FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Integrated Math 3

Date: November 2014

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

Grading: A-F **Course Length: One year**

Prerequisites: "C-" or better in Integrated Math 2 **Number of Credits: 5 per semester**

COURSE DESCRIPTION:

Integrated Math 3 is designed to extend and apply the mathematics learned in previous math courses. 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 four critical areas: (1) apply methods from probability and statistics to draw inferences and conclusions from data; (2) expand understanding of functions to include polynomial, rational, and radical functions; (3) expand right triangle trigonometry to include general triangles; and (4) consolidate functions and geometry to create models and solve contextual problems.

GENERAL GOALS/PURPOSES:

As stated in the *Mathematics Framework (2013)*, the focus of Integrated Math 3 is for students to expand their repertoire of functions to include polynomial, rational, and radical functions. They expand their study of right triangle trigonometry to include general triangles. Finally, students bring together all of their experience with functions and geometry to create models and solve contextual problems. Mathematical modeling is a major theme of this course as it involves the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions. 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.

CCSS STUDENT READING/WRITING/SPEAKING and LISTENING COMPONENTS:

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 heavy 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.

TEXTBOOKS AND RESOURCE MATERIALS:

Integrated Math III, A Common Core Math Program; Carnegie Learning, 2013

DETAILED UNITS OF INSTRUCTION:

Chapters	Standards	Chapter Overview
1: Interpreting Data in Normal Distributions	S.ID.1 S.ID.2 S.ID.4	The first lesson of this chapter leverages student knowledge of relative frequency histograms to introduce normal distributions. Students explore the characteristics of normal distributions. In the second lesson, students build their knowledge of normal distributions using the Empirical Rule for Normal Distributions. Students use the Empirical Rule for Normal Distributions to determine the percent of data between given intervals that are bounded by integer multiples of the standard deviation from the mean. In the third lesson, students use a z-score table and a graphing calculator to determine the percent of data in given intervals that are bounded by non-integer multiples of the standard deviation from the mean. In the last lesson, students use their knowledge of probability and normal distributions to analyze scenarios and make decisions.
2: Making Inferences and Justifying Conclusions	S.IC.1 S.IC.2 S.IC.3 S.IC.4 S.IC.5 S.IC.6	The first two lessons focus on methods of collecting data to analyze a question or characteristic of interest, specific sampling methods, and the significance of randomization. Then, students use data from samples to estimate population means and proportions, and determine whether results are statistically significant. In the last lesson, students have the opportunity to complete a culminating project based on concepts from the chapter.
3: Searching for Patterns	A.SSE.1a A.SSE.1b A.SSE.2 A.APR.1 A.APR.3 A.CED.1 A.CED.2 A.REI.11 F.IF.4 F.IF.5 F.IF.7a F.IF.7c F.IF.8b F.BF.1b	This chapter begins with opportunities for students to analyze and describe various patterns. Questions ask students to represent algebraic expressions in different forms and use algebra and graphs to determine whether they are equivalent. Lessons provide opportunities for students to identify linear, exponential, and quadratic functions using multiple representations. Lessons introduce students to the concept of building new functions on a coordinate plane by operating on separate functions.
4: Quadratic Functions	A.SSE.1a A.SSE.2 A.CED.1 A.APR.1 F.IF.4 F.IF.9	This chapter begins with a matching and sorting activity to review the different forms of quadratic functions. Key characteristics of quadratic functions and graphs are identified. Lessons then provide opportunities for students to explore and identify transformations performed on a quadratic function $f(x)$ to form a new function $g(x) = Af\big(B(x - C)\big) + D$. This transformational function form is

	F.IF.7a F.BF.1a F.BF.3	introduced in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of underlying function. In the later part of the chapter, lessons provide opportunities for students to explore and understand what conditions are necessary to write a unique quadratic function. The set of complex numbers is introduced and students will operate with the imaginary number *i*. Finally, students will solve quadratic functions over the set of complex numbers.
5: Polynomial Functions	A.SSE.1a A.SSE.1b A.APR.1 A.APR.3 F.IF.4 F.IF.5 F.IF.7a F.IF.7b F.IF.7c F.BF.3	This chapter begins with two different problem situations to explore how cubic functions are built. Lessons provide opportunities for students to connect characteristics and behaviors of cubic functions to their factors. An emphasis is placed on verifying equivalence between different forms both algebraically and graphically. Students will explore polynomial functions to gain an understanding of end behavior, symmetry, and whether a function is even, odd, or neither. Questions will ask students to graph, write, and explain the effects of transformations on cubic functions, and then draw conclusions about how symmetry is preserved in transformed functions. In the later part of the chapter, lessons focus on building various polynomial functions by operating with the basic power functions on a coordinate plane and in a table of values. Questions then ask students to compare and contrast the various polynomials to understand all the possible shapes and key characteristics for linear, quadratic, cubic, quartic, and quintic functions. At the end of the chapter, lessons focus on students' understanding that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.
6: Polynomial Expressions and Equations	A.SSE.1a A.SSE.3a A.CED.3 A.REI.11 A.APR.1 A.APR.2 A.APR.3 F.IF.4 F.IF.6 F.IF.8a N.CN.8	This chapter presents opportunities for students to analyze, factor, solve, and expand polynomial functions. The chapter begins with an analysis of key characteristics of polynomial functions and graphs. Lessons then provide opportunities for students to divide polynomials using two methods and to expand on this knowledge in order to determine whether a divisor is a factor of the dividend. In addition, students will solve polynomial equations over the set of complex numbers using the Rational Root Theorem. In the later part of the chapter, lessons provide opportunities for students to utilize polynomial identities to rewrite numeric expressions and identify patterns. Students will also explore Pascal's Triangle and the Binomial Theorem as methods to expand powers of binomials.
7: Polynomial Functions	A.CED.1 A.CED.2 A.CED.3 A.REI.11 F.IF.4 F.IF.5 F.IF.7b F.IF.9 F.BF.1	This chapter provides opportunities for students to solve polynomial inequalities algebraically and graphically. Lessons present various problem situations and ask students to use a graphing calculator to determine the polynomial regression function that best models the data. Students then use their regression functions to answer questions. Piecewise functions are introduced for situations where a single polynomial function is not the most appropriate model for a set of data. At the end of the chapter, the lesson provides opportunities for students to compare properties of two functions each represented in a different

	F.LE.3 S.ID.6a	way. Questions present functions that are represented using a graph, table of values, equation, or description of its key characteristics.
8: Sequences and Series	A.SSE.1a A.SSE.4 A.CED.1 F.BF.2	This chapter begins with a review of arithmetic and geometric sequences and their explicit and recursive formulas. Lessons provide opportunities for students to explore finite and infinite arithmetic series, and then finite and infinite geometric series are used to derive formulas to compute each type of series. Students will explore and analyze the common ratios of several infinite geometric series to understand under what conditions the series is either divergent or convergent. In the later part of the chapter, lessons provide opportunities for students to apply their understanding of geometric series to solve problems.
9: Rational Functions	F.IF.5 F.IF.8a F.BF.3 A.APR.6 A.SSE.2 A.CED.1 A.REI.2	This chapter presents opportunities for students to analyze, graph, and transform rational functions. The chapter begins with an analysis of key characteristics of rational functions and graphs. Lessons then expand on this knowledge for transformations of rational functions. Students will determine whether graphs of rational functions have vertical asymptotes, removable discontinuities, both, or neither, and then sketch graphs of rational functions detailing all holes and asymptotes. Finally, students will explore problem situations modeled by rational functions and answer questions related to each scenario.
10: Solving Rational Equations	A.SSE.2 A.APR.6 A.REI.2 A.REI.11 A.CED.1	This chapter provides opportunities for students to connect their knowledge of operations with rational numbers to operations with rational expressions. Lessons provide opportunities for students to analyze and compare the process to add, subtract, multiply, and divide rational numbers to the same operations with rational expressions. Students conclude rational expressions are similar to rational numbers and are closed under all the operations. In the later part of the chapter, lessons provide opportunities for students to write and solve rational equations and list restrictions. Student work is presented throughout the chapter to demonstrate efficient ways to operate with rational expressions and efficient ways to solve rational equations based on the structure of the original equation.
11: Radical Functions	F.IF.4 F.IF.5 F.IF.7b F.IF.9 F.BF.3 F.BF.4a A.REI.2 N.RN.1 N.RN.2	This chapter presents opportunities for students to explore radical functions, simplify radical expressions, and solve radical equations. The chapter begins with an introduction to radical functions as inverses of power functions. Students will graph radical functions, write their equations, and determine their key characteristics. Lessons then expand on this knowledge for transformations of radical functions. In the later part of the chapter, lessons provide opportunities for students to rewrite radicals using rational exponents and extract roots from radical expressions. Students will also multiply, divide, add, and subtract radical expressions. Finally, students will analyze solution strategies for radical equations, and solve real-world problem situations using radical equations.
12: Graphing	F.IF.4	This chapter presents opportunities for students to analyze, graph, and

Exponential and Logarithmic Functions	F.IF.5 F.IF.7e F.IF.8b F.IF.9 F.BF.3 F.BF.4a	transform exponential and logarithmic functions. The chapter begins with an exploration of exponential functions. Students will analyze key characteristics of exponential functions and graphs. Lessons then expand on this knowledge for transformations of exponential functions. In the later part of the chapter, lessons focus on logarithmic functions. Student will determine key characteristics of logarithmic functions and graphs. Students will also transform logarithmic functions and make generalizations about the effect of a transformation on an inverse function.
13: Exponential and Logarithmic Equations	F.LE.4	In this chapter, students use their understanding of exponential and logarithmic functions to solve exponential and logarithmic equations. Students begin by building understanding and fluency with exponential and logarithmic expressions, including estimating the values of logarithms on a number line and then use this understanding to derive the properties of logarithms. Students explore alternative methods for solving logarithmic equations and solve exponential and logarithmic equations in context.
14: Modeling with Functions	F.IF.1b F.IF.2 F.IF.3 F.IF.4 F.IF.5 F.IF.7a-e F.BF.1a F.BF.1b F.BF.1c F.BF.2 F.BF.3 F.BF.4b F.LE.2 F.LE.5 A.CED.3 A.REI.12	In this chapter, students explore various real-world and purely mathematical situations that are modeled with functions. Function composition is developed, and students apply function composition to solve contextual problems. Students also use functions to draw graphics, to model optimal solutions and self-similarity, and to study situations modeled by logistic growth, such as the spread of infectious diseases. Students end the chapter by choosing appropriate functions to model a variety of problem situations.
15: Trigonometric Functions	F.TF.1 F.TF.2 F.TF.5 F.IF.7e	This chapter begins with a problem situation involving a Ferris wheel in which students explore how periodic functions are built. Lessons provide opportunities for students to analyze the graphs of periodic functions for characteristics such as the maximum, minimum, period, amplitude, and midline. Students will explore the unit circle to understand radian measure and convert between angle measures in degrees and radians. Using new understanding of the unit circle, radian measure, and periodic functions, students will investigate the sine and cosine functions as well as their characteristics and graphs. In the later part of the chapter, students recall the transformational function form $g(x) = Af\big(B(x - C)\big) + D$ to graph and analyze transformations of the sine and cosine functions and build a graph of the tangent function using a context. Students will analyze the characteristics of the tangent graph, and apply their knowledge of transformations to sketch graphs of transformed tangent functions.

16: Trigonometric Equations	F.TF.1 F.TF.2 F.TF.5 F.TF.8	In this chapter, students are introduced to solving trigonometric equations. They use their knowledge of the unit circle, radian measures, and the graphical behaviors of trigonometric functions to solve sine, cosine, and tangent equations. Students then apply all that they have learned to model various situations with trigonometric functions, including circular motion. Finally, students explore the damping function and modeling with trigonometric transformations.

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.