Algebra 1 Instructional Toolkit

The Algebra 1 Instructional Focus Toolkit has been created to assist teachers with planning instruction. This toolkit is not intended to replace your district's curriculum, but rather to enhance understanding of the standards, clarify the reporting categories on the Algebra 1 End-of Course Assessment and support instruction with tasks that are well aligned to the benchmarks.

Teacher Resources – Essential tools for planning, teaching and assessment – What resources should be at the teacher's fingertips?

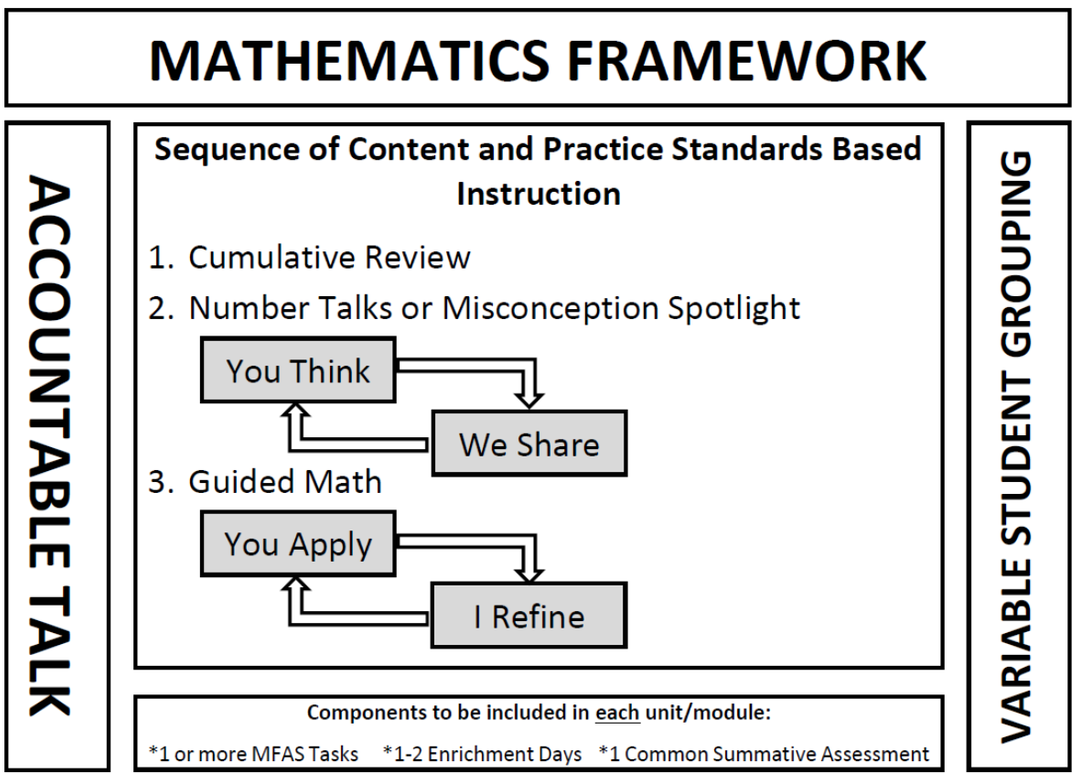
- **Course Descriptions with Florida Standards and Instructional Resources**
  - Algebra 1
  - Access Algebra 1
  - Algebra 1 Honors
- **Access Standards with Essential Understandings**
  - Algebra 1 Access Points with EUs
- **Sample Course Pacing Guides**
  - Escambia County Algebra 1 Pacing Guide
  - Leon County Algebra 1 Pacing Guide
- **Teaching Resources**
  - Kuta Algebra 1 Worksheets
  - Khan Academy
  - Math Nation
  - Virtual Algebra Tiles
  - Google Translate
  - Desmos Online Graphing Calculator
- **Algebra 1 End-of-Course Assessment Assistance**
  - Algebra 1 End-of-Course Item Specifications
  - Algebra 1 End-of-Course Assessment Sample Questions

Student Resources – Recommended Student Materials, Tools and Resources – What resources should be at the student's fingertips?

- Florida Students
- Khan Academy
- Official SAT Practice
- Math Nation
- YouTube – Yay Math Videos

Instructional Framework – Recommended framework to help embed best practices into instruction – What should quality instruction look like?

- **Quality instruction design fosters success in every classroom when students are**:
  - Fully engaged in the work of the lessons
  - Working on appropriately rigorous content
  - Taking ownership of their learning
  - Demonstrating understanding of the content



Foundational Principles of Effective Math

- All children can learn mathematics.
- A numeracy-rich environment promotes mathematical learning by students.
- Learning at its best is a social process.
- Learning mathematics is a constructive process.
- An organized classroom environment supports the learning process.
- Modeling and think-alouds, combined with ample opportunities for guided and independent problem solving and purposeful conversations, create a learning environment in which students' mathematical understanding grows.
- Ultimately, children are responsible for their learning.

8 Mathematical Practice Standards

1. Make sense of complex problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Eight Mathematical Practice Standards

The Standards for Mathematical Practice should be embedded in classroom instruction, discussions and activities. They describe the kind of mathematics teaching and learning to be fostered in the classroom. To promote such an environment, students should have opportunities to work on carefully designed standards-based mathematical tasks that can vary in difficulty, context and type. Carefully designed

standards-based mathematical tasks will reveal students' content knowledge and elicit evidence of mathematical practices. Mathematical tasks are an important opportunity to connect content and practices. To be consistent with the standards as a whole, assessment as well as curriculum and classroom activities must include a balance of mathematical tasks that provide opportunities for students to develop the kinds of expertise described in the practices. **While all of the Standards for Mathematical Practice are important, MP.1 and MP.4 should be emphasized in Algebra 1.**

Content Standards

Not all of the content in a given grade is emphasized equally in the standards. The list of content standards for each grade is not a flat, one-dimensional checklist; this is by design. There are sometimes strong differences of emphasis even within a single domain. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice. Without such focus, attention to the practices would be difficult and unrealistic, as would best practices like formative assessment.

Therefore, to make relative emphases in the standards more transparent and useful, the Model Content Frameworks designate clusters as **Major**, **Supporting** and **Additional** for the grade in question. Some clusters that are not major emphases in themselves are designed to *support* and strengthen areas of major emphasis, while other clusters that may not connect tightly or explicitly to the major work of the grade would fairly be called *additional*. **At least 65% and up to 85% of class time should be devoted to Major Clusters.**

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. All standards figure in a mathematical education and therefore will be eligible for inclusion on the Algebra 1 End-of-Course Assessment.

Numbers in parentheses designate each individual content standard covered in Algebra 1. For more information, each standard has been linked directly to CPALMS in the table below.

Content emphases are indicated by:

■ **Major Cluster**
□ **Supporting Cluster**
○ **Additional Cluster**

Domain: NUMBER & QUANTITY: THE REAL NUMBER SYSTEM
○ Cluster 1: Extend the properties of exponents to rational exponents (1, 2)
○ Cluster 2: Use properties of rational and irrational numbers (3)
Domain: NUMBER & QUANTITY: QUANTITIES
□ Cluster 1: Reason quantitatively and use units to solve problems (1, 2, 3)
Domain: ALGEBRA: SEEING STRUCTURE IN EXPRESSIONS
■ Cluster 1: Interpret the structure of expressions (1, 2)
□ Cluster 2: Write expressions in equivalent forms to solve problems (3)
Domain: ALGEBRA: ARITHMETIC WITH POLYNOMIALS & RATIONAL EXPRESSIONS
■ Cluster 1: Perform arithmetic operations on polynomials (1)
□ Cluster 2: Understand the relationship between zeros and factors of polynomials (3)
Domain: ALGEBRA: CREATING EQUATIONS
■ Cluster 1: Create equations that describe numbers or relationships (1, 2, 3, 4)
Domain: ALGEBRA: REASONING WITH EQUATIONS & INEQUALITIES
■ Cluster 1: Understand solving equations as a process of reasoning and explain the reasoning (1)
■ Cluster 2: Solve equations and inequalities in one variable (3, 4)
○ Cluster 3: Solve systems of equations (5, 6)
■ Cluster 4: Represent and solve equations and inequalities graphically (10, 11, 12)
Domain: FUNCTIONS: INTERPRETING FUNCTIONS

■ Cluster 1: Understand the concept of a function and use function notation (1, 2, 3)
■ Cluster 2: Interpret functions that arise in applications in terms of the context (4, 5, 6)
☐ Cluster 3: Analyze functions using different representations (7, 8, 9)
Domain: FUNCTIONS: BUILDING FUNCTIONS
☐ Cluster 1: Build a function that models a relationship between two quantities (1)
○ Cluster 2: Build new functions from existing functions (3)
Domain: FUNCTIONS: LINEAR, QUADRATIC, & EXPONENTIAL MODELS
☐ Cluster 1: Construct and compare linear, quadratic, and exponential models and solve problems (1, 2, 3)
☐ Cluster 2: Interpret expressions for functions in terms of the situation they model (5)
Domain: STATISTICS & PROBABILITY: INTERPRETING CATEGORICAL & QUANTITATIVE DATA
○ Cluster 1: Summarize, represent, and interpret data on a single count or measurement variable (1, 2, 3)
☐ Cluster 2: Summarize, represent, and interpret data on two categorical and quantitative variables (5, 6)
■ Cluster 3: Interpret linear models (7, 8, 9)

ALGEBRA 1 END-OF-COURSE ASSESSMENT

The content of the Algebra 1 End-of-Course (EOC) Assessment is organized by reporting categories that are used for test design, scoring and reporting purposes. Reporting categories group the assessed student knowledge and skills into three broad content areas:

- **Algebra and Modeling (41%)**
  - Students perform operations on polynomials. They understand the relationship between zeros and factors of polynomials. They use mathematical structure of expressions. They create, solve and reason with equations and inequalities. They choose and use appropriate mathematics to model situations.
- **Functions and Modeling (40%)**
  - Students understand the concept of a function. They interpret functions and key features in a context. They analyze and graph functions. They build a function that models a relationship. They construct linear, quadratic and exponential functions. They solve problems using functions.
- **Statistics and the Number System (19%)**
  - Students extend the properties of exponents to rational exponents. They use properties of rational and irrational numbers. They summarize, represent and interpret data for one- and two-variable data. They interpret linear models.

Within each of these reporting categories are essential “keystone” standards that help build the unit and provide the foundation for development of the content. These keystone standards are assessed on the EOC assessment and often contain additional supportive standards beneath them (indicated as “also assesses” on the assessment documents). For example, A-CED.1.1 also assesses A-REI2.3 and A-CED.1.4. Each corresponding keystone standard may be enhanced using outside resources such as the Mathematics Formative Assessment System (MFAS) located on CPALMS. The MFAS tasks provided below have been reviewed and approved by educators and subject area experts to enhance these units and keystone standards. For more detailed information on the EOC and assessment limits, please review the Test Item Specifications for Algebra 1 (http://fsassessments.org/wp-content/uploads/2015/08/Algebra1-FSA-ItemSpecs-508_Final_052217.pdf).

Algebra and Modeling (41%)

Students perform operations on polynomials. They understand the relationship between zeros and factors of polynomials. They use mathematical structure of expressions. They create and solve equations and inequalities. They reason with equations and inequalities. They choose and use appropriate mathematics to model situations.

MAFS.912.A-APR.1.1

Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Adding Polynomials
- Subtracting Polynomials
- Multiplying Polynomials - 1
- Multiplying Polynomials - 2

MAFS.912.A-CED.1.1

Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational, absolute, and exponential functions.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- State Fair
- Music Club
- Quilts
- Follow Me
- Solving Absolute Value Equations
- Solving Absolute Value Inequalities
- Writing Absolute Value Equations
- Writing Absolute Value Inequalities

Also assesses MAFS.912.A-REI.2.3

Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Solve for X
- Solve for N
- Solve for M
- Solve for Y
- Solving Multistep Inequalities
- Solving a Literal Linear Equations

Also assesses MAFS.912.A-CED.1.4

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.

Cognitive Complexity: Level 1: Recall

- Solving Literal Equations
- Literal Equations
- Solving Formulas for a Variable
- Surface Area of a Cube
- Rewriting Equations

MAFS.912.A-CED.1.2

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Tech Repairs
- Tee It Up
- Trees in Trouble
- Hotel Swimming Pool
- Tech Repair Graph
- Loss of Fir Trees
- Model Rocket

Also assesses MAFS.912.A-REI.3.5

Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning

- Solving Systems
- Solution Sets of Systems

Also assesses MAFS.912.A-REI.3.6

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Cognitive Complexity: Level 1: Recall

- Apples and Peaches
- Solving a System of Equations – 1
- Solving a System of Equations – 2
- Solving a System of Equations – 3

Also assesses MAFS.912.A-REI.4.12

Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Graphing Linear Inequalities
- Linear Inequalities in the Half-Plane
- Which Graph?
- Graph a System of Inequalities

MAFS.912.A-CED.1.3

Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning

- Sugar and Protein
- The New School
- Constraints on Equations

MAFS.912.A-REI.1.1

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.

Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning

- Justify the Process – 1
- Does it Follow?
- Justify the Process – 2
- Equation Logic

MAFS.912.A-REI.2.4

Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

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.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Complete the Square – 1
- Complete the Square – 2
- Complete the Square – 3
- Quadratic Formula – 1
- Quadratic Formula – 2
- Which Strategy?
- Complex Solutions?

MAFS.912.A-REI.4.11

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.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Graphs and Solutions – 1
- Graphs and Solutions – 2
- Using Tables Using Technology

Also assesses MAFS.912.A-REI.4.10

Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

Cognitive Complexity: Level 1: Recall

- Finding Solutions
- What Is the Point?
- Case In Point

MAFS.912.A-SSE.2.3

Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

c. Use the properties of exponents to transform expressions for exponential functions. For example the expression can be rewritten as ≈ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Jumping Dolphin
- Rocket Town
- Population Drop
- College Costs

Also assesses MAFS.912.A-SSE.1.1

Interpret expressions that represent a quantity in terms of its context.

a. Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret as the product of P and a factor not depending on P.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Interpreting Basic Tax
- Dot Expressions
- What Happens?

Also assesses MAFS.912.A-SSE.1.2

Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Finding Missing Values
- Quadratic Expressions
- Determine the Width
- Rewriting Numerical Expressions

Functions and Modeling (40%)

Students understand the concept of a function. They interpret functions and key features in a context. They analyze and graph functions. They build a function that models a relationship. They construct linear, quadratic, and exponential functions. They solve problems using functions.

MAFS.912.F-BF.2.3

Identify the effect on the graph of replacing $f(x)$ by $f(x) + k, kf(x), f(kx)$, and $f(x + k)$ for specific values of k (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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Comparing Functions – Linear
- Comparing Functions – Quadratic
- Comparing Functions – Exponential
- Write the Equations

MAFS.912.F-IF.1.2

Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- What is the Function Notation?
- What Is the Value?
- Evaluating a Function
- Graphs and Functions
- Cell Phone Battery Life

Also assesses MAFS.912.F-IF.1.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.

Cognitive Complexity: Level 1: Recall

- Identifying Functions
- Writing Functions
- Identifying the Graphs of Functions
- Cafeteria Functions
- What is a Function?
- Circles and Functions

Also assesses MAFS.912.F-IF.2.5

Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Height vs. Shoe Size
- Car Wash
- Describe the Domain
- Airport Parking

MAFS.912.F-IF.2.4

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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Bike Race
- Elevation Along a Trail
- Surf's Up
- Taxi Ride
- Uphill and Downhill

Also assesses MAFS.912.F-IF.3.9

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Comparing Linear Functions
- Comparing Linear and Exponential Functions
- Comparing Quadratics

MAFS.912.F-IF.2.6

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.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Pizza Palace
- Identifying Rate of Change
- Air Cannon
- Estimating the Average Rate of Change

Also assesses MAFS.912.S-ID.3.7

Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Slope for the Foot Length Model
- Slope for the Life Expectancy Model
- Intercept for Life Expectancy
- Bungee Cord Model

MAFS.912.F-IF.3.8

Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^2$, $y = (0.97)^t$,

$y = (1.01)^{12t}$, $y = (1.2)^{\frac{t}{10}}$, *and classify them as representing exponential growth or decay.*

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- A Home for Fido
- Exponential Functions – 1
- Exponential Functions – 2
- Launch From a Hill

☐ **Also assesses MAFS.912.A-APR.2.3**

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

Cognitive Complexity: Level 1: Recall

- Use Zeros to Graph
- Zeros of a Cubic
- Zeros of a Quadratic

☐ **Also assesses MAFS.912.F-IF.3.7a, b, c, and e**

Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available and showing end behavior.

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude and using phase shift.

Cognitive Complexity: Level 2: Basic Application of Skills & Concept

- Graphing a Linear Function
- Graphing a Quadratic Function
- Graphing a Rational Function
- Graphing a Step Function
- Graphing and Exponential Function
- Graphing a Root Function

☐ **MAFS.912.F-LE.1.1**

Distinguish between situations that can be modeled with linear functions and with exponential functions

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning

- Linear or Exponential
- Prove Linear
- Prove Exponential
- How does your Garden Grow?
- Exponential Growth

☐ **Also assess MAFS.912.F-LE.2.5**

Interpret the parameters in a linear or exponential function in terms of a context.

Cognitive Complexity: Level 2: Basic Application of Skills & Concept

- Computer Repair
- Interpreting Exponential Functions
- Lunch Account

☐ **MAFS.912.F-LE.1.2**

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).

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Writing a Function from Ordered Pairs?
- The Cost of Water
- Functions From Graphs
- Writing an Exponential Function from its Graph
- Writing an Exponential Function from a Description
- Writing an Exponential Function from a Table
- What is the Function Rule?

Also assesses MAFS.912.F-BF.1.1

Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

c. Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.

Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning

- Furniture Purchase
- Giveaway
- How Much Bacteria?
- Saving for a Car

Also assesses MAFS.912.F-IF.1.3

Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) \, for \, n \geq 1$.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Which Sequences are Functions?
- Recursive Sequences

MAFS.912.F-LE.1.3

Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Compare Linear and Exponential Functions
- Compare Quadratic and Exponential Functions

Statistics and the Number System (19%)

Students extend the properties of exponents to rational exponents. They use properties of rational and irrational numbers. They summarize, represent, and interpret data for one- and two-variable data. They interpret linear models.

MAFS.912.N-RN.1.2

Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Cognitive Complexity: Level 1: Recall

- Rational Exponents – 1
- Rational Exponents – 2
- Rational Exponents – 3
- Rational Exponents – 4

Also assesses MAFS.912.N-RN.1.1

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. For example, we define $5^{\frac{1}{3}}$ to be the cube root of 5 because we want $(5^{\frac{1}{3}})^3 = 5^{(\frac{1}{3})3}$ to hold, so $(5^{\frac{1}{3}})^3$ must equal 5.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Rational Exponents and Roots
- Roots and Exponents

Also assesses MAFS.912.N-RN.2.3

Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Sum of Rational Numbers
- Product of Rational Numbers
- Sum of Rational and Irrational Numbers
- Product of Non-Zero Rational and Irrational Numbers

MAFS.912.S-ID.1.1

Represent data with plots on the real number line (dot plots, histograms, and box plots).

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- A Tomato Garden
- Flowering Trees
- Winning Seasons
- Trees in the Park

MAFS.912.S-ID.1.2

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- How Many Jeans?
- Texting During Lunch
- Texting During Lunch Histograms

Also assesses MAFS.912.S-ID.1.3

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Using Centers to Compare Tree Heights
- Using Spread to Compare Tree Heights
- Comparing Distributions
- Total Points Scored

☐ **MAFS.912.S-ID.2.5**

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Breakfast Drink Preference
- Who is a Vegetarian?
- Conditional Relative Frequency
- Marginal and Joint Frequency

☐ **MAFS.912.S-ID.2.6**

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Swimming Predictions
- Fit a Function
- Residuals
- House Prices

■ **Also assesses MAFS.912.S-ID.3.8**

Compute (using technology) and interpret the correlation coefficient of a linear fit.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- July December Correlation
- How Big are Feet?
- Correlation Order
- Correlation for Life Expectancy

■ **Also assesses MAFS.912.S-ID.3.9**

Distinguish between correlation and causation.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Does the Drug Cause Diabetes?
- Sleep and Reading
- Does Studying Pay?
- Listing All Possible Causal Relationships

○ **MAFS.912.N-Q.1.1**

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Aquarium Visitors
- Fishy Formulas

- Notebooks to Trees

MAFS.912.N-Q.1.2

Define appropriate quantities for the purpose of descriptive modeling.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Rain Damage Model
- Time to Get to School

MAFS.912.N-Q.1.3

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts

- Density
- Tree Size