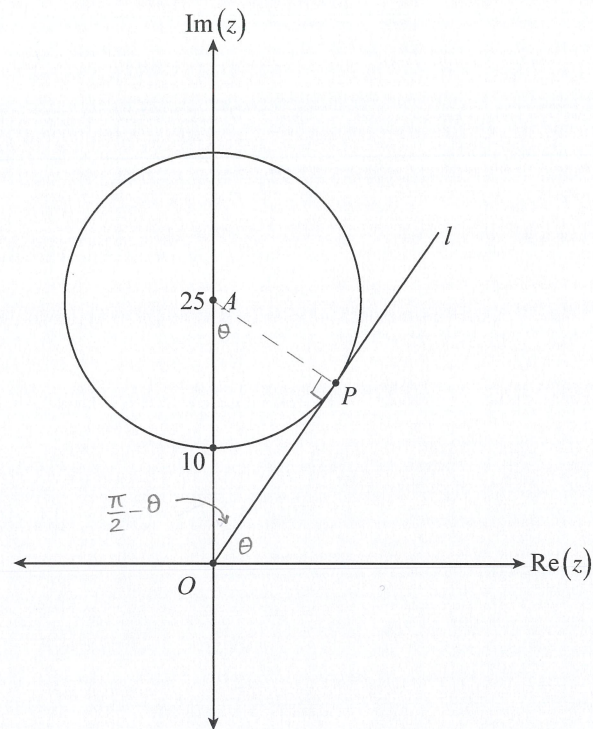


**QUESTION 7** (8 marks)

Figure 4 shows a circle with centre  $A$  in the complex plane.



**Figure 4**

(a) Write down an equation, in terms of  $z$ , that describes exactly all points on the circumference of the circle in Figure 4.

$ z - 25i  = 15$	

(2 marks)

- (b) The line  $l$  through the origin  $O$  is tangent to the circle at the point  $P$ .  
The point  $P$  represents the complex number  $w$ .

(i) Show that  $|w| = 20$ .

$$\begin{aligned} \Delta AOP \text{ is right angled} \\ \therefore |w| &= \sqrt{25^2 - 15^2} \\ &= 20 \end{aligned}$$

(2 marks)

(ii) Show that  $\arg w = \angle OAP$ .

$$\begin{aligned} \arg w &= \frac{\pi}{2} - \angle AOP \\ &= \frac{\pi}{2} - \left( \frac{\pi}{2} - \angle OAP \right) \\ &= \angle OAP \end{aligned}$$

(2 marks)

(iii) Hence write  $w$  in the form  $a + bi$ .

$$\begin{aligned} w &= 20(\cos \theta + i \sin \theta) \quad \text{where } \theta = \arg w \\ &= 20 \left( \frac{15}{25} + i \frac{20}{25} \right) \\ &= 12 + 16i \end{aligned}$$

(2 marks)