Official SAT Practice

Lesson Plans
for Teachers by Teachers

LESSON 1 (1 OF 5 FOR HEART OF ALGEBRA)

Linear Equations, Linear Inequalities, and Linear Functions in Context

Subscore: Heart of Algebra

Focus: Using algebra to analyze and solve problems in context, otherwise known as word problems

Objectives:
Students will

- identify and implement the steps necessary to use algebra to analyze and solve problems in context.
- define one or more variables that represent quantities in context, and write expressions, equations, inequalities, and/or functions that represent the relationships described in the context.
- solve equations and interpret their solutions in terms of the context.
- recognize that different questions could be asked about the same context.

Before the Lesson:
- ☐ Review Chapter **16** of the *SAT® Study Guide for Students;* especially the answers and explanations for Examples 1–4.
- ☐ Preview the Teacher Notes for this lesson.
- ☐ Make sure you have a way to display or hand out Examples 1–4 to the class.

Introductory Activity | **10 minutes**

- Divide the class into three groups (one for each of the first three example problems). Each group can split into pairs for this activity.
  - ◆ Problems can be displayed and/or on slips of paper to hand out to students.
- Have each pair of students work on one of the example problems. As they complete the problem ask them to record the following:
  - **a.** Solve the problem—show all work and answer the question.
  - **b.** What do you need to know in order to be able to solve this problem?
  - **c.** What is the process you used to solve this problem?
- After pairs of students have completed solving their example problem, have them share the process with their group and see that all reach a consensus about the answer, what you need to know to solve the problem, and the process for solving it.

Example 1

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, how many miles of paved road will County X have in 2030? (Assume that no paved roads go out of service.)

Example 2

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, if n is the number of years after 2014, which of the following functions f gives the number of miles of paved road there will be in County X? (Assume that no paved roads go out of service.)

- **A.** $f(n) = 8 + 783n$
- **B.** $f(n) = 2{,}014 + 783n$
- **C.** $f(n) = 783 + 8n$
- **D.** $f(n) = 2{,}014 + 8n$

Example 3

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, in which year will County X first have at least 1,000 miles of paved roads? (Assume that no paved roads go out of service.)

Class Discussion | 15 minutes

- Have the class read all three example problems.
- What do you need to know to solve each problem? Display a full list across the three examples. Note similarities and differences between the three examples. Determine the following:
  - What a variable is, and how to define a variable.
  - How to write an expression.
  - How to substitute-in a value for a variable.
  - How to create a function for a given situation/context.
  - How to solve an equation/inequality.
  - How to interpret a solution.
- Create a list of steps for solving these types of problems.
  - Define one or more variables that represent quantities in the question.
  - Write one or more equations, expressions, inequalities, or functions that represent the relationships described in the question.
  - Solve the equation, and interpret the solution in terms of what the question is asking.
- Discuss the process and answers for each example problem.
  - See pages 200–201 in Chapter 16 of the *SAT Study Guide for Students* for solutions and explanations.

On Your Own | 5 minutes

- Have students complete Example 4.
- Ask students to turn and talk to a partner once finished.
- Extension: What other questions could have been asked about this context?

Example 4

To edit a manuscript, Miguel charges $50 for the first 2 hours and $20 per hour after the first 2 hours. Which of the following expresses the amount, C, in dollars, Miguel charges if it takes him x hours to edit a manuscript, where $x > 2$?

- **A.** $C = 20x$
- **B.** $C = 20x + 10$
- **C.** $C = 20x + 50$
- **D.** $C = 20x + 90$

See page 201 in Chapter 16 of the *SAT Study Guide for Students* for the solution and explanation for Example 4.

Wrap-Up—Mathematical Terms Review | **10 minutes**

- Create a list of terms related to this lesson with the class. Encourage students to define/discuss the meaning of each one and keep a running list in a notebook or on a word wall. Let students know that they will not have to know these terms for the SAT, but being familiar with the concepts will help them to succeed.
- Examples include:
    - Variable
    - Linear
    - Expression
    - Function
    - Equation
    - Inequality
    - Independent and dependent variable

Homework | **20 minutes**

- Link your College Board account to your Khan Academy® account. If you don't have any scores to import from your College Board account, take Math Diagnostic Quiz 1.
- Once your accounts are linked or you've taken Diagnostic Quiz 1, you can begin to practice problems at your skill level in these areas:
    - Interpreting linear functions
    - Linear equations word problems
    - Linear inequality word problems
    - Linear function word problems

Teacher Notes

A Note About Skill Levels

Skill levels range from 1–4 on Official SAT Practice on Khan Academy and correlate to practicing foundation (Level 1); easier (Level 2); medium (Level 3); and hard (Level 4) SAT questions. Once students have linked accounts, taken a diagnostic quiz (on Official SAT Practice), or taken a practice test, practice problems will be personalized to their skill level. By practicing problems successfully, they will be able to "level up" to harder questions.

A Note About Personalization

Official SAT Practice on Khan Academy may recommend that some students practice in skill areas other than the ones listed above. You may decide to direct students to the skills that reflect the lesson (those listed) or to independent practice of those recommended by Official SAT Practice, or both.