

Chapter 1 – Performing Operations and Evaluating Expressions
Section 1 – Variables, Constants, Plotting Points, and Inequalities

(Concentrate on writing units with answers and complete sentence descriptions.)

Objectives

1. Describe the meaning of variable and constant.
2. Describe the meaning of numbers: counting, integers, rational, irrational, real, positive, and negative.
3. Use a number line to describe numbers.
4. Graph data on a number line.
5. Plot points on a coordinate system.
6. Describe the meaning of inequality symbols and inequality.
7. Graph an inequality and a compound inequality on a number line.
8. Use inequality notation, interval notation, and graphs to describe possible values of a variable for an authentic situation.
9. Describe a concept or procedure.

Vocabulary

1. variable
2. constant
3. counting or natural number
4. integer
5. rational number
6. irrational number
7. real number
8. data
9. positive/negative number
10. ordered pair, coordinates
11. quadrant
12. inequality/inequality symbol
13. interval notation
14. compound inequality

Opening/Purpose

Lesson/Activity

OBJECTIVE 1 – Describe the meaning of variable and constant.

Definition: Variable

A variable is a symbol that represents a quantity that can vary.

1. Let p be the price (in dollars) to see a Modest Mouse concert. What is the meaning of $p = 60$?
2. Let t be the number of years since 2010. What is the meaning of $t = 7$? of $t = -5$?
3. Choose a symbol to represent the number of students in a class. Explain why the symbol is a variable. Give two numbers that the variable can represent and two numbers that it cannot represent.

Definition: Constant

A constant is a symbol that represents a specific number (a quantity that does not vary).

4. A rectangle has an area of 16 square feet. Let W be the width (in feet), L be the length (in feet), and A be the area (in square feet).
 - a. Sketch three possible rectangles of area 16 square feet.
 - b. Which of the symbols W , L , and A are variables? Explain.
 - c. Which of the symbols W , L , and A are constants? Explain.

OBJECTIVE 2 – Describe the meaning of numbers: counting, integers, rational, irrational, real, positive, and negative.

- The **counting numbers**, or **natural numbers**, are the numbers 1, 2, 3, 4, 5, . . .
- The **integers** are the numbers ..., -3, -2, -1, 0, 1, 2, 3, . . .
- The **positive integers** are the numbers 1, 2, 3, . . .
- The **negative integers** are the numbers -1, -2, -3, . . .
- The number 0 is neither positive nor negative.
- The **rational numbers** are the numbers that can be written in the form $\frac{n}{d}$, where n and d are integers and d is nonzero.
- The numbers represented on the number line that are not rational are called **irrational numbers**.
- The **real numbers** are all the numbers represented on the number line.

OBJECTIVE 3 – Use a number line to describe numbers.

5. Graph the integers between -4 and 2, inclusive, on one number line.
6. Graph the integers between -4 and 2 on one number line.
7. Graph the numbers 3, -5, 7, 2, 0, -2.7, and -1.3 on one number line.

OBJECTIVE 4 – Graph data on a number line.

8. The average student debts per borrower are shown in the following table for the five states with the largest per-student debts.

<u>State</u>	<u>Average Student Debt (thousands of dollars)</u>
Georgia	30.4
Maryland	30.0
Virginia	28.5
South Carolina	28.3
Florida	27.9

Source: U.S. Department of Education

Let d be a state's average student debt (in thousands of dollars).
Graph the average debts shown in the table on a number line.

When we write numbers on a number line, they should increase by a fixed amount and be equally spaced.

OBJECTIVE 2 – (revisited) Describe the meaning of numbers: counting, integers, rational, irrational, real, positive, and negative.

- The **negative numbers** are the real numbers less than 0.
- The **positive numbers** are the real numbers greater than 0.

9. Let T be the temperature (in degrees Fahrenheit). What value of T represents the temperature 20 degrees Fahrenheit below 0? Graph the number on a number line.

OBJECTIVE 5 – Plot points on a coordinate system.

10. Plot the points $(2, 5)$, $(-3, 1)$, $(-2, -4)$, and $(6, -3)$ on a coordinate system.

OBJECTIVE 6 – Describe the meaning of inequality symbols and inequality.

Here are the definitions of **inequality symbols**:

<u>Symbol</u>	<u>Meaning</u>
$<$	is less than
\leq	is less than or equal to
$>$	is greater than
\geq	is greater than or equal to

An **inequality** contains one of the symbols $<$, \leq , $>$, and \geq with a constant or variable on one side and a constant or variable on the other side.

11. Decide whether the inequality statement is true or false.

a. $4 < 7$

b. $3 \leq 3$

c. $-4 > -4$

d. $-6 \geq -2$

OBJECTIVE 7 – Graph an inequality and a compound inequality on a number line.

Write the inequality in interval notation, and graph the values of x .

12. $x < 4$

13. $x \geq -3$

14. $-2 < x \leq 5$

OBJECTIVE 8 – Use inequality notation, interval notation, and graphs to describe possible values of a variable for an authentic situation.

15. A person held his breath for at least 50 seconds. Let t be the length of time (in seconds) that he held his breath. Describe the length of time he held his breath using inequality notation, interval notation, and a graph.

16. Let t be the time (in minutes) it takes for a student to drive to college. Interpret and graph the inequality $19 < t < 23$.

OBJECTIVE 9 – Describe a concept or procedure.

Here are some guidelines on writing a good response:

- Create an example that illustrates the concept or outlines the procedure. Looking at examples or exercises may jump-start you into creating your own example.
- Using complete sentences and correct terminology, describe the key ideas or steps of your example. You can review the text for ideas, but write your description in your own words.
- Describe also the concept or the procedure in general without referring to your example. It may help to reflect on several examples and what they all have in common.

- In some cases, it will be helpful to point out the similarities and the differences between the concept or the procedure and other concepts or procedures.
- Describe the benefits of knowing the concept or the procedure.
- If you have described the steps in a procedure, explain why it's permissible to follow these steps.
- Clarify any common misunderstandings about the concept, or discuss how to avoid making common mistakes when following the procedure.

17. Describe how inequality notation, interval notation, and graphs can be used to describe possible values of a variable for an authentic situation.

Homework/Assessment

1, 3, 5, 15, 21, 29, 31, 47, 51, 55, 71, 81, 85, 99, 107