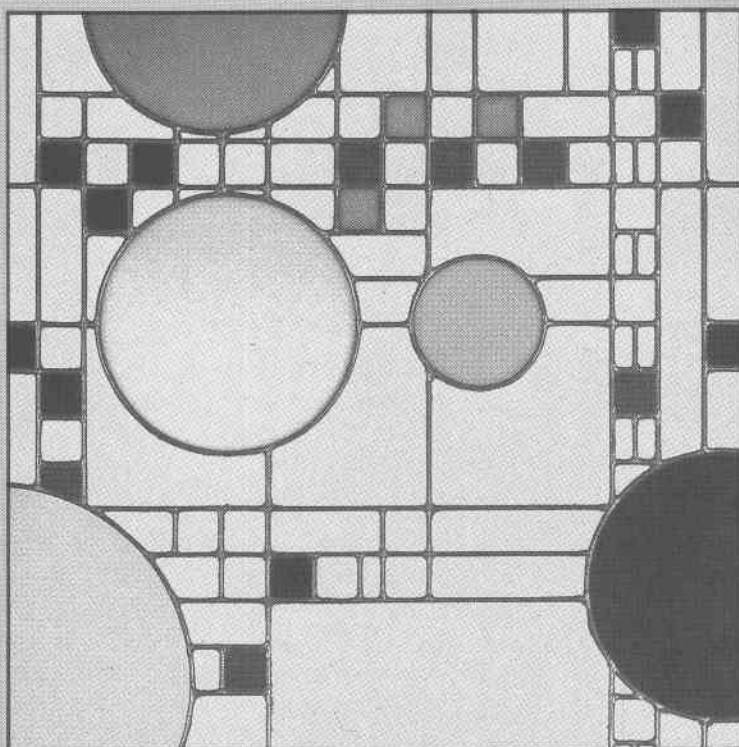


10

Signed Numbers



After completing this chapter, you should

Section 10.1 Variables, Constants, and Real Numbers

- be able to distinguish between variables and constants
- be able to recognize a real number and particular subsets of the real numbers
- understand the ordering of the real numbers

Section 10.2 Signed Numbers

- be able to distinguish between positive and negative real numbers
- be able to read signed numbers
- understand the origin and use of the double-negative property

Section 10.3 Absolute Value

- understand the geometric and algebraic definitions of absolute value

Section 10.4 Addition of Signed Numbers

- be able to add numbers with like signs and with unlike signs
- be able to use the calculator for addition of signed numbers

Section 10.5 Subtraction of Signed Numbers

- understand the definition of subtraction
- be able to subtract signed numbers
- be able to use a calculator to subtract signed numbers

Section 10.6 Multiplication and Division of Signed Numbers

- be able to multiply and divide signed numbers
- be able to multiply and divide signed numbers using a calculator

10.1 Variables, Constants, and Real Numbers

Section Overview

- VARIABLES AND CONSTANTS
- REAL NUMBERS
- SUBSETS OF REAL NUMBERS
- ORDERING REAL NUMBERS

VARIABLES AND CONSTANTS

A basic distinction between algebra and arithmetic is the use of symbols (usually letters) in algebra to represent numbers. So, algebra is a generalization of arithmetic. Let us look at two examples of situations in which letters are substituted for numbers:

- Suppose that a student is taking four college classes, and each class can have at most 1 exam per week. In any 1-week period, the student may have 0, 1, 2, 3, or 4 exams. In algebra, we can let the letter x represent the number of exams this student may have in a 1-week period. The letter x may assume any of the *various* values 0, 1, 2, 3, 4.
- Suppose that in writing a term paper for a biology class a student needs to specify the average lifetime, in days, of a male housefly. If she does not know this number off the top of her head, she might represent it (at least temporarily) on her paper with the letter t (which reminds her of *time*). Later, she could look up the average time in a reference book and find it to be 17 days. The letter t can assume only the one value, 17, and no other values. The value t is *constant*.

Variable

Constant

- A letter or symbol that represents any member of a collection of two or more numbers is called a **variable**.
- A letter or symbol that represents one specific number, known or unknown, is called a **constant**.

In example 1, the letter x is a variable since it can represent any of the numbers 0, 1, 2, 3, 4. The letter t in example 2 is a constant since it can only have the value 17.

REAL NUMBERS

Real Number Line

The study of mathematics requires the use of several collections of numbers. The **real number line** allows us to visually display (graph) the numbers in which we are interested.

A line is composed of infinitely many points. To each point we can associate a unique number, and with each number, we can associate a particular point.

Coordinate

The *number* associated with a point on the number line is called the **coordinate** of the point.

Graph

The *point* on a number line that is associated with a particular number is called the **graph** of that number.

We construct a real number line as follows:

Constructing a Real Number Line

- Draw a horizontal line.



- Choose any point on the line and label it 0. This point is called the **origin**.

