GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 1 – FOUNDATION TIER
3300U10-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

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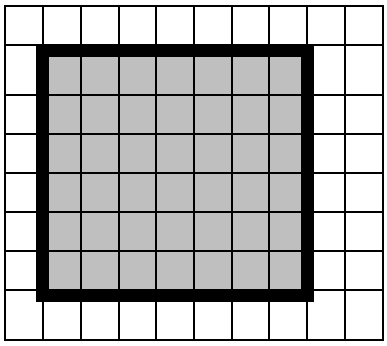
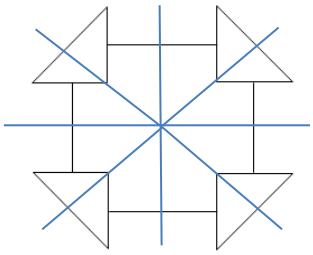
WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 1: Foundation Tier**	**Mark**	**Comments**
1.(a) 6·4 (cm)	B1	Accept 6·2 (cm) to 6·6 (cm)
1.(b) 53 (°)	B1	Accept 51 (°) to 55 (°)
2.(a) 106 000	B2	B1 for one of the following: • sight of 53000 • one hundred and six thousand • correctly doubling 'their 53 000' if it is first written in figures, provided 'their 53 000' is at least four figures and starts with the digits 5 and 3 (i.e. a place value error). • 106 followed by a minimum of two zeros
2.(b) 3600	B1	
2.(c) 42	B1	
2.(d) 1000 OR 980 OR 1030	B2	B1 for 100 × 10 OR 100 × 9·8 OR 103 × 10
2.(e) No, with appropriate working e.g. • (626 ÷ 3 =) 208 r.2 • (626 ÷ 3 =) 208·6(6…) • 6 + 2 + 6 = 14 AND 14 is not a multiple of 3 • 3 × 208 = 624 AND 3 × 209 = 627	B1	Allow No with 208·2 Arithmetic seen must be correct and show a remainder of 2 or first decimal place.
3.(a) unlikely	B1	
3.(b) impossible	B1	
4. 	B2	B1 for any one of the following: • a rectangle with length = 7 • a rectangle with width = 6 • drawing pattern 4 i.e. length = 6 AND width = 5 • drawing pattern 6 i.e. length = 8 AND width = 7 • drawing the correct pattern in the wrong orientation
5.(a) 	B2	B1 for either: • 3 or 4 correct lines and no more than1 incorrect line • 2 correct lines and 0 incorrect lines
5.(b) 5	B1	

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6.(a) (6,4)	B1	
6.(b)(i) D plotted at (– 7, – 5)	P1	
6.(b)(ii) (– 7, – 5)	B1	FT 'their D' provided both coordinates are negative
7.(a)(i) (p =) 12	B1	Allow B1 for a correct embedded answer BUT B0 if contradicted by $p \neq 12$.
7.(a)(ii) (n =) 14	B1	Allow B1 for a correct embedded answer BUT B0 if contradicted by $n \neq 14$.
7.(b) 2480 (cm)	B1	
8. 180 (°) – 147 (°) (x =) 33 (°)	M1 A1	Allow M1A1 for a correct embedded answer BUT M1A0 if contradicted by $x \neq 33$.
9. (Shorter length = 8 – 6 =) 2 (cm) (Perimeter of whole shape =) 2×(5 + 8 + 5 + 2) 40 (cm)	B1 M1 A1	May be seen on the diagram Or equivalent FT 'their stated or derived 2'
Alternative method *(Perimeter of one rectangle = 8+5+8+5 =) 26 (cm)* *(Perimeter of whole shape =) 2×26 - 2×6* *40 (cm)*	*B1* *M1* *A1*	*May be seen in later workings* *Or equivalent* *FT 'their 26'*
Organisation and Communication Accuracy of writing	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc

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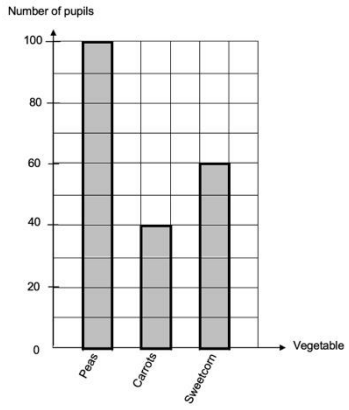
10. Correctly drawn bar chart.  	B3	Bar widths can be one or two squares and must be consistent. B2 for one of the following: • sight of the three values Peas 100 Carrots 40 Sweetcorn 60 • two correct values with correctly drawn graph for their values • one correct value and the sum of the three values being 200 with correctly drawn graph for their values • Correctly drawn bar heights with unequal bar widths B1 for unambiguous sight of one or two values, or one correct bar height. SC1 for bars of equal width and of height 50, 20, 30 correctly drawn if 0 marks awarded.
11.(a) –2	B2	Mark final answer. Award B2 for unsupported –2 provided not from incorrect working. Award B1 for one of the following: • sight of –20 (not $-20x$) • sight of (+)18 (not $18y$ and not –18) • –2 (with additional letters) • a final answer of 38 or –38 (18 or –20 implied).
11.(b) $2y - 3m$	B2	Mark final answer. Must be an expression for B2. Award B1 for one of the following: • sight of (+)$2y$ • sight of $-3m$ (do not allow …– – $3m$) • $2y + -3m$.

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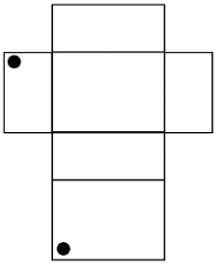
12. Showing 41% and 35% and (45%) OR $\frac{41}{100}$ and $\frac{35}{100}$ and $\frac{45}{100}$ OR (0·41) and 0·35 and 0·45 OR three correct calculations for a common amount. 45% 0·41 $\frac{7}{20}$ in order	B2 B1	Award B2 for one of the following: • all correct % ($\frac{41}{100}$ and $\frac{35}{100}$ must be shown as 41% or 35%) • all correct fractions **with a common denominator** (could include decimals as numerators and denominators) • all correct decimals • correct work using a common amount • a valid combination that allows full comparison (e.g. $\frac{7}{20}$ = 0·35 and 0·41 = 41%). Award B1 for one of the following: • one correct **conversion** (percentage or decimal) • two correct fractions with a common denominator • two correct calculations for a common amount. Allow any unambiguous indication (e.g. 'converted' values.) If first B1 awarded then allow a **strict FT** of 'their work' for a possible final B1. If first B0 awarded, then award the final B1 for a correct final answer, only if: • no incorrect conversions seen (e.g just 45/100 given), OR • an unsupported correct final answer seen.
13.(a) 	B2	Accept any indication. Award B1 for one of the following: • one correct dot with no more than one incorrect dot shown • two correct dots with one incorrect dot shown.
13.(b) $3 \times 5 \times p = 90$ or $90 \div (3 \times 5)$ or equivalent ($p =$) 6	M1 A1	M1 for complete method. Allow M1A1 for a correct embedded answer (e.g. $3 \times 5 \times 6 = 90$), BUT M1A0 if contradicted by $p \neq 6$). Unsupported 6 is awarded M1A1.

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14.(a) 9·17 ÷ 7 × 3 or equivalent 3·93 (km) 3930 (m)	 M1 A1 B1	Answer space takes precendence. May be seen in stages. FT 'their 3·93' × 1000.
14.(a) Alternative method (converting to m first) *9170 (m)* *9170 ÷ 7 × 3 or equivalent* *3930 (m)*	 *B1* *M1* *A1*	*Answer space takes precedence.* *FT 'their 9170' ÷ 7× 3 provided that the digits 917 are seen (i.e place value error).*
14.(b) $\frac{25}{2 \times 60 + 5}$ (× 100%) or equivalent = 20 (%)	M2 A1	Allow 0·2 or $\frac{1}{125 \div 25}$ or $\frac{1}{5}$ to imply M2. Award M1 for an attempt at $\frac{25}{2\ hours\ 5\ minutes}$ but with incorrect denominator (e.g. 2·5, 2·05, 2 hours 5 minutes stated incorrectly with 2 × 60 + 5 not shown). CAO Mark final answer. If no marks awarded, award SC1 for sight of 125 (minutes).
14(b). Alternative Method *125 minutes = (100%)* *12·5 minutes = 10%* *25 minutes = 20%*	 *B1* *M1* *A1*	 *CAO* *Mark final answer.*
15.(a) 36	B1	Allow B1 for a correct embedded answer (e.g. 36 ÷ 4 = 9 BUT B0 if contradicted by total ≠ 36). Allow the sequence 9, 18, 27, 36 for B1, but only if no further numbers are shown.
15.(b) **Four** numbers including 11, 11 AND a pair of non-identical numbers whose sum is 14 **1 13 11 11** **2 12 11 11** **3 11 11 11** **4 10 11 11** **5 9 11 11** **6 8 11 11**	B2	Numbers may be seen in any order. Accept answers using fractions, decimals or negative numbers. FT 11, 11 AND two numbers whose sum is 'their total' from (a) – 22 for a possible B2 or B1. Award B1 for **four** numbers with one of the following: • total = 36 • total = 'their total' from 5(a) • four numbers with a unique mode of 11 (11, 11, ?, ? or 11, 11, 11, ? or 11, 11, 11, 11) • 7, 7, 11, 11.
16.(a) 1 − 0·3 − 0·1 − 0·25 or equivalent = 0·35 or equivalent	 M1 A1	The value in the table takes precedence. Award M1 for complete method.
16.(b) 24	B2	Award B2 for a final answer of 24 : 20 or 20 : 24. Award B1 for one of the following: • 20 ÷ 0·25 × 0·3 • 80 – (8 + 28 + 20) • 25% → 20 5% → 4 30% → 20 + 4 • 0·3 × 80 or 20 × 1·2 or … • sight of 80 • other complete method • unsupported 24 as a numerator in a fraction <1.

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17. (length of small shaded square =) $\sqrt{16}$ or equivalent **OR** (length of large shaded square =) $\sqrt{144}$ or equivalent (length of small shaded square =) 4 (cm) (length of large shaded square =) 12 (cm) (total area of unshaded regions =) 96 (cm^2)	M1 A1 A1 B2	Check diagram for answers. Allow $16 \div 4 = 4$. Sight of 4 or 12 implies M1. FT 'their derived 4' $\times$ 'their derived 12' $\times$ 2 Award B1 for one of the following: • sight of 48 (cm^2) • 4×12 • 'their derived 4' $\times$ 'their derived 12'.
17. Alternative Method (find total area of square) *(length of small shaded square =) $\sqrt{16}$ or equivalent* ***OR*** *(length of large shaded square =) $\sqrt{144}$ or equivalent* *(length of small shaded square =) 4 (cm)* *(length of large shaded square =) 12 (cm)* *(total area of unshaded regions =)$(4+12)^2 - 16 - 144$* *96 (cm^2)*	 *M1* *A1* *A1* *M1* *A1*	*Check diagram for answers.* Allow $16 \div 4 = 4$ *Sight of 4 or 12 implies M1.* *Note: 256 - 160* *Award M1 for complete method.* *FT ('their derived 4' + 'their derived 12')^2 – 16 – 144*
18. $7y - 2 = 4y + 1 + 9$ or $7y - 2 = 4y + 10$ $7y - 4y = 10 + 2$ $3y = 12$ $y = 4$	B1 B1 B1 B1	FT until 2nd error. Allow $7y - 2$ **– 9** $= 4y + 1$ or $7y - 11 = 4y + 1$ Allow $7y - 4y = 1 + 11$. Mark final answer. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise accept a fraction. An embedded, unsupported answer or an answer following trial and improvement of 4 without showing $7y - 2 = 4y + 1 + 9$ or equivalent gains B1 only. Note: $7y - 2$ **+ 9** $= 4y + 1$ B0 $7y - 4y = 1 - 7$ B1 $3y = -6$ B1 $y = -2$ B1 $7y - 2 = 4y + 1$ **– 9** B0 $7y - 4y = -8 + 2$ B1 $3y = -6$ B1 $y = -2$ B1 $7y - 2 = 4y + 1$ B0 $7y - 4y = 1 + 2$ B1 $3y = 3$ B1 $y = 1$ B1 If $3y = -6$ or $3y = 3$ seen with no previous workings, award B0 B1 B1 with a possible final B1 if correct answer seen. **If no marks awarded**, award SC1 for sight of the following: • $7y + 7 = 4y + 1$ (adding 9 on the wrong side) • $4y + 10$ • $7y - 11$ (from correct working).

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GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 2 – FOUNDATION TIER
3300U20-1

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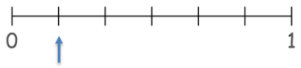
WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 2: Foundation Tier**	**Mark**	**Comments**
1.(a) 161	B1	
1.(b) 1944	B1	
2.(a) radius	B1	
2.(b) tangent	B1	
3.(a)	B1	Accept other unambiguous indication.
3.(b) 	B1	Accept other unambiguous indication.
4.(a)(i) 85°	B1	
4.(a)(ii) 95°	B1	
4.(b) Unambiguous parallel line, drawn through the point C.	B1	Mark intention.
5.(a) 3	B1	
5. (b) 4	B2	B1 for 1 2 3 4 8 8 9 (ascending or descending list)
5.(c) (Missing value =) $5 \times 3 - (7 + 2)$ (Missing value = 15 – 9 =) 6	M2 A1	Award M2 for sight of unambiguous 15 – 9 Award M1 for sight of (Total of all 3 values =) 5×3 or unambiguous '15' CAO
5.(c) Alternative method (trial and improvement) *A trial of any value* *An improved trial* *6*	 *M1* *m1* *A1*	 *'Their value' + 7 + 2 evaluated correctly* *3* *An improved trial means that their choice of value takes them in the right direction.* *May be seen as an embedded answer, unless contradicted. If contradicted award M1 m1 A0.* *Award M1 m1 A1 for a correct answer of 6.*

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6. (One more column/layer needed = 4 × 3 =) 12 (cubes) (One more layer/column needed = 4 × 4 =) 16 (cubes) (Additional cubes needed = 12 + 16 =) 28	 B1 B1 B1	 May be seen as 12 + 4 FT 'their column' and 'their layer' provided B1 previously awarded and answer > 24.
6. Alternative method *(Number of cubes in Dylan's cuboid = 4 × 3 × 3 =) 36* *(Number of cubes in Angharad's cube = 4 × 4 × 4 =) 64* *(Additional cubes needed = 64 – 36 =) 28*	 *B1* *B1* *B1*	 *Accept 'Volume' for 'Number of cubes'* *May be seen as 12 × 3 or 9 × 4* *FT 'their number of cubes in Dylan's shape' and 'their number of cubes in Angharad's shape' provided B1 previously awarded and neither shape has volume of 1 (cm^3).* *If no marks, award SC1 for sight of a correct volume calculation/value.*
Organisation and Communication. Accuracy of writing.	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc
7. 27 × 60 (+ 11) (=) 1631 (seconds)	M1 A1	Sight of 1620
8.(a) 7000	B2	B1 for sight of 7200.
8.(b) 0·04 × (£)250 or equivalent (£) 10 ISW	M1 A1	
8.(c) 14 × 5 or equivalent (= 70) 70 ÷ 2 or equivalent = 35	M1 m1 A1	 FT 'their 14 × 5' ÷ 2 CAO
8.(c) Alternative method 1 *1/5 = 20% AND 10% = 7* *7 × 5* *= 35*	 *B1* *M1* *A1*	 *FT 'their 7' provided 1/5 has been considered along with 50(%)* *CAO*
8(c) Alternative method 2 *14 × 2·5* *= 35*	 *M2* *A1*	 *May be seen in stages.* *e.g. 14 + 14 + 0·5 × 14* *CAO*
9.(a) $x + 5$ or $5 + x$	B1	Mark final answer.
9.(b) $3 - x$ or $-x + 3$	B1	Mark final answer.
9.(c) $\frac{x}{2}$ or $\frac{1}{2}x$ or $0{\cdot}5x$	B1	Allow $x \div 2$

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10. (a) 3·5 pints	B1	
10.(b) 20 miles	B1	
11.(a) 55% or 0·55 or $\frac{55}{100}$ or $\frac{11}{20}$ or equivalent	B1	Allow 55. Do not accept 0·55%.
11.(b) $\frac{1}{2}$	B1	
12.(a) $8a = 27{\cdot}5 - 3{\cdot}5$ or $8a = 24$ $a = 3$	B1 B1	Mark final answer. FT from $8a = k$. Unsupported correct answer implies B1B1. Award B1B0 for a final answer of $24 \div 8$ or $\frac{24}{8}$. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise, accept a fraction or a decimal, either rounded or truncated. Allow B1B1 for a correct embedded answer BUT only B1B0 if contradicted by $a \neq 3$ or equivalent.
12.(b) –22·5 or $-\frac{45}{2}$ or equivalent ISW	B1	
13. 9·2	B2	Answer line takes precedence. Award B2 for all three clues satisfied. Award B1 for one of the following on the answer line: • 6·9 • 11·5 • 84·64 • $9{\cdot}2^2$ Award B2 if answer line is blank but a **final** answer of 9·2 is clearly embedded (e.g. $9{\cdot}2^2$) in the working space. Award B1 if a final answer of 9·2 is contradicted on the answer line (e.g. $9{\cdot}2^2 = 84{\cdot}64$ in working space, but 84·64 is written on the answer line).
14.(a) 120	B2	**120 must come from correct working.** Unsupported 120 is awarded B2. Award B1 for one of the following: • sight of 117(·0631…) rounded or truncated. • an answer of 120 from 117·…
14.(b) 141·2	B2	**141·2 must come from correct working.** Unsupported 141·2 is awarded B2. Award B1 for one of the following: • 141(·183…) rounded or truncated • $\frac{74\sqrt{91}}{5}$ • an answer of 141·2 correctly rounded from 141·1….. or 141·2…..

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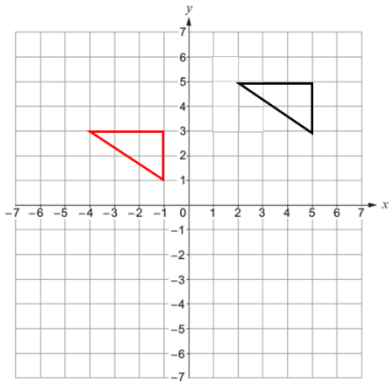
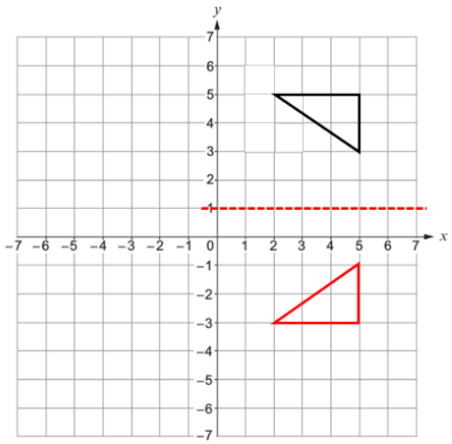
15. (Hours worked on Friday =) 4·5 (hours)	B2	Answer space takes precedence. Mark final answer. Accept 4½ (hours). Award B1 for sight of one of the following: • Correct time given but not in hours (e.g 4 hours 30 mins, 270 minutes) • 9 (hours for M,T,W) from correct working • method to arrive at hours for full day (e.g. $4x = 36$) • method to arrive at hours for half day (e.g. $8y = 36$) • 4·5 seen but then incorrect workings seen (e.g 4 hours 50 minutes, 4 hours 30).
16. (a) Correct translation 	B1	
16. (b) Correct reflection in $y = 1$. 	B2	Award B1 for one of the following: • correct reflection in $x = 1$ • sight of the line $y = 1$ unambiguously indicated.

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17. (Length of A = 35 cm ÷ 5 × 2 =) 14 (cm) (Total length of B and C = 35 – 14 =) 21 (cm) (Length of B =) 21 ÷ (1 + 6) **OR** (Length of C =) 21 ÷ (1 + 6) × 6 (Length of B =) 3 (cm) **AND** (Length of C =) 18 (cm)	 B1 B1 M1 A1	Check diagram for answers. Not from incorrect working. FT 35 – 'their 14'. Not from incorrect working. **Strict FT** 'their 21' (including 35 and 14) ÷ 7 Sight of 3 or 18 implies M. FT 'their 21' ÷ 7 × 6. Penalise -1 only once if their A, B or C labelled incorrectly.
17. Alternative method *(Total length of B and C = 35 cm ÷ 5 × 3 =) 21 (cm)* *(Length of A = 35 – 21 =) 14 (cm)* *(Length of B =) 21 ÷ (1 + 6) **OR*** *(Length of C =) 21 ÷ (1 + 6) × 6* *(Length of B =) 3 (cm) **AND*** *(Length of C =) 18 (cm)*	 *B1* *B1* *M1* *A1*	*Check diagram for answers.* Not from incorrect working. Not from incorrect working. *FT 35 – 'their 21'* ***Strict FT** 'their 14' (including 35 and 14) ÷ 7* *Sight of 3 or 18 implies M1* *FT 'their 21' ÷ 7 × 6.* Penalise -1 only once if their A, B or C labelled incorrectly.
18. (a) $x = 2$ drawn	P1	Award P0 if other lines are drawn unless $x = 2$ is unambiguously indicated. Ignore the line $y = 8$ drawn from (0,8) to the given line. Their line must be drawn must at least 5 small squares in length.
18. (b) (2 , 8)	B1	FT correct intersection of 'their drawn straight line $x = 2$' and the given line.
19. 10% £92(.00) 36 × 0·135 or equivalent £4.86	 B1 B1 M1 A1	Numbers shown in the boxes take precedence. If answer boxes are left blank allow unambiguous indication of their three answers. FT 9.2 ÷ 'their 0·1' (i.e. 'their 10%'). Allow 36 × $\frac{13{\cdot}5}{100}$ or equivalent for M1.

	£36	£92
10%	£3.60	£9.20
13·5%	£4.86	£12.42

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20. (Radius of smaller circle =) 4 (cm) **AND** (Radius of larger circle = 4 + 2 =) 6 (cm)	 B1	Check diagram for answers. May be seen or implied in later working.
(Width of rectangle = 8 + 2 + 2 or 6 + 6 =) 12 (cm) **AND** (Length of rectangle = 8 + 2 + 2 + 8 or 6 + 6 + 8 =) 20 (cm)	B1	May be seen or implied in later working. Implies previous B1. FT 2 × 'their 6'. FT 8 + 2 × 'their 6'.
(Shaded area =) $20 \times 12 - \pi \times 4^2 - \pi \times 6^2$ or $(12 \times 12) - \pi \times 6^2 + (12 \times 8) - \pi \times 4^2$	M2	FT 'their 12(cm)' and 'their 20(cm)' for a possible M2 and possible A1. FT 'their 4(cm)' and 'their 6(cm)' for a possible M2 A0. If a 12 × 12 square and 12 × 8 rectangle used, the previous B1 is implied. Award M1A0 for sight of any of the following (FT 'their 12(cm)', 'their 20(cm)', 'their 4(cm)' and 'their 6(cm)'): • (Area of the smaller circle =) $\pi \times 4^2$(= 50·265...cm^2) • (Area of the larger circle =) $\pi \times 6^2$(= 113·097.. cm^2) • (Shaded area =) $20 \times 12 - \pi \times x^2 - \pi \times y^2$
Accept answers in the range 76·6 to 76·72 (cm^2) or $240 - 52\pi$ (cm^2)	A1	Allow 77 (cm^2) from correct working.

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GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 1 – INTERMEDIATE TIER
3300U30-1

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WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 1: Intermediate Tier**	Mark	Comments
1.(a) 6 and −4	B2	Award B1 for one of the following: • 6 as the first missing number • 'their 6' – 10 evaluated correctly as the second missing number provided 'their 6' < 10.
1.(b) –2	B2	Mark final answer. Award B2 for unsupported –2 provided not from incorrect working. Award B1 for one of the following: • sight of –20 (not –20x) • sight of (+)18 (not 18y and not –18) • –2 (with additional letters) • a final answer of 38 or –38 (18 or –20 implied).
1.(c) $2y - 3m$	B2	Mark final answer. Must be an expression for B2. Award B1 for one of the following: • sight of (+)$2y$ • sight of $-3m$ (do not allow …– – $3m$) • $2y + -3m$.
2. Showing 41% and 35% and (45%) OR $\frac{41}{100}$ and $\frac{35}{100}$ and $\frac{45}{100}$ OR (0·41) and 0·35 and 0·45 OR three correct calculations for a common amount.	B2	Award B2 for one of the following: • all correct % ($\frac{41}{100}$ and $\frac{35}{100}$ must be shown as 41% or 35%) • all correct fractions **with a common denominator** (could include decimals as numerators and denominators) • all correct decimals • correct work using a common amount • a valid combination that allows full comparison (e.g. $\frac{7}{20}$ = 0·35 and 0·41 = 41%). Award B1 for one of the following: • one correct **conversion** (percentage or decimal) • two correct fractions with a common denominator • two correct calculations for a common amount.
45% 0·41 $\frac{7}{20}$ in order	B1	Allow any unambiguous indication (e.g. 'converted' values.) If first B1 awarded then allow a **strict FT** of 'their work' for a possible final B1. If first B0 awarded, then award the final B1 for a correct final answer, only if: • no incorrect conversions seen (e.g just 45/100 given), OR • an unsupported correct final answer seen.

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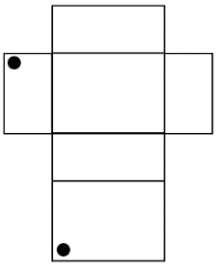
3.(a) 	B2	Accept any indication. Award B1 for one of the following: • one correct dot with no more than one incorrect dot shown • two correct dots with one incorrect dot shown.
3.(b) $3 \times 5 \times p = 90$ or $90 \div (3 \times 5)$ or equivalent ($p =$) 6	M1 A1	M1 for complete method. Allow M1A1 for a correct embedded answer (e.g. $3 \times 5 \times 6 = 90$), BUT M1A0 if contradicted by $p \neq 6$). Unsupported 6 is awarded M1A1.
4.(a) $9{\cdot}17 \div 7 \times 3$ or equivalent 3·93 (km) 3930 (m)	 M1 A1 B1	Answer space takes precendence. May be seen in stages. FT 'their 3·93' × 1000.
4.(a) Alternative method (converting to m first) *9170 (m)* *9170 ÷ 7 × 3 or equivalent* *3930 (m)*	 *B1* *M1* *A1*	*Answer space takes precedence.* *FT 'their 9170' ÷ 7× 3 provided that the digits 917 are seen (i.e place value error).*
4.(b) $\frac{25}{2 \times 60 + 5}$ (× 100%) or equivalent = 20 (%)	M2 A1	Allow 0·2 or $\frac{1}{125 \div 25}$ or $\frac{1}{5}$ to imply M2. Award M1 for an attempt at $\frac{25}{2\ hours\ 5\ minutes}$ but with incorrect denominator (e.g. 2·5, 2·05, 2 hours 5 minutes stated incorrectly with $2 \times 60 + 5$ not shown). CAO Mark final answer. If no marks awarded, award SC1 for sight of 125 (minutes).
4(b). Alternative Method *125 minutes = (100%)* *12·5 minutes = 10%* *25 minutes = 20%*	 *B1* *M1* *A1*	 *CAO* *Mark final answer.*

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5.(a) 36	B1	Allow B1 for a correct embedded answer (e.g. 36 ÷ 4 = 9 BUT B0 if contradicted by total ≠ 36). Allow the sequence 9, 18, 27, 36 for B1, but only if no further numbers are shown.
5.(b) **Four** numbers including 11, 11 AND a pair of non-identical numbers whose sum is 14 **1 13 11 11** **2 12 11 11** **3 11 11 11** **4 10 11 11** **5 9 11 11** **6 8 11 11**	B2	Numbers may be seen in any order. Accept answers using fractions, decimals or negative numbers. FT 11, 11 AND two numbers whose sum is 'their total' from (a) – 22 for a possible B2 or B1. Award B1 for **four** numbers with one of the following: • total = 36 • total = 'their total' from 5(a) • four numbers with a unique mode of 11 (11, 11, ?, ? or 11, 11, 11, ? or 11, 11, 11, 11) • 7, 7, 11, 11.
6.(a) 1 − 0·3 − 0·1 − 0·25 or equivalent = 0·35 or equivalent	M1 A1	The value in the table takes precedence. Award M1 for complete method.
6.(b) 24	B2	Award B2 for a final answer of 24 : 20 or 20 : 24. Award B1 for one of the following: • 20 ÷ 0·25 × 0·3 • 80 – (8 + 28 + 20) • 25% → 20 5% → 4 30% → 20 + 4 • 0·3 × 80 or 20 × 1·2 or … • sight of 80 • other complete method • unsupported 24 as a numerator in a fraction <1.

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7. (length of small shaded square =) $\sqrt{16}$ or equivalent **OR** (length of large shaded square =) $\sqrt{144}$ or equivalent (length of small shaded square =) 4 (cm) (length of large shaded square =) 12 (cm) (total area of unshaded regions =) 96 (cm^2)	 M1 A1 A1 B2	Check diagram for answers. Allow $16 \div 4 = 4$. Sight of 4 or 12 implies M1. FT 'their derived 4' $\times$ 'their derived 12' $\times$ 2 Award B1 for one of the following: • sight of 48 (cm^2) • 4×12 • 'their derived 4' $\times$ 'their derived 12'.
*7. <u>Alternative Method (find total area of square)</u> *(length of small shaded square =) $\sqrt{16}$ or equivalent* ***OR*** *(length of large shaded square =) $\sqrt{144}$ or equivalent* *(length of small shaded square =) 4 (cm)* *(length of large shaded square =) 12 (cm)* *(total area of unshaded regions =)$(4+12)^2 - 16 - 144$* *96 (cm^2)*	 *M1* *A1* *A1* *M1* *A1*	*Check diagram for answers.* Allow $16 \div 4 = 4$ *Sight of 4 or 12 implies M1.* *Note: 256 - 160* *Award M1 for complete method.* *FT ('their derived 4' + 'their derived 12')^2 – 16 – 144*
Organisation and Communication. Accuracy of writing.	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc

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8. $7y - 2 = 4y + 1 + 9$ or $7y - 2 = 4y + 10$ $7y - 4y = 10 + 2$ $3y = 12$ $y = 4$	B1 B1 B1 B1	FT until 2nd error. Allow $7y - 2 - \mathbf{9} = 4y + 1$ or $7y - 11 = 4y + 1$ Allow $7y - 4y = 1 + 11$. Mark final answer. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise accept a fraction. An embedded, unsupported answer or an answer following trial and improvement of 4 without showing $7y - 2 = 4y + 1 + 9$ or equivalent gains B1 only. Note: $7y - 2 + \mathbf{9} = 4y + 1$ B0 $7y - 4y = 1 - 7$ B1 $3y = -6$ B1 $y = -2$ B1 $7y - 2 = 4y + 1 - \mathbf{9}$ B0 $7y - 4y = -8 + 2$ B1 $3y = -6$ B1 $y = -2$ B1 $7y - 2 = 4y + 1$ B0 $7y - 4y = 1 + 2$ B1 $3y = 3$ B1 $y = 1$ B1 If $3y = -6$ or $3y = 3$ seen with no previous workings, award B0 B1 B1 with a possible final B1 if correct answer seen. **If no marks awarded**, award SC1 for sight of the following: • $7y + 7 = 4y + 1$ (adding 9 on the wrong side) • $4y + 10$ • $7y - 11$ (from correct working).
9. (Amount of tea in full cup =) $(44 \div 2) \times 7$ or equivalent = 154 (ml)	M1 A1	M1 for full complete method. May be seen in stages. If M0 awarded, award SC1 for one of the following: • appropriate sight of 22 • final answer of 61·6 (ml) (from $(44 \div 5) \times 7$).
9. <u>Alternative method</u> *(Amount of tea in full cup =)* *$(44 \div 2) \times 5 + 44$* *= 154 (ml)*	*M1* *A1*	*M1 for full complete method.* *May be seen in stages.* *If M0 awarded, award SC1 for appropriate sight of 22.*
10.(a) 10	B2	Award B1 for appropriate sight of 100. Mark final answer.
10.(b)(i) 3	B2	Award B1 for sight of $\sqrt[3]{27}$. Mark final answer.
10.(b)(ii) $(\sqrt[3]{8 \times 25x})^3 = 10^3$ or $200x = 1000$ or equivalent (x =) 5 ISW	M1 A1	Award M1 for $8 \times 25x = 10^3$. CAO Unsupported answer of 5 is awarded M1A1. Allow M1A1 for a correct embedded answer (e.g. $5 \times 8 \times 25 = 1000$), BUT M1A0 if contradicted by $x \neq 5$).

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11.(a) $4n + 7$ or equivalent	B2	Mark final answer. Award B1 for sight of $4n$. Award B0 for $-4n$.
11.(b) –4, –1, 4	B2	Answer space takes precedence. Award B1 for one of the following: • two correct terms • –5, –4, –1 • –1, 4, 11.
12. (a) For a correct method that produces 2 prime factors from the set {3,3,5,11} before 2nd error.	M1	Must be a method that involves only division. Check for errors in the method before checking the 2 prime factors from the set. (Note: 495 = 3 × 165 495 = 5 × 99 495 = 11 × 45)
3, 3, 5, 11	A1	CAO For sight of the four correct factors (Ignore 1s).
$3^2 \times 5 \times 11$	B1	Do not FT non-primes. FT 'their primes' provided at least one index form used with at least a square. Allow $(3^2)(5)(11)$ and $3^2.5.11$ Do not allow 3^2,5,11 Inclusion of 1 as a factor gets B0.
12. (b) Any valid reason referring to not all the indices being even e.g "the powers are not (all) even" "only one index is even"	E1	Allow reference to $22^2 = 484$ and $23^2 = 529$. Do not accept "they are not (all) even" "all factors are not (all) even" "the 5 and 11 are not squared" "the prime factors are all odd" "the little numbers are not even".
12. (c) 60 = 2 × 2 × 3 × 5 or equivalent correct strategy	M1	M1 for sight of 2,2,3,5 'together'. Allow M1 for selection of 2 × 2 × 15 or 4 × 15 (Not for other products e.g. 2 × 30, 3 × 20, 5 × 12, 6 × 10) (Not for just listing all the factors 1,2,3,4,5,6,10,12,15,20,30,60)
(HCF =) 15	A1	Mark final answer. M1A0 for 3 × 5. FT 'their answer to 12(a)' only if equivalent difficulty (at least two common prime factors). Unsupported 15 gains M1 A1. If no marks awarded, award SC1 for sight of all common factors (1, 3, 5 and 15) and no other factors.

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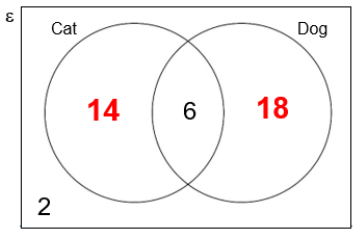
13. [n(just dog) =] 18 [n(just cat) =] 14  	B2 B1	Diagram takes precedence. Entries must be whole numbers. B1 for sight of ($\frac{3}{5} \times 40 =$) 24 from correct working. FT 32 – 'their 18', provided all sections not blank or 0.
14.(a) £285 × $0{\cdot}96^3$	B1	
14.(b) $\frac{34.2}{90} \times 100$ OR $\frac{34.2}{0.9}$ or equivalent = 38	M1 A1	Accept a **complete** and **convincing** method of trial and improvement. Award M1A1 for an embedded answer (e.g. 0·9 × 38 = 34·2 or $\frac{34.2}{38} \times 100$ = 90%), BUT only M1A0 if contradicted by stating original amount ≠ 38. Unsupported 38 is awarded M1A1.
15. (a) Any full valid explanation with reference to one or both correct scale factors (if fractions used, must be with a common denominator or in their simplest form) e.g. "the scale factor for one (corresponding) pair of sides is 1·5, the other is 1·25" "9/6 = 1·5 1·5 × 8 = 12 1·5 × 8 ≠ 10" "8/6 = 4/3 which is not the same as 10/9" "3/2 and 5/4 are not the same" "in A, the width is ¾ of the length, but in B it is not"	E2	Award E1 for partial explanation e.g. • "the scale factor is not the same for each pair of sides" • "10/8 is not the same as 9/6" • "10/9 ≠ 8/6" • "9 : 10 ≠ 6 : 8" • "8/10 is not the same as 6/9" • "the sides should be 12 (cm) and 9 (cm)" • "the sides should be 10 (cm) and 7·5 (cm)" **OR** Award E1 for • two scale factors which can be compared (one must be correct) e.g. 1·5 and 1·3 or two fractions with a common denominator (4/2 and 3/2).
15.(b) Method 1 *8 × 9/6 or 8 × 1·5 or equivalent* *Length = 12 (cm) and Width = 9 (cm)*	*M1* *A1*	*Answer space takes precedence.* *M1 for correct use of linear ratio.* *Allow Length = 9 (cm) and Width = 12 (cm)*
15.(b) Method 2 *6 × 10/8 or 6 × 1·25 or equivalent* *Length = 10 (cm) and Width = 7·5 (cm)*	*M1* *A1*	*Answer space takes precedence.* *M1 for correct use of linear ratio.* *Allow Length = 7·5 (cm) and Width = 10 (cm)*

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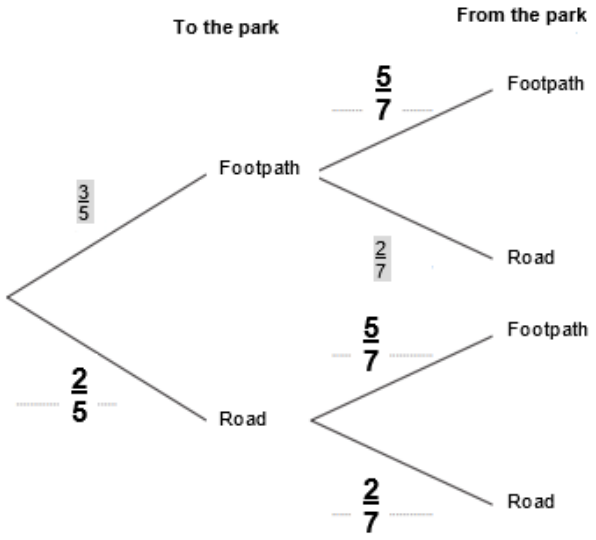
16. (a) Complete diagram  	B2	**If B2 not awarded**, award B1 for **one** of the following: • 2/5 or equivalent on Road to the park branch • 5/7 on a Footpath from the park branch.
16.(b) $\frac{3}{5} \times \frac{5}{7}$ or equivalent $\frac{15}{35}$ or equivalent ISW	M1 A1	FT $\frac{3}{5}$ × 'their $\frac{5}{7}$' (on 'uppermost footpath home branch') provided less than 1.
17. $(x - 10)(x + 2)$ $(x =) 10$ AND $(x =) -2$	B2 B1	B1 for one of the following: • $(x \ldots 10)(x \ldots 2)$. • two brackets which multiply to give $x^2 - 8x + k$ • two brackets which multiply to give $x^2 + kx - 20$. **Strict FT** from their pair of brackets. If no factorising shown, allow the following. B2 for $x - 10 (=0)$ AND $x + 2 (=0)$ (B1) $(x =) 10$ AND $(x =) -2$ (B1) B1 for $x + 10 (=0)$ AND $x - 2 (=0)$ (B0) $(x =) -10$ AND $(x =) 2$ (B1) FT B1 if only $(x =) 10$ AND $(x =) -2$ seen (B1)
18.(a) Statement explaining that, 'The **tangent** at any point on a circle is **perpendicular** (or equivalent) to the **radius** at that point'.	E1	Accept unambiguous similar wording. e.g. 'Radius and tangent 90(°)' 'The angle between a tangent and radius is 90(°)' Diameter could be used in place of radius. Must refer to tangent and radius by name (not simply *AF* and *OB* or description).
18.(b) (*AOB* =) 180 – 90 – 42 or 90 – 42 48 (°) x = 24(°)	 M1 A1 B1	Check diagram for answers. Note: 180 – 132 May be implied by sight of a final answer of 24. FT 'their 48' ÷ 2, provided 'their 48' ≠ 42.
18.(b) Alternative method *(x =) 180 – 90 – 42 or 90 – 42* *2 2* *x = 24(°)*	 *M2* *A1*	*Check diagram for answers.* *Award M2 for complete method.*

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19. Correct equation e.g. $\frac{50x + 10 - 21x + 9}{(15)} = \frac{9 \times 3 \times 5}{(15)}$ $(29x + 19 = 135)$ $29x = 116$ $x = 4$	 B2 B1 B1	FT until 2nd error. Award B1 for one of the following: • 1 error in one term • Sight of $5(10x + 2)$ AND $-3(7x - 3)$ or equivalent • Sight of $50x + 10 - 21x + 9$. Subsequent work may show use of common denominator in order to award the B2. Mark final answer. Award the final B0 for $\frac{116}{29}$. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise, accept a fraction. Allow B2B1B1 for a correct embedded answer BUT only B2B1B0 if contradicted by $x \neq 4$ or equivalent. Note 1: $\frac{50x + 10 - 21x - 9}{(15)} = \frac{135}{(15)}$ B1 (one error –9) $29x = 134$ B1 $x = \frac{134}{29}$ B1 Note 2: $\frac{50x + 10 - 21x + 9}{(15)} = \frac{9}{(15)}$ B1 (one error =9) $29x = -10$ B1 $x = \frac{-10}{29}$ B1 Note 3: $\frac{50x + 10 - 21x - 9}{(15)} = \frac{9}{(15)}$ B0 B0 B0 (2 errors –9 & 9) Award B2B1B1 for unsupported answer of 4, or for an answer which has come from a non-algebraic method.

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GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 2 – INTERMEDIATE TIER
3300U40-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

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WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 2: Intermediate Tier**	Mark	Comments
1. (a) 3·5 pints	B1	
1.(b) 20 miles	B1	
2.(a) 55% or 0·55 or $\frac{55}{100}$ or $\frac{11}{20}$ or equivalent	B1	Allow 55. Do not accept 0·55%.
2.(b) $\frac{1}{2}$	B1	
3.(a) $8a = 27{\cdot}5 - 3{\cdot}5$ or $8a = 24$ $a = 3$	B1 B1	Mark final answer. FT from $8a = k$. Unsupported correct answer implies B1B1. Award B1B0 for a final answer of $24 \div 8$ or $\frac{24}{8}$. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise, accept a fraction or a decimal, either rounded or truncated. Allow B1B1 for a correct embedded answer BUT only B1B0 if contradicted by $a \neq 3$ or equivalent.
3.(b)(i) $-22{\cdot}5$ or $-\frac{45}{2}$ or equivalent ISW	B1	
3.(b)(ii) A correct expression: • $5(n - 6)$ • $5n - 30$ • $5 \times (n - 6)$ • $(n - 6) \times 5$	B2	Mark final answer for B2. Must include brackets or be fully simplified for B2. Allow $(n - 6)5$ for B2. Award B1 for sight of one of the following: • $n - 6 \times 5$ • $5 \times n - 6$ • a correct expression with incorrect final answer, e.g. $5(n - 6) = 5n - 6$. Award B0 for unsupported • $n - 30$ • $5n - 6$.

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4. 9·2	B2	Answer line takes precedence. Award B2 for all three clues satisfied. Award B1 for one of the following on the answer line: • 6·9 • 11·5 • 84·64 • $9{\cdot}2^2$ Award B2 if answer line is blank but a **final** answer of 9·2 is clearly embedded (e.g. $9{\cdot}2^2$) in the working space. Award B1 if a final answer of 9·2 is contradicted on the answer line (e.g. $9{\cdot}2^2 = 84{\cdot}64$ in working space, but 84·64 is written on the answer line).
5.(a) 120	B2	**120 must come from correct working.** Unsupported 120 is awarded B2. Award B1 for one of the following: • sight of 117(·0631…) rounded or truncated. • an answer of 120 from 117·…
5.(b) 141·2	B2	**141·2 must come from correct working.** Unsupported 141·2 is awarded B2. Award B1 for one of the following: • 141(·183…) rounded or truncated • $\underline{74}\sqrt{\underline{91}}$ / 5 • an answer of 141·2 correctly rounded from 141·1….. or 141·2…..
6. (Hours worked on Friday =) 4·5 (hours)	B2	Answer space takes precedence. Mark final answer. Accept 4½ (hours). Award B1 for sight of one of the following: • Correct time given but not in hours (e.g 4 hours 30 mins, 270 minutes) • 9 (hours for M,T,W) from correct working • method to arrive at hours for full day (e.g. $4x = 36$) • method to arrive at hours for half day (e.g. $8y = 36$) • 4·5 seen but then incorrect workings seen (e.g 4 hours 50 minutes, 4 hours 30).

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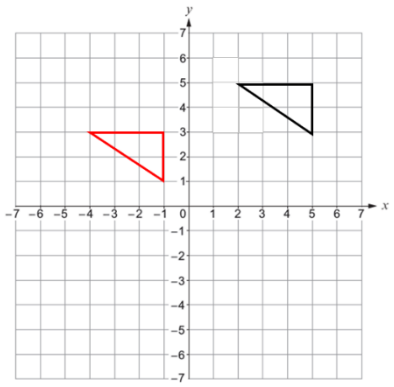
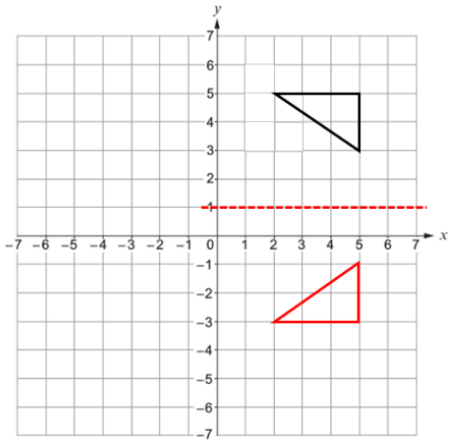
7. (a) Correct translation 	B1	
7. (b) Correct reflection in $y = 1$. 	B2	Award B1 for one of the following: • correct reflection in $x = 1$ • sight of the line $y = 1$ unambiguously indicated.

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8. (Length of A = 35 cm ÷ 5 × 2 =) 14 (cm) (Total length of B and C = 35 – 14 =) 21 (cm) (Length of B =) 21 ÷ (1 + 6) **OR** (Length of C =) 21 ÷ (1 + 6) × 6 (Length of B =) 3 (cm) **AND** (Length of C =) 18 (cm)	 B1 B1 M1 A1	Check diagram for answers. Not from incorrect working. FT 35 – 'their 14'. Not from incorrect working. **Strict FT** 'their 21' (including 35 and 14) ÷ 7 Sight of 3 or 18 implies M. FT 'their 21' ÷ 7 × 6. Penalise -1 only once if their A, B or C labelled incorrectly.
8. Alternative method *(Total length of B and C = 35 cm ÷ 5 × 3 =) 21 (cm)* *(Length of A = 35 – 21 =) 14 (cm)* *(Length of B =) 21 ÷ (1 + 6) **OR*** *(Length of C =) 21 ÷ (1 + 6) × 6* *(Length of B =) 3 (cm) **AND*** *(Length of C =) 18 (cm)*	 *B1* *B1* *M1* *A1*	*Check diagram for answers.* Not from incorrect working. Not from incorrect working. *FT 35 – 'their 21'* ***Strict FT** 'their 14' (including 35 and 14) ÷ 7* *Sight of 3 or 18 implies M1* *FT 'their 21' ÷ 7 × 6.* Penalise -1 only once if their A, B or C labelled incorrectly.
Organisation and Communication. Accuracy of writing.	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc

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9. (a) $x = 2$ drawn	P1	Award P0 if other lines are drawn unless $x = 2$ is unambiguously indicated. Ignore the line $y = 8$ drawn from (0,8) to the given line. Their line must be drawn must at least 5 small squares in length.
9. (b) (2 , 8)	B1	FT correct intersection of 'their drawn straight line $x = 2$' and the given line.
10. |	£36	£92
---	---	---
10%	£3.60	£9.20
13·5%	£4.86	£12.42			
10%	B1	Numbers shown in the boxes take precedence. If answer boxes are left blank allow unambiguous indication of their three answers.
£92(.00)	B1	FT 9.2 ÷ 'their 0·1' (i.e. 'their 10%').
36 × 0·135 or equivalent	M1	Allow 36 × $\frac{13{\cdot}5}{100}$ or equivalent for M1.
£4.86	A1	
11. (Radius of smaller circle =) 4 (cm) **AND** (Radius of larger circle = 4 + 2 =) 6 (cm)	B1	Check diagram for answers. May be seen or implied in later working.
(Width of rectangle = 8 + 2 + 2 or 6 + 6 =) 12 (cm) **AND** (Length of rectangle = 8 + 2 + 2 + 8 or 6 + 6 + 8 =) 20 (cm)	B1	May be seen or implied in later working. Implies previous B1. FT 2 × 'their 6'. FT 8 + 2 × 'their 6'.
(Shaded area =) $20 \times 12 - \pi \times 4^2 - \pi \times 6^2$ or $(12 \times 12) - \pi \times 6^2 + (12 \times 8) - \pi \times 4^2$	M2	FT 'their 12(cm)' and 'their 20(cm)' for a possible M2 and possible A1. FT 'their 4(cm)' and 'their 6(cm)' for a possible M2 A0. If a 12 × 12 square and 12 × 8 rectangle used, the previous B1 is implied. Award M1A0 for sight of any of the following (FT 'their 12(cm)', 'their 20(cm)', 'their 4(cm)' and 'their 6(cm)'): • (Area of the smaller circle =) $\pi \times 4^2$(= 50·265...cm^2) • (Area of the larger circle =) $\pi \times 6^2$(= 113·097.. cm^2) • (Shaded area =) $20 \times 12 - \pi \times x^2 - \pi \times y^2$
Accept answers in the range 76·6 to 76·72 (cm^2) or $240 - 52\pi$ (cm^2)	A1	Allow 77 (cm^2) from correct working.

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12.(a) 110(°)	B1	Award B1 for an answer in the range 108(°) to 112(°).
12.(b) 335(°)	B1	Award B1 for an answer in the range 333(°) to 337(°).
13.(a) 1 10	B2	B1 for each. Table takes precedence if conflicting values given.
13.(b) At least 4 correct plots and no incorrect plot. A smooth curve drawn through their plots.	P1 C1	FT 'their (−2,1)' and 'their (1,10)' OR (−2,1) and (1,10) plotted. Allow ± '½ a small square'. FT 'their 6 plots'. OR a curve through the 4 given points **AND** (−2,1) and (1,10) Allow intention to pass through their plots. (± 1 small square horizontally or vertically.)
14. (a) (Area =) $\frac{7{\cdot}4 + 9{\cdot}1}{2} \times 5{\cdot}7$ or equivalent $\times 15{\cdot}6$ Allow an answer from 733 to 734 (cm^3) inclusive.	M1 m1 A1	(= 47·025) May be seen in stages. Allow M1 for correct intent seen. e.g. 7·4 + 9·1 × 5·7 ÷ 2 CAO *Note: 733·59 or 733·6 (cm^3)*
14. (b) 733·59 × 19·3 14158(·287 (g)) Allow an answer from 14·1 to 14·2 (kg) inclusive.	M1 A1 B1	FT 'their volume from (a)' × 19·3 FT 'their 14158·287' ÷ 1000 Allow 14 from correct working. *Note: 14·158(287) or 14·16 or 14·2 (kg)*
14.(b) Alternative method (converting to g first) *0·0193 (kg/cm^3)* *733·59 × 0·0193* Allow an answer from 14·1 to 14·2 (kg) inclusive	*B1* *M1* *A1*	*FT 'their volume from (a)' and FT 'their 0.0193' provided a place value error has been made.* Allow 14 from correct working. *Note: 14·158(287) or 14·16 or 14·2 (kg)*

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15. Identifying or implying that there are 16 possible correct combinations (e.g 2 × 6) or products (e.g.12)	B1	Award B1 for • simply stating 16 • (4 × 4 =)16 • **completed** sample space (need not be correct) • sight of $\frac{1}{4} \times \frac{1}{4}$ • sight of 16 in a denominator.
Identifies <u>all</u> possible combinations (e.g 2 × 6) or products (e.g 12) that are a factor of 36 *1 × 6 = 6, 1 × 9 = 9, 2 × 6 = 12* *2 × 9 = 18, 3 × 6 = 18, 4 × 9 = 36*	B2	FT 'their 16 possible correct products'. If products not used (e.g 2 + 6 = 8), do not award B2 or B1. Award B2 for **clearly identifying** one of the following: • the **6** (and no more) combinations 1 × 6, 2 × 9, etc that form factors of 36 that can be achieved by the two spinners • the **6** (and no more) products of factors of 36 that can be achieved by the two spinners: 6, 9, 12, **18, 18**, 36 • sight of $6 \times \frac{1}{4} \times \frac{1}{4}$ or equivalent. Award B1 for **clearly identifying** one of the following: • at least 4 combinations that are factors of 36 • at least 4 products of factors of 36 that can be achieved by the two spinners: 6, 9, 12, 18, 36 • all of the factors of 36 (1,2,3,4,6,9,12,18,36).
(Probability factor of 36 =) $\frac{6}{16}$ or equivalent. ISW	B1	FT 'their list' only if at least 12 combinations or products given with **at least two factors of 36** that can be achieved by the two spinners **clearly identified.** Penalise, −1, any incorrect notation e.g. '6 out of 16'. Unsupported $\frac{6}{16}$ or $\frac{3}{8}$ or equivalent gains B1 B2 B1.

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16. $(AC^2 =)\ 8^2 + 4{\cdot}5^2$ or equivalent $(AC =)\ \sqrt{8^2 + 4.5^2}$ or equivalent 9·18 (cm)	M1 m1 A2	Check diagram. note: $(AC^2 =)\ 64 + 20{\cdot}25$. note: $(AC =)\ \sqrt{84{\cdot}25}$. FT √'their 84·25' for m1 only provided M1 gained. Mark final answer for A2. CAO. Award A1 for one of the following: • 9·17(878…) rounded or truncated to at least one decimal place • $\frac{\sqrt{337.}}{2}$ Final answer of • ***AC*** = 84·25 is M1m0A0.
16. *Alternative method to find AC using Trig* *A correct and complete method (using trigonometric relationships)* *(AC =) 9·18 (cm)*	*M2* *A2*	 CAO. Mark final answer. *Award A1 for one of the following:* • *9·17(878…) rounded or truncated to at least one decimal place* • $\frac{\sqrt{337.}}{2}$

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17. One correct evaluation $3 \leq x \leq 4$ 2 correct evaluations $3{\cdot}75 \leq x \leq 3{\cdot}95$, **(one value < 80, one value > 80)** 2 correct evaluations $3{\cdot}75 \leq x \leq 3{\cdot}85$, **(one value < 80, one value > 80)** $x = 3{\cdot}8$	B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if < 80 or > 80.* *If evaluations not seen accept 'too high' or 'too low'.* *Look out for* $x^3 + 6x - 80 = 0$ $\underline{x}$ $\underline{x^3 + 6x}$ 3 45 3.1 48·391 3.2 51·968 3.3 55·737 3.4 59·704 3.5 63·875 3.6 68·256 3.7 72·853 **3.8** 77·672 **3.9** 82·719 4 88 3.75 75·2343.. 3.84 79·6631.. **3.85 80·1666..** **3.95 85·3298..** Unsupported $x = 3{\cdot}8$ is awarded B0B0M0A0. An answer of $x = 3{\cdot}8$ can only be awarded M1A1, following sight of 2 correct evaluations $3{\cdot}75 \leq x \leq 3{\cdot}85$ **(one evaluation < 80, one evaluation > 80).** If 3·85 is given as 80 (truncated) award M0 A0 unless 'too high' or equivalent is indicated.
18. Sight of $(5x + 3)(2x - 1)$ or $2(5x + 3)(2x - 1)$ or equivalent (total area of both rectangles = $20x^2 + 2x - 6$ (cm^2)	S1 B2	Intention to (2 ×) width × length. Allow 4 × width × length or equivalent for S1. May be implied in later working if B2 or B1 awarded. Mark final answer for B2. Allow $20x^2 + 2x + - 6$ for B2. Award B1 for sight of one of the following: • $20x^2 + 12x - 10x - 6$ with at least three terms out of the four correct (must have x^2 term) • $10x^2 + 6x - 5x - 3$ • $2(10x^2 + x - 3)$ • $10x^2 + x - 3$ • $40x^2 + 4x - 12$. If no marks, award SC1 for one of the following: • $40x^2 + 24x - 20x - 12$. • $20x^2 + 22x + 6$ from $2(5x + 3)(2x + 1)$ • $20x^2 - 2x - 6$ from $2(5x - 3)(2x + 1)$ • $20x^2 - 22x + 6$ from $2(5x - 3)(2x - 1)$.

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19. Method using angle *XYZ* *YZ* = $\frac{18{\cdot}6}{\tan 40(°)}$ or $\frac{18{\cdot}6 \times \sin 50}{\sin 40}$ or equivalent = 22(·166..)(cm)	 M2 A1	Check diagram for answer. Award M1 for one of the following • $\tan 40(°) = \frac{18{\cdot}6}{YZ}$ • $\frac{YZ}{\sin 50} = \frac{18{\cdot}6}{\sin 40}$ or equivalent Accept an answer rounded or truncated. Award M2A0 for any of the following unsupported answers: Method: $\frac{18{\cdot}6}{\tan 40}$ — Radians: -16·648…. — Gradians: 25·600…
19. Alternative using angle YXZ *YZ = 18·6 × tan 50(°)* *= 22(·166..)(cm)*	*M2* *A1*	*Award M1 for tan 50(°) = $\frac{YZ}{18{\cdot}6}$* *Accept an answer rounded or truncated* *Award M2A0 for any of the following unsupported answers:* *Method: 18·6 × tan 50 — Radians: -5·057…. — Gradians: 18·6*
19. Alternative method ***Correct** use of a 'two-step' method.* *22(·166..)(cm) ISW*	*M2* *A1*	*A partial trigonometric method is M0.* *Accept an answer rounded or truncated.*
20. Working in mm: 60·5 × 7 **OR** 420 + 0·5 × 7 Working in cm: 6·05 × 7 **OR** 42 + 0·05 × 7 423·5 (mm) ISW	 M1 A1	 Allow 60 < 'their 60·5' ≤ 61. Allow 6 cm < 'their 6·05' cm ≤ 6·1 cm. Allow 42·35 cm, provided units are given and correct. CAO. If no marks, award SC1 for sight of 60·5 OR 6·05.

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21. Midpoints 25, 35, 45, (55), 65, 75 Missing 10 for $50 \leq t < 60$ $25\times2 + 35\times8 + 45\times4 + 55\times\mathbf{10} + 65\times3 + 75\times5$ (= 50 + 280 + 180 + **550** + 195 + 375 = 1630) $\div 32$ 50·9(375) or 51 or equivalent ISW	B1 B1 M1 m1 A1	May be implied in later working (i.e the correct products). FT 'their 10' provided ≠ 0 or 1. Allow with consistent incorrect midpoints provided at least 5 within the correct interval including 'bounds' Allow use of a instead of 10 (sight of 1080 + 55a). FT 22 + 'their a' (a ≠ 0). Allow use of a instead of 10. CAO. Must be derived from correct working. If no marks or first B1 only, award SC1 for one of the following: • (1080 ÷ 22 =) 49(·09…) from use of $a = 0$ • (1080 ÷ 32 =) 33·7(5) or 34 from use of $a = 0$ • (1135 ÷ 23 =) 49(·3…) from use of $a = 1$ • (1135 ÷ 32 =) 35(·46875) from use of $a = 1$. Award B1 B0 M1 m1 A0 for $\frac{1080 + 55a}{22 + a}$ or $\frac{1080 + 55a}{32}$ or equivalent expression involving a.
22. Sight of $12x + 4y = 180$ or equivalent AND $26x + 7y = 360$ or equivalent Method to eliminate one variable e.g. equal coefficients **AND** <u>appropriate intention to</u> add or subtract or use a method of substitution. First variable found $x = 9(°)$ or $y = 18(°)$ Substitute to find the 2nd variable. Second variable found.	 B2 M1 A1 m1 A1	 x and y terms need to be collected for B2. If B2 not awarded, award B1 for one of the following: • $12x + 4y = 180$ or equivalent • $13x + 5x + 8x + 7y = 360$ • $26x + 7y = 360$ or equivalent FT 'their equations', provided of equivalent difficulty. Allow one error in one term (not the term with equal coefficients). CAO (for their equations). FT substitution of their '1st variable' if M1 gained. No marks for 'trial and improvement'. No marks for an unsupported answer.

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GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 1 – HIGHER TIER
3300U50-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

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WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 1: Higher Tier**	**Mark**	**Comments**
1. (Amount of tea in full cup =) $(44 \div 2) \times 7$ or equivalent $= 154$ (ml)	M1 A1	M1 for full complete method. May be seen in stages. If M0 awarded, award SC1 for one of the following: • appropriate sight of 22 • final answer of 61·6 (ml) (from $(44 \div 5) \times 7$) .
1. Alternative method *(Amount of tea in full cup =)* *$(44 \div 2) \times 5 + 44$* *$= 154$ (ml)*	*M1* *A1*	*M1 for full complete method.* *May be seen in stages.* *If M0 awarded, award SC1 for appropriate sight of 22.*
Organisation and Communication. Accuracy of writing.	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc
2. (a) 3	B2	Award B1 for sight of $\sqrt[3]{27}$. Mark final answer.
2. (b) $(\sqrt[3]{8 \times 25x})^3 = 10^3$ or $200x = 1000$ or equivalent $(x =)$ 5 ISW	M1 A1	Award M1 for $8 \times 25x = 10^3$ CAO Unsupported answer of 5 is awarded M1A1. Allow M1A1 for a correct embedded answer (e.g. $5 \times 8 \times 25 = 1000$), BUT M1A0 if contradicted by $x \neq 5$).
3. (a) $4n + 7$ or equivalent	B2	Mark final answer. Award B1 for sight of $4n$. Award B0 for $-4n$.
3. (b) –4, –1, 4	B2	Answer space takes precedence. Award B1 for one of the following: • two correct • −5, −4, −1 • −1, 4, 11

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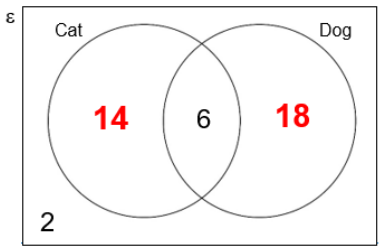
4. (a) For a correct method that produces 2 prime factors from the set {3,3,5,11} before 2nd error. 3, 3, 5, 11 $3^2 \times 5 \times 11$	M1 A1 B1	Must be a method that involves only division. Check for errors in the method before checking the 2 prime factors from the set. (Note: 495 = 3 × 165 495 = 5 × 99 495 = 11 × 45) CAO For sight of the four correct factors (Ignore 1s). Do not FT non-primes. FT 'their primes' provided at least one index form used with at least a square. Allow $(3^2)(5)(11)$ and $3^2.5.11$ Do not allow 3^2,5,11 Inclusion of 1 as a factor gets B0.
4. (b) Any valid reason referring to not all the indices being even e.g "the powers are not (all) even" "only one index is even"	E1	Allow reference to $22^2 = 484$ and $23^2 = 529$ Do not accept "they are not (all) even" "all factors are not (all) even" "the 5 and 11 are not squared" "the prime factors are all odd" "the little numbers are not even".
4. (c) 60 = 2 × 2 × 3 × 5 or equivalent correct strategy (HCF =) 15	M1 A1	M1 for sight of 2,2,3,5 'together' Allow M1 for selection of 2 × 2 × 15 or 4 × 15 (Not for other products e.g. 2 × 30, 3 × 20, 5 × 12, 6 × 10) (Not for just listing all the factors 1,2,3,4,5,6,10,12,15,20,30,60) Mark final answer. M1A0 for 3 × 5 FT 'their answer to 4(a)' only if equivalent difficulty (at least two common prime factors). Unsupported 15 gains M1 A1. If no marks awarded, award SC1 for sight of all common factors (1, 3, 5 and 15) and no other factors.
5. [n(just dog) =] 18 [n(just cat) =] 14  	 B2 B1	Diagram takes precedence. Entries must be whole numbers. B1 for sight of $(\frac{3}{5} \times 40 =)$ 24 from correct working. FT 32 – 'their 18', provided all sections not blank or 0.

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6. $\frac{34.2}{90} \times 100$ OR $\frac{34.2}{0.9}$ or equivalent = 38	M1 A1	Accept a **complete** and **convincing** method of trial and improvement. Award M1A1 for an embedded answer (e.g. 0·9 × 38 = 34·2 or $\frac{34.2}{38} \times 100$ = 90%), BUT only M1A0 if contradicted by stating original amount ≠ 38. Unsupported 38 is awarded M1A1.
7. (a) Any full valid explanation with reference to one or both correct scale factors (if fractions used, must be with a common denominator or in their simplest form) e.g. "the scale factor for one (corresponding) pair of sides is 1·5, the other is 1·25" "9/6 = 1·5 1·5 × 8 = 12 1·5 × 8 ≠ 10" "8/6 = 4/3 which is not the same as 10/9" "3/2 and 5/4 are not the same" "in A, the width is ¾ of the length, but in B it is not"	E2	Award E1 for partial explanation e.g. • "the scale factor is not the same for each pair of sides" • "10/8 is not the same as 9/6" • "10/9 ≠ 8/6" • "9 : 10 ≠ 6 : 8" • "8/10 is not the same as 6/9" • "the sides should be 12 (cm) and 9 (cm)" • "the sides should be 10 (cm) and 7·5 (cm)" **OR** Award E1 for • two scale factors which can be compared (one must be correct) e.g. 1·5 and 1·3 or two fractions with a common denominator (4/2 and 3/2).
7.(b) Method 1 *8 × 9/6 or 8 × 1·5 or equivalent* *Length = 12 (cm) and Width = 9 (cm)*	*M1* *A1*	*Answer space takes precedence.* *M1 for correct use of linear ratio.* *Allow Length = 9 (cm) and Width = 12 (cm)*
7.(b) Method 2 *6 × 10/8 or 6 × 1·25 or equivalent* *Length = 10 (cm) and Width = 7·5 (cm)*	M1 A1	*Answer space takes precedence.* *M1 for correct use of linear ratio.* *Allow Length = 7·5 (cm) and Width = 10 (cm)*

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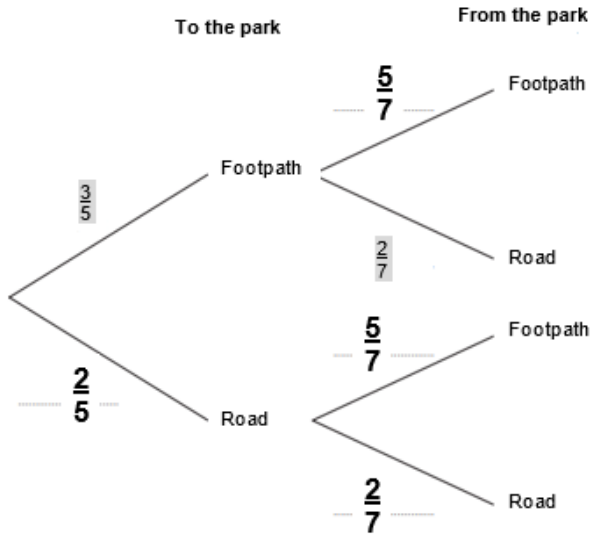
8.*(a)* Complete diagram  	B2	**If B2 not awarded,** award B1 for **one** of the following: • 2/5 or equivalent on Road to the park branch • 5/7 on a Footpath from the park branch.
8.(b) $\frac{3}{5} \times \frac{5}{7}$ or equivalent $\frac{15}{35}$ or equivalent ISW	M1 A1	FT $\frac{3}{7}$ × 'their $\frac{5}{7}$' (on 'uppermost footpath home branch') provided less than 1.
9. $(x - 10)(x + 2)$ $(x =) 10$ AND $(x =) -2$	B2 B1	B1 for one of the following: • $(x \ldots 10)(x \ldots 2)$. • two brackets which multiply to give $x^2 - 8x + k$ • two brackets which multiply to give $x^2 + kx - 20$. **Strict FT** from their pair of brackets. If no factorising shown, allow the following. B2 for $x - 10\ (=0)$ AND $x + 2\ (=0)$ (B1) $(x =) 10$ AND $(x =) -2$ (B1) B1 for $x + 10\ (=0)$ AND $x - 2\ (=0)$ (B0) $(x =) -10$ AND $(x =) 2$ (B1) FT B1 if only $(x =) 10$ AND $(x =) -2$ seen (B1)
10. (*AOB* =) 180 – 90 – 42 or 90 – 42 48(°) x = 24(°)	 M1 A1 B1	Check diagram for answers. Note: 180 – 132 May be implied by sight of a final answer of 24. FT 'their 48' ÷ 2, provided 'their 48' ≠ 42.
10. Alternative method *(x =) $\frac{180 - 90 - 42}{2}$ or $\frac{90 - 42}{2}$* *x = 24(°)*	 *M2* *A1*	*Check diagram for answers.* *Award M2 for complete method.*

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11. Correct equation e.g. $\frac{50x + 10 - 21x + 9}{(15)} = \frac{9 \times 3 \times 5}{(15)}$ $(29x + 19 = 135)$ $\quad 29x = 116$ $x = 4$	 B2 B1 B1	FT until 2nd error. Award B1 for one of the following: • 1 error in one term • Sight of $5(10x + 2)$ AND $-3(7x - 3)$ or equivalent • Sight of $50x + 10 - 21x + 9$. Subsequent work may show use of common denominator in order to award the B2. Mark final answer. Award the final B0 for $\frac{116}{29}$ If FT leads to a whole number answer, it must be shown as a whole number. Otherwise, accept a fraction. Allow B2B1B1 for a correct embedded answer BUT only B2B1B0 if contradicted by $x \neq 4$ or equivalent. Note 1: $\frac{50x + 10 - 21x - 9}{(15)} = \frac{135}{(15)}$ B1 (one error –9) $29x = 134$ B1 $x = \frac{134}{29}$ B1 Note 2: $\frac{50x + 10 - 21x + 9}{(15)} = \frac{9}{(15)}$ B1 (one error = 9) $29x = -10$ B1 $x = \frac{-10}{29}$ B1 Note 3: $\frac{50x + 10 - 21x - 9}{(15)} = \frac{9}{(15)}$ B0 B0 B0 (2 errors –9 & 9) Award B2B1B1 for unsupported answer of 4, or for an answer which has come from a non-algebraic method.
12. $x \leq 2$ or equivalent $y \leq 3$ or equivalent $y \geq -x + 1$ or equivalent	 B1 B1 B2	Accept in any order. Accept '<'. Accept '<'. Accept '>'. B1 for one of the following: • $y = -x + 1$ or $y < -x + 1$ or $y \leq -x + 1$ • $y \geq kx + 1$ or $y > kx + 1$ (with $k \neq -1$ and either $k < 0$ or $k = 1$) • $y \geq -x + c$ or $y > -x + c$ (with $c \neq 1$)

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13. (a) $y \propto \frac{1}{x^2}$ OR $y = \frac{k}{x^2}$ or equivalent $16 = \frac{k}{5^2}$ OR $k = 16 \times 5^2$ (= 400) $(y =) \frac{400}{x^2}$	B1 M1 A1	Allow $y \propto \frac{k}{x^2}$. May be implied by completely correct further working. FT for B0 M1 from $y \propto \frac{1}{x^n}$ with $n > 0$ and $n \neq 2$ No FT from direct proportion. May be seen (explicitly) in part (b). Allow $y \propto \frac{400}{x^2}$.
13. (b) x | 5 | 0·1 | **(±)2** y | 16 | **40 000** | 100	B2	Check working space if table is empty. Table takes precedence over working space. B1 for one correct value. FT from 'their k' (using $y = \frac{k}{x^2}$) or FT for inverse proportion only, but <u>not</u> from $y = \frac{k}{x}$.
14. (Arc BC – Arc AD =) $\frac{300}{360} \times 2\pi \times (14 + 6) - \frac{300}{360} \times 2\pi \times 14$ or $\frac{300}{360} \times [2\pi \times (14 + 6) - 2\pi \times 14]$ or equivalent $= 10\pi$	M2 A1	May be seen in parts. M1 for one correct product for an arc length e.g. $\frac{300}{360} \times 2\pi \times (14 + 6)$ or $\frac{300}{360} \times 2\pi \times 14$ Allow use of 3·14 for M1 or M2. CAO If no marks, award: SC2 for • an <u>answer of 2π</u> (using 60˚) from $\frac{60}{360} \times 2\pi \times (14 + 6) - \frac{60}{360} \times 2\pi \times 14$ or $\frac{60}{360} \times [2\pi \times (14 + 6) - 2\pi \times 14]$ OR SC1 for a full method using 60˚ • $\frac{60}{360} \times 2\pi \times (14 + 6) - \frac{60}{360} \times 2\pi \times 14$ or $\frac{60}{360} \times [2\pi \times (14 + 6) - 2\pi \times 14]$ OR SC1 for one of the following <u>final</u> answers: • $\frac{40\pi}{3}$ or equivalent (from using radii of 14 cm and 6 cm) • 20π (from using 2πD for circumference) • 5π (from using πr for circumference) • 10 (from omitting π) No marks for working with whole circumference (unless also subtracting fraction of circumference). No marks for working with area of circle.

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15. Formally identifying (in writing) two appropriate pairs of equal angles e.g. *BAC* = *DAE* and *BCA* = *DEA* (*CA* = *AE* given) or *BAC* = 79˚ and *DEA* = 27˚ (*CA* = *AE* given) AND Explanation that the triangles are congruent due to angle, side, angle or ASA or equivalent.	E2	(Check diagram) If all three angles are used, they must all be correct. For reference: *BAC* = *DAE* = 79° (vertically opposite angles) *BCA* = *DEA* = 27° (alternate angles) *ABC* = *ADE* = 74° (angles in a triangle with alternate angles) Award E1 for one of the following: • formally identifying at least one correct pair of angles AND explanation that the triangles are congruent due to angle, side, angle or ASA or equivalent. OR • a correctly completed diagram (at least two pairs of angles) AND Explanation that the triangles are congruent due to angle, side, angle or ASA or equivalent. OR • formally identifying (in writing) two pairs of matching angles (with no incorrect angles) e.g. *BAC* = *DAE* and *BCA* = *DEA* (*CA* = *AE* given) or *BAC* = 79˚ and *DEA* = 27˚ (*CA* = *AE* given)
16. (a)(i) 16	B1	
16. (a)(ii) $\frac{1}{100}$	B1	
16. (b) $100x = 7{\cdot}141414.....$ and $10000x = 714{\cdot}1414....$ with an attempt to subtract on both sides $\frac{707}{9900}$	M1 A1	Or x and $100x$, or equivalent. Or a complete alternative method. The multiplied decimals must be correct. An answer of $\frac{7{\cdot}07}{99}$ gains M1 only. ISW
16. (b) *Alternative method* *0·07 + 0·00141414…..* = $\frac{7}{100} + \frac{14}{9900}$ *or equivalent* $\frac{707}{9900}$	*M1* *A1*	 *ISW*
16. (c) $\frac{3\sqrt{5}}{2}$	B2	B1 for one of the following: • a numerator of $3\sqrt{5}$ • $\frac{\sqrt{45}}{\sqrt{4}}$ or $\frac{\sqrt{9}\times\sqrt{5}}{\sqrt{4}}$ i.e. for one step of simplification of surds (but not for $\sqrt{\frac{45}{4}}$) • sight of $1 \cdot 5\sqrt{5}$ (from $\sqrt{2 \cdot 25}\sqrt{5}$).
16. (d) An appropriate irrational number within the required range	B1	e.g. 2π, $\pi + 3$, $\sqrt{40}$, $3\sqrt{5}$, $8 - \sqrt{2}$. Ignore additional irrational numbers within range. B0 for multiple answers, unless all are irrational numbers within the required range.

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17. $4n^2 - 2n - 2n + 1$ [+ 7] or equivalent	B2	Correct expansion of brackets and intention to add. B1 for one of the following: • 3 correct terms (and 1 incorrect or missing term) • 4 correct terms, but no intention to add • $4n^2 + kn + 1$ [+ 7], $k \neq 0, -4$
$4n^2 - 4n + 8$ or $4(n^2 - n + 2)$ AND concluding statement, e.g. "4 is a common factor" "The expression is a multiple of 4"	E1	Factorisation is not explicitly required for this mark, provided statement is convincing. If B0, award SC1 for a concluding statement resulting from an expansion of $4n^2 + 1 + 7$. Award no marks for trialling numbers.
18.		No FT for 'splitting' the cube root into a sum of two roots, otherwise FT until 2nd error for equivalent level of difficulty.
Sight of $ct^3 - 9 = t^3$	B1	Cubing
$(c - 1)\, t^3 = 9$	B1	Isolating terms in t^3 and factorising. FT a formula with three or more terms AND with at least two terms in t^3.
$t^3 = \frac{9}{c-1}$ OR $t^3 = \frac{-9}{1-c}$	B1	Isolating t^3.
$t = \sqrt[3]{\frac{9}{c-1}}$ OR $t = \sqrt[3]{\frac{-9}{1-c}}$	B1	Taking cube root. B0 for inclusion of ±
19. 109° and 289° with no other values	B2	Check diagram. B1 for either angle. Allow embedded answers. Ignore extra (correct or incorrect) values outside the required range. Penalise –1 for each extra value within range (beyond 2 attempts). If no marks, award SC1 for sight of 180–71 AND 360–71 (or equivalent).
20. Horizontal translation to the left with curve intercepting x axis at (3, 0) and (7, 0).	B2	Mark clear intention. If not B2, award B1 for a horizontal translation to the left.
(5, –1)	B1	CAO

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21. (a) $\frac{7}{11}\times\frac{6}{10} + \frac{3}{11}\times\frac{2}{10} + \frac{1}{11}\times\frac{0}{10}$ $= \frac{48}{110}\left(=\frac{24}{55}\right)$	M2 A1	Full method for finding P(B,B) + P(W,W) + P(R,R). May be seen in parts. Allow the omission of P(R,R). M1 for sight of $\frac{7}{11}\times\frac{6}{10}$ or $\frac{3}{11}\times\frac{2}{10}$. M1 if additional incorrect products are included. ISW If no marks, SC1 for one of the following: • an answer of $\frac{59}{121}$ (method with replacement) • a correctly evaluated final answer from an incorrect total in denominator e.g. $\frac{48}{90}$ (from a total of 10).
Alternative method 1: *21. (a) 1 – $\left(\frac{7}{11}\times\frac{4}{10} + \frac{3}{11}\times\frac{8}{10} + \frac{1}{11}\times\frac{10}{10}\right)$* $= \frac{48}{110}\left(=\frac{24}{55}\right)$	*M2* *A1*	*Full method for finding 1 – P(BB' or WW' or RR')* *M1 if one of the subtracted products is incorrect or missing.* *ISW* *If no marks, SC1 for one of the following:* • *an answer of $\frac{59}{121}$ (method with replacement)* • *a correctly evaluated final answer from an incorrect total in denominator e.g. $\frac{28}{90}$ (from a total of 10)*
Alternative method 2: *21. (a) 1 – 2 × $\left(\frac{7}{11}\times\frac{3}{10} + \frac{3}{11}\times\frac{1}{10} + \frac{1}{11}\times\frac{7}{10}\right)$* *or equivalent* $= \frac{48}{110}\left(=\frac{24}{55}\right)$	*M2* *A1*	*Full method for finding* *1 – P(BW or WB or WR or RW or RB or BR)* *M1 if one or two of the subtracted products are incorrect or missing.* *ISW* *If no marks, SC1 for one of the following:* • *an answer of $\frac{59}{121}$ (method with replacement)* • *a correctly evaluated final answer from an incorrect total in denominator e.g. $\frac{28}{90}$ (from a total of 10)*
21. (b) $\frac{n}{2n+1}\times\frac{n-1}{2n}$ or equivalent $= \frac{n-1}{2(2n+1)}$ or $\frac{n-1}{4n+2}$	M2 A1	M1 for sight of $\frac{n}{2n+1}$ or $\frac{n-1}{2n}$ or equivalent For M1, FT 'their $2n+1$' -1 in denominator of 2nd fraction. CAO

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GCSE MARKING SCHEME

AUTUMN 2023

GCSE
MATHEMATICS
UNIT 2 – HIGHER TIER
3300U60-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

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WJEC GCSE MATHEMATICS

AUTUMN 2023 MARKING SCHEME

GCSE Mathematics **Unit 2: Higher Tier**	Mark	Comments
1.(a) 1 10	B2	B1 for each. Table takes precedence if conflicting values given.
1.(b) At least 4 correct plots and no incorrect plot.	P1	FT 'their (−2,1)' and 'their (1,10)' OR (−2,1) and (1,10) plotted. Allow ± '½ a small square'.
A smooth curve drawn through their plots.	C1	FT 'their 6 plots'. OR a curve through the 4 given points **AND** (−2,1) and (1,10) Allow intention to pass through their plots. (± 1 small square horizontally or vertically.)
2. (a) (Area =) $\frac{7{\cdot}4 + 9{\cdot}1}{2} \times 5{\cdot}7$ or equivalent	M1	(= 47·025) May be seen in stages. Allow M1 for correct intent seen. e.g. 7·4 + 9·1 × 5·7 ÷ 2
× 15·6	m1	
Allow an answer from 733 to 734 (cm^3) inclusive.	A1	CAO *Note: 733·59 or 733·6 (cm^3)*
2. (b) 733·59 × 19·3	M1	FT 'their volume from (a)' × 19·3
14158(·287 (g))	A1	
Allow an answer from 14·1 to 14·2 (kg) inclusive.	B1	FT 'their 14158·287' ÷ 1000 Allow 14 from correct working. *Note: 14·158(287) or 14·16 or 14·2 (kg)*
2.(b) Alternative method (converting to g first)		
0·0193 (kg/cm^3)	*B1*	
733·59 × 0·0193	*M1*	*FT 'their volume from (a)' and FT 'their 0.0193' provided a place value error has been made.*
Allow an answer from 14·1 to 14·2 (kg) inclusive	*A1*	Allow 14 from correct working. *Note: 14·158(287) or 14·16 or 14·2 (kg)*

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3. Identifying or implying that there are 16 possible correct combinations (e.g 2 × 6) or products (e.g.12)	B1	Award B1 for • simply stating 16 • (4 × 4 =)16 • **completed** sample space (need not be correct) • sight of $\frac{1}{4} \times \frac{1}{4}$ • sight of 16 in a denominator.
Identifies <u>all</u> possible combinations (e.g 2 × 6) or products (e.g 12) that are a factor of 36 *1 × 6 = 6, 1 × 9 = 9, 2 × 6 = 12* *2 × 9 = 18, 3 × 6 = 18, 4 × 9 = 36*	B2	FT 'their 16 possible correct products'. If products not used (e.g 2 + 6 = 8), do not award B2 or B1. Award B2 for **clearly identifying** one of the following: • the **6** (and no more) combinations 1 × 6, 2 × 9, etc that form factors of 36 that can be achieved by the two spinners • the **6** (and no more) products of factors of 36 that can be achieved by the two spinners: 6, 9, 12, **18, 18**, 36 • sight of $6 \times \frac{1}{4} \times \frac{1}{4}$ or equivalent. Award B1 for **clearly identifying** one of the following: • at least 4 combinations that are factors of 36 • at least 4 products of factors of 36 that can be achieved by the two spinners: 6, 9, 12, 18, 36 • all of the factors of 36 (1,2,3,4,6,9,12,18,36).
(Probability factor of 36 =) $\frac{6}{16}$ or equivalent. ISW	B1	FT 'their list' only if at least 12 combinations or products given with **at least two factors of 36** that can be achieved by the two spinners **clearly identified.** Penalise, −1, any incorrect notation e.g. '6 out of 16'. Unsupported $\frac{6}{16}$ or $\frac{3}{8}$ or equivalent gains B1 B2 B1.
Organisation and Communication	OC1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means
Accuracy of writing	W1	For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

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4. $(AC^2 =)\ 8^2 + 4{\cdot}5^2$ or equivalent $(AC =)\ \sqrt{8^2 + 4.5^2}$ or equivalent 9·1(7878…) (cm) ISW	M1 m1 A1	Check diagram. note: $(AC^2 =)\ 64 + 20{\cdot}25$. note: $(AC =)\ \sqrt{84{\cdot}25}$. FT √'their 84·25' for m1 only provided M1 gained. Accept the answer rounded or truncated to at least one decimal place. Final answer of • ***AC*** = 84·25 is M1m0A0.
4. Alternative method to find AC using Trig *A correct and complete method (using trigonometric relationships)* *9·1(7878…) (cm) ISW*	*M2* *A1*	 *Accept the answer rounded or truncated to at least one decimal place.*
5. One correct evaluation $3 \le x \le 4$ 2 correct evaluations $3{\cdot}75 \le x \le 3{\cdot}95$, **(one value < 80, one value > 80)** 2 correct evaluations $3{\cdot}75 \le x \le 3{\cdot}85$, **(one value < 80, one value > 80)** $x = 3{\cdot}8$	B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if < 80 or > 80.* *If evaluations not seen accept 'too high' or 'too low'.* *Look out for* $x^3 + 6x - 80 = 0$ x / $x^3 + 6x$ 3 / 45 3.1 / 48·391 3.2 / 51·968 3.3 / 55·737 3.4 / 59·704 3.5 / 63·875 3.6 / 68·256 3.7 / 72·853 **3.8** / 77·672 **3.9** / 82·719 4 / 88 3.75 75·2343.. 3.84 79·6631.. **3.85 80·1666..** **3.95 85·3298..** Unsupported $x = 3{\cdot}8$ is awarded B0B0M0A0. An answer of $x = 3{\cdot}8$ can only be awarded M1A1, following sight of 2 correct evaluations $3{\cdot}75 \le x \le 3{\cdot}85$ **(one evaluation < 80, one evaluation > 80).** If 3·85 is given as 80 (truncated) award M0 A0 unless 'too high' or equivalent is indicated.

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6. Sight of $(5x + 3)(2x - 1)$ or $2(5x + 3)(2x - 1)$ or equivalent (total area of both rectangles = $20x^2 + 2x - 6$ (cm^2)	S1 B2	Intention to (2 ×) width × length. Allow 4 × width × length or equivalent for S1. May be implied in later working if B2 or B1 awarded. Mark final answer for B2. Allow $20x^2 + 2x + - 6$ for B2. Award B1 for sight of one of the following: • $20x^2 + 12x - 10x - 6$ with at least three terms out of the four correct (must have x^2 term) • $10x^2 + 6x - 5x - 3$ • $2(10x^2 + x - 3)$ • $10x^2 + x - 3$ • $40x^2 + 4x - 12$. If no marks, award SC1 for one of the following: • $40x^2 + 24x - 20x - 12$. • $20x^2 + 22x + 6$ from $2(5x + 3)(2x + 1)$ • $20x^2 - 2x - 6$ from $2(5x - 3)(2x + 1)$ • $20x^2 - 22x + 6$ from $2(5x - 3)(2x - 1)$.
7. Method using angle *XYZ* *YZ* = $\frac{18{\cdot}6}{\tan 40(°)}$ or $\frac{18{\cdot}6 \times \sin 50}{\sin 40}$ or equivalent = 22(·166..)(cm)	 M2 A1	Check diagram for answer. Award M1 for one of the following • $\tan 40(°) = \frac{18{\cdot}6}{YZ}$ • $\frac{YZ}{\sin 50} = \frac{18{\cdot}6}{\sin 40}$ or equivalent Accept an answer rounded or truncated. Award M2A0 for any of the following unsupported answers: Method: $\frac{18{\cdot}6}{\tan 40}$ — Radians: -16·648…. — Gradians: 25·600…
7. Alternative using angle YXZ *YZ = 18·6 × tan 50(°)* *= 22(·166..)(cm)*	*M2* *A1*	*Award M1 for tan 50(°) = $\frac{YZ}{18{\cdot}6}$* *Accept an answer rounded or truncated* *Award M2A0 for any of the following unsupported answers:* *Method: 18·6 × tan 50 — Radians: -5·057…. — Gradians: 18·6*
7. Alternative method ***Correct** use of a 'two-step' method.* *22(·166..)(cm) ISW*	*M2* *A1*	*A partial trigonometric method is M0.* *Accept an answer rounded or truncated.*

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8. Working in mm: $60{\cdot}5 \times 7$ **OR** $420 + 0{\cdot}5 \times 7$ Working in cm: $6{\cdot}05 \times 7$ **OR** $42 + 0{\cdot}05 \times 7$ 423·5 (mm) ISW	M1 A1	Allow 60 < 'their 60·5' ≤ 61. Allow 6 cm < 'their 6·05' cm ≤ 6·1 cm. Allow 42·35 cm, provided units are given and correct. CAO. If no marks, award SC1 for sight of 60·5 OR 6·05.
9. Midpoints 25, 35, 45, (55), 65, 75 Missing 10 for $50 \leq t < 60$ $25\times2 + 35\times8 + 45\times4 + 55\times\mathbf{10} + 65\times3 + 75\times5$ (= 50 + 280 + 180 + **550** + 195 + 375 = 1630) ÷ 32 50·9(375) or 51 or equivalent ISW	B1 B1 M1 m1 A1	May be implied in later working (i.e the correct products). FT 'their 10' provided ≠ 0 or 1. Allow with consistent incorrect midpoints provided at least 5 within the correct interval including 'bounds' Allow use of a instead of 10 (sight of 1080 + 55a). FT 22 + 'their a' (a ≠ 0). Allow use of a instead of 10. CAO. Must be derived from correct working. If no marks or first B1 only, award SC1 for one of the following: • (1080 ÷ 22 =) 49(·09…) from use of $a = 0$ • (1080 ÷ 32 =) 33·7(5) or 34 from use of $a = 0$ • (1135 ÷ 23 =) 49(·3…) from use of $a = 1$ • (1135 ÷ 32 =) 35(·46875) from use of $a = 1$. Award B1 B0 M1 m1 A0 for $\frac{1080 + 55a}{22 + a}$ or $\frac{1080 + 55a}{32}$ or equivalent expression involving a.
10. Sight of $12x + 4y = 180$ or equivalent AND $26x + 7y = 360$ or equivalent Method to eliminate one variable e.g. equal coefficients **AND** appropriate intention to add or subtract or use a method of substitution. First variable found $x = 9(°)$ or $y = 18(°)$ Substitute to find the 2nd variable. Second variable found.	B2 M1 A1 m1 A1	x and y terms need to be collected for B2. If B2 not awarded, award B1 for one of the following: • $12x + 4y = 180$ or equivalent • $13x + 5x + 8x + 7y = 360$ • $26x + 7y = 360$ or equivalent FT 'their equations', provided of equivalent difficulty. Allow one error in one term (not the term with equal coefficients). CAO (for their equations). FT substitution of their '1st variable' if M1 gained. No marks for 'trial and improvement'. No marks for an unsupported answer.

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11.(a) $(2x+5)(3x+2)$ ISW	B2	B1 for one of the following: • $(2x \ldots 5)(3x \ldots 2)$ • A pair of brackets which leads to the expansion of $6x^2+bx+c$ where either $b=19$ or $c=10$ • $\frac{(2ax+5a)(3bx+2b)}{ab}$ [e.g. $(x+2.5)(6x+4)$]`
11.(b) $m(m+5)(m-5)$	B3	Mark final answer for B3. B2 for one of the following: • $(m+5)(m^2-5m)$ • $(m-5)(m^2+5m)$ • $m(m \ldots 5)(m \ldots 5)$ • $(m+5)(m-5)$ B1 for one of the following: • sight of $m(m^2-25)$ • sight of $(m+5)(m-5)$ included within an expression, e.g. $m^2(m+5)(m-5)$ • $(m \ldots 5)(m \ldots 5)$
11.(c) $(p+7)(p+31)$ ISW	B2	B1 for $(p+7)(p+29+2)$ OR Allow B1 for $(p+7)(p+k)$ with $k \neq 0$ or 2 or 7 or 29.
Alternative method $(p+7)(p+29)+2(p+7)=p^2+38p+217$ $=(p+7)(p+31)$ ISW	*B2*	*No mark for the expansion and collection of terms.* *Award B1 for a correct factorisation, if possible, on FT from 'their derived quadratic expression', provided no more than one error.* *SC1 for an answer of $(p+7)(p+k)$ with $k \neq 0$ or 7 or 2 or 29.*
12. $(BC^2=)\ 36\cdot1^2+13\cdot8^2-2\times36\cdot1\times13\cdot8\times\cos29$ OR $(BC=)\ \sqrt{[36\cdot1^2+13\cdot8^2-2\times36\cdot1\times13\cdot8\times\cos29]}$	M1	
$(BC=)\ 24\cdot9(4\ldots\text{cm})$	A2	Accept 25(cm) from correct working. A1 for $(BC^2=)\ 622\cdot2(1\ldots)$ *Method* / *Radians* / *Gradians* *Evaluating cos29 using 29rads or 29grads* / *47·31…* / *24·472…*
13. 2×10^{72}	B1	
14. (Area scale factor =) $(855/225)^2$ OR $(225/855)^2$	B1	$3\cdot8^2=14\cdot44$ OR $(19/5)^2$ OR 361/25 OR $(5/19)^2$ OR 25/361 or equivalent.
$5300\times(855/225)^2$ OR $5300\div(225/855)^2$	M1	
$=76532(\text{cm}^2)$	A1	CAO
15. $23\cdot5-\frac{0\cdot725}{8\cdot35}$	M2	If many attempts are offered without a method/answer being identified then mark final attempt. Accept 23·4999… or 8·34999… (or using recurring dot notation). Do not accept truncated values of 23·49 or 23·499 or 8·349 or 8·3499. Award M1 for correct use of values $23<b\leq24$, $0\cdot72\leq c<0\cdot73$ and $8\cdot3<d\leq8\cdot4$ OR award M1 for correct use of 2 of the 3 correct limits. Allow sight of 23·413(…) for M2.
$=23\cdot41$	A1	Only award A1 if M2 gained.

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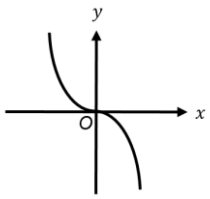
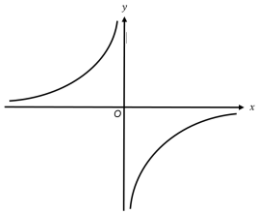
16.(a) 	B1	Third box
16.(b) Correct sketch of $y = -1/x$ in appropriate 2 quadrants with axes as asymptotes with no extra curves in the other quadrants. 	B2	Penalise -1 for the curling away from the asymptotes at the extremities only if B2 previously awarded. If not B2, award B1 for one of the following: • Correct sketch in 1 quadrant with axes as asymptotes with no more than 1 incorrect curve in another quadrant • Correct sketch in appropriate 2 quadrants with axes as asymptotes with extra incorrect curves in one or two of the other quadrants • for two curves sketched appropriately in both quadrants but not clearly with intention of axes as asymptotes • Correct sketch of $y = +1/x$ in appropriate 2 quadrants with axes as asymptotes.

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17.(a) $\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}$ $=\frac{6}{280}\left(=\frac{3}{140}\right)$ ISW	M1 A1	 Accept a decimal answer of 0·021(4…). Allow an answer of 0.02 from correct working.
17.(b) [1–'all pass to the left'–'all pass to the right'] $1-\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)-\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ ISW	M2 A1	Award only M1 if further incorrect work seen. FT from part (a) provided <1. M1 for any one of the following: $1-\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)\ \left[=\frac{137}{140}\right]$ $1-\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\ \left[=\frac{9}{14}\right]$ $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\left[=\frac{53}{140}\right]$ CAO Accept a decimal answer of 0·62(1…)
17.(b) Alternative method 1 *['2 pass left and 1 right'+'2 pass right and 1 left']* $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)$ $+\ \left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. M1 for any one of the following: $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)\left[=\frac{7}{40}\right]$ $\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\ \left[=\frac{125}{280}\right]$ CAO *Accept a decimal answer of 0·62(1…)*
17.(b) Alternative method 2 *[G no ball + D no ball + H no ball]* *P(G no ball) + P(D no ball) + P(H no ball) =* $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)$ $+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)$ $+\ \left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. *M1 for any one of the following:* *P(G no ball)=*$\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)$ *or* $\left(\frac{2}{7}\times\frac{5}{8}\right)\left[=\frac{5}{28}\right]$ *P(D no ball)=*$\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)$ *or* $\left(\frac{4}{5}\times\frac{3}{8}\right)\left[=\frac{3}{10}\right]$ *P(H no ball)=*$\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ *or* $\left(\frac{1}{5}\times\frac{5}{7}\right)\left[=\frac{1}{7}\right]$ CAO *Accept a decimal answer of 0·62(1…)*
17.(b) Alternative method 3 *[G receives 2 balls + D receives 2 balls + H receives 2 balls]* *P(H left, D right)+P(G left, H right)+P(D left, G right) =* $\left(\frac{3}{8}\times\frac{5}{7}\right)+\left(\frac{1}{5}\times\frac{5}{8}\right)+\left(\frac{2}{7}\times\frac{4}{5}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. *M1 for any one of the following:* *P(H left, D right) =* $\left(\frac{3}{8}\times\frac{5}{7}\right)\left[=\frac{15}{56}\right]$ *P(G left, H right) =* $\left(\frac{1}{5}\times\frac{5}{8}\right)\left[=\frac{1}{8}\right]$ *P(D left, G right) =* $\left(\frac{2}{7}\times\frac{4}{5}\right)\left[=\frac{8}{35}\right]$ CAO *Accept a decimal answer of 0·62(1…)*

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18.(a) $E\hat{C}G = 30(°)$ Sight of $C\hat{E}G = 45(°)$ AND $C\hat{G}E = 105(°)$ $CE = \frac{5\times\sin105}{\sin45}$ $= 6{\cdot}8(3\ldots\text{cm})$ or $\frac{5+5\sqrt{3}}{2}$ (cm)	 B1 B2 M2 A1	Angles must be clearly stated or seen on the diagram. B1 for $C\hat{E}G = 45(°)$ OR $C\hat{G}E = 105(°)$ Sight of $C\hat{E}G = 45(°)$-implies previous B1. FT 'their $E\hat{C}G = 30$' to calculate: • $C\hat{G}E$ = 'their 30'/2 + 90 • $C\hat{E}G$ = 90 – 'their 30' × 3/2 Use of correct angles implies B1B2. FT 'their $C\hat{G}E = 105$' AND 'their $C\hat{E}G = 45$'. M1 for $\frac{CE}{\sin105} = \frac{5}{\sin45}$ Award M2 for a **correct** use of 'two-step' trigonometric relationship. M0 otherwise. Allow 7(cm) from correct working.
18(a) Alternative version to find OC first and then use triangle OCE *$C\hat{O}E = 30(°)$* *Sight of $C\hat{E}G = 45(°)$* $\left(OC = \frac{2\cdot5}{\sin(15)} =\right)$ *9·6(5…cm) or 9·7(cm) or $\frac{5\sqrt{6}+5\sqrt{2}}{2}$ (cm)* *$CE = \frac{9\cdot6(5\ldots)\times\sin30}{\sin45}$* *$= 6{\cdot}8(3\ldots\text{cm})$ or $\frac{5+5\sqrt{3}}{2}$ (cm)*	 *B1* *B1* *B1* *M2* *A1*	*Angles must be clearly stated or seen on the diagram.* *Sight of $C\hat{E}G = 45(°)$ implies previous B1* *FT 'their $E\hat{C}G = 30$' to calculate:* *$C\hat{E}G$ = 90 – 'their 30' × 3/2* *Or equivalent e.g. using the sine rule in triangle OCG* *FT 'sin (½ of 'their $C\hat{O}E = 30$')* *Use of correct side and angles implies B1B1B1.* *FT 'their derived OC' AND 'their $C\hat{O}E = 30$' AND 'their $C\hat{E}G = 45$'.* *M1 for $\frac{CE}{\sin30} = \frac{9\cdot6(5\ldots)}{\sin45}$* *Award M2 for a **correct** use of 'two-step' trigonometric relationship. M0 otherwise.* Allow an answer of 7(cm) from correct working.
18.(b) ½×5×6·8(3…)×sin30 $= 8{\cdot}5(\ldots\text{cm}^2)$ or $\frac{25+25\sqrt{3}}{8}$ (cm^2)	M1 A1	FT their solution in (a), provided it does not refer to a side other than CE AND 'their $E\hat{C}G = 30(°)$'.

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19.	$x + 3 + 5x = 7x^2$ OR $x + 3 = x(7x - 5)$ OR $x + 3 = 7x^2 - 5x$	M1	Clearing the denominator of x. May be seen in stages, e.g. first writing $\frac{x+3}{x}$ as $1 + \frac{3}{x}$, etc
	$7x^2 - 6x - 3 = 0$	A1	CAO '= 0' required, but may be implied by an attempt to use the quadratic formula or if $a = 7, b = -6,\ c = -3$ used in the quadratic formula.
	$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4 \times (7) \times (-3)}}{2 \times (7)}$	M1	**This substitution into the formula must be seen for M1, otherwise award M0A0A0.** FT 'their derived quadratic equation equated to zero' provided of equivalent difficulty (a, b and c must be non-zero). Allow one slip in substitution **for M1 only**, but must be correct formula. This can be awarded as a single attempt which may be seen anywhere in the solution for solving their quadratic equation equated to zero.
	$= \frac{3 \pm \sqrt{30}}{7}\ \left(\frac{6 \pm \sqrt{120}}{14}\right)$	A1	Can be implied from at least one correct value of x evaluated, provided M1 awarded.
	x = 1·21(…) AND –0·35(…)	A1	CAO for their quadratic equation. Both solutions required. Accept 1·2 and –0·4.

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