Weekly Focus: equations
Weekly Skill: simplify, word problems

LESSON 19: Equations

Lesson Summary: For the Warm Up, students will solve a problem about area. In Activity 1, they will review vocabulary form Lesson 18 as well as learn new words. In Activity 2, they will work on word problems with expressions and equations. In Activity 3, they will solve equations. In Activity 4, they will do problems in the workbook. Activity 5 is a matching activity. Estimated time for the lesson is 2 hours.

Materials Needed for Lesson 19:

- Video (length 14:11) on solving equations with addition and subtraction.
- Video (length 7:40) on solving multiplication and division equations. The videos are required for teachers and recommended for students.
- 3 Worksheets (19.1, 19.2, 19.3) with answers (attached or embedded link)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Student Book (pages 52 – 53)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Workbook (pages 62 – 65)
- Scissors and card stock (if you have it) for Activity 5

Objectives: Students will be able to:

- Solve the review word problem on area and expressions
- Solve equations using addition, subtraction, multiplication, and division
- Solve word problems with equations

ACES Skills Addressed: N, CT, LS, ALS
CCRS Mathematical Practices Addressed: Make Sense of Problems and Persevere in Solving Them, Mathematical Fluency, Model with Math
Levels of Knowing Math Addressed: Intuitive, Pictorial, Abstract, and Application

Notes:
You can add more examples if you feel students need them before they work. Any ideas that concretely relates to their lives make good examples.

For more practice as a class, feel free to choose some of the easier problems from the worksheets to do together. The "easier" problems are not necessarily at the beginning of each worksheet. Also, you may decide to have students complete only part of the worksheets in class and assign the rest as homework or extra practice.

The GED Math test is 115 minutes long and includes approximately 46 questions. The questions have a focus on quantitative problem solving (45%) and algebraic problem solving (55%).

Students must be able to understand math concepts and apply them to new situations, use logical reasoning to explain their answers, evaluate and further the reasoning of others, represent real world problems algebraically and visually, and manipulate and solve algebraic expressions.

This computer-based test includes questions that may be multiple-choice, fill-in-the-blank, choose from a drop-down menu, or drag-and-drop the response from one place to another.

The purpose of the GED test is to provide students with the skills necessary to either further their education or be ready for the demands of today's careers.

Lesson 19 Warm-up: Solve the area problem	Time: 10 Minutes

Write on the board: The area of Rachel's garden is 70 square feet. The area of Roberto's garden is 20 square feet more than twice that of Rachel's garden.

Basic Questions:

- If the width of Rachel's garden is 7 feet, what is the length? *(10 feet since L x W = 70)*
- What is the area of Roberto's garden? *(70 + 70 + 20 = 160 square feet)*
- What could the length and width of Roberto's garden be? *(Some possible answers are 16 x 10, 40 x 4, or 8 x 20)*

Extension Question:

- Write an expression to describe the size of Roberto's garden *(2r + 20)* (any variable is ok)

Activity 1a: Vocabulary T or F Activity 1b: New vocabulary	Time: 10 Minutes

This activity can be projected on the board and done as a whole class. Have students volunteer to write answers. Part b is to teach new vocabulary and give examples.

1a answers: 1.F, 2.T, 3.T, 4.F (an expression doesn't have an = sign)
1b answers: 5. 2, 6.45, 7. B=30, 8. Inverse of subtraction is addition; we added 2 to both sides.

A. For questions 1-4, write True or False:

1. A constant is a number that changes. _____
2. An expression may contain variables and constants such as 5x – 12 _____
3. A variable is a symbol or letter used to represent the missing number. _____
4. Equation and expression mean the same thing. _____

B. For Questions 5-8, write the answer:

5. An expression may contain one **term** such as 3x or two terms such as 3x + 21. How many terms are there in 21y – 4? _____

6. In a term, the **coefficient** is the number used to multiply a variable. In the term 3x, 3 is the coefficient. What is the coefficient in the term 45c? _____

7. **Simplifying** an equation means solving it. We simplify x + 10 = 17 by solving as x=7. Simplify B – 2 = 28. _____

8. We use **inverse (opposite)** operations to solve equations. In the example x + 10 = 17, we used the inverse of addition, which is subtraction, to solve for x. We subtracted 10 from both sides. What is the inverse operation for B – 2 = 28? _____

Lesson 19 Activity 2: Word Problem Practice	Time: 15-20 Minutes

1. Use **student book pages 52-53**. Page 52 has examples of solving equations that will be practiced further in activities 3 and 4.
2. Do questions 1-10 to practice expressions, equations, and word problems.
3. Help the students write equations to solve the word problems.

Lesson 19 Activity 3: Solving Equations	Time: 20-25 Minutes

1) Example A: Jay's paycheck includes his regular pay plus overtime. If his regular pay is $900 and the total is $1225, how much is the overtime pay?
   a) Write an equation to help solve the problem. $900 + x = $1225
   b) Solve for the overtime. We subtract $900 from both sides to get x = $325. Since the $900 was added, we used the inverse, subtraction, to solve for x.

2) Example B: In the warm up problem, Rachel's garden is 7 feet wide and 70 feet square.
   a) Write an equation to solve for the length. Since we know that width times length gives area, the equation is 7 x L = 70, or preferably, 7L=70
   b) Solve for the length. Since 7 is multiplied by L, we do the inverse operation of dividing by 7 to isolate the L. 7L/7 = 70/7. L=10 feet.

3) Example C: Brandon works in a restaurant. He has a recipe that calls for ¼ cup of sugar for every 2 servings of a certain dessert. How many servings would 1 cup make?
   a) Write an equation for the original recipe. 1/4c = 2 servings
   b) Solve for c. We need to get 1 cup, so we multiply both sides by four. 4 $(1c/4) = 2\ (4)$. 1c= 8 servings
   c) Note to teacher: This can also be solved as a proportion problem. I wanted to have an example of multiplying a whole number by a fraction to cancel the denominator.

4) Practice with **Worksheet 19.1**. Do the first few together on the board.
5) Give **Worksheet 19.2** for homework.

Lesson 19 Activity 4: Word Problems	Time: 35-45 Minutes

Have students work independently in the **workbook pages 62-65**. Circulate to help. Some problems (like #19) will be challenging and you may need to do them together on the board.

Lesson 19 Activity 5: Matching Activity	Time: 15 Minutes

Below are the directions for the activity. If you don't have card stock or envelopes, use regular paper and paper clips (or make envelopes by folding paper and stapling the sides).

Directions: Print the cards on cardstock and pre-cut them before doing the activity. Place the cards in envelopes to hand out to each group. Allow your students to work in groups of 3-4 to complete the task. They must determine which values are solutions to the given equations. To encourage students to work together and prove their answers, give each group a large piece of poster paper where they are to show their work. Calculators may be used for lower-ability students if needed.

**Note: Be sure to cut the cards before doing the activity. The equations and solutions are already matched in the document.

Worksheet 19.1 Equations Computation

1) $h + 7 = -12$

2) $-60 = -6a$

3) $12 = \frac{v}{5}$

4) $2d = -24$

5) $-12 = 6 + b$

6) $\frac{k}{4} = -12$

7) $-7 = 7 + r$

8) $s - 2 = -9$

9) $6 = x + 7$

10) $7 = \frac{c}{3}$

Worksheet 19.1 Answers

1) $h + 7 = -12$

$h = -19$

2) $-60 = -6a$

$a = 10$

3) $12 = \frac{v}{5}$

$v = 60$

4) $2d = -24$

$d = -12$

5) $-12 = 6 + b$

$b = -18$

6) $\frac{k}{4} = -12$

$k = -48$

7) $-7 = 7 + r$

$r = -14$

8) $s - 2 = -9$

$s = -7$

9) $6 = x + 7$

$x = -1$

10) $7 = \frac{c}{3}$

$c = 21$

Worksheet 19.3 Matching Activity

Equations and Solutions Match-Up Activity

$-8 + x = -4$	$x = 4$
$\frac{x}{4} - 5 = -3$	$x = 8$
$-6x = 18$	$x = -3$
$x - 4 = -10$	$x = -6$
$12 = 7x - 2$	$x = 2$

Equations and Solutions Match-Up Activity

$11/3 = \frac{x-4}{6}$	$x = 12$
$\frac{35}{x} = 7$	$x = 5$
$x - \frac{5}{8} = \frac{5}{4}$	$x = 1\frac{7}{8}$
$2x + 3 + 6x = 75$	$x = 9$
$2x = -26$	$x = -13$