

Subject: Mathematics

Topic: Complex Number

Pre-Content/content Post-Content	Learning Outcome/Objectives	
<u>Pre-Content</u>	General	Specific
Some Quadratic Equations $x^2 + 1 = 0$ has no real roots what if $b^2 - 4ac < 0$ Content Complex number and algebra of complex number, Conjugate of the complex number additive inverse, multiplicative inverse of complex number. Properties of the conjugate of complex number Complex number in polar form Square root of complex number Complex roots of quadratic equation	Students will be able to understand the need of these numbers perform addition subtraction, multiplication & division of complex numbers familiarize with conjugate and multiplicative inverse of complex number translate Cartesian form to polar form obtain Square root of complex number apply the knowledge of complex nos. in solving quadratic equation	Students will be able to describe complex numbers carry out operations on the complex numbers ie., addition subtraction, multiplication & division of complex numbers illustrate conjugate of a complex number and Compute multiplicative inverse calculate modules and argument of complex numbers convert complex number from Cartesian to polar form Represent complex number geometrically in argant plane compute square root of a complex number prove identity based on complex number find the root of the Quadratic Equations in the complex number systems

Home Work /Assignments

NCERT Exercise /solved examples given as home task

Questions from sample papers to solve

Selected questions from NCERT Exemplar

CLASS: XI

Month: July /August

Teacher's Activity	Students' Activity	Teacher's Observation and Remedial action taken
Teacher will Introduce need for complex numbers and explain writing a complex number as real and imaginary part explain algebra of complex numbers ANNEXURE-5 explain how to calculate multiplicative inverse of complex number and Instruct them about the activity based on integral power of i explain how to convert Cartesian form to polar form explain steps to find square root of complex number find the root of the Quadratic Equations in the complex number system	Students will solve the Questions from NCERT book Page 103, ex -5.1 perform the activity as per the given instructions and write their observations ANNEXURE-5 solve the questions from, ex-5.3 question 1-5 will be done in class by students solve the questions from Miscellaneous exercise, question 1,2,3,5,6-8 require teacher guidance to do Questions from supplementary exercise	Teacher will write observation and remarks after the class

Teaching Aids: Smart board NCERT book,.

Methodology/Innovative Methods: Illustration and explanation method to be used.

Interdisciplinary Links: : used in science and engineering

Coordinator

Vice-Principal

Principal

ANNEXURE - 5

Subject	MATHEMATICS
Class	XI
Chapter/Unit	Complex numbers and quadratic equations
Topic	Complex numbers
Time	40 min
Nature of Activity	Individual

What will I learn (Learning Outcome)?

To interpret geometrically the meaning of square root of -1 and its integral powers

Skills: Logical ability, Analytical thinking, Deductive reasoning, Creativity, Accuracy.

What I have to do?

To interpret geometrically the meaning of $i = \sqrt{-1}$ and its integral powers

What do I require?

Cardboard, chart paper, sketch pen, ruler, compasses, adhesive, nails, thread.

What do I need to know?

Irrational numbers, Quadratic equations with negative discriminants, unit imaginary number

How will I proceed?

➤ **Teacher's Activity**

Teacher will guide the students to

1. Paste a graph paper on the cardboard .
2. Draw two mutually perpendicular lines $X'OX$ and $Y'OY$ intersecting at the point O (see Fig. 5.1 to 5.5).
3. Take a thread of a unit length representing the number 1 along OX . Fix one end of the thread to the nail at O and the other end at A as shown in the figures 5.1 to 5.5
4. Set free the other end of the thread at P and rotate the thread through angles of 90° , 180° , 270° and 360° and mark the free end of the thread in different cases as P_0 , P_1 , P_2 , P_3 and P_4 , respectively, as shown in the figure 5.1 to 5.5

➤ **Student's Activity**

Student will draw

1. In the argand plane, OP_0 , OP_1 , OP_2 , OP_3 , OP_4 represent, respectively, i , -1 , $-i$, 1 .
2. $OP_0 = i^0 = 1$, $OP_1 = i^1 = 1 \times i$, $OP_2 = -1 = i \times i = i^2$, $OP_3 = -i = i \times i \times i = i^3$, $OP_4 = i^4 = 1$ and so on.
3. Each time, rotation of OP by 90° is equivalent to multiplication by i . Thus, i is referred to as the multiplying factor for a rotation of 90° .

FIG 5.1

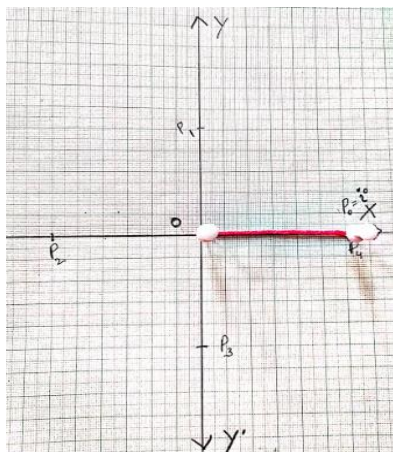


FIG 5.2

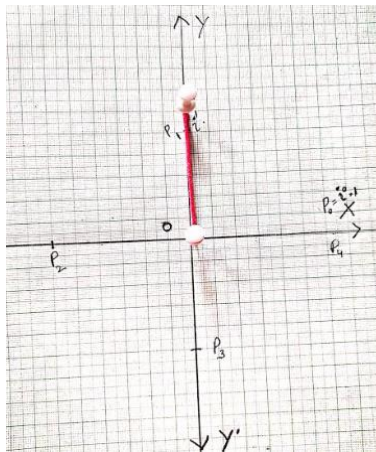
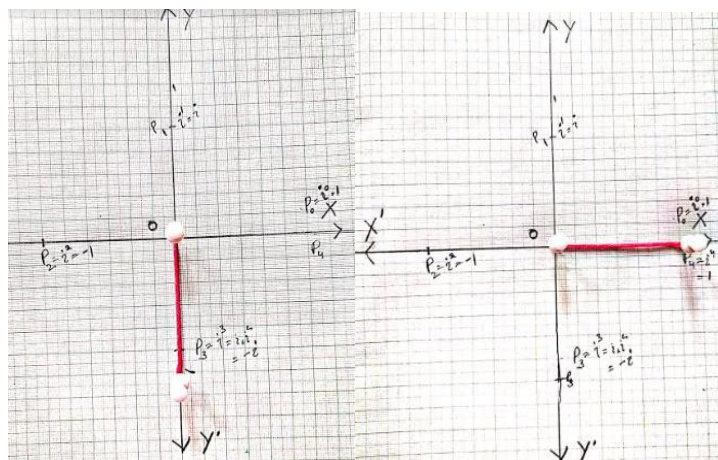
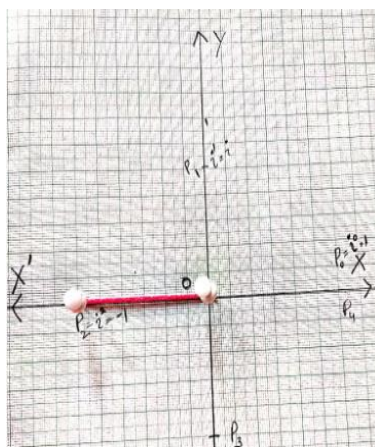


FIG 5.3



FIG 5.4

FIG



What have I observed?

<u>S.No</u>		
<u>1</u>	On rotating OP through 90° , $OP_1 = 1 \times i =$	_____
<u>2</u>	On rotating OP through an angle of 180° , $OP_2 =$	$1 \times _ \times _ = _$
<u>3</u>	. On rotation of OP through 270° (3 right angles), OP_3	$1 \times _ \times _ \times _ =$ _____.
<u>4</u>	On rotating OP through 360° (4 right angles), OP_4	$1 \times _ \times _ \times _ \times$ _____ = _____.

<u>5</u>	On rotating OP through n -right angles OP_n	$= 1 \times \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} \times$ $\underline{\hspace{1cm}} \times \dots n \text{ times} =$ $\underline{\hspace{1cm}}$
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What have I learnt?

This activity may be used to evaluate any integral power of i .

What am I curious to learn?

Integral powers of “ i ” that is i^{23} , i^{-17} , i^{97} etc

Let me evaluate myself

Q1.

Write the value of $i + i^{10} + i^{20} + i^{30}$

Write the additive Inverse of $6i - i\sqrt{-49}$

Q2.

Q3 If $(1 + i^2 + i^4 + i^6 + \dots + i^{208}) = a + ib$, then the value of (ab) is

- (a) -1 (b) 1 (c) 0 (d) ± 1 .

Q4. Express the complex number in the form $a + ib$: $\left(-2 - \frac{i}{3}\right)^3$

Q5.

Write in the form of $a + ib$: $\frac{1}{-2 + \sqrt{-3}}$
