Introduction

Thoughts or feelings in language are often conveyed through expressions; similarly, mathematical ideas are conveyed through algebraic expressions. **Algebraic expressions** are mathematical statements that include numbers, operations, and variables to represent a number or quantity. **Variables** are letters used to represent values or unknown quantities that can change or vary. One example of an algebraic expression is $3x - 4$. Notice the variable, x.

Key Concepts

- Expressions are made up of terms. A **term** is a number, a variable, or the product of a number and variable(s). An addition or subtraction sign separates each term of an expression.

- For example, in the expression $4x^2 + 3x + 7$, there are 3 terms: $4x^2$, $3x$, and 7.

- The **factors** of each term are the numbers or expressions that when multiplied produce a given product. In the expression $4x^2 + 3x + 7$, the factors of $4x^2$ are 4 and x^2. The factors of $3x$ are 3 and x.

Instruction
Identifying Terms, Factors, and Coefficients

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Key Concepts, *continued*

- Numbers have factors as well. For example, the factors of 7 are 1 and 7. *Note*: In this lesson, when asked for the "factors of a term," you are being asked to find the factors that make up an *algebraic* (non-constant) term.

- A **coefficient** is the number multiplied by a variable in an algebraic expression. In the terms $4x^2$ and $3x$, 4 is the coefficient of $4x^2$ and 3 is the coefficient of $3x$.

- The term $4x^2$ also has an exponent. **Exponents** indicate the number of times a factor is being multiplied by itself. In this term, 2 is the exponent and indicates that x is multiplied by itself 2 times.

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Key Concepts, *continued*

- Terms that do not contain a variable are called **constant** terms because the quantity does not change. In this example, 7 is the constant term.

- The table that follows summarizes the parts of the expression $4x^2 + 3x + 7$.

Expression	$4x^2 + 3x + 7$		
Terms	$4x^2$	$3x$	7
Factors	4 and x^2	3 and x	1 and 7
Coefficients	4	3	—
Constants	—	—	7

Instruction
Identifying Terms, Factors, and Coefficients

WALCH
HIGH SCHOOL MATH

Key Concepts, *continued*

- Terms with the same variable raised to the same exponent are called **like terms**. In the example $5x + 3x - 9$, $5x$ and $3x$ are like terms. Like terms can be combined following the **order of operations** by evaluating grouping symbols, evaluating exponents, completing multiplication and division, and completing addition and subtraction from left to right. In this example, the sum of $5x$ and $3x$ is $8x$.

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Common Errors/Misconceptions

- incorrectly following the order of operations
- incorrectly identifying like terms
- incorrectly combining terms involving subtraction

Guided Practice

Example 2

A smartphone is on sale for 25% off its regular price. The sale price of the smartphone is $149.25. What expression can be used to represent the regular price of the smartphone? Identify each term, the constant term, and the factors and coefficients of the terms that contain a variable.

Instruction
Identifying Terms, Factors, and Coefficients

WALCH
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Guided Practice: Example 2, *continued*

1. **Translate the verbal expression into an algebraic expression.**

   First, describe the situation. The regular price is found by adding the discount amount to the sale price:

   sale price + discount amount

   We know that the sale price is $149.25. The discount amount is found by multiplying the discount percent by the unknown regular price. The discount percent is 25%, or written as a decimal, 0.25.

Guided Practice: Example 2, *continued*

Let x represent the unknown regular price. Therefore, the algebraic expression that represents the regular price of the smartphone is 149.25 + 0.25x.

Instruction
Identifying Terms, Factors, and Coefficients

WALCH
HIGH SCHOOL MATH

2. **Identify each term in the algebraic expression.**

There are two terms in the expression: 149.25 and 0.25x. The term 149.25 represents the sale price, and 0.25x represents the discount.

3. **Identify any factors of the non-constant term(s).**

    0.25x is the product of the factors 0.25 and x.

Instruction

Identifying Terms, Factors, and Coefficients

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4.   **Identify any coefficients of the non-constant term(s).**

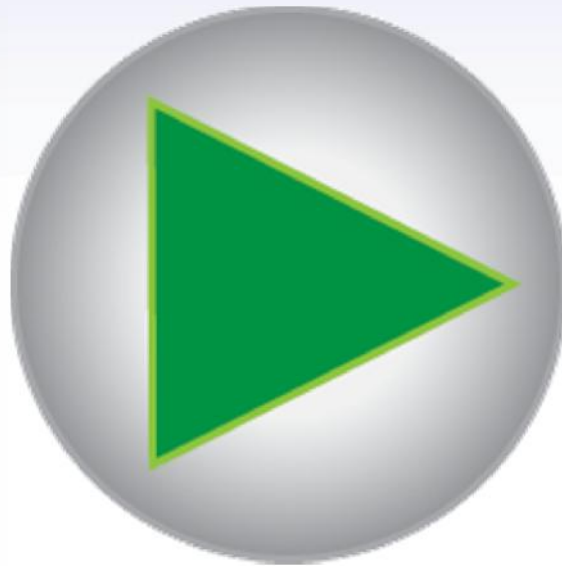0.25 is multiplied by the variable, *x*; therefore, 0.25 is a coefficient.

Guided Practice: Example 2, *continued*

5. **Identify any constant terms.**

The term that does not change in the expression is 149.25. Therefore, 149.25 is the constant term.

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Instruction
Identifying Terms, Factors, and Coefficients

WALCH
HIGH SCHOOL MATH

Instruction
Identifying Terms, Factors, and Coefficients

Guided Practice

Example 3

Helen purchased 3 books from an online bookstore and received a 20% discount on her total order. Each book cost the same amount. The shipping cost was $10 and was not discounted. Write an expression that can be used to represent the total amount Helen paid for 3 books plus the shipping cost. Simplify the expression, and then identify each term, the constant term, and the factors and coefficients of the terms that contain a variable.

Guided Practice: Example 3, *continued*

1. **Translate the verbal expression into an algebraic expression.**

   First, describe the situation. The total amount Helen paid can be found by subtracting the discount amount from the price of the 3 books, then adding the shipping cost:

   price of 3 books – discount amount + shipping cost

   Let x represent the unknown price of 1 book. Multiply x by the number of books purchased. Helen bought 3 books, so the term $3x$ represents the price of the books.

Instruction
Identifying Terms, Factors, and Coefficients

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Helen received 20% off the price of the books. Written as a decimal, 20% is equal to 0.20. The amount of the discount Helen received off the price of the 3 books can be found by multiplying 0.20 by $3x$. So, $0.20(3x)$ represents the discount amount.

Finally, Helen paid an additional $10 for shipping. This represents the shipping cost.

The algebraic expression used to represent the total amount Helen paid for the 3 books plus shipping is $3x - 0.20(3x) + 10$.

Instruction
Identifying Terms, Factors, and Coefficients

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2. Simplify the expression.

The expression can be simplified by following the order of operations and combining like terms.

$3x - 0.20(3x) + 10$	Expression from the previous step
$3x - 0.60x + 10$	Multiply 0.20 and $3x$.
$2.4x + 10$	Combine like terms: add $3x$ and $-0.60x$.

The simplified expression representing the total amount Helen paid for the books is $2.4x + 10$.

Instruction

Identifying Terms, Factors, and Coefficients

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3. **Identify each term in the simplified expression.**

   There are two terms in the simplified expression: 2.4x and 10. The term 2.4x represents the price of the books minus the discount, and 10 represents the shipping cost.

Guided Practice: Example 3, *continued*

4. **Identify any factors of the non-constant term(s).**

    2.4x is the product of the factors 2.4 and x.

5. **Identify any coefficients of non-constant term(s).**

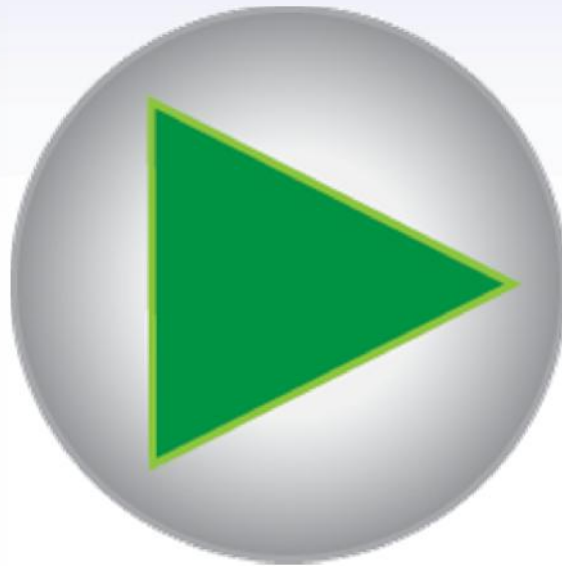   2.4 is multiplied by the variable, x; therefore, 2.4 is a coefficient.

6. **Identify any constant terms.**

   The term that does not change in the expression is 10. Therefore, 10 is the constant term.

Guided Practice: Example 3, *continued*

Instruction
Identifying Terms, Factors, and Coefficients

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