Indiana Tutorials are designed specifically for the Indiana Academic Standards to prepare students for the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) End-of-Course Assessments (ECAs).

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.

1. FUNCTIONS

- **FUNCTIONS AND RELATIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
- **DOMAIN AND RANGE**
- **INVERSE FUNCTIONS**
  - **F.BF.4.a** *Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.*
- **ABSOLUTE VALUE FUNCTIONS**

2. SEQUENCES

- **ARITHMETIC AND GEOMETRIC SEQUENCES**
  - **F.BF.2** *Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*
  - **F.IF.3** *Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.*
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
- **SUMS OF GEOMETRIC SEQUENCES**
  - **A.SSE.4** *Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.*

3. TWO-VARIABLE LINEAR SYSTEMS

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: GUESS AND CHECK**
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*
  - **A.REI.6** *Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.*

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: SUBSTITUTION**
  - **A.REI.6** *Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.*

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: ELIMINATION**
  - **A.REI.6** *Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.*

4. EXPONENTIAL FUNCTIONS AND EQUATIONS

- **LAWS OF EXPONENTS**
  - **N.RN.1** *Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.*
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **A.APR.6** *Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, (x), $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.*
  - **A.REI.1** *Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.*
  - **N.RN.2** *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*

- **EXPONENTIAL FUNCTIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.IF.8.b** *Use the properties of exponents to interpret expressions for exponential functions.*
  - **F.IF.6** *Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
  - **F.IF.7.e** *Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
  - **A.CED.1** *Create equations and inequalities in one variable and use them to solve problems.*
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*
  - **F.LE.5** *Interpret the parameters in a linear or exponential function in terms of a context.*

- **EXPONENTIAL GROWTH AND DECAY**
  - **F.IF.8.b** *Use the properties of exponents to interpret expressions for exponential functions.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
  - **F.LE.5** *Interpret the parameters in a linear or exponential function in terms of a context.*

- **SOLVING EXPONENTIAL EQUATIONS**
  - **A.SSE.3.c** *Use the properties of exponents to transform expressions for exponential functions.*
  - **F.IF.8.b** *Use the properties of exponents to interpret expressions for exponential functions.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*

5. LOGARITHMIC EXPRESSIONS, EQUATIONS, AND FUNCTIONS

- **LOGARITHMIC FUNCTIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.IF.7.e** *Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*

- **EVALUATING LOGARITHMIC EXPRESSIONS**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*

- **SOLVING LOGARITHMIC EQUATIONS**
  - **F.LE.4** *For exponential models, express as a logarithm the solution to ab to the ct power $= d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.*
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **A.REI.1** *Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.*

6. GRAPHS AND REPRESENTATIONS OF QUADRATIC FUNCTIONS

- **ANALYZING GRAPHS OF QUADRATIC FUNCTIONS**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **F.IF.9** *Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).*
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **A.APR.3** *Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.*

- **REPRESENTATIONS OF QUADRATIC FUNCTIONS**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.IF.9** *Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).*
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*
  - **A.APR.3** *Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.*
  - **F.IF.7.c** *Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*

- **MULTIPLE REPRESENTATIONS OF FUNCTIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.IF.9** *Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*

7. SOLVING QUADRATIC EQUATIONS

- **SOLVING QUADRATIC EQUATIONS BY FACTORING**

- **A.REI.4.b** *Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.*
- **A.APR.3** *Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.*
- **A.APR.4** *Prove polynomial identities and use them to describe numerical relationships.*
- **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*

- **QUADRATIC FORMULA**
  - **A.REI.4.b** *Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.*
  - **N.CN.7** *Solve quadratic equations with real coefficients that have complex solutions.*
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*

- **COMPLETING THE SQUARE**
  - **A.REI.4.b** *Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.*
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*

8. FACTORING POLYNOMIALS AND THE FACTOR THEOREM

- **FACTORING SPECIAL CASES**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **A.APR.4** *Prove polynomial identities and use them to describe numerical relationships.*

- **FACTORING CUBIC POLYNOMIALS**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **A.APR.4** *Prove polynomial identities and use them to describe numerical relationships.*

9. POLYNOMIALS

- **DIVISION OF POLYNOMIALS**
  - **A.APR.2** *Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.*
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*

- **GRAPHS OF POLYNOMIAL FUNCTIONS**
  - **A.APR.3** *Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.*
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.IF.7.c** *Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*

- **COMPLEX NUMBERS**
  - **N.CN.1** *Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and real.*
  - **N.CN.2** *Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.*

10. RADICAL FUNCTIONS AND EQUATIONS

- **ANALYZING GRAPHS OF SQUARE ROOT FUNCTIONS**
  - **F.BF.3** *Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.*

- **SOLVING SQUARE ROOT EQUATIONS**
  - **A.REI.2** *Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.*
  - **A.REI.1** *Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.*
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*

11. RATIONAL EXPRESSIONS, EQUATIONS, AND FUNCTIONS

- **OPERATIONS WITH RATIONAL EXPRESSIONS**
  - **A.SSE.2** *Use the structure of an expression to identify ways to rewrite it.*
  - **A.APR.6** *Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), (x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.*

- **ANALYZING GRAPHS OF RATIONAL FUNCTIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*

- **SOLVING RATIONAL EQUATIONS**
  - **A.REI.2** *Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.*
  - **A.REI.1** *Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.*

- **MODELING SITUATIONS WITH RATIONAL FUNCTIONS**
  - **F.BF.1.a** *Determine an explicit expression, a recursive process, or steps for calculation from a context.*

12. PARENT FUNCTIONS AND TRANSFORMATIONS

- **PARENT FUNCTIONS**
  - **F.IF.4** *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
  - **F.IF.7.e** *Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*

- **TRANSFORMATIONS OF PARENT FUNCTIONS**
  - **F.BF.3** *Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.*

- **MULTIPLE TRANSFORMATIONS OF PARENT FUNCTIONS**
  - **F.BF.3** *Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.*

13. SYSTEMS OF EQUATIONS

- **SOLVING THREE-VARIABLE SYSTEMS OF LINEAR EQUATIONS**
- **SYSTEMS OF NONLINEAR EQUATIONS**
  - **A.REI.7** *Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.*
  - **A.REI.6** *Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.*
  - **A.REI.11** *Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
  - **F.LE.2** *Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*

14. STATISTICS

- **DATA ANALYSIS**
- **ANALYZING STATISTICAL SAMPLES**
  - **S.IC.1** *Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*
  - **S.IC.4** *Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*
  - **S.IC.2** *Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.*
- **EXPERIMENTAL AND OBSERVATIONAL DESIGN**
  - **S.IC.3** *Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*

15. PROBABILITY

- **INTRODUCTION TO PROBABILITY**
  - **S.CP.2** *Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.*
  - **S.CP.5** *Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.*
  - **S.CP.7** *Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.*
- **CONDITIONAL PROBABILITY**
  - **S.CP.3** *Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of given A is the same as the probability of B.*
  - **S.CP.5** *Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.*
  - **S.CP.6** *Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.*
  - **S.CP.2** *Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.*

- **S.CP.4** *Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.*

- **COMBINATIONS AND PERMUTATIONS**