Lesson Plan: Quadratic Formula Method in Solving Quadratic Equations

Subject
Mathematics

Topic
Solving Quadratic Equations – Formula Method

Grade Level
Secondary (Year 9-11)

Duration
60 minutes

Teaching Method
Direct Instruction, Demonstration, Guided Practice, Individual Work

Objectives
- Understand the quadratic formula: $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$

- Identify values of a, b, and c in a quadratic equation

- Apply the quadratic formula to solve any quadratic equation

- Analyze the discriminant to determine the nature of the roots

Materials Needed
- Whiteboard and markers

- Graphing calculator or regular calculator

- Quadratic formula poster/chart

- Worksheets with practice problems

- Projector (optional)

Prior Knowledge

- Familiarity with standard form: $ax^2 + bx + c = 0$

- Understanding of square roots and basic operations

- Knowledge of discriminant and square numbers

Lesson Introduction (10 minutes)

Begin with a review of different methods for solving quadratic equations: factoring and completing the square.

Introduce the quadratic formula as a universal method that always works.

Write the formula on the board and explain each component.

Lesson Presentation (20 minutes)

Step-by-Step Example:

Solve $x^2 - 3x - 10 = 0$ using the quadratic formula

1. Identify $a = 1, b = -3, c = -10$

2. Substitute into the formula:

$x = [-(-3) \pm \sqrt{((-3)^2 - 4(1)(-10))}] / (2*1)$

$x = [3 \pm \sqrt{(9 + 40)}] / 2 = [3 \pm \sqrt{49}] / 2$

$x = [3 \pm 7] / 2 \rightarrow x = 5$ or $x = -2$

Discuss the discriminant ($b^2 - 4ac$) and its meaning:

- Positive: 2 real solutions

- Zero: 1 real solution

- Negative: No real solution

Guided Practice (10 minutes)

Solve together:

- $x^2 + 4x + 3 = 0$

- $2x^2 + 3x - 5 = 0$

- $x^2 + 2x + 5 = 0$ (discuss imaginary roots)

Independent Practice (10 minutes)

Students solve:

1. $x^2 - 6x + 9 = 0$

2. $x^2 + 7x + 12 = 0$

3. $3x^2 - x - 4 = 0$

4. Word problem: The height of a projectile is given by $h = -16t^2 + 40t + 5$. When will it hit the ground?

Review and Summary (5 minutes)

Recap the quadratic formula and how to use it.

Review the role of the discriminant.

Highlight when this method is most appropriate.

Answer questions.

Assessment (Homework)

Assign 5 problems using the quadratic formula, including one word problem and one with imaginary solutions.

Evaluation Criteria

- Proper identification of a, b, and c

- Accurate substitution and calculation

- Interpretation of discriminant

- Logical steps and clear solution process