Question			Answer	Mark	AO	Guidance
6	(a)		**DR**			In this question, if candidates attempt more than one method, review all their working to identify which is their 'final' or 'substantially most complete' answer, then apply one scheme only. Candidates cannot gain marks from more than one scheme.
			$2x^2 - 6x + a = 0$	**M1**	**3.1a**	Substitute $y = x$ into equation of circle (need not be simplified – may see this quadratic in y)
			At A: $x = \frac{6+\sqrt{36-8a}}{4} = \frac{3-\sqrt{9-2a}}{2}$ At B: $x = \frac{3+\sqrt{9-2a}}{2}$	**A1**	**2.2a**	A1 for <u>either</u> correct (condone if not specifically identified as A or B – may see y= these values)
			At M: $x = \frac{3}{2}$	**A1**	**1.1**	
			$CM^2 = \left(3 - \frac{3}{2}\right)^2 + \left(\frac{3}{2}\right)^2 \quad \left(= \frac{9}{2}\right)$	**M1**	**2.1**	Attempt CM using their values (method must be correct) May see $CM = \frac{3\sqrt{2}}{2}$
			$BA^2 = \left(\sqrt{9-2a}\right)^2 + \left(\sqrt{9-2a}\right)^2$ $\left(= 2\left(\sqrt{9-2a}\right)^2\right)$	**M1**	**1.1**	Attempt BA using their values (method must be correct) May see just $\sqrt{2(9-2a)}$ oe, e.g. $\sqrt{18-4a}$ Alternative: $AM = \sqrt{\frac{9}{2} - a}$ (and then $Area = 2 \times \frac{1}{2} \times CM \times AM$)
			Area $= \frac{1}{2} \times CM \times BA$	**M1**	**1.1**	Attempt at area, in terms of a
			$\frac{1}{2} \times \sqrt{2}\sqrt{9-2a} \times \frac{3}{\sqrt{2}} \quad \left(= 3\sqrt{\frac{9-2a}{4}}\right)$ **AG**	**A1**	**1.1**	Must see correct expression before answer

			Alternative Method			
			DR $(x-3)^2 + y^2 = 9 - a$	**M1**		Attempt complete the square for x
			C is (3, 0); radius = $\sqrt{9-a}$	**A1**		Both soi
			$CM = (3\cos 45 =)\ \frac{3}{\sqrt{2}}$	**B1**		Possibly coming from $\frac{\lvert 3-0\rvert}{\sqrt{1^2+1^2}}$
			$AM^2 = (9-a) - \left(\frac{3}{\sqrt{2}}\right)^2 \qquad (= \frac{9}{2} - a)$	**M1**		Their radius^2 (in terms of a) – their CM^2
			Area = $AM \times CM$ or $\frac{1}{2}AB \times CM$	**M1**		Attempted in terms of a
			$= \sqrt{\frac{9}{2}-a} \times \frac{3}{\sqrt{2}}$ oe	**A1FT**		FT their AM or AB (in terms of a), and their CM
			$= \sqrt{\frac{9-2a}{2}} \times \frac{3}{\sqrt{2}} \qquad (= 3\sqrt{\frac{9-2a}{4}}$ **AG**)	**A1**		Must see one correct intermediate step
			Alternative method for last three marks			
			Area = $\frac{1}{2}AB \times r \times \sin BAC$	**M1**		Attempted in terms of a
			$= \sqrt{\frac{9}{2}-a} \times \sqrt{9-a} \times (\frac{3}{\sqrt{2}} \div \sqrt{9-a})$	**A1FT**		FT their r and AM or AB (in terms of a), and their CM
			$= \sqrt{\frac{9-2a}{2}} \times \frac{3}{\sqrt{2}} \qquad (= 3\sqrt{\frac{9-2a}{4}}$ **AG**)	**A1**		Must see one correct intermediate step
			Alternative method for last three marks			
			Area $= \frac{1}{2} r \times r \times \sin BCA$	**M1**		Attempted in terms of a
			$= \sqrt{9-a} \times \sqrt{9-a} \times 2\left(\sqrt{\frac{9}{2}-a} \div \sqrt{9-a}\right)\left(\frac{3}{\sqrt{2}} \div \sqrt{9-a}\right)$	**A1FT**		FT their r and AM or AB (in terms of a), and their CM (using double angle formula for sinBCA)
			$= \sqrt{\frac{9-2a}{2}} \times \frac{3}{\sqrt{2}} \qquad (= 3\sqrt{\frac{9-2a}{4}})$ **AG**	**A1**		Must see one correct intermediate step
				[7]		

6	**(b)**	**(i)**	$\left(3\sqrt{\frac{9-2a}{4}} = 0 \Rightarrow\right) a = \frac{9}{2}$	**B1** **[1]**	**2.2a**	oe
6	**(b)**	**(ii)**	$y = x$ is a tangent to the circle or A and B are coincident oe	**B1** **[1]**	**3.2a**	Must see this geometrical answer (accept e.g. the line touches the circle) Accept a diagram that clearly shows the line is a tangent
6	**(c)**		Line $y = x$ does not meet circle	**B1** **[1]**	**3.2a**	Must see this geometrical answer (condone BOD for 'the line does not touch the circle') Accept a diagram that clearly shows the line does not meet the circle