

Lesson Plan: Completing the Square Method

Subject

Mathematics

Topic

Solving Quadratic Equations – Completing the Square

Grade Level

Secondary (Year 9-11)

Duration

60 minutes

Teaching Method

Direct Instruction, Guided Practice, Individual Work

Objectives

- Understand the concept of completing the square.
- Transform a quadratic equation into a perfect square trinomial.
- Solve quadratic equations using the completing the square method.
- Apply the method to real-life word problems.

Materials Needed

- Whiteboard and markers
- Graphing calculator (optional)
- Handouts with examples and exercises
- Projector (for visual examples)

- Quadratic tiles or visuals (optional)

Prior Knowledge

- Know how to expand and factor quadratic expressions
- Understand square roots and basic algebraic manipulation
- Be familiar with standard form of a quadratic equation: $ax^2 + bx + c = 0$

Lesson Introduction (10 minutes)

Begin with a warm-up: Ask students to solve a simple equation like $x^2 + 6x + 9 = 0$.

Guide them to recognize it as a perfect square: $(x+3)^2 = 0$.

Connect this to the day's topic: Today, we'll learn how to turn any quadratic equation into a perfect square.

Lesson Presentation (20 minutes)

Step-by-Step Example:

Solve $x^2 + 6x + 5 = 0$

1. Move constant to the right: $x^2 + 6x = -5$
2. Half of 6 is 3; square it: $3^2 = 9$
3. Add 9 to both sides: $x^2 + 6x + 9 = 4$
4. Factor: $(x + 3)^2 = 4$
5. Solve: $x + 3 = \pm 2 \rightarrow x = -1 \text{ or } -5$

Repeat with example where $a \neq 1$: $2x^2 + 8x + 3 = 0$

Guided Practice (10 minutes)

Solve together:

$$-x^2 - 4x + 1 = 0$$

$$-3x^2 + 12x - 6 = 0$$

Independent Practice (10 minutes)

Student exercises:

1. $x^2 + 10x + 16 = 0$
2. $x^2 - 2x - 8 = 0$
3. $2x^2 + 4x - 6 = 0$
4. Word problem involving a ball's height over time.

Review and Summary (5 minutes)

Recap steps of completing the square.

Highlight usefulness.

Answer questions.

Assessment (Homework)

Assign 4–5 problems using completing the square, including one real-life application.

Evaluation Criteria

- Accuracy in solving
- Correct completion of the square
- Logical steps and justification
- Participation in class