HANDWRITTEN NOTES

(Quantitative Aptitude)

EQUATIONS

Equations

- Any mathematical statement which states that left hand side is equal to right hands side; LHS = RHS.

Degree Of Equations

Highest power of variable is known as degree of equation.

Types of Equations on the basis of degree

(i) Linear $\Rightarrow$ Degree = 1

(ii) Quadratic $\Rightarrow$ Degree = 2

(iii) Cubic $\Rightarrow$ Degree = 3

Solutions of the Equation

The value of variable which satisfy the equation is known as root of equation or solution of the equation

Eg:- $3x+7 = 5x+3$

$x = 2$ is a solution of this equation because if we put $x = 2$, LHL & RHS will become equal.

LHS $= 3(2)+7 = 13$ | RHS $= 5(2)+3 = 13$

Linear Equation

In one variable: $ax+b=0$

In two variable: $ax+by+c=0$

Methods of Solving Linear Equation in Two Variables

(i) Substitution Method

(ii) Elimination Method

Substitution Method

- Two equations will be given.
- Find the value of x in terms of y in both equation
- Equate Two equation.

Elimination Method

- Two equations are given.
- Select one variable & make its coefficient same in both equation.
- Then eliminate that variable using addition or subtraction.

Quadratic Equation

$ax^2+bx+c = 0$ where $a \neq 0$.

It can have maximum Two roots which are generally denoted by 'α' & 'β'

Sum of Two Roots $= \alpha+\beta = -\frac{b}{a}$

Product of Two roots $= \alpha.\beta = \frac{c}{a}$

$\alpha^2+\beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$\alpha^3+\beta^3 = (\alpha+\beta)(\alpha^2+\beta^2-2\alpha\beta)$

$[(\alpha+\beta)^2 - (\alpha-\beta)^2 = 4\alpha\beta$

When one root is the reciprocal of other root Then $a=c$

When sign of two roots is opposite but magnitude is same then $b=0$

If one irrational root is $m+\sqrt{n}$. Then other irrational root will be $m-\sqrt{n}$.

If sum of roots and product of roots is given. Then Quadratic equation $x^2 - (\text{sum of roots})x + \text{Product} = 0$.

Eg: find Q.E whose roots are 3 & 8.

=) Sum of roots $= 3+8 = 11$; Product of roots $= 3\times 8 = 24$

Q.E will be : $x^2 - 11x + 24 = 0$

Methods of Solving Quadratic Equation

1) Factorization Method 2) Quadratic formula

=) Factorization Method (Middle Term Splitting)

- Calculate $a \times c$
- find Two factor of ac such that their sum of difference is equal to b

2) Quadratic Formula

- find a, b & c → Apply formula : $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

Eg: $2x^2 + 11x + 14 = 0$

=) $a = 2$, $b = 11$ & $c = 14$

$x = \dfrac{-11 \pm \sqrt{121 - 4(2)(14)}}{2(2)} = \dfrac{-11 \pm \sqrt{121-112}}{4} = \dfrac{-11 \pm \sqrt{9}}{4}$

$x = \dfrac{-11+3}{4}$ or $\dfrac{-11-3}{4}$ =) $-\dfrac{8}{4}$ or $-\dfrac{14}{4}$ =) -2 or $-\dfrac{7}{2}$.

Discriminant = D => $b^2 - 4ac$ - Tell nature of roots

If $D = b^2 - 4ac > 0$ (Roots are real & different)

If $D = b^2 - 4ac = 0$ (Roots are real & Equal)

If $D = b^2 - 4ac < 0$ (Roots are not real)

If D is a positive perfect square then root can be rational.

If D isn't positive perfect square. Then roots can irrational.

Cubic Equation

$ax^3 + bx^2 + cx + d = 0$ where $a \neq 0$

It can have maximum 3 roots α, β & γ

$\boxed{\alpha+\beta+\gamma = -\frac{b}{a}}$ $\boxed{\alpha\beta+\beta\gamma+\alpha\gamma = \frac{c}{a}}$ $\boxed{\alpha\beta\gamma = -\frac{d}{a}}$

Cubic equation

$x^3 - (\alpha+\beta+\gamma)x^2 + (\alpha\beta+\beta\gamma+\alpha\gamma)x - \alpha\beta\gamma = 0.$