Unit 4: Polynomials

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **4 Weeks**
Status: **Published**

Summary of Polynomials

Polynomials represent the next step towards advanced mathematics, comprising more sophisticated algebraic and graphical properties. In this unit, students will learn about the importance of working with the standard form of algebraic expressions, along with a deepening understanding about connections between the graph of a function and its corresponding algebraic representation. Emphasis in this unit will be given to arithmetic operations of polynomials after developing important vocabulary terms for the degree and the number of terms for a given polynomial. Students will be introduced to various types of factoring, for the purposes of simplifying polynomials. This unit serves as a precursor to a more extensive study of quadratics in the following unit and builds upon students' prior knowledge about the properties of exponents.

Revision Date: July 2024

NJ Standards for Polynomials Unit

A.APR	Arithmetic with Polynomials and Rational Expressions
1	Make sense of problems and persevere in solving them
1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
A.APR.A	Perform arithmetic operations on polynomials
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.
2	Reason abstractly and quantitatively
A.APR.B	Understand the relationship between zeros and factors of polynomials
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
3	Construct viable arguments and critique the reasoning of others
A.APR.C	Use polynomial identities to solve problems
A.APR.C.4	Prove polynomial identities and use them to describe numerical relationships.
P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
A.CED	Creating Equations
8	Look for and express regularity in repeated reasoning
A.REI.D	Represent and solve equations and inequalities graphically

A.SSE.A	Interpret the structure of expressions
A.SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
A.SSE.A.2	Use the structure of an expression to identify ways to rewrite it.
A.SSE.B	Write expressions in equivalent forms to solve problems
A.SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Essential Questions for Polynomials

- What is a polynomial, and how is it named according to its degree and the number of terms it contains?
- How does one perform arithmetic operations with polynomials?
- What does it mean to factor a polynomial, and what are the various ways in which this can be done?
- What is the connection between the factors of a polynomial, the roots of the function, and the solution to its equation?

Enduring Understandings for Polynomials

- Polynomials are named according to their degree and their number of terms.
- Polynomials can be added and subtracted, by combining like terms.
- Polynomials can be multiplied, using the properties of exponents.
- Removing a GCF and factoring by grouping, are two methods of simplifying polynomials.

Objectives for Polynomials

- Proper vocabulary terms associated with polynomials.
- How to add and subtract polynomials, by combining like terms.
- How to multiply polynomials, using the properties of exponents.
- How to remove the GCF from a polynomial.
- The method of factoring by grouping.

Objectives for Polynomials

- Naming polynomials according to their degree and number of terms.
- Performing arithmetic operations with polynomials and combining like terms.
- Identifying and removing a GCF from a polynomial.
- Factoring by grouping, to rewrite a polynomial with four terms into the product of two binomials.

Learning Plan for Polynomials

1 Day: Students learn proper notation, standard form, and how to name polynomials according to their degree and the number of terms they contain.

1-2 Weeks: Students practice arithmetic with polynomials, including addition and subtraction, paying careful attention to the act of combining like terms. Students multiply monomials, binomials, and polynomials, paying careful attention to variables' exponents. Develop familiarity with the process of FOIL, build a foundation for factoring quadratic expressions.

2 Weeks: Class time is used to demonstrate and practice the process of removing a GCF from a polynomial. As an extension students learn the method of factoring by grouping, to support future factoring with quadratics when the leading coefficient is not equal to one.

Evidence/Performance Tasks for Polynomials

Exploratory classroom activities in small groups will serve as formative assessments in which students can give and receive helpful peer feedback about their understanding of key concepts. Short written quizzes will be administered in the form of exit tickets towards the end of class to identify students' misconceptions and/or struggles with polynomials. Whole group discussion allows for students to verbally articulate their understanding of polynomials and to elaborate on their conversations from their small group sessions. The unit will conclude with a summative written assessment that addresses proper algebraic notation, arithmetic operations with polynomials, and an emphasis on factoring methods used to simplify polynomials.

Materials

Core Instructional materials: Lecture notes and classroom activities designed by instructors.

Core Book List including Algebra 1, Pearson Publishing

Supplemental instructional materials: DeltaMath

Suggested Strategies for Modification

Possible accommodations/modification for Algebra 1