1			147	P1	starts process, eg uses x and $x + 7$	
				P1	starts to work with at least 6 correct sides, may be on the diagram or in an expression	
				P1	(dep on previous P1) gives a correct expression for the perimeter, eg $x + x + 7 + x + 7 + x + 7 + x + x + 7 + x + 7 + x + 7$ or adds at least 6 correct sides and equates to 70	
				A1	for width = 3.5 oe **and** length = 10.5 oe	
				B1	ft (dep P2) for correct area for their x	

2		140	P1	for complete process to find sum of the interior angles of a pentagon eg $(5 - 2) \times 180$ or exterior $360 \div 5 = 72$, interior $180 - 72 = 108$, 108×5 **OR** for complete process to find sum of the exterior angles of the pentagon eg $(180 - x) + (180 - 2x) + (180 - 125) + (180 - 115) + (180 - 90)$	Must be a complete process that could lead to a figure of 540 if that process is evaluated incorrectly
			A1	for sum of interior angles is 540 **OR** for sum of exterior angles is 360	360 must be identified as the sum of the exterior angles
			P1	for start to process to find angle ABC eg [angles in a pentagon] $- 115 - 125 - 90 \ (= 210)$ or $115 + 125 + 90 + x + 2x =$ [angles in a pentagon] **OR** $(180 - x) + (180 - 2x) + (180 - 125) + (180 - 115) + (180 - 90) = 360$	Award provided [angles in a pentagon] is greater than 400 Algebraic route needs to show both sides of the equation. LHS of equation may be simplified
			P1	for process to find angle ABC eg "210" $\div 3 \ (= 70)$, "210" divided in the ratio 2 : 1 **or** for process to find angle BCD eg $\frac{2}{3} \times$ "210" **or** for $3x =$ "210" or $-3x = -$"210"	Award if 70 is given for either ABC or BCD on the diagram
			A1	cao	Award marks for 140 on the diagram with working and not contradicted by the answer line. Award 0 marks for 140 without working.

3	$\frac{5}{3}$	P1	for process to derive an equation in x, eg $\frac{x}{4x - 1} = \frac{6x + 5}{12x + 31}$	
		P1	for complete process to remove fractions, eg $x(12x + 31) = (6x + 5)(4x - 1)$	Must be correct use of brackets
		P1	for process to reduce to a quadratic equation, eg $12x^2 - 17x - 5 = 0$	Award for correct LHS only.
		P1	for process to solve the quadratic equation by factorisation or use of quadratic formula, eg $(4x + 1)(3x - 5) = 0$	Award for correct LHS only. Accept substitution into the formula; $\frac{- -17 \pm \sqrt{(-17)^2 - 4 \times 12 \times -5}}{2 \times 12}$
		A1	for $\frac{5}{3}$ oe	Accept answers in the range 1.66 to 1.67 as equivalent

4	8.5	P1	for process to use the area of $PQRS$ to find the length of PQ, eg $10y = 45$ **or** $45 \div 10 \ (= 4.5)$	Sets up equation for area
		P1	for process to use the perimeter of $ABCD$, eg $2x + 2 \times$ "4.5" = 26 **or** $26 - 2 \times$ "4.5" (= 17) **or** $26 \div 2$ (= 13)	Uses perimeter of $ABCD$
		P1	for process to use length of BC to find length of AB, eg solves $2x + 2 \times$ "4.5" = 26 **or** $(26 - 2 \times$ "4.5") $\div 2$ **or** "13" – "4.5"	
		A1	for 8.5 **or** $8\frac{1}{2}$	Accept $\frac{17}{2}$

5	93	M1	for method to find angle ACB, eg. $180 - 75 - 51$ $(= 54)$		Angles may be shown on diagram but must not be ambiguous eg. M0 for angle of 54° shown in the wrong place
		M1	(dep M1) for method to use the ratio, eg. "54" $\div (2 + 1)$ $(= 18)$		
		M1	for complete method, eg. $180 - 51 - $ "18" $\times 2$ or $75 + $ "18" oe		
		A1	cao		

6	116	P1	for setting up an equation, eg $(x + 4)^2 = x^2 + 70$	for setting up an equation, eg $x^2 - (x - 4)^2 = 70$	Equation must be in a single variable. If a candidate uses a trial and improvement method, it is either full marks or no marks.
		P1	for process to reduce equation down to a linear equation ready to solve eg $8x = 54$ oe	for process to reduce equation down to a linear equation ready to solve eg $8x = 86$ oe	Candidates must get as far as $ax = b$
		A1	for 6.75 oe	for 10.75 oe	
		B1	ft (dep P2) for finding the area of B **or** for answer in range 115 to 116		

7	$\dfrac{30w}{6 - 21w}$	P1	for forming an equation, eg $6(2w + y) = 7w(3y + 6)$ **or** $12w + 6y = 21wy + 42w$ oe	Condone missing brackets for this mark
		P1	for expanding brackets correctly and gathering w terms or isolating y terms in a correct equation, eg $6y = 21wy + 30w$ **or** $6y - 21wy = 42w - 12w$ **or** $6y - 21wy = 30w$	
		P1	(dep on two terms in y) for factorising out the y, eg $y(6 - 21w) = 42w - 12w$ **or** $y(6 - 21w) = 30w$ **or** $3y(2 - 7w) = 30w$	
		A1	for $(y =)$ $\dfrac{30w}{6 - 21w}$ oe	

8	Shown	M1	for a start to the method, eg finds one correct area $4(x + 1)$ **or** $(x + 7)(2x + 6)$ **or** $(x + 1)(x + 11)$ **or** $(x + 7)(x + 5)$ **or** $4(x + 5)$ **or** $(x + 11)(2x + 6)$	
		M1	for a complete expression for the total area, eg $4(x + 1) + (x + 7)(2x + 6)$ or $4x + 4 + 2x^2 + 14x + 6x + 42$ **OR** $(x + 1)(x + 11) + (x + 7)(x + 5)$ or $x^2 + x + 11x + 11 + x^2 + 7x + 5x + 35$ **OR** $(x + 11)(2x + 6) - 4(x + 5)$ or $2x^2 + 22x + 6x + 66 - 4x - 20$	
		A1	for a complete chain of reasoning with fully correct algebra leading to $2x^2 + 24x + 46$	$2x^2 + 24x + 46$ is given so need to see brackets expanded correctly

9	(9, 8)	P1	for setting up an equation for one dimension (width) of the pattern eg $2b - a = 8$ oe **or** $2x + y = 8$ oe	a and b are the width and length x is the difference between the length and width, y is the width of the rectangle
		P1	for setting up an equation for the other dimension (height) of the pattern eg $2b + a = 16$ oe **or** $2x + 3y = 16$ oe	
		P1	(dep P2) for a full process to solve for both variables eg $4b = 24$, $b = 6$ and $12 - a = 8$, $a = 4$ **or** $8 = 2y$, $y = 4$ and $8 = 2x + y$, $x = 2$	Both values correct implies this mark
		P1	(dep P3) for a full process to find one of the coordinates of C eg $3 + 6 (= 9)$ or $4 + 4 (= 8)$ **or** $3 + 2 + 4 (= 9)$ or $4 + 4 (= 8)$	
		A1	cao	Award 0 marks for a correct answer with no supportive working.

10	$8 : 12 : 9 : 1$	P1	for $2 + 3 (= 5)$ and $9 + 1 (= 10)$ OR for assigning a total number of sweets for F + G and O + J eg F + G = 100, O + J = 50	May be in algebraic form, eg $2a + 3a (= 5a)$ and $9a + 1a (= 10a)$ May be in algebraic form, eg F + G= $5a$, O + J = $2.5a$
		P1	for finding correct multiplier for relationship between totals for F + G and O + J eg × 4 to get from 5, 10 to 20, 10 OR for working out the number of sweets from their totals for F, G eg 40, 60 or for O, J, eg 45, 5	
		P1	for 2×4 (= 8) and 3×4 (= 12) OR for ratio in unsimplified form, eg 40 : 60 : 45 : 5	
		A1	cao	

11	Shown (supported)	M1	for eliminating y or x, eg $x^2 + 3x - 3 = 5x - 4$	
		M1	for rearranging, collecting terms and setting to 0 eg $x^2 - 2x + 1 (= 0)$	
		M1	for factorising or solving eg $(x - 1)^2 (= 0)$	
		C1	for statement confirming only 1 point in common eg only 1 root **or** only 1 value of x so only 1 set of coordinates	There must be a statement in words for the award of this mark

12	$1 - \left(\frac{1}{2}\right)^n - \left(\frac{1}{2}\right)^n$	M1	for $\left(\frac{1}{2}\right)^n$ oe	
		A1	oe eg $1 - \left(\frac{1}{2}\right)^{n-1}$	