

Question	Scheme	Marks	AOs
	$A = \{z \in \mathbb{C} :  z - 4 - 2i  < 3\}$ , $B = \left\{z \in \mathbb{C} : 0 \leq \arg(z) \leq \frac{\pi}{4}\right\}$ and $X = A \cap B$ .		

2(a)		Circle	B1	1.1b
		Sector	B1	1.1b
		Set X	B1ft	1.1b
		(3)		

(b)	$ 5 + 4i - 4 - 2i ^2 =  1 + 2i ^2 = 1^2 + 2^2 = 5 < 9$ so $5 + 4i \in A$	M1	1.1b
	$\text{Re}(5 + 4i) = 5 \geq 0$ , $\text{Im}(5 + 4i) = 4 \geq 0$ , so $5 + 4i \in B$ OR $\arg(5 + 4i) = \tan^{-1}\left(\frac{4}{5}\right) = 0.6747\dots$ and $0 \leq 0.6747\dots \leq \frac{\pi}{4}$ , so $5 + 4i \in B$	M1	2.2a
	As $5 + 4i$ is in both $A$ and $B$ , so $5 + 4i \in X = A \cap B$	A1	2.1
	(3)		

(6 marks)

<b>Notes:</b>			
(a)	<b>B1:</b> A circle/relevant arcs of circle in the first (and fourth) quadrant(s) only with centre above the real axis (shown dotted above). If only arcs shown, they should be only in the first quadrant, as shown dashed above. <b>B1:</b> Correct sector/portion of sector intersecting the circle, above the real axis and below the line $y = x$ . <b>B1:</b> Correct region shaded, inside their circle and sector (as long as they intersect), with indication that the arcs of the circle are excluded, but the rays of the sector are included - dotted/dashed lines for excluded and solid for included. Ignore lines that are not part of the boundary. If the circle was initially drawn solid, accept if it is clearly indicated the arcs are not included.		
(b)	<b>M1:</b> Attempts to show that $5 + 4i$ is inside the circle, ie considers $ 5 + 4i - 4 - 2i $ (or its square) and compares with 3 (or 9). <b>M1:</b> Attempts to show that $5 + 4i$ is inside the sector, ie finds the argument and checks it is in the range required. <b>A1:</b> Both attempts correct with a conclusion that $5 + 4i$ is inside the set $X$ - must be clear it has been checked to be in both sets.		