Teaching Guideline: Solving Systems of Equations (Substitution & Elimination)

🎯 Objective for the Lesson:

Students will learn:
- How to solve a system of two linear equations using substitution.
- How to solve a system using elimination.
- How to choose an appropriate method depending on the form of the equations.

◇ PART 1: Quick Review of Linear Equations (5–7 minutes)

Purpose: Activate prior knowledge and build confidence.
1. Ask students:
   - "What does it mean to solve a linear equation?"
   - "What does a solution to a system of equations represent?" → Emphasize that the solution is a pair of values that make both equations true at the same time.
2. Sample recall question: Solve: $2x + 5 = 11$ (Answer: $x = 3$)

◇ PART 2: Teaching the Substitution Method (15–20 minutes)

🔘 Concept Overview:

In the substitution method, we solve one of the equations for one variable in terms of the other, and then we substitute that expression into the second equation. This gives us an equation with only one variable, which we can solve. We then use that value to find the second variable.

🔘 Step-by-Step Example:

System:
1. $y = 2x + 1$
2. $3x + y = 16$

Step 1: Identify if any equation is already solved for a variable → Equation 1 is solved for y.
Step 2: Substitute $2x + 1$ for y in Equation 2: $3x + (2x + 1) = 16$
Step 3: Solve the resulting equation: $5x + 1 = 16 \rightarrow x = 3$
Step 4: Substitute $x = 3$ into Equation 1: $y = 2(3) + 1 = 7$
Step 5: Final answer → $(x, y) = (3, 7)$

Tips for Teaching Substitution:

- Always simplify expressions as much as possible.
- Remind students to use parentheses when substituting.
- Encourage checking the final answer in both original equations.

Practice Suggestions:

Example for practice:
1. x + y = 9
2. x = 2y

◇ PART 3: Teaching the Elimination Method (15–20 minutes)

Concept Overview:

In the elimination method, we combine both equations in a way that cancels out (eliminates) one of the variables. This allows us to solve for the other variable. We usually add or subtract the equations.

Step-by-Step Example:

System:
1. 2x + 3y = 12
2. 2x - y = 4

Step 1: x terms are identical. Subtract Equation 2 from Equation 1:
→ 2x + 3y - (2x - y) = 8 → 4y = 8 → y = 2
Step 2: Substitute y = 2 into Equation 2: 2x - 2 = 4 → x = 3
Step 3: Final Answer → (x, y) = (3, 2)

When Coefficients Don’t Match:

Example:
1. 2x + y = 10
2. 3x - 2y = 5

Multiply Equation 1 by 2 → 4x + 2y = 20
Then add: (4x + 2y) + (3x - 2y) = 25 → 7x = 25 → x = 25/7
Then substitute to find y.

Tips for Teaching Elimination:

- Always align equations vertically.
- Encourage students to check signs when adding or subtracting.
- Multiplying one or both equations is normal; expect fractions.

🔘 Practice Suggestions:

Example for practice:
1. x + 2y = 10
2. 2x - 2y = 4

◇ PART 4: Comparing the Two Methods (5 minutes)

Ask students:
- Which method did you prefer and why?
- Which method was easier for today's problems?

Key Comparison:
Substitution: Best when one equation is already solved for a variable.
Elimination: Best when coefficients match or can easily be matched.

◇ PART 5: Mixed Practice & Method Selection (10–15 minutes)

Provide a mix of problems. Some should suit substitution; others, elimination.
Ask students to choose a method, solve, and explain their choice.

◇ PART 6: Wrap-Up & Exit Ticket (5 minutes)

Exit Ticket Ideas:
- Solve a system using your preferred method.
- Explain how you choose a method.
- What was the most challenging part of the lesson?

☑ Final Notes for the Teacher:

- Use clear, small-step explanations.
- Check frequently with guiding questions.
- Watch for common errors (signs, distribution, substitution).
- Emphasize that both methods are valid and will yield the correct answer.