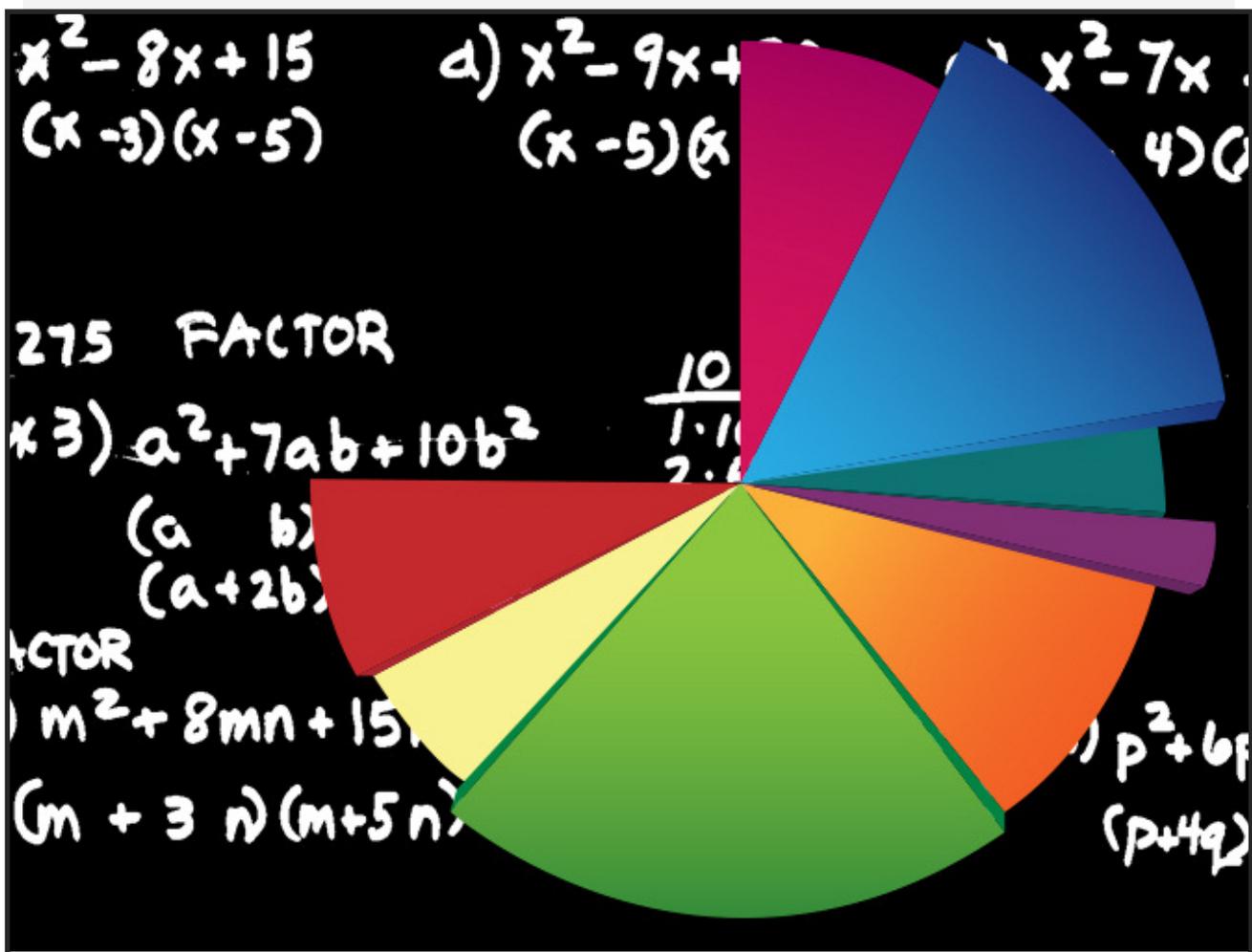


ALABAMA

# Curriculum Guide to the Standards: Algebra with Finance



# Algebra with Finance

Algebra with Finance is a one-credit college and career preparatory course that integrates algebra, precalculus, 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 that are taught at a higher level.

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.

Math concepts and skills are applied through study and problem-solving activities in workforce situations in the following areas: banking, investing, employment and income taxes, automobile ownership and operation, mathematical operations, consumer credit, independent living, and retirement planning and budgeting. *Prerequisites for this course are Algebra I and Geometry.*

Students will:

## Banking Services

1. Understand long-term costs associated with borrowing money.
  - a. Calculating cost of credit card interest with benefits
  - b. Utilizing and understanding amortization tables for loans  
Examples: stocks, certificates of deposit, mutual funds, retirement income, savings accounts, 401K
  - ◆ **Objective AF.1.1:** Define principle, interest rate, time, credit score, and amortization.
  - ◆ **Objective AF.1.2:** Identify the long term costs of borrowing money.
  - ◆ **Objective AF.1.3:** Identify benefits associated with credit cards.  
Examples: rewards programs, interest free time period
  - ◆ **Objective AF.1.4:** Discuss cause and effect between use of credit and personal credit score.
  - ◆ **Objective AF.1.5:** Compare simple and compound interests.
  - ◆ **Objective AF.1.6:** Identify an amortization table.
  - ◆
2. Evaluate banking services for varying purposes including checking, savings, loans, and market investments.
  - ◆ **Objective AF.2.1:** Define banking services, checking, savings, loans, and market investments.
  - ◆ **Objective AF.2.2:** Complete checks, deposit slips, check registers, and maintain a balanced account.

- ◆ **Objective AF.2.3:** Identify the purpose of a checking account.
- ◆ **Objective AF.2.4:** Identify the purpose of a savings account.
- ◆ **Objective AF.2.5:** Identify the purpose of a loan.
- ◆ **Objective AF.2.6:** Identify the purpose of market investments.
- ◆ **Objective AF.2.7:** Identify the services provided by a bank.

3. Utilize exponential functions to compare compound interest and simple interest.
- a. Deriving formulas and use iteration to compute compound interest
  - b. Creating, interpreting, and analyzing a graph, table, and equation to compare compound interest and simple interest.
  - c. Applying findings to short-term, long-term, single deposit and periodic deposit accounts  
Examples: Using simple interest formula  $I + PRT$  and using inverse operations to solve for all variables
  - d. Interpreting the limit notation
  - e. Modeling an infinite series and finding a finite sum for an infinite series with common ratio  $\frac{1}{2}$
  - f. Computing limits of polynomial functions as  $x \rightarrow \infty$
  - g. Computing Annual Percentage Yield (APY) where  $APY = \left(1 + \frac{r}{n}\right)^n - 1$ , given the Annual Percentage Rate (APR)
  - h. Adapting algebra from banking formulas for input into a spreadsheet
- ◆ **Objective AF.3.1:** Define compound interest, simple interest, limit notation, annual percentage yield, and annual percentage rate.
  - ◆ **Objective AF.3.2:** Calculate compound and simple interest.
  - ◆ **Objective AF.3.3:** Compare compound interest and simple interest.
  - ◆ **Objective AF.3.4:** Identify the formula to compute compound interest.
  - ◆ **Objective AF.3.5:** Identify the formula to compute simple interest.

## Investing

4. Read, interpret, and algebraically model stock ownership and transaction data.
- a. Constructing, interpreting, and analyzing scatterplots by utilizing linear, quadratic, and regression equations to see a complete picture of supply, demand, revenue, and profit
  - b. Constructing algebraic ratios and proportions
  - c. Recognizing, representing, and solving proportional relationships using equations.
  - d. Determining percent increase/decrease of monetary amounts
  - e. Constructing and interpreting scatterplots
  - f. Identifying form, direction, and strength from a scatterplot
  - g. Evaluating and using functions to model relationships between quantities
  - h. Translating verbal situations into algebraic linear functions and quadratic function
  - i. Creating algebraic formulas for use in spreadsheets
  - j. Evaluating and using functions to model relationships between algebraic

fractions, ratios, and proportions

- ◆ **Objective AF.4.1: Define stock, supply, demand, revenue, profit, scatterplot, regression equation, ratio, and proportion.**
- ◆ **Objective AF.4.2: Simulate stock purchases.**
- ◆ **Objective AF.4.3: Identify trends from a scatterplot.**
- ◆ **Objective AF.4.4: Locate stock transaction data.**
- ◆ **Objective AF.4.5: Identify whether a graph shows an increase or decrease in monetary amounts.**

## **Employment and Income Taxes**

5. Evaluate the impact of taxes on business ownership including property tax, sales tax, social security, retirement, and disability benefits.
  - a. Critiquing gross pay and net pay to determine total salary deductions
    - ◆ **Objective AF.5.1: Define property tax, sales tax, gross pay, net pay, and salary deductions.**  
Examples: Medicare, social security, health insurance, etc.
    - ◆ **Objective AF.5.2: Estimate the percentage of gross income paid to taxes.**
    - ◆ **Objective AF.5.3: Identify the types of taxes business owners pay.**
6. Evaluate insurance needs and their financial impact for various businesses and industries.
  - ◆ **Objective AF.6.1: Calculate the cost of insurance for a company.**
  - ◆ **Objective AF.6.2: Identify the different types of insurance a company might need.**
7. Use linear and polynomial functions to model Internal Revenue Service and Social Security Administration regulations using linear and polygonal functions.
  - a. Identifying continuous and discontinuous functions by their graphs
  - b. Graphing pay schedules
  - c. Graphing continuously polynomial functions with multiple slopes and cusps
    - ◆ **Objective AF.7.1: Define pay schedule, tax bracket, continuous functions, and discontinuous functions.**
    - ◆ **Objective AF.7.2: Calculate taxes owed based on a given income and tax bracket.**
    - ◆ **Objective AF.7.3: Determine tax bracket percentage for a given income.**

## **Automobile Ownership and Operation**

8. Calculate the long-term impact of major purchases on budgets.

- a. Critiquing and comparing options for purchasing an automobile including leasing, purchasing by cash, and purchasing by loan.
- b. Interpreting and analyzing various functions, graphs, and data analysis in order to make a responsible automobile purchase and to maintain the operation of an automobile.  
Example: model exponential depreciation as  $y = Px^b$ , where P is the purchase price and  $x < 1$ , and compare the depreciation to an increasing linear expense function
- c. Computing braking distance using the formula  $BD = 5(.1s)^2$
- d. Computing distance, rate, and time using  $D = RT$ ,  $R = \frac{D}{T}$ , and  $T = \frac{D}{R}$
- e. Using geometry theorems involving chords intersecting in a circle and radii perpendicular to chords to determine yaw mark arc length
- f. Computing total stopping distance of an automobile
- g. Calculating miles per gallon and distance using the formula  $D = MPG(G)$

- ◆ **Objective AF.8.1: Define depreciation and leasing.**
- ◆ **Objective AF.8.2: Compare the cost of purchasing a vehicle by cash, leasing, and by loan.**
- Objective AF.8.3: **Determine the cost of purchasing a vehicle with cash.**
- Objective AF.8.4: **Determine the cost of purchasing a vehicle by leasing.**
- Objective AF.8.5: **Determine the cost of purchasing a vehicle by loan.**
- ◆ **Objective AF.8.6: Compare miles per gallon of different vehicles.**
- ◆ **Objective AF.8.7: Compare braking distances based on rates of speed.**
- ◆ **Objective AF.8.8: Identify costs associated with operating and maintaining a vehicle.**  
**Examples: tires, insurance, oil changes, tune-ups**

## Mathematical Operations

9. Use mathematical operations in the workforce using whole numbers including addition, subtraction, multiplication, and division to solve complex problems.

Examples: Calculating bricks needed to build a structure, inventorying supplies, calculating hinges needed to build a set of cabinets, calculating tile needed to floor a room, calculating timber estimates for a landowner, calculating change for a customer, calculating electrical usage

- a. Using mathematical operations including addition and subtraction using negative numbers
- b. Solving problems that require multiple mathematical operations  
Example: calculating material based on unit size and total amount needed

- Objective AF.9.1: **Convert among units of measure (customary and metric).**
- ◆ **Objective AF.9.2: Analyze a given problem to determine the appropriate mathematical process needed to solve.**
- ◆ **Objective AF.9.3: Solve area and perimeter problems.**

- ◆ **Objective AF.9.4:** Use order of operations to simplify an expression containing integers.
- ◆ **Objective AF.9.2:** Solve problems to determine correct change for a purchase.
- ◆ **Objective AF.9.5:** Identify the appropriate units of measure for distance, volume, and mass (customary and metric).

10. Solve real-world business and industry problems involving mathematical operations with fractions, decimals, and percentages.

- a. Finding a common denominator in fractions
- b. Finding equivalent fractions in lowest terms
- c. Multiplying mixed numbers

- ◆ **Objective AF.10.1:** Solve real-world business and industry problems using fractions.
- ◆ **Objective AF.10.2:** Solve real-world business and industry problems using percentages.
- ◆ **Objective AF.10.3:** Solve real-world problems business and industry using decimals.
- ◆ **Objective AF.10.4:** Multiply or divide measurements in a recipe to increase or decrease the number of servings.
- ◆ **Objective AF.10.5:** Use percentages to find the sales tax on a purchase and percent of profit margin or discount on a purchase.
- ◆ **Objective AF.10.6:** Complete conversions between fractions, decimals, and percent.
- ◆ **Objective AF.10.7:** Measure lengths to the nearest fraction of an inch.

11. Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals.

Examples: calculating heart rate, measuring medication according to patient weight, using blueprints or a scale drawing

- ◆ **Objective AF.11.1:** Determine which method is needed to find a solution to a given problem involving averages, simple rates, and simple proportions.
- ◆ **Objective AF.11.2:** Calculate simple ratios using whole numbers and decimals.
- ◆ **Objective AF.11.3:** Calculate simple proportions using whole numbers and decimals.
- ◆ **Objective AF.11.4:** Calculate rates using whole numbers and decimals.
- ◆ **Objective AF.11.5:** Calculate averages using whole numbers and decimals.

12. Convert numbers from one form to another using whole numbers, fractions, decimals, or percentages.

- a. Converting units of money and time from one form to another
- ◆ **Objective AF.12.1:** Solve real-world problems that require converting units of measurement involving money and time.  
Examples: elapsed time, making change
  - ◆ **Objective AF.12.2:** Convert among seconds, minutes, and hours.
  - ◆ **Objective AF.12.3:** Convert between decimals and percentages.
  - ◆ **Objective AF.12.4:** Convert between fractions and decimals.
  - ◆ **Objective AF.12.5:** Convert between dollars and cents.

13. Solve multi-step real-world word problems, first, by placing information in the correct order, then, performing calculations.

Examples: calculating insurance premiums for a customer who has multiple types of policies, calculating the total cost of materials based on quantity, cost, and shipping and handling

- ◆ **Objective AF.13.1:** Identify known and unknown information.
- ◆ **Objective AF.13.2:** Determine correct sequence of steps for solving a multi-step real-world word problem.
- ◆ **Objective AF.13.3:** Solve multi-step equations.

14. Analyze a set of data utilizing mean, median, and mode.

Examples: calculating germination rate of seeds, determining success rate of various products passing a quality control test, calculating risk analysis for a job safety plan

- ◆ **Objective AF.14.1:** Define mean, median, and mode.
- ◆ **Objective AF.14.2:** Calculate mean for a set of data.
- ◆ **Objective AF.14.3:** Determine median for a set of data.
- ◆ **Objective AF.14.4:** Determine mode for a set of data.
- ◆ **Objective AF.14.5:** Collect and organize data for analysis.

## Consumer Credit

15. Use algebraic proportions and exponential growth and decay to make wise credit decisions.

- a. Creating, evaluating, and interpreting algebraic proportions
  - b. Determining the curve of best fit using linear, quadratic, or cubic regression equations
  - c. Using exponential growth and decay equations that model given relationships between quantities
  - d. Calculating finance charge at various percentages
- ◆ **Objective AF.15.1:** Define exponential growth, exponential decay, and curve of best fit.
  - ◆ **Objective AF.15.2:** Calculate exponential growth.
  - ◆ **Objective AF.15.3:** Calculate exponential decay.
  - ◆ **Objective AF.15.4:** Compare finance charges for various percentages

and time frames.

## Independent Living

16. Evaluate offers, such as advertisements, warranties, and guarantees, from producers and suppliers to make wise consumer decisions.

- ◆ **Objective AF.16.1: Define warranty and guarantee.**
- ◆ **Objective AF.16.2: Compare unit costs to determine best buy.**
- ◆ **Objective AF.16.3: Compare information from advertisements for equivalent products to determine best value.**

17. Compare and contrast housing options including rentals, lease to purchase, mortgage, or purchasing by cash.

- a. Evaluating the various mortgage products available
- b. Computing monthly mortgage payments at various terms and interest rates
- c. Comparing mortgage payments and increasing resale value of a home using a future value of a periodic deposit formula
- d. Modeling rent increases using exponential relationships

- ◆ **Objective AF.17.1: Define mortgage and lease.**
- ◆ **Objective AF.17.2: Identify various types of mortgages.**  
Examples: 30-year loan, 15-year loan, fixed rate loans, adjustable rate loans, VA loans, FHA loans
- ◆ **Objective AF.17.3: Investigate housing costs in local area.**
- ◆ **Objective AF.17.4: Identify housing options.**

18. Solve real-world and mathematical problems involving perimeter, circumference, area, volume, and surface area.

Examples: Fence a yard, lay carpet in a room, frame a picture, sewing clothing, paint a room, install a cabinet, tile a floor, and fill a pool

- a. Determining surface area and volume of irregular shapes including spheres, cylinders, or cones  
Examples: determining storage needs for materials, determining packaging size of various products
- b. Determining the circumferences of circles
- c. Determining area of various shapes including rectangles, squares, parallelograms, triangles, trapezoids, circles, regular polygons, irregular polygons

- ◆ **Objective AF.18.1 Identify known and unknown information.**
- ◆ **Objective AF.18.2: Identify correct method or formula for solving real-world problems involving perimeter, circumference, area, volume, and surface area.**
- ◆ **Objective AF.18.3: Substitute values into a formula and solve.**
- ◆ **Objective AF.18.4: Identify rectangles, squares, parallelograms, triangles,**

trapezoids, circles, spheres, cylinders, cones, regular polygons, and irregular polygons.

## Retirement Planning and Budgeting

19. Compare personal, state, and federal retirement plans to develop a retirement and personal budget plan.
- Analyzing overall debt, cash flow, and resources to determine net worth
  - Using the future value of a periodic investment formula to predict balances in future years
  - Identifying the effect that a change in multipliers has to the value of an algebraic expression
  - Creating rational expressions to represent increase over time
  - Creating and interpreting a graph showing linear and a piecewise function and determining the point of intersection
  - Interpreting points on a budget line graph in the context of their relationship to the budget line
- ◆ **Objective AF.19.1: Define debt, cash flow, net worth, periodic investment formula, and budget line graph.**
  - ◆ **Objective AF.19.2: Determine net worth based upon debt and cash flow.**
  - ◆ **Objective AF.19.3: Create a hypothetical personal budget plan.**
  - ◆ **Objective AF.19.4: Categorize expenses as fixed or variable.**
  - ◆ **Objective AF.19.5: Identify types of retirement plans available.**
  - ◆ **Objective AF.19.6: Plot points on a line graph.**