| Algebra 1 |
| --- |

(a) Basic understandings.

    (1) Foundation concepts for high school mathematics. As presented in Grades K-8, the basic understandings of number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry; measurement; and probability and statistics are essential foundations for all work in high school mathematics. Students will continue to build on this foundation as they expand their understanding through other mathematical experiences.

    (2) Algebraic thinking and symbolic reasoning. Symbolic reasoning plays a critical role in algebra; symbols provide powerful ways to represent mathematical situations and to express generalizations. Students use symbols in a variety of ways to study relationships among quantities.

    (3) Function concepts. A function is a fundamental mathematical concept; it expresses a special kind of relationship between two quantities. Students use functions to determine one quantity from another, to represent and model problem situations, and to analyze and interpret relationships.

    (4) Relationship between equations and functions. Equations and inequalities arise as a way of asking and answering questions involving functional relationships. Students work in many situations to set up equations and inequalities and use a variety of methods to solve them.

    (5) Tools for algebraic thinking. Techniques for working with functions and equations are essential in understanding underlying relationships. Students use a variety of representations (concrete, pictorial, numerical, symbolic, graphical, and verbal), tools, and technology (including, but not limited to, calculators with graphing capabilities, data collection devices, and computers) to model mathematical situations to solve meaningful problems.

    (6) Underlying mathematical processes. Many processes underlie all content areas in mathematics. As they do mathematics, students continually use problem-solving, language and communication, and reasoning (justification and proof) to make connections within and outside mathematics. Students also use multiple representations, technology, applications and modeling, and numerical fluency in problem-solving contexts.

| | (A.1) | **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways. | The student is expected to: |
| --- | --- | --- | --- |
| **Foundations of Functions: Functional Relationships** | | | (A) describe independent and dependent quantities in functional relationships; |
| | | | (B) gather and record data and use data sets to determine functional relationships between quantities; |
| | | | (C) describe functional relationships for given problem situations and write equations or inequalities to answer questions arising from the situations; |
| | | | (D) represent relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities; and |
| | | | (E) interpret and make decisions, predictions, and critical judgments from functional relationships. |

| | | | |
|---|---|---|---|
| **Foundations of Functions: Graphical Representations** | (A.2) | **Foundations for functions.** The student uses the properties and attributes of functions. | The student is expected to:<br><br>(A) identify and sketch the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions;<br><br>(B) identify mathematical domains and ranges and determine reasonable domain and range values for given situations, both continuous and discrete;<br><br>(C) interpret situations in terms of given graphs or creates situations that fit given graphs; and<br><br>(D) collect and organize data, make and interpret scatterplots (including recognizing positive, negative, or no correlation for data approximating linear situations), and model, predict, and make decisions and critical judgments in problem situations. |
| **Foundations: Using Variables** | (A.3) | **Foundations for functions.** The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. | The student is expected to:<br><br>(A) use symbols to represent unknowns and variables; and<br><br>(B) look for patterns and represent generalizations algebraically. |
| **Foundations: Symbolic Manipulation** | (A.4) | **Foundations for functions.** The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. | The student is expected to:<br><br>(A) find specific function values, simplify polynomial expressions, transform and solve equations, and factor as necessary in problem situations;<br><br>(B) use the commutative, associative, and distributive properties to simplify algebraic expressions; and<br><br>(C) connect equation notation with function notation, such as $y = x + 1$ and $f(x) = x + 1$. |
| **Linear Functions: Representations** | (A.5) | **Linear functions.** The student understands that linear functions can be represented in different ways and translates among their various representations. | The student is expected to:<br><br>(A) determine whether or not given situations can be represented by linear functions;<br><br>(B) determine the domain and range for linear functions in given situations; and<br><br>(C) use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions. |

| | (A.6) | **Linear functions.** The student understands the meaning of the slope and intercepts of the graphs of linear functions and zeros of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations. | The student is expected to: |
|---|---|---|---|
| **Linear Functions: Meanings of Slope and Intercepts** | | | (A) develop the concept of slope as rate of change and determine slopes from graphs, tables, and algebraic representations; <br><br> (B) interpret the meaning of slope and intercepts in situations using data, symbolic representations, or graphs; <br><br> (C) investigate, describe, and predict the effects of changes in $m$ and $b$ on the graph of $y = mx + b$; <br><br> (D) graph and write equations of lines given characteristics such as two points, a point and a slope, or a slope and $y$-intercept; <br><br> (E) determine the intercepts of the graphs of linear functions and zeros of linear functions from graphs, tables, and algebraic representations; <br><br> (F) interpret and predict the effects of changing slope and $y$-intercept in applied situations; and <br><br> (G) relate direct variation to linear functions and solve problems involving proportional change. |
| **Linear Functions: Solving Problems** | (A.7) | **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. | The student is expected to: <br><br> (A) analyze situations involving linear functions and formulate linear equations or inequalities to solve problems; <br><br> (B) investigate methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality, select a method, and solve the equations and inequalities; and <br><br> (C) interpret and determine the reasonableness of solutions to linear equations and inequalities. |
| **Systems of Linear Equations** | (A.8) | **Linear functions.** The student formulates systems of linear equations from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. | The student is expected to: <br><br> (A) analyze situations and formulate systems of linear equations in two unknowns to solve problems; <br><br> (B) solve systems of linear equations using concrete models, graphs, tables, and algebraic methods; and <br><br> (C) interpret and determine the reasonableness of solutions to systems of linear equations. |
| **Quadratic Functions: Graphical Representation** | (A.9) | **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions. | The student is expected to: <br><br> (A) determine the domain and range for quadratic functions in given situations; <br><br> (B) investigate, describe, and predict the effects of changes in $a$ on the graph of $y = ax^2 + c$; <br><br> (C) investigate, describe, and predict the effects of changes in $c$ on the graph of $y = ax^2 + c$; and <br><br> (D) analyze graphs of quadratic functions and draw conclusions. |

| | | |
|---|---|---|
| **Solving Quadratic Equations** | (A.10) **Quadratic and other nonlinear functions.** The student understands there is more than one way to solve a quadratic equation and solves them using appropriate methods. | The student is expected to:<br><br>(A) solve quadratic equations using concrete models, tables, graphs, and algebraic methods; and<br><br>(B) make connections among the solutions (roots) of quadratic equations, the zeros of their related functions, and the horizontal intercepts (*x*-intercepts) of the graph of the function. |
| **Other Nonlinear Functions** | (A.11) **Quadratic and other nonlinear functions.** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations. | The student is expected to:<br><br>(A) use patterns to generate the laws of exponents and apply them in problem-solving situations;<br><br>(B) analyze data and represent situations involving inverse variation using concrete models, tables, graphs, or algebraic methods; and<br><br>(C) analyze data and represent situations involving exponential growth and decay using concrete models, tables, graphs, or algebraic methods. |