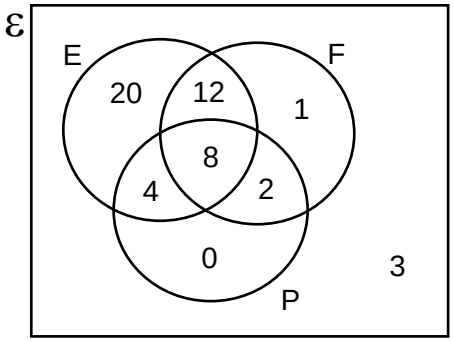
EDUQAS GCSE MATHEMATICS

AUTUMN 2022 MARK SCHEME

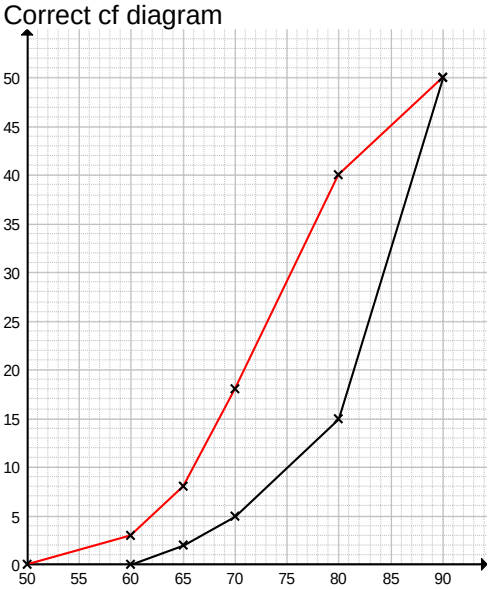
Component 1: Higher Tier	Mark	Comment
1.*(a) 55	B1	
1.(b) $5n - 1$ or $-1 + 5n$	B2	Mark final answer B1 for: • $5n + k$, where $k \neq -1$ • a correct answer seen and then spoiled. • an unsimplified expression which would lead to $5n$ -1 Allow the use of other variables for *n* for B1 or B2
	(3)	
2.*(a) Second and third statements indicated and no others	B2	Award B1 for one of the following: • One correct statement and up to one incorrect statement indicated • Two correct statements and exactly one incorrect statement indicated
2.(b) (Area of cross-section =) $\frac{1}{2} \times 3x \times x$ (Volume =) $\frac{1}{2} \times 3x \times x \times 4$ $\frac{1}{2} \times 3x \times x \times 4 = 216$ oe $x^2 = 216 \times 2 \div 4 \div 3$ (= 36) 6 (cm)	 M1 M1 A1 M1 A1	May be done in parts Accept ½ base x height oe FT 'their $\frac{1}{2} \times 3x \times x$' $\times$ 4, provided at least two terms in x. CAO FT 'their $k' \times x^2 = 216$ Mark final answer. FT Final 2 marks can be awarded if trials used on an equation of the form 'their $k' \times x^2 = 216$ to find a correct or correct FT answer. If x^2 is a square number, x must be given as a whole number. Otherwise, it may be written as an unsimplified surd.
Alternative method *(Area of cross-section =) 216 ÷ 4 (=54)* *(Area of cross-section =) $\frac{1}{2} \times 3x \times x$* *$\frac{1}{2} \times 3x \times x = 54$ oe,* *$x^2 = 54 \times 2 \div 3$ (= 36)* *6 (cm)*	*B1* *M1* *A1* *M1* *A1*	*Accept ½ base x height oe* *CAO* *FT 'their $k' \times x^2$ = 'their 54'* *Mark final answer.* *FT* *Final 2 marks can be awarded if trials used on an equation of the form 'their $k' \times x^2$ = 'their 54' to find a correct or correct FT answer* *If x^2 is a square number, x must be given as a whole number. Otherwise, it may be written as an unsimplified surd.*
		If no marks award SC3 for a complete correct method using trials leading to an answer of 6 OR SC2 for a correct trial with height > 3, e.g. $\frac{1}{2} \times 15 \times 5 \times 4$ (**and** comparison with 216) si OR a correct trial with height > 3. e.g. $\frac{1}{2} \times 15 \times 5$ **and** comparison with 54 si
	(7)	

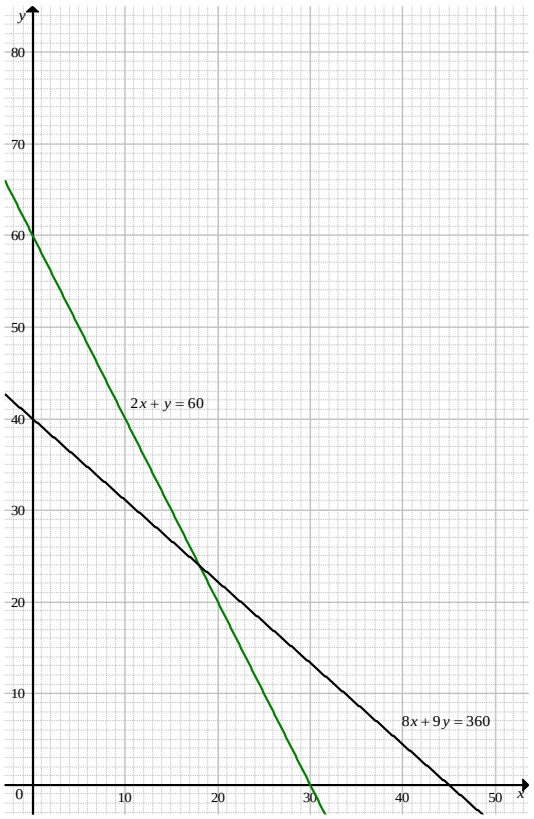
3.*(a) 1 ≤ time difference ≤ 3	B2	Not from wrong working B1 for one end correct in the inequality or for sight of both values
3.(b)		Accept a statement such as 'The van is always less than 6 m long/the maximum length acceptable' stated once only; may be written anywhere. If lengths are given, they must be within the appropriate limits.
Valid example for may be correct e.g. Van 590 cm AND trailer 198 cm	E1	For the van accept any statement such as 'The van is always less than 6 m long/the maximum length acceptable' or any values satisfying: 585 cm ≤ length of the van < 595 cm <u>AND</u> 195 cm ≤ length of the trailer ≤ 200 cm Allow e.g. 'The trailer could be less than 200 (cm).' Example might use the values given in the question (590 cm and 200 cm) and not consider the values are rounded to the nearest 10 cm.
Valid example for may not be correct e.g. (Van 590 cm and) trailer 201 cm	E1	(For the van accept any statement such as 'The van is always less than 6 m long' or any values satisfying: 585 cm ≤ length of the van < 595 cm AND) 200 cm < length of the trailer < 205 cm Allow e.g. 'The trailer could be more than 200 (cm)/the maximum length acceptable' or 'the length of the trailer could be 205 (cm)'.
	(4)	
4.*(a) 600 000 ÷ 20 or $(6 \times 10^5) \div (2 \times 10)$	M1	
3×10^4	A1	Award M1 A0 for any one of the following: • 30 000 • 0.3×10^5
4.(b) $60 \times 3 \times 10^8$ oe	M1	e.g. $300\,000\,000 \times 60$
180×10^8 or 18 000 000 000 oe	A1	CAO
$1{\cdot}8(0) \times 10^{10}$ (litres per hour)	A1	FT 'their $60 \times 3 \times 10^8$', provided M1 awarded. If no marks, award SC1 for 5×10^6
	(5)	
5.*(a) 9.6 ÷ 12 (= 0.8)	M1	
0.8 ÷ 8 × 3	M1	FT 'their 0.8' including place value error from conversion of kg to g
0.3 (kg) or 300g	A1	CAO
Alternative method *88 : 3 : 5*	*B1*	
$\frac{3}{88+3+5} \times 9.6$	*M1*	
0.3 (kg) or 300g	*A1*	*CAO*
5.(b) (Total force =) 1600 × 0.1	M1	
160 (N)	A1	

5.(c) Valid impact e.g. 'The force would be less'	E1	Ignore any extraneous comments e.g. 'The pressure would increase, and the force will be lower'.
	(6)	
6.* $\frac{1008}{60}\times 100$ or $\frac{1008}{0.6(0)}$ or $\frac{1008}{6}\times 10$ or $\frac{10080}{6}$ oe (£)1680(.00)	M2 A1	M1 for one of the following: • $\frac{1008}{6}$ (=168) (Calculating 10% of original value) • $\frac{1008}{60}$ (=16.8) (Calculating 1% of original value) • $0.6 \times x = 1008$ oe
	(3)	
7.*(a) $15x^2 + 21x - 20x - 28$ $15x^2 + x - 28$	B2 B1	B1 for any three terms correct. $mx^2 + x + n$ implies middle two terms correct if not from wrong working Mark final answer. Implies previous B2. FT their expression, provided it is a quadratic with 4 terms to consider and there are like terms to collect.
7.(b)(i) $2xy(x + 6y)$	B3	Mark final answer. B2 for any one of the following: • A correct answer seen then spoiled • $2x(xy + 6y^2)$ • $2y(x^2 + 6xy)$ • $xy(2x + 12y)$ • $2xy(x + my)$ where $m \neq 0$ or $m \neq 6$ • $2xy(nx + 6y)$ where $n \neq 1$ or $n \neq 0$ B1 for any one of the following: • $2(x^2y + 6xy^2)$ • $x(2xy + 12y^2)$ • $y(2x^2 + 12\,xy)$ • $2x(xy + my^2)$ where $m \neq 0$ or $m \neq 6$ • $2y(x^2 + mxy)$ where $m \neq 0$ or $m \neq 6$ • $xy(2x + my)$ where $m \neq 0$ or $m \neq 6$ • $2x(nxy + 6y^2)$ where $n \neq 1$ or $n \neq 0$ • $2y(nx^2 + 6xy)$ where $n \neq 1$ or $n \neq 0$ • $xy(nx + 12y)$ where $n \neq 1$ or $n \neq 0$ • $2xy(x + \ldots)$ • $2xy(\ldots + 6y)$
7.(b)(ii) $(x-8)(x+8)$	B1	
	(7)	

8.(a) Rotation 90° clockwise or 270° anti-clockwise about (–1, 0)	B3	Must be a single transformation for B3 If B3 not awarded, allow B1 for each correct 'condition', up to B2, from a single transformation or a multi-step transformation e.g. Award B1B1 for 'Centre of rotation (–1, 0)' Award B1B1 for 'Rotation clockwise 90°, and then a translation 1 to the left and 1 down'.
8.(b) Correct triangle with vertices at (–4, 10), (–7, 4), (8, 4)	B2	B1 for any one of the following: • A triangle with 2 correct vertices • 3 vertices correctly plotted, but not joined • for a correct enlargement from an incorrect centre • an enlargement using an different scale factor ($\neq 1$) from the centre (5, 1)
	(5)	
9.(a)  	B3	The 0 entry can be empty or ∅ B2 for any 6 or 7 correct or B1 for any 4 or 5 correct
9.(b) $\frac{27}{50}$ ISW or 0.54	B1	For the numerator: FT 20 + 'their 4' + 0 + 3 provided 'their 4' > 0 OR 50 – (12 + 8 + 'their 2' + 1) provided 'their 2' > 0
9.(c) $\frac{16}{44}$ ISW	B2	For B2 or B1: FT numerator of 'their 12' + 'their 4' and denominator of 'their 20 + their 12 + their 8 + their 4' or 50 – ('their 0' + 'their 1' + 'their 2' + 'their 3') provided no values are negative and fraction < 1 B1 for denominator of 44 or numerator of 16 provided in a fraction < 1 OR B1 for a correct answer with wrong notation e.g. 16 out of 44 or 16 : 44
	(6)	

10.(a)(i) $\frac{x^4}{2}$ or $\frac{1}{2}x^4$ or $0.5x^4$	B1	Mark final answer
10.(a)(ii) $\frac{5}{x^2}$ or $5x^{-2}$	B2	Mark final answer B1 for sight of $\left(\frac{x^2}{5}\right)^{-1}$ or $\left(\frac{\sqrt{5}}{x}\right)^2$ oe
10.(b) Use of a counter example e.g. $\sqrt{64+36} = \sqrt{100} = 10$ $\sqrt{64} + \sqrt{36} = 8 + 6 = 14$	B1	Accept e.g. $\sqrt{1+4} = \sqrt{5}$ $\sqrt{1} + \sqrt{4} = 1 + 2 = 3$ and $\sqrt{5} < 3$ or $\sqrt{5} \neq 3$ If a, b and a+b are not all square numbers then further explanation is required.
10.(c)(i) $\frac{1}{4}$ or 0.25	B1	
10.(c)(ii) 2^3 or $\sqrt[5]{32768}$ or $\left(\sqrt[5]{32}\right)^3$ or $\sqrt[5]{32^3}$ 8	M1 A1	
	(7)	
11. Clears the root and simplifies e.g. $64x^3 = 7y + xy$ si Factorises e.g. $64x^3 = y(7+x)$ or $(4x)^3 = y(7+x)$ Divides e.g. $y = \frac{64x^3}{7+x}$	B2 B1 B1	FT expressions of equivalent difficulty until 2nd error; marks can be awarded in a different order B1 for $(4x)^3 = 7y + xy$ si; Implied by e.g. $kx^3 = 7y + xy$ where $k \neq 0$ or 64 OR $64x = 7y + xy$ FT FT; final answer must be simplified
	(4)	
12. $\frac{2}{3}\pi r^3 = 18000\pi$ oe $r^3 = \frac{18000\pi \times 3}{2\pi}$ oe $(r =) \sqrt[3]{\frac{18000\pi \times 3}{2\pi}}$ oe $(r =) 30$ (cm)	M1 M1 M1 A1	 Allow for $r^3 = \frac{18000\pi}{\frac{2}{3}\pi}$ oe $(r =) \sqrt[3]{27000}$ If no marks, award SC2 for $(r =) \sqrt[3]{\frac{18000\pi \times 3}{4\pi}} (= \sqrt[3]{13500})$ oe or SC1 for $r^3 = \frac{18000\pi \times 3}{4\pi}$ oe
	(4)	

13. $\frac{x+2}{20}=\frac{5x+2}{60}$ oe $120 - 40 = 100x - 60x$ oe (x =) 2 (km) oe $\frac{2+1.8}{2+0.2+1.8}$ oe or $\left(1-\frac{0.2}{2+0.2+1.8}\right)$ oe $\frac{19}{20}$	B2 M1 A1 M1 A1	May be seen in parts B1 for $\frac{x+0.2+1.8}{8+2+10}$ oe FT 'their derived equation' provided of equivalent difficulty. FT 'their derived equation.' FT 'their derived 2', if possible; do not ft negative values of x FT provided simplification needed
	(6)	
14.(a) 21 42 (%)	B2 B1	B1 for $5 \times 2.2 + (1 \times) 10$ FT provided at least B1 awarded. If no marks award SC1 for $0.3 \times 10 + (1 \times) 5 + 2 \times 5 + 2.2 \times 10 + (1 \times) 10$
14.(b) $v \le 50$: 0; $v \le 60$: 3; $v \le 65$: 8; $v \le 70$: 18; $v \le 80$: 40; $v \le 90$: 50	B2	B1 FT for any 2 or 3 unshaded cells correct; FT 'their 3' + 5, 'their 8' + 10, 'their 18' + 22
14.(c)(i) Correct cf diagram  	B2	FT 'their part (b)' for B2 or B1 provided an attempt at cumulative frequency; may be a curve; lines need not be ruled B1 FT for first 5 points plotted correctly but not joined or for at most 2 incorrectly plotted points which have been correctly joined NB, if correct: (50, 0), (60, 3), (65, 8), (70, 18), (80, 40), (90, 50)
14.(c)(ii) Sight of numerical evidence Tuesday indicated and valid interpretation using their numerical evidence e.g. 'The median for Tuesday is greater, (so more had a higher greatest speed).' or 'The upper quartile for Tuesday is greater, so the top 25% of drivers drove more quickly.'	E1 E1	e.g. Mon: Median 73 OR between 70 and 80; LQ 67; UQ 79; % ≥ 75mph 42 (FT part a); No. > 80mph 10 Tues: Median 83 OR between 80 and 90; LQ 77 - 78; UQ 86 - 87; % ≥ 75mph 80; No. > 80mph 35
	(9)	

15.(a)(i) $0.8x + 0.9y \leq 36$ (so $8x + 9y \leq 360$)	B1	
15.(a)(ii) $0.2x + 0.1y \leq 6$ oe, ISW	B1	Note: If, after gaining B1 (ISW), the inequality is incorrectly simplified, penalise -1, in (b), if the incorrectly simplified inequality is plotted
15.(b)  3×18 + 2.5×24 (£)114	B2 B1 B1	FT for B2 or B1 if possible B1 for one correct line FT 'their 24' where 'their 24' is obtained correctly from either one of the lines drawn or from solving one of their equations FT 54 + 2.5 × ('their 24') correctly evaluated
	(6)	
16. $P\hat{Q}R$ = 90° (angle in a semi-circle oe)	B1	Angles may be shown on diagram, otherwise any given angles must be identified e.g. $P\hat{R}S$ = 76°
$P\hat{Q}S$ = 76° (angle in the same segment oe)	B1	
$S\hat{Q}R$ = (90 – 76 =) 14°	B1	Implies 3 marks
Both reasons stated	E1	
Alternative method 1 *By drawing, or imagining, an extra line segment, PS:* *$P\hat{S}R = 90°$* *(angle in a semi-circle oe)*	*B1*	*Angles may be shown on diagram, otherwise any given angles must be labelled e.g. $P\hat{R}S = 76°$*
$R\hat{P}S = (90 – 76 =) 14°$	*B1*	
$S\hat{Q}R = 14°$ *(angle in the same segment oe)*	*B1*	*Implies 3 marks*
Both reasons stated	*E1*	

Alternative method 2 *By introducing a specific value for one of the unknown angles, not used in the solution e.g. for an angle at the intersection of PR and QS, or for the angle $Q\hat{S}R$.* *$P\hat{Q}R = 90^\circ$* *(angle in a semi-circle oe)*	*B1*	*Angles may be shown on diagram, otherwise any given angles must be labelled e.g. $P\hat{R}S = 76^\circ$*
Full method using angle facts to gain $S\hat{Q}R = 14^\circ$ *(must include, at some stage, angles in the same segment oe)*	*B2*	*Implies 3 marks*
Both reasons stated	*E1*	
	(4)	
17.(a) Sight of $\frac{10}{8}$ or $\frac{8}{10}$ oe si	B1	Can be implied from 128 × 10 ÷ 8 oe
128 × $\left(\frac{10}{8}\right)^2$ or 128 ÷ $\left(\frac{8}{10}\right)^2$ oe	M1	
200 (cm^2)	A1	
17.(b) 64 : 125	B2	If not B2, award B1 for any one of the following: • $4^3 : 5^3$ • $8^3 : 10^3$ oe • sight of 125 AND 64 • $\left(\frac{10}{8}\right)^3$ oe FT 128 × 8 : 'their 200' × 10 from (a) oe
	(5)	
18.(a) $0.1\dot{6}\dot{3}$	B1	Allow for 0.16363... provided no rounding or termination
18.(b) $1000x - x = 3712.\dot{7}1\dot{2} - 3.\dot{7}1\dot{2}$ oe, si	M1	
$\frac{3709}{999}$ ISW or $3\frac{712}{999}$ ISW	A1	
18.(c) $\frac{1}{18} + \frac{1}{5}$ oe	B1	Award no marks if the method for 18(b) is used to answer 18(c)
$\left(\frac{5}{90} + \frac{18}{90} =\right) \frac{23}{90}$ oe, ISW	B1	
	(5)	
19.(a) $V \propto 3^t$ or $V = k \times 3^t$ si	B1	Allow for $V \propto k \times 3^t$
$k = \frac{9}{3^4}$ oe, si	B1	For isolating 'k'
$V = \frac{3^t}{9}$ oe	B1	Mark final answer Accept $V = 3^{t-2}$ Must be in terms of V and t Allow B1B1B0 only for V = 0.11(1..)3^t if truncated
19.(b)(i) $(V =)\ \frac{1}{9}$	B1	FT 'their constant of proportionality', provided ≠ 1
19.(b)(ii) $27 \times 9 = 3^t$ or $3^3 = 3^{t-2}$ oe	M1	FT 'their constant of proportionality', provided ≠ 1
$(t =)$ 5	A1	FT if possible
	(6)	

20.(a) 125	B2	B1 for sight of 5^3 oe
20.(b) 60	B2	B1 for sight of $5 \times 4 \times 3$ but not $5 \times 4 \times 3 \times 2$ ($\times 1$)
$\frac{60}{125}$ oe ISW	B1	FT 'their derived 125' provided it is not 100, and 'their $5 \times 4 \times 3$' provided fraction < 1
	(5)	
21. Sight of $\sqrt{27} = 3\sqrt{3}$	B1	
$\frac{44}{5+\sqrt{3}} \times \frac{5-\sqrt{3}}{5-\sqrt{3}}$ oe	M1	
$44 \times \frac{5-\sqrt{3}}{22}$ oe	B1	For a correct denominator of 22
$7-3\sqrt{3}+10-2\sqrt{3}$ oe	M1	FT for final M1 A0 provided B1 M1 previously awarded
$17-5\sqrt{3}$	A1	CAO
Alternative method Sight of $\sqrt{27} = 3\sqrt{3}$	*B1*	*May be seen at any stage*
$\frac{(7-\sqrt{27})(5+\sqrt{3})+44}{5+\sqrt{3}} \left(= \frac{35+7\sqrt{3}-5\sqrt{27}-\sqrt{27}\times 3}{5+\sqrt{3}}\right)$ oe	*M1*	
$\left(= \frac{70-8\sqrt{3}}{5+\sqrt{3}}\right)$ oe si		
$= \frac{(70-8\sqrt{3})(5-\sqrt{3})}{(5+\sqrt{3})(5-\sqrt{3})}$ oe si	*M1*	*FT 'their' $\frac{70-8\sqrt{3}}{5+\sqrt{3}}$, provided B1 M1 previously awarded*
$= \frac{(350-70\sqrt{3}-40\sqrt{3}+24)}{22}$ oe si	*B1*	*For a correct denominator of 22*
$= 17 - 5\sqrt{3}$	*A1*	*CAO*
	(5)	
22. $\left(\frac{6}{10} \times \frac{3}{9}\right) + \left(\frac{3}{10} \times \frac{6}{9}\right)$	M2	M1 for either product
$\frac{36}{90}$ oe ISW	A1	Must be from correct work, if shown
	(3)	
23. (a) maximum point indicated	B1	
23. (b) $(x-5)^2 - 16 = 0$ si	B1	
$5 \pm \sqrt{16}$ or $(x-1)(x-9)$	M2	May be seen in stages M1 for $x - 5 = \pm\sqrt{16}$ or $5 + \sqrt{16}$ or $x^2 - 10x + 9 (= 0)$
$x = 1$, $x = 9$	A1	Not from wrong working; allow (1, 0) and (9, 0) final answer of $x = 9$ only implies M1
	(5)	