FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Two Year Integrated Math 1 (10)

Date: January 2016
Proposed Grade Level(s): 9^{th}-12^{th}
Grading: A-F
Prerequisites: IEP team recommendation

Subject Area: Mathematics
Course Length: Two years
Number of Credits:
Year 1: 10 Math credits
Year 2: 10 Math credits

Intent to Pursue 'A-G' College Prep Status: No

COURSE DESCRIPTION:

Two Year Integrated Math 1 (10) is an integrated math course that will be taught over a two year time period. Year 1 is designed to formalize and extend the mathematics that students learned in the middle grades and to provide additional support in developing foundational skills not previously mastered. The standards are based on the Common Core State Standards for Mathematics and include topics from the conceptual categories: Number and Quantity, Algebra, Functions, Geometry, and Statistics and Probability. Instructional time will focus on six critical areas: (1) extend understanding of numerical manipulation to algebraic manipulation; (2) synthesize understanding of functions; (3) deepen and extend understanding of linear relationships; (4) apply linear models to data that exhibit a linear trend; (5) establish criteria for congruence based on rigid motions; and (6) apply the Pythagorean Theorem to the coordinate plane.

GENERAL GOALS/ESSENTIAL QUESTIONS:

As stated in the *Mathematics Framework (2013)*, the fundamental purpose of Integrated Math 1 is to formalize and extend students' understanding of linear functions and their applications. The critical topics of study deepen and extend understanding of linear relationships, in part by contrasting them with exponential phenomena, and in part by applying linear models to data that exhibit a linear trend. Integrated Math 1 uses properties and theorems involving congruent figures to deepen and extend understanding of geometric knowledge from prior grades. The courses in the integrated pathway follow the structure that began in the K-8 standards of presenting mathematics as a coherent subject, mixing standards from various conceptual categories. Integrated Math 1 is intended to be an introductory high school course and will satisfy the Algebra 1 graduation requirement.

CCSS READING/WRITING/SPEAKING and LISTENING COMPONENTS:

The curriculum has literacy strategies embedded within the text that assists students in the following:

- Understanding math tasks
- Communicating understanding orally and through writing
- Writing about math
- Building math vocabulary
- Building academic vocabulary

The eight *Standards for Mathematical Practice* describe the attributes of mathematically proficient students and expertise that mathematics educators at all levels should seek to develop in their students.

Mathematical practices provide a vehicle through which students engage with and learn mathematics with a focus on reading, writing, and explaining.

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.

DETAILED UNITS OF INSTRUCTION:

Chapters	Standards	Chapter Overview
1: Understanding Quantities and Their Relationships	N.Q.2 F.IF.1 F.IF.2 F.IF.4 F.IF.5 F.IF.9 F.LE.1b F.LE.2 A.CED.2 A.REI.10	This chapter introduces students to the concept of functions. Lessons provide opportunities for students to explore functions, including linear, exponential, quadratic, linear absolute value functions, and linear piecewise functions through problem situations, graphs, and equations. Students will classify each function family using graphs, equations, and graphing calculators. Each function family is then defined and students will create graphic organizers that represent the graphical behavior and examples of each.
2: Graphs, Equations, and Inequalities	A.REI.1 A.REI.3 A.REI.10 A.CED.1 A.CED.2 A.CED.3 A.SSE.1a N.Q.1 N.Q.2 N.Q.3 F.IF.2 F.IF.6 F.LE.1b F.LE.1c	This chapter reviews solving linear equations and inequalities with an emphasis towards connecting the numeric, graphic, and algebraic methods for solving linear functions. Students explore the advantages and limitations of using tables, functions, and graphs to solve problems. A graphical method for solving linear equations, which involves graphing the left and right side of a linear equation, is introduced. Upon student understanding of solving and graphing equations by hand, the chapter introduces the use of a graphing calculator. Finally, the graphical method for solving problems is extended to include non-linear equations and inequalities.
3: Linear Functions	A.SSE.1a A.SSE.1b A.CED.2 A.CED.3 A.CED.4 A.REI.1 A.REI.3	This chapter guides student exploration and comprehension of different forms of linear equations. Questions ask students to compare the mathematical and contextual meanings of various linear equations and to determine when to use the most appropriate form of a linear equation to represent a problem situation.
4: Sequences	F.IF.1	This chapter introduces students to sequences, and then focuses

	F.IF.2 F.IF.3 F.IF.4 F.BF.1 F.BF.1a F.BF.2 F.LE.1b F.LE.1c F.LE.2 F.LE.5 A.SSE.1a	student attention on arithmetic and geometric sequences. Students then use recursive and explicit formulas to determine subsequent terms of a sequence. The relationship between arithmetic sequences and linear functions and some geometric sequences and exponential functions is developed.
5: Exponential Functions	A.SSE.1a A.SSE.1b A.CED.1 A.CED.2 A.REI.3 A.REI.10 A.REI.11 N.RN.1 N.RN.2 N.Q.2 F.IF.3 F.IF.4 F.IF.6 F.IF.7e F.LE.2 F.LE.3 F.LE.5	This chapter examines the graphical behavior of exponential functions, including intercepts, domain and range, intervals of increase or decrease, and asymptotes. Students also explore the transformations of exponential functions. The chapter then introduces students to the relationship between rational exponents and radical form. Students will learn the strategy to use common bases to solve simple exponential equations algebraically.
6: Systems of Equations	A.REI.5 A.REI.6 A.REI.10 A.REI.11 A.CED.2	This chapter focuses on solving systems of linear equations graphically and algebraically using the substitution method and the linear combinations method.
7: Systems of Inequalities	A.REI.12 A.CED.3	This chapter extends student comprehension of graphing linear equations to include graphing and solving linear inequalities. Students will solve systems of inequalities and use that skill to model mathematics with linear programming.
8: Analyzing Data Sets for One Variable	S.ID.1 S.ID.2 S.ID.3	This chapter reviews data analysis of data sets with one variable. Students first learn to represent data graphically through dot plots, histograms, and box-and-whisker plots. The chapter leads students to determining measures of center for a data set, determining any outliers in a data set, and determining the interquartile range (IQR) and standard deviation for data sets.
9: Correlation and Residuals	S.ID.6a S.ID.6b S.ID.6c S.ID.7 S.ID.8	This chapter reviews data analysis of data sets with one variable. Students first learn to represent data graphically through dot plots, histograms, and box-and-whisker plots. The chapter leads students to determining measures of center for a data set, determining any outliers in a data set, and determining the interquartile range (IQR)

	S.ID.9	and standard deviation for data sets.
10: Analyzing Data Sets for Two Categorical Variables	S.ID.5	This chapter reviews data analysis of data sets with one variable. Students first learn to represent data graphically through dot plots, histograms, and box-and-whisker plots. The chapter leads students to determining measures of center for a data set, determining any outliers in a data set, and determining the interquartile range (IQR) and standard deviation for data sets.
11: Modeling Mathematics (optional)	F.IF.4 F.IF.5 F.IF.7 F.BF.1 F.BF.3 F.LE.1b F.LE.1 F.LE.2	This chapter presents opportunities to model real-world data using linear and exponential functions. The focus builds student decision-making to determine the appropriate function or functions for a given data set. (This chapter is optional since it goes beyond the study of linear and exponential functions).
12: Geometry on the Coordinate Plane	G.CO.1 G.CO.2 G.CO.4 G.CO.5 G.CO.6 G.CO.12 G.CO.13 G.GPE.5 G.GPE.6 G.GPE.7	This chapter uses distance, midpoint, and slope to examine segments and lines in the coordinate plane. Patty paper and constructions are used to duplicate segments and angles, bisect segments and angles, construct parallel and perpendicular lines, and construct triangles and quadrilaterals.
13: Congruence through transformations	G.CO.2 G.CO.4 G.CO.5 G.CO.6 G.CO.7 G.CO.8 G.CO.12	This chapter addresses transformations of figures on the coordinate plane, focusing on similarity and congruence, and the effects of transformation on coordinates. The chapter leads student exploration of the conditions for triangle congruence and opportunities for constructions of congruent triangles under the stated conditions are provided.
14: Perimeter and Area of Geometric Figures on the Coordinate Plane	G.GPE.5 G.GPE.7	This chapter focuses on calculating perimeter and area of various geometric figures represented on the coordinate plane. The use of transformation is explored to ease arithmetic operations
15: Connecting Algebra and Geometry with Polygons	G.GPE.4 G.GPE.5	This chapter focuses on using slope and distance to classify triangles and quadrilaterals on the coordinate plane. Given a subset of vertices and a set of conditions, the remaining possible vertices are determined

16: Logic(optional)	F.IF.4 F.IF 5 F.IF.7 F.BF.1 F.BF.4 F.LE.1 F.LE.2	This unit introduces logical reasoning. Students have opportunities to explore induction and deduction to formulate conclusions. The unit then leads students through conditional statements, truth values, and truth tables which provides opportunities for students to practice direct and indirect proof. The unit concludes by having students solve logic puzzles.

TEXTBOOKS AND RESOURCE MATERIALS:

Integrated Math I, *A Common Core Math Program;* Carnegie Learning, 2013

COMMON CORE STATE STANDARDS ADDRESSED:

The content standards addressed in this course come from each of the conceptual categories:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

*See attachment for specific standards addressed.

DISTRICT ESLRs TO BE ADDRESSED:

When students exit a secondary mathematics course, they will be:

- **Self-directed Learners** who will be able to use notes and a textbook to assist them in continuing their learning outside of the classroom setting.
- **Efficient Communicators** who can explain mathematical concepts to others and use mathematics to organize and explain data.
- **Quality Producers** who understand the importance of neat, organized work that demonstrates their thinking and understanding of the solution they've formed to solve a problem.
- **Constructive Thinkers** who are able to attack problems with organization, logic, and mathematical skills they've developed in a systematic fashion.
- **Collaborative Workers** who can work in a variety of settings in culturally diverse groups. They will be able to form and use study groups to strengthen their own understanding in addition to providing the same service for classmates.
- **Responsible Citizens** who accept the consequences of their actions and who demonstrate their understanding of their role in the learning process.

ATTACHMENT 1:
Integrated Math I Specific State Standards Addressed

- **<u>Number and Quantity</u>**
    - **Quantities**
        - Reason quantitatively and use units to solve problems.
            - 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. N.Q.1
            - Define appropriate quantities for the purpose of descriptive modeling.N.Q.2
            - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.N.Q.3
    - The Real Number System
        - Extend the properties of exponents to rational exponents. N.RN. 1,2
- **<u>Algebra</u>**
    - Seeing Structure in Expressions
        - Interpret the structure of expressions.
            - Interpret expressions that represent a quantity in terms of its context.A.SSE.1
            - Interpret parts of an expression, such as terms, factors, and coefficients.A.SSE.1.a
            - Interpret complicated expressions by viewing one or more of their parts as a single entitiy.1.b
    - Creating Equations
        - Create equations that describe numbers or relationships.
            - Create equations and inequalities in one variable including ones with absolute value and use them to solve problems. A.CED.1
            - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.2
            - 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.A.CED.3
            - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A.CED.4
    - Reasoning with Equations and Inequalities
        - Understand solving equations as a process of reasoning and explain the reasoning.
            - 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. A.REI.1
        - Solve equations and inequalities in one variable.

- Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.3
- Solve systems of equations.
  - 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. A.REI.5
  - Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables. A.REI.6
- Represent and solve equations and inequalities graphically.
  - 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 would be a line). A.REI.10
  - 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. A.REI.11
  - 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. A.REI.12

- **Functions**
  - Interpreting Functions
    - Understand the concept of a function and use function notation.
      - 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, the $f(x)$ denotes the output of ‘f’ corresponding to the input ‘x’. The graph of ‘f’ is the graph of the equation $y = f(x)$. F.IF.1
      - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F.IF.2
      - Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. F.IF.3
    - Interpret functions that arise in applications in terms of the context.
      - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.F.IF.4
      - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F.IF.5
      - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F.IF.6
    - Analyze functions using different representations.

        - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F.IF.7a
        - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F.IF.7e
        - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables or by verbal descriptions). F.IF.9
- Building Functions
    - Build a function that models a relationship between two quantities.
        - Write a function that describes a relationship between two quantities. F.BF. 1
        - Determine an explicit expression, a recursive process, or steps for calculation from a context. F.BF.1.a
        - Combine standard function types using arithmetic operations.F.BF.1.b
        - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. F.BF.2
    - Build new functions from existing functions.
        - 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 ka 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. F.BF. 3
- Linear, Quadratic, and Exponential Models
    - Construct and compare linear, quadratic, and exponential models and solve problem.
        - Distinguish between situations that can be modeled with linear functions and with exponential functions.F.LE.1
        - Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. F.LE.1.a
        - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.F.LE.1.b
        - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.1.c
        - Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or tow input-output pairs (include reading these from a table). F.LE.2

            - Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial functions. F.LE.3
        - Interpret expressions for functions in terms of the situation they model.
            - Interpret the parameters in a linear or exponential function in terms of context. F.LE.5
- **Geometry**
    - Congruence
        - Experiment with transformations in the plane.
            - 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. G.CO.1
            - Represent transformations in the plane using, e.g. transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Computer transformations that preserve distance and angle to those that do not (e.g. translation versus horizontal stretch). G.CO.2
            - Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.G.CO.3
            - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.G.CO.4
            - Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g. graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. G.CO.5
        - Understand congruence in terms of rigid motions.
            - 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. G.CO. 6
            - 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. G.CO.7
            - Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. G.CO.8
        - Make geometric constructions.
            - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment, copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.G.CO. 12

        - Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. G.CO.13
    - Expressing Geometric Properties with Equations
        - Interpreting Categorical and Quantitative Data
            - Use Coordinates to prove simple geometric theorems algebraically. G.GPE.4
            - Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a given line that passes through a given point). G.GPE.5
            - Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G.GPE.7
- **Statistics and Probability**
    - Interpreting Categorical and Quantitative Data
        - Summarize, represent, and interpret data on a single count or measurement variable.
            - Represent data with plots on the real number line (dot plots, histograms, and box plots). S.ID.1
            - 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. S.ID.2
            - Interpret difference in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S.ID.3
        - Summarize, represent, and interpret data on two categorical and quantitative variables.
            - 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.S.SID.5
            - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.S.SID.6
                - Fit a function to the data; use functions fitted to data to solve problems in the context of data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.S.SID.6.a
                - Informally assess the fit of a function by plotting and analyzing residuals. S.SID. 6.b
                - Fit a linear function for a scatter plot that suggest a linear association. S.SID.6.c
        - Interpret linear models.
            - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of data.S.SID.7

- Compute (using technology) and interpret the correlation coefficient of a linear fit. S.ID.8
- Distinguish between correlation and causation. S.ID.9