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.

This Tutorial is built to state standards.

Unit 1: Exponents

- **PROPERTIES OF EXPONENTS**
  - PA.N.1.1: Develop and apply the properties of integer exponents, including a = 1 (with a not equal to 0), to generate equivalent numerical and algebraic expressions.
- **POWERS OF 10**
  - PA.N.1.2: Express and compare approximations of very large and very small numbers using scientific notation.
- **SCIENTIFIC NOTATION**
  - PA.N.1.2: Express and compare approximations of very large and very small numbers using scientific notation.
  - PA.N.1.3: Multiply and divide numbers expressed in scientific notation and express the answer in scientific notation.

Unit 2: Expressions

- **APPROXIMATING IRRATIONAL NUMBERS**
  - PA.N.1.4: Compare and order real numbers; locate real numbers on a number line. Identify the square roots of perfect squares to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.

- **EVALUATING EXPRESSIONS**
  - PA.A.3.1: Use substitution to simplify and evaluate algebraic expressions.
- **EQUIVALENT EXPRESSIONS**
  - PA.A.3.2: Justify steps in generating equivalent expressions by combining like terms and using order of operations (to include grouping symbols). Identify the properties used, including the properties of operations (associative, commutative, and distributive).

Unit 3: Slope

- **SLOPE**
  - PA.A.2.3: Identify graphical properties of linear functions, including slope and intercepts. Know that the slope equals the rate of change and that the -intercept is zero when the function represents a proportional relationship.
- **SLOPE-INTERCEPT FORM**
  - PA.A.1.2: Use linear functions to represent and model mathematical situations.
  - PA.A.1.3: Identify a function as linear if it can be expressed in the form y = mx + b or if its graph is a non-vertical straight line.
  - PA.A.2.1: Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another.
  - PA.A.2.2: Identify, describe, and analyze linear relationships between two variables.
- **GRAPHING AND MANIPULATING Y = MX + B**
  - PA.A.2.4: Predict the effect on the graph of a linear function when the slope or y-intercept changes. Use appropriate tools to examine these effects.

Unit 4: Functions

- **FUNCTIONS AND RELATIONS**
  - PA.A.1.1: Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable.
- **WRITING LINEAR FUNCTIONS**
  - PA.A.1.2: Use linear functions to represent and model mathematical situations.
  - PA.A.2.1: Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another.
  - PA.A.2.2: Identify, describe, and analyze linear relationships between two variables.
  - PA.A.2.3: Identify graphical properties of linear functions, including slope and intercepts. Know that the slope equals the rate of change and that the -intercept is zero when the function represents a proportional relationship.
  - PA.A.2.5: Solve problems involving linear functions and interpret results in the original context.

Unit 5: Linear Equations and Inequalities

- **SOLVING LINEAR EQUATIONS**
  - PA.A.4.1: Solve mathematical problems using linear equations with one variable where there could be one, infinitely many, or no solutions. Represent situations using linear equations and interpret solutions in the original context.
  - PA.A.4.3: Represent real-world situations using equations and inequalities involving one variable.
- **SOLVING LINEAR INEQUALITIES**
  - PA.A.4.2: Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form px + q r and px + q r, where p, q, and r are rational numbers.
  - PA.A.4.3: Represent real-world situations using equations and inequalities involving one variable.

Unit 6: The Pythagorean Theorem and Distance Formula

- **THE PYTHAGOREAN THEOREM**
  - PA.GM.1.1: Justify the Pythagorean theorem using measurements, diagrams, or dynamic software to solve problems in two dimensions involving right triangles.
- **THE CONVERSE OF THE PYTHAGOREAN THEOREM**
  - PA.GM.1.1: Justify the Pythagorean theorem using measurements, diagrams, or dynamic software to solve problems in two dimensions involving right triangles.
- **DISTANCE ON THE COORDINATE PLANE**
  - PA.GM.1.2: Use the Pythagorean theorem to find the distance between any two points in a coordinate plane.

Unit 7: Area, Volume, and Surface Area

- **AREA, VOLUME, AND SURFACE AREA**
  - PA.GM.2.1: Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate units (e.g., cm).
  - PA.GM.2.3: Justify why base area (B) and height (h) in the formula V = Bh are multiplied to find the volume of a rectangular prism. Use appropriate units (e.g., cm).
- **VOLUME OF CYLINDERS AND CONES**
  - PA.GM.2.4: Develop and use the formulas V = (pi r)h and V = Bh to determine the volume of right cylinders, in terms of pi and using approximations for pi. Justify why base area (B) and height (h) are multiplied to find the volume of a right cylinder. Use appropriate units (e.g., cm).
- **SURFACE AREA OF CYLINDERS AND CONES**
  - PA.GM.2.2: Calculate the surface area of a cylinder, in terms of pi and using approximations for pi, using decomposition or nets. Use appropriate units (e.g., cm).

Unit 8: Data Analysis

- **POPULATION AND SAMPLES**

- PA.D.2.2: Determine how samples are chosen (randomness) to draw and support conclusions about generalizing a sample to a population, including identifying limitations and biases.

- **DATA ANALYSIS**
  - PA.D.1.2: Explain how outliers affect measures of center and spread.

Unit 9: Data Models

- **SCATTERPLOTS**
  - PA.D.1.3: Collect, display, and interpret data using scatter plots. Use the shape of the scatter plot to find the informal line of best fit, make statements about the average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels, and units.
- **LINEAR MODELS IN DATA**
  - PA.D.1.3: Collect, display, and interpret data using scatter plots. Use the shape of the scatter plot to find the informal line of best fit, make statements about the average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels, and units.

Unit 10: Probability

- **PROBABILITY**
  - PA.D.2.1: Calculate experimental probabilities and represent them as percents, fractions, and decimals between 0 and 1. Use experimental probabilities to predict relative frequencies when actual probabilities are unknown.
- **ADDITION AND SUBTRACTION RULES IN PROBABILITY**
  - PA.D.2.3: Define, compare, and contrast the probabilities of dependent and independent events.