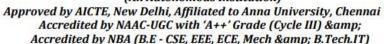




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## $\ref{thm:property}$ Puzzle: Find the Complex Number z

## Problem:

Consider the complex number z=a+bi, where a and b are real numbers. The following conditions are given:

1. The modulus of z is 5:

$$|z|=5$$

2. The argument of z is  $\theta = \frac{\pi}{3}$ .

## Question:

Determine the real and imaginary parts of z, i.e., find a and b.



## Solution:

1. Modulus and Argument Form:

A complex number  $\boldsymbol{z}$  in polar form is expressed as:

$$z = r(\cos heta + i \sin heta)$$

where r=|z| is the modulus, and heta is the argument.

2. Substitute the Given Values:

Given |z|=5 and  $\theta=\frac{\pi}{3}$  , substitute these into the polar form:

$$z=5\left(\cosrac{\pi}{3}+i\sinrac{\pi}{3}
ight)$$

3. Evaluate the Trigonometric Functions:







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$$z=5\left(\cosrac{\pi}{3}+i\sinrac{\pi}{3}
ight)$$

3. Evaluate the Trigonometric Functions:

From trigonometric values:

$$\cos rac{\pi}{3} = rac{1}{2}, \quad \sin rac{\pi}{3} = rac{\sqrt{3}}{2}$$

4. Final Expression for z:

Substituting these values:

$$z=5\left(rac{1}{2}+irac{\sqrt{3}}{2}
ight)$$

Simplifying:

Simplifying:

$$z=rac{5}{2}+irac{5\sqrt{3}}{2}$$

Therefore, the real part  $a=rac{5}{2}$  and the imaginary part  $b=rac{5\sqrt{3}}{2}$ .

Answer:

The complex number z is:

$$z=rac{5}{2}+irac{5\sqrt{3}}{2}$$

with real part  $a=rac{5}{2}$  and imaginary part  $b=rac{5\sqrt{3}}{2}$  .