Unit # 4: Exponents and Polynomials

Content Area: **Mathematics**
Course(s): **College Prep Math 2**
Time Period: **March**
Length: **13 days**
Status: **Published**

Unit Overview

In this unit, the concept of an exponent and the product and power rules of exponents are reintroduced. The addition, subtraction, multiplication, and division of polynomials are developed and applied in conjunction with addition rules of exponents. Simplifying expressions and solving problems involving zero and negative exponents along with writing numbers in scientific notation are also developed in this unit .

Enduring Understandings

- Algebraic expressions, such as polynomials and rational expressions, symbolize numerical relationships and can be manipulated in much the same way as numbers.
- Algebraic rules and properties determine how expressions are simplified
- There are multiple representations for any number.

Essential Questions

- How can the properties of the real number system be useful when working with polynomials and rational expressions?
- How can we model situations using exponents?
- How do you add and subtract polynomials?
- How do you divide polynomials?
- How do you multiply polynomials?
- How do you simplify expressions with zero and negative exponents ?
- How is a number converted to scientific notation and what are its uses ?
- What is the difference between finding the product of powers and a power of a power and how are each computed ?

Standards / Indicators / Student Learning Objectives (SLOs) :

- SWBAT add and subtract polynomials with one or more variables.
- SWBAT apply division to a geometry problem.
- SWBAT define the vocabulary for polynomials.
- SWBAT divide a polynomial by a monomial.
- SWBAT divide a polynomial by a polynomial.

- SWBAT evaluate polynomials given values for the variables.
- SWBAT find powers of binomials.
- SWBAT find the product of the sum and difference of two terms.
- SWBAT multiply a monomial by a polynomial
- SWBAT multiply two polynomials using the FOIL method and various other methods.
- SWBAT represent numbers in scientific notation.
- SWBAT simplify an expression contain zero as an exponent.
- SWBAT simplify an expression containing combinations of exponent rules.
- SWBAT simplify an expression containing negative exponents.
- SWBAT square a binomial.
- SWBAT use combinations of the exponent rules when simplifying an algebraic expression.
- SWBAT use exponents to represent repeated products.
- SWBAT use the power rules for exponents.
- SWBAT use the product rule for exponents.
- SWBAT use the quotient rule for exponents.
- SWBAT use the rules for exponents in geometry applications

MA.K-12.1	Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
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. Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x +$ 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an

	auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MA.A-APR.A	Perform arithmetic operations on polynomials
MA.A-APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
MA.A-APR.C.5	Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
MA.A-APR.D.6	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

Lesson Titles

- Adding and Subtracting Polynomials
- An Application of Exponents; Scientific Notation
- Dividing a Polynomial by a Monomial
- Dividing a Polynomial by a Polynomial
- Integers, Exponents , and the Quotient Rule
- Multiplying Polynomials
- Special Products
- The Product Rule and Power Rules for Exponents

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

Inter-Disciplinary Connections

LA.RH.11-12.4	Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.WHST.11-12.2.E	Provide a concluding paragraph or section that supports the argument presented.
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
9-12.HS-PS2-1.4.1	Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.

9-12.HS-PS1-7.5.1 Use mathematical representations of phenomena to support claims.

Instructional Strategies, Learning Activities, and Blooms/DOK:

- Explanation , examples, and practice converting numbers to scientific notation and vice versa.
- Explanation , examples, and practice dividing a polynomial by a monomial.
- Explanation , examples, and practice dividing a polynomial by polynomial.
- Explanation , examples, and practice adding and subtracting polynomials.
- Explanation , examples, and practice applying the product of powers and power of powers rules.
- Explanation , examples, and practice multiplying polynomials.
- Explanation , examples, and practice simplifying expressions containing negative and zero exponents.
- Explanation , examples, and practice simplifying special (binomial) products
- Tutoring during Delsea One

Modifications

ELL Modifications

- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Repeat, reword, clarify
- Tap prior knowledge
- Use real objects when possible

IEP and 504 Modifications

- Allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Allowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from
- Providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides

G & T Modifications

- Additional reinforcement activities soliciting a deeper understanding of curriculum.
- Creation of technology-based assessments to address the higher levels of Bloom's
- Specific career they are interested in? How would this apply to their interest?)
- Student led/directed discussions

At Risk Modifications

- Review, restate, reword directions
- Additional help during tutoring/Delsea One/Academic Enrichment
- Guided notes
- Hands-on Instruction
- Modeling and showing lots of examples
- Study guides
- Tutoring during Delsea One
- Visuals

Resources & Materials

- Computer Generated Warm Ups (see formative assessment section for specific topics)
- Internet worksheets (see formative assessment section for specific topics)
- Teacher made worksheets (see formative assessment section for specific topics)
- Text: Introductory Algebra (2010) (Ninth Edition)
- Warm up problems (see formative assessment section)

Technology

- Chrome book
- Internet Sources: http://accuplacer.collegeboard.org/students
- Math XL
- Smart Board

TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.