Virginia Tutorials are developed specifically for the Virginia Standards of Learning to help prepare your students for the Standards of Learning Tests.

Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

Unit 1: Numbers and Proportions

- **APPROXIMATING IRRATIONAL NUMBERS**
  - 8.NS.1.a: Estimate and identify the two consecutive natural numbers between which the positive square root of a given number lies and justify which natural number is the better approximation. Numbers are limited to natural numbers from 1 to 400.
  - 8.NS.1.b: Use rational approximations (to the nearest hundredth) of irrational numbers to compare, order, and locate values on a number line. Radicals may include both positive and negative square roots of values from 0 to 400 yielding an irrational number.
  - 8.NS.1.c: Use multiple strategies (e.g., benchmarks, number line, equivalency) to compare and order no more than five real numbers expressed as integers, fractions (proper or improper), decimals, mixed numbers, percents, numbers written in scientific notation, radicals, and pi. Radicals may include both positive and negative square roots of values from 0 to 400. Ordering may be in ascending or descending order. Justify solutions orally, in writing or with a model.
  - 8.NS.2.a: Describe and illustrate the relationships among the subsets of the real number system by using representations (e.g., graphic organizers, number lines). Subsets include rational numbers, irrational numbers, integers, whole numbers, and natural numbers.

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- 8.NS.2.b: Classify and explain why a given number is a member of a particular subset or subsets of the real number system.
- 8.NS.2.c: Describe each subset of the set of real numbers and include examples and non-examples.

- **PERCENTS AND PROPORTIONS**
  - 8.CE.1.a: Estimate and solve contextual problems that require the computation of one discount or markup and the resulting sale price.
  - 8.CE.1.b: Estimate and solve contextual problems that require the computation of the sales tax, tip and resulting total.
  - 8.CE.1.c: Estimate and solve contextual problems that require the computation of the percent increase or decrease.

Unit 2: Expressions

- **EVALUATING EXPRESSIONS**
  - 8.PFA.1.b: Simplify and generate equivalent algebraic expressions in one variable by applying the order of operations and properties of real numbers. Expressions may need to be expanded (using the distributive property) or require combining like terms to simplify. Expressions will include only linear and numeric terms. Coefficients and numeric terms may be rational.
- **ORDER OF OPERATIONS AND PROPERTIES**
  - 8.PFA.1.a: Represent algebraic expressions using concrete manipulatives or pictorial representations (e.g., colored chips, algebra tiles), including expressions that apply the distributive property.
- **PROPERTIES AND EQUIVALENCE**
  - 8.PFA.4.b: Apply properties of real numbers and properties of equality to solve multistep linear equations in one variable (up to four steps). Coefficients and numeric terms will be rational. Equations may contain expressions that need to be expanded (using the distributive property) or require combining like terms to solve.

Unit 3: Equations and Inequalities

- **MULTI-STEP EQUATIONS AND INEQUALITIES**
  - 8.PFA.4.f: Interpret algebraic solutions in context to linear equations in one variable.
- **SOLVING INEQUALITIES**
  - 8.PFA.5.a: Apply properties of real numbers and properties of inequality to solve multistep linear inequalities (up to four steps) in one variable with the variable on one or both sides of the inequality. Coefficients and numeric terms will be rational. Inequalities may contain expressions that need to be expanded (using the distributive property) or require combining like terms to solve.
  - 8.PFA.5.b: Represent solutions to inequalities algebraically and graphically using a number line.
  - 8.PFA.5.c: Write multistep linear inequalities in one variable to represent a verbal situation, including those in context.
  - 8.PFA.5.d: Create a verbal situation in context given a multistep linear inequality in one variable.

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- 8.PFA.5.e: Solve problems in context that require the solution of a multistep linear inequality in one variable.
- 8.PFA.5.g: Interpret algebraic solutions in context to linear inequalities in one variable.

- **SOLVING 2-STEP EQUATIONS**
  - 8.PFA.4.d: Create a verbal situation in context given a multistep linear equation in one variable.
  - 8.PFA.4.e: Solve problems in context that require the solution of a multistep linear equation.

Unit 4: Linear Equations

- **SOLVING LINEAR EQUATIONS**
  - 8.PFA.4.c: Write a multistep linear equation in one variable to represent a verbal situation, including those in context.
  - 8.PFA.4.g: Confirm algebraic solutions to linear equations in one variable.
- **WRITING LINEAR EQUATIONS**
  - 8.PFA.3.c: Graph a linear function given a table, equation, or a situation in context.
  - 8.PFA.3.e: Write an equation of a linear function in the form y = mx + b, given a graph, table, or a situation in context.

Unit 5: Functions

- **RELATIONS AND FUNCTIONS**
  - 8.PFA.2.a: Determine whether a relation, represented by a set of ordered pairs, a table, or a graph of discrete points is a function. Sets are limited to no more than 10 ordered pairs.
- **DOMAIN AND RANGE**
  - 8.PFA.2.b: Identify the domain and range of a function represented as a set of ordered pairs, a table, or a graph of discrete points.
- **INDEPENDENT AND DEPENDENT VARIABLES**
  - 8.PFA.3.b: Describe key characteristics of linear functions including slope (m), y-intercept (b), and independent and dependent variables.
- **SLOPE INTERCEPT FORM**
  - 8.PFA.3.c: Graph a linear function given a table, equation, or a situation in context.
  - 8.PFA.3.d: Create a table of values for a linear function given a graph, equation in the form of y = mx + b, or context.

Unit 6: The Pythagorean Theorem

- **THE PYTHAGOREAN THEOREM**
  - 8.MG.4.a: Verify the Pythagorean Theorem using diagrams, concrete materials, and measurement.
  - 8.MG.4.c: Identify the parts of a right triangle (the hypotenuse and the legs) given figures in various orientations.

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- 8.MG.4.d: Determine the measure of a side of a right triangle, given the measures of the other two sides.

- **THE CONVERSE OF THE PYTHAGOREAN THEOREM**
  - 8.MG.4.b: Determine whether a triangle is a right triangle given the measures of its three sides.
  - 8.MG.4.e: Apply the Pythagorean Theorem, and its converse, to solve problems involving right triangles in context.

Unit 7: Transformations

- **BASIC TRANSFORMATIONS**
  - 8.MG.3.g: Identify and describe transformations in context (e.g., tiling, fabric, wallpaper designs, art).
- **TRANSFORMATIONS IN THE COORDINATE PLANE**
  - 8.MG.3.a: Given a preimage in the coordinate plane, identify the coordinates of the image of a polygon that has been translated vertically, horizontally, or a combination of both.
  - 8.MG.3.b: Given a preimage in the coordinate plane, identify the coordinates of the image of a polygon that has been reflected over the x- or y-axis.
  - 8.MG.3.c: Given a preimage in the coordinate plane, identify the coordinates of the image of a polygon that has been translated and reflected over the x- or y-axis or reflected over the x- or y-axis and then translated.
  - 8.MG.3.d: Sketch the image of a polygon that has been translated vertically, horizontally, or a combination of both.
  - 8.MG.3.e: Sketch the image of a polygon that has been reflected over the x- or y-axis.
  - 8.MG.3.f: Sketch the image of a polygon that has been translated and reflected over the x- or y-axis, or reflected over the x- or y-axis and then translated.

Unit 8: Geometry

- **ANGLE RELATIONSHIPS**
  - 8.MG.1.a: Identify and describe the relationship between pairs of angles that are vertical, adjacent, supplementary, and complementary.
  - 8.MG.1.b: Use the relationships among supplementary, complementary, vertical, and adjacent angles to solve problems, including those in context, involving the measure of unknown angles.
- **AREA**
  - 8.MG.5.a: Subdivide a plane figure into triangles, rectangles, squares, trapezoids, parallelograms, circles, and semicircles. Determine the area of subdivisions and combine to determine the area of the composite plane figure.
  - 8.MG.5.c: Apply perimeter, circumference, and area formulas to solve contextual problems involving composite plane figures.
- **AREA, VOLUME, AND SURFACE AREA**

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- 8.MG.5.a: Subdivide a plane figure into triangles, rectangles, squares, trapezoids, parallelograms, circles, and semicircles. Determine the area of subdivisions and combine to determine the area of the composite plane figure.
- 8.MG.5.c: Apply perimeter, circumference, and area formulas to solve contextual problems involving composite plane figures.

Unit 9: Three-Dimensional Geometry

- **SOLID FIGURES**
  - 8.MG.2.a: Determine the surface area of square-based pyramids by using concrete objects, nets, diagrams, and formulas.
  - 8.MG.2.d: Solve problems in context involving volume of cones and square-based pyramids and the surface area of square-based pyramids.
- **VOLUME OF CYLINDERS AND CONES**
  - 8.MG.2.b: Determine the volume of cones and square-based pyramids, using concrete objects, diagrams, and formulas.
  - 8.MG.2.c: Examine and explain the relationship between the volume of cones and cylinders, and the volume of rectangular prisms and square based pyramids.
  - 8.MG.2.d: Solve problems in context involving volume of cones and square-based pyramids and the surface area of square-based pyramids.
- **VOLUME OF PRISMS**
  - 8.MG.2.c: Examine and explain the relationship between the volume of cones and cylinders, and the volume of rectangular prisms and square based pyramids.

Unit 10: Probability and Statistics

- **INTRODUCTION TO PROBABILITY**
  - 8.PS.1.a: Determine whether two events are independent or dependent and explain how replacement impacts the probability.
  - 8.PS.1.b: Compare and contrast the probability of independent and dependent events.
  - 8.PS.1.c: Determine the probability of two independent events.
  - 8.PS.1.d: Determine the probability of two dependent events.
- **STATISTICAL QUESTIONS AND DATA DISTRIBUTIONS**
  - 8.PS.2.b: Determine the data needed to answer a formulated question and collect the data (or acquire existing data) using various methods (e.g., observations, measurement, surveys, experiments).
  - 8.PS.3.a: Formulate questions that require the collection or acquisition of data with a focus on scatterplots.
- **POPULATIONS AND SAMPLES**

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- 8.PS.2.c: Determine how statistical bias might affect whether the data collected from the sample is representative of the larger population.

- **BOX POTS**
  - 8.PS.2.a: Formulate questions that require the collection or acquisition of data with a focus on boxplots.
  - 8.PS.2.d: Organize and represent a numeric data set of no more than 20 items, using boxplots, with and without the use of technology.
  - 8.PS.2.e: Identify and describe the lower extreme (minimum), upper extreme (maximum), median, upper quartile, lower quartile, range, and interquartile range given a data set, represented by a boxplot.
  - 8.PS.2.i: Given a contextual situation, justify which graphical representation (e.g., pictographs, bar graphs, line graphs, line plots/dot plots, stem-and-leaf plots, circle graphs, histograms, and boxplots) best represents the data.

Unit 11: Data Representations

- **DOT PLOTS AND HISTOGRAMS**
  - 8.PS.2.i: Given a contextual situation, justify which graphical representation (e.g., pictographs, bar graphs, line graphs, line plots/dot plots, stem-and-leaf plots, circle graphs, histograms, and boxplots) best represents the data.
- **BAR GRAPHS**
  - 8.PS.2.i: Given a contextual situation, justify which graphical representation (e.g., pictographs, bar graphs, line graphs, line plots/dot plots, stem-and-leaf plots, circle graphs, histograms, and boxplots) best represents the data.
- **SCATTER PLOTS**
  - 8.PS.3.c: Organize and represent numeric bivariate data using scatterplots with and without the use of technology.
  - 8.PS.3.d: Make observations about a set of data points in a scatterplot as having a positive linear relationship, a negative linear relationship, or no relationship.
  - 8.PS.3.e: Analyze and justify the relationship of the quantitative bivariate data represented in scatterplots.
- **LINEAR MODELS IN DATA**
  - 8.PS.3.e: Analyze and justify the relationship of the quantitative bivariate data represented in scatterplots.
  - 8.PS.3.f: Sketch the line of best fit for data represented in a scatterplot.

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