EDUQAS GCSE MATHEMATICS

SUMMER 2023 MARK SCHEME

Component 1: Higher Tier	Mark	
1.*(a) $\frac{7}{15}$	B1	Accept equivalent fractions.
1.(b) $\frac{60}{15}\times 3$ or $\frac{60}{15}\times 5$ or $\frac{60}{15}\times 7$ si 12 (cm), 20 (cm), 28 (cm)	M1 A1	FT 'their 3 + 5 + 7' from (a). FT. Two correct answers imply M1. May be seen in any order.
	(3)	
2.* 140 + 180 or 360 – 40 320°	M1 A1	
	(2)	
3.*(a) 2	B2	B1 for sight of two correct consecutive terms from the sequence 11, 13, 15, 17, …
3.(b)(i) $n < 45$ oe	B2	B1 for either: • $2n < 99 – 9$ oe • $n < k/2$, from $2n < k$, where k is a constant. Use of '=' is B0 unless finally replaced.
3.(b)(ii) 44	B1	FT 'their 45' – 1, unless 'their 45' = 99.
	(5)	
4.* 65 × 0.8(0) oe (£)52 52 × 1.2(0) oe (€)62.4(0) and online indicated	M1 A1 M1 A1	FT 'their 65 × 0.8(0)' Airport / Online £: 52 / 50 $: 65 / 62.5(0) €: 62.4(0) / 60
Alternative method 1 *65 × 0.8(0) oe* *(£)52* *60 ÷ 1.2(0) oe* *(£)50 and online indicated*	*M1* *A1* *M1* *A1*	
Alternative method 2 *60 ÷ 1.2(0) oe* *(£)50* *50 ÷ 0.8(0) oe* *($)62.5(0) and online indicated*	*M1* *A1* *M1* *A1*	*FT 'their 60 ÷ 1.2(0)'*
	(4)	

5.* $(x =)\ \frac{360-290}{2}$ oe	M2	Check diagram M1 for $x + 75 + x + 70 + 85 + 60 = 360$ oe May be in stages e.g. 60 + 85 = 145, 360 – 145 = 215, $2x + 145 = 215$
$x = 35$	A1	Implied by 105 on the diagram.
$y = 180 - (35 + 70)$ or $x + 70 = 180 - y$	m1	FT 'their derived 35' provided it is less than 110 and M2 previously awarded.
$y = 75$	A1	FT
	(5)	
6.(a) $16^2 + \text{east}^2 = 20^2$	S1	Strategy of using Pythagoras; si by sight of e.g. 3, 4, 5
$\text{east}^2 = 20^2 - 16^2$ or (east =) $\sqrt{20^2 - 16^2}$	M1	si by sight of 12, 16, 20 or 3 × 4
(east =) 12 (km)	A1	
6.(b) $\frac{20}{25}\ (\times\ 60)$	M1	May be seen in stages. e.g. (5 km in 12 minutes) x 4
48 (minutes)	A1	
	(5)	
7.*(a) $x =$ 0.7 or 0.8	B1	
$y =$ 1.4 or 1.5	B1	If no marks award SC1 for one of the following: • a value of x between 0·7 and 0·8 (including 7/9) and a value of y between 1·4 and 1·5 (including $1\frac{4}{9}$ or $\frac{13}{9}$), • correct values given as coordinates in the working lines, • correct answers, written to 1 decimal place, reversed.
7.(b)(i) –8	B1	Allow (0, –8) or $y = -8$
7.(b)(ii) (–1, –9)	B2	B1 for each. If no final coordinate given, allow: • B2 for an unambiguous $x = -1$ AND $y = -9$ seen in the working • B1 for an unambiguous $x = -1$ OR $y = -9$ seen in the working If no marks, award SC1 for (–9, –1).
7.(b)(iii) $x = -4$, $x =$ 2	B1	If answer line is not completed, allow –4, 2, but do not allow (–4, 2)
	(6)	

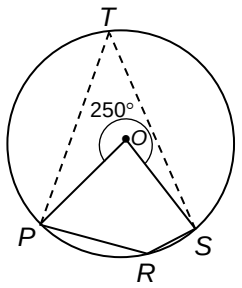
8.* Sight of 70% and 5×10^8 OR 71% and 5×10^8 OR 70% and $5{\cdot}1 \times 10^8$ $0{\cdot}7 \times 5 \times 10^8$ oe OR $0{\cdot}71 \times 5 \times 10^8$ oe OR $0{\cdot}7 \times 5{\cdot}1 \times 10^8$ oe $3{\cdot}5 \times 10^8$ (km^2) ISW OR $3{\cdot}55 \times 10^8$ ISW OR $3{\cdot}57 \times 10^8$ ISW	B1 M1 A1	Not for sight of 71% and $5{\cdot}1 \times 10^8$ Allow for $0{\cdot}71 \times 5{\cdot}1 \times 10^8$ If 5×10^8 or 5.1×10^8 is written in ordinary form, condone a slip by a power of 10 for M1. e.g. $0{\cdot}7 \times 50\,000\,000$ CAO Award B1 M1 A1 for an unsupported answer of $3{\cdot}5 \times 10^8$ (km^2).
	(3)	
9.* $\frac{2}{8} \times \frac{2}{8}$ or $\frac{1}{4} \times \frac{1}{4}$ $\frac{4}{64}$ or $\frac{1}{16}$ ISW	M1 A1	Or equivalent Or equivalent
	(2)	
10. (a) $20 \times 170 + 30 \times 180$ (= 8800) $\div 50$ 176 (cm)	M2 m1 A1	M1 for either: • 20×170 (= 3400) • 30×180 (= 5400) dep on M2 Award M3 for 20/50 x 170 + 30/50 x 180 oe.
10.(b) Valid explanation e.g. • 'Only three of the team have heights below the mean'. • 'Most of the team have heights above the mean'. • 'The mean is affected by extreme values such as 150'. • 'The 150 is much smaller than the other heights'.	E1	
	(5)	

11.* $4a + c = 9.5(0)$ AND $5a + 2c = 13$ oe	B1	Allow other letters or words throughout. Values may be in pence throughout
Method to eliminate an unknown e.g. equal coefficients and subtraction or rearranges one equation and substitutes into the other	M1	FT their equations provided one is correct and the other is linear in the same pair of unknowns. Allow one error in one term, not in the equated coefficients. Allow one error in rearrangement but not substitution.
Finds one unknown	A1	CAO; $a = 2$ or $c = 1.5(0)$
Finds the other unknown	A1	FT 'their a' or 'their c' used in one of their equations.
(£)9(.00) or 900(p)	B1	Provided at least <u>two</u> of the previous four marks awarded, FT 3('their derived a') + 2('their derived c') If units are given, they must be correct. <u>For candidates that are awarded B1</u> and use trials to find the values of a and c, award SC2 for a final answer of (£)9(.00) or 900(p).
	(5)	
12.(a) $y = 4x - 5$ only indicated	B1	
12.(b) $\frac{9-3}{2a-a}$ oe, si	B1	
$\frac{9-3}{2a-a} = \frac{3}{4} \times \left(\frac{2}{2}\right)$ oe, si	M1	FT 'their derived gradient' providing numerator or denominator correct. $2a - a = 8$ Award B1 M1 for change in $y = 6$ and change in $x = 8$.
(a =) 8	A1	CAO
	(4)	

13. (a)(i) 10	B1	
13.(a)(ii) $\frac{1}{9}$	B2	B1 for sight of one of the following: • (6th term =) $\frac{1}{3\sqrt{3}\sqrt{3}}$ • (5th term =) $\frac{1}{3\sqrt{3}}$ • (ratio =) $\frac{1}{\sqrt{3}}$
13.(b) $n^2 - 4$	B2	B1 for either: • $n^2 + k$, $k \neq -4$ or 0 • $kn^2 - 4$, $k \neq 1$ or 0.
	(5)	
14. (a) Correct rectangle with vertices (1, 3), (1, 2), (3, 2), (3, 3)	B2	B1 for one of the following: • at least 3 vertices correct, • a correct enlargement of scale factor $-\frac{1}{3}$.
14.(b) Rotation 180° about (0, 0) OR enlargement scale factor −1 centre (0, 0)	B3	If correct triangle seen, then award B1 for each component. Rotation may be clockwise or anticlockwise. If no marks, award SC1 for triangle drawn at (−2, −4), (−4, −4), (−2, −8) or these coordinates seen.
	(5)	
15. (Original depth of liquid =) 5400 ÷ 0·9 ÷ (20 × 20) × $\frac{2}{3}$ 10 (cm)	 M1 M1 M1 A2	 Method marks may be awarded in any order Award A1 for sight of any ONE of the following: • (5400 ÷ 0·9 =) 6000 • (5400 × $\frac{2}{3}$ =) 3600 • (5400 ÷ (20 × 20) =) 13.5 • Two correct evaluations, following an initial error e.g. 5400 ÷ 0·9 = 600, 600 ÷ 400 × $\frac{2}{3}$ = 1.
Alternative method *Let original depth = x* *20 × 20 × 1.5x (= 600x)* *0.9 = 5400 (= 9)* *600x x* *x = 10 (cm)*	 *M2* *M1* *A1* *A1*	 *M1 for 20 × 20 × h (= 400h)* *M1 for 0.9 = 5400* *'their volume'*

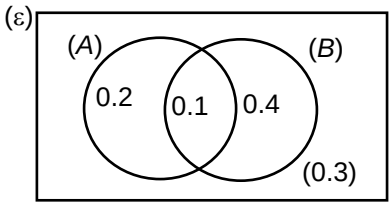
Alternative method 2 *Let final depth = h* *20 × 20 × h (= 400h)* *0.9 = 5400 / 400h* *(original depth =) h × 2/3* *10 (cm)*	 *M1* *M1* *A1* *M1* *A1*	 *M1 for 0.9 = 5400 / 'their volume'*
	(5)	
16.(a) 13^5	B1	
16.(b) $\frac{1}{2}$	B2	B1 for sight of either: • $\left(\frac{1}{8}\right)^{\frac{1}{3}}$ • $\sqrt[3]{8^{-1}}$ oe
16.(c) $a = 2$, $b = 9$ OR $a = 10$, $b = 1$	B2	Allow embedded answers, provided not contradicted. B1 for one of the following: • $a = 2$ • $a = 10$ • $\left(\sqrt[a]{3}\right)^5$ oe • sight of $9\sqrt{3}$
	(5)	

17. (a) Two valid, different criticisms e.g. • 'She has used the midpoint from each class (, not the upper, when plotting)' • 'She should have used the higher value from each group (for her plots, not the midpoint.)' AND • 'The first point should not be at (0, 0), (it should be at (3, 0).)' • 'The graph shows there is data between 0 and 3 (when there is none.)'	E2	One comment about the midpoint being used and the other comment about the plot at the origin. E1 for one valid criticism.
17.(b)(i) Frequency densities: 0·2, 0·9, 1·2, 0·5, 0·4 si Fully correct histogram	 B2 B2	 B1 for either: • any 4 correct calculations from $6 \div 30$, $9 \div 10$, $12 \div 10$, $5 \div 10$, $8 \div 20$ • any 4 values correctly found. FT candidate's frequency density for B2 or B1 provided at least 3 frequency densities are correct. B1 for 3 or 4 correct bars; no gaps.
17.(b)(ii) $(0{\cdot}4 \times 30 + 1{\cdot}5 \times 10 + 0{\cdot}6 \times 5)$ $- (6 + 9 + 12 \div 2)$ 9	 M1 m1 A1	Check diagram $12 + 15 + 3$ or $40 - 0.5 \times 0.6 \times 10 - 0.7 \times 10$ or $40 - 3 - 7$ $- 21$
	(9)	

18.(a) $P\hat{R}S = 125(°)$	B1	Allow if marked on diagram
$O\hat{P}R = \frac{2}{5}\times(360-(125+110))$ or $125-\frac{3}{5}\times125$ oe	B1	
50(°)	B1	Accept 50 : 75. *If no marks, award SC1 for correct evaluation of 2/5 × (250 – 'their PRS') provided 90 < PRS < 180.*
Alternative method		*Adding a 4th point to the circumference* 
$P\hat{T}S = 55(°)$ AND $P\hat{R}S = 125(°)$	*B1*	*Allow if angles marked on diagram*
$O\hat{P}R = \frac{2}{5}\times(360-(125+110))$ or *$125-\frac{3}{5}\times125$ oe*	*B1*	
50(°)	*B1*	*Accept 50 : 75.*
18.(b) $a = b$ AND $c = d$ (isosceles trapezium) $a + d = 180°$ OR $b + c = 180°$ (co-interior angles between parallel lines) $a + c = 180°$ OR $b + d = 180°$ Opposite angles in a cyclic quadrilateral (add up to 180°)	B3	Complete proof. At least two reasons must be provided. One of these reasons must be the cyclic quadrilateral. B2 for a complete proof with no reasons. B1 for $a + c = 180°$ OR $b + d = 180°$ AND $a = b$ AND $c = d$ OR $a + d = 180°$ OR $b + c = 180°$
	(6)	

19.(a) $y \propto \frac{1}{x^2}$ or $y = \frac{k}{x^2}$ oe, si	B1	Allow $y \propto \frac{k}{x^2}$
$3 = \frac{k}{4^2}$ or $k = 3 \times 4^2$ or $k = 48$	M1	FT from $y \propto x^2$ or $y \propto \frac{1}{x^n}$ with $n > 0$ and $n \neq 2$. M1 implies B1 (excluding FT case).
$y = \frac{48}{x^2}$	A1	Correct answer implies all 3 marks. Allow for $y = \frac{k}{x^2}$ AND $k = 48$ seen.
19.(b)(i) $\frac{48}{64}$ oe, ISW	B1	FT 'their (a) provided M1 previously awarded.
19.(b)(ii) $\sqrt{\frac{48}{1200}}$ or $\sqrt{\frac{1}{25}}$ oe	M1	FT 'their (a) provided M1 previously awarded.
$\frac{1}{5}$ oe	A1	CAO
	(6)	
20. $100x - x = (3)21\dot{2}\dot{1} - (3)\dot{2}\dot{1}$ oe	M1	
$\frac{318}{99}$ or (3) $\frac{21}{99}$	A1	May see unsupported $3\frac{21}{99}$ for M1A1
$3\frac{7}{33}$	A1	
	(3)	
21. $\left(8\sqrt{5} - 2 - 2(\sqrt{5}+3)\right) \div 2$ OR $4\sqrt{5} - 1 - (\sqrt{5}+3)$	M2	Condone missing brackets if A1 is awarded. M1 for either: • $8\sqrt{5} - 2 - 2(\sqrt{5}+3)$ (= $6\sqrt{5} - 8$) • $2(\sqrt{5}+3) + 2x = 8\sqrt{5} - 2$
$3\sqrt{5} - 4$	A1	CAO
$(3\sqrt{5}-4)(\sqrt{5}+3) = 15 + 9\sqrt{5} - 4\sqrt{5} - 12$	M1	FT 'their $a\sqrt{5} \pm b$' providing $a \neq 0$ and $b \neq 0$.
$5\sqrt{5} + 3$ (cm^2)	A1	Mark final answer. FT
	(5)	
22. **DO** + **OA**+ **AC** si OR **DB** + **BC** si	S1	
$-\frac{1}{2}\mathbf{b} + \mathbf{a} + \frac{1}{4}(\mathbf{b} - \mathbf{a})$ OR $\frac{1}{2}\mathbf{b} - \frac{3}{4}(\mathbf{b} - \mathbf{a})$	M2	M1 for sight of one of the following: • **(DO =)** $-\frac{1}{2}\mathbf{b}$ • **(AC =)** $\frac{1}{4}(\mathbf{b} - \mathbf{a})$ • **(DB =)** $\frac{1}{2}\mathbf{b}$ • **(BC =)** $-\frac{3}{4}(\mathbf{b} - \mathbf{a})$ May be seen on diagram.
$\frac{3}{4}\mathbf{a} - \frac{1}{4}\mathbf{b}$ or $\frac{3\mathbf{a} - \mathbf{b}}{4}$	A1	If S1 M1 then award SC1 for a final answer of $^4/_5\,\mathbf{a} - {}^3/_{10}\,\mathbf{b}$.
	(4)	

23. 9 × 1000 ÷ 60 150 (metres per minute) 7.2 (minutes)	 M1 M1 A1 B1	Method marks can be awarded in either order CAO Mark final answer. FT from 'their 150' provided at least M1 previously awarded and their 150 > 60
	(4)	
24.(a) $(x=)\dfrac{-(-8)\pm\sqrt{(-8)^2-4\times5\times(-1)}}{2\times5}$ $(x=)\dfrac{8\pm\sqrt{84}}{10}$ $(x=)\dfrac{4\pm\sqrt{21}}{5}$	 M1 A1 A1	
24.(b) $4x = 3x\,(x-1) + 2(x-1)$ or $4x = (3x+2)\,(x-1)$ oe, si $4x = 3x^2 + 2x - 3x - 2$ or better $3x^2 - 5x - 2 = 0$ $(3x+1)(x-2)$ (= 0) $x = -\frac{1}{3}$, $x = 2$	 M2 M1 A1 M1 A1	M1 for $\left(\frac{4}{x-1}\right) = \frac{3x+2}{x}$ si Allow one error in expansion. CAO Allow for $(3x-1)(x+2)$ FT 'their $3x^2 - 5x - 2 = 0$' provided at least M2 previously awarded.
Alternative method $4 = (3 + \frac{2}{x})(x-1)$ $4 = 3x - 3 + \frac{2x}{x} - \frac{2}{x}$ $4x = 3x^2 - 3x + 2x - 2$ $3x^2 - 5x - 2 = 0$ $(3x+1)(x-2)$ (= 0) $x = -\dfrac{1}{3}$, $x = 2$	 M1 M1 M1 A1 M1 A1	 Allow one error in expansion. CAO Allow for $(3x-1)(x+2)$ FT 'their $3x^2 - 5x - 2 = 0$' provided at least M2 previously awarded.
	(9)	

25.(a) Correctly completed Venn diagram e.g.  OR 0·7 – 0·3 + 0·1 oe 0·5	B2 B1	B1 for either: • 0·2 or 0·4 correctly placed in a Venn diagram or correctly identified, • 0·7 = 0·3 + *P(B)* – 0·1 FT 'their 0·4' + 0·1.
25.(b) $1 - P(A \cap B)$ oe or correct region on Venn diagram indicated. 0.9	S1 B1	Implied by e.g. 1 – 0·1 or 0·4 + 0·2 + 0·3 implies S1
	(5)	