LESSON PLAN - 3

Class: **X** Subject: **Mathematics**

Name of the teacher: School:

Name of the chapter	Topic	Number of periods required (12)	Timeline for teaching		Any specific information
			From	To	
3. POLYNOMIALS	**3.1** introduction	1			
	3.2 What are polynomials? **3.2.1** Degree of a polynomial **3.2.2** Value of a polynomial	2			
	3.3 Working with Polynomial **3.4** Geometrical meaning of the zeroes of a polynomial **3.4.1** Graphical representation of a Linear polynomial **3.4.2** Graphical representation of a quadratic polynomial **3.4.3** Geometrical meaning of zeroes of Cubic polynomial.	5			e-content : Representation of graphs using Geogebra
	3.5 Relationship between zeroes and coefficients of a polynomial. **3.6** Cubic polynomials	2			Real life examples

	3.7 Division algorithm for polynomials.	2			

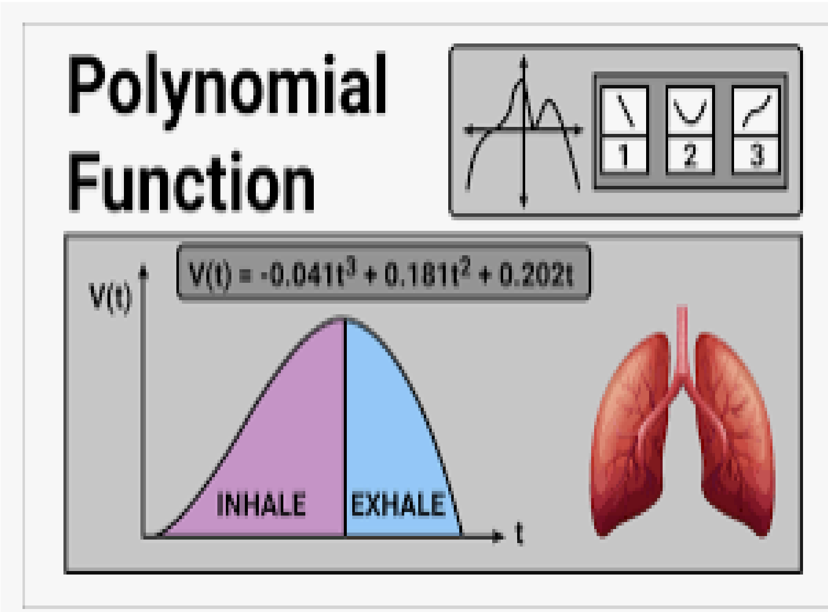
Prior Concept / Skills:
1. Basic information about Constant, Variable, terms, statements, expressions 2. Terms, monomial, binomial, trinomial and polynomials 3. Perimeter and areas of geometrical shapes 4. Exponents and powers 5. Value of an expression at given value of variable 6. Co-ordinate axes-and its representation 7. Division formula

Learning outcomes	**Number of Periods**
Students are able to: 1. Differentiate between an expression and a polynomial	1
2. Combine the earlier generalized expressions to form a new expression	1
3. working with polynomials by considering its coefficients, constant term	1
4. Draw the graphs of linear, quadratic and cubic polynomials	4
5. verify the relations ship between coefficients and zeroes of quadratic and cubic polynomials	3
6. Apply Euclid's division algorithm in dividing polynomials.	2

TEACHING LEARNING PROCESS

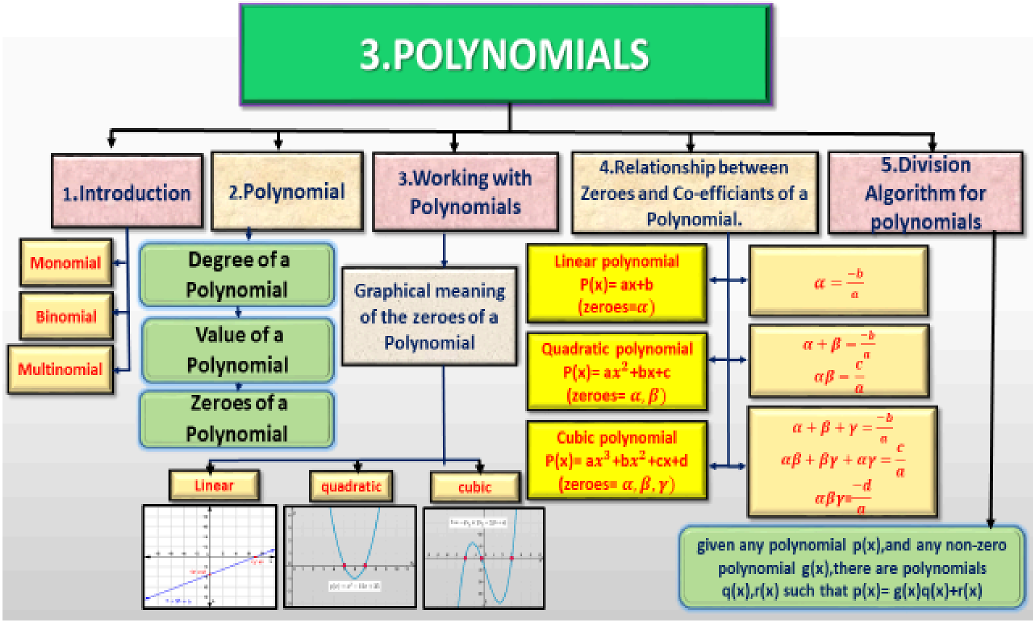
Induction/Introduction(Generating interest, informing students about the outcomes and expectations for the lesson)

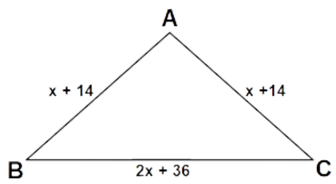
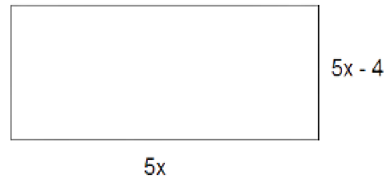
- Introduce the concept of by taking situations like perimeter of triangular and area of rectangular fields and then writing polynomials of different degrees by expressing their perimeters in terms of variables.
- Create interest by explain uses of polynomials in different branches for example, an engineer designing a roller coaster would use polynomials to model the curves, while a civil engineer would use polynomials to design roads, buildings and other structures
- Even a taxi driver can benefit from the use of polynomials. Suppose a driver wants to know how many miles he has to drive to earn Rs.100



Experience and Reflection(Task/question that helps students explore the concept and connect with their life)

- Recall the degree of different types of polynomial
- Write the general form of n^{th} degree of polynomial in given variable.
- Find the value of polynomial
- Represent linear, quadratic polynomials in graph and find the zeroes of that polynomials.
- Check the relationship between coefficients and zeroes of quadratic and cubic polynomials.
- Represent all concepts through Flow chart.



Explicit Teaching/Teacher Modelling (I Do)	Group Work (We Do)	Independent Work (You Do)	Notes
3.1 **Introduction: (1)** By considering the situations like triangular shaped flower bed and rectangular field, explain how to convert the perimeter and areas of above situations into algebraic expressions using variables. **3.2 WHAT ARE POLYNOMIALS?:**	 Write the expression for perimeter of the triangle		 Write the area of rectangle in terms of x

(2)

Polynomials are algebraic expressions consisting constants and variables, which can be raised to powers of non-negative integrals.

Ex: $2x+5$, $3x^2+5x+6$, y^3... are some polynomials

$\frac{1}{x^2}, \frac{1}{\sqrt{x}}, \frac{1}{y-1}$... are not polynomials.

3.2.1.Degree of a polynomial:

Recall that if P(x) is a polynomial in x, the highest power of x in p(x) is called degree of the polynomial.

- Explain the degree of monomial, binomial, and polynomials by several examples.

3.2.2 Value of a polynomial:

If p(x) is a polynomial in x, and if k is a real number, then the value obtained by replacing x by k in p(x), is called the value of p(x) at x = k and is denoted by p(k).

- Write some more examples and non-examples to polynomials

Table showing polynomial and its degree with examples.

Polynomial	Degree	Example
Linear **Polynomial**	1	$3x+1$
Quadratic **Polynomial**	2	$4x^2+1x+1$
Cubic **Polynomial**	3	$6x^3+4x^3+3x$
Quartic **Polynomial**	4	$6x^4+3x^3+3x$

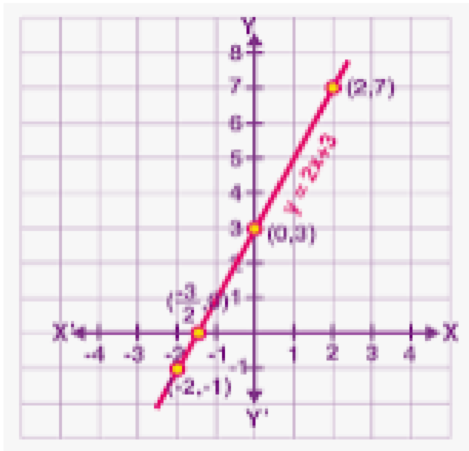
- **Do This** (page.48)
- **Try This** (page.48)
- **Try This** (page.49)
- **Do this** (page.49)

General form of polynomial

- Linear polynomial: $ax+b, a \neq 0$
- Quadratic polynomial: $ax^2+bx+c, a \neq 0$
- Cubic polynomial: $ax^3+bx^2+cx+d, a \neq 0$

- Chart showing nth degree of polynomial and its condition

Lab Activity: Write some polynomials and find their different values for x.

3.2.3. Zeroes of a polynomial: A real number k is said to be a zero of polynomial p(x), if p(k) = 0	Solve the problems 3,4 and 5 of exercise.3.1	• **Do this** (page.50) Solve the problems 1 and 2 of **exercise.3.1**	
<u>3.3 WORKING WITH POLYNOMIALS:</u> **(5)** The general form of linear polynomial $p(x) = ax + b, a \neq 0$ The zero value of ax + b is $\frac{-b}{a}$ **<u>3.4. GEOMETRICAL MEANING OF THE ZEROES OF A POLYNOMIAL:</u>** Explain what type of shapes does the graphical representation of linear and quadratic polynomial occur and also the geometrical meaning of their zeroes. **3.4.1 Graphical representation of a linear polynomial:**	Understand that zero of a linear polynomial is related to its coefficients and the constant term.	Are the zeroes of higher degree polynomials also related to their coefficients?	

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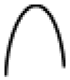
Recall that the graph of y = ax + b is a straight line.
The zero of the polynomial ax + b is the x-coordinate of the point where the graph of ax + b intersects the X - Axis.
3.4.2. Graphical representation of a quadratic polynomial:
For any quadratic polynomial $ax^2 + bx + c$, a≠0, the graph opens upwards like  or opens downwards like  .This depends on whether a>0 or a<0
The shapes of these curves are called Parabola.

3.4.3. Geometrical meaning f zeroes of a cubic polynomial.
By considering different cubic polynomials, prove that there are at most 3 zeroes for any cubic polynomial.
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Discuss with others and tell that for any quadratic polynomial, i.e., the zeroes of a quadratic polynomial $ax^2 + bx + c$ are the x-coordinates of the points where the parabola intersects the x-axis.

Try This (page.53)
Try This (page.55)

Try This (page.57)
In general for a polynomial p(x) of degree 'n', the graph of y = p(x) intersects x-axis at at most n points.

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Do this
(page.52)

Draw the graphs of polynomials in different cases and thus proves that a polynomial of degree 2 has at most two zeroes.

Solve the problems of Exercise.3.2
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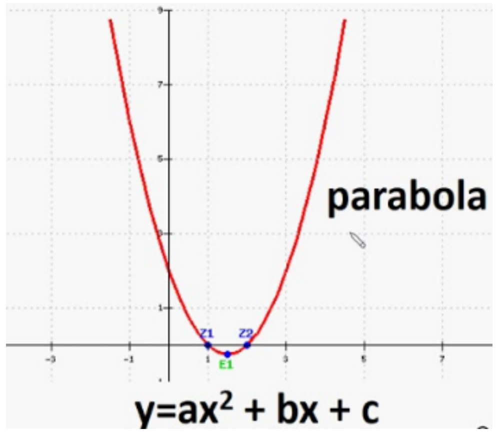

Historical Note:
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• Explain examples 1, 2 of text book. **<u>3.5 RELATION SHIP BETWEEN ZEROES AND COEFFICINTS OF A POLYNOMIAL: (2)</u>** • The zero of a linear polynomial $ax + b = \frac{-b}{a}$ • If zeroes for any quadratic polynomial $ax^2 + bx + c$, are α, β, then, • Sum of its zeroes, $\alpha + \beta = \frac{-b}{a}$ • Product of zeroes $\alpha\beta = \frac{c}{a}$ Explain examples 3,4,5 and 6 **3.6. CUBIC POLYNOMIALS:** If α, β, γ are 3 zeroes of a cubic polynomial $p(x) = ax^3 + bx^2 + cx + d$ then,	• **A polynomial p(x) of degree n, has at most 'n' zeroes.** Express the relation between zeroes and coefficients as below $\alpha + \beta = \frac{-b}{a} = \frac{-\, coefficient\ of\ x}{coefficient\ of\ x^2}$ $\alpha\,\beta = \frac{c}{a} = \frac{constant\ term}{coefficient\ of\ x^2}$ • **Try This**(page.64)	• **Do This** (page.62) • **Do This** (page.66)	Explaining about Greek alphabets. And History of Numbers. The quadratic polynomial with zeroes α, β is $\mathbf{p(x)} = x^2 - (\alpha + \beta)x + \alpha\beta$ The cubic polynomial with zeroes α, β, γ is $\mathbf{p(x)} = x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)x - \alpha\beta\gamma$

• Sum of its zeroes, $\alpha + \beta + \gamma = \frac{-b}{a}$ • $\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$ • Product of zeroes $\alpha\beta\gamma = \frac{-d}{a}$	Verify whether the given values are zeroes of cubic polynomial or not (example.7)	Solve the problems of **Exercise.3.3**	**Activity:** Write the results from the Division Algorithm for polynomials and verify with suitable examples.
<u>3.7. DIVISION ALGORITHM FOR POLYNOMIALS. (2)</u> Recall the methods of division of a polynomial by different polynomials like monomial, binomial and a polynomial in earlier class. • Explain by applying Euclid's division algorithm, find the other two zeroes of a cubic polynomial if one zero is known, through examples 8,9,10 and 11	Euclid's Division Algorithm: If p(x) and g(x) are any two polynomials with g(x)≠0, then we can find polynomials q(x) and r(x) such that **p(x) = g(x)** $\times q(x) + r(x)$ • Solve the problems 3,4,5 of **Exercise.3.4**	Solve the problems 1 and 2 of **Exercise.3.4**	

Check For Understanding Questions

- **Factual:**

- Write the general forms of Linear, quadratic and cubic polynomial
- Find the zero value of 2x – 5 and $x^2 - 4$
- Find the value of $-4x^2 + 5x + 3$ at $(i) x = 0$ $(ii) x = -1$ $(iii) x = 2$
- Write Euclid' Division Algorithm
- Find quadratic polynomial with 3 and -2 as zeroes.

- Match the following

(i) constant polynomial	(a) $3x^3 - 6x^2 + 9x - 1$
(ii) Linear polynomial	(b) 4x +1
(iii) Quadratic polynomial	(c) 3
(iv) Cubic polynomial	(d) $5x^2 - 6x + 8$

1. **Open Ended / Critical Thinking:**

- If p(x) = $x^2 - 3x + 1$, find p(2x)
- If p, q are zeroes pf polynomial f(x) = $2x^2 - 7x + 3$, find the value of $p^2 + q^2$
- If A ={x: x is a digit of Ramanujan Number} B ={x :x is a digit of Kaprekar constant}, find a polynomial of zeroes of elements of A∩B
- Find the polynomial expression having zeroes of powers of prime factors of 10800
- Find a quadratic polynomial in x whose zeroes are the values of sin45° and cos45°

SIGNATURE OF THE TEACHER

SIGNATURE OF THE HEAD MASTER

VISITING OFFICER WITH REMARKS