BAL BHARATI PUBLIC SCHOOL, PITAMPURA,DELHI – 110034

SUBJECT:- MATHEMATICS

CHAPTER:-2

TOPIC:- Polynomials

STEP 1:- GUIDELINES AND INTRODUCTION

Guidelines:

Dear students Kindly refer to the following notes/video links from the Chapter- "Polynomials" and thereafter do the questions in your math notebook.

 Chapter2 – Part 1

LINK FOR THE CHAPTER: http://ncert.nic.in/textbook/textbook.htm?jemh1=2-15

INTRODUCTION

 Let us recall the concepts done in class IX

1) **Polynomial**: The expression, which contains one or more terms with non-zero coefficient is called a polynomial. A polynomial can have any number of terms.
For Example: 25, p + q, 7x + y + 5, wx + xy+ y z+ zx etc. are some polynomials.

2) **Degree of polynomial**: The highest power of the variable in a polynomial is called as the degree of the polynomial.
For Example: The degree of $p(x) = x^5 – x^3 + 7$ is 5.

A polynomial of degree 1 is called a linear polynomial, degree 2 is called quadratic polynomial, degree 3 is called a cubic polynomial.

3) **Zeroes of a Polynomial**: The value of variable for which the polynomial becomes zero is called as the zeroes of the polynomial.

i.e. a real number **k** is said to be zero of a polynomial p(x) if p(k) = 0

For Example: Consider $p(x) = x + 2$. Find zeroes of this polynomial.
If we put x = -2 in p(x), we get,
p(-2) = -2 + 2 = 0.
Thus, -2 is a zero of the polynomial p(x).
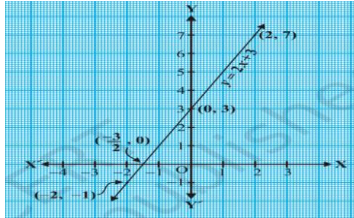

STEP 2:

Subtopic:

   (i)   Geometrical Meaning of zeroes of a polynomial
   (ii)   Relationship between zeroes and coefficients of a polynomial

(iii)   Forming a polynomial, given its zeroes

STEP 3: **Key Points and important link for references**:

(i) Geometrical Meaning of the Zeroes of a Polynomial

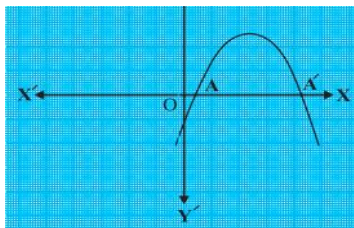(i)   Graph of a linear polynomial ax + b is a straight line.

Refer to the link for zeroes of linear polynomial
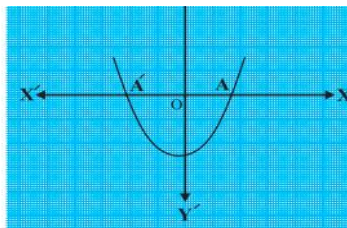https://www.youtube.com/watch?v=XAuAH64puJU

(ii) Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open upwards if $a > 0$.
    Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open downwards,
    if $a < 0$.

a < 0   a > 0

Refer to the link for the quadratic polynomial

https://www.youtube.com/watch?v=s-AlezS1ByQ

Refer to the following link for other polynomials

https://www.youtube.com/watch?v=bSzmfUdBp2w

https://www.youtube.com/watch?v=Xz5gXe2Ok-0

Q1 Write the number of zeroes of the polynomial y = f(x) whose graph is given in the following figures:

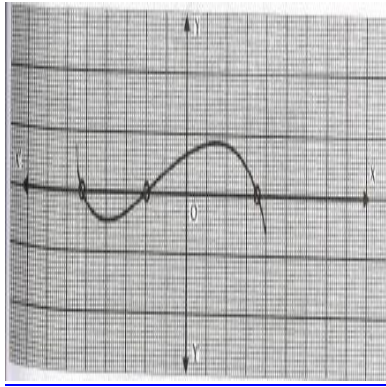fig (i)   fig (ii)

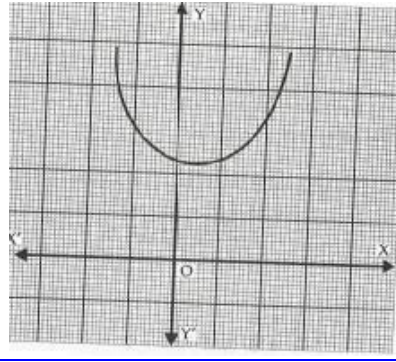fig (i) has 3 zeroes   fig (ii) has no zeroes

(ii) Relationship Between Zeroes and Coefficients of a Polynomial

The general form of linear polynomial is p(x) = ax+b, its zero is $\frac{-b}{a}$ .i.e.x = $\frac{-b}{a}$ or $\frac{-\text{Constant term}}{\text{Coefficient of x}}$.

General form of quadratic polynomial is ax^2 + bx +c where a ≠ 0. There are two zeroes of quadratic polynomial.

Sum of zeroes = $\frac{-b}{a}$ = $\frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of zeroes = $\frac{c}{a}$ = $\frac{\text{Constant term}}{\text{Coefficient of } x^2}$.

General form of cubic polynomial of ax^3 + bx^2+ cx + d where a ≠ 0. There are three zeroes of cubic polynomial.

The sum of zeroes of the cubic polynomial = $\frac{-b}{a}$ = $\frac{-\text{coefficient of } x^2}{\text{Coefficient of } x^3}$

Sum of the product of zeroes taken two at a time = $\frac{c}{a}$ = $\frac{\text{coefficient of } x}{\text{Coefficient of } x^3}$

Product of zeroes = $\frac{-d}{a}$ = $\frac{-\text{Constant term}}{\text{Coefficient of } x^3}$.

https://www.youtube.com/watch?time_continue=139&v=cmrKOQJ3hTE&feature=emb_logo

Example 1 : Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.

Solution : We have

$$x^2 + 7x + 10 = (x + 2)(x + 5)$$

So, the value of $x^2 + 7x + 10$ is zero when $x + 2 = 0$ or $x + 5 = 0$, i.e., when $x = -2$ or $x = -5$. Therefore, the zeroes of $x^2 + 7x + 10$ are -2 and -5. Now,

$$\text{sum of zeroes} = -2 + (-5) = -(7) = \frac{-(7)}{1} = \frac{-(\text{Coefficient of } x)}{\text{Coefficient of } x^2},$$

$$\text{product of zeroes} = (-2) \times (-5) = 10 = \frac{10}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}.$$

(iii) Forming a polynomial, given its zeroes

(a) A quadratic polynomial whose zeroes are α and β ,is given by :
$p(x) = k[x^2 - (α + β) x + α β]$, where k is any real number
(b) A quadratic polynomial whose zeroes are α, β and γ , is given by :
$P(x) = k[x^3 - (α+β +γ) x^2 + (α β + β γ + α γ)x - α β γ]$, where k is any real number

Example 2: Find the quadratic polynomial with the sum of the zeroes as 2 and the product of the zeroes as – 6.
Solution :A quadratic polynomial whose zeroes are α and β ,is given by :
$p(x) = k[x^2 - (α + β) x + α β]$, where k is any real number
here α + β = 2 and α β= -6
So, the required equation is $k[x^2 - 2x -6]$, where k is any real number.

STEP 4 : Points to Remember:

1) For finding the zeroes of the polynomial p(x), we put p(x) = 0.
2) On the graph if the curve is
   (a) Intersecting the axis, it gives one zero
   (b) Touching the axis, it gives two equal zeroes
   (c) No point of intersection implies no zero
3) To find the total number of zeroes of the polynomial y = p(x) geometrically,the number of zeroes is equal to the total number of distinct points where the curve meets the x axis
4) If the zeroes of the polynomial are given, then we will find the sum (α + β) and product (α β) of the zeroes and substitute and find the polynomial
   $p(x) = k[x^2 -(α + β) x +α β]$, where k is any real number.

ASSIGNMENT

1) Do NCERT Ex 2.1 and Ex 2.2 (to be done in cw/hw register)

   (Q2 to Q5 of the assignment to be done in practice register)

2) If the product of zeroes of the polynomial $ax^2 – 6x – 6$ is 4, find the value of 'a'.

3) If one zero of the polynomial $(a^2 + 9) x^2 + 13x + 6a$ is the reciprocal of the other, find the value of 'a'.
   (Hint : take the zeroes as α and 1/ α ,then find the product of the zeroes)

4) Find the zeroes of the quadratic polynomial $6x^2 – 3 – 7x$ and verify the relationship between the zeroes and the coefficient of the polynomial.

5) Find the quadratic polynomial, the sum of whose zeroes is 8 and their product is 12. Hence, find the zeroes of the polynomial.

NOTE

1. Refer to the following links to practice more questions:

a) https://diksha.gov.in/play/content/do_31279570461884416011633?referrer=utm_source%3Ddiksha_mobile%26utm_content%3Ddo_31279645524094156816824%26utm_campaign%3Dshare_content

b) From Khan Academy Assignments

   https://www.khanacademy.org/math/in-in-grade-10-ncert

c) www.examfear.com

d) http://www.ei-india.com/mindspark-math (free trial for 60 days)