04-Monomials & Polynomials

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3-4 weeks (12-14 blocks)**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will extend their knowledge of numerical operations to monomials and polynomials. Students will discover exponent rules by expanding expressions and will then apply these rules to simplify monomial expressions. They will then investigate polynomials and how to simplify and perform operations with polynomial expressions.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Operations with algebraic expressions mirror arithmetic operations
- A single quantity may be represented by many different expressions
- Monomials can be used to form larger expressions called polynomials

Essential Questions:

- How do you know if a monomial is in simplest form?
- How are operations with monomials similar to and different from operations with real numbers?
- Can two algebraic expressions that appear to be different be equivalent? Give an example to support your answer.
- How are the properties of real numbers related to polynomials?

CONTENT AREA STANDARDS

A.CED

A. Create equations that describe numbers or relationships

A.REI

A. Understand solving equations as a process of reasoning and explain the reasoning

B. Solve equations and inequalities in one variable

C. Solve systems of equations

D. Represent and solve equations and inequalities graphically

A.SSE

A. Interpret the structure of expressions

B. Write expressions in equivalent forms to solve problems

HS Functions

F.BF

A. Build a function that models a relationship between two quantities

B. Build new functions from existing functions

F.IF

A. Understand the concept of a function and use function notation

B. Interpret functions that arise in applications in terms of the context

C. Analyze functions using different representations

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
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.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences. •
9.1.8.PB.6: Construct a budget to save for short-term, long term, and charitable goals.

LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
TECH.K-12.P.4	Demonstrate creativity and innovation.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- A monomial is a real number, a variable, or a product of a real number and one or more variables with whole-number exponents
- A polynomial is a monomial or a sum of monomials
- Polynomials are names based on their degree and number of terms
- Standard form of a polynomial means that the degrees of its monomial terms decrease from left to right

Procedural Knowledge

Students will be able to:

- Simplify monomials and polynomials
- Perform operations with monomials and polynomials
- Apply the distributive property to multiply a monomial by a polynomial
- Extend the distributive property to multiply two binomials or a binomial by a trinomial
- Divide a polynomial by a monomial

EVIDENCE OF LEARNING

Benchmark Assessments

Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based Assessments)

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- Class Discussion/Exit Cards
- Homework/practice problems (assigned from textbook or various web resources, such as Khan Academy, Albert, Quizizz, or Desmos)

Summative Assessments

- Lesson quizzes
- Teacher-generated unit test
- Performance tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

- *Algebra 1: Common Core*, Chapter 7 and 8 (sections 1-4)
- Illustrative Math Tasks
- Arlington Algebra Project (Exponents)
- Arilington Algebra Project (Polynomials)
- Desmos Activities:
    - Circles
    - Intro to Monomials and Exponent Rules
    - More Multiplying Monomials
    - Dividing Monomials
- Binomial Tic-Tac-Times Game

INTERDISCIPLINARY CONNECTIONS

Exponent rules and expressions relate directly to exponential functions, which students studied in pre-algebra. Exponential growth and decay models are used in many real-life situations involving science, history, finance, health care, and sports.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.