Chapter – 14

Factorisation

- **Factorisation:** Representation of an algebraic expression as the product of two or more expressions is called factorization. Each such expression is called a factor of the given algebraic expression.
- When we factorise an expression, we write it as a product of factors. These factors may be numbers, algebraic variables or algebraic expressions.
- An irreducible factor is a factor which cannot be expressed further as a product of factors.
- A systematic way of factorising an expression is the common factor method. It consists of three steps: (i) Write each term of the expression as a product of irreducible factors (ii) Look for and separate the common factors and (iii) Combine the remaining factors in each term in accordance with the distributive law.
- Sometimes, all the terms in a given expression do not have a common factor; but the terms can be grouped in such a way that all the terms in each group have a common factor. When we do this, there emerges a common factor across all the groups leading to the required factorisation of the expression. This is the method of regrouping.
- In factorisation by regrouping, we should remember that any regrouping (i.e., rearrangement) of the terms in the given expression may not lead to factorisation. We must observe the expression and come out with the desired regrouping by trial and error.
- A number of expressions to be factorised are of the form or can be put into the form: $a^2 + 2ab + b^2$, $a^2 - 2ab + b^2$, $a^2 - b^2$ and $x^2 + (a + b)x + ab$. These expressions can be easily factorised using Identities I, II, III and IV

  $a^2 + 2ab + b^2 = (a + b)^2$

  $a^2 - 2ab + b^2 = (a - b)^2$

  $a^2 - b^2 = (a + b)(a - b)$

  $x^2 + (a + b)x + ab = (x + a)(x + b)$

- In expressions which have factors of the type $(x + a)(x + b)$, remember the numerical term gives ab. Its factors, a and b, should be so chosen that their sum, with signs taken care of, is the coefficient of x.
- We know that in the case of numbers, division is the inverse of multiplication. This idea is applicable also to the division of algebraic expressions.
- In the case of division of a polynomial by a monomial, we may carry out the division either by dividing each term of the polynomial by the monomial or by the common factor method.
- In the case of division of a polynomial by a polynomial, we cannot proceed by dividing each term in the dividend polynomial by the divisor polynomial. Instead, we factorise both the polynomials and cancel their common factors.
- In the case of divisions of algebraic expressions that we studied in this chapter, we have

  Dividend = Divisor × Quotient.

  In general, however, the relation is

  Dividend = Divisor × Quotient + Remainder

  Thus, we have considered in the present chapter only those divisions in which the remainder is zero.
- There are many errors students commonly make when solving algebra exercises. You should avoid making such errors.