

RRPS District Standards: MATHEMATICS

Algebra I

5/2008

STRAND 2: ALGEBRA

NM State Content Standard 2: Students will understand algebraic concepts and applications.

NM State Benchmarks Grades 9-12

RRPS Algebra I Power Standards

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

NM State Benchmark 2.A: Grades 9-12

Represent and analyze mathematical situations and structures using algebraic symbols.

NM Algebra I 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., $[5xy^2]^3$) an algebra 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.

Power Standard 1 (Benchmark 2.A.3)

Evaluate the numerical value of expressions of one or more variables that are:

- polynomial
- rational
- radical

Power Standard 2 (Benchmark 2.A.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.

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NM State Benchmark 2.A: Grades 9-12

Represent and analyze mathematical situations and structures using algebraic symbols.

NM Algebra I Performance Standards

- 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).
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 differences of cubes.
15. Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to lowest terms.
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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Power Standard 3 (Benchmark 2.A.13)

Solve:

- formulas for specified variables
- radical equations involving one radical

Power Standard 4 (Benchmark 2.A.14)

Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.

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NM State Benchmark 2.B: Grades 9-12

Understand patterns, relations, functions, and graphs.

Power Standard 5 (Benchmark 2.B.8)

Describe the concept of a graph of an equation.

NM Algebra I 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)
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.)

STRAND 2: ALGEBRA

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

NM State Benchmarks Grades 9-12

NM State Benchmark 2.C: Grades 9-12

Use mathematical models to represent and understand quantitative relationships.

NM Algebra I 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 of the line, and be able to derive linear equations by using the point-slope formula.

RRPS Algebra I Power Standards

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Power Standard 6 (Benchmark 2.C.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)

Power Standard 7 (Benchmark 2.C.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

Power Standard 8 (Benchmark 2.C.9)

Generate an algebraic sentence to model real-life situations.

Power Standard 9 (Benchmark 2.C.10)

Write an equation of the line that passes through two given points.

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NM State Benchmark 2.D: Grades 9-12

Analyze changes in various contexts.

NM Algebra I Performance Standards

1. 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)
2. Solve routine two- and three-step problems relating to change using concepts such as:
 - exponents
 - factoring
 - ratio
 - proportion
 - average
 - percent
3. Calculate the percentage of increase and decrease of a quantity.
4. 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)
5. Estimate the rate of change of a function or equation by finding the slope between two points on the graph.
6. Evaluate the estimated rate of change in the context of the problem.
7. Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers

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Power Standard 10 (Benchmark 2.D.1)

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)

Power Standard 11 (Benchmark 2.D.2)

Solve routine two- and three-step problems relating to change using concepts such as:

- exponents
- factoring
- ratio
- proportion
- average
- percent

Power Standard 12 (Benchmark 2.D.5)

Estimate the rate of change of a function or equation by finding the slope between two points on the graph.