# Unit E - *Factors and Monomials*

## Overview

Students understand the structure of exponents by expanding multiplication and division of expressions and raising a power to a power and then simplifying those expressions using concepts from multiplication of whole numbers and simplifying fractions. Properties of exponents are extended by raising integers and monomials to a negative exponent. Students use the properties of exponents they developed with positive exponents and accept them as true for all integer exponents and are shown the value of learning those properties.

Students' understanding of integer exponents is expanded to scientific notation. Students learn that positive powers of ten are large numbers and negative powers of 10 are very small numbers. Students will express large and small numbers in the form of a single digit times a power of 10 and express how many times as much one of these numbers is compared to another. Lessons will demonstrates the need for such a notation and then how to compare and compute with numbers in scientific notation. Also, in this unit, students will use what they know about exponential notation, properties of exponents, and scientific notation to interpret results that have been generated by technology. By the end of the unit, students are able to compare and perform operations on numbers given in both decimal and scientific notation.

**21ˢᵗ Century Capacities:** Synthesizing

## Stage 1 - Desired Results

| ESTABLISHED GOALS/ STANDARDS | *Transfer:* |
|---|---|
| **MP7** Look for and make use of structure<br><br>**CC.8.EE.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. For example, estimate the population of the United States as $3 \times 10^8$ and the population of the world as $7 \times 10^9$, and determine that the world population is more than 20 times larger. | *Students will be able to independently use their learning in new situations to...*<br><br>1. Manipulate equations/expressions or objects to create order and establish relationships;<br>2. Fluently represent and interpret numbers and expressions in various equivalent forms. (Synthesizing) |

<table>
<tr><td colspan="2"><em>Meaning:</em></td></tr>
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<td>UNDERSTANDINGS: <em>Students will understand that:</em><br><br>1. Why the exponent rules for multiplication, division, and raising a power to a power work<br>2. Why applying a negative exponent to a whole number produces a fraction<br>3. Mathematicians use numbers and, ways of</td>
<td>ESSENTIAL QUESTIONS: <em>Students will explore & address these recurring questions:</em><br><br>A. What is another way to represent this number?<br>B. How can I break a problem down into manageable parts?<br>C. How can I explain this mathematically?</td>
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| CC.8.EE.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. | representing numbers to build meaning. | |
|---|---|---|
| | *Acquisition:* | |
| | *Students will know…* | *Students will be skilled at…* |
| | 1. The rules for working with exponents <br> 2. Vocabulary: factor, monomial, polynomial, exponent, power, base, | 1. GCF of an algebraic expression <br> 2. Factoring an expression by reversing the distributive property <br> 3. Multiplying monomials (including those with negative exponents) <br> 4. Dividing monomials (including those with negative exponents) <br> 5. Simplifying a monomial that is raised to a power <br> 6. Moving between standard form and scientific notation <br> 7. Multiplying numbers in which at least one factor is written in scientific notation (with and without a calculator) <br> 8. Dividing numbers where at least one number is written in scientific notation(with and without a calculator) <br> 9. Comparing numbers written in scientific notation <br> 10. Working with scientific notation in context |