

## Solving Systems by Elimination (6-3) – 2 days

### *Grade Level and Content*

8<sup>th</sup> Grade Algebra

### *Big Idea*

Students review that the solution of a system of linear equations is an ordered pair that makes both equations true. In this lesson, students recall the addition and multiplication properties of equality and discover that they can reduce a system to one equation with one variable by applying these properties to eliminate one of the variables. They then practice solving systems of equations using elimination.

### *Objectives*

Students will be able to ...

1. Correctly solve systems of linear equations in two variables by elimination 8 out of 10 times.
2. Correctly choose a method to solve a system of linear equations 8 out of 10 times.

### *PA State Standards*

**Anchor Descriptor - A1.1.2.2: Write, solve and/or graph systems of linear equations using various methods.**

**A1.1.2.2.1:** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations).

**A1.1.2.2.2:** Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only).

### *Rationale for Students*

The graphics and color will promote interest and motivation. Students need to know this technique for future classes and for future standardized tests. It is required by the standards.

### *Materials*

- 1 promethean board with computer
- 22 copies: Frog Riddle Worksheet
- 22 copies: Did you hear about riddle sheet letters A, B, C, D, J, L

### *Adaptations for Special Needs*

No adaptations were recommended by the special education teacher. I approach this lesson first by presenting new properties and questioning in a way that guides students to put the pieces together on their own. I then summarize or have students summarize the steps required to solve the problem.

### *Technology*

The promethean board will be used to present the lesson and enables the teacher and the students to work out solutions together. Students have access to online tutorials for each section so they can review concepts and have guided practice at home. All assignments will be posted on the class website so students who miss class won't fall behind.

## Anticipatory Set

7 minutes, 7 minutes

### Homework Check

Students warm up by reviewing converting equations to slope-intercept form. Particularly, students review my comments on the exit ticket they did for the Solving Systems by Graphing section. This is in preparation for a short quiz.

As students go through the steps to convert from one form to another, remind them about the addition and multiplication properties of equality since they will need this for elimination. In fact, when dividing, multiply by the reciprocal and distribute instead.

## Procedure (Day 1)

33 minutes, 40 minutes

### Homework

5 minutes, 12 minutes

*Go over the homework.*

### Interactive Presentation

10 minutes, 22 minutes

Recall the addition property of equality. As with substitution, the goal with elimination is to reduce the system to one equation with one variable so we can solve for that variable.

When we have an equation, what's on the left is equal to what's on the right. Would you agree that I can do this (*move equation to scale*)?

From the addition property of equality, I can add something to this side of the equation as long as I add it to the other side, too. Does anyone have any ideas about what we could add to this equation to make one equation with one variable?

Recall the multiplication property of equality. Remember the goal with elimination is to reduce the system to one equation with one variable so we can solve for that variable.

Remember that we can do this with an equation (*move equation to scale*).

From the multiplication property of equality, I can multiply something to this side of the equation as long as I multiply it to the other side, too. Does anyone have any ideas about what we could multiply to this equation to make one equation with one variable?

### Practice Problems

8 minutes, 30 minutes

Students work at their seats while one student (selected randomly) works at the board. Student at the board then explains the problem.

### Quiz

10 minutes, 40 minutes

Quiz on solving systems by graphing and by substitution.

## Closing/Homework (Day 1)

5 minutes, 45 minutes

Think about how the solutions found by graphing, substitution, and elimination compare to one another. What did you notice about the solutions to the system that you solved by graphing and by substitution on the quiz? If you solved this system by elimination, what do you think the solution would be?

### Homework

Frog Riddle Worksheet

## Anticipatory Set (Day 2)

5 minutes, 5 minutes

### Homework Check

Students warm up with a simple addition problem.

## Procedure (Day 2)

35 minutes, 40 minutes

### Interactive Presentation

5 minutes, 20 minutes

*Because I was unable to get through everything that I had planned yesterday and because I felt my presentation was too complex, I plan to start with a warm up that has them solve a simple elimination problem. I will then move into a discussion on choosing the best method for solving a system. I will not go over homework at the start. I chose three homework problems to do after the presentation example problems. I will then display the solutions and students can ask additional questions or sign up for Math Mastery.*

There are three methods for solving a system of linear equations. This first example has two equations in slope-intercept form. What method do you think would work for this system? (graphing or substitution)

This next system has one equation solved for a variable. What method do you think would work for this system? (substitution)

Here is the final example. What do you think would be the easiest method to use to solve this system? (elimination)

Some systems don't come perfectly setup for any given method. You will have to make some modifications first. You know this from graphing and substitution. You have to put both equations in slope-intercept form if they are not already. For substitution, you have to solve one equation for a variable if one is not already in that form.

To solve for elimination, you know that you need one of the variable terms to have opposite coefficients. Here is a problem that I want you to solve by elimination, but there is something you have to do first to get into a form that will work. What do you think we have to do?

### Practice Problems

10 minutes, 30 minutes

Students work at their seats while one student (selected randomly) works at the board. Student at the board then explains the problem. I included three homework problems to go over before giving the solutions.

## Closing/Homework (Day 2)

5 minutes, 45 minutes

### Exit Ticket

Solve by elimination.

$$\begin{cases} x = 2y - 4 \\ x + 8y = 16 \end{cases}$$

### Homework

Did you hear about riddle sheet letters A, B, C, D, J, L  
Additional enrichment I, K