(15) (a) $m_{CP} = \frac{13-12}{5-8}$

$= -\frac{1}{3}$

$m_{\perp} = 3$

$y - 13 = 3(x-5)$

$y - 13 = 3x - 15$

$y = 3x - 2$

(b)(i) $T(0, -2)$

$y = 3 \times 0 - 2 = -2$

(ii) CT is the diameter.

- $M_{CT} = \left(\frac{8+0}{2}, \frac{12+(-2)}{2}\right) = (4, 5)$
- $d_{MC} = \sqrt{(4-8)^2 + (5-12)^2}$

$= \sqrt{16 + 49}$

$= \sqrt{65}$

$(x-4)^2 + (y-5)^2 = 65$

C 2019 H2 Q15

(a) $m_{\text{radius}} = -\frac{1}{3}$, $m_{TP} = 3$

For TP, $\frac{y-13}{x-5} = 3$

$y - 13 = 3x - 15$

$y = 3x - 2$

(b)

When $y = 0$, $x = -2$

T is point $(0, -2)$

(c) $x^2 + y^2 + 2gx + 2fy + c = 0$

$25 + 169 + 10g + 26f + c = 0$

$64 + 144 + 16g + 24f + c = 0$

$0 + 4 + 0 - 4f + c = 0$

$10g + 26f + c = -194$

$16g + 24f + c = -208$

$-4f + c = -4$

$c = 4f - 4$

$10g + 26f + 4f - 4 = -194$

$16g + 24f + 4f - 4 = -208$

$10g + 30f = -190$ — (1)

$16g + 28f = -204$ — (2)

$80g + 240f = -190.8 = -1520$

$80g + 140f = -204.5 = -1020$

$100f = -500$

$f = -5$

$10g + 30f = -190$

$10g - 150 = -190$

$10g = -40$

$g = -4$

$c = 4f - 4 = -20 - 4$

$c = -24$

$x^2 + y^2 - 8x - 10y + 24 = 0$

Or, note that $\hat{TPC} = 90°$

$\Rightarrow$ TC diameter.

Find midpoint to get radius, and $(x-a)^2 + (y-b)^2 = r^2$

Question			Generic scheme	Illustrative scheme	Max mark
15.	(a)		•1 find gradient of radius •2 state gradient of tangent •3 state equation of tangent	•1 $-\frac{1}{3}$ •2 3 •3 $y = 3x - 2$	**3**
Notes:					
1. Do not accept $y = \frac{3}{1}x - 2$ for •3. 2. •3 is only available as a consequence of trying to find and use a perpendicular gradient. 3. At •3 accept, $y - 3x + 2 = 0$ or any other rearrangement of the equation where the constant terms have been simplified.					
Commonly Observed Responses:					
	(b)	(i)	•4 find coordinates of T	•4 (0,−2)	**1**
		(ii)	•5 find midpoint CT •6 find radius of circle with diameter CT •7 state equation of circle	•5 (4,5) •6 $\sqrt{65}$ stated or implied by •7 •7 $(x-4)^2 + (y-5)^2 = 65$	**3**
Notes:					
4. Answers in part (b)(i) must be consistent with answers from part (a). 5. Accept $x = 0,\ y = -2$ for •4. 6. $(x-4)^2 + (y-5)^2 = \left(\sqrt{65}\right)^2$ does not gain •7. 7. •7 is not available to candidates who use a line other than CT as the diameter of the circle.					
Commonly Observed Responses:					

[END OF MARKING INSTRUCTIONS]