

Section 1.4

Basic Rules of Algebra

Widening the World Wide Web



In the time it took for the number of internet users in the United States to double, the number of internet users worldwide more than quadrupled.

In the Exercise Set of this section of your textbook, you will simplify, and then utilize, formulas that model these changes in the number of Internet users.



First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 1.4 of your textbook which begins on page 44.
- Complete the *Concept and Vocabulary Check* on page 53 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Understand and use the vocabulary of algebraic expressions.

✓ *Solved Problem #1*

1. Use the algebraic expression
 $6x + 2x + 11$
to answer the following questions.
 - 1a. How many terms are in the algebraic expression?
There are 3 terms.
 - 1b. What is the coefficient of the first term?
6 is the coefficient of the first term.
 - 1c. What is the constant term?
11 is the constant term.
 - 1d. What are the like terms in the algebraic expression?
 $6x$ and $2x$ are like terms.

✎ *Pencil Problem #1*

1. Use the algebraic expression
 $x + 2 + 5x$
to answer the following questions.
 - 1a. How many terms are in the algebraic expression?
 - 1b. What is the coefficient of the first term?
 - 1c. What is the constant term?
 - 1d. What are the like terms in the algebraic expression?

Objective #2: Use commutative properties.

 **Solved Problem #2**

2a. Use the commutative property of addition to write an equivalent algebraic expression of $x + 14$.

$$14 + x$$

 **Pencil Problem #2** 

2a. Use the commutative property of addition to write an equivalent algebraic expression of $y + 4$.

2b. Use the commutative property of multiplication to write an equivalent algebraic expression of $7y$.

$$y7$$

2b. Use the commutative property of multiplication to write an equivalent algebraic expression of $9x$.

Objective #3: Use associative properties.

 **Solved Problem #3**

3a. Simplify: $8 + (x + 4)$

$$\begin{aligned} 8 + (x + 4) &= 8 + (4 + x) \\ &= (8 + 4) + x \\ &= 12 + x \text{ or } x + 12 \end{aligned}$$

 **Pencil Problem #3** 

3a. Simplify: $7 + (5 + x)$

3b. Simplify: $6(5x)$

$$\begin{aligned} 6(5x) &= (6 \cdot 5)x \\ &= 30x \end{aligned}$$

3b. Simplify: $7(4x)$

Objective #4: Use the distributive property.

 **Solved Problem #4**

4a. Multiply: $5(x + 3)$

$$\begin{aligned} 5(x + 3) &= 5 \cdot x + 5 \cdot 3 \\ &= 5x + 15 \end{aligned}$$

 **Pencil Problem #4** 

4a. Multiply: $3(x - 2)$

4b. Multiply: $6(4y + 7)$

$$\begin{aligned} 6(4y + 7) &= 6 \cdot 4y + 6 \cdot 7 \\ &= 24y + 42 \end{aligned}$$

4b. Multiply: $2(4x - 5)$

Objective #5: Combine like terms.

 **Solved Problem #5**

5a. Combine like terms: $7x + 3x$

$$\begin{aligned} 7x + 3x &= (7 + 3)x \\ &= 10x \end{aligned}$$

 **Pencil Problem #5**

5a. Combine like terms: $7x + 10x$

5b. Combine like terms: $9a - 4a$

$$\begin{aligned} 9a - 4a &= (9 - 4)a \\ &= 5a \end{aligned}$$

5b. Combine like terms: $11a - 3a$

5c. Simplify: $9x + 6y + 5x + 2y$

$$\begin{aligned} 9x + 6y + 5x + 2y &= 9x + 5x + 6y + 2y \\ &= (9 + 5)x + (6 + 2)y \\ &= 14x + 8y \end{aligned}$$

5c. Simplify: $11a + 12 + 3a + 2$

Objective #6: Simplify algebraic expressions. **Solved Problem #6****6a.** Simplify: $7(2x+3)+11x$

$$\begin{aligned}
 7(2x+3)+11x &= 7 \cdot 2x + 7 \cdot 3 + 11x \\
 &= 14x + 21 + 11x \\
 &= (14x + 11x) + 21 \\
 &= 25x + 21
 \end{aligned}$$

 **Pencil Problem #6** **6a.** Simplify: $5(3x+2)-4$ **6b.** Simplify: $7(4x+3y)+2(5x+y)$

$$\begin{aligned}
 7(4x+3y)+2(5x+y) &= 7 \cdot 4x + 7 \cdot 3y + 2 \cdot 5x + 2 \cdot y \\
 &= 28x + 21y + 10x + 2y \\
 &= (28x + 10x) + (21y + 2y) \\
 &= 38x + 23y
 \end{aligned}$$

6b. Simplify: $7(3a+2b)+5(4a+2b)$ **Answers for Pencil Problems (Textbook Exercise references in parentheses):**

- 1a.** 3 (1.4 #3a) **1b.** 1 (1.4 #3b) **1c.** 2 (1.4 #3c) **1d.** x and $5x$ (1.4 #3d)
2a. $4+y$ (1.4 #7) **2b.** x^9 (1.4 #15) **3a.** $12+x$ (1.4 #23) **3b.** $28x$ (1.4 #25)
4a. $3x-6$ (1.4 #35) **4b.** $8x-10$ (1.4 #37) **5a.** $17x$ (1.4 #47) **5b.** $8a$ (1.4 #49)
5c. $14a+14$ (1.4 #57) **6a.** $15x+6$ (1.4 #59) **6b.** $41a+24b$ (1.4 #63)

Homework:

- Review the Section 1.4 summary** on page 105 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.