Tennessee Mathematics Standards

Approved July 30, 2010

Bridge Math Course

#3181

In alignment with the Developmental Studies Program for Mathematics (DSPM) outcomes, the curriculum standards have been organized into groups of mathematical skills. Certain mathematical skills are required in order to prepare a DSPM student for college level mathematics courses. However, these particular skills should be developed in an environment that promotes learning beyond skill and drill techniques. These new skills should be introduced in conjunction with appropriate mathematical concepts and should be related to previous learning. Applications of these skills should play a principal role in the learning and assessment process. Technology should be used to strategically enhance the student's understanding of core concepts via the use of multiple problem solving strategies.

I. Ways of Looking: Revisiting Concepts

Students learn mathematics best by being introduced to concepts that they have previously studied in a new approach. The concepts in this section appear in a manner that emphasizes their basic definition. This presentation of each concept is based upon the format that would be a "best practice" of introducing the particular concept.

3181.1.1 Diagrammatic Mathematics
- ✓ 3181.1.1.1 Identify the graph of a linear inequality on the number line.
- ✓ 3181.1.1.2 Create and use absolute value functions to model and solve problems in common settings.
- ✓ 3181.1.1.3 Given an equation of a line, write an accurate definition of a line by determining the unique characteristics that define it (i.e. slope and intercepts).
- ✓ 3181.1.1.4 Compute the perimeter of simple composite geometric figures with unknown side lengths.
- ✓ 3181.1.1.5 Apply a variety of strategies to determine the circumference and the area for circles.
- ✓ 3181.1.1.6 Investigate the area of a sector and the arc length of a circle.

3181.1.2 Verbal Mathematics
- ✓ 3181.1.2.1 Understand that a line parallel to one side of a triangle divides the other two proportionally, and conversely.

- ✓ 3181.1.2.2 Apply similar triangles to solve problems, such as finding heights and distances.
- ✓ 3181.1.2.3 Use several angle properties to find an unknown angle measure (i.e. supplementary, complementary, vertical, angles along a transversal, and sum of angles in a polygon).
- ✓ 3181.1.2.4 Describe, compare, and contrast plane and solid figures using their attributes.
- ✓ 3181.1.2.5 Multiply, divide and simplify radicals.
- ✓ 3181.1.2.6 Use mathematical grammar and appropriate mathematical symbols to represent contextual situations.

3181.1.3 Symbolic Mathematics

- ✓ 3181.1.3.1 Operations with numbers expressed in scientific notation.
- ✓ 3181.1.3.2 Develop a thorough understanding of both rational and irrational numbers: make both historical and concrete connections between irrational numbers and the real world.
- ✓ 3181.1.3.3 Use mathematical symbols and variables to express a relationship between quantities.
- ✓ 3181.1.3.4 Model a variety of problem situations with expressions.
- ✓ 3181.1.3.5 Skillfully manipulate formulas involving exponents.
- ✓ 3181.1.3.6 Understand how mathematical properties yield equivalent equations and can be used in determining if two expressions are equivalent.
- ✓ 3181.1.3.7 Perform polynomial arithmetic, including addition, subtraction, multiplying, dividing, factoring, and simplifying results.
- ✓ 3181.1.3.8 Demonstrate fluency with techniques needed to simplify radical expressions and calculate with them, including addition, subtraction, and multiplication.
- ✓ 3181.1.3.9 Rationalize denominators in order to perform division with radicals.

3181.1.4 Graphic Mathematics

- ✓ 3181.1.4.1 Understand that a linear function models a situation in which a quantity changes at a constant rate, m, relative to another.
- ✓ 3181.1.4.2 Graph quadratic equations and identify key characteristics of the function.
- ✓ 3181.1.4.3 Find the solution of a quadratic equation and/or zeros of a quadratic function.
- ✓ 3181.1.4.4 Operate (add, subtract, multiply, and divide) with and evaluate rational expressions.
- ✓ 3181.1.4.5 Operate (add, subtract, multiply, divide, simplify, powers) with radicals and radical expressions including radicands involving rational numbers and algebraic expressions.
- ✓ 3181.1.4.6 Identify and calculate the measures of central tendency and spread in a set of data.
- ✓ 3181.1.4.7 Understand the correlation coefficient and its role in measuring the goodness of fit for a model for a data set.

- ✓ 3181.1.4.8 Analyze data to make predictions based on an understanding of the data set, for example, use a scatter-plot to determine if a linear relationship exists and describe the association between the variables.
- ✓ 3181.1.4.9 Use algebra and geometry to solve problems involving midpoints and distances (i.e. geometric figures).

3181.1.5 Numeric Mathematics

- ✓ 3181.1.5.1 Understand that there are numbers that are not rational numbers, called irrational numbers, e.g., π, e, and $\sqrt{2}$, which together with the rational numbers form the real number system that satisfies the laws of arithmetic.
- ✓ 3181.1.5.2 Apply and use elementary number concepts and number properties to model and solve nonroutine problems that involve new ideas.
- ✓ 3181.1.5.3 Determine if a data set represents a line through numerically analyzing slope calculations. If appropriate, interpret the slope in terms of a rate.
- ✓ 3181.1.5.4 Find the probability of simple events, disjoint events, compound events, and independent events in a variety of settings using a variety of counting techniques.
- ✓ 3181.1.5.5 Develop fluency with the basic operations of complex numbers.

II. Making Connections

Making connections allows those concepts that need a more complex look to be studied through two different modalities. This allows connections to be made between the concepts, and allows for a more in-depth understanding of the topics supporting the foundation for problem solving application. In addition, building topics in this manner helps students work problems of a higher depth of knowledge level.

3181.2.1 Symbolic & Diagrammatic Mathematics

- ✓ 3181.2.1.1 Use the laws of exponents to simplify and interpret expressions for exponential functions, recognizing positive rational exponents as indicating roots of the base and negative exponents as indicating the reciprocal of a power.
- ✓ 3181.2.1.2 Solve a linear inequality and provide an interpretation of the solution.
- ✓ 3181.2.1.3 Recognize special products and factors of polynomials to facilitate problem solving with polynomials; in particular, find the zeros of a quadratic polynomial.
- ✓ 3181.2.1.4 Investigate the properties of plane figures, developing precise mathematical descriptions of geometric shapes, both in the plane and in space.
- ✓ 3181.2.1.5 Apply a variety of strategies using relationships between perimeter, area, and volume to calculate desired measures in composite figures.

3181.2.2 Symbolic & Verbal Mathematics
- ✓ 3181.2.2.1 Explain, solve, and/or draw conclusions for complex problems using relationships and elementary number concepts.
- ✓ 3181.2.2.2 Solve simple rational and radical equations in one variable, noting and explaining extraneous solutions.
- ✓ 3181.2.2.3 Write ratios, proportions, and solve proportions in a contextual setting for an unknown value.
- ✓ 3181.2.2.4 Solve literal equations for any variable; interpret the results based on units.

3181.2.3 Symbolic & Numeric Mathematics
- ✓ 3181.2.3.1 In the context of exponential models, solve equations of the form $a \cdot b^{ct} = d$ where a, c, and d are specific numbers and the base b is 2, 10, or e.
- ✓ 3181.2.3.2 Use the rules of exponents to develop an understanding of the difference between the rational and real numbers.
- ✓ 3181.2.3.3 Recognize functions as mappings of an independent variable into a dependent variable.
- ✓ 3181.2.3.4 Evaluate polynomial and exponential functions that use function notation.
- ✓ 3181.2.3.5 Recognize composite functions as an application of substitution and use this understanding to write expressions for and evaluate composite functions.

3181.2.4 Symbolic & Graphic Mathematics
- ✓ 3181.2.4.1 Graphically represent the solution to a linear equation and the solution to a system of linear equations in two variables.
- ✓ 3181.2.4.2 Graphically represent the solution to a linear inequality and the solution to a system of linear inequalities in two variables.
- ✓ 3181.2.4.3 Relate the basic definitions of the trigonometric ratios to the right triangle.
- ✓ 3181.2.4.4 Identify the graphs of basic trigonometric functions and shifts of those graphs.
- ✓ 3181.2.4.5 Solve a simple system consisting of one linear equation and one quadratic equation in two variables; for example, find points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. Illustrate the solution graphically.

3181.2.5 Numeric & Graphic Mathematics
- ✓ 3181.2.5.1 Given a variety of appropriate information, determine the equation of a line.
- ✓ 3181.2.5.2 Use appropriate technology to generate the equation of a line from a set of data and if appropriate, use it to make a prediction.
- ✓ 3181.2.5.3 Use appropriate technology to find the mathematical model for a set of non-linear data.

- ✓ 3181.2.5.4 Compare measures of central tendency and spread for a single data set along with its graph and summary statistics.
- ✓ 3181.2.5.5 Compare data sets using graphs and summary statistics, and measures of central tendency and spread.
- ✓ 3181.2.5.6 Examine radical and rational equations, both graphically and numerically, to determine restrictions on the domain of the variables.
- ✓ 3181.2.5.7 Apply special right-triangle properties and the Pythagorean Theorem to solve congruent, similar shape, and contextual problems.

3181.2.6 Numeric & Diagrammatic Mathematics
- ✓ 3181.2.6.1 Understand and use basic counting techniques in contextual settings.
- ✓ 3181.2.6.2 Use counting techniques to calculate probabilities for conditional and independent events.
- ✓ 3181.2.6.3 Compare a theoretical probability model to an experimental probability model for the same process.

III. Applications: Ways of Looking at the World

Students are confronted with different ways to look at the world. Here students look at multiple representations of concepts, blend their new understanding of topics with applications, and have the opportunity to model contextual situations. Various applications should be addressed each week, throughout the course to support theoretical learning and increased complexity.

3181.3.1 Applications with Numbers
- ✓ 3181.3.1.1 Solve problems using scientific notation.
- ✓ 3181.3.1.2 Solve problems involving percent of increase or decrease, for example mark-ups and mark-downs.
- ✓ 3181.3.1.3 Solve rate, distance, and work problems using proportions and percentages.
- ✓ 3181.3.1.4 Solve problems involving evaluation of exponential functions, for example applications involving simple and compound interest.

3181.3.2 Applications with Geometry
- ✓ 3181.3.2.1 Solve problems involving ratios in geometric settings, such as similar figures and right triangle distance problems.
- ✓ 3181.3.2.2 Solve problems involving finding missing dimensions given area or perimeter of the figure.
- ✓ 3181.3.2.3 Solve problems involving surface areas and volumes of 3-dimensional figures, including maximization, scale, and increment problems.
- ✓ 3181.3.2.4 Solve problems involving angles of elevation and angles of declination.

✓ 3181.3.2.5 Solve problems requiring the interpretation of polynomial, rational, and exponential graphs that depict real-world phenomena, including identification of max/min and end behavior of functions.

3181.3.3 Applications with Functions
✓ 3181.3.3.1 Solve problems involving applications of linear equations.
✓ 3181.3.3.2 Solve problems involving direct and inverse variations, such as frequency, interest, and pressure.
✓ 3181.3.3.3 Solve problems involving systems of equations such as mixture problems.
✓ 3181.3.3.4 Solve problems involving quadratic equations such as area and gravity; additionally examine the fact that quadratic functions have maximum or minimum values and can be used to model problems with optimum solutions.
✓ 3181.3.3.5 Solve problems involving radical equations, such as wind chill and body mass index.
✓ 3181.3.3.6 Solve problems involving rational equations such as work problems.
✓ 3181.3.3.7 Solve problems involving exponential applications such as half-life and continuous interest.

3181.3.4 Applications with Data
✓ 3181.3.4.1 Solve problems involving constructing and interpreting pie charts.
✓ 3181.3.4.2 Solve problems that use the construction and interpretation of Venn diagrams to analyze the attributes of a set of data, for example logic and counting problems.
✓ 3181.3.4.3 Solve problems involving geometric probabilities.