

FOCUS:

Students will be encouraged to develop an understanding of functions and relations and apply this knowledge to solve analytical problems and systems of equations and inequalities. They will also appreciate the diverse nature of algebraic techniques and their value in solving problems.

1AL 1.0 – SIMPLIFYING EXPRESSIONS

Students ...

- 1AL 1.1** Understand and use such operations as finding the *opposite* and finding the *reciprocal*.
- 1AL 1.2** Understand determining a *root*, simplifying a root (e.g. $\sqrt{8} = 2\sqrt{2}$ *surds*) and the meaning of a fractional power (*rational exponents*) and understand and use the *rules of exponents (Index laws)*.
- 1AL 1.3** Simplify or evaluate linear expressions in one variable with integer, fraction and decimal coefficients.
- 1AL 1.4** Solve equations and inequalities involving absolute value and know how to use both interval and number line notation.

1AL 2.0 – LINEAR EQUATIONS & INEQUALITIES

Students ...

- 1AL 2.1** Graph a *linear equation* and compute the *x*- and *y*- intercepts (e.g., graph $2x + 6y = 4$) *using a table of points*.
- 1AL 2.2** Are able to sketch the region defined by *linear inequality* (e.g. $2x + 6y < 4$).
- 1AL 2.3** Can verify that a point lies on a line, given an equation of the line.
- 1AL 2.4** Solve multi-step problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- 1AL 2.5** Are able to derive linear equations by using the *point-slope formula*.
- 1AL 2.6** Understand the concepts of parallel lines and perpendicular lines and how those slopes are related and are able to find the equation of a line passing through a point and parallel or perpendicular to a given line.
- 1AL 2.7** Know and apply the formula for the *distance between two points* and *between a point and a line*.



1AL 3.0 – LINEAR SYSTEMS

Students ...

- 1AL 3.1 Solve a system of two linear equations in two variables *graphically*.
- 1AL 3.2 Solve a system of two linear equations in two variables algebraically using the *elimination* and *substitution* methods.
- 1AL 3.3 Understand both algebraically and geometrically the three possible conclusions of a system of two linear equations in two variables (*inconsistent*, infinite and one solution).
- 1AL 3.4 Solves real-world problems involving the solution of a system of two linear equations in two variables, including rate problems, work problems, and percent mixture problems.

1AL 4.0 – POLYNOMIALS

Students ...

- 1AL 4.1 Add, subtract, multiply, and divide *monomials* and *polynomials*. Students solve multi-step problems, including word problems, by using these techniques.
- 1AL 4.2 Students apply basic *factoring techniques* to second- and simple 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* (see also 1AL 5.2)
- 1AL 4.3 Simplify fractions with polynomials in the *numerator* and *denominator* by factoring both and reducing them to the lowest terms.
- 1AL 4.4 Add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.

1AL 5.0 – QUADRATICS

Students ...

- 1AL 5.1 Solve a *quadratic* equation by factoring or *completing the square*.
- 1AL 5.2 Know the *quadratic formula* and are familiar with its proof by completing the square.
- 1AL 5.3 Use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.
- 1AL 5.4 Graph quadratic functions and know that their roots are the *x- intercepts (zeros)*.
- 1AL 5.5 Determine the *axis of symmetry* of a quadratic and how the *coefficients* affect its position on a graph.
- 1AL 5.6 Use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the *x-axis* in zero, one, or two points.
- 1AL 5.7 Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.

1AL 6.0 – FUNCTIONS

Students ...

- 1AL 6.1** Understand 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.
- 1AL 6.2** 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.
- 1AL 6.3** Determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.

1AL 7.0 – ALGEBRAIC LOGIC

Students ...

- 1AL 7.1** 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.
- 1AL 7.2** Use and know simple aspects of a *logical argument*:
- Explain the difference between *inductive* and *deductive reasoning* and identify and provide examples of each.
 - Identify the *hypothesis* and *conclusion* in logical deduction.
 - Use *counterexamples* to show that an assertion is false and recognize that a single counterexample is sufficient to refute an *assertion*.
- 1AL 7.3** 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:
- Use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate *counterexamples* to, claimed *assertions*.
 - 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.
 - Determine whether the statement is true sometimes, always, or never, given a specific algebraic statement involving linear, quadratic, or *absolute value* expressions or equations or inequalities.