FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Mathematics 3

Date: December 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 Mathematics 2 or Integrated Math 2

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

A-G Course Identifier: C: Mathematics

COURSE DESCRIPTION:

The Mathematics 3 course is designed to extend and apply the mathematics learned in previous math courses as well as review content from Mathematics 1 and 2. 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) expand understanding of functions to include polynomial, rational, and radical functions; (2) expand right triangle trigonometry to include general triangles; (3) apply methods from probability and statistics to draw inferences and conclusions from data; and (4) consolidate functions and geometry to solve contextual problems. Students will be prepared for the next course in mathematics and be assessed using district diagnostic tools.

The course requires weekly math lab to ensure students are meeting all of the math standards.
Class Cycle - This course will work on a cycle; one week will be a group Performance Task and the next week will be a work week.

During the Performance Task week, all three days will involve participation 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, and 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 are 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 to lab.

Self-Help
One of the things we will constantly be exploring in Mathematics Lab 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 focus of Integrated Math 3 is for students to:

- Expand their repertoire of functions to include polynomial, rational, and radical functions.
- Expand their study of right triangle trigonometry to include general triangles.
- Bring together all of their experience with functions and geometry to solve contextual problems.

- The courses in the Integrated Pathway follow the structure begun in the K-8 standards of presenting mathematics as a coherent subject, mixing standards from various conceptual categories.

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:

*Standards details follow beginning on page 7.

Sections	Standards*	Overview
Real Numbers	Standards of Mathematical Practices G.GMD.4 G.MG.1 N.RN.1 N.RN.2	Standards in this section are designed to be available to students who test in needing remediation on K-8 and M1-2 standards. During first diagnostic, students can test out of these areas.
Linear Equations and Inequalities	A.CED.1 A.CED.4 A.REI.2 G.MG.2 G.MG.3	Standards in this section are designed to be available to students who test in needing remediation on K-8 and M1-2 standards. During first diagnostic, students can test out of these areas. This section reviews solving linear equations and inequalities while connecting the numeric, graphic, and algebraic methods for solving linear functions an inequalities.
Graphing, Functions, and Systems	A.CED.2 A.CED.3 A.REI.11 F.IF.4 F.IF.5 F.IF.6 F.IF.7.b F.IF.7.c F.IF.9 F.BF.1.b F.BF.3	Standards in this section are designed to be available to students who test in needing remediation on K-8 and M1-2 standards. During first diagnostic, students can test out of these areas. This section reviews piecewise functions, absolute value functions, step functions, and systems. Inverses of linear functions are reviewed graphically, numerically, and algebraically. Online construction tools as well as hand tools are used.
Exponents and Polynomials	A.SSE.1.a A.SSE.2 A.APR.1 A.APR.3 A.APR.6 A.CED.1 A.CED.2 F.IF.7.c F.IF.8.a	This section is designed to be available to students who test in needing remediation on K-8 and M1-2 standards in areas of product, power, and quotient rules as well as factoring with a review in Pythagorean Theorem to prepare students for more complex functions. During first diagnostic, students can test out of these areas. This section also reviews polynomial addition, subtraction, and multiplication. Lessons then provide opportunities for students to divide polynomials using two methods (long division and synthetic division) and to expand on this knowledge in order to determine

		whether a divisor is a factor of the dividend. Questions then ask students to compare and contrast the various polynomials to understand all the possible shapes and key characteristics of different functions. At the end of the section, students examine the closure properties of integers and polynomials.
Rational Expressions	A.SSE.1.b A.SSE.2 A.APR.7 A.CED.1 A.CED.4 A.REI.2 F.IF.5	This section 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. This section also presents opportunities for students to analyze, graph, and solve rational functions. Students analyze key characteristics of rational functions and graphs. Students will determine whether graphs of rational functions have vertical asymptotes 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.
Radicals	A.CED.1 A.CED.4 A.REI.2 F.IF.4 F.IF.5 F.IF.7.b N.RN.1 N.RN.2	This section reviews the real number system and the complex number system. This section presents opportunities for students to explore radical functions, simplify radical expressions, and solve radical equations. Students will graph radical functions, write their equations, and determine their key characteristics. As students master these skills, later 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.
Polynomial, Exponential, and Logarithmic Functions	N.CN.8 N.CN.9 A.SSE.1.a A.SSE.1.b A.APR.2 A.APR.3 A.CED.1 A.CED.2	The section begins with a review of key characteristics of functions and graphs based on student needs. Lessons provide opportunities for students to connect characteristics and behaviors of cubic functions to their factors as well as 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

	A.REI.11 F.IF.4 F.IF.5 F.IF.7.c F.IF.7.e F.IF.8.a F.IF.8.b F.IF.9 F.BF.1.b F.BF.3 F.BF.4.a F.LE.4 F.LE.4.1 F.LE.4.2 F.LE.4.3 G.MG.3	function is even, odd, or neither. In the later part of the section, lessons focus on building various polynomial functions by operating with the basic power functions on a coordinate plane and in a table of values. This section presents opportunities for students to analyze, factor, solve, and expand polynomial, exponential, inverse, and logarithmic functions. First, students will solve polynomial equations over the set of complex numbers using the rational roots. In the later part of the section, lessons provide opportunities for students to utilize polynomial identities to rewrite numeric expressions and identify patterns. Then, 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.
Sequences and Probability	A.SSE.4 A.APR.5 A.REI.11 G.GPE.3.1 S.ID.4 S.IC.1 S.IC.2 S.IC.3 S.IC.4 S.IC.6 S.MD.6 S.MD.7	This section 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. In the later part of the section, lessons provide opportunities for students to apply their understanding of geometric series to solve problems. Students will also explore the Binomial Theorem as a method to expand powers of binomials.
Trigonometry	F.IF.7.e F.TF.1 F.TF.2 F.TF.2.1 F.TF.5 G.SRT.9 G.SRT.10 G.SRT.11	This section first reviews trigonometric ratios using right triangles. Lessons provide opportunities for students to discover and analyze these ratios and solve application problems using them. This section continues lessons for students that provide opportunities 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. Finally, in this section 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

		equations.

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.

Mathematics Content Standards

The California Math Content Standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level. The math content standards addressed in this course are as follows:

Number and Quantity

The Real Number System

Extend the properties of exponents to rational exponents.

N-RN.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

N-RN.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.

The Complex Number System

Use complex numbers in polynomial identities and equations.

N-CN 8: Extend polynomial identities to the complex numbers.

N-CN 9: Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Algebra

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 2: Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems.

A-SSE 4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

Arithmetic with Polynomials and Rational Expressions

Perform arithmetic operations on polynomials.

A-APR1: Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials.

A-APR 2: Know and apply the Remain Theorem: for a polynomial $p(x)$ and a number a, the remainder on division by x-a is $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.

A-APR 3: Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

A-APR 5: Know and apply the Binomial Theorem for the expansion of (+) in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

Rewrite rational expressions.

A-APR 6: Rewrite simple rational expressions in different from; write $a(x)/b(x)$ in the form $a(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, *and* $r(x)$ are polynomials with the degree $r(x)$ less than the degree $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

A-APR 7: Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

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.

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 2: Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

<u>Functions</u>

Interpreting Functions

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

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 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 of the graph, by hand in simple cases and using technology for more complicated cases.

F-IF 8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

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.

Build new functions from existing functions.

F-BF 3: Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F-BF 4: Find inverse functions.

Linear, Quadratic, and Exponential Models

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

F-LE 4: For exponential models, express as a logarithm the solution to =, where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

F-LE 4.1: Prove simple laws of logarithms.

F-LE 4.2: Use the definition of logarithms to translate between logarithms in any base.

F-LE 4.3: Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.

Trigonometric Functions

Extend the domain of trigonometric functions using the unit circle

F-TF 1: Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF 2: Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Model periodic phenomena with trigonometric functions.

F-TF 5: Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

<u>Geometry</u>

Similarity, Right Triangles, and Trigonometry

Apply trigonometry to general triangles.

G-SRT 9: Derive the formula A = ½ *ab sin(C)* for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

G-SRT 10: Prove the Laws of Sines and Cosines and use them to solve problems.

G-SRT 11: Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

Expressing Geometric Properties with Equations

Translate between the geometric description and the equation for a conic section.

G-GPE 3.1 Given a quadratic equation of the form $ax^2 + bx^2+cx+dy+e= 0$, use the method for completing the square to put the equation into standard form; identify whether the graph of the equation is a circle, ellipse, parabola, or hyperbola and graph the equation.

Geometric Measurement and Dimension

Visualize relationships between two-dimensional and three-dimensional objects.

G-GMD 4: Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry

Applying geometric concepts in modeling situations.

G-MG 1: Use geometric shapes, their measures, and their properties to describe objects.

G-MG 2: Apply concepts of density based on area and volume in modeling situations.

G-GM 3: Apply geometric methods to solve design problems.

Statistics and Probability

Interpreting Categorical and Quantitative Data

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

S-ID 4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Making Inferences and Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments.

S-IC 1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

S-IC 2: Decide if a specified model is consistent with results from a given data-generating process.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

S-IC 3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC 4: Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

S-IC 6: Evaluate reports based on data.

Using Probability to Make Decisions

Use probability to evaluate outcomes of decisions.

S-MD 6: Use probabilities to make fair decisions.

S-MD 7: Analyze decisions and strategies using probability concepts.

DISTRICT ESLRs TO BE ADDRESSED:

When students successfully complete this 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.

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

SIGNATURE PAGE

Mathematics 3

Date: September 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 Mathematics 3 or Integrated Math 3

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

A-G Course Identifier: C: Mathematics

Site Proposing Course: Walnutwood High School

Author: (typed/signature) **Jessica Cisneros-Elliott**

Principal: (signature) _____

Subject Area Lead Teacher or Division Leader: (signatures) _____

By signing approval, I concur that I have thoroughly reviewed this course outline and am in agreement with the proposal as written.

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