Simplifying Expressions – Combining Like Terms

Vocabulary Review:

- **Term**: parts of an algebraic expression separated by an addition or subtraction sign
- **Coefficient**: the numerical factor of a term that contains a variable
- **Constant**: A term without a variable
- **Like Terms**: terms that contain the same variables

To simplify an algebraic expression with one variable: Use the properties of operations to write an equivalent expression that has no like terms or parentheses.

**Example #1:** Simplify the expression: $7x + 3 + 9x + 15$

$7x + 3 + 9x + 15 = 7x + 9x + 3 + 15$  
Use Commutative Property to change the order of the terms

$= 16x + 18$  
Evaluate by combining like terms

$= 16x + 18$  
Final Answer

**Example #2:** Simplify the expression: $4(m + 3) + 2m$

$4(m + 3) + 2m = 4m + 12 + 2m$  
Use Distributive Property to eliminate parentheses

$= 4m + 2m + 12$  
Use Commutative Property to re‐order the terms

$= 6m + 12$  
Combine like terms to get final answer

**Practice:** Simplify each expression.

1. $(3 \cdot x) \cdot 11$
2. $m + m + m + m + m$
3. $2f + 17 + 5f$
4. $5(6x)$
5. Write and simplify an expression for the total cost of 7 friends going to a movie and only 4 of the friends getting popcorn. Let $t$ = the cost of the movie ticket and $\$3$ be the cost of each bag of popcorn.
The Properties of Operations can also be used to simplify expressions with more than one variable.

**Example #3:** Simplify the expression: \((7x + y) + 15x\)

\[
(7x + y) + 15x = (y + 7x) + 15x \quad \text{Use Commutative Property to re-order the terms}
\]

\[
= y + (7x + 15x) \quad \text{Use Associative Property to re-group}
\]

\[
= y + 22x \quad \text{Combine like terms to get final answer}
\]

**Example #4:** Simplify the Expression: \(9(m + 3k)\)

\[
9(m + 3k) = 9 \cdot m + 9 \cdot 3k \quad \text{Use Distributive Property to eliminate parentheses}
\]

\[
= 9m + 27k \quad \text{Evaluate to get final answer}
\]

**Practice:** Simplify each expression.

1. \(7h + 5g + 3h + 2h\)

2. \(3(9x + p)\)

3. \(15g + (11g + 7k)\)

4. \(4(2x + 5y)\)

5. A set of glasses includes 8 tall glasses and 4 juice glasses. Let \(g\) = the cost of each tall glass and let \(j\) = the cost of each juice glass. Write and simplify an expression that represents the total cost of 4 sets of glasses.