Mathematics

Learning Outcomes	*Sources and Resources*	*Week-wise Suggested Activities (to be guided by teachers/parents)*
The learner • develops a relationship between algebraic and graphical methods of finding the zeroes of a polynomial. • finds solutions of pairs of linear • equations in two variables using graphical and different algebraic methods. • demonstrates strategies of finding • roots and determining the nature of roots of a quadratic equation.	**NCERT Mathematics Textbook for Class X** Chapter 2 Polynomials Chapter 3 Pair of Linear Equations in two Variables Chapter 4 Quadratic Equations E-resources Chapter 2 Polynomials http://ncert.nic.in/textbook/textbook.htm?jemh1=2-15 https://nroer.gov.in/5645d28d81fccb60f166681d/file/58dd37ba472d4a03227bf8e0 Chapter 3 Pair of Linear Equations in two Variables http://ncert.nic.in/textbook/textbook.htm?jemh1=3-15 Chapter 4 Quadratic Equations http://ncert.nic.in/textbook/textbook.htm?jemh1=4-15 Books published by The Association of Mathematics Teachers of India (AMTI)	**WEEK 5** • A brief review of polynomials can be done by asking students to pick polynomials from a collection of algebraic expressions. This may be followed by asking students to classify given polynomials as linear, quadratic or cubic. They may be encouraged to form more such polynomials. • A discussion about notation for representing a polynomial using different letters as variables, say p(x), q(y), r(m) may follow. • Students may be given different polynomials and asked to find values of those polynomials for different values of the variable. For e.g. if $p(t) = (2/3)t + 1$ the then $p(t)$ may be found for $t=1,-2,0$ etc. Students may choose their values, calculate and send to the teacher. • Tasks of the following nature may be encouraged to be done by the students: Given a number say, Ö2 , they should construct polynomials of different degrees and terms that will have Ö2 as a zero. For example $x2 – 2$ or $x2 – (Ö2 + Ö8) x + 4$ etc. Different such numbers may be taken. **WEEK 6** • Discussion about zero of polynomials may then follow. Students may be encouraged to form as many examples as possible using rational and irrational numbers as coefficients of terms in polynomials. • Students may be sent different polynomials for sketching their graphs. They may be asked to observe which graphs cross the x-axis and which do not. For e.g., *graph of $x^2 – 1$ will cross at x=1 and x= -1, whereas that of $x^2 +1$ will never cross the x-axis.* • Students may be motivated to explore a relation between the zeros of a polynomial and crossing of x-axis of its graph followed by relation between the number of zeros, degree of the polynomial and the number of times crossing of the x-axis by its graph may be discussed. Many examples of polynomials of different degrees may be created by the students for this purpose.

Week 7

- The discussion may be supported by attempting exercises from the Class X NCERT textbook and Exemplar problem book, both available on the NCERT website.

- Students may be asked to observe the coefficients of polynomials whose zeros they have found earlier. They may be motivated to explore some relation between the zeros of the polynomial and the coefficients of the terms. The discussion may finally culminate in establishing relation between sum of zeros, product of zeros and the coefficients.

- The relation so established may be verified by creating new polynomials and solving them.

- The analogy of dividing two positive integers may be extended to division of two polynomials. The terms quotient, divisor, dividend, remainder may be discussed in the context of polynomials. For e.g. *when $2x^2 +3x+5$ is divided by x+1, the quotient is x+1, remainder is 4 divisor is x+1 and dividend is $2x^2 +3x+5$.*

Week 8

- This discussion can lead to the concept of division algorithm for polynomials and its verification through lots of examples generated by students.

- Polynomials of different degrees and terms may be encouraged to be formed for verifying different related concepts. For e.g. x^2-2x+1, x^3-5 etc.

- A recall of linear equations can be done. There are infinite solutions of these equations, many of them can be found.

- Students may be motivated to improvise the situations that generated a single linear equation in two variables to those that will generate two linear equations in two variables. For e.g., *in a situation, two friends donated an amount of Rs 9500 to PM's relief fund generates an equation x + y = 9500. A condition can be added further that- one of them donated Rs 1500 more than the other. To find the amounts donated by each, equations x + y = 9500 and x – y = 1500 must be formed.*

- More such situations be discussed and equations be formed. It may further be thought out whether a pair of such equations will give one or more solutions.

WEEK 9

- Students may be asked to plot graphs for the given pair of linear equations in two variables. Initially teachers may send these equations to the students, later students may be encouraged to do that. Students may send their observations about the nature of graph i.e., whether the lines representing the given equations intersect at a point or overlap each other or are parallel. This may lead to the discussion on the nature of solutions of these equations.

- The three algebraic methods of finding solutions may then be discussed one by one. After finding the solution students may be asked to verify it by substituting the values of the variables in the equations.

- Students may be encouraged to refer literature of other subject areas which she is learning and try to frame questions that may lead to formation of linear equations in two variables.

WEEK 10

- Given a pair of such equations, students may try to solve it using all the three methods, verify it graphically as well as by substituting the solutions obtained in the given equations. They may try to think how these three methods are linked to each other and which is more workable etc.

- To deepen their understanding students may continue with the learning activities using exercises given in Class X NCERT textbook, *Exemplar Problem Book, Laboratory Manual for Secondary Stage* and e-resources on NROER

WEEK 11

- Situations may be thought of that generate a quadratic equation. For e.g., *suppose a charity trust decides to build a prayer hall having a carpet area of 300 square metres with its length one metre more than twice its breadth. What should be the length and breadth of the hall?* Quadratic polynomials may be generated and may be put equal to zero to get a quadratic equation.

- Students may form equations that appear to be quadratic and exchange with their friends to verify whether they are quadratic or not. For e.g., *equation $x(x + 1) + 8 = (x + 2)(x – 2)$ reduces to the form $x + 12 = 0$ which is not in the form $ax^2+bx +c = 0$.* Also students may create situations and exchange with their friends who in turn will form a quadratic equation for them.

| | | • Teacher may encourage students to see through examples the analogy between the number of zeros of a quadratic polynomial and the number of solutions i.e. roots of a quadratic equation. |

• Finding of roots of a quadratic equation by factoring it into linear factors may now be initiated.

WEEK 12

• The method of completing the squares to find the solution of a quadratic equation may now be discussed. Students may be encouraged to apply this method to a general form of a quadratic equation $ax^2+bx+c =0$ and a general formula for finding solution of a quadratic equation may be explored.

• The nature of roots of a quadratic equation may be discussed based on the quadratic formula.

• Teachers may guide students to convert equations convertible to quadratic equations and solve them.

• Use of Class X NCERT mathematics textbook and exemplar problem book be made to attempt innovative and thought provoking exercises. Students may generate more questions based on these and solve them to get a better insight in the concepts.