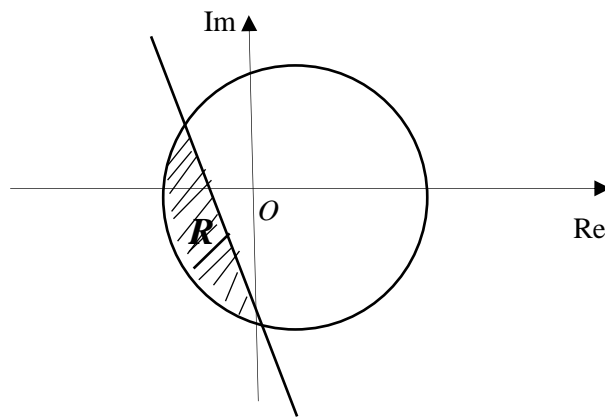| Question	Scheme	Marks	AOs
3(a) (i)	$\| x + iy - 3 \| = 3\sqrt{2}$ $\| x - 3 + iy \| = 3\sqrt{2}$ $(x - 3)^2 + y^2 = 18$	M1 A1	1.1b 1.1b
(ii)	$\| x + iy - 2 - i \| = \| x + iy + 4 + i \|$ $\| x - 2 + i(y - 1) \| = \| x + 4 + i(y + 1) \|$ $(x - 2)^2 + (y - 1)^2 = (x + 4)^2 + (y + 1)^2$	M1	1.1b
	$x^2 - 4x + 4 + y^2 - 2y + 1 = x^2 + 8x + 16 + y^2 + 2y + 1$ $\Rightarrow y = -3x - 3$ oe	M1 A1	1.1b 1.1b
		(5)	
(ii) ALT 1	$\| z - (2 + i) \| = \| z - (-4 - i) \|$ Attempts to find the gradient of line through points $(2, 1)$ and $(-4, -1)$ $(m = \frac{1}{3})$	M1	1.1b
	Complete attempt to find the equation of perpendicular bisector e.g., $y - 0 = - \frac{1}{''m''}\ (x - -1)$ $\qquad\qquad y = -3x - 3$ oe	M1 A1	1.1b 1.1b
(b)	$(x - 3)^2 + y^2 = 18, y = -3x - 3$ $(x - 3)^2 + (-3x - 3)^2 = 18$ $\Rightarrow 10x^2 + 12x = 0$ OR $[\left(\frac{-3-y}{3}\right) - 3]^2 + y^2 = 18$ $\Rightarrow 10y^2 + 24y - 18 = 0$	M1	1.1b
	$x = 0 \ or \ x = -\frac{6}{5}$ $y = -3 \ or \ y = \frac{3}{5}$	A1ft	1.1b
	$z = -3i, \qquad z = -\frac{6}{5} + \frac{3}{5}i$	A1	1.1b
		(3)	

(c)		M1 A1	3.1a 1.1b
		(2)	
		(10 marks)	

Notes

(a) (i)
M1: Substitutes for $z = x + iy$ and proceeds to collect real and imaginary parts before proceeding to equation in terms of x and y only.
A1: $(x - 3)^2 + y^2 = 18$ oe

(a) (ii)
M1: Substitutes for $z = x + iy$ and proceeds to collect real and imaginary parts before proceeding to an equation in terms of x and y only.
M1: Expands brackets and simplifies terms to achieve a linear equation.
A1: $y = -3x - 3$ oe

Alternative:
M1: Identifies coordinates $(\pm 2, \pm 1)$ and $(\pm 4, \pm 1)$ and proceeds to find gradient through their points
M1: Finds gradient of perpendicular bisector using $-\frac{1}{''m''}$ and their midpoint
A1: $y = -3x - 3$ oe

(b)
M1: Substitutes for their y in their x equation or vice versa to produce a quadratic equation.
A1: Solves the quadratic to find either both x or both y values.
A1: Finds the correct z values.
$z = -3i$, $z = -\frac{6}{5} + \frac{3}{5}i$ cao

(c)
M1: Sketches a circle which passes through all 4 quadrants and a line with a negative gradient that intersects the circle at two distinct points.
A1: Shades the region beneath their line and within the circle.