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MATHEMATICS

Grade 8

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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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