Chapter 1 – Performing Operations and Evaluating Expressions
Section 2 – Expressions

Objectives
1. Describe the meaning of expression and evaluate an expression.
2. Use expressions to describe authentic quantities.
3. Evaluate expressions.
4. Translate English phrases to and from mathematical expressions.
5. Evaluate expressions with more than one variable.

Vocabulary
1. expression
2. evaluate an expression
3. product/factor
4. quotient

Lesson/Activity
OBJECTIVE 1 − Describe the meaning of expression and evaluate an expression.
OBJECTIVE 2 − Use expressions to describe authentic quantities.

1. A person is driving 3 miles per hour over the speed limit.
   For each speed limit shown, find the driving speed.

   a. 55 mph
   b. 70 mph
   c. ***s*** mph
   We call **s + 3** is an ***expression***.

Definition: Expression

An **expression** is a constant, a variable, or combination of constants, variables, operation symbols, and grouping symbols, such as parentheses.

Here are some examples of expressions:

x + 9 5 x – 7 π $\frac{20}{x}$ xy

OBJECTIVE 3 − Evaluate expressions.

2. Substitute 65 for ***s*** in the expression ***s*** + 3 and discuss the meaning of the result (see Problem 1).

We say we have **evaluated** the expression ***s*** + 3 at *s* = 65.

Definition: Evaluate an expression

We **evaluate an expression** by substituting a number for each variable in the expression and then calculating the result. If a variable appears more than once in the expression, the same number is substituted for that variable each time.

Draw the skeleton of the following expressions.

$2x^2 - 3x + 7$ $\frac{4x+9}{x^3-1}$ $-x^4 + x^2 - 25$

3. A certain type of pen costs $3.
   a. Complete the following table to help find an expression that describes the total cost (in dollars) of ***n*** pens. Show the arithmetic to help see the pattern.

Number of Pens	Total Cost (dollars)
5	
6	
7	
8	
n	

b. Evaluate your result for $n = 10$. What does it mean in this situation?

- We avoid using × for the multiplication operation.
- Each of the following expressions describes multiplying 3 by ***n***: 3***n***, 3 · ***n***, 3(***n***), (3)***n***, and (3)(***n***).

OBJECTIVE 4 – Translate English phrases to and from mathematical expressions.
Mathematics is a language.

Definition: Product, factor, and quotient

Let ***a*** and ***b*** be numbers. Then

- The **product** of **a** and ***b*** is ***ab***. We call ***a*** and ***b*** **factors** of ***ab***.
- The **quotient** of **a** and ***b*** is ***a*** ÷ ***b***, or $\frac{\mathbf{a}}{\mathbf{b}}$ where ***b*** is not zero.

4. Use phrases such as "2 plus x" and sentences such as "Add 2 and x." to complete the second column of the following table.

Mathematical Expression	English Phrase or Sentence
2 + x	
2 – x	
2 · x	
2 ÷ x	

Warning: **Subtracting 2 from 7** is 7 – 2, not 2 – 7.

5. Let ***x*** be a number. Translate the English phrase into a mathematical expression or vice versa, as appropriate:

- The difference of the number and 9
- The product of 5 and the number
- $7 + x$
- $x \div 4$

6. Let ***x*** be a number. Translate the sentence "Subtract the number from 10." into a mathematical expression. Evaluate the expression at $x = 7$.

OBJECTIVE 5 – Evaluate expressions with more than one variable.

Recall that the **area** of a rectangle **is equal to** the **length times** the **width** of the rectangle.

7. Let ***W*** be the width (in feet) and ***L*** be the length (in feet) of a rectangle. Evaluate the expression ***LW*** for $L = 7$ and $W = 5$. What does your result mean in this situation?
8. Write the phrase "the quotient of ***x*** and ***y***" as a mathematical expression, and then evaluate the result for $x = 24$ and $y = 3$.

Homework/Assessment

1, 3, 11, 13, 19, 21, 23, 29, 35, 49, 53, 59, 61, 63, 67