That it was 48° the whole way down'. 'That it is a right-angled triangle' 'The track is level' (assume they mean not bumpy) Do not allow: 'That it was 48°'
7.*(b)(ii) A correct effect of assumption e.g. 'If the surface of the slope is not smooth then Vaughan will have cycled further than the calculated value in (a).'	E1	If no valid assumption is made, then this mark cannot be awarded. Cannot award E0 E1. Allow e.g. 'He cycled further.' 'The answer would be bigger.' Do not allow: 'The answer would be different'
	(6)	

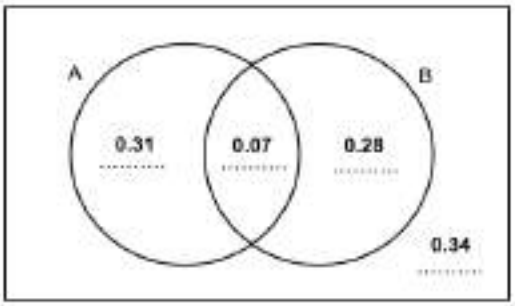
8. (a) 95 % ≡ (£)1451.6(0)	B1	Accept any indication.
1451.6(0) ÷ 95 × 100	M1	Or equivalent e.g.1451.6(0) ÷ 0.95 *Note: This implies B1 M1.*
= (£)1528	A1	
8.(b) 8.1 × 7.3 × 4	M1	(Volume = 236.52 cm^3) The following two marks can be awarded in any order.
× 10.49	m1	(Total mass = 2481.0948 g or
÷ 200	m1	Volume of one piece = 1.1826 cm^3)
= 12.4 (05..) (g)	A1	Allow 12g from correct working
	(7)	
9. A circle with a radius of 4 cm centred at the water feature.	B1	
Correct perpendicular bisector construction with appropriate arcs.	B2	B1 for perpendicular bisector within tolerance (± 2°) without arcs or with invalid arcs or for a correct pair of arcs that intersect twice.
Correct angle bisector construction with appropriate arcs.	B2	B1 for angle bisector within tolerance (± 2°) without arcs or with invalid arcs or for a correct pair of arcs.
Correct area clearly indicated.	B1	FT provided at least B1, B1, B1 previously awarded.
	(6)	
10. $\frac{g + 3f}{4} = e$	B2	B1 for $g + 3f = 4e$ or $-g - 3f = -4e$ If no marks, award SC1 for an answer of $\frac{g - 3f}{4} = e$
	(2)	
11. Sight of 38.5 (cm) AND 44.5 (mm)	B1	May be in a list of all the bounds and may be seen as 385 mm and 4.45 cm Note: 44.5 mm × 7 = 311.5 mm or 31.15 cm
38.5 – 7 × 4.45 or 385 – 7 × 44.5	M2	If B0, FT provided unambiguously chosen: Allow M2 for either of the following: • use of 38 < 'their 38.5' ≤ 39 AND 4.4 ≤ 'their 4.45' < 4.5 • use of 380 < 'their 385' ≤ 390 AND 44 ≤ 'their 44.5' < 45 Allow M1 for calculations with the bounds for M2 but with mixed units e.g. 38.5 – 7 × 44
= 7.35 (cm) or 73.5 (mm)	A1	CAO. If units are given, they must be correct.
	(4)	

12. No indicated or implied with $(2 \times 1.81^3 - 3 \times 1.81^2 - 2 =) 0.03(1\ldots.)$ AND $(2 \times 1.82^3 - 3 \times 1.82^2 - 2 =) 0.1(19\ldots)$ AND a correct explanation e.g 'one should be positive, and one should be negative'. '0 is not between 0.119.. and 0.03..' '0.119… and 0.03.. are both positive' <u>*Alternative Method*</u> *No indicated or implied with* *$(2 \times 1.81^3 - 3 \times 1.81^2 =) 2.03(1\ldots.)$ AND* *$(2 \times 1.82^3 - 3 \times 1.82^2 =) 2.1(19\ldots)$ AND* *a correct explanation e.g* *'one should be more than 2, and one should be less than 2'.* *'0 is not between 0.119.. and 0.03..'* *'0.119… and 0.03.. are both positive'*	B2 *B2*	Allow for 0.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative. Award B1 for one of the following: • 0.03(1….) and 0.1(19…) seen with a correct explanation but with yes indicated. • a correct explanation following an error in their substitution. • 0.03(1….) and 0.1(19…). *Allow for 2.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative.* Award B1 for one of the following: • *2.03(1….) and 2.1(19…) seen with a correct explanation but with yes indicated.* • *a correct explanation following an error in their substitution.* • *2.03(1….) and 2.1(19…).*
	(2)	

13.(a)(i) A value between 39 and 40 (mins) inclusive	B1	
13.(a)(ii) Intention UQ – LQ using readings for 37.5 and 12.5 (pupils) 50 to 51 (minutes) and 30 to 31 (minutes) Answers in the range 19 to 21 (minutes) inclusive.	M1 A1	 If no marks and a median of 43 to 44 seen in (a) award SC2 answers of 33 to 34 (from LQ and UQ at frequencies of 15 and 45 respectively)
13(a)(iii) $\frac{7}{50}$ (× 100) = 14 (%)	M1 A1	 If no marks, award SC1 for an answer of 86 (%) If use of 60 as total frequency already penalised award SC2 for an answer of 28(.33…%) or SC1 for $\frac{17}{60}$ (× 100) or an answer of 71.66.. or 72%
13(b) Left whisker at 12 and right at 65 UQ 55 UQ 55, median 45 and LQ 31 in a box plot	B1 B1 B1	 Seen or implied. Must be seen in a correct box plot, FT their UQ; if no UQ is stated and it is not at 55 allow this mark provided $45 < UQ < 65$.
13.(c) Valid comment comparing medians e.g. 'On average, School A were quicker than School B as the median was 39.5 in school A and 45 in School B.' 'On average, School B were slower than School A as the median was 39.5 in school A and 45 in School B.'	E1	FT their median and IQR from (a) Must be a comparison not simply a comment about one school. Allow e.g. 'School A had a lower median (so were quicker on average)'. 'The average of School A is 5.5 minutes faster'. 'School A had a lower average of 39.5' as clearly using the median as the average. Do not allow e.g. 'School A had a median of 39.5 and School B had a median of 45' (no comparison). 'On average School A were quicker', (no reference to median or comparison of values).
Valid comment comparing IQRs or range e.g. 'School A's results were less varied than School B's as the IQR was 20 which was less than School B's (which was 24)' 'School A's results were more consistent than School B's as the IQR was 20 which was less than School B's (which was 24)' 'School A's results were more varied than School B's as the range is bigger than School B's (which was 53)'	E1	FT "their IQR' from (a)(ii) Must be a comparison not simply a comment about one school. Allow e.g. 'School A's marks were more consistent as the IQR is smaller'. Do not allow e.g. 'School A had an IQR of 20 and School B had an IQR of 24' (no comparison). 'School B's results are more spread out than School A's' (need to mention IQR since range for School A is greater)
	(10)	

14. $(x^2 =)\ 12^2 - (9 \div 2)^2$	M1	Where x represents the perpendicular height. Accept other notation.
$x^2 = 123.75$ or $(x =)\ \sqrt{123.75}$	A1	
$(x =)\ 11(.12\ldots)$ or $\frac{3\sqrt{55}}{2}$ (cm)	A1	
(Volume =) $\frac{1}{3} \times 9 \times 9 \times 11(.12\ldots)$	M1	FT their height provided M1 awarded.
Answers in the range 299.7 to 300.4 inclusive.	A1	FT
	(5)	
15.(a) $\frac{8}{17} \times \frac{7}{16}$	M1	
$= \frac{56}{272}$ or $\frac{7}{34}$ oe	A1	Allow 0.205 to 0.206 from correct working
15.(b) $\frac{8}{17} \times \frac{7}{16} + \frac{9}{17} \times \frac{8}{16}$	M1	FT Their answer to (a) + $\frac{9}{17} \times \frac{8}{16}$
$= \frac{128}{272}$ or $\frac{8}{17}$ oe	A1	Allow 0.47 or 0.471 from correct working
	(4)	
16. $(\text{Area} =)\ \frac{1}{2}(x + 1 + 2x)(2x - 3)$	M1	
$(3x^2 - 3.5x - 1.5 = 59.5) \times 2$ oe convincingly leading to $6x^2 - 7x - 3 = 119$	A1	
$(x =)\ \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 6 \times -122}}{2 \times 6}$	M1	**The substitution into the formula must be seen for M1, otherwise award M0A0A0.** FT 'their $6x^2 - 7x + c = 0$' where $c \neq -3$ for M1 and possible m1 Allow one slip in substitution **for M1 only** but must be correct formula.
$(x =)\ \frac{7 \pm \sqrt{2977}}{12}$	m1	Can be implied from at least one correct value of x evaluated.
$(x =)$ 5.1(30...) (and -3.963…)	A1	CAO
(Height =) 7.26…. (cm)	B1	Accept answers in the range 7.2 to 7.3 inclusive Allow this B1 if the correct value given following sight of $6x^2 - 7x - 122 = 0$ otherwise, FT provided 2nd M1 awarded. If their equation has two positive solutions, then two correct FT heights must be given for the B1.
	(6)	

17.(a) $\frac{131}{360} \times \pi \times 11^2$ =138.3(….) (mm^2)	M1 A1	 Allow 136.26 or 138 (mm^2) from correct working
17.(b) $\frac{21}{60}$ × π × 2y or $\frac{126}{360}$ × π × 2y oe = $\frac{7\pi y}{10}$ or 0.7πy	M1 A1	
	(4)	
18.(a) $t \propto \frac{1}{m^2}$ OR $t = \frac{k}{m^2}$ $38 = \frac{k}{3^2}$ or k = 342 $t = \frac{342}{m^2}$	B1 M1 A1	 FT from B0 for a correct calculation of k from $t \propto \frac{1}{m}$ or $t \propto m^2$ or $t \propto \frac{1}{\sqrt{m}}$ CAO *Note: This may be seen in 18(b).*
18.(b) $m^2 = \frac{342}{12}$ or $m = (\pm)\sqrt{28.5}$ or $m = (\pm)5.3(3..)$ 6 (mechanics)	 M1 A1	No marks for unsupported answers, work must follow from (a). FT provided at least M1 awarded in (a). CAO
	(5)	
19. $(BC =) \sqrt{6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)}$ $(BC =)$ 8.67(5 …) or 8·7 (cm) $\sin(BDC) = \frac{sin(68)}{11.1} \times 8.6(75 \ldots)$ (BDC =) 46.4 to 46.6 (°) (CBD =) 65.4 to 65.6 (°)	M2 A1 M2 A1 A1	Allow alternative full methods throughout M1 for $(a^2) = 6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)$ (=75.26…) Allow A1 for an answer of 8.6 from correct working not from premature rounding FT 'their derived BC' provided it is a length. M1 for $\frac{\sin(BDC)}{8.6(75\ldots)} = \frac{sin(68)}{11.1}$ Allow 47(°) from correct working. Allow answers of 65(°) or 66(°) from correct working. FT provided both cosine and sine rule attempted and at least M1 awarded for each.
	(7)	

20.(a) $x > -2$	B1	
$y \geq 3x + 1$	B2	B1 for one of the following: • $y > 3x + 1$ • $y = 3x + 1$ • $y < 3x + 1$ • $y \leq 3x + 1$ • $y \geq kx + 1$ with $k > 1$ • $y \geq 3x (\pm k)$
20.(b) (Gradient of AB =) . -4	B1	
(Gradient of perpendicular bisector =). $\frac{1}{4}$	B1	FT 'their gradient of AB'
(Mid-point of AB =) (-1, 2)	B1	
$y - 2 = \frac{1}{4}(x - (-1))$ or $2 = \frac{1}{4} \times -1 + c$ oe	M1	FT 'their perpendicular bisector gradient' and 'their mid-point'
$4y - 8 = x + 1$ or $y = \frac{1}{4}x + 2\frac{1}{4}$ oe or better	A1	Allow any correct intermediate step.
for convincingly showing $4y = x + 9$	A1	CAO
	(9)	
21.(a) (0.66 – 0.07 – 0.31 =) 0.28	B3	B3 only if no incorrect working seen and/or Venn diagram correct. Otherwise, possible B1 or B2. B2 for a fully correct Venn diagram  or answer from 0.66 – 0.07 – 0.31 not for sight of B1 for at least two sections of the Venn diagram completed correctly or sight of 0.66 – 0.07 – 0.31
21.(b) 0.72	B2	B1 for 1 – 0.28 or 0.34 + 0.31 + 0.07 FT their Venn diagram or answer in (a) for B1 or B2 provided < 1
	(5)	

22.(a) (y =) $(x - 2)^2 - 5$	B2	B1 for either a = -2 or b = -5
22.(b)(i) Translation through $\begin{pmatrix} k \\ 0 \end{pmatrix}$ where $k > 0$ Correct coordinates seen or scale marked, (0,0) may be implied.	B1 B1	Ignore coordinates for this mark. Correct curve through (0, 0) and (4, 0)
22.(b)(ii) The correct reflection in the y axis intersecting the y axis at (0,4) AND (-5,0) indicated on the x axis	B2	B1 for a correct reflection in the y-axis but (-5, 0) not marked or incorrect.
	(6)	
23.(a) $x^2 + y^2 = 25$ or $x^2 + y^2 = 5^2$	B1	
23.(b) (1,5)	B2	Allow x = 1 and y = 5 B1 for 5 = 2x + 3 or better
	(3)	