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Question Number	Scheme	Marks
2.(a)	$\frac{1}{4-2\sqrt{2}}=\frac{1}{4-2\sqrt{2}}\times\frac{4+2\sqrt{2}}{4+2\sqrt{2}}$	M1
	$=\frac{4+2\sqrt{2}}{16-8}=\frac{1}{2}+\frac{1}{4}\sqrt{2}$ oe	A1
		(2)
(b)	$4x=2\sqrt{2}x+20\sqrt{2}\Rightarrow\left(4-2\sqrt{2}\right)x=20\sqrt{2}$	M1
	$\Rightarrow x=\frac{20\sqrt{2}}{\left(4-2\sqrt{2}\right)}=20\sqrt{2}\times(a)$	dM1
	$\Rightarrow x=20\sqrt{2}\times\left(\frac{1}{2}+\frac{1}{4}\sqrt{2}\right)=10+10\sqrt{2}$	A1
		(3) **(5 marks)**

(a)

M1 For sight of $\frac{1}{4-2\sqrt{2}}\times\frac{4+2\sqrt{2}}{4+2\sqrt{2}}$ oe

A1 For achieving $\frac{1}{2}+\frac{1}{4}\sqrt{2}$ or exact equivalent such as $0.5+\frac{\sqrt{2}}{4}$, $\frac{2}{4}+\frac{2}{8}\sqrt{2}$ or correct *a* and *b*.

Remember it does not have to be simplified and isw following a correct answer

(b) Hence

M1 For attempting to collect the terms in *x* on one side of the equation and the constant term on the other side . Condone slips but there must be an attempt to collect terms with a bracket or implied bracket

dM1 For using part (a) and attempting to find $k\sqrt{2}\times(a)$

A1 $10\sqrt{2}+10$ or $10+10\sqrt{2}$ but NOT $10\left(\sqrt{2}+1\right)$. It cannot be awarded without sight of $k\sqrt{2}\times(a)$

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Otherwise (1)- SQUARING APPROACH

M1 Squaring both sides $4x=2\sqrt{2}x+20\sqrt{2}\rightarrow16x^2=8x^2+160x+800$ Condone slips on coefficients

Cannot be scored by squaring each term. Look $ax^2=px^2+qx+r$

dM1 Re-arranging and attempting to solve their 3TQ usual rules

Eg $8x^2-160x-800=0\Rightarrow x^2-20x-100=0\Rightarrow x=\frac{20\pm\sqrt{400+400}}{2}$

A1 $10\sqrt{2}+10$ or $10+10\sqrt{2}$ following a correct solution of the quadratic equation seen above.

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Otherwise (2)- REPEATING THE PROCESS OF PART (a)

M1 Rearranges $4x=2\sqrt{2}x+20\sqrt{2}\Rightarrow\left(4\pm2\sqrt{2}\right)x=20\sqrt{2}$ condoning slips. May even divide by 2 first

dM1 Then divide, rationalise and attempt to simplify. Eg $x=\frac{20\sqrt{2}}{\left(4-2\sqrt{2}\right)}\times\frac{\left(4+2\sqrt{2}\right)}{\left(4+2\sqrt{2}\right)}=\frac{80\sqrt{2}+40\sqrt{2}\times\sqrt{2}}{16-8}$ oe

A1 $10\sqrt{2}+10$ or $10+10\sqrt{2}$ only. It cannot be awarded without sight of the correct intermediate line seen above

Question Number	Scheme	Marks
3.(a)	Attempts perimeter of garden = $2\times5x+2\times(6x-2)$	M1
	Sets $2\times5x+2\times(6x-2)>29\Rightarrow22x>33$	dM1
	$\Rightarrow x>\frac{33}{22}\Rightarrow x>1.5$ *	A1*
		(3)
(b)	Attempts area of garden = $2x(2x-1)+3x(6x-2)$	M1
	Sets $A<72\Rightarrow 22x^2-8x-72<0$	A1
	Finds critical values $11x^2-4x-36\Rightarrow x=-\frac{18}{11},2$	M1
	Chooses inside region	ddM1
	$-\frac{18}{11}<x<2$	A1
		(5)
(c)	$1.5<x<2$	B1
		(1)
		(9 marks)

(a)

M1 An attempt at finding the perimeter of the garden.
Scored for sight of $5x+2x-1+2x+6x-2+$ additional term(s) involving x
Individual lengths may not be seen so imply for sight of a total of $ax+b$, where $a>15$

dM1 Sets their $P>29$ and attempts to solve by proceeding to $ax>c$
You may condone an attempt in which $P=29\Rightarrow ax=c$

A1* cso with at least one correct intermediate (simplified) line $22x>33$ or $x>\frac{33}{22}$ before $x>1.5$ seen.
Condone an attempt in which you see $P=29\Rightarrow x=1.5$ before $x>1.5$ seen
Note that it is possible to start with $x>1.5$ and prove $P>29$ but for the A1* to be scored there must be a final statement of the type "hence $x>1.5$". There is no requirement for any units

(b) **Mark part (b) and (c) together**

M1 For an attempt at finding the area of the garden. For this to be scored look for
The sum of two areas $2x(2x-1)+...x(6x-2)$ condoning slips
The sum of two areas $5x(2x-1)+...x(..x\pm...)$ condoning slips
The difference between two areas $5x(6x-2)-2x(..x\pm...)$ condoning slips.

A1 A "correct and simplified" equality or inequality, condoning $<\leftrightarrow\leqslant\leftrightarrow=$ Eg. $22x^2-8x-72<0$ oe

M1 A valid attempt to find the critical values of their 3TQ. Allow factorisation, formula, completion of square or use of calculator. If a calculator is used then the answer(s) must be correct for their 3TQ. Condone candidates who fail to state the negative root of their quadratic.

ddM1 Dependent upon both M's. For choosing the inside region for their critical values. Condone $<\leftrightarrow\leqslant$
Condone for this mark replacing a negative root with 0, 0.5 or 1.5. So accept for example one of either $1.5<x<"2"$, $0<x<"2"$ or $0.5<x<"2"$

A1 $-\frac{18}{11}<x<2$ Allow $0<x<2$ or $0.5<x<2$ due to context. Allow alternative notation. See below

(c)