

Question	Scheme		Marks	AOs
17 (a)	<b>Way 1:</b> Finds circle equation $(x \pm 2)^2 + (y \mp 6)^2 =$ $(10 \pm (-2))^2 + (11 \mp 6)^2$	<b>Way 2:</b> Finds distance between $(-2, 6)$ and $(10, 11)$	M1	3.1a
	Checks whether $(10, 1)$ satisfies their circle equation	Finds distance between $(-2, 6)$ and $(10, 1)$	M1	1.1b
	Obtains $(x + 2)^2 + (y - 6)^2 = 13^2$ and checks that $(10 + 2)^2 + (1 - 6)^2 = 13^2$ so states that $(10, 1)$ lies on $C^*$	Concludes that as distance is the same $(10, 1)$ lies on the circle $C^*$	A1*	2.1
			(3)	
(b)	Finds radius gradient $\frac{11-6}{10-(-2)}$ or $\frac{1-6}{10-(-2)}$ ( $m$ )		M1	3.1a
	Finds gradient perpendicular to their radius using $-\frac{1}{m}$		M1	1.1b
	Finds (equation and ) $y$ intercept of tangent (see note below)		M1	1.1b
	Obtains a correct value for $y$ intercept of their tangent i.e. 35 or $-23$		A1	1.1b
	<b>Way 1:</b> Deduces gradient of second tangent	<b>Way 2:</b> Deduces midpoint of $PQ$ from symmetry $(0, 6)$	M1	1.1b
	Finds (equation and ) $y$ intercept of second tangent	Uses this to find other intercept	M1	1.1b
	So obtains distance $PQ = 35 + 23 = 58^*$		A1*	1.1b
			(7)	
<b>(10 marks)</b>				

**Question 17 continued****Notes:****(a) Way 1 and Way 2:**

**M1:** Starts to use information in question to find equation of circle or radius of circle

**M1:** Completes method for checking that (10, 1) lies on circle

**A1\*:** Completely correct explanation with no errors concluding with statement that circle passes through (10, 1)

**(b)**

**M1:** Calculates  $\frac{11-6}{10-(-2)}$  or  $\frac{1-6}{10-(-2)}$  ( $m$ )

**M1:** Finds  $-\frac{1}{m}$  (correct answer is  $-\frac{12}{5}$  or  $\frac{12}{5}$ ). This is referred to as  $m'$  in the next note

**M1:** Attempts  $y-11 = \textit{their}\left(-\frac{12}{5}\right)(x-10)$  or  $y-1 = \textit{their}\left(\frac{12}{5}\right)(x-10)$  and puts  $x=0$ , or

uses vectors to find intercept e.g.  $\frac{y-11}{10} = -m'$

**A1:** One correct intercept 35 or -23

**Way 1:**

**M1:** Uses the negative of their previous tangent gradient or uses a correct  $-\frac{12}{5}$  or  $\frac{12}{5}$

**M1:** Attempts the second tangent equation and puts  $x=0$  or uses vectors to find intercept

e.g.  $\frac{11-y}{10} = m'$

**Way 2:**

**M1:** Finds midpoint of  $PQ$  from symmetry. (This is at (0, 6))

**M1:** Uses this midpoint to find second intercept or to find difference between midpoint and first intercept. e.g.  $35 - 6 = 29$  then  $6 - 29 = -23$  so second intercept is at (-23, 0)

**Ways 1 and 2:**

**A1\*:** Obtain 58 correctly from a valid method