# CLASS 10 MATHS – CHAPTER 4

## QUADRATIC EQUATIONS – ALL FORMULAE

### Basic Idea

- Highest power = 2
- Forms parabola graph
- Used in real-life problems
- Can have 0, 1, or 2 roots
- Based on quadratic polynomial
- Appears in motion problems
- Important algebra topic
- Helps in modelling situations

### Quadratic Form

- $ax^2 + bx + c = 0$
- $a \neq 0$ (must condition)
- a, b, c → real numbers
- a → quadratic coefficient
- b → linear coefficient
- c → constant term
- Standard form required
- Degree always 2

### Roots or Solutions

- Values of x satisfying equation
- Also called zeroes
- Represented as α, β
- Can be real or imaginary
- Found using methods
- Correspond to graph points
- May be equal or distinct
- Satisfy equation

### Factorisation

- Used when factors possible
- Convert into standard form
- Split middle term
- Take common factors
- Form product = 0
- Solve each factor
- Quick & easy method
- Not always applicable

## Completing Square

- Convert into perfect square
- Make coefficient of $x^2 = 1$
- Shift constant to RHS
- Add square of half coefficient
- Form $(x+a)^2$ type
- Solve by square root
- Useful when factorisation fails
- Step-based method

## Quadratic Formula

- $x = (-b \pm \sqrt{D}) / 2a$
- Universal solving method
- Works for all equations
- Substitute a, b, c values
- Solve discriminant first
- Gives exact roots
- Useful in exams
- Time-saving method

## Discriminant

- $D = b^2 - 4ac$
- Determines nature of roots
- Calculate before solving
- Important in theory
- Helps choose method
- Used in formula
- Quick result indicator
- Key exam concept

## Nature Of Roots

- $D > 0 \rightarrow$ two real & distinct
- $D = 0 \rightarrow$ equal roots
- $D < 0 \rightarrow$ no real roots
- Based on discriminant
- Linked with graph
- Helps in analysis
- Important for MCQs
- Predicts solution type

## Graph Of Parabola

- Shape = U-curve
- Cuts x-axis → 2 roots
- Touches x-axis → 1 root
- No touch → no real root
- a > 0 → opens upward
- a < 0 → opens downward
- Vertex is turning point
- Symmetrical graph

## Roots & Coefficient Relation

- $\alpha + \beta = -b/a$
- $\alpha\beta = c/a$
- Based on coefficients
- Helps in forming equation
- Used in problems
- Works for quadratic only
- No need to solve fully
- Important formula

## Forming Equation

- If roots known → form equation
- Formula: $x^2 - (\text{sum})x + \text{product}$
- Substitute $\alpha + \beta$, $\alpha\beta$
- Simplify expression
- Gives required equation
- Used in exams
- Reverse of solving
- Easy application