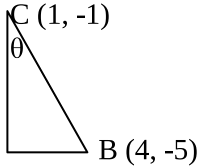
Question			Answer	Marks	AOs		Guidance
12	**(i)**		C is (1, -1)	**B1** **[1]**	**1.1a**	Cao	
	(ii)	A	EITHER Substitute $y=\frac{3}{4}x-8$ into the equation of the circle $(x-1)^2+\left(\frac{3}{4}x-8+1\right)^2=25$ $x^2-8x+16=0$ EITHER $(x-4)^2=0$ OR Discriminant = $(-8)^2-4\times1\times16=0$ So the equation has a repeated root so the line is a tangent	**M1** **M1** **A1** **A1** **[4]**	**3.1a** **1.1a** **1.1b** **2.2a**	**AG** Attempt to eliminate one variable Attempt to expand and collect terms to obtain 3 term quadratic expression A correct 3 term quadratic Clearly argued	
	(ii)	A	OR Substitute $x=\frac{4}{3}y-\frac{32}{3}$ into the equation of the circle $\left(\frac{4}{3}y-\frac{32}{3}-1\right)^2+(y+1)^2=25$ $y^2+10y+25=0$ EITHER $(y+5)^2=0$ OR Discriminant = $10^2-4\times1\times25=0$ So the equation has a repeated root so the line is a tangent	**M1** **M1** **A1** **A1** **[4]**	**3.1a** **1.1a** **1.1b** **2.2a**	**AG** Attempt to eliminate one variable Attempt to expand and collect terms to obtain 3 term quadratic expression A correct 3 term quadratic Clearly argued	
		B	$x=4$ and $y=-5$ so B is (4, -5)	**B1** **[1]**	**1.1a**	Cao	

Question			Answer	Marks	AOs		Guidance
	(iii)		$\angle CAD = \angle CBD = 90°$ (radius is perpendicular to the tangent) Gradient of AC $= \frac{2-(-1)}{5-1} = \frac{3}{4}$ Gradient of BC $= \frac{(-1)-(-5)}{1-4} = -\frac{4}{3}$ So AC is perpendicular to BC so $\angle ACB = 90°$ So ADBC is a rectangle Either AC = BC radius [=5] Or AD = BD equal tangents so ADBC is a square.	**B1** **B1** **B1** **[3]**	**2.1** **3.1a** **2.1**	Allow for one or other of these angles Complete proof **AG**	Allow up to B1, B1 for any two of these three pieces of evidence. Allow the final B1 only when the proof is complete and clearly argued.
			$\angle CAD = \angle CBD = 90°$ (radius is perpendicular to the tangent) Gradient of AC $= \frac{2-(-1)}{5-1} = \frac{3}{4}$ Gradient of BD is $\frac{3}{4}$ So AC is parallel to BD So ADBC is a rectangle AC = BC = radius so ADBC is a square.	**B1** **B1** **B1**		Allow for one or other of these angles Complete proof **AG**	
			$\angle CAD = 90°$ (radius is perpendicular to the tangent) AC = BC radius [=5] Gradient of AC $= \frac{2-(-1)}{5-1} = \frac{3}{4}$ Equation of AD is $y-2 = -\frac{4}{3}(x-5)$ So coordinates of D are (8, -2) Hence BD = 5 and AD = 5 So ABCD is a rhombus	**B1** **B1** **B1**		Gradient of AD must be found from the coordintes of A and C Complete proof	

Question	Answer	Marks	AOs	Guidance	
(iv)	E is the point (1, -6)	**B1**	**2.1**	May be implied	
	EITHER 	**M1**	**3.1a**	Right-angled triangle formed and use of arctan	
	$\theta = \arctan\left(\frac{3}{4}\right) = 0.6435$	**A1**	**3.1a**	oe	
	OR $BE = \sqrt{(4-1)^2 + (-5-(-6))^2} = \sqrt{10}$ Cosine rule in triangle BCE $\cos BCE = \frac{5^2+5^2-10}{2\times5\times5}\left[=\frac{40}{50}\right]$	**(M1)**		Using distance BC and the cosine rule	
	$\angle BCE = 0.6435...$	**(A1)**		oe	
	OR M is the midpoint of BE M is (2.5, -5.5) $BM = \sqrt{(4-2.5)^2 + (-5-(-5.5))^2} = \frac{1}{2}\sqrt{10}$ $\angle BCM = \arcsin\left(\frac{\frac{1}{2}\sqrt{10}}{5}\right) = 0.32175...$	**(M1)**		Using trig in triangle BCM or ECM Allow for $\angle BCM$	
	$\angle BCE = 0.6435...$	**(A1)**		Oe. Must be $\angle BCE$	
	Area sector = $\frac{1}{2}r^2\theta = \frac{1}{2}\times25\times2\times0.32175...$	**M1dep**	**1.1a**	Using the sector area formula	
	$=8.04376$	**A1** **[5]**	**1.1b**	FT their $\angle BCM$	