FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Mathematics 1

Date: October 2017 **Course Length: 2 Semesters**

Proposed Grade Level(s): 9-12 **Subject Area: Mathematics**

Grading: A - F **Credits: 5 per semester**

Prerequisite(s): "C" or better in Course 3

Intent to Pursue 'A-G' College Prep: Yes

A-G Course Identifier: C: Mathematics

COURSE DESCRIPTION:

Mathematics 1 is an integrated math course designed to formalize and extend the mathematics that students learned in the middle grades. 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 seven critical areas: (1) extend understanding of numerical manipulation to algebraic manipulation; (2) synthesize understanding of function; (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 (6) establish understanding of representative transformations, rotations, reflections, and translations on the coordinate plane; and (7) interpret categorical and quantitative data. Students will be prepared for the next course in mathematics and be assessed using district diagnostic tools.

Course requires weekly math lab to ensure meeting of all standards.
Class Cycle - This course will work on a cycle. One week will be Performance Task Week; the next week will be a Work Week.

During the Performance Task Week, students will participate all three days in the same Performance Task(s).

> A Performance Task involves significant interaction of students with a variety of information materials (e.g., readings, video clips, data) and/or engagement in a problem solution, leading to a show of the students' application of knowledge and skills in writing or presentation. A key component of college and career readiness is the ability to integrate knowledge and skills across multiple content standards

During the Work Week, students will be required to be actively working on their course for the hour and fifteen minutes. This would be the best opportunity to bring questions that a student couldn't answer on their own or their regular teacher suggested they bring it to lab.

Self-Help
One of the things we will consistently be exploring in Mathematics 1 is how to help yourself when you get stuck. We will look at utilizing calculators, Khan Academy, Math.com, reading techniques, etc.

GENERAL GOALS:

- As stated in the Mathematics Framework (2013), the fundamental purpose of Mathematics 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.
- Mathematics 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 began in the K-8 standards of presenting mathematics as a coherent subject, mixing standards from various conceptual categories.
- Mathematics 1 is intended to be an introductory high school course and will satisfy the Algebra 1 graduation requirement.

COMMON CORE STATE ANCHOR STANDARDS FOR READING (K-12):

Key Ideas & Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft & Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge & Ideas

7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Reading Range / Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

COMMON CORE STATE ANCHOR STANDARDS FOR WRITING (K-12):

Text Types & Purposes

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production & Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

COMMON CORE STATE ANCHOR STANDARDS FOR SPEAKING AND LISTENING (K-12):

Comprehension & Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge & Ideas

4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and ensure that the organization, development, and style are appropriate to task, purpose, and audience.
5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
   Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

TEXTBOOKS AND RESOURCE MATERIALS:

Aleks (Assessment and Learning in Knowledge Spaces), University of California, Irvine (UC Regents), McGraw Hill, (2017)

DETAILED UNITS OF INSTRUCTION:

Sections	Standards	Overview
Arithmetic Readiness	Standards of Mathematical Practices	This section is designed to be available to students who test in needing remediation on K-8 standards.
Real Numbers	Standards of Mathematical Practices	This section is designed to be available to students who test in needing remediation on K-8 standards.

	A.SSE.1b	
Linear Equations and Inequalities	A.SSE.1a A.CED.1 A.CED.2 A.CED.4 N.Q.1 N.Q.2 N.Q.3 A.REI.1 A.REI.3 A.REI.3.1 A.REI.6	This section reviews solving linear equations and inequalities while connecting the numeric, graphic, and algebraic methods for solving linear functions. This section also 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.
Graphing, Functions, and Linear Systems	A.SSE.1a A.SSE.1b A.CED.2 A.CED.3 F.BF.1.a F.BF.1.b F.BF.2 A.REI.5 A.REI.6 A.REI.10 A.REI.11 A.REI.12 F.IF.1 F.IF.2 F.IF.3 F.IF.4 F.IF.5 F.IF.6 F.IF.7.a F.IF.9 F.LE.2 F.LE.1.a F.LE.1.b G.GPE.5 N.Q.1 N.Q.2 S.ID.6.a S.ID.6.b S.ID.6.c S.ID.8 S.ID.9	This section has students explore 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. Also this section focuses on solving systems of linear equations graphically and algebraically using the substitution method and the linear combinations method. Then extends student comprehension of graphing linear equations to include graphing and solving linear inequalities. Students will solve systems of inequalities. Students are also introduced to arithmetic sequences. Students then use recursive and explicit formulas to determine subsequent terms of an arithmetic sequence. Students represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
Exponents and Exponential Functions	A.SSE.1a A.CED.1 A.CED.2 F.IF.2 A.REI.3 A.REI.10	This section 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 section then introduces students to the relationship between rational exponents and radical

	F.BF.2 F.BF.3 A.SSE.1b N.Q.2 F.LE.3 F.LE.1.c F.LE.1.a	form. Students will learn the strategy to use common bases to solve simple exponential equations algebraically. Also this section introduces students to 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.
Data Analysis and Probability	S.ID.1 S.ID.2 S.ID.3 S.ID.5	This section reviews data analysis of data sets with one variable. Students first learn to represent data graphically through dot plots, histograms, bar graphs, and box-and-whisker plots. The section leads students to determining measures of center for a data set, determining any outliers in a data set, and determining the interquartile range and standard deviation for data sets.
Segments, Lines, and Angles	Standards of Mathematical Practices G.CO.1 G.CO.5 G.CO.6 G.CO.7 G.CO.8 G.CO.12	This section uses distance, midpoint, and slope to examine segments and lines in the coordinate plane. Online construction tools as well as hand tools are used to duplicate segments and angles, bisect segments and angles, construct parallel and perpendicular lines, and construct triangles and quadrilaterals.
Triangles, Quadrilaterals, and Polygons	G.GPE.4 G.GPE.7 N.Q.1	This section focuses on proving triangle congruence theorems and using the theorems to determine whether triangles are congruent. Also students are introduced to polygons and parallelograms in the coordinate plane.
Similarity and Transformations	G.CO.2 G.CO.3 G.CO.4 G.CO.5 G.CO.6	This section addresses transformations of figures on the coordinate plane, focusing on similarity and congruence, and the effects of transformation on coordinates. The section leads student exploration of the conditions for congruence, translation, reflection, rotation, symmetry, and dilations while opportunities for constructions are provided.
Area, Volume, and Circles	G.GPE.7 N.Q.1 G.CO.13	This section focuses on calculating perimeter and area of various geometric figures represented on the coordinate plane.

SUBJECT AREA CONTENT STANDARDS TO BE ADDRESSED:

Standards for Mathematical Practice

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. The Standards for Mathematical Practice represent a picture of what it looks like for students to *do mathematics*. Mathematical practices provide a vehicle through which students engage with and learn mathematics with a focus on reading, writing, and explaining. The Standards for Mathematical Practice along with the Standards for Mathematical Content (which follow this section), prescribe that students experience mathematics as a coherent, relevant, and meaningful subject.

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

<u>Mathematics Content Standards</u>

<u>Number and Quantity</u>

Quantities

Reason quantitatively and use units to solve problems

N-Q.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.

N-Q.2: Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

<u>Algebra</u>

Seeing Structure in Expressions

Interpret the structure of expressions.

A-SSE.1: Interpret expressions that represent a quantity in terms of its context.

A-SSE.1a: Interpret parts of an expression, such as terms, factors, and coefficients.

A-SSE.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity.

Creating Equations

Create equations that describe numbers or relationships.

A-CED.1: Create equations and inequalities in one variable including ones with absolute value and use them to solve problems.

A-CED.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A-CED.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.

A-CED.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Reasoning with Equations and Inequalities

Understand solving equations as a process of reasoning and explain the reasoning.

A-REI.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.

Solve equations and inequalities in one variable.

A-REI.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A-REI 3.1: Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context.

Solve systems of equations.

A-REI.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.

A-REI.6: Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables.

Represent and solve equations and inequalities graphically.

A-REI.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 would be a line).

A-REI.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.

A-REI.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.

Functions

Understand the concept of function and use function notation.

F-IF.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, 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.2: Use function notation, evaluates functions for inputs in their domains, and interprets statements that use function notation in terms of a context.

F-IF.3: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Interpret functions that arise in terms of applications in terms of the concepts.

F-IF.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.

F-IF.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF.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.

Analyze functions using different representations.

F-IF.7: Graph functions expressed symbolically and show key features for the graph, by hand in simple cases and using technology for more complicated cases.

F-IF.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

F-IF.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables or by verbal descriptions).

Building Functions

Build a function that models a relationship between two quantities.

F-BF 1: Write a function that describes a relationship between two quantities.

F-BF 1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

F-BF 1b. 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.

F-BF 2: Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Build new functions from existing functions.

F-BF 3: Identify the effect on the graph of replacing by $F(x) by\ f(x) + k, kf(x), f(kx), f(x + k)$ and for specific values of k, (both positive and negative); find the value of 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.

Linear, Quadratic, and Exponential Models

Construct and compare linear, quadratic, and exponential models and solve problems.

F-LE 1: Distinguish between situations that can be modeled with linear functions and with exponential functions.

F-LE.1a: Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

F-LE.1b: Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

F-LE.1c: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F-LE.2: 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.3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial functions.

<u>Geometry</u>

Congruence

Experiment with transformations in the plane.

G-CO.1: 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.2: 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. Compare transformations that preserve distance and angle to those that do not (e.g. translation versus horizontal stretch).

G-CO.3: Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G-CO.4: Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G-CO.5: 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.

Understand congruence in terms of rigid motions.

G-CO.6: 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.7: 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.8: Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Make geometric constructions.

G-CO.12: 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; constructing a line parallel to a given line through a point not on the line.

G-CO.13: Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Expressing Geometric Properties with Equations

Use coordinates to prove geometric theorems algebraically.

G-GPE.4: Use Coordinates to prove simple geometric theorems algebraically.

G-GPE.5: 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.7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

<u>Statistics and Probability</u>

Interpreting Categorical and Quantitative Data

Summarize, represent, and interpret data on a single count or measurement variable.

S-ID.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.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.

S-ID.3: Interpret difference in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.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.

S-ID.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

S-ID.6a: 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-ID.6b: Informally assess the fit of a function by plotting and analyzing residuals. S.SID. 6.b

S-ID.6c: Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models.

S-ID.8: Compute (using technology) and interpret the correlation coefficient of a linear fit.

S-ID.9: Distinguish between correlation and causation.

<u>DISTRICT ESLRs TO BE ADDRESSED:</u>

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

- **<u>Self-directed Learners</u>** who will be able to use notes and a textbook to assist them in continuing their learning outside of the classroom setting.
- **<u>Efficient Communicators</u>** who can explain mathematical concepts to others and use mathematics to organize and explain data.
- **<u>Quality Producers</u>** who understand the importance of neat, organized work that demonstrates their thinking and understanding of the solution they’ve formed to solve a problem.
- **<u>Constructive Thinkers</u>** who are able to attack problems with organization, logic, and mathematical skills they’ve developed in a systematic fashion.
- **<u>Collaborative Workers</u>** 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.
- **<u>Responsible Citizens</u>** who accept the consequences of their actions and who demonstrate their understanding of their role in the learning process.

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