15.

$$x + 3y = 17$$

$$3y = -x + 17$$

$$y = -\frac{1}{3}x + \frac{17}{3}$$

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

$$m_{radius} = 3$$

$$y - 5 = 3(x-2)$$

$$y - 5 = 3x - 6$$

$$y = 3x - 1$$

Since   centre   lies   on   y axis,

centre   is   y intercept of   the

equation   of   the   radius

$$\underline{C \ (0, -1)}$$

Question	Generic scheme	Illustrative scheme	Max mark
15.	$\bullet^1$ determine gradient of tangent $\bullet^2$ determine gradient of radius $\bullet^3$ strategy to find centre $\bullet^4$ state coordinates of centre	$\bullet^1$ $-\dfrac{1}{3}$ $\bullet^2$ 3 $\bullet^3$ eg $y = 3x - 1$ or $3 = \dfrac{y-5}{x-2}$ $\bullet^4$ $(0,-1)$	4

Notes:

1. Ignore errors in processing the constant term in $\bullet^1$.

2. Do not accept $m = -\dfrac{1}{3}x$ for $\bullet^1$. However $\bullet^2$, $\bullet^3$ and $\bullet^4$ are still available where the candidate uses a numerical value for $m_\perp$.

3. Accept $y - 5 = 3(x - 2)$ as evidence for $\bullet^3$.

4. $\bullet^4$ is only available as a consequence of trying to find and use a perpendicular gradient along with a point on the y-axis.

5. Where candidates use "stepping out" with the perpendicular gradient, the diagram must be consistent with the solution to gain $\bullet^3$ and $\bullet^4$.

6. Accept "$x = 0$", "$y = -1$" stated explicitly for $\bullet^4$.

Commonly Observed Responses:

Candidate A - perpendicular gradient clearly stated

$x + 3y = 17$

$m_\perp = 3$ $\bullet^1$ ✓ $\bullet^2$ ✓

$y = 3x - 1$ $\bullet^3$ ✓

Candidate B - no communication for perpendicular gradient

$x + 3y = 17$

$y = -\dfrac{1}{3}x + \dfrac{17}{3}$

$m = 3$ $\bullet^1$ ∧ $\bullet^2$ ✓₁

$y = 3x - 1$ $\bullet^3$ ✓₁

$\bullet^4$ is available

Candidate C - no communication for perpendicular gradient or rearrangement

$x + 3y = 17$

$m = 3$ $\bullet^1$ ∧ $\bullet^2$ ∧

$y = 3x - 1$ $\bullet^3$ ✓₂

$\bullet^4$ is not available

Candidate D – using geometry

⋮ $\bullet^1$ ✓ $\bullet^2$ ✓ $\bullet^3$ ✓

Using point diametrically opposite $(2,5)$, by symmetry identify that x-coordinate is -2.

$\therefore y = 3(-2) - 1 = -7$.

Centre is midpoint of $(-2,-7)$ and $(2,5)$.

$\therefore$ centre is $(0,-1)$ $\bullet^4$ ✓

Candidate E – incorrect gradient

$x + 3y = 17$

$3y = -x + 17$

$m_\perp = 1$ $\bullet^1$ ∧ $\bullet^2$ ✗

$1 = \dfrac{5 - y}{2 - 0}$ $\bullet^3$ ✓₁

Centre is at $(0,3)$ $\bullet^4$ ✓₁

[END OF MARKING INSTRUCTIONS]