

# Tennessee Mathematics Standards 2009-2010 Implementation

## Grade Six Mathematics

### Standard 1 – Mathematical Processes

#### Grade Level Expectations:

- GLE 0606.1.1 Use mathematical language, symbols, and definitions while developing mathematical reasoning.
- GLE 0606.1.2 Apply and adapt a variety of appropriate strategies to problem solving, including estimation, and reasonableness of the solution.
- GLE 0606.1.3 Develop independent reasoning to communicate mathematical ideas and derive algorithms and/or formulas.
- GLE 0606.1.4 Move flexibly between concrete and abstract representations of mathematical ideas in order to solve problems, model mathematical ideas, and communicate solution strategies.
- GLE 0606.1.5 Use mathematical ideas and processes in different settings to formulate patterns, analyze graphs, set up and solve problems and interpret solutions.
- GLE 0606.1.6 Read and interpret the language of mathematics and use written/oral communication to express mathematical ideas precisely.
- GLE 0606.1.7 Recognize the historical development of mathematics, mathematics in context, and the connections between mathematics and the real world.
- GLE 0606.1.8 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):

- ✓ 0606.1.1 Recognize different conventions used in calculator and computer spreadsheets (e.g., \* for multiplication, ^ for exponent), but use mathematical notation in written work.
- ✓ 0606.1.2 Recognize when an estimate is more appropriate than an exact answer in a variety of problem situations.
- ✓ 0606.1.3 Recognize errors generated by rounding.
- ✓ 0606.1.4 Describe how changes in one quantity or variable result in changes in another.
- ✓ 0606.1.5 Illustrate properties of operations by showing that two expressions are equivalent in a given context (e.g., using an area model for distributive property, and grouping/set models for commutative and associative properties).
- ✓ 0606.1.6 Model situations by devising and carrying out experiments and simulations.
- ✓ 0606.1.7 Formulate questions, design studies, and collect real world data.
- ✓ 0606.1.8 Determine an appropriate sample to test an hypothesis.
- ✓ 0606.1.9 Use age-appropriate books, stories, and videos to convey ideas of mathematics.
- ✓ 0606.1.10 Use various methods (such as dynamic geometry software) to explore properties of triangles and quadrilaterals.
- ✓ 0606.1.11 Model algebraic expressions with manipulatives, technology, and pencil and paper.

#### State Performance Indicators:

- SPI 0606.1.1 Make conjectures and predictions based on data.
- SPI 0606.1.2 Judge the reasonableness of the results of rational number estimates and/or computations.

- SPI 0606.1.3 Use concrete, pictorial, and symbolic representation for integers.
- SPI 0606.1.4 Select the representation that models one of the arithmetic properties (commutative, associative, or distributive).
- SPI 0606.1.5 Model algebraic expressions using algebra tiles.

## **Standard 2 – Number & Operations**

### **Grade Level Expectations:**

- GLE 0606.2.1 Understand and explain the procedures for multiplication and division of fractions, mixed numbers, and decimals.
- GLE 0606.2.2 Solve multi-step mathematical, contextual and verbal problems using fractions, mixed numbers, and decimals.
- GLE 0606.2.3 Understand and use ratios, rates and percents.
- GLE 0606.2.4 Understand and convert between fraction, decimal, and percent forms of rational numbers.
- GLE 0606.2.5 Develop meaning for integers; represent and compare quantities with integers.

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

- ✓ 0606.2.1 Efficiently compare and order fractions, decimals and percents; determine their approximate locations on a number line.
- ✓ 0606.2.2 Use area models to represent multiplication of fractions.
- ✓ 0606.2.3 Create and solve contextual problems that lead naturally to division of fractions.
- ✓ 0606.2.4 Understand ratio as a fraction used to compare two quantities by division.
- ✓ 0606.2.5 Recognize  $a:b$ ,  $a/b$ , and “a to b” as notations for ratios.
- ✓ 0606.2.6 Recognize common percentages as ratios based on fractions whose denominators are 2, 3, 4, 5, or 10.
- ✓ 0606.2.7 Connect ratio and rate to multiplication and division.
- ✓ 0606.2.8 Recognize that a terminating decimal equals a fraction with a denominator that is a power of ten.
- ✓ 0606.2.9 Recognize that the decimal form of a rational number either terminates or repeats.
- ✓ 0606.2.10 Explore contexts that can be described with negative numbers (such as money, elevation, and temperature).

### **State Performance Indicators:**

- SPI 0606.2.1 Solve problems involving the multiplication and division of fractions.
- SPI 0606.2.2 Solve problems involving the addition, subtraction, multiplication, and division of mixed numbers.
- SPI 0606.2.3 Solve problems involving the addition, subtraction, multiplication, and division of decimals.
- SPI 0606.2.4 Solve multi-step arithmetic problems using fractions, mixed numbers, and decimals.
- SPI 0606.2.5 Transform numbers from one form to another (fractions, decimals, percents, and mixed numbers).
- SPI 0606.2.6 Solve problems involving ratios, rates and percents.
- SPI 0606.2.7 Locate positive rational numbers on the number line.
- SPI 0606.2.8 Locate integers on the number line.

## **Standard 3 – Algebra**

### **Grade Level Expectations:**

- GLE 0606.3.1 Write and solve two-step equations and inequalities.
- GLE 0606.3.2 Interpret and represent algebraic relationships with variables in expressions, simple equations and inequalities.
- GLE 0606.3.3 Extend order of operations to include grouping symbols and exponents.
- GLE 0606.3.4 Use expressions, equations and formulas to solve problems.
- GLE 0606.3.5 Use multiple representations including symbolic algebra to model and/or solve contextual problems that involve linear relationships.
- GLE 0606.3.6 Understand and use the Cartesian coordinate system.

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

- ✓ 0606.3.1 Write and solve two-step linear equations corresponding to given situations (non-negative numbers only).
- ✓ 0606.3.2 Write and solve one-step inequalities corresponding to given situations (non-negative numbers only).
- ✓ 0606.3.3 Recognize the use of juxtaposition (such as  $3x$ ,  $ab$ ) to stand for multiplication, and the convention in these cases of writing numbers before letters.
- ✓ 0606.3.4 Generate data and graph relationships concerning measurement of length, area, volume, weight, time, temperature, money, and information.
- ✓ 0606.3.5 Use the commutative, associative and distributive properties to show that two expressions are equivalent.
- ✓ 0606.3.6 Use equations to describe simple relationships shown in a table or graph.
- ✓ 0606.3.7 Move fluently between different representations (such as verbal, tabular, numerical, algebraic, and graphical) of equations and expressions.
- ✓ 0606.3.8 Represent patterns using words, graphs, and simple symbolic notation.
- ✓ 0606.3.9 Write a contextual story modeled by a given graph.
- ✓ 0606.3.10 Understand that in an ordered pair  $(x, y)$ , the  $x$  represents horizontal location and  $y$  represents vertical location.
- ✓ 0606.3.11 Identify the quadrant of the coordinate system in which a point lies.

**State Performance Indicators:**

- SPI 0606.3.1 Represent on a number line the solution of a linear inequality.
- SPI 0606.3.2 Use order of operations and parentheses to simplify expressions and solve problems.
- SPI 0606.3.3 Write equations that correspond to given situations or represent a given mathematical relationship.
- SPI 0606.3.4 Rewrite expressions to represent quantities in different ways.
- SPI 0606.3.5 Translate between verbal expressions/sentences and algebraic expressions/equations.
- SPI 0606.3.6 Solve two-step linear equations using number sense, properties, and inverse operations.
- SPI 0606.3.7 Use algebraic expressions and properties to analyze numeric and geometric patterns.
- SPI 0606.3.8 Select the qualitative graph that models a contextual situation (e.g., water filling then draining from a bathtub).
- SPI 0606.3.9 Graph ordered pairs of integers in all four quadrants of the Cartesian coordinate system.

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

**Grade Level Expectations:**

- GLE 0606.4.1 Understand and use basic properties of triangles, quadrilaterals, and other polygons.
- GLE 0606.4.2 Use the concepts of translation, rotation, reflection, and symmetry to understand congruence in the plane.
- GLE 0606.4.3 Develop and use formulas to determine the circumference and area of circles, and the area of trapezoids, and develop strategies to find the area of composite shapes.

GLE 0606.4.4 Develop and use formulas for surface area and volume of 3-dimensional figures.

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

- ✓ 0606.4.1 Investigate the sum of the angles in a triangle and a quadrilateral using various methods.
- ✓ 0606.4.2 Relate the sum of the angles in a triangle to the sum of the angles in polygons.
- ✓ 0606.4.3 Verify the basic properties of triangles and quadrilaterals using a protractor and ruler.
- ✓ 0606.4.4 Classify triangles by side lengths (scalene, isosceles, and equilateral) and angle measure (acute, right, obtuse, isosceles and equiangular).
- ✓ 0606.4.5 Model and use the Triangle Inequality Theorem.
- ✓ 0606.4.6 Use the properties of interior and exterior angles of polygons to solve problems.
- ✓ 0606.4.7 Work with transformations in a plane and explore their meanings through drawings and manipulatives.
- ✓ 0606.4.8 Understand scaling, dilation and their relation to similarity.
- ✓ 0606.4.9 Analyze the differences between congruence and similarity.
- ✓ 0606.4.10 Describe the effect of a transformation on a 2-dimensional figure and the resulting symmetry.
- ✓ 0606.4.11 Relate the circumference of a circle with the perimeter of a polygonal figure.
- ✓ 0606.4.12 Derive the meaning of Pi using concrete models and/or appropriate technology.
- ✓ 0606.4.13 Understand the relationships among the radius, diameter, circumference and area of a circle, and that the ratio of the circumference to the diameter is the same as the ratio of the area to the square of the radius, and that this ratio is called Pi.
- ✓ 0606.4.14 Relate the area of a trapezoid to the area of a parallelogram.
- ✓ 0606.4.15 Find lengths given areas or volumes, and vice versa.
- ✓ 0606.4.16 Solve contextual problems involving area and circumference of circles, surface areas and volumes of prisms, pyramids, cones, and cylinders.
- ✓ 0606.4.17 Use manipulatives to discover the volume of a pyramid is one-third the volume of the related prism (the heights and base areas are equal).
- ✓ 0606.4.18 Use manipulatives to discover the volume of a cone is one-third the volume of the related cylinder (the heights and base areas are equal).

**State Performance Indicators:**

- SPI 0606.4.1 Identify, define or describe geometric shapes given a visual representation or a written description of its properties.
- SPI 0606.4.2 Find a missing angle measure in problems involving interior/exterior angles and/or their sums.
- SPI 0606.4.3 Solve problems using the Triangle Inequality Theorem.
- SPI 0606.4.4 Calculate with circumferences and areas of circles.
- SPI 0606.4.5 Determine the surface area and volume of prisms, pyramids and cylinders.
- SPI 0606.4.6 Given the volume of a cone/pyramid, find the volume of the related cylinder/prism or vice versa.

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

**Grade Level Expectations:**

- GLE 0606.5.1 Understand the meaning of probability and how it is expressed.
- GLE 0606.5.2 Interpret representations of data from surveys and polls, and describe sample bias and how data representations can be misleading.

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

- ✓ 0606.5.1 Understand that the probability of an event is a number between zero and one that expresses the likelihood of its occurrence.
- ✓ 0606.5.2 Identify the probability of an event as the ratio of the number of its actual occurrences to the total number of its possible occurrences.
- ✓ 0606.5.3 Express probabilities in different ways.
- ✓ 0606.5.4 Understand the difference between probability and odds.
- ✓ 0606.5.5 Analyze a situation that involves probability of an independent event.
- ✓ 0606.5.6 Estimate the probability of simple and compound events through experimentation or simulation.
- ✓ 0606.5.7 Apply procedures to calculate the probability of complimentary events.
- ✓ 0606.5.8 Connect data sets and their graphical representations (such as bar graphs, circle, graphs, and stem-and-leaf plots).
- ✓ 0606.5.9 Determine the sample space for a given situation.
- ✓ 0606.5.10 Distinguish between a random and nonrandom sample.
- ✓ 0606.5.11 Select the appropriate measure of center to describe a data set.
- ✓ 0606.5.12 Predict the characteristics of a population based on the analysis of sample data.

**State Performance Indicators:**

- SPI 0606.5.1 Determine the theoretical probability of simple and compound events in familiar contexts.
- SPI 0606.5.2 Identify features of graphs that may be misleading.
- SPI 0606.5.3 Determine whether or not a sample is biased.