

Terms and Factors in Algebraic Expressions

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WHAT'S COVERED

In this lesson, you will learn how to simplify an algebraic expression by combining like-terms. Specifically, this lesson will cover:

1. Terms and Factors in Algebraic Expressions

Recall that an **algebraic expression** is a combination of numbers, variables, and operators representing a quantity. When working with algebraic expressions, you should be familiar with the parts that make up the expression.

- Within an algebraic expression, there may be a **variable**, which is a quantity that can change. It is expressed as a letter or a symbol, such as x .
- When a variable is multiplied by a number, we call that number a **factor**. A factor is a number or quantity used in multiplication. This is also referred to as a **coefficient**.
- A power, or an exponent, tells you how many times a number or an expression is multiplied by itself.
- If there is a number by itself, this is just referred to as a **constant**.

When you have a combination of numbers, variables, and exponents, this is known as a **term**. The following are examples of a single term:

$$3x^7$$

$$5a$$

$$12$$

In the first example above, we see the two separate quantities 3 and x^7 multiplied by one another. We can also dissect the expression a little further we get $3 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$. Notice how all numbers and variables are combined through multiplication only. So we can say that the above examples represent a single term.

➞ **EXAMPLE** Suppose we have the expression $5x^2 - 7x + 3$. Define the parts of this algebraic expression:

- The variable represents an unknown quantity and is typically written as a letter. In this case, the variable would be x .

$$5x^2 - 7x + 3$$

- The coefficients would be the number in front of the variables. In this case, the 5 and 7 would be coefficients.

$$5x^2 - 7x + 3$$

- The power or degree of this polynomial is 2 since that is the highest power variables are being raised to.

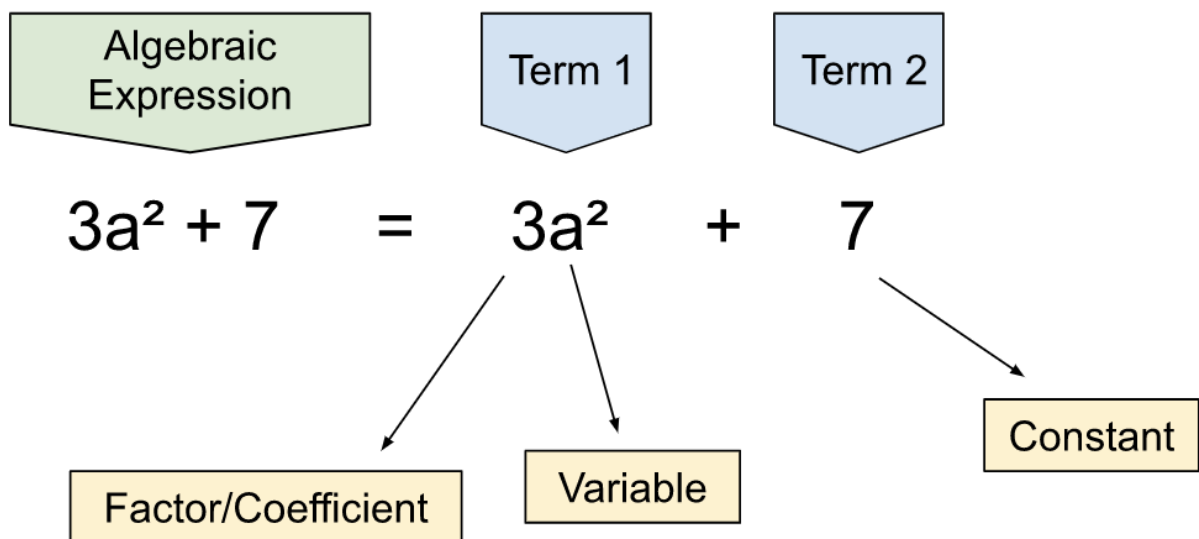
$$5x^2 - 7x + 3$$

- The constant would be 3 since that is the only term without a variable component.

$$5x^2 - 7x + 3$$



BIG IDEA



TERMS TO KNOW

Algebraic Expression

A combination of numbers, variables, and operators representing a quantity.

Variable

A quantity that can change, expressed as a letter or symbol.

Factor

A number or quantity used in multiplication.

Coefficient

The number in front of a variable term that acts as a factor or multiplier.

Constant

A term with no variable component.

Term

A collection of numbers, variables, and powers combined through multiplication.

2. Types of Algebraic Expressions

When dealing with algebraic expressions the number of different terms that are added to or subtracted from one another give the expression a different name. Here we will look at different types of expressions based on the number of unique terms they contain.

2a. Monomials

A single algebraic expression with no other terms added to or subtracted from it is called a **monomial**.

→ EXAMPLE $2x^3$ is a monomial.



HINT

A constant is a special type of monomial where there are no variables being multiplied by a number. For instance, 5 or 14 are constants.

Typically when writing algebraic expressions we refer to them using their variable and the power the variable is being raised to.

→ EXAMPLE $4x^2$ would be called a second-degree monomial because the variable is being raised to the second power.



TERM TO KNOW

Monomial

An expression with only one term

2b. Binomials

More complex types of algebraic expressions contain more than one monomial and are combined through either addition or subtraction.

If we have two monomials combined with one another through addition or subtraction, we call that expression a **binomial**.

→ EXAMPLE $2x + 3$ and $x - 2$ are binomials.



TERM TO KNOW

Binomial

An expression with two terms

2c. Polynomials

If we have more than two monomials combined with one another, we have what is called a **polynomial**.

→ EXAMPLE $2x^2 - 2x + 3$ is a polynomial. We typically say that this expression is a second-degree polynomial because the highest power of any variable in the expression is 2.

→ EXAMPLE If we had the expression $2x^2y - 3x^2 - 2y^2 + 3x - 1$, we would count the total number of powers in each monomial to determine the power. In this example, we would say that this is a 3rd-degree polynomial because in the term $2x^2y$ the combined power of x and y add up to 3.

Type of Algebraic Expression	Description	Examples
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Constant	A number	4 12 157
Monomial	One term	$6x$ $3y^7$ $8xy$
Binomial	Two terms	$4x + 7$ $y + 5$ $3xy + 2y$
Polynomial	More than two terms	$4x^2 - x + 9$ $5x^2y - 2x^2 - 3y^2 + 4x - 7$ $- 2a^2 + 3b - 7b^2 + 9$



TERM TO KNOW

Polynomial

An expression containing several terms.

3. Combining Like-Terms

One way we can simplify expressions is to combine like-terms. Like-terms are terms where the variables match exactly (exponents included). Examples of like-terms would be $3xy$ and $-7xy$, or $3a^2b$ and $8a^2b$, or -3 and 5 . If we have like-terms, we are allowed to add (or subtract) the numbers in front of the variables, then keep the variables the same.

→ EXAMPLE

$$8x^2 - 3x + 7 - 2x^2 + 4x - 3 \quad \text{Combine like terms } 8x^2 - 2x^2$$

$$6x^2 - 3x + 7 + 4x - 3 \quad \text{Combine like terms } -3x + 4x$$

$$6x^2 + x + 7 - 3 \quad \text{Combine like terms } 7 - 3$$

$$6x^2 + x + 4 \quad \text{Our Solution}$$

→ EXAMPLE

$$5x - 2y - 8x + 7y \quad \text{Combine like terms } 5x - 8x$$

$$-3x - 2y + 7y \quad \text{Combine like terms } -2y + 7y$$

$$-3x + 5y \quad \text{Our Solution}$$



HINT

As we combine like-terms, we need to interpret subtraction signs as part of the following term. This means if we see a subtraction sign, we treat the following term like a negative term, the sign always stays with the term.



SUMMARY

When considering **terms and factors in algebraic expressions**, we can define term as a collection of numbers, variables, and powers. **Types of algebraic expressions** can be monomials, binomials, and polynomials. **Parts of an algebraic expression** include the variables, corresponding coefficients, powers, and constants. Terms are referred to by their variable and their power or exponent. When **combining like-terms**, we are combining terms that have the same variable and the same power with addition and subtraction.

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