

RRPS District Standards: MATHEMATICS

Algebra II

05/2008

STRAND II: ALGEBRA

NM State Content Standard II: Students will understand algebraic concepts and applications.

NM State Benchmarks I-A: Grades 9-12

Represent and analyze mathematical situations and structures using algebraic symbols.

NM Algebra II Performance Standards

1. Classify numbers and members of the following sets:
 - natural
 - whole
 - integers
 - rationals
 - irrationals
2. Simplify numerical expressions using the order of operations, including exponents.
3. Evaluate the numerical value of expressions of one or more variables that are:
 - polynomial
 - rational
 - radical
4. Simplify algebraic monomial expressions raised to a power (e.g., $[5xy^2]^3$) and algebraic binomial (e.g., $[5x^2 + y]^2$) expressions raised to a power.
5. Compare and order polynomial expressions by degree.
6. Represent and analyze relationships using written and verbal expressions, tables, equations, and graphs, and describe the connections among those representations:
 - Translate from verbal expression to algebraic formulae (e.g., “Set up the equations that represent the data in the following equation: John’s father is 23 years older than John. John is 4 years older than his sister Jane. John’s mother is 3 years younger than John’s father. John’s mother is 9 times as old as Jane. How old are John, Jane, John’s mother, and John’s father?”)
 - given data in a table, construct a function that represents these data (linear only)
 - given a graph, construct a function that represents the graph (linear only)

RRPS Algebra II Power Standards

While all benchmarks are taught, Power Standards are consistently emphasized and regularly assessed.

Power Standard 1

Represent and analyze mathematical situations and structure using algebraic symbols

- Represent and analyze relationships using written and verbal expressions, tables, equations, and graphs, and describe the connections among those representations.
- Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.
- Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

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NM State Benchmark I-A: Grades 9-12

Represent and analyze mathematical situations and structures using algebraic symbols

NM Algebra II Performance Standards

7. Know, explain, and use equivalent representations for the same real number including:
 - integers
 - decimals
 - percents
 - ratios
 - scientific notation
 - numbers with integer exponents
 - inverses (reciprocal)
 - prime factoring
8. Simplify algebraic expressions using the distributive property.
9. Explain and use the concept of absolute value.
10. Know, explain, and use equivalent representations for algebraic expressions.
11. Simplify square roots and cube roots with monomial radicands that are perfect squares or perfect cubes (e.g., $9a^2x^4$).
12. Calculate powers and roots of real numbers, both rational and irrational.
13. Solve:
 - formulas for specified variables
 - radical equations involving one radical
14. Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.
15. Simplify fractions with polynomials in the number and denominator by factoring both and reducing them to the lowest terms.
(# 16 is part of the Algebra II curriculum)
16. Manipulate simple expressions with + and – exponents.
17. Use the four basic operations (+, -, x, ÷) with:
 - linear expressions
 - polynomial expressions
 - rational expressions

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NM State Benchmarks Grade 9-12

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NM State Benchmark II-B: Grades 9-12

Understand patterns, relations, functions, and graphs

Power Standard II (Benchmark II-B)

Understand patterns, relations, functions, and graphs

NM Algebra II Performance Standards

1. Distinguish between the concept of a relation and a function.
2. Determine whether a relation defined by a graph, a set of ordered pairs, a table of values, an equation, or a rule is a function.
3. Describe the concept of a graph of a function.
4. Translate among tabular, symbolic, and graphical representations of functions.
5. Explain and use function notation.
6. Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.
7. Identify the independent and dependent variables from an application problem (e.g., height of a child).
8. Describe the concept of a graph of an equation.
(#'s 9-11 are part of the Algebra II curriculum)
9. Understand symmetry of graphs.
10. Analyze and describe middle and end (asymptotic behavior of linear, quadratic and exponential functions, and sketch the graphs of functions.
11. Work with composition of functions (e.g., find $f(g)$ when $f(x) = 2x-3$ and $g(x) = 3x-2$), and find the domain, range, intercepts, zeros, and local maxima or minima of the final function.
12. Use the quadratic formula and factoring techniques to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points.
13. Apply quadratic equations to physical phenomena (e.g., the motion of an object under the force of gravity). (Optional for Algebra I curriculum but covered in Algebra II.)

- Translate among tabular, symbolic, and graphical representations of functions
- Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression
- Analyze and describe middle and end (asymptotic) behavior of quadratic, polynomial, rational, radical, exponential and logarithmic functions, and sketch the graphs of these functions.

STRAND II: ALGEBRA

NM State Content Standard II: Students will understand algebraic concepts and applications.

NM State Benchmark II-C: Grades 9-12

NM State Benchmark II-C: Grades 9-12

Use mathematical models to represent and understand quantitative relationships

NM Algebra II Performance Standards

1. Model real-world phenomena using linear and quadratic equations and linear inequalities (e.g., apply algebraic techniques to solve rate problems, work problems, and percent mixture problems; solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest; apply quadratic equations to model throwing a baseball in the air). (Algebra I and Algebra II curriculum)
2. Use a variety of computational methods (e.g., mental arithmetic, paper and pencil, technological tools).
3. Express the relationship between two variables using a table with a finite set of values and graph the relationship.
4. Express the relationship between two variables using an equation and a graph:
 - graph a linear equation and linear inequality in two variables
 - solve linear inequalities and equations in one variable
 - solve systems of linear equations in two variables and graph the solutions
 - use the graph of a system of equations in two variables to help determine the solution
5. Solve applications involving systems of equations.
6. Evaluate numerical and algebraic absolute value expressions.
7. Create a linear equation from a table of values containing co-linear data.
8. Determine the solution to a system of equations in two variables from a given graph.
9. Generate an algebraic sentence to model real-life situations.
10. Write an equation of the line that passes through two given points.
11. Understand and use: • such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power • the rules of exponents
12. Verify that a point lies on a line, given an equation

RRPS Algebra II Power Standards

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Power Standard III (Benchmark II-C)

Use mathematical models to represent and understand quantitative relationships

- Model real-world phenomena using linear and quadratic equations and linear inequalities
- Express the relationship between two variables using an equation and a graph
- Generate an algebraic sentence to model real-life situations
- Understand and use:
 - Such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power
 - The rules of exponents

STRAND II: ALGEBRA

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NM State Benchmark II-D: Grades 9-12

Analyze changes in various contexts

NM Algebra II Performance Standards

- Analyze the effects of parameter changes on these functions:
 - linear (e.g., changes in slope or coefficients)
 - quadratic (e.g., $f[x-a]$ changes coefficients and constants) (Algebra II curriculum)
 - exponential (e.g., changes caused by increasing $x[x + c]$ or $[a^x]$) (Algebra II curriculum)
 - polynomial (e.g., changes caused by positive or negative values of a , or in a constant c) (Algebra II curriculum)
- Solve routine two- and three-step problems relating to change using concepts such as:
 - exponents
 - factoring
 - ratio
 - proportion
 - average
 - percent
- Calculate the percentage of increase and decrease of a quantity.
- Analyze the general shape of polynomial expressions and equations for different degree polynomials (e.g., positive and negative general shapes for third-, fourth-, and fifth-degree polynomials). (Algebra II curriculum)
- Estimate the rate of change of a function or equation by finding the slope between two points on the graph.
- Evaluate the estimated rate of change in the context of the problem.
- Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers

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Power Standard IV (Benchmark II-D)

Topics for further study: Logs and exponential functions

- Operate with logs and exponential functions on the basis of their inverse relations
- Identify the concept of e
- Use exponential functions and common and natural logs to understand real-life situations
- Use logs and exponents to solve equations

