Appendix

Texas Essential Knowledge and Skills

7th Grade
Algebra I

§111.23. Mathematics, Grade 7.

(a) Introduction.

(1) Within a well-balanced mathematics curriculum, the primary focal points at Grade 7 are using proportional relationships in number, geometry, measurement, and probability; applying addition, subtraction, multiplication, and division of decimals, fractions, and integers; and using statistical measures to describe data.

(2) Throughout mathematics in Grades 6-8, students build a foundation of basic understandings in number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry and spatial reasoning; measurement; and probability and statistics. Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other; and they connect verbal, numeric, graphic, and symbolic representations of relationships. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about objects or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, reasoning, and concepts of probability to draw conclusions, evaluate arguments, and make recommendations.

(3) Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning underlie all content areas in mathematics. Throughout mathematics in Grades 6-8, students use these processes together with technology (at least four-function calculators for whole numbers, decimals, and fractions) and other mathematical tools such as manipulative materials to develop conceptual understanding and solve problems as they do mathematics.

(b) Knowledge and skills.

(7.1) **Number, operation, and quantitative reasoning.** The student represents and uses numbers in a variety of equivalent forms.	The student is expected to: (A) compare and order integers and positive rational numbers; (B) convert between fractions, decimals, whole numbers, and percents mentally, on paper, or with a calculator; and (C) represent squares and square roots using geometric models.
(7.2) **Number, operation, and quantitative reasoning.** The student adds, subtracts, multiplies, or divides to solve problems and justify solutions.	The student is expected to: (A) represent multiplication and division situations involving fractions and decimals with concrete models, pictures, words, and numbers; (B) use addition, subtraction, multiplication, and division to solve problems involving fractions and decimals;

		(C) use models to add, subtract, multiply, and divide integers and connect the actions to algorithms; (D) use division to find unit rates and ratios in proportional relationships such as speed, density, price, recipes, and student-teacher ratio; (E) simplify numerical expressions involving order of operations and exponents; (F) select and use appropriate operations to solve problems and justify the selections; and (G) determine the reasonableness of a solution to a problem.
(7.3)	**Patterns, relationships, and algebraic thinking.** The student solves problems involving proportional relationships.	The student is expected to: (A) estimate and find solutions to application problems involving percent; and (B) estimate and find solutions to application problems involving proportional relationships such as similarity, scaling, unit costs, and related measurement units.
(7.4)	**Patterns, relationships, and algebraic thinking.** The student represents a relationship in numerical, geometric, verbal, and symbolic form.	The student is expected to: (A) generate formulas involving conversions, perimeter, area, circumference, volume, and scaling; (B) graph data to demonstrate relationships in familiar concepts such as conversions, perimeter, area, circumference, volume, and scaling; and (C) describe the relationship between the terms in a sequence and their positions in the sequence.
(7.5)	**Patterns, relationships, and algebraic thinking.** The student uses equations to solve problems.	The student is expected to: (A) use concrete models to solve equations and use symbols to record the actions; and (B) formulate a possible problem situation when given a simple equation.

(7.6) **Geometry and spatial reasoning.** The student compares and classifies shapes and solids using geometric vocabulary and properties.

The student is expected to:

(A) use angle measurements to classify pairs of angles as complementary or supplementary;

(B) use properties to classify shapes including triangles, quadrilaterals, pentagons, and circles;

(C) use properties to classify solids, including pyramids, cones, prisms, and cylinders; and

(D) use critical attributes to define similarity.

(7.7) **Geometry and spatial reasoning.** The student uses coordinate geometry to describe location on a plane.

The student is expected to:

(A) locate and name points on a coordinate plane using ordered pairs of integers; and

(B) graph translations on a coordinate plane.

(7.8) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world.

The student is expected to:

(A) sketch a solid when given the top, side, and front views;

(B) make a net (two-dimensional model) of the surface area of a solid; and

(C) use geometric concepts and properties to solve problems in fields such as art and architecture.

(7.9) **Measurement.** The student solves application problems involving estimation and measurement.

The student is expected to estimate measurements and solve application problems involving length (including perimeter and circumference), area, and volume.

(7.10) **Probability and statistics.** The student recognizes that a physical or mathematical model can be used to describe the probability of real-life events.

The student is expected to:

(A) construct sample spaces for compound events (dependent and independent); and

(B) find the approximate probability of a compound event through experimentation.

(7.11) **Probability and statistics.** The student understands that the way a set of data is displayed influences its interpretation.

The student is expected to:

(A) select and use an appropriate representation for presenting collected data and justify the selection; and

(B) make inferences and convincing arguments based on an analysis of given or collected data.

(7.12) **Probability and statistics.** The student uses measures of central tendency and range to describe a set of data.

The student is expected to:

(A) describe a set of data using mean, median, mode, and range; and

(B) choose among mean, median, mode, or range to describe a set of data and justify the choice for a particular situation.

(7.13) **Underlying processes and mathematical tools.** The student applies Grade 7 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school.

The student is expected to:

(A) identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics;

(B) use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;

(C) select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem; and

(D) select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems.

(7.14) **Underlying processes and mathematical tools.** The student communicates about Grade 7 mathematics through informal and mathematical language, representations, and models.

The student is expected to:

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models; and

(B) evaluate the effectiveness of different representations to communicate ideas.

(7.15) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions.

The student is expected to:

(A) make conjectures from patterns or sets of examples and nonexamples; and

(B) validate his/her conclusions using mathematical properties and relationships

Source: The provisions of this §111.23 adopted to be effective September 1, 1998, 22 TexReg 7623.

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.

§111.31. Implementation of Texas Essential Knowledge and Skills for Mathematics, Grades 9-12.

The provisions of this subchapter shall be implemented beginning September 1, 1998, and at that time, shall supersede §75.63(e)-(g) of this title (relating to Mathematics).

Source: The provisions of this §111.31 adopted to be effective September 1, 1996, 21 TexReg 7371.

§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.

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