

Maryland Tutorials are designed specifically for the Maryland College and Career-Ready Standards to prepare students for the PARCC assessment, the Maryland School Assessment (MSA), and the Maryland High School Assessment (HSA).

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 AND EQUALITY

### • MONITORING PRECISION AND ACCURACY

- **N.Q.2.A** Ability to select and use units of measure to accurately model a given real world scenario

### • AXIOMS OF EQUALITY

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.REI.1.A** Ability to identify the mathematical property (addition property of equality, distributive property, etc.) used at each step in the solution process as a means of justifying a step

### • LAWS OF EXPONENTS

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.REI.1.A** Ability to identify the mathematical property (addition property of equality, distributive property, etc.) used at each step in the solution process as a means of justifying a step
- **N.RN.1.A** Ability to use prior knowledge of properties of integer exponents to build understanding of rational exponents and radicals
- **N.RN.2.A** Knowledge of the connection between radical and exponential notation
- **N.RN.2.B** Ability to translate between radical and exponential notation

## 2. RATIONAL RELATIONSHIPS

### • SOLVING SQUARE ROOT EQUATIONS

- **A.REI.2.A** Ability to connect prior experience with solving simple equations in one variable to solving equations which require new strategies and additional steps
- **A.REI.1.A** Ability to identify the mathematical property (addition property of equality, distributive property, etc.) used at each step in the solution process as a means of justifying a step
- **F.LE.2.A** Ability to produce an algebraic model
- **A.REI.2.B** Ability to make connections between the domain of a function and extraneous solutions

- **A.REI.2.C** Ability to identify extraneous solutions
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms

- **OPERATIONS WITH RATIONAL EXPRESSIONS**

- **A.APR.7.A** Ability to make connections between the algorithms for operations on rational numbers and operations on rational expressions
- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique

- **SOLVING RATIONAL EQUATIONS**

- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **A.REI.1.A** Ability to identify the mathematical property (addition property of equality, distributive property, etc.) used at each step in the solution process as a means of justifying a step
- **F.LE.2.A** Ability to produce an algebraic model
- **A.REI.2.B** Ability to make connections between the domain of a function and extraneous solutions
- **A.REI.2.C** Ability to identify extraneous solutions
- **A.REI.2.A** Ability to connect prior experience with solving simple equations in one variable to solving equations which require new strategies and additional steps

### 3. TWO-VARIABLE LINEAR SYSTEMS

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

- **A.REI.6.A** Ability to extend experiences with solving simultaneous linear equations from 8EE.8 b&c to include solving systems of three equations three unknowns
- **A.REI.6.B** Ability to solve systems using the most efficient method

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

- **A.REI.6.A** Ability to extend experiences with solving simultaneous linear equations from 8EE.8 b&c to include solving systems of three equations three unknowns
- **A.REI.6.B** Ability to solve systems using the most efficient method

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

- **A.REI.6.A** Ability to extend experiences with solving simultaneous linear equations from 8EE.8 b&c to include solving systems of three equations three unknowns
- **A.REI.6.B** Ability to solve systems using the most efficient method

### 4. SOLVING SYSTEMS ALGEBRAICALLY

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

- **A.REI.6.A** Ability to extend experiences with solving simultaneous linear equations from 8EE.8 b&c to include solving systems of three equations three unknowns
- **A.REI.6.B** Ability to solve systems using the most efficient method
- **F.LE.2.A** Ability to produce an algebraic model

- **SYSTEMS OF NONLINEAR EQUATIONS**

- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **A.REI.11.A** Ability to connect experience with solving systems of equations graphically from Algebra I to solving systems that include polynomial, exponential, rational, root, absolute value and logarithmic functions
- **A.REI.11.B** Ability to show the equality of two functions using multiple representations

## 5. SOLVING QUADRATIC EQUATIONS

- **SOLVING QUADRATIC EQUATIONS BY FACTORING**

- **A.REI.4.b.1** Ability to solve quadratic equations using various methods and recognize the most efficient method
- **A.APR.4.A** Knowledge of the process for proving identities
- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity
- **F.LE.2.A** Ability to produce an algebraic model
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **F.BF.1.a.1** Ability to connect experience with linear and exponential functions from Algebra I Unit 2 to quadratic functions
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions

- **QUADRATIC FORMULA**

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **N.CN.7.A** Ability to use the quadratic formula and/or completing the square as a means of solving a quadratic equation
- **N.CN.7.B** Knowledge that complex solutions occur in conjugate pairs
- **N.CN.7.C** Ability to connect experience with solving quadratic equations from Algebra I to situations where analyzing the discriminant will reveal the nature of the solutions which would include complex solutions
- **A.REI.4.b.2** Ability to use the value of the discriminant to determine if a quadratic equation has one double solution, two unique solutions or no real solutions
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.LE.2.A** Ability to produce an algebraic model
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.BF.1.a.1** Ability to connect experience with linear and exponential functions from Algebra I Unit 2 to quadratic functions
- **F.IF.4.A** Ability to connect appropriate function to context
- **A.REI.4.b.1** Ability to solve quadratic equations using various methods and recognize the most efficient method

- **COMPLETING THE SQUARE**

- **N.CN.7.A** Ability to use the quadratic formula and/or completing the square as a means of solving a quadratic equation
- **A.REI.4.b.1** Ability to solve quadratic equations using various methods and recognize the most efficient method
- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.LE.2.A** Ability to produce an algebraic model

## 6. POLYNOMIAL RELATIONSHIPS

## • GRAPHS OF POLYNOMIAL FUNCTIONS

- **F.IF.7.c.1** Ability to connect experience with graphing linear, exponential and quadratic functions from Algebra I to graphing polynomial functions
- **F.IF.7.c.2** Ability to identify key features of a function: max, min, intercepts, zeros, and end behaviors.
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.LE.2.A** Ability to produce an algebraic model
- **A.APR.2.C** Ability to use the graph of a polynomial to assist in the efficiency of the process for complicated cases
- **A.APR.3.A** Knowledge of the differences in the end behavior of the graphs as dictated by the leading coefficient and whether the function is even or odd
- **A.APR.3.B** Ability to capture the graphical behavior of polynomial functions which have roots with multiplicity greater than one
- **F.BF.3.A** Ability to connect experience with this standard as it relates to linear, quadratic and exponential functions from Algebra I to all functions studied
- **F.BF.3.B** Ability to make generalizations about the changes that will take place in the graph of any function as a result of making a particular change to the algebraic representation of the function

## • PARABOLAS

- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **G.GPE.2.A** Ability to connect the distance formula and the definition of a parabola
- **G.GPE.2.B** Ability to connect the algebraic and geometric definitions of a parabola
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions

## 7. ADDITION AND SUBTRACTION OF POLYNOMIALS

### • POLYNOMIAL BASICS

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression

### • ADDITION AND SUBTRACTION OF POLYNOMIALS

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression

## 8. MULTIPLICATION AND DIVISION OF POLYNOMIALS

### • MULTIPLICATION OF POLYNOMIALS

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression

### • DIVISION OF POLYNOMIALS

- **A.APR.2.B** Ability to use both long division and synthetic division
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.APR.6.A** Ability to make connections to the Remainder Theorem

## 9. FACTORING

### • FACTORING SPECIAL CASES

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.APR.4.A** Knowledge of the process for proving identities

- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity

- **FACTORING CUBIC POLYNOMIALS**

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.APR.4.A** Knowledge of the process for proving identities
- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity

## 10. FACTORING HIGHER-ORDER POLYNOMIALS

- **FACTORING HIGHER-ORDER POLYNOMIALS**

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.APR.2.A** Ability to make connections between factors, roots and evaluating functions
- **A.APR.4.A** Knowledge of the process for proving identities
- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity

- **FACTOR THEOREM AND REMAINDER THEOREM**

- **A.APR.2.B** Ability to use both long division and synthetic division
- **A.APR.2.A** Ability to make connections between factors, roots and evaluating functions
- **A.APR.6.A** Ability to make connections to the Remainder Theorem

## 11. COMPLEX NUMBERS AND QUADRATIC FUNCTIONS

- **COMPLEX NUMBERS**

- **N.CN.1.A** Ability to extend experience with solving quadratic equations with no real solution from Algebra I to the existence of complex numbers (e.g. use solving  $x^2 + 1 = 0$  as a way to introduce complex numbers)
- **N.CN.2.A** Knowledge of conjugate pairs and the nature of their products

- **COMPLEX NUMBERS AND QUADRATIC FUNCTIONS**

- **N.CN.7.A** Ability to use the quadratic formula and/or completing the square as a means of solving a quadratic equation
- **N.CN.7.B** Knowledge that complex solutions occur in conjugate pairs
- **N.CN.7.C** Ability to connect experience with solving quadratic equations from Algebra I to situations where analyzing the discriminant will reveal the nature of the solutions which would include complex solutions
- **A.REI.4.b.2** Ability to use the value of the discriminant to determine if a quadratic equation has one double solution, two unique solutions or no real solutions
- **N.CN.1.A** Ability to extend experience with solving quadratic equations with no real solution from Algebra I to the existence of complex numbers (e.g. use solving  $x^2 + 1 = 0$  as a way to introduce complex numbers)
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions

## 12. POLYNOMIAL IDENTITIES

- **POLYNOMIAL IDENTITIES**

- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.APR.4.A** Knowledge of the process for proving identities
- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity
- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression

- **A.APR.5.A** Ability to replicate Pascal's triangle

- **POLYNOMIAL IDENTITIES AND COMPLEX NUMBERS**

- **N.CN.8.A** Knowledge that a negative number can be thought of as the square of an imaginary number (e.g.  $-4 = (-2i)^2$ )
- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **A.SSE.2.C** Ability to factor expressions completely over complex numbers
- **A.APR.4.A** Knowledge of the process for proving identities
- **A.APR.4.B** Ability to see, use and manipulate the structure in an expression as needed to prove an identity
- **N.CN.1.A** Ability to extend experience with solving quadratic equations with no real solution from Algebra I to the existence of complex numbers (e.g. use solving  $x^2 + 1 = 0$  as a way to introduce complex numbers)
- **N.CN.7.A** Ability to use the quadratic formula and/or completing the square as a means of solving a quadratic equation
- **N.CN.7.B** Knowledge that complex solutions occur in conjugate pairs
- **N.CN.9.A** Knowledge of the connection between the number of roots and the degree of the polynomial; considering multiple roots, complex roots and distinct real roots

### 13. TWO-VARIABLE DATA AND TRIGONOMETRIC FUNCTIONS

- **SCATTERPLOTS AND MODELING**

- **A.CED.1.B** Ability to distinguish between linear, quadratic, exponential, root and simple rational relationships given the verbal, numeric and/or graphic representations
- **S.ID.6.a.2** Ability to create and use regression models to represent a contextual situation
- **S.ID.6.a.1** Ability to recognize types of relationships that lend themselves to linear and exponential models

- **RADIANS AND THE UNIT CIRCLE**

- **F.TF.1.B** Ability to convert between degree and radian measure
- **F.TF.1.A** Knowledge that angle measures in radians may be determined by a ratio of intercepted arc to radius
- **F.TF.2.B** Ability to extend to angles beyond  $[-2\pi, 2\pi]$ , using counterclockwise as the positive direction of rotation
- **F.TF.2.A** Ability to connect knowledge of special right triangles gained in Geometry to evaluating trigonometric functions at any domain value

- **TRIGONOMETRIC FUNCTIONS**

- **F.TF.2.A** Ability to connect knowledge of special right triangles gained in Geometry to evaluating trigonometric functions at any domain value
- **F.TF.2.B** Ability to extend to angles beyond  $[-2\pi, 2\pi]$ , using counterclockwise as the positive direction of rotation
- **F.TF.5.A** Ability to connect contextual situations to appropriate trigonometric function: e.g. using sine or cosine to model cyclical behavior
- **F.TF.8.A** Ability to make connections to angles in standard position
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions

### 14. SEQUENCES

- **SEQUENCES**

- **F.IF.8.B** Ability to recognize functions in various forms
- **F.BF.2.A** See the skills and knowledge that are stated in the Standard.
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.3.A** See the skills and knowledge that are stated in the Standard.

- **ARITHMETIC AND GEOMETRIC SEQUENCES**

- **F.LE.2.A** Ability to produce an algebraic model
- **A.CED.1.B** Ability to distinguish between linear, quadratic, exponential, root and simple rational relationships given the verbal, numeric and/or graphic representations
- **F.BF.2.A** See the skills and knowledge that are stated in the Standard.
- **F.IF.3.A** See the skills and knowledge that are stated in the Standard.

- **SUMS OF GEOMETRIC SEQUENCES**

- **A.SSE.4.A** Knowledge of the difference between an infinite and a finite series
- **A.SSE.4.B** Ability to apply the formula for the sum of a finite geometric series:  $S_n = a(1-r^n)/(1-r)$

## 15. FUNCTIONS

- **FUNCTIONS AND RELATIONS**

- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions

- **INVERSE FUNCTIONS**

- **F.BF.4.a.3** Ability to determine if a function has an inverse
- **F.BF.4.a.1** Ability to connect experience with finding the inverse of a linear function from Algebra I to finding the inverse of simple exponential, root and rational functions
- **F.BF.4.a.2** Knowledge of the connection of the domain and range of a function to its inverse

## 16. LINEAR RELATIONSHIPS

- **SLOPE**

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.6.A** Ability to apply this skill to linear, quadratic, polynomial, root and simple rational functions
- **F.LE.5.A** Ability to interpret the slope and y-intercept of a linear model in terms of context

- **GRAPHING AND ANALYZING LINEAR FUNCTIONS**

- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.4.A** Ability to connect appropriate function to context
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.LE.5.A** Ability to interpret the slope and y-intercept of a linear model in terms of context

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

- **F.LE.2.A** Ability to produce an algebraic model
- **F.LE.5.A** Ability to interpret the slope and y-intercept of a linear model in terms of context
- **F.IF.6.A** Ability to apply this skill to linear, quadratic, polynomial, root and simple rational functions



- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.4.A** Ability to connect appropriate function to context

## 17. EXPONENTIAL RELATIONSHIPS

### • EXPONENTIAL FUNCTIONS

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.8.b.1** Ability to connect experience with properties of exponents from Algebra I Unit 2 Linear and Exponential Relationships to more complex expressions.
- **F.LE.5.C** Ability to interpret the rate of increase/decrease in an exponential model
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.4.A** Ability to connect appropriate function to context
- **F.IF.8.B** Ability to recognize functions in various forms
- **A.SSE.3.c.1** Ability to connect experience with properties of exponents from Unit 4 of Algebra I to more complex expressions
- **F.LE.2.A** Ability to produce an algebraic model
- **F.LE.5.B** Ability to identify the initial amount present in an exponential model ( $f(0)=b^0 + k = 1 + k$ )

### • EXPONENTIAL GROWTH AND DECAY

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.8.b.1** Ability to connect experience with properties of exponents from Algebra I Unit 2 Linear and Exponential Relationships to more complex expressions.
- **F.IF.4.A** Ability to connect appropriate function to context
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model
- **F.LE.5.C** Ability to interpret the rate of increase/decrease in an exponential model

### • SOLVING EXPONENTIAL EQUATIONS

- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.IF.8.B** Ability to recognize functions in various forms
- **F.BF.4.a.1** Ability to connect experience with finding the inverse of a linear function from Algebra I to finding the inverse of simple exponential, root and rational functions
- **F.BF.4.a.2** Knowledge of the connection of the domain and range of a function to its inverse
- **A.SSE.3.c.1** Ability to connect experience with properties of exponents from Unit 4 of Algebra I to more complex expressions
- **F.IF.8.b.1** Ability to connect experience with properties of exponents from Algebra I Unit 2 Linear and Exponential Relationships to more complex expressions.
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **F.IF.7.e.2** Ability to produce a rough graph of the parent function for each type of function



- **F.LE.2.A** Ability to produce an algebraic model

## 18. LOGARITHMIC RELATIONSHIPS

### • LOGARITHMIC FUNCTIONS

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **F.IF.7.e.2** Ability to produce a rough graph of the parent function for each type of function
- **F.BF.4.a.1** Ability to connect experience with finding the inverse of a linear function from Algebra I to finding the inverse of simple exponential, root and rational functions
- **F.BF.4.a.3** Ability to determine if a function has an inverse
- **F.LE.4.A** Knowledge that logarithmic functions are inverses of exponential functions
- **F.BF.4.a.2** Knowledge of the connection of the domain and range of a function to its inverse
- **F.IF.8.B** Ability to recognize functions in various forms

### • EVALUATING LOGARITHMIC EXPRESSIONS

- **A.SSE.2.A** Ability to use properties of mathematics to alter the structure of an expression
- **A.SSE.2.B** Ability to select and then use an appropriate factoring technique
- **F.LE.4.B** Knowledge of the properties of logarithms and exponents and their connection to one another

### • SOLVING LOGARITHMIC EQUATIONS

- **F.BF.4.a.1** Ability to connect experience with finding the inverse of a linear function from Algebra I to finding the inverse of simple exponential, root and rational functions
- **F.BF.4.a.2** Knowledge of the connection of the domain and range of a function to its inverse
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **A.REI.1.A** Ability to identify the mathematical property (addition property of equality, distributive property, etc.) used at each step in the solution process as a means of justifying a step

## 19. MODELING WITH QUADRATIC FUNCTIONS

### • ANALYZING GRAPHS OF QUADRATIC FUNCTIONS

- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **F.IF.9.A** Ability to recognize common attributes of functions from various representations
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.4.A** Ability to connect appropriate function to context
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **A.REI.4.b.1** Ability to solve quadratic equations using various methods and recognize the most efficient method
- **F.BF.1.a.1** Ability to connect experience with linear and exponential functions from Algebra I Unit 2 to quadratic functions

### • REPRESENTATIONS OF QUADRATIC FUNCTIONS

- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.IF.4.A** Ability to connect appropriate function to context

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.9.A** Ability to recognize common attributes of functions from various representations
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.BF.1.a.1** Ability to connect experience with linear and exponential functions from Algebra I Unit 2 to quadratic functions
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.8.B** Ability to recognize functions in various forms
- **F.BF.1.a.2** Ability to write the algebraic representation of a quadratic function from a contextual situation

## 20. MODELING WITH RADICAL AND RATIONAL FUNCTIONS

### • ANALYZING GRAPHS OF SQUARE ROOT FUNCTIONS

- **F.BF.3.A** Ability to connect experience with this standard as it relates to linear, quadratic and exponential functions from Algebra I to all functions studied
- **F.BF.3.B** Ability to make generalizations about the changes that will take place in the graph of any function as a result of making a particular change to the algebraic representation of the function
- **F.IF.8.B** Ability to recognize functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model
- **F.BF.4.a.1** Ability to connect experience with finding the inverse of a linear function from Algebra I to finding the inverse of simple exponential, root and rational functions
- **F.BF.4.a.3** Ability to determine if a function has an inverse
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.BF.4.a.2** Knowledge of the connection of the domain and range of a function to its inverse

### • ANALYZING GRAPHS OF RATIONAL FUNCTIONS

- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.8.B** Ability to recognize functions in various forms
- **A.REI.2.B** Ability to make connections between the domain of a function and extraneous solutions

### • MODELING SITUATIONS WITH RATIONAL FUNCTIONS

- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **A.CED.1.A** Ability to connect experience from Algebra I with creating linear, exponential and quadratic equations in one variable to include creating simple rational functions
- **F.IF.8.B** Ability to recognize functions in various forms
- **A.REI.2.A** Ability to connect prior experience with solving simple equations in one variable to solving equations which require new strategies and additional steps
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model

## 21. WORKING WITH FUNCTIONS

### • MULTIPLE REPRESENTATIONS OF FUNCTIONS

- **A.REI.11.B** Ability to show the equality of two functions using multiple representations
- **A.CED.1.B** Ability to distinguish between linear, quadratic, exponential, root and simple rational relationships given the verbal, numeric and/or graphic representations
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.8.B** Ability to recognize functions in various forms
- **F.IF.9.A** Ability to recognize common attributes of functions from various representations
- **F.LE.2.A** Ability to produce an algebraic model
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **F.IF.7.e.2** Ability to produce a rough graph of the parent function for each type of function

- **ARITHMETIC OPERATIONS ON FUNCTIONS**

- **F.BF.1.b.1** Ability to connect experience with adding, subtracting, multiplying and dividing linear, quadratic and exponential functions from Algebra I to adding, subtracting, multiplying and dividing any functions
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model

## 22. NONLINEAR FUNCTIONS

- **LINEAR VERSUS NONLINEAR FUNCTIONS**

- **F.IF.6.A** Ability to apply this skill to linear, quadratic, polynomial, root and simple rational functions
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **F.IF.7.e.2** Ability to produce a rough graph of the parent function for each type of function
- **F.LE.2.A** Ability to produce an algebraic model
- **F.LE.5.C** Ability to interpret the rate of increase/decrease in an exponential model
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.LE.5.A** Ability to interpret the slope and y-intercept of a linear model in terms of context
- **F.IF.8.A** Ability to connect experience with writing linear, quadratic and exponential functions in various forms from Algebra I to writing all functions in various forms
- **F.IF.9.A** Ability to recognize common attributes of functions from various representations
- **F.IF.4.A** Ability to connect appropriate function to context

- **ABSOLUTE VALUE FUNCTIONS**

- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions
- **F.IF.8.B** Ability to recognize functions in various forms
- **F.LE.2.A** Ability to produce an algebraic model

## 23. PARENT FUNCTIONS AND TRANSFORMATIONS

- **PARENT FUNCTIONS**

- **F.IF.7.c.1** Ability to connect experience with graphing linear, exponential and quadratic functions from Algebra I to graphing polynomial functions
- **F.BF.3.A** Ability to connect experience with this standard as it relates to linear, quadratic and exponential functions from Algebra I to all functions studied

- **F.BF.3.B** Ability to make generalizations about the changes that will take place in the graph of any function as a result of making a particular change to the algebraic representation of the function
- **A.REI.7.A** Knowledge of the algebraic and graphic representations of quadratic relations as well as quadratic functions
- **F.LE.2.A** Ability to produce an algebraic model
- **F.IF.7.e.1** Ability to connect experience with graphing linear and quadratic functions from Algebra I to graphing exponential and logarithmic functions
- **F.IF.7.e.2** Ability to produce a rough graph of the parent function for each type of function
- **F.IF.4.B** Knowledge of the key features of linear, exponential, polynomial, root, absolute value, piece-wise, simple rational, logarithmic and trigonometric functions

- **TRANSFORMATIONS OF PARENT FUNCTIONS**

- **F.IF.7.c.1** Ability to connect experience with graphing linear, exponential and quadratic functions from Algebra I to graphing polynomial functions
- **F.BF.3.A** Ability to connect experience with this standard as it relates to linear, quadratic and exponential functions from Algebra I to all functions studied
- **F.BF.3.B** Ability to make generalizations about the changes that will take place in the graph of any function as a result of making a particular change to the algebraic representation of the function
- **F.IF.7.e.3** Knowledge of how parameters introduced into a function alter the shape of the graph of the parent function

- **MULTIPLE TRANSFORMATIONS OF PARENT FUNCTIONS**

- **F.BF.3.A** Ability to connect experience with this standard as it relates to linear, quadratic and exponential functions from Algebra I to all functions studied
- **F.IF.7.c.1** Ability to connect experience with graphing linear, exponential and quadratic functions from Algebra I to graphing polynomial functions
- **F.BF.3.B** Ability to make generalizations about the changes that will take place in the graph of any function as a result of making a particular change to the algebraic representation of the function
- **F.IF.7.e.3** Knowledge of how parameters introduced into a function alter the shape of the graph of the parent function

## 24. GATHERING DATA

- **POPULATIONS AND SAMPLES**

- **S.IC.4.C** Ability to use sample means and sample proportions to estimate population values

- **EXPERIMENTAL AND OBSERVATIONAL DESIGN**

- **S.IC.3.A** Ability to conduct sample surveys, experiments and observational studies
- **S.IC.3.B** Understanding of the limitations of observational studies that do not allow major conclusions on treatments
- **S.IC.1.A** Knowledge of various sampling methods (e.g., simple random, convenience, stratified...)
- **S.IC.3.C** Ability to recognize and avoid bias

- **SIMULATIONS**

- **S.IC.2.C** Ability to design, conduct and interpret the results of simulations

## 25. STATISTICAL ANALYSIS

- **ANALYZING STATISTICAL SAMPLES**

- **S.IC.1.C** Ability to explain in context the difference between values describing a population and a sample
- **S.IC.4.C** Ability to use sample means and sample proportions to estimate population values
- **S.IC.1.A** Knowledge of various sampling methods (e.g., simple random, convenience, stratified...)
- **S.IC.1.B** Ability to select an appropriate sampling technique for a given situation

- **S.IC.4.A** Ability to informally establish bounds as to when something is statistically significant
- **S.IC.4.B** Ability to conduct simulations and accurately interpret and use the results
- **S.IC.5.C** Ability to determine the statistical significance of data

- **CONCLUSIONS IN DATA**

- **S.IC.4.B** Ability to conduct simulations and accurately interpret and use the results
- **S.IC.5.B** Ability to draw conclusions based on comparisons of simulation versus experimental results
- **S.IC.5.A** Ability to set up and conduct a randomized experiment or investigation, collect data and interpret the results
- **S.IC.4.A** Ability to informally establish bounds as to when something is statistically significant
- **S.IC.5.C** Ability to determine the statistical significance of data

- **NORMAL DISTRIBUTION**

- **S.ID.4.A** Ability to construct, interpret and use normal curves, based on standard deviation
- **S.ID.4.B** Ability to identify data sets as approximately normal or not
- **S.ID.4.C** Ability to estimate and interpret area under curves using the Empirical Rule (68-95-98.7%)

## 26. INTRODUCTION TO PROBABILITY

- **INTRODUCTION TO PROBABILITY**

- **S.CP.2.C** Ability to determine if two events are dependent or independent
- **S.CP.5.A** Ability to make connections between statistical concepts and real world situations
- **S.MD.7.B** Ability make connections between the numeric probabilities and context
- **S.CP.1.A** Ability to describe a sample space
- **S.CP.7.B** Ability to make connections between numeric results and context
- **S.CP.8.A** Ability to analyze a situation to determine the probability of a described event
- **S.CP.8.B** Ability to make connections between numeric results and context

- **CALCULATING PROBABILITY**

- **S.CP.5.A** Ability to make connections between statistical concepts and real world situations
- **S.IC.2.A** Ability to calculate and analyze theoretical and experimental probabilities accurately

## 27. APPLICATIONS OF PROBABILITY

- **CONDITIONAL PROBABILITY**

- **S.CP.2.A** Ability to determine the conditional probability of an event given that another event occurs
- **S.CP.4.B** Knowledge of the characteristics of conditional probability
- **S.CP.6.A** Ability to analyze a situation to determine the conditional probability of a described event given that another event occurs
- **S.CP.7.A** Ability to analyze a situation to determine the conditional probability of a described event given that another event occurs
- **S.CP.7.B** Ability to make connections between numeric results and context
- **S.CP.8.A** Ability to analyze a situation to determine the probability of a described event
- **S.CP.8.B** Ability to make connections between numeric results and context
- **S.CP.2.C** Ability to determine if two events are dependent or independent
- **S.CP.4.A** Ability to connect experience with two-way frequency tables from Algebra I to sample spaces
- **S.CP.3.A** Understanding of and ability to use set notation, key vocabulary and graphic organizers linked to this standard
- **S.CP.1.B** Understanding of and ability to use set notation, key vocabulary and graphic organizers linked to this standard

- **COMBINATIONS AND PERMUTATIONS**

- **S.CP.7.B** Ability to make connections between numeric results and context
- **S.CP.8.A** Ability to analyze a situation to determine the probability of a described event
- **S.CP.8.B** Ability to make connections between numeric results and context
- **S.CP.9.A** Ability to use formulas containing factorial notation
- **S.CP.9.B** Ability to analyze a situation to determine the probability of a described event

- **ANALYZING DECISIONS IN PROBABILITY**

- **S.MD.7.A** Ability to synthesize and apply various probability concepts to evaluate decisions
- **S.CP.9.B** Ability to analyze a situation to determine the probability of a described event
- **S.MD.6.A** Ability make connections between the numeric probabilities and context
- **S.MD.7.B** Ability make connections between the numeric probabilities and context