

Chapter 111. Texas Essential Knowledge and Skills for Mathematics

Subchapter C. High School

Statutory Authority: The provisions of this Subchapter C issued under the Texas Education Code, §28.002, unless otherwise noted.

§111.32. Algebra I (One Credit).

- (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. Functions represent the systematic dependence of one quantity on another. Students use functions to represent and model problem situations and to analyze and interpret relationships.
 - (4) Relationship between equations and functions. Equations arise as a way of asking and answering questions involving functional relationships. Students work in many situations to set up equations and use a variety of methods to solve these equations.
 - (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, numerical, algorithmic, graphical), tools, and technology, including, but not limited to, powerful and accessible hand-held calculators and computers with graphing capabilities and 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, computation in problem-solving contexts, language and communication, connections within and outside mathematics, and reasoning, as well as multiple representations, applications and modeling, and justification and proof.
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(b) **Foundations for functions:** knowledge and skills and performance descriptions.

(1) The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

Following are performance descriptions.

- (A) The student describes independent and dependent quantities in functional relationships.
- (B) The student gathers and records data, or uses data sets, to determine functional (systematic) relationships between quantities.
- (C) The student describes functional relationships for given problem situations and writes equations or inequalities to answer questions arising from the situations.
- (D) The student represents relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.
- (E) The student interprets and makes inferences from functional relationships.

(2) The student uses the properties and attributes of functions.

Following are performance descriptions.

- (A) The student identifies and sketches the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions.
- (B) For a variety of situations, the student identifies the mathematical domains and ranges and determines reasonable domain and range values for given situations.
- (C) The student interprets situations in terms of given graphs or creates situations that fit given graphs.
- (D) In solving problems, the student collects and organizes data, makes and interprets scatterplots, and models, predicts, and makes decisions and critical judgments.

(3) The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations.

Following are performance descriptions.

- (A) The student uses symbols to represent unknowns and variables.
- (B) Given situations, the student looks for patterns and represents generalizations algebraically.

- (4) 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.

Following are performance descriptions.

- (A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.
- (B) The student uses the commutative, associative, and distributive properties to simplify algebraic expressions.

- (c) **Linear functions:** knowledge and skills and performance descriptions.

- (1) The student understands that linear functions can be represented in different ways and translates among their various representations.

Following are performance descriptions.

- (A) The student determines whether or not given situations can be represented by linear functions.
- (B) The student determines the domain and range values for which linear functions make sense for given situations.
- (C) The student translates among and uses algebraic, tabular, graphical, or verbal descriptions of linear functions.

- (2) The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

Following are performance descriptions.

- (A) The student develops the concept of slope as rate of change and determines slopes from graphs, tables, and algebraic representations.
- (B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.
- (C) The student investigates, describes, and predicts the effects of changes in m and b on the graph of $y = mx + b$.
- (D) The student graphs and writes equations of lines given characteristics such as two points, a point and a slope, or a slope and y -intercept.
- (E) The student determines the intercepts of linear functions from graphs, tables, and algebraic representations.
- (F) The student interprets and predicts the effects of changing slope and y -intercept in applied situations.

- (3) 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.
- (G) The student relates direct variation to linear functions and solves problems involving proportional change.

Following are performance descriptions.

- (A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.
- (B) The student investigates methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.
- (C) For given contexts, the student interprets and determines the reasonableness of solutions to linear equations and inequalities.

- (4) 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.

Following are performance descriptions.

- (A) The student analyzes situations and formulates systems of linear equations to solve problems.
- (B) The student solves systems of linear equations using concrete models, graphs, tables, and algebraic methods.
- (C) For given contexts, the student interprets and determines the reasonableness of solutions to systems of linear equations.

- (d) **Quadratic and other nonlinear functions:** knowledge and skills and performance descriptions.

- (1) 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.

Following are performance descriptions.

- (A) The student determines the domain and range values for which quadratic functions make sense for given situations.
- (B) The student investigates, describes, and predicts the effects of changes in a on the graph of $y = ax^2$.
- (C) The student investigates, describes, and predicts the effects of changes in c on the graph of $y = x^2 + c$.
- (D) For problem situations, the student analyzes graphs of quadratic functions and draws conclusions.

- (2) The student understands there is more than one way to solve a quadratic equation and solves them using appropriate methods.

Following are performance descriptions.

- (A) The student solves quadratic equations using concrete models, tables, graphs, and algebraic methods.
- (B) The student relates the solutions of quadratic equations to the roots of their functions.

- (3) The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations.

Following are performance descriptions.

- (A) The student uses patterns to generate the laws of exponents and applies them in problem-solving situations.
- (B) The student analyzes data and represents situations involving inverse variation using concrete models, tables, graphs, or algebraic methods.
- (C) The student analyzes data and represents situations involving exponential growth and decay using concrete models, tables, graphs, or algebraic methods.

Source: The provisions of this §111.32 adopted to be effective September 1, 1996, 21 TexReg 7371.