$$\Delta = .00\,\pi + \frac{1}{200000}\sqrt{xy}$$

Objectives

- **Define algebraic vocabulary.**
- **Identify the coefficient of a term.**
- **Classify polynomials by the number of terms.**
- **Find the degree of a monomial.**
- **Find the degree of a polynomial.**

$$\Omega \frac{1}{15750}$$ $$5\text{-}61\;\sqrt{xy}\;\tfrac{1}{12}\;\Delta$$

2.1
teacher notes

Vocabulary

Variable

Algebraic expression

Term

Constant

Monomial

Radical sign (Lesson 1-4)

Coefficient

Polynomial

Binomial

Trinomial

Degree of a monomial

Exponent (Lesson 1-4)

Degree of a polynomial

Prerequisites

Simplifying expressions with rational numbers

Get Started

- Say, "lease-pay et-gay our-yay aterials-may o-say at-thay e-way ay-may egin-bay our-ay esson-lay." Pig Latin for, "Please get your materials so that we may begin our lesson."

- When students do not obey these instructions repeat them again.

- Explain that the words have been altered by leaving off the first sound of each word, saying it at the end of the word, and adding the sound "ay."

- Say the instructions again, slowly, and let students decipher the message.

- Learning algebra is like listening to Pig Latin. You must know the vocabulary to decipher the message.

Section 1

Expand Their Horizons

This lesson focuses on the importance of the vocabulary that students need to know in algebra. When students know the basic terminology for algebra, they will be able to communicate with each other and the teacher and learn the concepts and skills better.

Students can relate nonmathematical definitions of words to the meanings within the study of algebra. For example, the word "variable" refers to something that changes, or varies.

⚠ Common Error Alert

Emphasize that an expression is not a monomial if a <u>variable</u> is in the denominator of a fraction or is under a radical sign. If a constant is in any of these places, then the expression is still a monomial.

Students may be intrigued by the use of the Greek alphabet. Greek letter symbols are sometimes used as variables and in other cases they are used as constants. Greek letters are also used to name sororities and fraternities. The names of the lower case Greek letters used in the video are: α, alpha, is the first letter of the alphabet; β, beta, is the second letter of the alphabet; δ, delta, is the fourth letter of the alphabet; σ, sigma, is the eighteenth letter of the alphabet; χ, chi is the 22nd letter of the alphabet; θ, theta, is the eighth letter of the alphabet; and Ω, omega, is the twenty-fourth and last letter of the Greek alphabet.

It is important for students to realize that the symbol "π" is not a variable. Pi always has a constant value and is represented by a non-terminating decimal. Therefore, pi is a constant.

In conversation, an "expression" is a group of words used to communicate with someone.

The use of examples outside the realm of mathematics can help students see that the vocabulary in an algebra class is similar to the vocabulary used in an English class. Making a connection to another curriculum helps build a better understanding of mathematical terms.

When an expression is extended to include an equal sign, it becomes an equality. For example, $3 + 4$ is an expression. $3 + 4 = 7$ is an equation.

Remind students that a term does not include any addition or subtraction signs. Have students look closely at terms containing fractions. If the denominator contains a variable, then the term is not a monomial. To classify a polynomial, if one of the terms contains fractions with a variable in the denominator, then the expression is not a polynomial. Emphasize to students that an expression must contain monomials before it can be classified as a binomial, trinomial, or polynomial. An expression such as $\sqrt{x}$ is not a monomial since a variable appears under a radical sign.

⚠ Common Error Alert

Students may identify zero, instead of one, as the coefficient of a variable such as b. The coefficient is always multiplied with the variable. If the understood coefficient was zero, then all terms with an understood coefficient would equal zero.

1 ▷ The coefficient is the number multiplied by the variable, –4. In $\frac{z}{2} = \frac{1}{2}z$, the coefficient is $\frac{1}{2}$.

2 ▷ In $\frac{3t}{4} = \frac{3}{4}t$, the coefficient is $\frac{3}{4}$.

Additional Examples

1. **Name the coefficient of b^2cd.**

   Because $b^2cd = 1 \cdot b^2cd$ and a coefficient is the numeric factor of the term, the coefficient is 1.

2. **What is the coefficient of $-\frac{2t}{3}$?**

   $-\frac{2t}{3} = -\frac{2}{3}t$
   The coefficient is $-\frac{2}{3}$.

Section 2

Expand Their Horizons

In Section 2, students will classify polynomials as monomials, binomials, and trinomials. The prefix "mono-" can be related to a monorail at an amusement park; the "bi-" and "tri-" can be related to bicycles and tricycles. Have students brainstorm for other words with these prefixes. A group activity could include investigating words with these prefixes using a dictionary.

A polynomial has many terms. Any expression with one or more monomials is a polynomial.

Binomial and trinomials are special polynomials.

An expression such as $\frac{3}{x} + 4$ is not a polynomial because x is in the denominator. Therefore, $\frac{3}{x}$ is not a monomial.

Common Error Alert

Students may calculate the degree of a monomial such as 3^4x^2 as 6 instead of 2. The degree of a monomial only includes the exponents of the variables, not the coefficient.

3 The expression $x^2 - 36$ has two terms, x^2 and -36. It is a binomial.

This is a good time to introduce students to algebra tiles. Have them model $x^2 - 36$ using the tiles. x^2 is positive. It is represented by the large blue tile. The 36 is subtracted. Therefore,

it is negative. Students can group their tiles together to have 36 small red squares. Since students had to make two groups of tiles to represent this polynomial, it is a binomial.

For students who miscalculate the degree of a term by not adding the understood exponent 1, have them write an exponent of 1 for every variable that does not have an exponent written.

4 To find the degree of the monomial $5x^4y^2$, find the sum of the exponents of the variables, $4 + 2 = 6$.

To find the degree of a polynomial, find the degree of each term and choose the largest one. It may be helpful to the students to write the degree of each term underneath the term and then choose the largest. Emphasize to them that they do not add these degrees.

Connections

It is important in any field of study to be proficient in the use of the appropriate terminology. In the medical field, knowledge of the appropriate terms could be the difference in life or death for a patient. When a surgeon asks for a specific tool in the operating room, it is important that he be given the correct tool. When a doctor orders a certain prescription, the patient's life could be in danger if he or she is given the wrong medicine.

Look Beyond

In geometry, students will look more closely at the number, π. Pi is the ratio of a circle's circumference to its diameter. It is an irrational number that is approximately equal to $\frac{22}{7}$.

Additional Examples

1. **Is the expression $x^3y + 3xy + \frac{1}{2}z$ a polynomial? If so, is it a monomial, binomial, or trinomial?**

   x^3y, $3xy$, and $\frac{1}{2}z$ are all monomials. Therefore, this expression is a trinomial.

2. **What is the degree of the polynomial: $3^2x^3 - 4xy^2 + 5$?**

   The degree of 3^2x^3 is 3. The degree of $-4xy^2$ is 3. The degree of 5 is 0. The degree of the polynomial is 3.