

## CHAPTER -2

### EQUATIONS AND MATRICES

#### UNIT-1

#### EQUATIONS

##### EQUATIONS :

- \* Equation is defined to be a mathematical statement of equality.

##### CONDITIONAL EQUATION :

- \* If the equality is true for certain value of the variable involved, the equation is called a conditional equation.

Eg:  $\frac{x+2}{3} + \frac{x+3}{2} = 3$  holds true only for  $x=1$ .

##### IDENTITY :

- \* If the equality is true for all values of the variable involved, the equation is called an identity.

##### SOLUTION OR ROOT OF THE EQUATION :

- \* Determination of value of the variable which satisfies an equation is called solution of the equation or root of the equation.

### CUBIC EQUATION:

$$ax^3 + bx^2 + cx + d = 0.$$

$$\text{Sum of roots} = -b/a$$

$$\text{Product of roots} = -d/c$$

### SOLUTION OF CUBIC EQUATION:

- \* On trial basis putting, if some value of  $x$  satisfies the equation then we get a factor.
- \* This is a trial & error method.
- \* With this factor, factorise the cubic equation and get other two values of  $x$ .

## METHODS OF SOLVING SIMULTANEOUS LINEAR EQUATIONS :

i) Elimination method .

ii) Cross multiplication method .

$$\begin{array}{ccccccc} b_1 & & c_1 & & a_1 & & b_1 \\ & \searrow & \nearrow & \searrow & \nearrow & \searrow & \nearrow \\ b_2 & & c_2 & & a_2 & & b_2 \end{array}$$

$$\Rightarrow \frac{x}{b_1 c_2 - b_2 c_1} = \frac{y}{c_1 a_2 - c_2 a_1} = \frac{1}{a_1 b_2 - a_2 b_1}$$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1}$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1}$$

## QUADRATIC EQUATION :

\* Quadratic equation is of the form  $ax^2 + bx + c = 0$   
where  $a \neq 0$ .

\* If  $b = 0$ , then it is called pure quadratic equation .

\* If  $b \neq 0$ , then it is called affected quadratic equation .

## METHODS OF SOLVING QUADRATIC EQUATION :

\* Factorisation method .

\* Formula method .  $\left[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \right]$

- \* While finding solution/roots of the equation, it is advisable to equate the equation to 0.

#### LINEAR EQUATION:

- \* Highest power of the equation is 1.
- \* Eg:  $8x + 17(x - 3) = 4(4x - 9) + 12$

#### QUADRATIC EQUATION:

- \* Highest power of the equation is 2
- \* Eg:  $3x^2 + 5x + 6 = 0$ .

#### CUBIC EQUATION:

- \* Highest power of the equation is 3.
- \* Eg:  $x^3 + 3x^2 + x - 7 = 1$

#### SIMULTANEOUS EQUATIONS:

- \* Two or more equations involving two or more variables.
- \* Eg:  $x + 2y = 1$  ;  $2x + 3y = 2$ .

#### SIMPLE EQUATION:

- \* One unknown  $x$  is in the form  $ax + b = 0$ .
- \* Eg:  $\frac{4x}{3} - 1 = \frac{14x}{15} + \frac{19}{15}$

### RATIONAL NUMBERS:

\* All positive & negative numbers without squareroot is called rational numbers.

\* Eg:  $25$ ,  $\sqrt{25}$ ,  $\sqrt{100}$ ,  $100$ .

### IRRATIONAL NUMBERS:

\* The square root of a possible real number whose value cannot be determined exactly but can be determined approximately is called irrational number.

\* Eg:  $\sqrt{5}$ ,  $\sqrt{2}$

[Rational numbers & irrational numbers are subset of real numbers]

### POINTS TO REMEMBER:

\*  $b^2 - 4ac$  is called the discriminant as it discriminates the roots.

\* Irrational roots occur in conjugate pairs.  
Eg:  $2 - \sqrt{3}$ ;  $2 + \sqrt{3}$

\* If  $ax^2 + bx + c = 0$  in a quadratic equation

$ax^2 + bx + c = 0$ , then the roots are real & rational and one root is  $1$  and the other root is  $c/a$ .

## CONSTRUCTION OF A QUADRATIC EQUATION:

$$ax^2 + bx + c = 0$$

$$x^2 - (\text{Sum of roots})x + \text{products of roots} = 0$$

$$\text{Where, sum of roots} = \frac{-b}{a}$$

$$\text{Products of roots} = \frac{c}{a}$$

## NATURE OF ROOTS:

- \* If  $b^2 - 4ac = 0$ , then roots are real & equal.
- \* If  $b^2 - 4ac > 0$ , then roots are real & unequal.
- \* If  $b^2 - 4ac < 0$ , then roots are imaginary.
- \* If  $b^2 - 4ac > 0$  and is a perfect square, then roots are real, unequal & rational.
- \* If  $b^2 - 4ac > 0$  and is not a perfect square, then roots are real, unequal & irrational.

## NOTES:

### i) IMAGINARY OR COMPLEX NUMBERS:

- \* The square root of negative numbers are called imaginary or complex numbers.
- \* Eg:  $\sqrt{-2}$ ,  $\sqrt{-64}$

### ii) REAL NUMBERS:

- \* All numbers except imaginary numbers are called real numbers.