

# Tennessee Mathematics Standards 2009-2010 Implementation

## Grade Seven Mathematics

### Standard 1 – Mathematical Processes

#### Grade Level Expectations:

- GLE 0706.1.1 Use mathematical language, symbols, and definitions while developing mathematical reasoning.
- GLE 0706.1.2 Apply and adapt a variety of appropriate strategies to problem solving, including estimation, and reasonableness of the solution.
- GLE 0706.1.3 Develop independent reasoning to communicate mathematical ideas and derive algorithms and/or formulas.
- GLE 0706.1.4 Move flexibly between concrete and abstract representations of mathematical ideas in order to solve problems, model mathematical ideas, and communicate solution strategies.
- GLE 0706.1.5 Use mathematical ideas and processes in different settings to formulate patterns, analyze graphs, set up and solve problems and interpret solutions.
- GLE 0706.1.6 Read and interpret the language of mathematics and use written/oral communication to express mathematical ideas precisely.
- GLE 0706.1.7 Recognize the historical development of mathematics, mathematics in context, and the connections between mathematics and the real world.
- GLE 0706.1.8 Use technologies/manipulatives appropriately to develop understanding of mathematical algorithms, to facilitate problem solving, and to create accurate and reliable models of mathematical concepts.

#### Checks for Understanding (Formative/Summative Assessment):

- ✓ 0706.1.1 Recognize common abbreviations (such as gcd/gcf and lcm).
- ✓ 0706.1.2 Recognize round-off error and the inaccuracies it introduces.
- ✓ 0706.1.3 Check answers both by estimation and by appropriate independent calculations, using calculators or computers judiciously.
- ✓ 0706.1.4 Recognize quantities that are inversely proportional (such as the relationship between the lengths of the base and the side of a rectangle with fixed area).
- ✓ 0706.1.5 Understand that a linear function in which  $f(0) = 0$  is called a directly proportional relationship.
- ✓ 0706.1.6 Develop meaning of intercept and rate of change in contextual problems.
- ✓ 0706.1.7 Explain and demonstrate how scale in maps and drawings shows relative size and distance.
- ✓ 0706.1.8 Recognize the applications of scale factor by exploring blueprints, shadow measuring, and scale models.
- ✓ 0706.1.9 Use age-appropriate books, stories, and videos to convey ideas of mathematics.
- ✓ 0706.1.10 Model algebraic equations with manipulatives, technology, and pencil and paper.
- ✓ 0706.1.11 Translate from calculator notation to scientific/standard notation.
- ✓ 0706.1.12 Use dynamic geometry software to explore scale factor and similarity.

#### State Performance Indicators:

- SPI 0706.1.1 Use proportional reasoning to solve mixture/concentration problems.
- SPI 0706.1.2 Generalize a variety of patterns to a symbolic rule from tables, graphs, or words.

- SPI 0706.1.3 Recognize whether information given in a table, graph, or formula suggests a directly proportional, linear, inversely proportional, or other nonlinear relationship.
- SPI 0706.1.4 Use scales to read maps.

## Standard 2 – Number & Operations

### Grade Level Expectations:

- GLE 0706.2.1 Extend understandings of addition, subtraction, multiplication and division to integers.
- GLE 0706.2.2 Understand and work with the properties of and operations on the system of rational numbers.
- GLE 0706.2.3 Develop an understanding of and apply proportionality.
- GLE 0706.2.4 Use ratios, rates and percents to solve single- and multi-step problems in various contexts.
- GLE 0706.2.5 Understand and work with squares, cubes, square roots and cube roots.
- GLE 0706.2.6 Introduce the concept of negative exponents.
- GLE 0706.2.7 Understand and use scientific notation.

### Checks for Understanding (Formative/Summative Assessment):

- ✓ 0706.2.1 Understand that the set of rational numbers includes any number that can be written as a ratio of two integers in which the denominator is not zero.
- ✓ 0706.2.2 Develop and analyze algorithms and compute efficiently with integers and rational numbers.
- ✓ 0706.2.3 Recognize that rational numbers satisfy the commutative and associative laws of addition and multiplication and the distributive law.
- ✓ 0706.2.4 Understand that  $a$  and  $-a$  are additive inverses and are located the same distance from zero on the number line; relate distance from zero to absolute value.
- ✓ 0706.2.5 Understand that  $-(-a) = a$  for any number  $a$ .
- ✓ 0706.2.6 Use the number line to demonstrate addition and subtraction with integers.
- ✓ 0706.2.7 Write number sentences to solve contextual problems involving ratio and percent.
- ✓ 0706.2.8 Apply ratios, rates, proportions and percents (such as discounts, interest, taxes, tips, distance/rate/time, and percent increase or decrease).
- ✓ 0706.2.9 Efficiently compare and order rational numbers and roots of perfect squares/cubes; determine their approximate locations on a number line.
- ✓ 0706.2.10 Recognize that when a whole number is not a perfect square, then its square root is not rational and cannot be written as the ratio of two integers.
- ✓ 0706.2.11 Estimate square/cube roots and use calculators to find approximations.
- ✓ 0706.2.12 Recognize  $\sqrt{mn} = \sqrt{m} \cdot \sqrt{n}$  and  $(\sqrt{m})^2 = m$ .
- ✓ 0706.2.13 Use the meaning of negative exponents to represent small numbers; translate between scientific and standard notation.
- ✓ 0706.2.14 Express numbers in scientific notation and recognize its importance in representing the magnitude of a number.
- ✓ 0706.2.15 Report results of calculations appropriately in a given context (i.e. using rules of rounding, degree of accuracy, and/or significant digits).

### State Performance Indicators:

- SPI 0706.2.1 Simplify numerical expressions involving rational numbers.
- SPI 0706.2.2 Compare rational numbers using appropriate inequality symbols.
- SPI 0706.2.3 Use rational numbers and roots of perfect squares/cubes to solve contextual problems.
- SPI 0706.2.4 Determine the approximate location of square/cube roots on a number line.
- SPI 0706.2.5 Solve contextual problems that involve operations with integers.

- SPI 0706.2.6 Express the ratio between two quantities as a percent, and a percent as a ratio or fraction.  
SPI 0706.2.7 Use ratios and proportions to solve problems.

## Standard 3 – Algebra

### Grade Level Expectations:

- GLE 0706.3.1 Recognize and generate equivalent forms for simple algebraic expressions.  
GLE 0706.3.2 Understand and compare various representations of relations and functions.  
GLE 0706.3.3 Understand the concept of function as a rule that assigns to a given input one and only one number (the output).  
GLE 0706.3.4 Use function notation where  $f(x)$  represents the output that the function  $f$  assigns to the input  $x$ .  
GLE 0706.3.5 Understand and graph proportional relationships.  
GLE 0706.3.6 Conceptualize the meanings of slope using various interpretations, representations, and contexts.  
GLE 0706.3.7 Use mathematical models involving linear equations to analyze real-world phenomena.  
GLE 0706.3.8 Use a variety of strategies to efficiently solve linear equations and inequalities.

### Checks for Understanding (Formative/Summative Assessment):

- ✓ 0706.3.1 Perform basic operations on linear expressions (including grouping, order of operations, exponents, simplifying and expanding).
- ✓ 0706.3.2 Represent and analyze mathematical situations using algebraic symbols.
- ✓ 0706.3.3 Identify a function from a written description, table, graph, rule, set of ordered pairs, and/or mapping.
- ✓ 0706.3.4 Make tables of inputs  $x$  and outputs  $f(x)$  for a variety of rules that include rational numbers (including negative numbers) as inputs.
- ✓ 0706.3.5 Plot points to represent tables of linear function values.
- ✓ 0706.3.6 Understand that the graph of a linear function  $f$  is the set of points on a line representing the ordered pairs  $(x, f(x))$ .
- ✓ 0706.3.7 Distinguish proportional relationships ( $y/x = k$ , or  $y = kx$ ) from other relationships, including inverse proportionality ( $xy = k$ , or  $y = k/x$ ).
- ✓ 0706.3.8 Understand slope as the ratio of vertical change to horizontal change.
- ✓ 0706.3.9 Identify a function exhibiting a constant rate of change as a linear function and identify the slope as a unit rate.
- ✓ 0706.3.10 Solve problems involving unit rates (e.g., miles per hour, words per minute).
- ✓ 0706.3.11 Relate the features of a linear equation to a table and/or graph of the equation.
- ✓ 0706.3.12 Use linear equations to solve problems and interpret the meaning of slope,  $m$ , and the  $y$ -intercept,  $b$ , in  $f(x) = mx + b$  in terms of the context.
- ✓ 0706.3.13 Given a graph that exhibits the intersection of a line and the  $y$ -axis, write a linear function in slope-intercept form:  $y = mx + b$ .
- ✓ 0706.3.14 Understand that when solving linear inequalities, multiplication or division by a negative reverses the inequality symbol.

### State Performance Indicators:

- SPI 0706.3.1 Evaluate algebraic expressions involving rational values for coefficients and/or variables.  
SPI 0706.3.2 Determine whether a relation (represented in various ways) is a function.  
SPI 0706.3.3 Given a table of inputs  $x$  and outputs  $f(x)$ , identify the function rule and continue the pattern.  
SPI 0706.3.4 Interpret the slope of a line as a unit rate given the graph of a proportional relationship.  
SPI 0706.3.5 Represent proportional relationships with equations, tables and graphs.  
SPI 0706.3.6 Solve linear equations with rational coefficients symbolically or graphically.

- SPI 0706.3.7 Translate between verbal and symbolic representations of real-world phenomena involving linear equations.
- SPI 0706.3.8 Solve contextual problems involving two-step linear equations.
- SPI 0706.3.9 Solve linear inequalities in one variable with rational coefficients symbolically or graphically.

## **Standard 4 – Geometry & Measurement**

### **Grade Level Expectations:**

- GLE 0706.4.1 Understand the application of proportionality with similar triangles.
- GLE 0706.4.2 Apply proportionality to converting among different units of measurements to solve problems involving rates such as motion at a constant speed.
- GLE 0706.4.3 Understand and use scale factor to describe the relationships between length, area, and volume.
- GLE 0706.4.4 Understand and use ratios, derived quantities, and indirect measurements.

### **Checks for Understanding (Formative/Summative Assessment):**

- ✓ 0706.4.1 Solve problems involving indirect measurement such as finding the height of a building by comparing its shadow with the height and shadow of a known object.
- ✓ 0706.4.2 Use similar triangles and proportionality to find the lengths of unknown line segments in a triangle.
- ✓ 0706.4.3 Understand that if a scale factor describes how corresponding lengths in two similar objects are related, then the square of the scale factor describes how corresponding areas are related, and the cube of the scale factor describes how corresponding volumes are related.
- ✓ 0706.4.4 Compare angles, side lengths, perimeters and areas of similar shapes.
- ✓ 0706.4.5 Solve problems using ratio quantities: velocity (measured in units such as miles per hour), density (measured in units such as kilograms per liter), pressure (measured in units such as pounds per square foot), and population density (measured in units such as persons per square mile).

### **State Performance Indicators:**

- SPI 0706.4.1 Solve contextual problems involving similar triangles.
- SPI 0706.4.2 Use SSS, SAS, and AA to determine if two triangles are similar.
- SPI 0706.4.3 Apply scale factor to solve problems involving area and volume.

## **Standard 5 – Data Analysis, Statistics, & Probability**

### **Grade Level Expectations:**

- GLE 0706.5.1 Collect, organize, and analyze both single- and two-variable data.
- GLE 0706.5.2 Select, create, and use appropriate graphical representations of data.
- GLE 0706.5.3 Formulate questions and design studies to collect data about a characteristic shared by two populations, or different characteristics within one population.
- GLE 0706.5.4 Use descriptive statistics to summarize and compare data.
- GLE 0706.5.5 Understand and apply basic concepts of probability.

### **Checks for Understanding (Formative/Summative Assessment):**

- ✓ 0706.5.1 Create and interpret box-and-whisker plots and stem-and-leaf plots.
- ✓ 0706.5.2 Interpret and solve problems using information presented in various visual forms.

- ✓ 0706.5.3 Predict and compare the characteristics of two populations based on the analysis of sample data.
- ✓ 0706.5.4 Use proportional reasoning to make predictions about results of experiments and simulations.
- ✓ 0706.5.5 Evaluate the design of an experiment.
- ✓ 0706.5.5 Apply percentages to make and interpret histograms and circle graphs.
- ✓ 0706.5.6 Use a tree diagram or organized list to determine all possible outcomes of a simple probability experiment.

**State Performance Indicators:**

- SPI 0706.5.1 Interpret and employ various graphs and charts to represent data.
- SPI 0706.5.2 Select suitable graph types (such as bar graphs, histograms, line graphs, circle graphs, box-and-whisker plots, and stem-and-leaf plots) and use them to create accurate representations of given data.
- SPI 0706.5.3 Calculate and interpret the mean, median, upper-quartile, lower-quartile, and interquartile range of a set of data.
- SPI 0706.5.4 Use theoretical probability to make predictions.