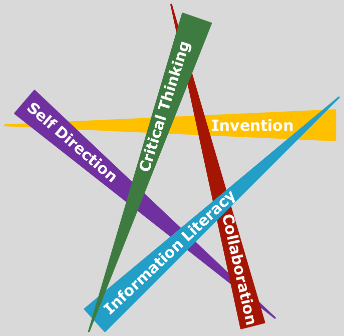
Curriculum Development Course at a Glance
Planning for High School Mathematics

Content Area	Mathematics	**Grade Level**	High School
Course Name/Course Code	Integrated Math I		

Standard	Grade Level Expectations (GLE)	GLE Code
1. Number Sense, Properties, and Operations	1. The complex number system includes real numbers and imaginary numbers	MA10-GR.HS-S.1-GLE.1
	2. Quantitative reasoning is used to make sense of quantities and their relationships in problem situations	MA10-GR.HS-S.1-GLE.2
2. Patterns, Functions, and Algebraic Structures	1. Functions model situations where one quantity determines another and can be represented algebraically, graphically, and using tables	MA10-GR.HS-S.2-GLE.1
	2. Quantitative relationships in the real world can be modeled and solved using functions	MA10-GR.HS-S.2-GLE.2
	3. Expressions can be represented in multiple, equivalent forms	MA10-GR.HS-S.2-GLE.3
	4. Solutions to equations, inequalities and systems of equations are found using a variety of tools	MA10-GR.HS-S.2-GLE.4
3. Data Analysis, Statistics, and Probability	1. Visual displays and summary statistics condense the information in data sets into usable knowledge	MA10-GR.HS-S.3-GLE.1
	2. Statistical methods take variability into account supporting informed decisions making through quantitative studies designed to answer specific questions	MA10-GR.HS-S.3-GLE.2
	3. Probability models outcomes for situations in which there is inherent randomness	MA10-GR.HS-S.3-GLE.3
4. Shape, Dimension, and Geometric Relationships	1. Objects in the plane can be transformed, and those transformations can be described and analyzed mathematically	MA10-GR.HS-S.4-GLE.1
	2. Concepts of similarity are foundational to geometry and its applications	MA10-GR.HS-S.4-GLE.2
	3. Objects in the plane can be described and analyzed algebraically	MA10-GR.HS-S.4-GLE.3
	4. Attributes of two- and three-dimensional objects are measurable and can be quantified	MA10-GR.HS-S.4-GLE.4
	5. Objects in the real world can be modeled using geometric concepts	MA10-GR.HS-S.4-GLE.5

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Mathematical Practices:

1. Make sense of 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.

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Data Driven	3 weeks	1
Toe the Line	4 weeks	2
All Systems Go	5 weeks	3
Exploding Exponentially	5 weeks	4
Fantastic Function Fun	5 weeks	5
Transform the World	8 weeks	6

Unit Title	Data Driven	**Length of Unit**	3 weeks
Focusing Lens(es)	Interpretation Influence	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.3-GLE.1
Inquiry Questions (Engaging-Debatable):	• Most people who die of lung cancer have an ashtray at home. Do ashtrays cause cancer? • What makes a statistic believable? What makes a statistic accurate? Is there a difference between the two? • What makes data meaningful or actionable? (MA10-GR.HS-S.3-GLE.1-IQ.1)		
Unit Strands	Statistics and Probability: Interpreting Categorical and Quantitative Data		
Concepts	Two-way frequency tables, categorical variables, association, outliers, interpretation, statistical measures, shape, center, spread, measures of center, measures of spread, comparison, data, representation		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Two-way frequency tables provide the necessary structure to make conclusions about the association of categorical variables. (MA10-GR.HS-S.3-GLE.1-EO.b.i)	What is categorical data? What does joint, marginal and conditional frequency mean?	Why is it appropriate to use a two-way frequency table with categorical data?
The influence of outliers helps mathematicians select and interpret statistical measures. (MA10-GR.HS-S.3-GLE.1-EO.a.iii)	What is an outlier?	Why do outliers affect some measures of center more than others? Why do outliers affect some measures of spread more than others?
Knowledge of shape, center and spread facilitates comparison of two sets of data. (MA10-GR.HS-S.3-GLE.1-a.ii)	How can you use technology to find center and spread for a set of data? What can be inferred about two sets of data with large differences in measures of spread?	How can summary statistics or data displays be accurate but misleading? Why is it important to analyze the spread of data?
The analysis of data representations helps determine the appropriate measures of center and spread. (MA10-GR.HS-S.3-GLE.1.a.i)	What is the best way to display data? How does your choice of how to display data affect what information other people will understand? How can summary statistics or data displays be accurate but misleading? (MA10-GR.HS-S.3-GLE.1-IQ.3)	Why are the mean and standard deviation not always appropriate measures for a data set?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Represent data with plots on the real number line (dot plots, histograms, and box plots) (MA10-GR.HS-S.3-GLE.1.a.i)
- 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 (MA10-GR.HS-S.3-GLE.1-a.ii)
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers) (MA10-GR.HS-S.3-GLE.1-EO.a.iii)
- Summarize categorical data for two categories in two-way frequency tables and interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies) to recognize possible associations and trends in the data (MA10-GR.HS-S.3-GLE.1-EO.b.i)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*Outliers have an effect on the mean and standard deviation, but not on the median or inter-quartile range.*
Academic Vocabulary:	Identify, compare, analyze, develop, interpret, association, recognize, find, accuracy
Technical Vocabulary:	Two-way frequency tables, categorical variables, association, outliers, statistical measures, shape, center, spread, measures of center, measures of spread, joint, marginal, conditional, relative frequencies, skewed, normal, mean, median, inter-quartile range, quartiles, range, standard deviation,

Unit Title	Toe the Line		**Length of Unit**	4 weeks
Focusing Lens(es)	Modeling Equivalence	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.2 MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.4 MA10-GR.HS-S.3-GLE.1	
Inquiry Questions (Engaging-Debatable):	• Why do adults over generalize the concept of linearity to all real world phenomena? Can you think of an example?			
Unit Strands	Number and Quantity: Quantities Algebra: Creating Equations Algebra: Reasoning with Equations and Inequalities Functions: Interpreting Functions Statistics and Probability: Interpreting Categorical and Quantitative Data			
Concepts	Linear models, constant rate of change, slope, correlation, residual plots, predictions, data, equivalence, algebraic representations, y-intercept			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Linear models describe situations with a constant rate of change (slope). (MA10-GR.HS-S.3-GLE.1-EO.c.i)	What is slope? How can I tell if a situation has a constant rate of change?	Why can you only model situations with constant rates of change with linear functions?
Correlation coefficients can determine the usefulness of linear models for describing data and making predictions. (MA10-GR.HS-S.3-GLE.1-EO.b.ii)	What is a correlation coefficient? Where do I find correlation coefficient on the graphing calculator? How do I determine if I have a strong or weak linear correlation?	Why is important to know the strength of a correlation for a set of data? Why does correlation not imply a causal relationship? Why is a linear model not always the best choice for all data sets?
Mathematicians focus on the slope and y-intercept of a linear model when transforming representations and interpreting situations. (MA10-GR.HS-S.3-GLE.1-EO.c.i)	What is a y-intercept? What is a solution? How do I transfer between algebraic and graphical forms of a line?	How do I interpret the meaning of the y-intercept in context? What does it mean to be a solution of an equation or inequality? Why is it important to be able to represent a linear function in multiple ways?

The points on the graph of an equation represent the set of all solutions for a context often forming a curve (which could be a line). (MA10-GR.HS-S.2-GLE.4-EO.e.i)	How can you determine from a graph if an ordered is part of the solution set of an equation?	Why is it important to coordinate and understand the units of problem when determining solutions to the problem?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- 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 origin in graphs and data displays. (MA10-GR.HS-S.1-GLE.2-EO.a.i.1,2)
- Define appropriate quantities for the purpose of descriptive modeling. (MA10-GR.HS-S.1-GLE.2-EO.a.ii)
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (MA10-GR.HS-S.1-GLE.2-EO.a.iii)
- Graph linear functions and show intercepts. (MA10-GR.HS-S.2-GLE.1-EO.c.ii)
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (MA10-GR.HS-S.2-GLE.4-EO.a.iv)
- Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (MA10-GR.HS-S.2-GLE.4-EO.c.i)
- Understand 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). (MA10-GR.HS-S.2-GLE.4-EO.e.i)
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. (MA10-GR.HS-S.3-GLE.1-EO.b.ii)
- Fit a function to the data; use functions fitted to data to solve problems in the context of the data. (MA10-GR.HS-S.3-GLE.1-EO.b.ii.1)
- Fit a linear function for a scatter plot that suggests a linear association. (MA10-GR.HS-S.3-GLE.1-EO.b.ii.3)
- Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. (MA10-GR.HS-S.3-GLE.1-EO.c.i)
- Compute (using technology) and interpret the correlation coefficient of a linear fit. (MA10-GR.HS-S.3-GLE.1-EO.c.ii)
- Distinguish between correlation and causation. (MA10-GR.HS-S.3-GLE.1-EO.c.iii)
- Describe the factors affecting take-home pay and calculate the impact. (MA10-GR.HS-S.1-GLE.2-EO.a.iv) *
- Design and use the budget, including income (i.e., net take-home pay) and expenses to demonstrate how living within your means is essential for a secure financial future. (MA10-GR.HS-S.1-GLE.2-EO.a.v) *

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EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *“Mark Twain exposes the hypocrisy of slavery through the use of satire.”*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*I can use linear models to describe situations with a constant rate of change (slope).*
Academic Vocabulary:	Solve, identify, compare, analyze, develop, definition, interpret, association, recognize, predictions, data,
Technical Vocabulary:	Slope, y-intercept, x-intercept, scatterplot, correlation, correlation coefficient, residuals, literal equation, inequality, solution, linear models, constant rate of change, equivalence

*** Denotes a connection to Personal Financial Literacy (PFL)**

Unit Title	All Systems Go	**Length of Unit**	5 weeks
Focusing Lens(es)	Modeling Concurrence	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.2-GLE.4
Inquiry Questions (Engaging-Debatable):	• How do you determine when a hybrid car would pay for itself in gas savings compared to a less expensive conventional car? (MA10-GR.HS-S.2-GLE.4-EO.a)		
Unit Strands	Algebra: Creating Equations Algebra: Reasoning with Equations and Inequalities		
Concepts	Solutions, systems of equations, linear equations, solution set, one solution, no solutions, infinite solutions, graphically, algebraically, characteristics, equations, efficiency, inequalities, system of inequalities, intersection, half-plane, relevance, model, context, viable, non-viable		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
When solving systems of linear equations mathematicians can determine the type of solution set (one solution, no solutions, or infinite solutions) both graphically and algebraically. (MA10-GR.HS-S.2-GLE.4-EO.d)	What do the different types of solutions for a system of linear equations look like on a graph? How are solutions to systems of equations visualized or approximated on a graph? Is it possible for a system of equations to have no solution, what would this look like on a graph?	Why does the geometry of a pair of lines describe the possible solution sets for a system of a pair of linear equations?
The characteristics of the equations in a system determine the most efficient strategy for finding a solution. (MA10-GR.HS-S.2-GLE.4-EO.d)	What are the different types of solution processes for solving systems of linear equations? How does your calculator find the solution to systems of equations?	Why do different types of systems require different types of solution processes? Why if you use an inefficient method will you still get the correct solution to system of equations? Why is substitution sometimes more efficient than elimination for solving a system of linear equations algebraically and vice versa?
The intersection of two half-planes provides a means to visualize and represent the solution to a system of linear inequalities. (MA10-GR.HS-S.2-GLE.4-EO.e.iii)	What would a graph of a system of linear inequalities with no solution look like?	Why are solutions to linear inequalities better represented graphically than algebraically?

Mathematicians evaluate mathematical solutions for their relevance to a model; not all solutions to a system are viable in context. (MA10-GR.HS-S.2-GLE.4-EO.a.iii)	What are characteristics of non-viable solutions? How do you know when a solution will be viable?	Why is it important to evaluate all solutions within the original context?

Key Knowledge and Skills: My students will…	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Create equations and inequalities in one variable and use them to solve problems, include equations arising from linear and exponential functions with integer exponents. (MA10-GR.HS-S.2-GLE.4-EO.a.i)
- Create linear equations in two or more variables to represent relationships between quantities and graph the equations on coordinate axes with labels and scales. (MA10-GR.HS-S.2-GLE.4-EO.a.ioi)
- Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. (MA10-GR.HS-S.2-GLE.4-EO.a.iii)
- 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. (MA10-GR.HS-S.2-GLE.4-EO.d.i)
- Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. (MA10-GR.HS-S.2-GLE.4-EO.d.ii)
- 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 $f(x) = g(x)$ and 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 and polynomial. (MA10-GR.HS-S.2-GLE.4-EO.e.i)
- 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. (MA10-GR.HS-S.2-GLE.4-EO.e.iii)

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EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*The intersection of two linear equations is their solution set; and, if the lines do not intersect, there are no viable solutions.*
Academic Vocabulary:	Intersection, efficiency, characteristics, solutions, one solution, no solutions, infinite solutions, viable, non-viable, approximation, constraints, relevance, context,
Technical Vocabulary:	Systems of equations, linear equations, solution set, graphically, algebraically, equations, inequalities, system of inequalities, half-plane, model, elimination, substitution, function, linear,

Unit Title	Exploding Exponentially		**Length of Unit**	5 weeks
Focusing Lens(es)	Modeling	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.1 MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.2 MA10-GR.HS-S.2-GLE.3	
Inquiry Questions (Engaging-Debatable):	• What would happen if a population grew exponentially forever? (MA10-GR.HS-S.2-GLE.2-EO.a.i) • What does it mean when people say that a car “depreciates in value the moment it is driven off the lot”?			
Unit Strands	Number and Quantity: Quantities Algebra: Seeing Structure in Expressions Functions: Interpreting Functions Functions: Linear, Quadratic and Exponential Models			
Concepts	Model, grow, decay, constant rate of growth, exponential, linear, properties of exponents, relationships, situations/context, functions, arithmetic sequence, geometric sequence			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Linear and exponential functions provide the means to model constant rates of change and constant rates of growth, respectively. (MA10-GR.HS-S.2-GLE.3-EO.a.i)	How do you determine from an equation whether an exponential function models growth or decay? How do you determine whether a situation can be modeled by a linear function, an exponential function, or neither?	Why are differences between linear and exponential functions visible in equations, tables and graphs?
A quantity increasing exponentially eventually exceeds a quantity increasing linearly. (MA10-GR.HS-S.2-GLE.2-EO.a.iii)	How does the rate of growth in linear and exponential functions differ? How can you determine when an exponential function will exceed a linear function?	Why is important to consider the limitations of an exponential model?
The generation of equivalent exponential functions by applying properties of exponents sheds light on a problem context and the relationships between quantities. (MA10-GR.HS-S.2-GLE.3-EO.a, b)	How do properties of exponents simplify exponential expressions?	Why does a number raised to the power of zero equal one? Why do exponential patterns explain negative exponents?

Linear and exponential functions model arithmetic and geometric sequences respectively. (MA10-GR.HS-S.2-GLE.2-EO.a.ii)	How can you determine the slope and y-intercept of an arithmetic sequence? How can you determine the ratio for a geometric sequence? How do you know whether a sequence is arithmetic or geometric?	Why do linear and exponential functions model so many situations?
The interpretation of the parameters of equations and inequalities must consider real world contexts. (MA10-GR.HS-S.2-GLE.2-EO.b.i)	What is a coefficient? How do you choose coefficients given a set of data?	Why are coefficients sometimes represented with letters? Why does changing coefficients affect a model? Why would you model a context with an inequality rather than an equation?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Interpret parts of an exponential expression, such as terms, factors, and coefficients. (MA10-GR.HS-S.2-GLE.3-EO.a.i.1)
- Interpret complicated expressions by viewing one or more of their parts as a single entity. (MA10-GR.HS-S.2-GLE.3-EO.a.i.2)
- Interpret the parameters in a linear or exponential (domain of integers) function in terms of a real world context and prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. (MA10-GR.HS-S.2-GLE.2-EO.b.i)
- Use the properties of exponents to transform expressions for exponential functions. (MA10-GR.HS-S.2-GLE.3-EO.b.i.3)
- Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (MA10-GR.HS-S.2-GLE.1-EO.a.iii)
- Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. (MA10-GR.HS-S.2-GLE.2-EO.a.i.1)
- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. (MA10-GR.HS-S.2-GLE.2-EO.a.i.2)
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. (MA10-GR.HS-S.2-GLE.2-EO.a.i.3)
- 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). (MA10-GR.HS-S.2-GLE.2-EO.a.ii)
- Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. (MA10-GR.HS-S.2-GLE.2-EO.a.iii)
- Determine an explicit expression, a recursive process, or steps for calculation from a context that is linear or exponential with integer domain. (MA10-GR.HS-S.2-GLE.1-EO.d.i.1)
- Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. (MA10-GR.HS-S.2-GLE.1-EO.d.ii)

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A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*A quantity increasing exponentially eventually exceeds a quantity increasing linearly.*
Academic Vocabulary:	Model, grow, decay, transform, compare, create, interpret, situations, context, construct, relationships,
Technical Vocabulary:	Linear, exponential, function, equation, variable, coefficient, rate of growth, rate of decay, explicit, recursive, properties of exponents, functions, arithmetic sequence, geometric sequence, coefficient, initial value

Unit Title	Fantastic Function Fun		Length of Unit	5 weeks
Focusing Lens(es)	Representation Modeling	Standards and Grade Level Expectations Addressed in this Unit	MA10-GR.HS-S.2-GLE.1	
Inquiry Questions (Engaging-Debatable):	• Are there any examples of something that can't be modeled by a function? (MA10-GR.HS-S.2-GLE.1-EO.b)			
Unit Strands	Functions: Interpreting Functions			
Concepts	Function, input, output, domain, range, context/situation, visualization, coordinate plane, key features of functions, maxima, minima, intercepts, average rate of change, functional representations, comparisons, interpretation			

Generalizations My students will **Understand** that…	Guiding Questions Factual	Conceptual
Functions describe situations where each input determines exactly one output. (MA10-GR.HS-S.2-GLE.1-EO.a)	Given an input and output, how do you determine a rule? What notation is used to write a function? What does y=f(x) denote?	Why is only one output permissible for every input in a function? Why is possible to have two inputs for one output? Why are functions an important tool in mathematical modeling?
Mathematicians limit domains of a function to ensure both the domain and range make sense in a given context. (MA10-GR.HS-S.2-GLE.1-EO.b)	What is another name for the inputs of a function? Outputs? What is the relationship between domain and range of a function? How can you quantify the relationship between two variables?	How do you determine a reasonable domain and range for a context? Why is it necessary to constrain the domain and range of a function model?
Visualizing a variety of functions on a coordinate plane helps to interpret key features, such as domain, range, maxima, minima, intercepts, symmetry, end behavior and average rate of change. (MA10-GR.HS-S.2-GLE.1-EO.b.i)	What are important characteristics of a function that can be seen on a graph? What do the graphs of linear, exponential, square root, cube root, step and absolute value functions look like? What is the relationship between an average rate of change of any function and the slope of a linear function?	Why are multiple types of functions needed to model real world phenomena? How does visualizing a function help interpret the relationship between two variables? How is the graph of an equation related to its solutions? (A.REI.10)

Mathematician use a variety of functional representations to compare and interpret the differences and similarities of functions. (MA10-GR.HS-S.2-GLE.1-EO.c.v.3)	What are different types of functional representations? How do graphs, equations, and tables show the similarity and differences of functions?	Why is it important to interpret the differences and similarities of functions through multiple representations?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Understand 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 $y = f(x)$.
- Use function notation and evaluate functions for inputs in their domains. (MA10-GR.HS-S.2-GLE.1-EO.a.ii)
- Interpret statements that use function notation in terms of a context. (MA10-GR.HS-S.2-GLE.1-EO.a.ii)
- Interpret key features of graphs and tables, for a function that models a relationship between two quantities, 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. (MA10-GR.HS-S.2-GLE.1-EO.b.i)
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (MA10-GR.HS-S.2-GLE.1-EO.b.ii)
- Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval and estimate the rate of change from a graph. (MA10-GR.HS-S.2-GLE.1-EO.b.iii)
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions); limit functions to linear, square root, cube root, piece-wise, step, absolute value and exponential with integer domain. (MA10-GR.HS-S.2-GLE.1-EO.c.v.3)

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A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*When using functions to model real world phenomena it is important to constrain the domain and range to inputs and outputs that make sense within the context of the model.*
Academic Vocabulary:	Interpret, transform, represent, relationships, compare, distinguish, increasing, decreasing, symmetry, input, output, visualization, coordinate plane,
Technical Vocabulary:	Function, domain, range, functional representations, piecewise function, square root, cube root, linear, exponential, square root, cube root, and piecewise-defined functions, step functions, absolute values, key features of functions, maxima, minima, average rate of change, end behavior, intercepts,

Unit Title	Transform the World		**Length of Unit**	8 weeks
Focusing Lens(es)	Justification Transformation	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.4-GLE.1	
Inquiry Questions (Engaging-Debatable):	• How do architectural engineers use transformations? (MA10-GR.HS-S.4-GLE.1)			
Unit Strands	Geometry: Congruence			
Concepts	Algebraic representations, model, transformation, coordinate plane, angles, side lengths, congruency, definitions, proofs			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Algebraic representations model geometric transformations performed on a coordinate plane. (MA10-GR.HS-S.4-GLE.1-EO.a)	On a coordinate plane, what algebraic description describes a translation? Rotation? Reflection? What is the effect on the x and y coordinates of a point when applying rotations, reflections or translations?	Why is it useful to describe transformations on a coordinate plane? How is it possible for different compositions of transformations to be equivalent? Why is a rotation of 180 degrees equivalent to a reflection over the x-axis combined with a reflection over the y-axis?
Sequences of transformations or combinations of angles and side lengths can determine the congruence of shapes. (MA10-GR.HS-S.4-GLE.1-EO.b)	What transformations preserve shape and size? How can you determine if a transformation preserves shape and size? What combinations of sides and angles are sufficient to prove congruency of triangles? How can congruence between shapes be shown through indirect comparison?	Why can transformations determine if two figures are congruent? Why do combinations of sides and angles prove congruency of triangles? Why are some combinations of angles and sides sufficient to prove congruency while others are not?
Precise definitions of basic geometric concepts facilitate the development of careful proofs. (MA10-GR.HS-S.4-GLE.1-EO.c)	What is an angle? What is a triangle? What is a parallelogram?	How do definitions contribute to the development of a proof?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. (MA10-GR.HS-S.4-GLE.1-EO.a.i)
- Represent transformations in the plane and describe transformations as functions that take points in the plane as inputs and give other points as outputs. (MA10-GR.HS-S.4-GLE.1-EO.a.ii, iii)
- Compare transformations that preserve distance and angle to those that do not. (MA10-GR.HS-S.4-GLE.1-EO.a.iv)
- Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. (MA10-GR.HS-S.4-GLE.1-EO.a.v)
- Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. (MA10-GR.HS-S.4-GLE.1-EO.a.vi)
- Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. (MA10-GR.HS-S.4-GLE.1-EO.a.vii)
- Specify a sequence of transformations that will carry a given figure onto another. (MA10-GR.HS-S.4-GLE.1-EO.a.viii)
- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. (MA10-GR.HS-S.4-GLE.1-EO.b.i, ii)
- Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. ((MA10-GR.HS-S.4-GLE.1-EO.b.iii)
- Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. (MA10-GR.HS-S.4-GLE.1-EO.b.iv)
- Prove theorems about lines and angles, triangles, and parallelograms. (MA10-GR.HS-S.4-GLE.1-EO.c)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*I can use rigid transformations to show that necessary and sufficient combinations of congruent sides and angles prove triangles congruent.*
Academic Vocabulary:	Classify, identify, compare, analyze, prove, substitution, develop, sufficient, necessary, definition, coordinate plane, angles, side lengths,
Technical Vocabulary:	Transformation, definitions, proofs, vertical angles, perpendicular bisector, rotation, translation, reflection, rigid transformation, congruence, theorem, postulate,