

Financial Algebra

[Insert school name]

[Insert school code]

Title: Financial Algebra

Transcript Abbreviations: Financial Alg

Length of Course: **[Full Year]**

Subject Area: Mathematics (C)

UC Honors Designation: No

Prerequisites: Algebra I or Math I (Required), Algebra II or Math II (Recommended)

Co-requisites: None

Integrated (Academics/CTE): No

Grade Levels: **[Insert grade levels]**

Course Learning Environment: Classroom Based

Course Overview

Financial Algebra is designed to blend essential personal finance skills with rigorous standards-aligned math instruction. This course strengthens and builds on students' previous knowledge from CCSS Algebra I standards, with a focus on using math to understand the financial landscape and model financial decision-making.

Throughout this course, students will:

- Deepen their understanding of linear functions to flexibly analyze a broad array of real-world scenarios, like comparing piecewise functions for marginal and effective tax rates and justifying an optimal solution given numerous budgeting constraints.
- Use exponential functions to model investing and extend their understanding to include logarithms, the compound interest formula, compound annual growth rate, the future value of a periodic deposit, and exponential regression.

- Write recursive formulas to model loan repayment and build amortization spreadsheets
- Represent and interpret univariate and bivariate data, extending their analysis to include sampling methods, hypothesis testing, measures of correlation, and regression models using different function types.
- Apply probability formulas to model insurance scenarios by working with counting principles; simple, compound, and conditional probability; and expected value.

Financial Algebra consists of 10 units that each weave together one core personal finance topic with a relevant math topic. The following topics will be covered in this order:

1. [Taxes & Fundamentals of Algebra](#)
2. [Checking & Linear Equations](#)
3. [Saving & Systems of Equations](#)
4. [Budgeting & Systems of Inequalities](#)
5. [Intro to Investing & Exponential Functions](#)
6. [Investing Strategies & Exponential Functions](#)
7. [Types of Credit & Modeling Functions](#)
8. [Managing Credit & Fundamentals of Statistics](#)
9. [Paying For College & Statistical Analysis](#)
10. [Insurance & Probability](#)

Course Content

UNIT 1: TAXES & FUNDAMENTALS OF ALGEBRA

Taxes & Fundamentals of Algebra Overview

Students will learn about functions, including function notation, multiple representations of a function, and piecewise functions. They will understand how taxes are collected, what tax revenue is used for, and how to file their taxes. By weaving together these two topics, students will deepen their understanding of how functions can model real-world scenarios.

Major Math Topics

- Rational numbers
- Convert between fractions, decimals, and percentages
- Function notation
- Graph points on a coordinate plane
- Domain and range
- Write piecewise linear functions
- Continuous and discontinuous functions

Taxes & Fundamentals of Algebra Unit Assignment - [APPLICATION: Income and Payroll Taxes as Piecewise Functions \(Level 2\)](#)

In this assignment, students apply their knowledge of piecewise functions to model how tax brackets work and compare marginal and effective tax rates. First, students use tax bracket values to write a piecewise function for a person's total taxes paid and their effective tax rate as a function of income. Next, students analyze a graph showing both marginal and effective tax rates and reflect on why effective tax rates are always lower than marginal tax rates. Finally, students answer an error analysis question about the common misconception that moving into a higher tax bracket can result in lower take-home pay.

UNIT 2: CHECKING & LINEAR EQUATIONS

Checking & Linear Equations Overview

Students will write, graph, and interpret linear equations in different contexts, including representing visual patterns, modeling real-world banking scenarios, and understanding linear regression models. Students will learn the purpose and elements of a checking account, including online banking and common fees. They will apply their understanding of linear functions to analyze fee structures and model wages and cost of living.

Major Math Topics:

- Write linear equations in slope-intercept form
- Graph linear equations in slope-intercept form
- Interpret linear equations in context
- Use graphing tools strategically to visualize and solve a problem
- Contextualize the equation for a line of best fit

Checking & Linear Equations Assignment - [APPLICATION: Graphing Wages and Linear Equations \(Level 2\)](#)

In this assignment, students apply their understanding of linear equations to analyze their state's minimum wage and a proposed \$15 per hour minimum wage. First, students look up their state's minimum wage and average monthly rent. Next, they write two linear equations for gross pay as a function of hours worked, based on their state's minimum wage and a \$15 minimum wage. Using the Desmos graphing tool, they graph those two equations and find the number of hours they would need to work to pay rent. Finally, they calculate what percentage of their income they would spend on rent if they worked full-time at their state's minimum wage or \$15 per hour.

UNIT 3: SAVING & SYSTEMS OF EQUATIONS

Saving & Systems of Equations Overview

Students will graph linear equations, write linear equations in standard form, and manipulate equations to highlight different features or variables. They will solve systems of linear equations by flexibly applying three solution methods: graphing, substitution, and elimination. Students will distinguish between saving and investing, recognize the importance and challenges of saving, and compare different savings strategies and accounts. By connecting these math and personal finance topics, students will deepen their understanding while analyzing real-world graphs and modeling simple interest, income, and savings goals.

Major Math Topics:

- Write linear equations in standard form
- Manipulate equations to highlight key features or solve for a single variable
- Graph systems of linear equations
- Determine the number of solutions to a system of linear equations
- Solve systems of equations using the graphing, substitution, and elimination methods.

Saving & Systems of Equations Unit Assignment - [APPLICATION: Business Decisions and Solving by Elimination \(Level 3\)](#)

In this assignment, students apply different strategies to solve a system of equations and complete an error analysis problem. In the first part of this activity, students are given a word problem that includes a system of linear equations. They solve the system of equations using each method - graphing, substitution, and elimination. Then, students interpret the answer in context and justify which solution method works best for solving this problem. In the second part of this activity, students are given a system of equations and sample work from two students who incorrectly solved the system using the elimination method. They justify whether the students were correct and fix the errors.

UNIT 4: BUDGETING & SYSTEMS OF INEQUALITIES

Budgeting & Systems of Inequalities Overview

Students will graph systems of linear inequalities and interpret solutions in context. They will deepen their understanding of linear inequalities by exploring optimization problems and creating a budgeting spreadsheet. Students will understand the components of a budget, evaluate the cost of living, and apply budgeting strategies.

Major Math Topics:

- Graph linear inequalities
- Identify solutions to systems of linear inequalities
- Justify an optimal solution given multiple constraints
- Use a spreadsheet to create a model budget

Budgeting & Systems of Inequalities Assignment - APPLICATION: Constraints and Optimization for a Small Business (Level 3)

In this assignment, students use linear inequalities to determine how to minimize costs and maximize profits for a clothing factory manager, Frieda, who produces shirts and pants. First, students write linear inequalities representing 5 constraints from the scenario and write a cost minimization equation. Next, students graph those inequalities by hand or by using the Desmos graphing calculator. They identify how many of each product Frieda should produce to minimize costs. Finally, they write a profit equation and find the optimal solution for Frieda to maximize profits.

UNIT 5: INTRO TO INVESTING & EXPONENTIAL FUNCTIONS

Intro to Investing & Exponential Functions Overview

Students will understand exponential change, write exponential equations, and use exponential functions to model investment decisions. They will understand the fundamentals of investing, including compound interest, inflation, and asset types. Additionally, they will learn to strategically use spreadsheets as a tool to analyze an investment portfolio's composition and growth.

Major Math Topics:

- Compare exponential and linear functions
- Writing exponential equations
- Modeling investment growth with exponential functions
- Compound interest formula
- Writing spreadsheet equations

Intro to Investing & Exponential Functions Unit Assignment -

APPLICATION: Analyze Investments for Exponential Change (Level 2)

In this assignment, students apply their understanding of exponential equations to compare three different options to save for retirement, each with a different starting age, initial investment, and anticipated rate of return. First, students predict which option will have the greatest return after 10 years, 20 years, and 30 years. Next, they write equations for each option and complete a table with the investment value for each option at different ages. Finally, they discuss and synthesize their findings to choose the best option and come up with one piece of investment advice.

UNIT 6: INVESTING STRATEGIES & EXPONENTIAL FUNCTIONS

Investing Strategies & Exponential Functions Overview

Students will expand their understanding of exponential functions by learning to graph exponential functions, fit exponential models to real-world data, and convert between exponential and logarithmic functions. They will learn how different mutual funds work and consider common investing biases. They will apply their knowledge of exponential functions to analyze the impact of investing fees. They will use a spreadsheet to analyze dollar cost averaging as an investing strategy.

Major Math Topics:

- Interpret the parameters of an exponential function in context
- Graphing exponential functions
- Exponential regression models
- Compound annual growth rate
- Logarithms
- Convert between exponential and logarithmic functions
- Change of base formula

Investing Strategies & Exponential Functions Unit Assignment -

APPLICATION: Exponential Regression & Investing Trends (Level 2)

In this assignment, students use exponential regression to compare the performance of a bond fund and stock fund over time. Students are given real-world data on the funds' prices over 5 years. First, they use regression results to write an exponential equation for each fund's price over time. Then, they contextualize the regression results by identifying the annual rate of return, considering the impact of fees, and using the model to make a prediction. Finally, they discuss three higher-level summary questions about low growth rate, volatility, and which fund would be a better long-term investment.

UNIT 7: TYPES OF CREDIT & MODELING FUNCTIONS

Types of Credit & Modeling Functions Overview

Students will apply and interpret the compound interest formula and write recursive formulas. They will deepen their understanding by applying the compound interest formula to compare loan terms, modeling debt repayment with recursive formulas, and building an amortization spreadsheet. Students will learn the basic components of a credit agreement and compare types of credit with an emphasis on auto loans, student loans, and credit cards. Throughout the unit, students will use math to further understand personal finance concepts, like APR vs APY, the impact of loan terms on monthly payments and overall loan cost, and the future value of a periodic investment.

Major Math Topics:

- Compound interest
- Future value of a periodic investment
- Recursive formulas
- Amortization spreadsheets

Types of Credit & Modeling Functions Unit Assignment - [LESSON FA-7.6: Building an Amortization Spreadsheet](#)

Students create an amortization spreadsheet that uses recursive formulas and includes a graph to illustrate loan repayment. First, students are given a template spreadsheet that includes headers for basic information about a loan, like the principal, interest rate, and monthly payment. Using a video walkthrough, they complete the spreadsheet, including writing recursive repayment formulas, for a sample loan. Then, they explain how the spreadsheet reflects a recursive sequence, analyze the cost of interest, and add a graph to show the loan balance and cumulative interest over time. Finally, they choose one of three new scenarios and create their own amortization spreadsheet to model the loan's cost and repayment over time.

UNIT 8: MANAGING CREDIT & FUNDAMENTALS OF STATISTICS

Managing Credit & Fundamentals of Statistics Overview

Students will represent and interpret single-variable data. They will calculate measures of center, create box plots and histograms, and analyze the spread and distribution of a data set. Throughout this unit, students will apply these statistical skills to analyze real-world data related to credit, including data on mortgage interest rates, credit card debt, and credit scores. Students will learn how to use and manage credit. They will compare debt repayment strategies, understand the components of their credit history and credit scores, and analyze the impact of their credit score on the cost of credit.

Major Math Topics:

- Box plots
- Histograms
- Measures of center: mean, median, mode
- Measures of spread: range, interquartile range, standard deviation
- Distributions: symmetric, normal, skewed, bimodal, uniform

Managing Credit & Fundamentals of Statistics Unit Assignment - DESMOS: Histograms and Box Plots of Housing Costs

In this assignment, students use histograms and box plots to analyze state-level data on housing costs from the U.S. Census. First, they are given 8 total histograms and box plots representing the monthly mortgage or rent payments in California and Michigan. They match each histogram with the corresponding box plot, then explain their reasoning with a partner. Next, students read three statements about the median, mode, and standard deviation of Michigan housing costs to determine whether they are true, false, or cannot be determined. Then, students look up the histogram of mortgage and rent payments for their specific state. They compare the median rent and mortgage, answer an error analysis question about the specificity of the data, and sketch a box plot. Finally, they write and answer their own statements that are true, false, or unable to be determined.

UNIT 9: PAYING FOR COLLEGE & STATISTICAL ANALYSIS

Paying For College & Statistical Analysis Overview

Students will deepen their understanding of statistical analysis by analyzing real-world data about college costs, acceptance rates, grant amounts, and more. Students will distinguish between correlation and causation, recognize the purpose of different sampling methods, investigate sampling bias, and understand hypothesis testing. They will represent and analyze data using two-way tables, including relative frequency tables, and least-squares regression, including linear, exponential, and quadratic models. Students will compare the costs and benefits of college, learn the fundamentals of financial aid, and consider different methods of paying for college.

Major Math Topics:

- Correlation and causation
- Correlation coefficient (r) and coefficient of determination (r^2)
- Sampling methods
- Observational studies and randomized experiments
- Types of data: categorical, numerical, discrete, continuous
- Two-way tables and relative frequency tables
- Ordinary least squares (OLS) regression
- Hypothesis testing

Paying For College & Statistical Analysis Unit Assignment - [APPLICATION: College Tuition, Graduation Rate, and ACT Scores \(Level 2\)](#)

In the assignment, students use a linear and exponential regression model to analyze how the cost of college has changed over time. Students are given data from the National Center for Education Statistics (NCES) on the average annual cost of attending a 4-year college, adjusted for inflation, over the last 50 years. First, they use a linear regression model to analyze the data. They make a prediction about the future cost of college, calculate the residual at a given point, and explain the linear regression equation slope in context. Next, they use an exponential regression model to analyze the same data set. They compare the predictions resulting from each model, then identify the growth factor and explain it in context. Finally, they decide which model best describes the cost of college, considering the r^2 value, predictions, and overall shape of the data points.

UNIT 10: INSURANCE & PROBABILITY

Insurance & Probability Overview

Students will learn the fundamentals of probability and apply them to model financial scenarios. They will strategically apply the combination and permutation formulas to count outcomes related to insurance plan options, diversifying an investment portfolio, and choosing a college. They will calculate expected value using the addition and multiplication rules to make decisions about phone insurance, auto insurance, the lottery, and redundancy for an internet hosting company. They will use conditional probability to analyze the relationship between employment factors and insurance, calculate the costs of homeowners insurance, and understand false positives. Throughout the unit, students will consider the role of probability in both how individuals make decisions as well as how insurance companies pool risk and determine premiums.

Major Math Topics:

- Fundamental Counting Principle
- Permutations and combinations
- Represent the sample space and use set notation
- Theoretical and experimental probability
- Law of Large Numbers
- Addition rule and multiplication rule
- Independence and conditional probability
- Expected value

Insurance & Probability Unit Assignment - [LESSON FA-10.7: Health](#)

Insurance (Math Connection)

In this assignment, students apply what they've learned about probability to analyze healthcare costs and determine how much to save in a Flexible Savings Account (FSA). Students are given a list of medical expenses along with their costs and estimated probabilities of occurring in a given year. They calculate the expected value of their medical expenses for the year, the savings from using an FSA, and the probability that they incur all of the medical expenses. Students consider the financial implications if they overestimate their medical costs and save too much in an FSA. Next, they use the Binomial Distribution Formula, which applies their understanding of complementary probability and combinations, to find the probability that they have 4 doctor visits in a year. Finally, they consider the challenges for an individual to predict their medical expenses and explain one financial strategy they could use to minimize medical costs.

Course Materials

Author(s)	Affiliated Institution or Organization	Curriculum URL
Kathryn Dawson, Jessica Endlich, Dave Martin, Daniel Rolando	Next Gen Personal Finance	NGPF's Financial Algebra Course