Question	Scheme	Marks	AOs
10	$(x-3)^2+(y-5)^2=(2r)^2$ and $y=-x+2$	B1	1.1b
	$(x-3)^2+(-x+2-5)^2=(2r)^2$ or $(-y+2-3)^2+(y-5)^2=(2r)^2$	M1	3.1a
	$2x^2+18-4r^2=0$ or $2y^2-8y+26-4r^2=0$	A1	1.1b
	$b^2-4ac>0 \Rightarrow 0^2-4(2)(18-4r^2)>0 \Rightarrow r>...$ or $x^2=9-2r^2 \Rightarrow 9-2r^2>0 \Rightarrow r>...$ or $b^2-4ac>0 \Rightarrow (-8)^2-4(2)(26-4r^2)>0 \Rightarrow r>...$	dM1	3.1a
	Finds a maximum value for r $(2r)^2=5^2+(3-2)^2 \Rightarrow r=...$	M1	3.1a
	$\frac{3\sqrt{2}}{2}<r<\frac{\sqrt{26}}{2}$ o.e.	A1 A1	1.1b 1.1b
	Alternative Using a circle with centre (3, 5) and radius 2r and $y=-x+2$	B1	1.1b
	$y-5=1(x-3) \Rightarrow y=x+2$ $x+2=-x+2 \Rightarrow x=...$	M1	3.1a
	$(0,2)$	A1	1.1b
	$2r>\sqrt{(3-0)^2+(5-2)^2} \Rightarrow r>...$	dM1	3.1a
	Finds a maximum value for r $(2r)^2=5^2+(3-2)^2 \Rightarrow r=...$	M1	3.1a
	$\frac{3\sqrt{2}}{2}<r<\frac{\sqrt{26}}{2}$ o.e.	A1 A1	1.1b 1.1b
		(7)	

(7 marks)

Notes:

B1: Correct equations for each loci of points

M1: A complete method to find a 3TQ involving one variable using equations of the form $(x\pm3)^2+(y\pm5)^2=(2r)^2$ or $2r^2$ or r^2 and $y=\pm x\pm2$

A1: Correct quadratic equation

dM1: Dependent on previous method mark. A complete method uses $b^2-4ac>0$ or rearranges to find $x^2=\mathrm{f}\left(r\right)$ and uses $\mathrm{f}\left(r\right)>0$ to the minimum value of *r*. **M1:** Realises there will be an upper limit for *r* and uses Pythagoras theorem $\left(2r\right)^2=\left(y \text{ coord of centre}\right)^2+\left(x \text{ coord of centre}-2\right)^2$ condone $\left(r\right)^2=\left(y \text{ coord of centre}\right)^2+\left(x \text{ coord of centre}-2\right)^2$ **A1:** One correct limit, either $\frac{3\sqrt{2}}{2}<r$ or $r<\frac{\sqrt{26}}{2}$ o.e. **A1:** Fully correct inequality
Alternative **B1:** Using a circle with centre (3, 5) and radius 2*r* and $y=-x+2$ **M1:** A complete method to find the point of intersection of the line $y=\pm x\pm 2$ and circle where the line is a tangent to the circle. **A1:** Correct point of intersection **dM1:** Finds the distance between the point of intersection and the centre and uses this to find the minimum value of *r*. Condone radius of r. **M1:** Realises there will be an upper limit for *r* and uses Pythagoras theorem $\left(2r\right)^2=\left(y \text{ coord of centre}\right)^2+\left(x \text{ coord of centre}-2\right)^2$ **A1:** One correct limit, either $\frac{3\sqrt{2}}{2}<r$ or $r<\frac{\sqrt{26}}{2}$ o.e. **A1:** Fully correct inequality