Unit 3- Exponents

Content Area: **Mathematics**
Course(s): **Algebra, Math 8**
Time Period: **September**
Length: **15 Days**
Status: **Published**

Unit Summary

Many of the numbers used to solve problems or in formulas have an exponent indicating repeated multiplication. The symbols used to represent powers generate equivalent numerical values and understanding their meanings and how to use them is necessary for solving complex and real world problems.

This unit extends knowledge of numerical and algebraic powers from previous grades. The goal is to develop understanding of the properties of integer exponents, including the product and quotient properties of powers, power of a power property, and zero and negative properties. Students will apply these properties to multiplying polynomials, dividing polynomials by a monomial, operations with scientific notation and to problems involving exponential growth and decay.

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.N-RN.A	Extend the properties of exponents to rational exponents.
MA.N-RN.A.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.8.EE.A	Work with radicals and integer exponents.
MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
MA.K-12.6	Attend to precision.
MA.8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
MA.8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
MA.F-LE.A.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

PFL.9.1.8.C.5	Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).
PFL.9.1.8.D.1	Determine how saving contributes to financial well-being.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.

Student Learning Objectives

- Students will learn to apply the product of powers property, the power of a power property, and power of a product property.
- Students will learn to evaluate and simplify problems with zero and negative exponents.
- Students will learn to apply the quotient of powers property and the power of a quotient property.
- Students will learn to multiply polynomials and divide a polynomial by a monomial.
- Students will learn to convert between scientific notation and standard notation.
- Students will learn to input and read scientific notation per their calculator.
- Students will learn to perform operations with numbers expressed in scientific notation.
- Students will learn to compare numbers in scientific notation by approximation and exactly.
- Students will learn to model exponential growth and decay.

Essential Questions

- Why is it necessary to have so many ways of representing a single number?
- How do we communicate growth?

Enduring Understandings

- Students will understand that exponents are one way to communicate quantities that involve very large and/or very small numbers.

Application

- Students will be able to independently use their learning to generate equivalent numerical and algebraic expressions involving exponents to simplify problems and/or answers
- Students will be able to independently use their learning to use and read scientific notation on their calculator
- Students will be able to independently use their learning to calculate the value of a situation represented by exponential growth or decay such as compound interest

Skills

Students will be skilled at:

- Applying the properties of exponents.
- Utilizing their calculator for operations with scientific notation.
- Solving problems involving exponential growth and decay.