Question Number	Scheme	Marks
9.	$\frac{3}{x}+5=-2x+c$	
	Multiplies through by x $\quad 3+5x=-2x^2+cx \Rightarrow \pm 2x^2 .....(=0)$	M1
	and writes in quadratic form $\quad \Rightarrow 2x^2+(5-c)x+3(=0)$ oe	A1
	Attempts $"b^2-4ac"=(5-c)^2-24$	M1
	Attempts $"b^2-4ac"=0 \Rightarrow (5-c)^2-24=0 \Rightarrow c=...$	dM1
	$(c=)\ 5\pm 2\sqrt{6}$ oe	A1
	Attempt at inside region	M1
	$5-2\sqrt{6}<c<5+2\sqrt{6}$ oe	A1
		(7) (7 marks)

M1 Attempts to multiply through by x and moves all terms to one side. This may be implied by later work. Condone one term not being multiplied by x for this mark but all four terms must be on one side. You do not have to see the "=0".

A1 Correct quadratic with the terms in x factorised, or correct values of a, b and c. Accept the equivalent form where terms have been collected on the other side. The "=0" is not needed for this mark and ignore the use of any inequalities.

M1 Attempts b^2-4ac using their values. You may see $"b^2...4ac"$. It is sufficient to see the values substituted in correctly for this mark and you can condone invisible brackets. They must have achieved a quadratic in x to calculate the discriminant so do not allow if eg a is their coefficient of x^{-1} but do allow this mark if they have a quadratic from incorrect working.

dM1 Attempts to solve their $b^2-4ac=0$ to find at least one of the critical values for c. Must have achieved a quadratic in c. Apply general marking principles for solving a quadratic. This is dependent on the previous method mark and may be implied by solutions correct to 1dp for their quadratic.

A1 Correct critical values $(c=)\ 5\pm\sqrt{24}$ or exact equivalent of the form $\frac{a\pm\sqrt{b}}{c}$ (the critical values may appear within inequalities)

M1 Finds inside region for their critical values. They may draw a diagram but they must proceed to an $...<c<...$ (allow use of $\leq$ for one or both inequalities for this mark and they may even be separate statements) May be in terms of x or any other variable for this mark.

A1 $5-2\sqrt{6}<c<5+2\sqrt{6}$ Must be in terms of c and must be exact

Accept others such as $5-\sqrt{24}<c<5+\sqrt{24}$, $c>5-2\sqrt{6}$ AND $c<5+2\sqrt{6}$ $c>5-2\sqrt{6}, c<5+2\sqrt{6}$

$5+2\sqrt{6}>c>5-2\sqrt{6}$, $\left\{c:5-2\sqrt{6}<c<5+2\sqrt{6}\right\}$, $\frac{10-\sqrt{96}}{2}<c<\frac{10+\sqrt{96}}{2}$

Do NOT accept $c>5-2\sqrt{6}$ OR $c<5+2\sqrt{6}$

Question Number	Scheme	Marks
10. (a)	Correct equations $\frac{1}{2}r^2\theta = 6, \quad 2r + r\theta = 10$	B1 B1
	Eliminates $r = \frac{10}{2+\theta} \Rightarrow \frac{1}{2}\left(\frac{10}{2+\theta}\right)^2 \theta = 6$	M1
	$\Rightarrow 50\theta = 6\left(4 + 4\theta + \theta^2\right) \Rightarrow 3\theta^2 - 13\theta + 12 = 0$ *	A1*
		(4)
(b)	$(3\theta - 4)(\theta - 3) = 0 \Rightarrow \theta = \frac{4}{3}, 3$	B1
	$\theta = \frac{4}{3}, r = 3 \qquad \theta = 3, r = 2$	M1 A1
		(3)
		(7 marks)

(a)

B1 One correct equation $\frac{1}{2}r^2\theta = 6$ or $2r + r\theta = 10$ (may use φ instead of θ which is fine)

B1 Two correct equations $\frac{1}{2}r^2\theta = 6$ and $2r + r\theta = 10$ ($r + r + r\theta = 10$ is acceptable)

Note you may see one of both of these equations in (b) which you can award the marks retrospectively. They may be implied from later work:

Eg. $r^2 = \frac{12}{\theta} \Rightarrow 2\sqrt{\frac{12}{\theta}} + \sqrt{\frac{12}{\theta}}\theta = 10$ implies B1B1

M1 Scored for eliminating r and reaching an equation in θ only. The initial equations must be of a similar form to the area of the sector and the perimeter but possibly with errors (look for $...r^2\theta = 6$ and $2r + ...r\theta = 10$). Condone errors when rearranging but their subsequent substitution must be correct for their rearrangement. Eg. $10 = r\theta + 2r \Rightarrow \frac{10}{\theta} = 3r$

A1* Reaches the given answer with no errors. There must be at least one intermediate line of manipulation following the elimination stage and $(\theta + 2)^2$ must be multiplied out correctly before achieving the final answer to score full marks.