

## I. EXPRESSIONS

## OBJECTIVES

When you have completed this section, you should be able to:

1. Identify bases, exponents, constants, variables, numerical coefficients, terms, sums, and products.
2. Simplify algebraic expressions when possible.
3. Evaluate algebraic expressions.
4. Translate algebraic expressions.

The expression  $8 + 3$  is a *numerical expression*: *numerical* because it consists of numbers; *expression* because it expresses an operation, in this case addition.

In algebra letters of the alphabet are used to represent numbers. These letters are referred to either as *unknowns* or as *variables*. An expression that contains a variable, such as  $n + 3$ , is an *algebraic expression*. Learning to handle algebraic expressions is the first step in this new system of mathematics. You will have an opportunity in this section to review and practice basic number skills and then to apply those skills in simplifying expressions by the distributive property.

## VARIABLES

If expressions, whether numerical or algebraic, imply addition, they are called *sums*; if they imply subtraction, they are called *differences*; if multiplication, *products*; and if division, *quotients*. These four operations will now be used in evaluating expressions.

## SUMS AND DIFFERENCES

In the expression  $n + 3$ ,  $n$  and  $3$  are *addends*. Since we have inserted the plus sign between the letter  $n$  and the number  $3$ , the expression is called an *indicated sum*. Its value cannot be determined until we know the value of  $n$ .

The expression  $n - 3$  means that  $3$  is to be subtracted from  $n$ . Likewise,  $3 - n$  means that  $n$  is to be subtracted from  $3$ .  $n - 3$  is called an *indicated difference*. The expressions  $n - 3$  and  $3 - n$  are not necessarily equal, because subtraction is an *ordered* operation. We see that  $8 - 3$  cannot be  $3 - 8$ . The *differences* are different.

In an algebraic expression, the letter that represents a number is called a *variable*. In the expression  $n + 8$ ,  $n$  is the variable and 8 is the *constant*.

Here are some other models of sums and differences.

$5 - y$

$x + 6$

$A + 10$

$A + B$

$x + y$

$x - y$

**\*\*\* Simplify. Work from left to right and perform any operation in parentheses first.**

Model:  $9 + 12 - 3 = 21 - 3 = 18$   
 $(2 + 5) - 4 = 7 - 4 = 3$

1.1  $9 + 6$  \_\_\_\_\_

1.2  $8 + 13$  \_\_\_\_\_

1.3  $5 + 22$  \_\_\_\_\_

1.4  $17 + 16$  \_\_\_\_\_

1.5  $32 + 43$  \_\_\_\_\_

1.6  $9 + 5 + 4$  \_\_\_\_\_

1.7  $3 + 8 + 4$  \_\_\_\_\_

1.8  $10 + 15 + 4$  \_\_\_\_\_

1.9  $17 + 18 + 5$  \_\_\_\_\_

1.10  $14 + 13 + 7$  \_\_\_\_\_

1.11  $10 - 6 + 8$  \_\_\_\_\_

1.12  $15 - 4 + 1$  \_\_\_\_\_

1.13  $17 - 3 - 4$  \_\_\_\_\_

1.14  $13 - 8 + 10$  \_\_\_\_\_

1.15  $28 + 4 - 10$  \_\_\_\_\_

1.16  $5 + (6 - 4)$  \_\_\_\_\_

1.17  $10 + (3 - 2)$  \_\_\_\_\_

1.18  $29 - (7 + 2)$  \_\_\_\_\_

1.19  $(13 + 2) - 8$  \_\_\_\_\_

1.20  $(50 + 5) - 11$  \_\_\_\_\_

**►► Write the meaning of each of the following expressions.**

Model:  $x + 10$       The sum of some number  $x$  and 10.

1.21  $n + 5$  \_\_\_\_\_

1.22  $n - 5$  \_\_\_\_\_

1.23  $x + 8$  \_\_\_\_\_

1.24  $x - 8$  \_\_\_\_\_

Model: George is 3 times as old as his sister Kate. Kate is 5 years younger than their sister Sue. In 5 years, George will be twice as old as Kate. How old is each now?

	age now	age in 5 years
George	$3x$	$3x + 5$
Kate	$x$	$x + 5$
Sue	$x + 5$	$x + 10$

The table should be filled in by simply adding 5. Leave the new relationship for the equation.

George will be twice Kate.

$$3x + 5 = 2(x + 5)$$

$$3x + 5 = 2x + 10$$

$$x = 5$$

$$3(5) + 5 \stackrel{?}{=} 2(5 + 5)$$

$$15 + 5 \stackrel{?}{=} 2(10)$$

$$20 = 20$$

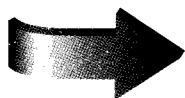
George is 15 years old.

Kate is 5 years old.

Sue is 10 years old.

Check:

$$\begin{array}{r} 5 \quad 5 \quad 10 \\ x \ 3 \quad + \ 5 \quad x \ 2 \\ \hline 15 \quad 10 \quad 20 \end{array}$$



Represent these answers in terms of  $x$ .

3.1 If Tammy is  $x$  years old now, how old will she be in 10 years? \_\_\_\_\_

3.2 How old was Tammy 11 years ago? \_\_\_\_\_

3.3 If Tom is 5 more than twice Dick's age, how old is he? \_\_\_\_\_

3.4 If Harry's age is  $3x - 12$ , how old will he be 15 years from now? \_\_\_\_\_

3.5 How old was Lisa  $x$  years ago if she is now 13? \_\_\_\_\_



Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items you missed on this test will indicate where restudy is needed for mastery.

## SELF TEST 1

Indicate (by *yes* or *no*) whether each of the following equations is quadratic. If so, give the values of  $A$ ,  $B$ , and  $C$  from the general form of each equation; if not, tell why (each part, 3 points).

1.01  $2x^2 - 4x + 1 = 0$  \_\_\_\_\_; \_\_\_\_\_

1.02  $x(x^2 + 1) = 0$  \_\_\_\_\_; \_\_\_\_\_

1.03  $5(4x + 2) = 3$  \_\_\_\_\_; \_\_\_\_\_

1.04  $(x + 3)(x + 4) = 5$  \_\_\_\_\_; \_\_\_\_\_

1.05  $-\frac{3}{4}x^2 + 2 = 0$  \_\_\_\_\_; \_\_\_\_\_

Apply the Square Roots Property of Equations to find each solution set (each answer, 3 points).

1.06  $x^2 = 9$

1.07  $(3x - 1)^2 = 5$

# MATHEMATICS 907: LIFE PAC TEST

Complete these items (each answer, 2 points).

1. Convert the fraction  $\frac{17}{20}$  to its equivalent decimal form.

\_\_\_\_\_

2. Convert the decimal  $0.\overline{14}$  to its equivalent fraction form.

\_\_\_\_\_

Complete these items (each numbered item, 3 points).

3. Give the order of the rational numbers  $(\frac{8}{5})^2$ ,  $2.5\overline{6}$ ,  $2\frac{1}{2}$ .

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\_\_\_\_\_

4. Find the rational number  $\frac{3}{4}$  of the way between -3 and 3.

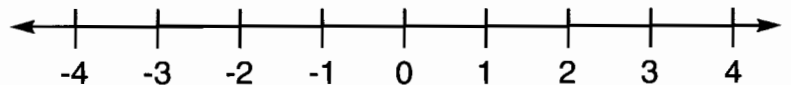
5. Is the real number  $\sqrt{1.21}$  rational or irrational? \_\_\_\_\_

Why? \_\_\_\_\_

6. Is the real number  $\sqrt{12.1}$  rational or irrational? \_\_\_\_\_

Why? \_\_\_\_\_

7. Draw the graph of  $x \geq -1.3$ .



8. Draw the graph of  $|y| < \pi$ .

