Weekly Focus: one-variable equations
Weekly Skill: solve, apply

LESSON 23: Linear Equations with One Variable

Lesson Summary: For the warm-up, students will solve a problem about pay options. In Activity 1, they will learn the steps to solve one-variable equations and practice one-step equations and two-step equations. In Activity 2, students can practice more two-step equations. Activity 3 consists of word problems. Activity 4 is an application problem about cheeseburgers. Estimated time for the lesson is 2 hours.

Materials Needed for Lesson 23:

- Video (length 9:16) on one-variable equations. The video is required for teachers and optional for students.
- 2 Worksheets (23.1, 23.2) with answers (embedded links)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Student Book (pages 60 – 61)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Workbook (pages 78 – 81)
- For the application activity, go to: http://robertkaplinsky.com/work/in-n-out-100-x-100/

Objectives: Students will be able to:

- Solve the 'pay' word problem
- Solve one-variable equations with one or two steps
- Solve the application problem about cost

ACES Skills Addressed: N, CT, LS, EC
CCRS Mathematical Practices Addressed: Building Solution Pathways, 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 relate 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 23 Warm-up: Solve the pay problem	Time: 5-10 Minutes

Write on the board: Elise was hired to work as a salesperson. Her boss offered her a choice of pay packages: Would she prefer (a) to get paid a straight salary of $3,200 a month, or (b) a base salary of $1,000 + 5% commission on sales she made?

Basic Questions:

- What other information do we need before we can answer the question?
  - Projected monthly sales
- If Elise is projected to have $60,000 in sales monthly, which is a better deal?
  - Choice B is better: $1,000 + 0.05 (60,000) = 1,000 + 3,000 = $4,000
  - Note: Did anyone mentally take 10% of $60,000 and cut it in half to get 5%?

Extension Question:

- Write an equation for choice B with s for sales and p for pay.
  - P = $1,000 + 0.05s

Lesson 23 Activity 1: How to Solve One-Variable Equations	Time: 30 Minutes

1. Steps to Solving a One-Variable Equation:
   a. Group all the variable terms on one side of the equation.
   b. Undo addition and subtraction by doing inverse operation.
   c. Undo multiplication and division by doing inverse operation.
   d. Check your answer by substituting answer back into original equation.

2. Example: The perimeter (P) of a basketball court is 90 meters and the width is 13 meters. What is the length (L)? Write an equation and solve it.
   a. We know that P= 2W + 2L. Substitute the numbers we are given to get 90 = 2(13) + 2L. 90=26 + 2L
   b. Solve for the variable L using the above steps.
      i. 90-26 = 26-26 + 2L
      ii. 64 = 2L
      iii. 23 = L
      iv. Check: 26 + 2(23) = 26 + 64 = 90. It is correct.
      v.

3. Do **Worksheet 23.1** One-Step Equations (10 minutes). Students had some practice with this in Lesson 19, so it is optional if students can already do one-step equations easily.

4. Do the problems in the **student book pages 60-61** together. Follow the steps outlined above.

   Teacher Note: You can also show the subtraction of 26 from both sides by writing -26 underneath the 90 and underneath 26 in a different color marker. Many students prefer this method visually.

Lesson 23 Activity 2: Two-Step Equations Practice	**Time: 15 Minutes**

Let students work independently on **Worksheet 23.2** Two-Step Equations**.** Follow steps outlined above. Do a few together first.

Lesson 23 Activity 3: Word Problems	**Time: 35-45 Minutes**

1. Have students work independently in the **workbook pages 78-81.**
2. These problems include one more step: multiplying the quantity in parentheses by the quantity outside the parentheses. Explain the example on page 78 and do #1 and #2 on the board together.
3. Circulate to help. Review any questions that students found challenging. Choose a few problems to have volunteer students do on the board.

Lesson 23 Activity 4 Application: Large Cheeseburger	**Time: 30-40 Minutes**

Notes for the teacher:

1. This activity practices input/output tables, equations, and graphing.
2. Look at the website for information and pictures: http://robertkaplinsky.com/work/in-n-out-100-x-100/
3. Just do the cost, not the calories, unless you have time at the end.
4. If you don't have time to do the whole activity:
   a. start the input/output table for a cheeseburger, a double, a triple, etc.
   b. write the equation together
   c. solve the equation for 100 cheeseburgers
   d. show the students the picture of 100 patties