Chino Valley Unified School District
High School Course Description

A. CONTACTS	
1. School/District Information:	School/District: Chino Valley Unified School District Street Address: 5130 Riverside Dr., Chino, CA 91710 Phone: (909) 628-1201 Web Site: chino.k12.ca.us
2. Course Contact:	Teacher Contact: Sandra Ross Position/Title: Teacher Phone: (909) 606-7540 E-mail: Sandra_Ross@chino.k12.ca.us
B. COVER PAGE - COURSE ID	
1. Course Title:	Financial Algebra
2. Transcript Title/Abbreviation:	Financial Alg
3. Transcript Course Code/Number:	5E42
4. Seeking Honors Distinction:	No
5. Subject Area/Category:	Meets the UC/CSU "c" Mathematics requirement
6. Grade Level(s):	11-12
7. Unit Value:	10 credits/ 5 credits per semester
8. Course Previously Approved by UC:	Yes
9. Classified as a Career Technical Education Course:	No
10. Modeled after an UC-approved Course:	Yes
11. Repeatable for Credit:	No
12. Date of Board Approval:	06/20/2019

13. Brief Course Description:

Financial Algebra is an application-based mathematics course covering numerous financial topics. The course addresses college preparatory mathematics from Advanced Algebra, Statistics, Probability, Pre-Calculus, and Calculus through several financial topics: Banking, Investing, Credit, Employment and Income Taxes, Automobile Ownership, Independent Living, and Retirement Planning and Household Budgeting. Students will have multiple opportunities to use, construct, question, model, and interpret financial situations through symbolic algebraic representations, graphical representations, geometric representations, and verbal representations.

14. Prerequisites:	Integrated Math 3/3H or Algebra 2 with a C or better

15. Context for Course:

This course is designed to develop and build skills related to personal and business finance. It develops awareness of business and interest in careers in business and provides critically needed and relevant math skills for everyday living. Instructional methods and/or strategies are specifically geared to support the delivery of the curriculum and the course goals in a balanced fashion.

16. History of Course Development:

The current mathematics pathway is: Integrated Math 1 (CP), Integrated Math 2 (CP and Honors), Integrated Math 3 (CP and Honors), Calculus AB (CP and AP), Calculus BC (AP), and Statistics (CP and AP). The course was developed as a 4th year math course option in lieu of Calculus or Statistics.

17. Textbooks:	Financial Algebra: Advanced Algebra with Financial Applications Robert Gerver and Richard Sgroi South-Western Cengage Learning 2018 Second Edition
18. Supplemental Instructional Materials:	None

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C. COURSE CONTENT

1. Course Purpose:
Financial Algebra is a mathematics course designed to show students practical applications of mathematics in challenging, real-life situations covering numerous financial topics.

2. Course Outline:
Unit 1: Linear and Quadratic Equations – The Stock Market
From the perspective of an individual investor in the market, students are introduced to basic business organization terminology in order to read, interpret, chart, and algebraically model stock ownership and transaction data. Students will be able to gather data from stock market charts and reports and determine measurement statistics such as percentage change in value, simple moving averages, capital gains, and dividends. Students will track portfolio performances by creating spreadsheets. Students will understand how stock transactions can take place and how transaction fees and/or broker fees may apply. Students will gain an understanding of why corporations choose to split or reverse split their stock and calculate portfolio values of stocks after splits or reverse splits. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematics Topics
- Algebraic ratios and proportions
- Algebraic representations of percent increase and decrease
- Pictorial representations of data including scatterplot analysis
- Operations with functions, domains of functions, and evaluation of functions

Unit 2: Linear and quadratic Functions – Modeling a Business
Students will utilize mathematical modeling skills to analyze the mathematics of business organization. Using linear, quadratic, and exponential regression equations students will model supply, demand, expense, revenue, and profit as they model the production of a new product. Students will understand how businesses experience fixed and variable costs, how to graph both expense and revenue functions and locate break-even points by solving systems of equations algebraically and with graphing calculator technologies. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematical Topics students will utilize in Unit 2 include:
- Scatterplots
- Operations with functions
- Function domains
- Function evaluation
- Linear, quadratic, and exponential functions to model situations
- Rational functions
- Systems of equations (linear/linear and linear/quadratic)
- Systems of inequalities
- Finding linear, quadratic, and exponential regression equations using graphing calculator technologies
- Extrapolation and interpolation
- Correlation coefficient
- Axis of symmetry, roots, intercepts and concavity of parabolas
- Quadratic formula
- Explanatory, response, and lurking variables
- Causation vs. correlation for bivariate data

Unit 3: Exponential and Logarithmic Functions – Banking
Students will understand the various types of accounts that banks offer. Students will compare the effects of simple interest to compound interest to continuous compounding of interest. Using the compound interest formula, students will solve for future values of accounts and determine initial investment needs to have their investments grow to a specified amount in the future. Students will also be able to solve exponential equations to determine necessary interest rates for a current value to grow to a specified future value in a given amount of time. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematical skills students will need for unit 3 include:
- Derivation of the compound interest formula
- Solve algebraic equations using the simple interest and compound interest formula
- Limits of polynomial functions, rational functions, and sequences
- Exponential functions
- Exponential growth and decay
- Solve exponential equations
- Natural logarithm as the inverse of the exponential function
- Solve algebraic equations using the formula for continuous compounding interest
- Computations based on iterative processes
- Solve algebraic equations using the formulas for future and present value of investments
- Using inductive reasoning

Unit 4: Exponential and Logarithmic Functions – Consumer Credit
Becoming familiar with credit terminology and regulations is critical in making wise credit decisions. Students will become familiar with the vocabulary of credit terms, the types of lending institutions, and the various types of consumer credit available. Students will calculate finance charges for installation payments, compute monthly payments using a formula and compute finance charges on loans and credit card balances. When dealing with loans, students will calculate computations on the present value of single deposit investments and periodic deposit investments. With regard to credit cards, students will understand how to calculate average daily balances and understand the information provided in credit card statements. 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. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

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 5: Functions, Their Graphs and Statistics – Automobile Ownership
Students will look at various mathematical concepts associated with automobile ownership. Students will begin by looking at the mathematics of classified ads using piecewise continuous functions and calculate the sales tax on transactions. Students will utilize summary statistics such as mean, median, range, interquartile range, and standard

deviation on data sets such as prices of multiple cars of the same make and model when developing buying/selling prices for a vehicle. This data will also be presented graphically in statistical graphs such as stem and leaf plots, histograms, and boxplots. Students will look at the mathematics of automobile insurance including the role of deductibles and expected values based on probabilities of accidents. Automobile depreciation rates will be modeled using both linear and exponential modeling techniques. Students will investigate the relationship between distance, rate, and time and use these algebraic formulas to determine fuel economies and gas usage. Students will work in both the English Standard and Metric Systems to calculate measurements related to automobile safety including reaction times, stopping distances, and skid mark formulas. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

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 6: Systems of Equations – Employment and 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. Students will learn about payments for social security and Medicare and how they have changed over time. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

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

Unit 7: Radical, Rational Functions, and Geometry – Independent Living

In this unit, students work their way through the mathematics that models moving, renting, and purchasing a place to live. This will include determining the affordability of a monthly rent, moving expenses, and other household expenses. Students will mathematical modeling to look at the relationship between square footage and rental price. They also explore the geometric demands of floor plans and design, and discover the relationship between area and probability. When purchasing a home, students will understand the mortgage application process, various types of mortgages, how to calculate interest payments and monthly mortgage payments including balloon payments. When purchasing a home, students will understand the affordability of certain homes and create amortization tables for fixed rate and adjustable rate mortgages. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematics Topics
- Dilations and scale
- Ratios and proportions
- Area of a regular polygon
- Areas of shaded regions
- Rational functions
- Exponential functions
- Linear and quadratic regression
- Solving systems of linear equations

Unit 8: Mathematical Modeling – Planning for Retirement

Students will learn about retirement savings options and how to calculate future values of investments that are both single deposit and periodic. Students will be able to compare the tax savings by making pre-tax contributions to retirement accounts such as IRAs. Students will determine the value of employer contributions to retirement accounts such as 401(k) plans. Other retirement benefit plans such as pension plans and deferred compensation programs will be understood. In addition to investment income, students will learn about the Social Security program, understand how the government determines social security payments and be able to determine the federal income tax on benefits. Students will learn about the different types of life insurance plans that are available and compute the costs of different types of plans. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematics Topics
- Exponential modeling
- Exponential equations, including the compound interest function
- Calculate expected value of a discrete random variable

Unit 9: Mathematical Modeling – Preparing a Budget

When preparing a household budget, students will understand the different expenses experienced by households such as utilities. Students will set-up spreadsheets to track household budgets including factors of cash flow, monthly, quarterly, or yearly expenses (i.e., property taxes), and strategies for growing savings and/or reducing debt. Standards for Mathematical Practice (SMPs) are emphasized in each lesson and used heavily on the projects within each unit.

Mathematics Topics
- Create, graph and interpret the greatest integer function
- Create, graph and interpret linear and piecewise functions

- Use multiple representations to chart data

3. Key Assignments:

Unit 1 Project – Stock Market Portfolio
Students, in small groups, will utilize a $10,000 budget to pick a portfolio of various individual stocks. Students will be expected to research individual stocks and justify their selections. After the stocks are selected, students will track their portfolio performance in a spreadsheet. A class competition will search for the group that has the highest rate of return or capital gain during a 30-day investing window. During the 30-day time period, stocks can be sold, and other stocks purchased. Students will have to take transactions fees into account on all transactions as if they were utilizing a common discount broker.

Unit 2 Project – Business Proposal for Summer Job
Students will be in small groups and will create a business proposal for a summer job, such as a painting business or a landscaping business. In their business proposal, students will determine fixed and variable costs, determine a pricing strategy, create expense and revenue functions, and make a prediction on business profits. The business model will be presented to the class.

Unit 3 Project – The Rule of 72
Students will research the Rule of 72. They will discuss the history and use of the rule. Students will also prepare examples to illustrate the rule. Students will present their research to the class using presentation software.

Unit 4 Project – Affordability of a Loan
Students will use three modalities to determine the affordability of a loan: exponential formula evaluation, logarithmic formula evaluation, and interpreting an exponential/linear system. Students will use technology (graphing utility and/or spreadsheet) to make the determinations required and justify their responses. Students are given a scenario in which a family must make a decision about the affordability of a loan based on the principle, the loan-length, the APR and the maximum affordable monthly payment the family is able to make towards loan debt reduction. Students determine the affordability of the loan in three different ways: using the monthly payment function, interpreting the graphs of the system of equations defined by the exponential monthly payment function and the linear maximum affordable monthly payment, and using the logarithmic loan length function. They are then asked to construct two spreadsheets: a monthly payment spreadsheet that charts the monthly payment as loan length time varies from one to 20 years and a loan length spreadsheet that charts time as monthly payments vary from $100 to$1000. Finally, students must write up a summary analysis for this situation explaining how the algebraic modeling by the spreadsheet formulas supports their prior work.

Unit 5 Project – Buying and Selling Automobiles
Students will use measures of central tendency and measures of dispersion to mathematically negotiate the buying and/or selling of an automobile. Students will choose a make, model, and year for an automobile. They will use the Internet and newspaper classified ads to find 10-20 of those cars for sale. They will get the price of the car and the mileage it has. Students will construct modified box-and-whisker plots and describe the frequency distribution. They will pair each cars price with its mileage to create a scatterplot. They will classify the association as positive or negative. Students will find the regression line and correlation coefficient and interpret the relationship as strong, moderate, or weak, and discuss its linearity. Students will present their results to the class using presentation software.

Unit 6 Project – Taxes

Unit 6 Project: Students will derive the slope-intercept form used on the IRS tax worksheet by translating tax tables into piecewise functions. The tax tables give taxpayers a function in which the independent variable is the taxable income and the dependent variable is the tax. It is convoluted and has confused taxpayers for years. Within the last decade, the IRS created a worksheet that uses the slope-intercept form of the equations of a line to simplify calculations for the taxpayer. In this project, students interpret the IRS Schedule, express the domains using compound inequality notation, and create the piecewise function that models the IRS intentions. They then covert this function, which is a translated version of point-slope form, into the slope-intercept form to create the tax worksheet.

Unit 7 Project - Mortgages

Students will determine the reduction in interest that extra mortgage payments result in. Students will use the monthly payment formula to compute the monthly payment for a hypothetical mortgage amount over 15 and 30 years. They will compute the total payments, based on 12 monthly payments each year, and the total interest for the entire loan. They then use a mortgage calculator to assume an extra 13th payment made each year (i.e., payments are made once every 4 weeks instead of once each month). Students will compute the interest and new total repayment period and compare the total interest to the original conventional mortgage to see the savings in total years and interest.

Unit 8 Project – Retirement

Students will apply prior knowledge from the banking unit to make decisions about the feasibility of a retirement plan. Students are given financial information about a prospective retiree and asked to act as a financial retirement planner. The prospective retiree has also supplied the planner with desired monetary goals in retirement. Based upon information about savings plans, social security benefits, pensions, and life insurance policies, and using formulas learned in this unit, the planner is to write up a financial plan for the prospective retiree that includes at least two ways of meeting the goals and has mathematical justification for the recommendations made.

Unit 9 Project – Prepare a Budget/Independent Living

Students are given a budget spreadsheet that contains the headings of income, fixed expenses, variable expenses, and non-monthly expenses. There are subheadings under each of these listing specific categories relating to the heading. Students are given a full accounting of a person's financial status and asked to build a spreadsheet that calculates that person's cash flow. In addition, the students are given information about the person's assets and liabilities and are asked to add it to the spreadsheet and determine the net worth. Finally, based upon the calculation of the debt-to-income ratio, students are asked to develop a debt reduction plan for the individual if necessary.

4. Instructional Methods and/or Strategies:

Direct Instruction: Lectures will be utilized to introduce and teach the course concepts via PowerPoint slides presentations and online tutorials.

Hands-on Activities, Assignments and Projects: "Real-life" applications are the basis for solidifying comprehension of the topics. Students regularly make calculations on situations that mimic real-world problems, such buying stocks, doing accounting entries of a business, taking out a loan/mortgage, and designing a budget, to name a few.

Student Collaboration: Group work is also an essential aspect of this class, fostering teamwork and problem-solving skills.

5. Assessment Including Methods and/or Tools:

The evaluation of student progress and evaluation will be based on the following criteria outlined in Board Policy:
- Assessments: 60-75% of the final grade
- Assignments and class discussions: 25-40% of the final grade