

# 2002 National Teacher Training Institute

Grades 8-12

Eliminate What?

## Master Teacher

Mindy Hester

## Time Allotment

One class period

## Overview

Students will solve systems of two linear equations in two unknowns by the elimination method. After a brief review of other methods of solving, such as using a table of values and graphing, students will note that these methods do have drawbacks. Another method, the algebraic approach of solving by elimination, offers an alternative. Students will watch a video lesson demonstrating how two equations can be manipulated to produce one equation with one variable, which is easily solved. Students will have the opportunity to practice the skill, both on an interactive Web site and on paper.

## Subject Matter

Mathematics—Algebra I

## Learning Objectives

Students will be able to:

- ✎ solve systems of linear equations using the elimination method

## South Carolina Standards

(These Standards can be found online at [http://www.sde.state.sc.us/offices/cso/Standards\\_Page.htm](http://www.sde.state.sc.us/offices/cso/Standards_Page.htm).)

SC Standard II-B-2: Solve systems of linear equations using concrete models, graphs, tables, and algebraic methods.

## Media Components

### Video

*Linear Systems*, Lesson 4: “Methods of Elimination” begins with two computer-generated characters who have been trying to solve a system of linear equations with two variables. They become frustrated with the drawbacks of the methods they have been using and look for another alternative. The video lesson shows the algebraic method of solving by elimination, giving several examples. In each case, the object is to take the two equations, eliminate one variable, resulting in one equation with just one variable, which is easy to solve, and then substitute that value into one of the original equations to find the value of the other variable.

### Web Site

*edhelper.com* (<http://www.edhelper.com/algebra.htm#s5>) is devoted to offering help and solving tips for a variety of math topics, as well as language arts skills and test prep practice. This page gives two sample problems worked out in detail and then provides the student with a worksheet of practice problems, with answers available by e-mail.

## Materials

### Per student:

paper  
pencil  
“Practice Exercises” (Activity Sheet 1)

### Prep for Teachers

- ✎ Prior to teaching the lesson, bookmark the Web site, <http://www.edhelper.com/algebra.htm#s5>

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- ✍ Prepare the hands-on element of the lesson by copying the Practice Exercises. Each student gets a copy.
- ✍ When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites, or other multimedia elements.
- ✍ Preview the video and have it set to the beginning of Lesson 4: “Methods of Elimination.”

## Introductory Activity

**Step 1:** Provide the students with a **Focus for Media Interaction** by asking them to list one advantage and one disadvantage for each method of solving already discussed. START the videotape at the beginning of Lesson 4. PAUSE the tape after the narrator says, “we really need another way to identify this ordered pair,” and you see on the screen a flashing yellow question mark on the point where the two blue lines intersect.

**Step 2:** To check for comprehension, ask students what was one advantage and one disadvantage to solving by a table of values (*Advantage—easy to see the match; Disadvantage—could be very time-consuming*); and one advantage and one disadvantage to solving by graphing (*Advantage—easy to locate the point of intersection; Disadvantage—can’t always identify the point of intersection accurately*).

## Learning Activities

**Step 1:** Provide students with a **Focus for Media Interaction** by asking them to look for the mathematical principle that allows for solving by elimination. START the tape again and watch till the narrator says “and eliminate one of the variables,” and you see on the screen  $8x + 0 = 16$ .

PAUSE the tape and check for comprehension by asking which mathematical principle allows this. (*Addition property of equality, or equals added to equals are still equal.*)

**Step 2:** Provide students with a **Focus for Media Interaction** by asking them to listen for the narrator to tell what the object of algebraic methods is. START the tape again and let the narrator finish the solving of the example. PAUSE the tape after the narrator says, “we used addition in this case to eliminate the y variable,” and you see on the screen “Elimination Method” with the problem worked out and a solution of  $x = 2$  on the bottom row.

Check for comprehension by asking what the object of algebraic methods is. (*To take two equations with two variables, and produce one easy-to-solve equation with just one variable.*)

**Step 3:** Provide students with a **Focus for Media Interaction** by asking them to notice what is multiplied in the next example, and why. START the tape again and play it until the problem is solved for y. PAUSE the tape when the narrator says, “and simply solve for y,” and you see on the bottom line of the screen  $y = 2$ .

Check for comprehension by asking what was multiplied and why. (*Multiplied first equation by 5 and second equation by 3 so both equations have 15 for the coefficient of x, then subtract to eliminate the x terms.*)

START the tape again and let it play while the example is completed. PAUSE the tape when the narrator says, “x equals minus 3, and y equals 2,” and  $x = -3$  and  $y = 2$  are showing on the bottom line of the screen.

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**Step 4:** Provide students with a **Focus for Media Interaction** by asking them to listen for the narrator’s comment that “it really doesn’t matter” and ask them what it is that doesn’t matter. START the tape again and play it until the narrator says, “we will get the same solution.” PAUSE the tape and check for comprehension by asking what doesn’t matter. (*Which variable you eliminate.*) Then have students solve the problem the other way (on scratch paper), by eliminating the  $y$ ’s, and check to see that they did indeed get the same solution. ( $x = -3, y = 2$ )

## Culminating Activity

(Includes assessment)

**Step 1:** Provide students with a **Focus for Media Interaction** by asking them to complete the problems on this Web page. Have students log on to the Web site <http://www.edhelper.com/algebra.htm#s5> and read the explanations of the sample problems. Then have them scroll down to the bottom of the page and indicate in the check-box if they wish to have the answers to the worksheet e-mailed to them; if so, they should enter their e-mail address. Then tell them to click on the blue box that says “Create WorkSheet Now!” Students may print out the worksheet, or they may carefully copy the problems onto their own paper to solve. Students should check their own answers to the worksheet.


**Step 2:** Hand out Activity Sheet 1, the “Practice Exercises.” Tell students to complete the exercises and turn their sheets in to you. Instruct students to show all necessary work.

## Cross-Curricular Extensions

**Language Arts:** Have students write a summary for a classmate who was absent describing what they learned, necessary steps for solving by the elimination method, and reasons why it is a convenient method for solving.

**Technology:** Investigate solving some of the practice exercises by other methods, such as using a graphing calculator.

## Community Connections

 Interview a pilot (airline or boat) or member of the armed forces about how they use technology and systems of equations in plotting courses and avoiding traffic.

## Student Materials

Activity Sheet 1, “Practice Exercises”

## Activity Sheet 1: Practice Exercises

Solve the following systems of equations using the algebraic method of elimination by addition or subtraction. Show all necessary work.

1.  $5x - 3y = 17$   
 $2x + 3y = 11$

2.  $3x + 2y = 13$   
 $x + 2y = 7$

3.  $5a + 2b = 8$   
 $4a - 3b = -12$

4.  $2m + 7n = 2$   
 $5m + 3n = -2$

Write full solutions for the following word problems. A full solution includes opening statements to introduce the variables, such as “Let  $x = \dots$ , [”?”] the translation of the words into two equations with two variables, the solution of the system, and final statements which answer the problem.

1. The sum of two real numbers is 17. Their difference is 7. Find the numbers.

2. Three times one number, plus twice a second number is 58. Ten times the first number less three times the second number is  $-29$ . Find the numbers.

3. Tickets to a school play cost \$5.00 for adults and \$3.00 for students. A total of 249 tickets is sold for \$961.00. How many adults and how many students purchased tickets?

Permission to reprint these exercises from the *Linear System's Teacher Guide* is granted by TVOntario, Cary, NC.