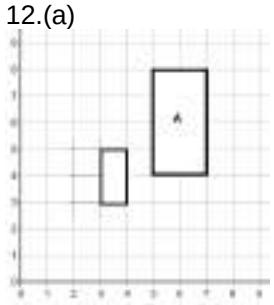
EDUQAS GCSE MATHEMATICS

AUTUMN 2023 MARK SCHEME

Component 1: Higher Tier	Mark	Comment
1.* $2 \times 330 \div (1 + 2 + 7)$ 66 (ml)	M1 A1	May be seen in stages. Full method required
	(2)	
2.* (Area of shape =) $2 \times \pi \times 6^2$ OR $4 \times \frac{\pi \times 6^2}{2}$ $+ 12^2$ $= 144 + 72\pi$ (cm^2)	M2 m1 A1	M1 for $\pi \times 6^2$ or $\frac{\pi \times 6^2}{2}$ FT from M2 or M1 CAO
	(4)	
3.* 700×7.5 5250 (g) or 5.25 kg AND No indicated or clearly implied	M1 A1 A1	 CAO FT 'their 700 x 7.5'.
Alternative method 1 $\frac{5 \times 1000}{700}$ *7·1(… cm^3)* *No indicated or clearly implied*	*M1* *A1* *A1*	 *CAO* *FT 'their* $\frac{5 \times 1000}{700}$ *'*
Alternative method 2 $\frac{5 \times 1000}{7{\cdot}5}$ *666·6(… cm^3) or 666·7 (cm^3)* *No indicated or clearly implied*	*M1* *A1* *A1*	 *CAO* *FT 'their* $\frac{5 \times 1000}{700}$ *'*
	(3)	
4. 100(g) $\leq$ mass difference $\leq$ 300(g)	B2	Not from incorrect working B1 for one end correct in the inequality or for sight of both values
	(2)	
5. 8 parts are red $\frac{8}{41}$	B2 B1	B1 for 0.4 × 20 oe or writing a ratio 8 : 12 (: 21) or 12 : 8 (: 21) CAO
	(3)	

6.* $2x + 3 = 8$ $x = 2.5$ $7 \times 2.5 - 5y = 10$ oe $y = 1.5$	 M1 A1 M2 A1	 FT 'their stated/derived 2.5' M1 for $7x - 5y = 10$
	(5)	
7.*(a) $21\sqrt{2}$	 B1	
7.(b) $\sqrt{11}$	 B1	
	(2)	
8.* $3xy(y + 2x)$	 B3	Mark final answer. B2 for any one of the following: • A correct answer seen then spoiled • $3x(y^2 + 2xy)$ • $3y(xy + 2x^2)$ • $xy(3y + 6x)$ • $3xy(y + mx)$ where $m \neq 0$ or $m \neq 2$ • $3xy(ny + 2x)$ where $n \neq 1$ or $n \neq 0$ B1 for any one of the following: • $3(xy^2 + 2x^2y)$ • $x(3y^2 + 6xy)$ • $y(3xy + 6x^2)$ • $3xy(y+\ldots)$ • $3xy(\ldots + 2x)$
	(3)	
9.* $4(.0) \times 10^3$	 B2	B1 for: • sight of 4000 • $\frac{9{\cdot}6 \times 10^8}{2{\cdot}4 \times 10^5}$ • $4(\cdot 0) \times 10^n$ where $n > 0$. • $a \times 10^3$ where $1 < a < 10$
	(2)	
10.*(a) 0.6 on the 'Does not go on a train' branch Use of $0.4 \times$ …….. = 0.28 OR $0{\cdot}28 \div 0{\cdot}4$ P(Goes to the theatre) = 0.7 0.7, 0.3, 0.7 and 0.3 correctly placed	 B1 M1 A1 A1	 Allow M1A1 if 0.7 seen on one of the 'Goes to the theatre' branches. FT 'their 0.7' only if M1 awarded. (0.28, 0.72, 0.28, 0.72 is M0A0A0)
10. (b) 0.6×0.3 0.18	 M1 A1	 FT their tree provided both values between 0 and 1.
	(6)	

11.* $2 \times \frac{2}{8.} \times \frac{9}{3}$ or $2 \div 4 \times 3$ oe 1.5 hours oe	M2 A1	May be seen in stages. Candidates might work in minutes. M1 for one step, e.g. • $2 \div 4$ (0·5 hours) • 2×3 (6 hours) oe CAO
Alternative method 1 **Pumps** / **Tanks** / **Time** 9 / 8 / 2 ÷ 3 / / × 3 3 / 8 / 6 / ÷ 4 / ÷ 4 3 / 2 / 1.5	 *M1* *M1* *A1*	 *Method to find tanks and time for 3 pumps.* *Method to find time for 2 tanks. FT.* *CAO*
Alternative method 2 **Pumps** / **Tanks** / **Time** 9 / 8 / 2 ÷ 9 / / × 9 1 / 8 / 18 / ÷ 4 / ÷ 4 1 / 2 / 4.5 × 3 / / ÷ 3 3 / 2 / 1.5	 *M1* *M1* *A1*	 *Method to find tanks and time for 1 pump.* *Method to find tanks and time for 3 pumps. FT.* *CAO*
Alternative method 3 **Pumps** / **Tanks** / **Time** 9 / 8 / 2 / ÷ 8 / ÷ 8 9 / 1 / ¼ ÷ 3 / / × 3 3 / 1 / ¾ / × 2 / × 2 3 / 2 / 1.5	 *M1* *M1* *A1*	 *Method to find pumps and time for 1 tank.* *Method to find pumps and time for 2 tanks. FT.* *CAO*
	(3)	

12.(a) 	B2	B1 for either: • 3 out of 4 vertices correct • all vertices correct but not joined • a completely correct solution with use of centre (2,1)
12.(b) (i)Triangle C drawn correctly Triangle D drawn correctly (ii)Reflection in the line $y = x$.	B1 B1 B1	 FT 'their Triangle C' FT 'their Triangle D' provided at least B1 awarded. Must be written as a single transformation.
	(5)	
13.*(a) Correctly rewriting the equations in the form $y = mx + c$ $y = 4x + 3$ AND $y = 4x - 6.5$ (So lines parallel)	B3	B2 for: • one correct equation and a correct but incomplete rearrangement of the other seen e.g. $y = 4x - 6{\cdot}5$ and $3y = 12x + 9$ • both in the form $y = 4x + c$ with an error in one constant term, provided constants aren't equal. e.g $y = 4x - 6{\cdot}5$ and $y = 4x + 9$ B1 for: • one correct equation $y = 4x - 6.5$ or or $y = 4x + 3$ • two equations of the form $y = 4x + \ldots$ with errors in both constant terms or no constant terms. *Allow all marks for equivalent complete methods* *e.g.* $6y - 24x = 18$ *AND* $6y - 24x = -39$ *or* $(3y = 12x + 9$ *AND* $3y = 12x - 19.5)$ *and a clear statement that the two equations are of the same form and the only difference is the constant, so they are parallel.*
13.(b) (-2, 9)	B2	B1 for each If no final coordinate given, award B2 for an unambiguous x = -2 and y = 9 seen in working B1 for one of x = -2 or y = 9 seen in working
	(5)	

14.(a)(i) $\frac{3125}{32}$	B2	B1 for a fraction with either: • a numerator of 3125 • a denominator of 32 • sight of $-\frac{625}{16} \times -\frac{5}{2}$
14.(a)(ii) 105	B1	
14.(b) 250 000 oe ISW	B2	B1 for 25 x 10 000
14.(c) $4n^2 - 1$	B2	May be seen as $(2n)^2 - 1$ B1 for $4n^2 + k$ or $(2n)^2 + k$ where $k \neq -1$
	(7)	
15.(a) $(5x + 3)(x + 2)$	B2	B1 for two brackets which multiply to give $5x^2 + 13x + k$ or $5x^2 + mx + 6$
15.(b) Valid response e.g. '(Dividing by a negative) he should reverse the inequality'	E1	Allow 'the answer should be x < –2'.
15.(c) x^{10}	B2	B1 for either: • sight of x^{12} • sight of $x^{\text{'their 12'} - 2}$
	(5)	
16.(a) $\binom{5}{2}$ drawn correctly	B2	B1 for one of the following: • sight of $\binom{5}{2}$, • a line representing $\binom{5}{2}$ without an arrow, • **correct t** joined to correct **w** drawn without the resultant shown, • **t** + **w** drawn, with either **t** or **w** drawn incorrectly, with resultant shown. • Correct drawing of their **t** + **w** with one error in addition.
16.(b) (**WY** =) 6**a** – 4**b** (**WZ** =) $\frac{5}{2}$ (6**a** – 4**b**) oe (**WZ** =) 15**a** – 10**b**	Check diagram B1 B1 B1	FT **WY** = 6**a** + 4**b** FT **WY** = 6**a** + 4**b** If B1 B0 B0 awarded then award SC1 for a final answer of (**YZ**=) 9**a** – 6**b** If no marks and **WY** = 6**a** + 4**b** then award SC1 for a final answer of (**YZ**=) 9**a** + 6**b**
	(5)	

17. (a) 32	B2	May be seen in stages. B1 for one of the following: • 2^5 • $\left(\sqrt[3]{8}\right)^5$ • $\sqrt[3]{\left(8^5\right)}$ • $(2^3)^{5/3}$
17.(b) $\frac{6}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $3\sqrt{2}$	M1 A1	
17.(c) $\frac{9\times10^8}{3\times10^2}$ or $\frac{900\,000\,000}{300}$ 3×10^6	M2 A1	M1 for $\frac{9\times10^8}{300}$ or $\frac{9\times10^8}{298}$ or $\frac{8{\cdot}85\times10^8}{300}$ or $\frac{8{\cdot}9\times10^8}{298 \text{ or } 300}$ or $\frac{2\times10^8+7\times10^8}{3\times10^2}$ or $\frac{2\times10^8+7\times10^8}{300}$ CAO An answer of 3 000 000 is awarded M2 A0
	(7)	
18. 		Tea	Coffee	Milkshake	Totals
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Small	5	**36**	**20**	61
Medium	**18**	**3**	6	**27**
Large	**30**	42	**40**	**112**
Totals	**53**	**81**	66	200 | $\frac{18+3}{200}$ or $\frac{27-6}{200}$ $\frac{21}{200}$ oe ISW	B4 M1 A1	If the values are not in in the table they must be clearly identified. B4 for the whole table completed correctly. If not B4, award B3 for the 4 values in the shaded cells correct along with at least one circled correct pair (forming a correct total of 200): • 18, 30, 20, 40, 36 and 3 • 18, 30, 20, 40, 53 and 81 • 18, 30, 20, 40, 112 and 27 If not B3, award B2 for any one of the following correct values: • 18, 30, 20 and 40 • 18, 30, 53 and 81 • 30, 20, 40, 112 and 27 If not B2, award B1 for one of the following correct values: • 18 and 30 • 18, 20 and 40 • 30, 20 and 40 FT 'their 18' + 'their 3' provided non-zero or FT 'their 27' – 6, provided non-zero SC1 for 21/134 or 21/27
	(6)	

19.(a) For a correct method that produces two prime factors from the set {2, 2, 2, 3, 3, 7} before the second error.	M1	Must be a method that involves only division.
2, 2, 2, 3, 3, 7	A1	CAO for sight of the six correct factors (ignore 1s) FT provided of equivalent difficulty (e.g. must be at least two 3s)
HCF = 126	B2	B1 for 2 × 3 × 3 × 7 oe 126 on answer space implies M1A1B2 If no marks, award SC1 for a common factor > 9
19.(b) 14	B1	
	(5)	
20. *XOZ* = 180 – (2 × 34)	M1	May be seen in stages or on the diagram.
112 (°)	A1	
XYZ = 56(°)	B1	FT 'their 112' provided M1 awarded
A complete proof with at least two valid angle properties appropriately stated e.g. • two radii make an isosceles triangle • an angle at the centre is twice the angle at the circumference	E1	At least one of the angle properties must be a Circle Theorem.
Alternative method *XCZ= 180(°) – 90(°) – 34(°)*	*M1*	*Extending XO or ZO to a point C on the circumference to create a right-angle triangle* *May be seen in stages or on the diagram.*
56(°)	*A1*	
XCZ= XYZ = 56(°)	*B1*	
A complete proof with at least two valid angle properties appropriately stated e.g. • *an angle in a semi-circle is 90°* • *angles in the same segment are equal*	*E1*	*At least one of the angle properties must be a Circle Theorem.*
	(4)	

21.(a) Any suitable explanation e.g. 'By grouping the data the modal group has changed' 'By grouping the data information has been lost'	E1	Do not accept e.g. 'The data grouping has changed'. 'Alice has combined some groups'
21.(b) 100 – (18 + 20 + 10 + 12 +10) or 100 – 70 = 30 Histogram completed with group of frequency density 0.3	 M1 A1 B1	Check the diagram. Allow one error with the frequencies CAO FT 'their 30' provided M1 awarded or the frequencies seen with at most one error
21.(c) Any suitable comparison e.g. '(More) Year 11 students spend more time on their phones (than Year 7 students)' '(More) Year 7 students spend less than 200 minutes on their phones (than Year 11 students)'	E1	Do not allow comparisons that include the data from the histograms.
	(5)	
22.(a) $B_1 = 1.2 \times 1000$ (=1200)	B1	
22.(b) B_2 (= $1.2 \times B_1$) = 1440 $B_3 = 1.2 \times B_2$ or $B_3 = 1.2^2 \times B_1$ or $B_3 = 1.2^3 \times 1000$ 1728 oe ISW	 B1 M1 A1	 FT 'their B_2' $\times$ 1.2
	(4)	
23.(a) $5 \times 4 \times 3$ 60	 M1 A1	
23.(b) $4 \times 1 \times 3 \times 2$ or $2 \times 60 \div 5$ 24	 M1 A1	May be seen in stages FT 'their 60' Allow 2/5 of 60.
	(4)	

24.(a) Tangent drawn at time 8 seconds $\frac{\text{Difference in y}}{\text{Difference in x}}$ Correctly evaluated gradient from their tangent	 M1 m1 A1	 Accept answer written as an improper fraction (unless it gives a whole number), mixed number or decimal. If answer given as a decimal, it must be correct to 1 decimal place – rounded or truncated.
24.(b) $\frac{0+16}{2} \times 4 + \frac{16+24}{2} \times 4 + \frac{24+28}{2} \times 4 + \frac{28+30}{2} \times 4 + \frac{30+30}{2} \times 4$ $(32 + 80 + 104 + 116 + 120)$ = 452 (m)	 M2 A1	 M1 for the sum of the areas of the 5 trapezia with one error - (possibly repeated) of the vertical heights used. Accept equivalent with vertical strips split into triangles and rectangles FT from M1
Alternative method $\frac{1}{2} \times 4 \times (0 + 30 + 2(16 + 24 + 28 + 30))$ *= 452 (m)*	*M2* *A1*	*Award M1 if only one value is incorrect.* *FT from M1*
	(6)	
25.(a) $h^{-1}(x) = \sqrt{x-3}$ Valid explanation e.g. 'You cannot find the square root of a negative number, so the smallest value of x is 3'.	 B2 E1	 B1 for $x^2 = y - 3$ or equivalent
25.(b) $fg(x) = (x-4)^2 + 5$ $gf(x) = (x^2+5) - 4$ $(x-4)^2 + 5 - ((x^2+5) - 4)$ $(x^2 - 8x + 16 + 5 - x^2 - 1 =)\ 20 - 8x$	 B1 B1 M1 A1	 FT 'their $fg(x)$' and/or '$gf(x)$' provided of equivalent difficulty Must not be from incorrect working.
	(7)	

26. $9e^2 = 7 - de^2$ $9e^2 + de^2 = 7$ $e^2(9 + d) = 7$ $e^2 = \frac{7}{9+d}$ $e = (\pm)\sqrt{\frac{7}{9+d}}$	 B1 B1 B1 B1 B1	FT until 2nd error for equivalent level of difficulty Squaring both sides Allow 3^2e^2 or $(3e)^2$ for $9e^2$ Isolating terms in e^2 Factorising Isolating e^2 Taking square root. Mark final answer.
	(5)	
27. 10x = 3.4545…. and 1000x = 345.4545… with an attempt to subtract on both sides $\frac{342}{990}$ (= $\frac{19}{55}$)	M1 A1	Or x and 100x or equivalent. Or a complete alternative method. ISW An answer of $\frac{34.2}{99}$ gains M1 only
Alternative method *0.3 + 0.04545… =* $\frac{3}{10} + \frac{45.}{990}$ $\frac{342}{990}$ *(=* $\frac{19}{55}$ *)*	*M1* *A1*	 *ISW*
	(2)	
28. $\frac{12 - w}{10 - 5}$ or $\frac{w - 12}{10 - 5}$ $\frac{w - 12}{10 - 5} = -1.5$ or $\frac{12 - w}{10 - 5} = 1.5$ w = 4.5 (m/s)	S1 M1 A1	 Implies S1 Allow for $\frac{w - 12}{10 - 5} = 1.5$ CAO An answer of w = 19.5 is awarded S1 M1 A0 provided no incorrect working seen.
Alternative method *Use of v = u + at with u = 12, a = -1.5, t = 5* *12 − 1.5 × 5* *w = 4.5 (m/s)*	*S1* *M1* *A1*	*Allow S1 and M1 for use of a = 1.5* *Implies S1* *CAO*
	(3)	