1 **1**			**DR**				

Question			Answer	Marks	AO	Guidance	
	(a)	**(i)**	$x^2 + (mx + 2)^2 - 10x - 14(mx + 2) + 64 = 0$	**M1**	**1.1a**	Substitute eqn of tangent into eqn of circle	Could work backwards, eliminating m to obtain equation of circle
			$x^2 + m^2x^2 + 4mx + 4 - 10x - 14mx - 28 + 64 = 0$ $(m^2 + 1)x^2 - 10(m + 1)x + 40 = 0$ **A.G.**	**A1**	**1.1**	Expand and tidy to given answer, including '= 0' in final answer	**AG** so unsimplified expansion needs to be seen
				[2]			
		(ii)	$100(m + 1)^2 - 160(m^2 + 1) = 0$	**M1***	**3.1a**	Use $b^2 - 4ac = 0$	M1 only awarded when '= 0' soi
			$60m^2 - 200m + 60 = 0$	**A1**	**1.1**	Obtain correct equation	Any correct 3 term equation
			$(3m - 1)(m - 3) = 0$ $m = 3,\ m = \frac{1}{3}$	**M1d***	**1.1a**	Attempt to solve quadratic	DR so method for solving the quadratic must be shown
			$y = 3x + 2$	**A1**	**1.1**	Obtain correct equation	SC B1for correct equation if roots not justified A0 if second equation also given
				[4]			**OR** (for first 2 marks) M1 – Attempt two equations in m and x (eg use lengths and gradients) and eliminate one variable A1 – correct quadratic in m or x
	(b)		radius $= \sqrt{10}$, $PC = 5\sqrt{2}$, $PA = PB = 2\sqrt{10}$, $AB = 4\sqrt{2}$	**M1**	**3.1a**	Attempt (at least 2) useful lengths	NB points of intersection are (2, 8) and (6, 4)
			$\tan\left(\frac{1}{2}APB\right) = \frac{1}{2}$	**A1**	**1.1**	Obtain a correct related trig ratio	$\cos APB = \frac{3}{5}$, from cosine rule
			$\tan APB = \frac{1}{1 - \frac{1}{4}}$	**M1**	**3.1a**	Attempt tan APB	**DR** so need to see use of identity or relevant triangle to find tan APB

Question			Answer	Marks	AO	Guidance	
			$\tan APB = \frac{4}{3}$	**A1** **[4]**	**1.1**	Obtain $\frac{4}{3}$	From explicit, exact, working
							OR M2 – attempt $\frac{\pm m \pm n}{1 \pm mn}$ with their values for m and n A1FT – correct $\frac{m-n}{1+mn}$ for their values of m and n A1 – obtain $\tan APB = \frac{4}{3}$