

Pennsylvania Tutorials are designed specifically for the Pennsylvania Core Standards and the Pennsylvania Academic Standards to prepare students for the Keystone Exams and the Pennsylvania System of School Assessment (PSSA).

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. REAL NUMBER SYSTEM

### • LAWS OF EXPONENTS

- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.1.HS.F.1** Apply and extend the properties of exponents to solve problems with rational exponents.

### • OPERATIONS ON RATIONAL AND IRRATIONAL NUMBERS

- **CC.2.1.HS.F.2** Apply properties of rational and irrational numbers to solve real world or mathematical problems.

### • MONITORING PRECISION AND ACCURACY

- **CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.
- **CC.2.1.HS.F.4** Use units as a way to understand problems and to guide the solution of multi-step problems.
- **CC.2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

## 2. EXPRESSIONS AND LITERAL EQUATIONS

### • FORMULATING AND SIMPLIFYING ALGEBRAIC EXPRESSIONS

- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.D.1** Interpret the structure of expressions to represent a quantity in terms of its context.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials.

### • AXIOMS OF EQUALITY

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.

- **LITERAL EQUATIONS**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.

### 3. EQUATIONS AND INEQUALITIES

- **ONE-STEP EQUATIONS AND INEQUALITIES**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.

- **MULTI-STEP EQUATIONS AND INEQUALITIES**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.

- **FORMULATING AND SOLVING EQUATIONS FROM WORD PROBLEMS**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **FORMULATING AND SOLVING INEQUALITIES FROM WORD PROBLEMS**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### 4. FUNCTIONS

- **FUNCTIONS AND RELATIONS**

- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.

- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

- **DOMAIN AND RANGE**

- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.

- **EVALUATING FUNCTIONS**

- **CC.2.2.HS.D.5** Use polynomial identities to solve problems.
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.

## 5. GRAPHING LINEAR EQUATIONS AND INEQUALITIES

- **SLOPE**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.

- **GRAPHING AND ANALYZING LINEAR FUNCTIONS**

- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **GRAPHING AND MANIPULATING  $Y = MX + B$**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.

- **GRAPHS OF LINEAR INEQUALITIES**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

## 6. LINEAR EQUATIONS

- **SLOPE-INTERCEPT FORM OF A LINEAR EQUATION**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.

- **POINT-SLOPE FORM OF A LINEAR EQUATION**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

## 7. LINEAR SYSTEMS

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: GUESS AND CHECK**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: GRAPHING**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: SUBSTITUTION**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: ELIMINATION**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **SOLVING SYSTEMS OF LINEAR INEQUALITIES**

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

- **SOLVING THREE-VARIABLE SYSTEMS OF LINEAR EQUATIONS**

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

## 8. EXPONENTIAL FUNCTIONS, EQUATIONS, AND INEQUALITIES

- **EXPONENTIAL FUNCTIONS**

- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*
- **CC.2.2.HS.C.3** *Write functions or sequences that model relationships between two quantities.*
- **CC.2.2.HS.D.7** *Create and graph equations or inequalities to describe numbers or relationships.*

- **EXPONENTIAL GROWTH AND DECAY**

- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.6** *Interpret functions in terms of the situation they model.*
- **CC.2.2.HS.C.3** *Write functions or sequences that model relationships between two quantities.*
- **CC.2.2.HS.D.7** *Create and graph equations or inequalities to describe numbers or relationships.*

- **SOLVING EXPONENTIAL INEQUALITIES**

- **CC.2.2.HS.D.7** *Create and graph equations or inequalities to describe numbers or relationships.*
- **CC.2.2.HS.D.10** *Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*
- **CC.2.2.HS.C.6** *Interpret functions in terms of the situation they model.*

## 9. SEQUENCES

- **SEQUENCES**

- **CC.2.2.HS.C.3** *Write functions or sequences that model relationships between two quantities.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*

- **ARITHMETIC AND GEOMETRIC SEQUENCES**

- **CC.2.2.HS.C.3** *Write functions or sequences that model relationships between two quantities.*

## 10. POLYNOMIALS

- **ADDITION AND SUBTRACTION OF POLYNOMIALS**

- **CC.2.2.HS.D.3** *Extend the knowledge of arithmetic operations and apply to polynomials.*

- **MULTIPLICATION OF POLYNOMIALS**

- **CC.2.2.HS.D.3** *Extend the knowledge of arithmetic operations and apply to polynomials.*

- **FACTORING QUADRATIC TRINOMIALS**

- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.D.2** *Write expressions in equivalent forms to solve problems.*
- **CC.2.2.HS.D.3** *Extend the knowledge of arithmetic operations and apply to polynomials.*

- **FACTORING SPECIAL CASES**

- **CC.2.2.HS.D.2** *Write expressions in equivalent forms to solve problems.*
- **CC.2.2.HS.D.5** *Use polynomial identities to solve problems.*

## 11. GRAPHS OF QUADRATIC FUNCTIONS

### • ANALYZING GRAPHS OF QUADRATIC FUNCTIONS

- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.4** Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.

### • REPRESENTATIONS OF QUADRATIC FUNCTIONS

- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.

## 12. SOLVING QUADRATIC EQUATIONS

### • QUADRATIC FUNCTIONS

- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.

### • SOLVING QUADRATIC FUNCTIONS WITH FACTORING

- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.4** Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials.

### • COMPLETING THE SQUARE

- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.

- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*

- **QUADRATIC FORMULA**

- **CC.2.2.HS.D.10** *Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*

## 13. WORKING WITH FUNCTIONS

- **LINEAR VERSUS NONLINEAR FUNCTIONS**

- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.6** *Interpret functions in terms of the situation they model.*

- **ABSOLUTE VALUE FUNCTIONS**

- **CC.2.2.HS.D.10** *Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.*
- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*

- **MULTIPLE REPRESENTATIONS OF FUNCTIONS**

- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.6** *Interpret functions in terms of the situation they model.*

- **INVERSE FUNCTIONS**

- **CC.2.2.HS.C.4** *Interpret the effects transformations have on functions and find the inverses of functions.*

## 14. PARENT FUNCTIONS AND TRANSFORMATIONS

- **LINEAR AND EXPONENTIAL PARENT FUNCTIONS**

- **CC.2.2.HS.D.7** *Create and graph equations or inequalities to describe numbers or relationships.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*
- **CC.2.2.HS.C.2** *Graph and analyze functions and use their properties to make connections between the different representations.*

- **QUADRATIC PARENT FUNCTION**

- **CC.2.2.HS.D.7** *Create and graph equations or inequalities to describe numbers or relationships.*
- **CC.2.2.HS.C.5** *Construct and compare linear, quadratic and exponential models to solve problems.*

- **TRANSFORMATIONS OF THE LINEAR AND EXPONENTIAL PARENT FUNCTIONS**

- **CC.2.2.HS.C.4** *Interpret the effects transformations have on functions and find the inverses of functions.*

- **TRANSFORMATIONS OF THE QUADRATIC PARENT FUNCTION**

- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions.

## 15. STATISTICS

- **DATA ANALYSIS**

- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.
- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.

- **FREQUENCY TABLES**

- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.
- **CC.2.4.HS.B.6** Use the concepts of independence and conditional probability to interpret data.

- **SCATTERPLOTS**

- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.

- **SCATTERPLOTS AND MODELING**

- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.5** Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.2.HS.C.5** Construct and compare linear, quadratic and exponential models to solve problems.