FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Advanced Algebra with Financial Applications

Date: November 2012	**Subject Area: Mathematics**
Proposed Grade Level(s): 10th – 12th	**Course Length: One Year**
Grading: A-F	**Number of Credits: 5 per Semester**
Prerequisites: "C" or better in Algebra 2	**Articulation Units:**

COURSE DESCRIPTION:

Advanced Algebra with Financial Applications is a college-preparatory course that will use sophisticated mathematics to give you the tools to become a financially responsible young adult. The course employs algebra, pre-calculus, probability and statistics, calculus and geometry to solve financial problems that occur in everyday life. Real-world problems in investing, credit, banking, auto insurance, mortgages, employment, income taxes, budgeting and planning for retirement are solved by applying the relevant mathematics. Field projects, computer spreadsheets, and graphing calculators are key components of the course.

GENERAL GOALS/PURPOSES:

Advanced Algebra with Financial Applications is a mathematical modeling course that is algebra-based, applications-oriented, and technology-dependent. The course addresses college preparatory mathematics topics from Advanced Algebra, Statistics, Probability, Pre-Calculus, and Calculus under seven financial umbrellas: Banking, Investing, Credit, Employment and Income Taxes, Automobile Ownership, Independent Living, and Retirement Planning and Household Budgeting. The course allows students to experience the interrelatedness of mathematical topics, find patterns, make conjectures, and extrapolate from known situations to unknown situations. The mathematics topics contained in this course are introduced, developed, and applied in an as-needed format in the financial settings covered. Students are encouraged to use a variety of problem-solving skills and strategies in real-world contexts, and to question outcomes using mathematical analysis and data to support their findings. The course offers students multiple opportunities to use, construct, question, model, and interpret financial situations through symbolic algebraic representations, graphical representations, geometric representations, and verbal representations. It provides students a motivating, young-adult centered financial context for understanding and applying the mathematics they are guaranteed to use in the future, and is thusly aligned with the recommendations of the Common Core State Standards.

STUDENT READING/WRITING/ORAL COMPONENT:

The **motivational unit openers** are real-life problems that need to be solved mathematically. Students realize that they "need to know" this material, as they will be encountering financial matters every days of their adult lives. Financial situations are inherently natural motivators. Since all of the problems in the course are real-world applications, lessons must integrate **reading and discussion** on a daily basis. An **essential question**, written on the board each day, serves as a focal point as algebraic symbols are used to represent the situation. These applications are all embedded in prose, so every new topic begins with a reading passage that acts as a springboard to a full-class discussion. This lively interactive feature of every lesson sets a constructive, motivating stage for the mathematics that follows.

Reading and writing are an essential part of Advanced Algebra with Financial Applications. Teachers will use **written and oral response to reading** (from the textbook, newspapers, magazines, Internet, brochures, laws, etc.) as a way of assessing understanding. Some writing activities will offer students an opportunity to interpret data that is displayed in a pictorial representation. Based upon the data, they are asked to write a short, newspaper-type story centered on the graph. There is one such activity for each chapter.

DETAILED UNITS OF INSTRUCTION:

Text Used: *Financial Algebra*, by Gerver, R. & Sgroi, R., (South-Western/Cengage Learning: Mason OH), Copyright 2011.

Unit 1: Banking Services

In this unit, students use exponential functions to compute compound interest and compare it to simple interest. They derive formulas and use iteration to compute compound interest. They apply their findings to short-term, long-term, single deposit and periodic deposit accounts.

Mathematics Topics

- Derivation of the compound interest formula
- Exponential functions
- Computations based on iterative processes
- Limits of polynomial functions, rational functions, and sequences
- Natural logarithm as the inverse of the exponential function
- Exponential growth and decay
- Solving exponential equations
- Using inductive reasoning

Unit 2: Investing

Students are introduced to basic business organization terminology in order to read, interpret, chart and algebraically model stock ownership and transaction data. Statistical analysis plays a very important role in the modeling of a business. Using linear, quadratic, and regression equations in that process assists students in getting a complete picture of supply, demand, expense, revenue, and profit as they model the production of a new product.

Mathematics Topics

- Algebraic ratios and proportions
- Algebraic representations of percent increase and decrease
- Pictorial representations of data
- Scatterplots
- Operations with functions
- Function domains
- Function evaluation
- Linear and quadratic functions to model situations
- Rational functions
- Systems of equations (linear/linear and linear/quadratic)
- Systems of inequalities
- Regression equations
- Extrapolation and interpolation
- Pearson Product-Moment Correlation Coefficient
- Axis of symmetry, roots, intercepts and concavity of parabolas
- Quadratic formula
- Absolute and relative extrema
- Explanatory, response, and lurking variables
- Causation vs. correlation for bivariate data
- Transitive Property of Dependence
- Zero Net Difference

Unit 3: Employment and Income Taxes

Many Internal Revenue Service and Social Security Administration regulations can be modeled by using linear and polygonal functions that have different slopes over different domains. Line-by-line instructions for IRS forms can also be algebraically symbolized.

Mathematics Topics
- Point-slope form of linear equations
- Jump discontinuities
- Continuous functions with cusps
- Slope
- Compound inequality notation
- Piecewise functions
- Interval notation
- Percent increase and decrease
- Data analysis
- Algebraic modeling

Unit 4: Automobile Ownership

Various functions, their graphs, and data analysis can be instrumental in the responsible purchase and operation of an automobile.

Mathematics Topics
- Exponential/linear systems of equations
- Irrational functions
- Quadratic functions
- Arc length
- Piecewise functions
- Graphs of piecewise functions
- Systems of linear equations
- Frequency distributions
- Stem-and leaf plots
- Modified box-and-whisker plots
- Measures of dispersion
- Quartiles
- Interquartile range
- Outliers of a frequency distribution

Unit 5: Consumer Credit

Becoming familiar with credit terminology and regulations is critical in making wise credit decisions. Credit comes at a price and in this unit students learn how to use mathematics to make wise credit choices that fit their needs, current financial situation, and future goals.

Mathematics Topics
- Algebraic proportions
- Linear, quadratic, cubic, and exponential equations
- Exponential growth and decay
- Regression equations
- Inverse function of an exponential equation
- Logarithms
- Summation notation

Unit 6: Independent Living

In this unit, students work their way through the mathematics that models moving, renting, and purchasing a place to live. They also explore the geometric demands of floor plans and design, and discover the relationship between area and probability.

Mathematics Topics
- The apothem of a regular polygon
- Area of a regular polygon
- Areas of shaded regions
- Rational functions
- The Monte Carlo Method
- Exponential functions
- Dilations and scale

Unit 7: Retirement Planning and Budgeting

The focus of this unit is on the mathematics of fiscal plans that workers can make years ahead of their retirement date. This involves a detailed study of retirement savings plans, both personal and federal, employee pension programs, and life insurance. Additionally, students are asked to call upon the knowledge acquired in all of the preceding units in order to create and chart a responsible personal budget plan, to mathematically analyze cash flow, and to determine net worth.

Mathematics Topics
- Expected value of a probability distribution
- Greatest Integer function
- Sectors and central angles
- Exponential Equations
- Rational expressions as combinations of rational and polynomial expressions
- Piecewise Greatest Integer Function
- Systems of linear and piecewise functions
- Domains, constants, coefficients, dependent and independent variable

COMMON CORE STATE STANDARDS ADDRESSED:

In Advanced Algebra with Financial Applications, the mathematics necessary for daily living is embedded in content that directly relates to financial decisions adults make in their daily lives. The mathematical formulas, functions, and pictorial representations used in the text assist students in making sense of the financial world around them through mathematical modeling and, equip them with the ability to make sound financial decisions based on data.

Advanced Algebra with Financial Applications builds strength in reasoning and number sense, because the real-world applications demand that solutions make sense. Through contextual problem solving and the mathematical modeling of real situations, the course gives the students the motivation to persevere through routine and non-routine problems, and as a result, develop strength and confidence in their mathematics ability.

The content standards addressed in this course come from each of the conceptual categories:
- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

<u>**THIS COURSE WILL PREPARE STUDENTS FOR THE CAHSEE and/or STATE ASSESSMENTS:**</u>
Math

<u>**LAB FEE, IF REQUIRED:**</u>
None

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