



MISSISSIPPI

# EXEMPLAR

Units & Lessons

MATHEMATICS

Grade 8

Grant funded by:



## Lesson 7: More Substitution

**Focus Standard(s):** 8.EE.8b

**Additional Standard(s):** 8.EE.7a, 8.EE.7b

**Standards for Mathematical Practice:** SMP.3, SMP.4, SMP.6, SMP.7

**Estimated Time:** 50 minutes

**Resources and Materials:**

- Colored pencils
- Document camera
- Highlighters
- Handout 7.1: Buying Chips and Candy
- Handout 7.2: Lesson 7 Homework

**Lesson Target(s):**

- Students will understand the relationship between linear equations in two variables and lines in a plane.
- Students will be able to understand the relationship between equivalent forms of linear equations.

**Guiding Question(s):**

- How can systems of equations be solved algebraically?


### Vocabulary

**Academic Vocabulary:**

- Substitution

**Instructional Strategies for Academic Vocabulary:**

- Introduce words with student-friendly definition and pictures
- Model how to use the words in discussion
- Read and discuss the meanings of words in a mathematical context

Symbol	Type of Text and Interpretation of Symbol
	Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below the grade level and/or for students who perform well above grade level
✓	Assessment (Pre-assessment, Formative, Self, or Summative)

### Instructional Plan

**Understanding Lesson Purpose and Student Outcomes:** Students will use colored pencils to make connections between equivalent values and how they may be used in solving systems through substitution. Students will solve a real-world scenario using any method.

#### Anticipatory Set/Introduction to the Lesson: Making Connections

Instruct students to solve the following multi-step equations with variables on both sides (SMP.4, SMP.6).

1.  $2x = 2x - 5$
2.  $4y + 6 = 2y - 4$
3.  $5(x - 3) = 3x + 8$

Ask students how this relates to our previous lesson on solving systems of equations using substitution.

#### For students who are EL, have disabilities, or perform well below grade-level:

- Provide graph paper to aid in solving one-variable equations. Each term gets a square. Highlight equal sign and squares below.
- Allow students to use Algebra Tiles to solve equations.

#### Activity 1: Substitution with Colored Pencils

Distribute two different colored pencils to each student. Using a document camera, model solving the following system using substitution.

$$x + 3y = 2$$

$$y = 3x + 4$$

Instruct students to highlight the isolated variable:  $y = 3x + 4$

Writes systems using colored pencils: both  $y$ -values in one color, the rest of the equation in the other. For example, notate ' $x+3$ ' using green, ' $y$ ' using purple, ' $=2$ ' using green as shown:  $x + 3y = 2$ .

Have students copy equation in their notes and independently write the second equation using colored pencils (SMP.7).

Model re-writing the first equation, but inform students that only one color should be used (in this case, green).

Model solving for  $x$  using green pencil, substituting  $3x+4$  for the  $y$  in the first equation.

Students copy as teacher solves. Students will re-write second equation using purple for  $y = 3$ , green pencil for the value of  $x$  and  $+ 4$  using purple pencil. Students solve for  $y$  using purple.

Repeat this process with examples of no solution and infinite solutions and try to keep one equation in standard form and one equation solved for a variable (SMP.7).

**Note:** When substituting, watch for students failing to use parentheses or needing remediation with the Distributive Property.

**For students who are EL, have disabilities, or perform well below grade-level:**

- Students may want to highlight the what  $y$  equals in one equation and the  $y$  in the second equation that it will replace.

**Activity 2: Show Time**

Distribute **Handout 7.1: Show Time** to each student pair.

- ✓ Allow students to work in pairs to complete the task (SMP.1, SMP.2, and SMP.4).

Prompting Questions:

- What variables are needed to write a system for this scenario?
- What would the variables represent?
- What are some other ways to solve this besides substitution or graphing?

**For students who are EL, have disabilities, or perform well below grade-level:**

- Encourage students to make tables of the scenarios and look for a common point on the tables.

**Extensions for students with high interest or working above grade level:**

- Have students justify their responses using multiple representations.

**Activity 3: Ambassador**

One student from each pair of students will share their findings from Activity 2 with another group. Throughout this process, students may make changes to their original responses.

Facilitate a whole group discussion by asking students about changes, if any, that were made to the task after the walk-around and which method was the most efficient to work with(SMP.3).

**Homework**

Distribute **Handout 7.2: Lesson 7 Homework** and instruct students to complete the assignment independently overnight.

**Handout 7.1: Show Time**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Movie tickets at the local theater cost \$6 for adults and \$2 for children under 12. If 175 tickets were sold, with cash receipts of \$750, how many children's tickets were sold?**

**Reflection:**

**What was the best method to solving the system? Why was this the most efficient way to solve?**

**Handout 7.2: Lesson 7 Homework**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Solve each system using substitution. Show your work. List your solution as a coordinate pair.

1.  $x - \frac{y}{2} = -1$

$$x + y = -7$$

2.  $x = 3 + 3y$

$$2x + 9y = 11$$

Handout 7.2: Lesson 7 Homework **KEY**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Solve each system using substitution. Show your work. List your solution as a coordinate pair.

1.  $x - \frac{y}{2} = -1$

$x + y = -7$

**(-3, -4)**

2.  $x = 3 + 3y$

$2x + 9y = 11$

**(4, 1/3)**



For training or questions regarding this unit,  
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