Sec. 3.1 Simplifying Algebraic Expressions

Learning Objectives:
1. Use properties of numbers to combine like terms.
2. Simplify expressions by multiplying and then combining like terms.
3. Find the perimeter and area of figures.
4. Key Vocabulary: algebraic expression, constant, variable, numerical coefficient, like terms, distributive property, and simplify.

1. Use properties of numbers to combine like terms
Definitions:
Algebraic Expression—is a collection of numbers and variables connected by "+" or "−".
Term—part that are being added or subtracted.
Like term—Terms that contain the same variables that raised to the same exponents or power.
Numerical coefficient—is the number in front of the variable term.
Combine like term—is to add or subtract the coefficient of the like terms.

Example 1. Identify the numerical coefficient of each term.
1. $9x$
2. $−x$
3. $2.7x^2y$

Answer:_________________         Answer:_________________                           Answer:___________ ______

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Example 2. Indicate whether the terms in each list are like or unlike.
1. $5ab, −\frac{1}{2}ba$
2. $−x^2y, −xy^2$
3. $2x^3yz^2, −x^3yz^2$

Answer:_________________         Answer:___________ ______                           Answer:___________ ______

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Example 3. Simplify each expression by combining any like terms.
1. $−9y + 2 − 1 + 6 + y − 7$

Answer:_______________________________

2. $1.6x^5 + 0.9x^2 − 0.3x^5$

Answer:_______________________________

3. $\frac{4}{5}x − \frac{2}{3} + \frac{1}{3}x − \frac{1}{5}$

Answer:_______________________________
2. **Simplify expressions by multiplying and then combining like terms**

**Example 4.** Simplify each expression. Use the distributive property to remove parentheses.

1. \( \frac{2}{5}(-15x) \)
   Answer: _______________________

2. \(-(-5m+6n-2p)\)
   Answer: _______________________

3. \(3(2x-5)-(x+7)\)
   Answer: _______________________

4. \(-4(x+1)+4(8-x)-18\)
   Answer: _______________________

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3. **Find the perimeter and area of figures**

**Example 5.** Find the perimeter of the figures.

1. 
   ![Triangle](image)
   Answer: _______________________

2. 
   ![Rectangle](image)
   Answer: _______________________

Learning Objectives:
1. Use the addition or the multiplication or both properties to solve equations.
2. Translate word phrases to mathematical expressions.
3. Key Vocabulary: expression, and equation

1. Use the addition or the multiplication or both properties to solve equations

Steps for Solving Linear Equations
1. If an equation contains parentheses, use distributive property to remove the parentheses.
2. Simplify each side of the equation by combining like terms.
3. Get all variable terms on one side and all numbers on the other side by using the addition or the multiplication property of equality.
4. Check the solution by substituting the result into the original equation.

Example 1. Solve
1. \[ \frac{-y}{-6} = 6 - (-1) \]
   Answer: _______________________

2. \[ -3(2x - 3) = 5(x + 4) \]
   Answer: _______________________

3. \[ |-13| + 3^2 = 100y - |-20| - 99y \]
   Answer: _______________________

2. Translate word phrases to mathematical expressions

Example 3. Write each phrase as a variable expression. Use \( x \) to represent “a number.”

1. Eight subtracted from a number
   Answer: ______________________
2. The product of a number and 5

Answer: ____________________________

3. The quotient of a number and negative 7

Answer: ____________________________

4. The total of twice a number and 3

Answer: ____________________________
Learning Objectives:
1. Solve linear equations using the addition and multiplication properties.
2. Write numerical sentences as equations.

1. Solve linear equations using the addition and multiplication properties

Example 1. Solve each equation. Remember to check your answer by substitution.

1. 

\[-5y + 5 = -2y - 10 - 4y\]

Answer:________________________

2. 

\[-17x + 14 + 20x - 2x = 5 - (-3)\]

Answer:________________________

3. 

\[-3(x - 6) + 13 = 20 - 1\]

Answer:________________________

2. Write numerical sentences as equations

<table>
<thead>
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<th>Key words or phrases</th>
<th>mean</th>
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<tr>
<td>...equals...</td>
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<td>...gives...</td>
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Example 3. Write each sentence as an equation.

1. The sum of \(-57\) and \(49\) is \(-8\).

Answer: ____________________________

2. The difference of negative \(31\) and \(15\) is negative \(46\).

Answer: ____________________________

3. The quotient of \(-10\) and \(2\) amounts to \(-5\).

Answer: ____________________________
Sec. 3.4 Linear Equations in One Variable and Problem Solving

**Learning Objectives:**
1. Write sentences as equations.
2. Use problem-solving steps to solve problems.

1. **Write sentences as equations**

**Key words:**

<table>
<thead>
<tr>
<th>Addition (+)</th>
<th>Subtraction (−)</th>
<th>Multiplication (×)</th>
<th>Division (÷)</th>
<th>Equal sign (=)</th>
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<td>....sum....</td>
<td>....difference...</td>
<td>....product...</td>
<td>....quotient...</td>
<td>....equal...</td>
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<td>....added to..</td>
<td>....subtracted from..</td>
<td>....multiply...</td>
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<td>....less than....</td>
<td>....twice...</td>
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<td>....decreased by....</td>
<td>....of...</td>
<td>....divided by...</td>
<td>....yields...</td>
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<td>....total...</td>
<td>....less...</td>
<td>....double...</td>
<td>....divided into...</td>
<td>....amounts to...</td>
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</table>

**Example 1.** Write each sentence as an equation. Use x to represent “a number”. **Do not solve.**

1. A number added to −12 equals 15.

   Answer: ________________________________

2. Two subtracted from a number amounts to 55.

   Answer: ________________________________

3. Ten subtracted from ten times a number is equal to 150.

   Answer: ________________________________

4. The product of a number and -4 is twice the sum of the number and 2.

   Answer: ________________________________

5. The quotient of 10 and a number is 130.

   Answer: ________________________________
2. **Use problem-solving steps to solve problems**

**General Strategy for Problem Solving**

1. **Understand** the problem by doing the following
   - Read and reread the problem.
   - Choose a variable to represent the unknown.
   - Construct a drawing if needed.
2. **Translate** the problem into an equation.
3. **Solve** the equation using algebra.
4. **Verify** the solution (Check if the answer making sense).

**Example 2.** Translate each to an equation and solve the resulting equation. Use $x$ to represent “a number”.

1. Six times a number yields 36. Find the number.

   Answer: ____________________________

2. A number subtracted from 16 amounts to the quotient of 42 and 6. Find the number.

   Answer: ____________________________

3. The difference of –6 times some number and 12 gives –8 times the sum of the number and –8. Find the number.

   Answer: ____________________________

4. A Ford Taurus is traveling three times as fast as a Honda CRV. If their combined speed is 96 miles per hour, find the speed of each car.

   Answer: ____________________________