Financial Algebra
Syllabus & Essential Elements

Chapter 1: The Stock Market (approximately 20 days)

Students are introduced to basic business organization terminology in order to read, interpret and chart stock ownership and transaction data.

1-1   Business Organizations (1 day)
Objectives
- Learn the basic vocabulary of business organizations.
- Compute financial responsibility of business ownership based on ratios and percents

Key Terms
Capital, corporation, limited liability, partnership, personally liable profit, public corporation, shareholders, shares of stock, sole proprietorship

1-2   Stock Market Data (2 days)
Objectives
- Use stock data to follow the daily progress of a corporate stock.
- Write spreadsheet formulas.

Key Terms
52-week high, 52-week low, after-hours trading, cell, close, high, last, low, NASDAQ, net change, NYSE, sales in 100s, spreadsheet, stock market, trades, volume

1-3   Stock Market Data Charts (3 days)
Objectives
- Interpret a stock bar chart.
- Create a stock bar chart.
- Interpret a stock candlestick chart.
- Create a stock candlestick chart.

Key Terms
Candlestick chart, stock bar chart, stock chart

1-4   Simple Moving Averages (3 days)
Objectives
- Understand how data is smoothed.
- Calculate simple moving averages using the arithmetic average formula.
- Calculate simple moving averages using the subtraction and addition method.
- Graph simple moving averages using a spreadsheet.

Key Terms
Arithmetic average (mean), crossover, fast moving average, lagging indicators, simple moving average (SMA), slow moving average, smoothing techniques

1-5   Stock Market Ticker (1 day)
       Objectives
- Understand stock market ticker information.
- Determine the total value of a trade from ticker information.
- Determine trade volumes from ticker information.

       Key Terms

       Daily money flow, directional arrow, Dow Jones Industrial Average (DJIA), downtick, money flow, negative money flow, net money flow, positive money flow, stock symbol, ticker, ticker symbol, total value of a trade, trading price, trading volume, uptick

1-6   Stock Transactions (2 days)
       Objectives
- Learn the basic vocabulary of buying and selling stock.
- Compute gains and losses from stock trades.

       Key Terms

       Gross capital gain, gross capitol loss, odd lot, portfolio, round lot, trade

1-7   Stock Transaction Fees (2 days)
       Objectives
- Compute the fees involved in buying and selling stocks.
- Become familiar with the basic vocabulary of stock trading.

       Key Terms

       At the market, broker fee, commission, discount broker, limit order, net proceeds, stockbroker

1-8   Stock Splits (3 days)
       Objectives
- Calculate the post-split outstanding shares and share price for a traditional split.
- Calculate the post-split outstanding shares and share price for a reverse split.
- Calculate the fractional value amount that a shareholder receives after a split.

       Key Terms

       Fractional part of a share, market capitalization (market cap), outstanding shares, penny stock, reverse stock split, stock split, traditional stock split

1-9   Dividend Income (2 days)
       Objectives
- Understand the concept of shareowners splitting the profit for the corporation they own.
- Compute dividend income.
- Compute the yield for a given stock.
- Compute the interest earned on corporate bonds.

       Key Terms

       Common stock, corporate bonds, dividend, dividend income, face value, growth stock, income stock, matures, preferred stock, yield

Chapter 1 Mathematics Topics

- Constructing, using, and interpreting algebraic ratios and proportions

- Given investment ratios of the form $r_1 : r_2 : ... : r_{n-1} : r_n$ and a total T, write and solve the investment equation $r_1 x + r_2 x + ... + r_{n-1} x + r_n x = T$ and determine the investment amount associated with each ratio

- Determining, using, and interpreting percent increase/decrease of stock transaction prices

- Determining, using, and interpreting percent net change of stock transaction prices

- Constructing and interpreting stock bar and candlestick charts

- Given a set of n closing prices, $p_1,\ p_2, p_3, ..., p_{n-1}, p_n$, calculate and interpret d-day simple moving averages by applying the Arithmetic Average Formula and the Subtraction/Addition Method

- Use and interpret stock market ticker notation of the form SYM PK@D#C where SYM is the corporation symbol, Px1000 is the transaction amount (K=1000), D is the transaction price per share, # is either ▲ (increase) or ▼ (decrease), and C is the change from the previous day's closing price

- In situations where w represents the purchase price for a set number of shares, y represents the selling price of that same number of shares , and x represents the percent increase/decrease of an investment, use the equation $x = \dfrac{y - w}{w}$ to determine the percent increase of an investment

- In any a-for-b stock split, let P represent the pre-split price per share, calculate the post-split price per share using $\dfrac{b}{a} \times P$

- In any a-for-b stock split, let D represent the pre-split number of shares, calculate the post-split number of shares using $\dfrac{a}{b} \times D$

- Calculate the stock yield percentage using the formula $Yield = \dfrac{A}{C} \times 100$, where A represents the annual dividend per share and C represents the current price per share

Chapter 2: Modeling a Business (approximately 20 days)

Statistical analysis plays a very important role in the modeling of a business. Using linear, quadratic, and regression equations in that process assist students in getting a complete picture of supply, demand, expense, revenue, and profit as they relate to the sale of a product.

2-1   Interpret Scatterplots (2 days)
  Objectives
- Graph bivariate data.
- Interpret trends based on scatterplots.
- Draw lines and curves of best fit.

  Key Terms

Bivariate data, causal relationship, correlation, data, explanatory variable, negative correlation, positive correlation, response variable, scatterplot, trend, univariate data

2-2   Linear Regression (3 days)
  Objectives
- Be able to fit a regression line to a scatterplot.
- Find and interpret correlation coefficients.
- Make predictions based on lines of best fit.

  Key Terms

Correlation coefficient, domain, extrapolation, interpolation, least squares line, linear regression line, line of best fit, moderate correlation, range, strong correlation, weak correlation

2-3   Supply and Demand (2 days)
  Objectives
- Understand the slopes of supply and demand curves.
- Find points of equilibrium.

  Key Terms

Demand, demand function, equilibrium, function, markup, retail price, shift, supply, wholesale price, widget

2-4   Fixed and Variable Expenses (2 days)
  Objectives
- Understand the differences between fixed and variable expenses.
- Create an expense equation based on fixed and variable expenses.

  Key Terms

Breakeven point, expense equation, fixed expenses, loss, profit, revenue, revenue equation, variable expenses

2-5   Graphs of Expense and Revenue Functions (3 days)
Objectives
- Write, graph, and interpret the expense function.
- Write, graph, and interpret the revenue function.
- Identify the point of intersection of the expense and revenue functions.
- Identify breakeven points and explain them in the context of the problem.

Key Terms
> Axis of symmetry, leading coefficient, maximum value, nonlinear function, parabola, quadratic equation, second degree equation, vertex of a parabola

2-6   Breakeven Analysis (2 days)
Objectives
- Determine the breakeven prices and amounts using technology and/or algebra.

Key Terms
> Quadratic formula, zero net difference

2-7   The Profit Equation (3 days)
Objectives
- Determine a profit equation given the expense and revenue equations.
- Determine the maximum profit and the price at which that maximum is attained.

Key Terms
> Maximum profit, profit

2-8   Mathematically Modeling a Business (2 days)
Objectives
- Recognize the transitive property of dependence as it is used in a business model.
- Use multiple pieces of information, equations, and methodologies to model a new business.

Key Terms
> Dependence, transitive property of dependence

Chapter 2 Mathematics Topics
- Constructing and interpreting scatterplots

- Operations with functions

- Evaluating functions and using them to model situations

- Translating verbal situations into algebraic linear functions

- Translating verbal situations into quadratic functions

- Creating rational functions of the form $f(x) = \dfrac{mx + b}{x}$

- Translating verbal situations into linear and quadratic inequalities

- Solving linear systems of equations and inequalities such as:
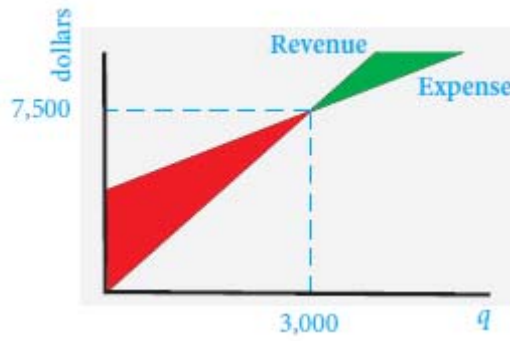
- Solving systems of linear equations and inequalities in two variables

- Identifying domains for which f(x) > g(x), f(x) = g(x), and f(x) < g(x)

- Identifying form, direction, and strength from a scatterplot

- Finding, interpreting, and graphing linear regression equations

- Determining domains for which prediction using a regression line is considered extrapolating or interpolating

- Finding and interpreting the Pearson Product-Moment Coefficient of Correlation

- Finding the axis of symmetry $x = \dfrac{-b}{2a}$, vertex $\left(\dfrac{-b}{2a},\ f\left(\dfrac{-b}{2a}\right) \right)$, roots, and the concavity of parabolic curves

- Using the quadratic formula $if\ ax^2 + bx + c = 0\ then\ x = \dfrac{-b}{2a} \pm \dfrac{\sqrt{b^2 - 4ac}}{2a}$

- Finding and interpreting quadratic regression equations

- Solving linear-quadratic systems of equations and inequalities such as:
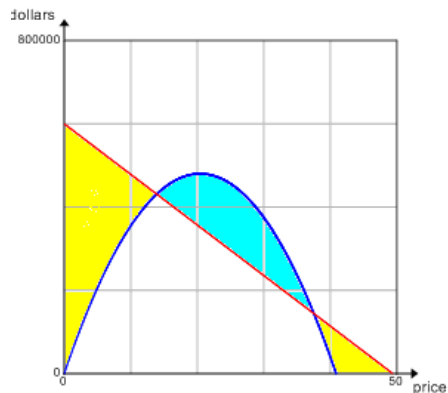
- Finding absolute and relative extrema

- Causation vs. correlation for bivariate data

- Identifying explanatory and response variables

- Identifying and diagramming lurking variables such as:
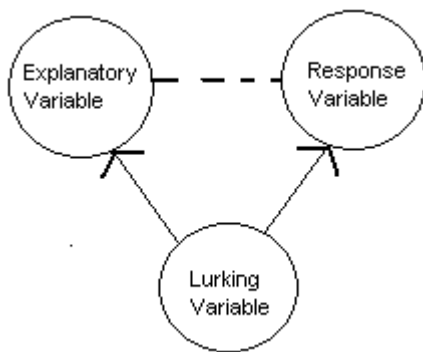
- Using the slope-intercept form of a linear equation $y = mx + b$

- Interpreting slope as a rate of change $\dfrac{\Delta y}{\Delta x}$

- Using the transitive property of dependence

- Determining the zero net difference

- Writing algebraic formulas for use in spreadsheets

- Rational Expressions

- Algebraic fractions, ratios, and proportions
- Writing literal equations

- Solving linear equations and inequalities

- Calculating moving averages

- Reading and interpreting data in pictorial representations

- Algebraic representations of percent, percent increase and percent decrease

- Expressing averages as rational functions

- Translating verbal expressions into algebraic formulas for use in a spreadsheet

Chapter 3: Banking Services (approximately 15 days)

Banks offer a complete array of paper and electronic services that make access to money easy. In this chapter, students learn the function and computation of interest in short-term, long-term, single deposit and periodic deposit accounts.

3-1   Checking Accounts (2 days)
Objectives
- Understand how checking accounts work.
- Complete a check register.

Key Terms
Automatic teller machine (ATM), canceled, check, check clearing, checking account, check register, credit, deposit, deposit slip, direct deposit, drawer, debit, electronic funds transfer (ETF), endorse, hold, insufficient funds, interest, joint account, overdraft protection, payee, personal identification number (PIN), maintenance fee, single account

3-2   Reconcile a Bank Statement (2 days)
Objectives
- Reconcile a checking account with a bank statement by hand and by using a spreadsheet.

Key Terms
Account number, balancing, bank statement, ending balance, outstanding checks, outstanding deposits, reconciling, starting balance, statement period

3-3   Savings Accounts (1 day)
Objectives
- Learn the basic vocabulary of savings accounts.
- Compute simple interest using the simple interest formula.

Key Terms
Certificate of deposit (CD), interest, interest rate, maturity, minimum balance, money market account, principal, savings account, simple interest, simple interest formula, statement savings

3-4   Explore Compound Interest (2 days)
Objectives
- Understand the concept of getting interest on your interest.
- Compute compound interest using a table.

Key Terms
Annual compounding, compound interest, crediting, daily compounding, quarterly compounding, semiannual compounding

3-5   Compound Interest Formula (2 days)
Objectives
- Become familiar with the derivation of the compound interest formula.
- Make computations using the compound interest formula.

Key Terms

Annual percentage rate (APR), annual percentage yield (APY), compound interest formula

3-6   Continuous Compounding (2 days)
Objectives
- Compute interest on an account that is continuously compounded.

Key Terms

Continuous compounding, continuous compound interest formula, exponential base (e), finite, infinite, limit

3-7   Future Value of Investments (2 days)
Objectives
- Calculate the future value of a periodic deposit investment.
- Graph the future value function.
- Interpret the graph of the future value function.

Key Terms

Biweekly, future value of a periodic deposit investment, future value of a single deposit investment, periodic investment

3-8   Present Value of Investments (2 days)
Objectives
- Calculate the present value of a single deposit investment.
- Calculate the present value of a periodic deposit investment.

Key Terms

Present value, present value of a periodic investment, present value of a single deposit investment

Chapter 3 Mathematics Topics
- Using the simple interest formula $I = PRT$ and its algebraic equivalents

- Understanding compounding via iteration

- Deriving the compound interest formula $B = (1 + \dfrac{r}{n})^{nt}$

- Computing compound interest with and without the formula

- Applying the compound interest formula

- Introduction to limit notation $\displaystyle Lim_{x \to a} f(x) = b$

- Approximating e by examining the sequence $\left\{\left(1+\dfrac{1}{x}\right)^{x}\right\}$

- Defining the natural base e using the rational and exponential expression limit notation

$$\underset{x\to\infty}{Lim}\left(1+\frac{1}{x}\right)^{x}$$

- Applying the natural base e in the continuous compounding formula $B = Pe^{rt}$

- Identifying $y = ax^{b}$ as exponential decay when x < 1

- Identifying $y = ax^{b}$ as exponential growth when x > 1

- Modeling a geometric series of the type $\displaystyle\sum_{b=0}^{n-1} ax^{b}$

- Graphing exponential functions of the type $y = ax^{b}$

- Analyzing rational functions and their limits of the form $\underset{x\to\infty}{Lim}\dfrac{ax^{n}\pm b}{cx^{m}\pm d}$ where n=m, n >m, and n< m

- Using the compound interest formula to derive the present value of a single deposit investment formula $P = \dfrac{B}{\left(1+\dfrac{r}{n}\right)^{nt}}$

- Using the compound interest formula to derive the present value of a periodic deposit investment formula $P = \dfrac{B\left(\dfrac{r}{n}\right)}{\left(1+\dfrac{r}{n}\right)^{nt}-1}$

- Using the future value of a periodic deposit investment formula

$$B = \frac{P\left(\left(1+\dfrac{r}{n}\right)^{nt} - 1\right)}{\left(\dfrac{r}{n}\right)}$$

- Adapting all banking formulas for input into a spreadsheet

Chapter 4: Consumer Credit (approximately 15 days)

The understanding and use of credit is extremely important to the consumer since actions taking in the present can have long standing ramifications in the future. Becoming familiar with credit terminology and regulations is critical in making wise credit decisions. Credit comes at a price and in this chapter students learn how to use and manipulate the credit formulas in order to make wise credit choices that fit their needs, current financial situation, and future goals.

4-1   Introduction to Consumer Credit (2 days)
  Objectives
  - Become familiar with the basic vocabulary of credit terms.
  - Become familiar with types of lending institutions.
  - Compute finance charges for installment purchases.

  Key Terms
  Asset, credit, creditor, credit rating, credit reporting agency, debtor, down payment, earning power, FICO score, finance charge, installment plan, interest

4-2   Loans (3 days)
  Objectives
  - Read monthly payments from tables.
  - Compute monthly payments using a formula.
  - Compute finance charges on loans.

  Key Terms
  Annual percentage rate, balloon payment, collateral, cosigner, lending institution, life insurance, prepayment penalty, prepayment privilege, principal, promissory note, wage assignment, wage garnishment

4-3   Loan Calculations and Regression (2 days)
  Objectives
  - Calculate the present value of a single deposit investment.
  - Calculate the present value of a periodic deposit investment.

  Key Terms
  Cubic function, cubic regression, monthly payment calculator, natural logarithm

4-4   Credit Cards (2 days)
  Objectives
  - Become familiar with the basic vocabulary of credit cards.
  - Compute an average daily balance.

  Key Terms
  Average daily balance, charge card, credit card, debit card, Electronic Funds Transfer Act, Fair Credit Billing Act, Fair Debt Collection Practices Act, impulse buying, mean, revolving charge account, Truth-In-Lending Act

4-5   Credit Card Statement (2 days)
  Objectives
  - Identify and use the various entries in a credit card statement.

Key Terms

Account number, APR, available credit, average daily balance, billing cycle, billing date, credit card statement, credit line, debit/credit, finance charge, late charges, minimum payment, monthly periodic rate, new balance, new purchases, number of days in billing cycle, payments/credits, payment due date, previous balance, transactions

4-6 Average Daily Balance (3 days)
Objectives
- Calculate the average daily balance using the credit calendar.
- Calculate the finance charge using the credit calendar.

Key Terms

Average daily balance, billing date, credit calendar

Chapter 4 Mathematics Topics
- Using algebraic proportions

- Finding and interpreting cubic regression equations of the form
$$y = ax^3 + bx^2 + cx + d$$

- Using slope-intercept form $y = mx + b$

- Using and interpreting exponential growth and decay equations

- Computing the average daily balance

- Applying the monthly payment formula $M = \dfrac{P\left(\dfrac{r}{12}\right)\left(1 + \dfrac{r}{12}\right)^{12t}}{\left(1 + \dfrac{r}{12}\right)^{12t} - 1}$

- Using slope-intercept form y=Mx+b where $M = \dfrac{P\left(\dfrac{r}{12}\right)\left(1 + \dfrac{r}{12}\right)^{12t}}{\left(1 + \dfrac{r}{12}\right)^{12t} - 1}$

- Using the formula $FC = \left[\dfrac{P\left(\dfrac{r}{12}\right)\left(1+\dfrac{r}{12}\right)^{12t}}{\left(1+\dfrac{r}{12}\right)^{12t}-1} \right] x + b - R$ where FC = finance

  charge and R = retail price

- Using inverse functions to introduce the natural logarithm function $y = \ln x$ as

  $y = \log_e x$ and as the inverse of $y = e^x$

- Using the formula $M = \dfrac{P\left(\dfrac{r}{12}\right)\left(1+\dfrac{r}{12}\right)^{12t}}{\left(1+\dfrac{r}{12}\right)^{12t}-1}$ to solve for the exponent t where

  $$ t = \frac{\ln\left(\dfrac{M}{p}\right) - \left(\ln\left(\dfrac{M}{p} - \dfrac{r}{12}\right)\right)}{12\ln\left(1+\dfrac{r}{12}\right)} $$

- Modeling the average daily balance using the formula $\displaystyle\sum_{i=1}^{n} \frac{d_n}{n}$

- Calculating the finance charge using the formula $FC = \left(\displaystyle\sum_{i=1}^{n} \frac{d_n}{n}\right)\dfrac{APR}{12}$

- Creating algebraic formulas and applying them for use in spreadsheets

Chapter 5: Automobile Ownership (approximately 20 days)

Whether it is a used or new car, ownership requires an understanding of the mathematics that models purchasing, insuring, depreciating, and driving that car.

5-1   Classified Ads (2 days)
     Objectives
- Compute the cost of classified ads for used cars.
- Compute the cost of sales tax on automobiles.

     Key Terms
       Cusp, domain, piecewise function, sales tax, split function

5-2   But or Sell a Car (2 days)
     Objectives
- Compute the mean, media, mode, range, quartiles, and interquartile range.

     Key Terms
       Arithmetic average, ascending order, bimodal, data, descending order, interquartile range (IQR), lower quartile, mean, measures of central tendency, outlier, quartiles, range, resistant, skew, statistics, subscripts, median, outlier, upper quartile

5-3   Graph Frequency Distributions (2 days)
     Objectives
- Create a frequency distribution from a set of data.
- Use box-and-whisker plots and stem-and-leaf plots to display information.
- Use linear regression to negotiate the purchase or sale of a car.

     Key Terms
       Box-and-whisker plot, boxplot, frequency, frequency distribution, modified boxplot, stem-and-leaf plot

5-4   Automobile Insurance (3 days)
     Objectives
- Learn about different types of automobile insurance coverage.
- Compute insurance costs.
- Compute payments on insurance claims.

     Key Terms
       Actuary, automobile insurance, bodily injury liability (BI), car rental insurance, claim, collision insurance, comprehensive insurance, deductible, emergency road service insurance, liable, liability insurance, negligent, no-fault insurance , personal injury protection (PIP), premium, property damage liability (PD), surcharge, uninsured/underinsured motorist protection insurance (UMP)

5-5   Linear Automobile Depreciation (2 days)
     Objectives
- Write, interpret, and graph a straight line depreciation equation.

     Key Terms

Appreciate, depreciate, slope, straight line depreciation, straight line depreciation equation

5-6   Historical and Exponential Depreciation (2 days)
Objectives
- Write, interpret, and graph an exponential depreciation equation.
- Manipulate the exponential depreciation equation in order to determine time, original price, and depreciated value.

Key Terms
Dollar value, exponential decay, exponential depreciation, historical data, historical depreciation

5-7   Driving Data (2 days)
Objectives
- Write, interpret and use the distance formula.
- Use the formula for the relationship between distance, fuel economy, and gas usage.

Key Terms
Currency exchange rate, distance formula, electronic odometer, English Standard System, fuel economy measurement, kilometers per liter, mechanical odometer, Metric System, miles per gallon, odometer, speedometer, trip odometer

5-8   Driving Safety Data (2 days)
Objectives
- Calculate reaction time and distance in the English Standard System.
- Calculate and use the braking distance in both English Standard and Metric Systems.
- Calculate and use the total stopping distance in both the English Standard and Metric Systems.

Key Terms
Braking distance, reaction distance, reaction time, thinking time, total stopping distance

5-9   Accident Investigation Data (3 days)
Objectives
- Determine the minimum skid speed using the skid mark formula.
- Determine the minimum skid speed using the yaw mark formula.

Key Terms
Accident reconstructionist, anti-lock braking system (ABS), braking efficiency, chord, drag factor, middle ordinate, shallow skid mark, skid distance, skid mark, skid speed formula, yaw mark

Chapter 5 Mathematics Topics
- Systems of linear equations

- Modeling exponential depreciation as

  $y = Px^b$ where P is purchase price and $x < 1$.

- Transforming raw data into a frequency distribution

- Creating and interpreting stem and leaf plots and side-by-side steam plots such as

$$
\begin{array}{r|c|l}
9\ 8\ 1\ 1\ 1\ 1 & 87 & 1\ 2\ 2 \\
3\ 2 & 88 & 2\ 4\ 6\ 7 \\
7\ 5\ 4 & 89 & 1\ 3 \\
7\ 6\ 6\ 6\ 6\ 5 & 90 & 2\ 7\ 7\ 7
\end{array}
$$

- Creating and interpreting box and whisker plots and side-by-side boxplots
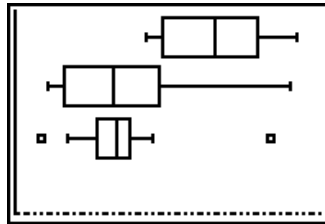

- Creating and interpreting modified box and whisker plots

- Computing measures of dispersion $R = x_H - x_L$ and $IQR = Q_3 - Q_1$.

- Computing Q_1, Q_2, Q_3, and Q_4 manually and with the graphing calculator

- Using the expressions $Q_1 - 1.5(IQR)$ and $Q_3 + 1.5(IQR)$ to determine outliers

- Compute and interpret percentiles

- Measures of central tendency $\bar{x} = \dfrac{\sum\limits_{i=1}^{n} x_i}{n}$, median and mode

- Creating and interpreting piecewise (split) functions of the form

$$
c(x) = \begin{cases} 38 \text{ when } x \le 4 \\ 38 + 6.25(x - 4) \text{ when } x > 4 \end{cases}
$$

- Determining the domains of a piecewise function from verbal situations

- Graphing piecewise functions using mutually exclusive domains

- Identifying the cusp of a piecewise function at a change in slope such as

c(x)

cusp (6, 41.55)

x
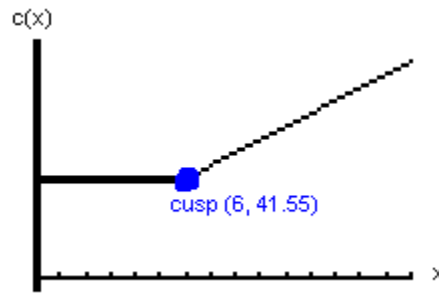
- Using multi-variable square root functions such as the skid length $S = \sqrt{30Dfn}$.

- Using $RD = 0.75\left(\dfrac{5280s}{60^2}\right)$ to determine reaction distance

- Using $BD = 5(.1s)^2$ to compute the breaking distance

- Using $TSD = 0.75\left(\dfrac{5280s}{60^2}\right) + 5(0.1s)^2$ to compute total stopping distance

- Manipulating $D = RT, R = \dfrac{D}{T}, \text{ and } T = \dfrac{D}{R}$ to determine distance, rate, and time

- Using $D = MPG(G)$ to compute miles per gallon

- Using geometry theorems involving chords intersecting in a circle and radii perpendicular to chords to determine yaw mark arc length

- Finding radius $r = \dfrac{C^2}{8M} + \dfrac{M}{2}$ where C is chord length and M is middle ordinate

- Computing arc lengths

- Using dilations D_k to transform formulas between the English Standard and Metric measurement systems

- Applying all algebraic formulas from the chapter for use in spreadsheets

Chapter 6: Employment Basics (approximately 10 days)

Employment is an integral part of our daily lives.   Knowing how salaries are computed, benefits bestowed, and wage taxes calculated allow the employee the opportunity to make smart employment choices both before accepting a job and during the period of employment in that job.

6-1   Look for Employment (1 day)
  Objectives
  - Compute periodic salary based on annual contract salary.
  - Interpret abbreviations in classified ads.
  - Express classified ad prices as piecewise functions.

  Key Terms
  Benefits, discount, employment agency, fee paid, Form W-4: Employee's Withholding Allowance Certificate, resume

6-2   Pay Periods and Hourly Rates (2 days)
  Objectives
  - Compute weekly, semimonthly, and biweekly earnings given annual salary.
  - Compute hourly pay and overtime pay given hourly rate.

  Key Terms
  Biweekly, direct deposit, double-time pay, gross pay, hourly rate, monthly pay, overtime hours, overtime hourly rate, semimonthly, time-and-a-half overtime, weekly pay

6-3   Commissions, Royalties, and Piecework Pay (2 days)
  Objectives
  - Compute pay based on percent commission.
  - Compute piecework pay.
  - Understand advantages and disadvantages of pay based on production.

  Key Terms
  Commission, pieceworker, piecework rate, royalty

6-4   Employee Benefits (2 days)
  Objectives
  - Understand and calculate the value of certain employee benefits.

  Key Terms
  Base period, childcare leave, employee benefits, family health care, individual health care, insurance, paid vacation time, paid holiday time, pension, retirement plans, stock ownership plans, unemployment insurance, worker's compensation

6-5   Social Security and Medicare (3 days)
  Objectives
  - Compute paycheck deductions for Social Security.
  - Compute paycheck deductions for Medicare.

Key Terms

Federal Insurance Contributions Act, FICA tax, maximum taxable income, Medicare tax, Social Security, Social Security tax.

## Chapter 6 Mathematics Topics

- Identifying continuous and discontinuous functions by their graphs

- Interpreting jump discontinuities

- Writing an interpreting domains and piecewise functions of the forms

$$r(x) = \begin{cases} 29.95 \text{ if } x \text{ is an integer and } x \le 2 \\ 29.95 + 14(x-2) \text{ if } x \text{ is an integer and } x > 2 \end{cases}$$

and

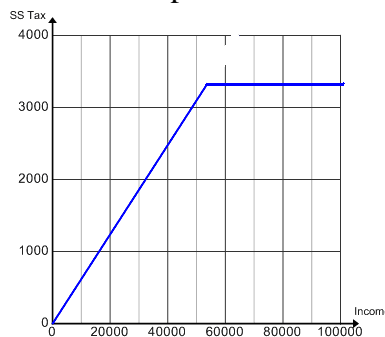$$c(x) = \begin{cases} 0.20x \text{ when } 0 \le x < 750 \\ 0.22x \text{ when } 750 \le x \le 1{,}000 \\ 0.25x \text{ when } x > 1{,}000 \end{cases}$$

- Graphing exponential pay schedules such as
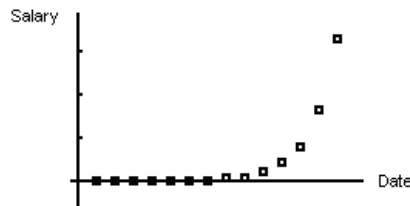
- Graphing piecewise functions with cusps such as

- Using measures of central tendency and rational functions such as

$$a(x) = \frac{40r + 1.5tr}{t + r}$$

- Geometric sequences such as $a_n = xr^n$ with common ratio r

- Expressing percent increases and decreases as rational functions

- Reading and interpreting data

Chapter 7: Income Taxes (approximately 20 days)

The Federal income tax laws and forms need not be a maze of complexities. In this chapter, students see how mathematics can be used to model and understand our progressive tax system. Through the creation of functions and the analysis of graphic representations of those functions, students gain insight into their income reporting and tax paying obligations.

7-1   **Tax Tables, Worksheets, and Schedules (3 days)**
         Objectives
- Express tax schedules algebraically.
- Compute Federal income taxes using a tax table and tax schedule.

         Key Terms
         Head of household, Income tax, Internal Revenue Service, married filing jointly, married filing separately, property tax, qualifying widower, sales tax, tax, taxable income

7-2   **Modeling Tax Schedules (3 days)**
         Objectives
- Construct income tax graphs using piecewise functions derived from tax schedules.

         Key Terms
         Flat tax, progressive tax system, proportional tax, regressive tax schedule, tax bracket

7-3   **Income Statements (2 days)**
         Objectives
- Interpret and use the information on a pay stub, W-2 form and 1099 form..

         Key Terms
         Cafeteria plan, flexible spending account, Form 1099, Form W-2, gross pay, net pay, paycheck, pay stub, take-home pay, tax-deferred contribution, withholding tax

7-4   **Forms 1040EZ and 1040A (4 days)**
         Objectives
- Complete Form 1040EZ.
- Complete Form 1040A.

         Key Terms
         Dependent, exemption, Form 1040A, Form 1040EZ, Form 1040, itemize, standard deduction

7-5   **Form 1040 and Schedules A and B (6 days)**
   **Objectives**
- File Form 1040 with itemized deductions.
- Understand the difference between a tax credit and a tax deduction.

         Key Terms
         Form 1040, Schedule A-Itemized Deductions, Schedule B-Interest and Dividend Income, tax avoidance, tax credit, tax evasion, voluntary compliance

Chapter 7 Mathematics Topics

- Introducing point-slope form $y - y_1 = m(x - x_1)$ and converting it to slope-intercept form $y = mx + b$

- Graphing continuous polygonal functions with multiple slopes and cusps
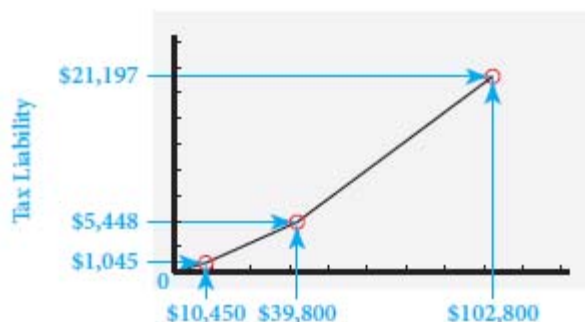
- Translating verbal expressions into literal rational, exponential, and linear equations.

- Expressing domains using compound inequality notation of the form
  $t \geq t_1 \ and \ t < t_2$

- Expressing domains using compound inequality notation of the form
  $t > t_1 \ and \ t \leq t_2$, interval notation of the form $t_1 < x \leq t_2$, and tax schedule notation of the form "over t_1 but not over t_2"

- Given a compound inequality statement, modeling a tax bracket to determine the tax using a linear equation of the form $y = a + p(x - t_1)$ where y is the tax, a is the base tax, p is the tax percentage expressed as a decimal, t_1 is the lower boundary of the domain, and x is the taxable income

- Converting point-slope form to slope-intercept form of a linear equation

- Writing equations in point-slope form

- Modeling algebraically a tax schedule of the form

Schedule Y-1— If your filing status is **Married filing jointly** or **Qualifying widow(er)**

If your taxable income is:		The tax is:	of the amount over—
Over—	But not over—		
$0	$16,050	········ 10%	$0
16,050	65,100	$1,605.00 + 15%	16,050
65,100	131,450	8,962.50 + 25%	65,100
131,450	200,300	25,550.00 + 28%	131,450
200,300	357,700	44,828.00 + 33%	200,300
357,700	········	96,770.00 + 35%	357,700

- Using a piecewise function of the form

$$f(x) = \begin{cases} 0.10x & 0 < x \le 16{,}050 \\ 1{,}605 + 0.15(x - 16{,}050) & 1{,}605 < x \le 65{,}100 \\ 8{,}962.50 + 0.25(x - 65{,}100) & 65{,}100 < x \le 131{,}450 \\ 25{,}550 + 0.28(x - 123{,}700) & 131{,}450 < x \le 200{,}300 \\ 44{,}828 + 0.33(x - 200{,}300) & 200{,}300 < x \le 357{,}700 \\ 96{,}770 + 0.35(x - 357{,}700) & x > 357{,}700 \end{cases}$$

where f(x) represents the tax liability function for taxpayers using a given tax schedule with taxable incomes on a given domain

- Graphing piecewise functions of the form

$$f(x) = \begin{cases} y = 0.10x & 0 < x \le 16{,}050 \\ y = 0.15x - 802.5 & 16{,}050 < x \le 65{,}400 \\ y = 0.25x - 7{,}312.5 & 65{,}100 < x \le 131{,}450 \end{cases}$$

on the coordinate plane.

- Identifying the cusps of piecewise functions from the function notation

- Interpreting the graphs, slopes, and cusps of continuous polygonal functions with multiple slopes and cusps

- Translating verbal expressions into literal equations

- Adapting all algebraic formulas in the unit for use in spreadsheets

Chapter 8: Independent Living (approximately 15 days)

A "place of my own to call home" comes in many forms and with varying degrees of financial responsibilities. In this chapter, students work their way through the mathematics that models moving, renting, and purchasing a place to live.

8-1   Find a Place t Live (3 days)
   Objectives
- Calculate the affordability of a monthly rent.
- Determine the relationship between square footage and monthly rent.
- Determine lease signing costs.
- Calculate moving expenses..

   Key Terms
   Apartment, application deposit, evict, expire, furnished, landlord, security deposit, single-family home, square footage, and tenant.

8-2   Read a Floor Plan (3 days)
   Objectives
- Compute the perimeter and the area of a polygon.
- Compute areas of irregular regions.
- Compute volumes of rectangular solids..

   Key Terms
   Apothem, area, British Thermal Units (BTUs), congruent, floor plan, Monte Carlo Method, perimeter, volume.

8-3   Mortgage Application Process (3 days)
   Objectives
- Compute the monthly cost of paying for a house.
- Understand the research thatis necessary before you purchase a home..

   Key Terms
   Assessed value, adjustable-rate mortgage, back-end ratio, balloon mortgage, debt-to-income ratio, down payment, escrow, fixed-rate mortgage, foreclose, front-end ratio, homeowner's insurance, interest-only market value, mortgage, mortgage, property tax, real estate tax.

8-4   Purchase a Home (4 days)
   Objectives
- Estimate closing costs.
- Create an amortization table for a fixed-rate mortgage.
- Create an amortization table for a fixed-rate mortgage with extra payments.
- Investigate the amortization table for an adjustable rate mortgage.

   Key Terms
   Adjustment period, arrears, attorney fee, closing, closing costs, discount points, earnest money deposit, hybrid ARM, initial rate, non-recurring costs, origination points, prepaid interest, title, title search, transfer tax.

8-5   Rentals, Condominiums, and Cooperatives (2 days)
   Objectives
   - Compute costs of purchasing a cooperative or condominium.
   - Understand the advantages and disadvantages of different forms of homes.

   Key Terms
   Board of directors, condominium, cooperative, co-op apartment, equity, landominium, maintenance fee

Chapter 8 Mathematics Topics
- Using rational functions to compute back-end ratios of the form

$$b = \frac{m + p/12 + h/3 + c + d}{a/12}.$$

- Using rational functions to compute front-end ratios of the form

$$f = \frac{m + p/12 + h/12}{x/12}.$$

- Using the monthly payment formula $M = \dfrac{\left(P\left(\dfrac{r}{12}\right)\left(1+\dfrac{r}{12}\right)^{12t}\right)}{\left(\left(1+\dfrac{r}{12}\right)^{12t}-1\right)}$

- Computing interest $I = \dfrac{\left(P\left(\dfrac{r}{12}\right)\left(1+\dfrac{r}{12}\right)^{12t}\right)}{\left(\left(1+\dfrac{r}{12}\right)^{12t}-1\right)} - C$ where C is original cost

- Using the apothem to compute the area of a regular polygon $A = \dfrac{1}{2}ap$

- Using probability to find the area of irregular plane region (The Monte Carlo Method)

$$\frac{\text{number of points inside region}}{\text{number of random points generated}} = \frac{\text{area of irregular region}}{\text{area of framing rectangle}}$$

- Using factors of dilations to draw to scale

- Finding areas of irregular and shaded regions

- Using rational functions to compute BTU's, such as $\text{BTU rating} \approx \dfrac{while}{60}$

- Solving proportions

- Creating multi-variable tax assessment equations

- Using exponential equations to model rent increases such as $R = A\left(1 + \dfrac{B}{100}\right)^{D-1}$

- Modeling rent increases using exponential regression

- Reading and interpreting data

- Using the future value of a periodic deposit formula $B = \dfrac{P\left(\left(1 + \dfrac{r}{n}\right)^{nt} - 1\right)}{\left(\dfrac{r}{n}\right)}$ to make comparisons to mortgage payments and increasing resale value of a home

- Writing all algebraic formulas from the chapter for use in spreadsheets

- Translating verbal expressions into literal equations

Chapter 9: Planning for Retirement (approximately 10 days)

For most high school students, the notion of retirement is so far in the distant future that many rarely consider the fact that actions they take now can affect how they will live once they stop working. The focus of this chapter is on the 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.

9-1   Retirement Income from Savings (2 days)
   Objectives
   - Calculate future values of retirement investments that are both signle deposit and periodic.
   - Compare the tax savings by making contributions to pre-tax retirement savings accounts.
   - Calculate an employer's matching contribution to a retirement account.
   Key Terms
   401K, 403B, after-tax investments, individual retirement account (IRA), Keogh plan, retirement, Roth IRA, semi-retired, tax-deferred, tax-exempt, traditional IRA

9-2   Social Security Benefits (3 days)
   Objectives
   - Understand the benefits paid by Social Security.
   - Understand how benefits are computed.
   - Compute Federal income tax on benefits that are paid under Social Security.
   Key Terms
   Full-retirement age, Old-Age, Survivors, and Disability Insurance (OASDI), Social Security benefit, Social Security credit, Social Security statement

9-3   Pensions (2 days)
   Objectives
   - Calculate pension benefits using various formulas.
   - Calculate pension benefits during and after vesting periods..
   Key Terms
   Consumer Price Index (CPI), cost of living adjustment (COLA), deferred compensation, defined benefit plan, Employee Retirement Income Security Act, lump-sum payment, pension, Pension Benefit Guaranty Corporation, Pension Protection Act, qualified joint and survivor annuity, vested

9-4   Life Insurance (2 days)
   Objectives
   - .Compute the cost of different types of life insurance.
   - Understand the advantages and disadvantages of different types of life insurance.

Key Terms

Beneficiary, cash value, decreasing term insurance, face value, group term life insurance, increasing term insurance, level term insurance, mortality table, permanent life insurance, premium, term life insurance, universal life insurance, variable life insurance, whole life insurance

Chapter 9 Mathematics Topics

- Using the future value of a periodic investment formula of the form

$$B = \frac{P\left(\left(1 + \frac{r}{n}\right)^{nt} - 1\right)}{\frac{r}{n}}$$

  to predict balances after t years when given a periodic deposit amount, an investment return rate, and compounding information

- Using the present value of a periodic investment formula of the form when given a future value, a time in years, an investment return rate, and compounding information

$$P = \frac{B\left(\frac{r}{n}\right)}{\left(1 + \frac{r}{n}\right)^{nt} - 1}$$

- Writing rational expressions as a combination of rational and polynomial expressions

- Using inequalities to define domains when creating algebraic expressions

- Analyzing the effect that a change in multipliers has to the value of an algebraic expression

- Writing rational expressions to represent increase over time

- Using and interpreting the greatest integer function of the form $[x]$

- Determining and interpreting the expected value of a probability distribution where the expected value is of the form $\sum_{i=1}^{n} x_i f(x_i)$

- Reading and interpreting data presented in multiple formats

- Creating, interpreting, and graphing greatest integer functions of the form
$$y = [x-a]$$
- Creating, interpreting, and graphing greatest integer functions of the form
$$y = [x-a]+1$$
- Understanding the algebraic and contextual differences between $y = [x-a]$ and
$$y = [x-a]+1$$

- Incorporating the greatest integer function into a piecewise function of the form

$$c(x) = \begin{cases} a \text{ when } x \le b \\ x-d) \qquad\qquad \text{ when } x > b \text{ and } x \text{ is an integer} \\ a + c([x-d]+1) \qquad \text{ when } x > b \text{ and } x \text{ is not an integer} \end{cases}$$

- Evaluating a piecewise function that includes a greatest integer function for various values on the domain of the piecewise function

- Creating, interpreting, and graphing a system of a linear and a piecewise function and determining the point of intersection as shown in the following graph:
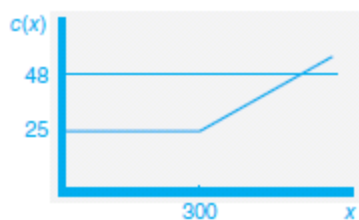
Chapter 10: Prepare a Budget (approximately 10 days)

This final chapter of the text calls upon the knowledge acquired in the preceding chapters in order to create, chart, and use a responsible personal budget.

10-1   Utility Expenses (2 days)
Objectives
- Compute the cost of electric, gas, oil and water for a home.
- Compute the cost of using specific appliances for specific lengths of time.
- Compute the time is takes an energy-saving appliance to pay for itself

Key Terms
Ccf, cubic foot, kilowatt-hour (kWh), meter, present reading, previous reading, utility, volume, watt, watt-hour

10-2   Electronic Utilities (2 days)
Objectives
- .Compute the cost of cell phone calls, text messaging, Internet service, and cable television.

Key Terms
Electronic utilities

10-3   Charting a Budget (3 days)
Objectives
- Create and use a budget check-off matrix.
- Visualize and interpret a budget using a pie chart, a bar graph, a line graph, and a budget line graph..

Key Terms
Bar graph, budget check-off matrix, budget line graph, budget matrix, column, electronic matrix, line graph, matrix, order of a matrix, pie chart, row, sector

10-4   Cash Flow and Budgeting (3 days)
Objectives
- Develop and interpret a cash flow chart.
- Develop and interpret a frequency budget plan.
- Develop and interpret a year-long expense budget plan..

Key Terms
Assets, cash flow, cash-flow matrix, debt reduction plan, debt-to-income ratio, year-long expense budget plan, envelope accounting system, frequency budget plan, net worth,

Chapter 10 Mathematics Topics
- Using sectors and central angles of a circle to depict proportional categories on a pie chart when given categorical information

- Creating and interpreting budget line equations of the type $C_x x + C_y y = B$ where C_x represents the cost of the first of two items and C_y represents the cost of the second of two items, x and y represent quantities under consideration and B represents an amount budgeted

- Interpreting points on a budget line graphs in the context of their relationship to the budget line as shown in the following display:
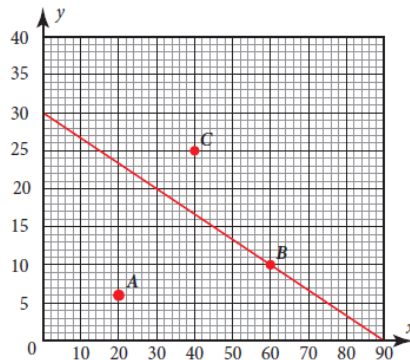
- Comparing budget line graphs and interpreting them as transformations in the plane as shown here:
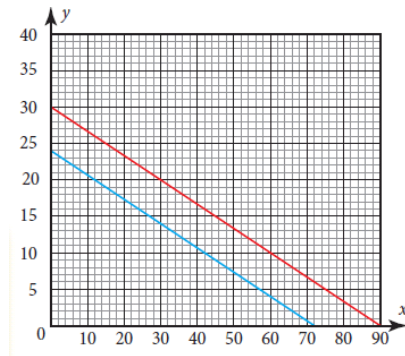
- Using inequalities to interpret regions and points in the plane in relation to a budget line graph

- Using multiple representations to chart data such as
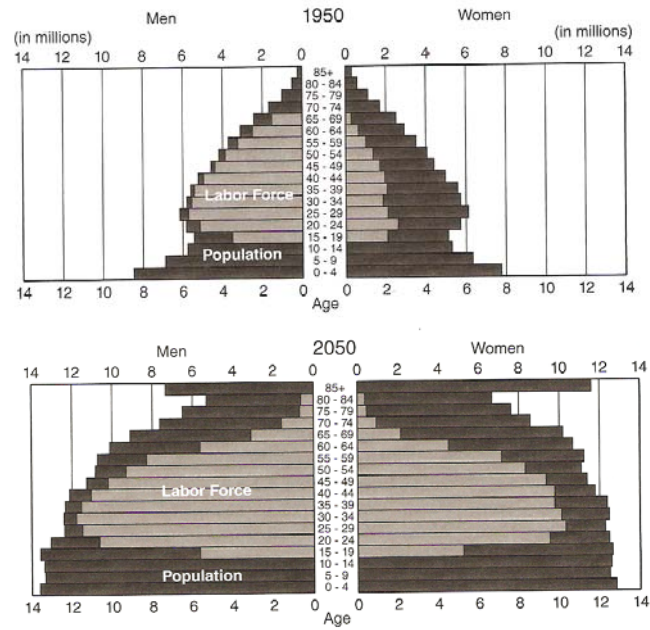
Bureau of Labor Statistics

- Using algebraic rational expressions to model ratios in context

- Writing algebraic formulas for use in spreadsheets