Class 10 Mathematics – Chapter: Quadratic Equations

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1. Introduction

A quadratic equation is a polynomial equation of degree 2, generally expressed as:

ax2+bx+c=0,a□0ax^2 + bx + c = 0, \quad a \neq 0ax2+bx+c=0,a□=0

where a,b,ca, b, ca,b,c are constants, and xxx is the variable.

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2. Methods to Solve Quadratic Equations

- Factorization Method: Express the quadratic as a product of two binomials and find roots by setting each factor to zero.
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Completing the Square: Rewrite the equation in the form (x+p)2=q(x + p)^2 = q(x+p)2=q and then solve for xxx.

- Quadratic Formula:

x=−b±b2−4ac2ax = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}x=2a−b±b2−4ac

This formula gives the roots directly.

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3. Nature of Roots

- Calculate the discriminant D=b2−4acD = b^2 - 4acD=b2−4ac.
- If D>0D > 0D>0, roots are real and distinct.
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If D=0D = 0D=0, roots are real and equal.

- If D<0D < 0D<0, roots are complex (no real roots).

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4. Relationship Between Roots and Coefficients

For roots α\alphaα and β\betaβ:

α+β=−baandαβ=ca\alpha + \beta = -\frac{b}{a} \quad \text{and} \quad \alpha \beta = \frac{c}{a}α+β=−abandαβ=ac

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5. Formation of Quadratic Equation from Roots

If roots are α\alphaα and β\betaβ, the quadratic equation is:

x2−(α+β)x+αβ=0x^2 - (\alpha + \beta)x + \alpha \beta = 0x2−(α+β)x+αβ=0

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6. Word Problems Involving Quadratic Equations

- Problems related to area, motion, and other contexts can be translated into quadratic equations and solved.
- Practice setting up the equation correctly before solving.

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7. Important Exam Tips

- Always calculate the discriminant first to know the nature of roots.
- Double-check factorization and arithmetic steps.

- Remember the quadratic formula and use it when factorization is not easy.
- Practice problems involving word problems to improve problem formulation skills.