Kentucky Tutorials are designed specifically for the Kentucky Academic Standards to prepare students for the K-PREP, EOC exams, ACT, and ACT Plan.

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: The Number System

- **RATIONAL AND IRRATIONAL NUMBERS**
  - KY.8.NS.1: Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.
- **APPROXIMATING IRRATIONAL NUMBERS**
  - KY.8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram and estimate the value of expressions.
  - KY.8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form x = and x = , where is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that perfect squares and perfect cubes are rational.
  - KY.8.NS.1: Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.
  - KY.8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form x = and x = , where is a positive rational number. Evaluate square roots of small perfect squares and cube

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roots of small perfect cubes. Know that perfect squares and perfect cubes are rational.

Unit 2: Exponents

- **PROPERTIES OF EXPONENTS**
  - KY.8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions.
- **POWERS OF 10**
  - KY.8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 (Scientific Notation) to estimate very large or very small quantities and express how many times larger or smaller one is than the other.
  - KY.8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.
- **SCIENTIFIC NOTATION**
  - KY.8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 (Scientific Notation) to estimate very large or very small quantities and express how many times larger or smaller one is than the other.
  - KY.8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

Unit 3: Proportional Reasoning and Slope

- **SLOPE**
  - KY.8.F.5.a: Use graphs to represent functions. Describe qualitatively the functional relationship between two quantities by analyzing a graph.
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.
  - KY.8.F.4.b: Construct a function to model a linear relationship between two quantities. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
  - KY.8.EE.6: Use similar triangles to explain why the slope, , is the same between any two distinct points on a non-vertical line in the coordinate plane; know the equation = for a line through the origin and the equation = + for a line intercepting the vertical axis at .
  - KY.8.EE.6: Use similar triangles to explain why the slope, , is the same between any two distinct points on a non-vertical line in the coordinate plane; know the equation = for a line through the origin and the equation = + for a line intercepting the vertical axis at .

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- KY.8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

- **MULTIPLE REPRESENTATIONS OF PROPORTIONS**
  - KY.8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

Unit 4: Functions

- **RELATIONS AND FUNCTIONS**
  - KY.8.F.1: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- **COMPARING FUNCTIONS**
  - KY.8.F.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
  - KY.8.F.5.a: Use graphs to represent functions. Describe qualitatively the functional relationship between two quantities by analyzing a graph.
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.
  - KY.8.F.4.b: Construct a function to model a linear relationship between two quantities. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
- **GRAPHS OF FUNCTIONS**
  - KY.8.F.5.b: Use graphs to represent functions. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
  - KY.8.F.5.a: Use graphs to represent functions. Describe qualitatively the functional relationship between two quantities by analyzing a graph.
  - KY.8.F.3.b: Understand properties of linear functions. Identify and give examples of functions that are not linear.

Unit 5: Linear Functions

- **SLOPE-INTERCEPT FORM**
  - KY.8.EE.6: Use similar triangles to explain why the slope, , is the same between any two distinct points on a non-vertical line in the coordinate plane; know the equation = for a line through the origin and the equation = + for a line intercepting the vertical axis at .
  - KY.8.F.3.a: Understand properties of linear functions. Interpret the equation = + as defining a linear function, whose graph is a straight line.
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,)

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values, including reading these from a table or from a graph.

- KY.8.F.4.b: Construct a function to model a linear relationship between two quantities. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
- KY.8.F.3.a: Understand properties of linear functions. Interpret the equation = + as defining a linear function, whose graph is a straight line.
- KY.8.F.3.b: Understand properties of linear functions. Identify and give examples of functions that are not linear.
- KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.

- **WRITING LINEAR FUNCTIONS**
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.
  - KY.8.F.4.b: Construct a function to model a linear relationship between two quantities. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.

Unit 6: Solving Equations

- **SOLVING LINEAR EQUATIONS**
  - KY.8.EE.7.b: Solve linear equations in one variable. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms.
  - KY.8.EE.7.a: Solve linear equations in one variable. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form = , = , or = results (where and are different numbers).
  - KY.8.EE.8.c: Analyze and solve a system of two linear equations. Solve real-world and mathematical problems leading to two linear equations in two variables.
- **SOLVING SYSTEMS OF LINEAR EQUATIONS**
  - KY.8.EE.8.c: Analyze and solve a system of two linear equations. Solve real-world and mathematical problems leading to two linear equations in two variables.
  - KY.8.EE.8.a: Analyze and solve a system of two linear equations. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because

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points of intersection satisfy both equations simultaneously; understand that a system of two linear equations may have one solution, no solution, or infinitely many solutions.

- KY.8.EE.8.b: Analyze and solve a system of two linear equations. Solve systems of two linear equations in two variables algebraically by using substitution where at least one equation contains at least one variable whose coefficient is 1 and by inspection for simple cases.

- **SOLVING EQUATIONS USING ROOTS**
  - KY.8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form x = and x = , where is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that perfect squares and perfect cubes are rational.

Unit 7: The Pythagorean Theorem and Distance Formula

- **THE PYTHAGOREAN THEOREM**
  - KY.8.G.6: Explain a proof of the Pythagorean Theorem and its converse.
  - KY.8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- **THE CONVERSE OF THE PYTHAGOREAN THEOREM**
  - KY.8.G.6: Explain a proof of the Pythagorean Theorem and its converse.
  - KY.8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- **DISTANCE ON THE COORDINATE PLANE**
  - KY.8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Unit 8: Three-Dimensional Geometry

- **VOLUME OF CYLINDERS AND CONES**
  - KY.8.G.9: Apply the formulas for the volumes and surface areas of cones, cylinders and spheres and use them to solve real-world and mathematical problems.
- **SPHERES**
  - KY.8.G.9: Apply the formulas for the volumes and surface areas of cones, cylinders and spheres and use them to solve real-world and mathematical problems.

Unit 9: Rotations, Reflections, and Translations

- **BASICS OF TRANSFORMATIONS**
  - KY.8.G.3: Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
  - KY.8.G.1: Verify experimentally the properties of rotations, reflections and translations:
  - KY.8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations. Given two similar two-

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dimensional figures, describe a sequence that exhibits the similarity between them.

- KY.8.G.1.1: Verify experimentally the properties of rotations, reflections and translations: Lines are congruent to lines.

- **TRANSFORMATIONS AND CONGRUENCE**
  - KY.8.G.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections and translations. Given two congruent figures, describe a sequence that exhibits the congruence between them.
  - KY.8.G.3: Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

Unit 10: Congruence and Similarity Transformations

- **TRANSFORMATIONS ON THE COORDINATE PLANE**
  - KY.8.G.3: Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
  - KY.8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations. Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
- **SIMILARITY AND DILATIONS**
  - KY.8.G.3: Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
  - KY.8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations. Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
  - KY.8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Unit 11: Angles and Angle Relationships

- **PARALLEL LINES AND ANGLE RELATIONSHIPS**
  - KY.8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal and the angle-angle criterion for similarity of triangles.
- **ANGLE RELATIONSHIPS IN TRIANGLES**
  - KY.8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal and the angle-angle criterion for similarity of triangles.

Unit 12: Probability and Statistics

- **SCATTERPLOTS**

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- KY.8.SP.1: Construct and interpret scatter plots for bivariate numerical data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association.
- KY.8.SP.2: Know that lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a line and informally assess the model fit by judging the closeness of the data points to the line.

- **LINEAR MODELS IN DATA**
  - KY.8.SP.2: Know that lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a line and informally assess the model fit by judging the closeness of the data points to the line.
  - KY.8.SP.1: Construct and interpret scatter plots for bivariate numerical data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association.
  - KY.8.SP.3: Use the equation of a linear model to solve problems in the context of bivariate numerical data, interpreting the slope and intercept.
  - KY.8.F.4.a: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (,) values, including reading these from a table or from a graph.
  - KY.8.F.4.b: Construct a function to model a linear relationship between two quantities. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

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