

MATHEMATICS STANDARDS

Algebra

STANDARD:

Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student will develop and apply the understanding of the symbolic language of mathematics and the sciences. In addition, the student will use algebraic skills and concepts in a wide variety of problem-solving situations.

Student Performance Expectations: All students who have completed Algebra I shall be expected to:

Standard 1.0:

Students identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable.

- 1.1 Students use properties of numbers to demonstrate whether assertions are true or false.

Standard 2.0:

Students will use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They demonstrate knowledge and apply the rules of exponents.

Standard 3.0:

Students solve equations and compound inequalities involving absolute values.

Standard 4.0:

Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.

- 4.1 Students will solve equations containing decimals and fractions.
- 4.2 Students will solve equations for a specific variable. For example: Solve for x in $ax + by = c$.

Standard 5.0:

Students solve multi-step problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

Standard 6.0:

Students graph a linear equation and compute the x - and y -intercepts (e.g., graph $2x + 6y = 4$). The student will also be able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).

Standard 7.0:

Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.

Standard 8.0:

Students demonstrate an understanding of the concepts of parallel lines and perpendicular lines and how those slopes are related.

- 8.1 Students are able to find the equation of a line perpendicular and or parallel to a given line that passes through a given point.

Standard 9.0:

Students solve a system of two linear equations in two variables algebraically (i.e., substitution and elimination) and are able to interpret the answer graphically.

- 9.1 Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.

Standard 10.0:

Students add, subtract, multiply, and divide monomials and polynomials.

- 10.1 Students solve multi-step problems, including word problems, by using multiple techniques.

Standard 11.0:

Students apply basic factoring techniques to second and third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.

Standard 12.0:

Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

Standard 13.0:

Students add, subtract, multiply, and divide rational expressions and functions.

- 13.1 Students solve both computationally and conceptually challenging problems by using these techniques.

Standard 14.0:

Students solve a quadratic equation by factoring or completing the square.

Standard 15.0:

Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Standard 16.0:

Students apply the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions.

- 16.1 Students will find functional values for a given function. Example: Given $f(x) = 2x + 1$ find $f(5)$.

Standard 17.0:

Students 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.

Standard 18.0:

Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.

Standard 19.0:

Students use the quadratic formula and are familiar with its proof by completing the square.

Standard 20.0:

Students simplify and rationalize radical expressions and solve simple radical equations.

Standard 21.0:

Students graph quadratic functions and know that their roots are the x-intercepts.

Standard 22.0:

Students use the discriminant to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points, and then use the quadratic formula or factoring techniques to find these roots.

Standard 23.0:

Students apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.

Standard 24.0:

Students use and know simple aspects of a logical argument.

- 24.1 Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- 24.2 Students identify the hypothesis and conclusion in logical deduction.
- 24.3 Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

Standard 25.0:

Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements.

- 25.1 Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- 25.2 Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.

Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never