Financial Algebra
Gerver/Sgroi
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Robert Gerver
Richard Sgroi

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Bringing the world to the classroom and the classroom to life

A PART OF CENGAGE
Introductions

Rob has been teaching at North Shore High School since 1977. He received the Presidential Award for Excellence in Mathematics Teaching from President Reagan in 1988.

He attended Martin Van Buren HS, and did his student teaching there in 1976.

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Agenda

1. Who, What, Why, and Where
2. Examples from the textbook
3. Instructional Model
4. Instructor Support
Most Americans aren’t fluent in the language of money. Yet we’re expected to make big financial decisions as early as our teens … even though most of us received no formal instruction on financial matters until it is too late. All of this raises the question: What’s happening inside our classrooms? And how many schools even broach the topic? As it turns out, for a country that prizes personal responsibility, we’re doing very little.
What Do You Know?
What Should You Know?

Who won the World Series last year?
What rock band played at the last Super Bowl?
Who are the two newest judges on American Idol?
Do you check the sports scores everyday?
Does the iPod have an APP for checking restaurant menus?

What is No-Fault insurance?
What is a progressive tax system?
Do you keep track of your car loan and mortgage payments?
Do you know your FICO score?
Do you check each expense on your credit card bills?
What is Financial Algebra?

- A mathematically rigorous, algebra-based course. (Not an arithmetic-based personal finance course).

- Algebra 1 is the prerequisite, and Algebra 1 skills are reinforced throughout.

- Includes selected topics from Algebra 2, Precalculus, Statistics, Probability and Geometry that are taught at an ability-appropriate level for the Algebra 1-prerequisite audience.

- It is technology-dependent and applications-oriented.
Topics Covered

- Investments
- Starting Your Own Business
- Banking
- Credit
- Automobile Ownership
- Employment Basics
- Income Taxes
- Home Ownership
- Retirement
- Budgeting
**Financial Algebra**

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

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<table>
<thead>
<tr>
<th>Financial Algebra Chapter &amp; Section</th>
<th>Financial Algebra Page Numbers</th>
<th>Common Core Standard</th>
</tr>
</thead>
</table>
| **C1 1-1**                          | Pages 5-9                     | Mathematics| High School Modeling ★
Modeling Standards Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). |
| **C1 1-2** (continued on next page) | Pages 10-15                   | Algebra - Creating Equations ★ A-CED
Creating equations that describe numbers or relationships
1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

Algebra - Reasoning with Equations and Inequalities A-REL
Solve equations and inequalities in one variable
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Number and Quantity - Quantities ★ N-Q
Reason quantitatively and use units to solve problems
1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

2. Define appropriate quantities for the purpose of descriptive modeling. |
Who is the target audience?

- Students in need of a **third or fourth-year math credit**
- Students looking to take a **math elective**
- Students who may have experienced difficulty in Algebra 1 and/or Geometry and may **not be ready for Algebra 2 or Precalculus**
### Where does this course fit?

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra 1</td>
<td>Financial Algebra</td>
<td>Geometry</td>
<td>Algebra 2</td>
</tr>
<tr>
<td>Algebra 1</td>
<td>Geometry</td>
<td>Financial Algebra</td>
<td>Algebra 2</td>
</tr>
<tr>
<td>Algebra 1</td>
<td>Geometry</td>
<td>Algebra 2</td>
<td>Financial Algebra</td>
</tr>
</tbody>
</table>

- Concurrently with Geometry, Algebra 2, or Precalculus
- Can be taken as an ELECTIVE
Why should students take Financial Algebra

- It is a chance for students who struggled in algebra and/or geometry to gain confidence in, and an appreciation for, mathematics.

- It allows solid mathematics students to use their mathematics savvy on a daily basis.

- All students *need* this material.

- It offers a mathematics course that addresses a current “hot topic” in education.

- It allows departments to graduate all students with 3 and 4 years of mathematics, and as a result could increase math enrollment.
There is an abundance of rich mathematics content in *Financial Algebra*. We are going to look at a sampling of some of the advanced algebra, precalculus and statistics that it covers, all with an Algebra 1 prerequisite.
Scatterplots, linear regression, modified boxplots, outliers, mean, median, range, interquartile range: What role can statistics play in negotiating an automobile purchase or sale?

Megan is selling a used Honda. The car has 60,000 miles on it and the price is $19,000. Megan comparison shops and finds these prices for the same car.

<table>
<thead>
<tr>
<th>Mileage, x</th>
<th>Price, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>21,000</td>
<td>$22,000</td>
</tr>
<tr>
<td>30,000</td>
<td>$19,000</td>
</tr>
<tr>
<td>40,000</td>
<td>$18,000</td>
</tr>
<tr>
<td>51,000</td>
<td>$16,700</td>
</tr>
<tr>
<td>55,000</td>
<td>$15,900</td>
</tr>
</tbody>
</table>

Brian compares 13 Chevy trucks: $8,500 $8,500 $8,500 $9,900 $10,800 $10,800 $11,000 $12,500 $12,500 $13,000 $13,000 $14,500 $23,000

![Modified Boxplot Example](image-url)
Mollie has 100/300/50 liability insurance, and $50,000 PIP insurance. She runs a stop sign and hits a telephone pole and bounces into a minivan with 8 people inside. Some are seriously hurt and sue her. Others have minor injuries. Three passengers in Mollie’s car are also hurt.

a. The pole will cost $7,000 to replace. Mollie also did $6,700 worth of damage to the minivan. What insurance will cover this, and how much will the company pay?

b. The minivan’s driver was a concert violinist. The injury to his hand means he can never work again. He sues for $4,000,000 and is awarded that money in court. What type of insurance covers this, and how much will the insurance company pay?

c. The minivan’s driver (from part b) had medical bills totaling $60,000 from his hospital trip and physical therapy after the accident. What type of insurance covers this, and how much will the insurance company pay?

d. The three passengers in Mollie’s car are hurt and each requires $12,000 worth of medical attention. What insurance covers this, and how much will the company pay?
AUTOMOBILE DEPRECIATION:
How does your car appreciate or depreciate; linearly, exponentially, or like a historical “bath tub”? 

STRAIGHT LINE DEPRECIATION-linear, with a negative slope. The x and y intercepts have specific interpretations.

Celine bought a new car for $33,600. She made a $4000 down payment and pays $560 each month for 5 years to pay off her loan. She knows from her research that the make and model of the car she purchased is straight-line depreciated over 10 years.
How can you model automobile loan and down payments and depreciation over a fixed period of time?
EXPONENTIAL DEPRECIATION-Students learn to model the fact that a car can lose a constant percent of its value each year.
Your speed can determine your financial liability in an auto accident.

• Simple arithmetic:
A car traveling 55 miles per hour covers 4840 feet per minute, or about 80 feet in one second. It covers 60 feet in the reaction time of \( \frac{3}{4} \) second!

• A quadratic function:
\[
\text{Braking Distance} = 5(0.1s)^2, \text{ where } s = \text{ speed}
\]

• A square root function:
\[
\text{Skid speed } S = \sqrt{30Dfn}
\]
S = speed entering skid; D = skid distance; f = drag factor (an index); n = braking efficiency (an index).
What is compound interest?

SAVINGS ACCOUNTS

Jennifer has a bank account that compounds interest daily at a rate of 3.2%. On the morning of Feb 10 the principal is $1,234.98. That day she withdraws $200 to pay for a car repair. Later that day she is mailed a $34 check from her health insurance company, and she deposits that in the bank. On Feb 11, she deposits her $345.77 paycheck. What is her balance at the end of the day on Feb 11?
### Students should get a feel for “getting interest on your interest” before deriving the compound interest formula.

<table>
<thead>
<tr>
<th></th>
<th>Feb 10</th>
<th>Feb 11</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Opening Balance</strong></td>
<td>$1,234.98</td>
<td>$1,069.07</td>
</tr>
<tr>
<td><strong>Deposit (+)</strong></td>
<td>$34.00</td>
<td>$345.77</td>
</tr>
<tr>
<td><strong>Withdrawal (-)</strong></td>
<td>$200.00</td>
<td>---</td>
</tr>
<tr>
<td><strong>Principal Used to Compute Interest</strong></td>
<td>$1,068.98</td>
<td>$1,414.84</td>
</tr>
<tr>
<td><strong>Day’s Interest rounded to the nearest cent</strong></td>
<td>$0.09</td>
<td>$0.12</td>
</tr>
<tr>
<td><strong>Ending Balance- (also tomorrow’s opening balance)</strong></td>
<td>$1,069.07</td>
<td>$1,414.96</td>
</tr>
</tbody>
</table>

After this introduction, students derive the compound interest formula

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

They use a calculator to evaluate

\[
e = \lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x
\]

and use \( B = Pe^{rt} \) for continuous compounding.
The Dalton Family wants to take out a $50,000, 10-year loan with an APR of 4.15%. What is the monthly payment?

The monthly loan payment formula must be carefully entered into a calculator—understanding the placement of the parentheses is crucial!

\[
M = \left( \frac{P \left( \frac{r}{12} \right) \left( 1 + \frac{r}{12} \right)^{12t}}{\left( \left( 1 + \frac{r}{12} \right)^{12t} - 1 \right)} \right)
\]
MORTGAGES: The mathematics is taught alongside the vocabulary.

adjustable rate mortgage
assessed value closing costs
back-end ratio balloon mortgage
debt-to-income ratio escrow
foreclose front-end ratio
homeowner’s insurance
interest only market value
mortgage property taxes
What is that “FICA” box on your paystub?

SOCIAL SECURITY & MEDICARE PAYROLL TAXES

For 2010, the Social Security Tax maximum salary was $106,800. If the tax rate was 6.2% of all gross earnings up to this maximum,

a) Express the 2010 Social Security Tax as a piecewise function.

b) Draw the graph of this function.

c) Identify and interpret the coordinates of the cusp.
Students interpret the two different slopes, define a cusp, and give the coordinates of the cusp.
How can you model and graph the tax schedules?

**FEDERAL TAXES**

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

<table>
<thead>
<tr>
<th>If your taxable income is:</th>
<th>But not over—</th>
<th>The tax is:</th>
<th>of the amount over—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0</td>
<td>$15,100</td>
<td>........</td>
<td>10%</td>
</tr>
<tr>
<td>15,100</td>
<td>61,300</td>
<td>$1,510.00 + 15%</td>
<td>15,100</td>
</tr>
<tr>
<td>61,300</td>
<td>123,700</td>
<td>8,440.00 + 25%</td>
<td>61,300</td>
</tr>
<tr>
<td>123,700</td>
<td>188,450</td>
<td>24,040.00 + 28%</td>
<td>123,700</td>
</tr>
<tr>
<td>188,450</td>
<td>336,550</td>
<td>42,170.00 + 33%</td>
<td>188,450</td>
</tr>
<tr>
<td>336,550</td>
<td>........</td>
<td>91,043.00 + 35%</td>
<td>336,550</td>
</tr>
</tbody>
</table>
If $f(x)$ represents the entire tax liability function for married taxpayers filing jointly, then this tax schedule can be written in piecewise function notation as:

$$f(x) = \begin{cases} 
0.10x & \quad 0 < x \leq 15100 \\
1510 + 0.15(x - 15100) & \quad 15100 < x \leq 61300 \\
8440 + 0.25(x - 61300) & \quad 61300 < x \leq 123700 \\
24040 + 0.28(x - 123700) & \quad 123700 < x \leq 188450 \\
42170 + 0.33(x - 188450) & \quad 188450 < x \leq 336550 \\
91043 + 0.35(x - 336550) & \quad x > 336550 
\end{cases}$$
For taxable incomes over $61300 but not over $123700, the equation is stated as

\[ f(x) = 8440 + 0.025(x - 61300) \]

Distribute and combine like terms to get

\[ y = mx + b \text{ form:} \quad f(x) = 0.25x - 6885 \]

This is what the IRS uses on the tax worksheet:

<table>
<thead>
<tr>
<th>Taxable income. If line 43 is—</th>
<th>Enter the amount from line 43</th>
<th>(b) Multiplication amount</th>
<th>(c) Multiply (a) by (b)</th>
<th>(d) Subtraction amount</th>
<th>Tax. Subtract (d) from (c). Enter the result here and on Form 1040, line 44</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least $100,000 but not over $123,700</td>
<td>$</td>
<td>$\times25%\ (.25)$</td>
<td>$</td>
<td>$6,885.00</td>
<td>$</td>
</tr>
<tr>
<td>Over $123,700 but not over $188,450</td>
<td>$</td>
<td>$\times28%\ (.28)$</td>
<td>$</td>
<td>$10,596.00</td>
<td>$</td>
</tr>
<tr>
<td>Over $188,450 but not over $336,550</td>
<td>$</td>
<td>$\times33%\ (.33)$</td>
<td>$</td>
<td>$20,018.50</td>
<td>$</td>
</tr>
<tr>
<td>Over $336,550</td>
<td>$</td>
<td>$\times35%\ (.35)$</td>
<td>$</td>
<td>$26,749.50</td>
<td>$</td>
</tr>
</tbody>
</table>
How can you set up an expense and a demand function?

The accounting department has calculated that this new widget could be the biggest product to hit the market in years!

- They anticipate that the fixed costs to make the product will be $160,000 and the variable cost will be $150 per widget.

- The market research department conducted surveys from retail outlets that would potentially buy the widgets. In these ordered pairs, the first number represents the possible price and the second number represents the quantity demanded. The points are listed as (p, q).

(300, 10000), (325, 8900), (350, 8800), (375, 8650), (400, 6700), (425, 6500), (450, 5000), (475, 4500), (500, 4450), (525, 3000)
Using Linear Regression, the demand equation is

\[ q = -30.74p + 19330 \]

Using the concept of fixed and variable costs, the expense equation is

\[ E = 150q + 160000 \]
How can Revenue be expressed in terms of price?

The amount of revenue generated by the sale of $q$ widgets at a price of $p$ dollars per widget is the product of $p$ and $q$.

$$R = pq$$

Recall that $q$ is a function of $p$, so the revenue function’s graph is a concave down parabola.
How can profit be modeled as the difference between a quadratic and linear function?

Profit = Revenue - Expense
Mike’s bedroom measures 16 feet by 14 feet, and has a 9-foot ceiling. It is well-insulated, and is on the west side of his house. He wants to purchase an air conditioner. How large an air conditioner should he purchase?

\[
\text{BTU rating} \approx \frac{\text{while}}{60}
\]

where

\[
l, w, h = \text{length, width, height}
\]

\[
i = \text{insulation (an index)}
\]

\[
e = \text{exposure (an index)}
\]
Combining piecewise functions and the greatest integer function to model CELL PHONE EXPENSES!

A cell phone calling plan has a basic charge per month, which includes a certain amount of free minutes. There is a charge for each additional minute. The split function below gives the price $f(x)$ of an $x$-minute phone call. Fractions of a minute are charged as if they were a full minute.

$$f(x) = \begin{cases} 
40 & \text{if } x \leq 750 \\
40 + 0.35(x - 750) & \text{if } x > 750 \text{ and } x \text{ is an integer} \\
40 + 0.35([x - 750]+1) & \text{if } x > 750 \text{ and } x \text{ is not an integer}
\end{cases}$$

Describe the cost of the plan by interpreting the split function.
Combining the dozens of expenses addressed in the first nine chapters:

**SPREADSHEETS & HOUSEHOLD BUDGETS**

<table>
<thead>
<tr>
<th>Mortgage</th>
<th>Cell phone</th>
<th>Auto repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings</td>
<td>Land line phone</td>
<td>Landscape maintenance</td>
</tr>
<tr>
<td>Groceries</td>
<td>Water</td>
<td>Plumber</td>
</tr>
<tr>
<td>Dining out</td>
<td>Sanitation</td>
<td>Clothing</td>
</tr>
<tr>
<td>Car loan</td>
<td>Medical Insurance</td>
<td>Life Insurance</td>
</tr>
<tr>
<td>College loan</td>
<td>Auto Insurance</td>
<td>Tuition</td>
</tr>
<tr>
<td>Personal loan</td>
<td>Homeowner’s insurance</td>
<td>Vacation expenses</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Cable TV/Internet</td>
<td>Gifts to charity</td>
</tr>
<tr>
<td>Electricity</td>
<td>Entertainment</td>
<td>Property taxes</td>
</tr>
<tr>
<td>Oil</td>
<td>Credit card payment</td>
<td>Income taxes, etc.</td>
</tr>
<tr>
<td>Natural gas</td>
<td>Medical bills</td>
<td></td>
</tr>
</tbody>
</table>
What are the essential elements of a Financial Algebra classroom?

How is it the same as a “typical” math class?
Do now, motivation, development, model problems, practice, and applications problems.

How does it differ?
DISCUSSION
PASSION
READING
HIGHLIGHTING
QUOTES
USING OUTSIDE RESOURCES
PROJECTS.
OCCASIONALLY ADMITTING “I don’t know—let’s find out!”
Really? Really! grasps students’ attention by discussing a fascinating real-life topic related to the chapter content.
Instructional Model

Each section opens with the statement of an ESSENTIAL QUESTION.

3-7 Future Value of Investments
How can you effectively plan for the future balance in an account?

5-9 Accident Investigation Data
What data might a car leave behind at the scene of an accident?

6-4 Employee Benefits
What are the benefits of a job?
Each lesson begins with a discussion of terms and concepts related to the lesson topic.
Skills and Strategies, teaches the math concepts through worked-out examples. Several examples teach each math concept step-by-step.

All math concepts are taught within real-life context. *When am I ever going to use this in real-life?* is answered here!
Check Your Understanding allows students to immediately practice the concept on their own.

Extend Your Understanding provides an opportunity to solve a more challenging problem.
Carefully developed applications at the end of each lesson require students to apply concepts learned in the section.

I believe non-dividend stocks aren’t much more than baseball cards. They are worth what you can convince someone to pay for them.

Mark Cuban, Billionaire businessman

1. Based on what you learned about dividends, why are non-dividend stocks compared to baseball cards?
2. Years ago, Home Depot had an annual dividend of $0.90. If you owned 4,000 shares of Home Depot, how much did you receive annually in dividends?
3. Barnes and Noble had a $1.00 annual dividend during 2008. If you owned 500 shares of Barnes and Noble, how much did you receive on a quarterly dividend check?
4. If you owned $r$ shares of a stock that had an annual dividend of $p$ dollars, express the amount of your quarterly dividends algebraically.
5. The quarterly dividend for Tiffany, a jewelry company, was $0.17 during the second quarter of 2008. What was the annual dividend for 2,000 shares?
6. Mike owned 3,000 shares of Merck Corporation and received a quarterly dividend check for $1,140. What was the annual dividend for one share of Merck?
7. Jean owned a shares of a corporation and received a quarterly dividend check for $y$ dollars. Express the annual dividend for one share algebraically.
8. The Walt Disney Company paid a $0.35 annual dividend on a day it closed at a price of $33.86 per share.
   a. What was the annual dividend for 500 shares?
   b. What was the quarterly dividend for 500 shares?
   c. Express the yield as a fraction.
   d. What was the yield, rounded to the nearest tenth of a percent?

<table>
<thead>
<tr>
<th></th>
<th>Price Per Share</th>
<th>Annual Dividend</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37.12</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>44.55</td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>65.29</td>
<td>2.01</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>14.35</td>
<td>0.48</td>
<td></td>
</tr>
</tbody>
</table>

9. You own $k$ shares of a stock that is selling for $x$ per share. The quarterly dividend is $y$ per share.
   a. Express the annual dividend for one share algebraically.
   b. Express the annual dividend for all $k$ shares algebraically.
   c. Express the yield as an algebraic fraction.
10. The spreadsheet can be used to compute the yield. Write the formula that can be used to compute the yields in cell C2.
Examine the graph below. Write a short newspaper-type article centered around this graph. You can find an electronic copy at www.cengage.com/school/math/financialalgebra. Copy and paste it into your article.

Apple Computers

<table>
<thead>
<tr>
<th>Closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
</tr>
<tr>
<td>185</td>
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<tr>
<td>180</td>
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<tr>
<td>175</td>
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<tr>
<td>170</td>
</tr>
<tr>
<td>165</td>
</tr>
<tr>
<td>160</td>
</tr>
</tbody>
</table>

2-Month Span

May     June
1. Choose a corporation that you are interested in following. Use the newspaper or Internet to find the daily low, high, close, and volume of your stock for the next three weeks. Set up a graph to record these prices and the volume. Discuss the trends for the three-week period. During the three weeks, check the corporation’s website for major news about the corporation. Discuss the trend over the three-weeks and include any major corporate news that might have affected the trend.

2. Contact the New York Stock Exchange by mail or through the website. Request a list of publications that the Exchange offers.

3. Survey your classmates and compile a list of questions your class has about stocks. Compile a list of the top five stocks they are interested in. Call a local stock broker and request an appointment for a short meeting. Interview the broker. Ask the broker why these stocks may or may not be a good investment. Report your findings.

4. Visit a local bank and ask to speak to one of the representatives about United States Savings Bonds. Find out about the forms necessary to purchase a bond, the interest it pays, and how long the bonds take to reach their face value. Prepare a report and present your findings to the class.
Dollars and Sense guides students to the companion website where they will find up-to-date information and activities related to the chapter content.

Go to www.cengage.com/school/math/financialalgebra where you will find a link to a website containing current issues about the stock market.
Meaningful applications at the end of each chapter require students to apply concepts that were taught throughout the chapter.

Applications

1. Nick and Matt are the partners in a local health food store. They needed $73,000 to start the business. They invested in the ratio 3:7.
   a. How much money did each invest?
   b. What percent of the business was owned by Matt? Round to the nearest tenth of a percent.

2. Tom purchased shares of DuPont for $47.65 per share. He plans to sell them when the price rises 20%. At what price will he sell his shares?

3. The top three shareholders each own $x$ shares of a certain stock. The corporation's ownership is represented by a total of $x$ shares of stock. Express the percent of the corporation owned by the top three shareholders algebraically.

4. Marilyn purchased 2,000 shares of stock for $25.43 per share. She sold them for $44.10 per share. Express her capital gain to the nearest tenth of a percent.

5. A local hairdresser bought 450 shares of a cosmetics corporation for $33.50 per share. He sold them for $39.01 per share.
   a. What was the percent increase in the price per share? Round to the nearest tenth of a percent.
   b. What was the total purchase price for the 450 shares?
   c. What was the total selling price for the 450 shares?
   d. What was the percent capital gain for the 450 shares? Round to the nearest tenth of a percent.

6. Deanna purchases $24,000 worth of stock and pays her broker a 1% broker fee. She sells it when it increases to $29,100 three years later and uses a discount broker who charges $35 per trade. Compute her net proceeds after the broker fees are taken out.

7. The Revreg Corporation paid Leslie a quarterly dividend check for $828. Leslie owns 450 shares of Revreg. What was the quarterly dividend for one share of Revreg?

8. Aaron owned $x$ shares of a corporation and received an annual dividend of $y$ dollars. Express the quarterly dividend for one share algebraically.

9. The Zyco Corporation pays an annual dividend of $2.10 per share. On Tuesday it closed at $72 per share with a net change of +0.95. The dividend has remained at $2.10 for several months.
   a. What was the yield on Tuesday? Round to the nearest tenth of a percent.
   b. At what price did Zyco close on Monday?
   c. What was the yield on Monday? Round to the nearest tenth of a percent.
A relevant quote and chapter introduction set the stage for the topics covered in the chapter.

The Stock Market

1-1 Business Organization
1-2 Stock Market Data
1-3 Stock Market Data Charts
1-4 Simple Moving Averages
1-5 Stock Market Ticker
1-6 Stock Transactions
1-7 Stock Transaction Fees
1-8 Stock Splits
1-9 Dividend Income

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
- smoothing techniques
- simple moving average (SMA)
- arithmetic average (mean)
- lagging indicators
- fast moving average
- slow moving average
- crossover

Never try to walk across a river just because it has an average depth of four feet.

Milton Friedman, American economist

In the future, you will incur many expenses, such as a home, automobile, insurance, food, clothing, and health care. Some are major expenses and some are minor, but each costs money. To have money for major expenses, it helps to have your savings grow in value. Investing can help money grow in value.

You need to find a personal balance between risk and reward when you make choices about investments. Investments are never without questions. Did you miss the chance to make more money because you were being overly cautious? Was the investment too risky? Did you risk losing too much money by investing in something that may not have had a sound foundation?

Investors struggle with these questions every day. The stock market is a forum in which the investment risk/reward balance is put to the test. Will the market advance? Will the market decline? No one can be certain. With a strong knowledge of the stock market, you as an investor can make decisions that are based on experience, data, trends, and mathematics.
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Use the following ticker to answer Exercises 1 - 6. The stock symbols represent the corporations: C, Citigroup Inc; BAC, Bank of America; F, Ford Motor Corp; and MOT, Motorola.

MOT 4.22K @ 8.38 ▼ 0.16  BAC .65K @ 15.28 ▲ 1.11

F 61.8K @ 9.67 ▼ 2.07  C 76K @ 3.42 ▲ 0.09

1. Millie is following the trades of Motorola. The result of the latest trade is posted on the ticker.
   a. How many shares of MOT were traded and at what price per share?
   b. What was the value of the MOT trade?
   c. Suppose the next MOT trade represents a sale of 1,200 shares at a price that is $0.23 lower than the last transaction. What will Millie see scrolling on the ticker for this transaction?

2. Susan sold her Bank of America shares as indicated on the ticker above.
   a. How many shares did she sell?
   b. For how much did each share sell?
   c. What was the total value of all the shares Susan sold?
   d. Suppose that the next BAC trade that comes across the ticker represents a sale of 34,000 shares at a price that is $2.31 higher than the last transaction. What will Susan see scrolling across her screen for this transaction of BAC?

3. How many shares of Ford are indicated on the ticker?

4. What is the total value of all of the Citigroup shares traded?

5. Interpret each of the following.
   a. @3.42
   b. MOT 4.2K
   c. ▲1.11

6. What was the previous day’s closing price for each stock?
Workbook

11. How much interest would you earn in one day at a rate of 3.75% compounded daily?

12. Mrs. Huber opened a savings account on June 26 with a $1,300 deposit. The account pays 3.6% interest compounded daily. On June 27, she deposited $450 and on June 28 she withdrew $110. Complete the table based on Mrs. Huber’s banking activity.

<table>
<thead>
<tr>
<th>Opening balance</th>
<th>Deposit</th>
<th>Withdrawal</th>
<th>Principal used to compute interest</th>
<th>Interest</th>
<th>Ending balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 26</td>
<td></td>
<td>b.</td>
<td>c.</td>
<td>d.</td>
<td>e.</td>
</tr>
<tr>
<td>June 27</td>
<td></td>
<td>g.</td>
<td>h.</td>
<td>i.</td>
<td>j.</td>
</tr>
<tr>
<td>June 28</td>
<td></td>
<td>---</td>
<td>l.</td>
<td>m.</td>
<td>n.</td>
</tr>
</tbody>
</table>

13. Mr. Nolan has a bank account that compounds interest daily at a rate of 3.7%. On the morning of December 7, the principal is $2,644.08. That day he withdraws $550 to pay for a snow blower. Later that day he receives a $934 paycheck from his employer, and he deposits that in the bank. On December 8, he withdraws $300 to go holiday shopping. What is his balance at the end of the day on December 8?

14. Mrs. Platt has an account that pays p percent interest compounded daily. On April 27, she had an opening balance of b dollars. Also on April 27, she made a w dollars withdrawal and a d dollars deposit. Express her interest for April 27 algebraically.

15. This morning, Mrs. Rallan had a balance of b dollars in an account that pays 3.05% interest compounded weekly. This afternoon she makes a withdrawal in the amount of w dollars. Express her interest for the day algebraically.

16. Kristin deposited $9,000 in an account that has an annual interest rate of 4.1% compounded monthly. How much interest will she earn at the end of one month?

17. How much would $25,000 earn in one hour at the rate of 5% compounded hourly?

18. The Jules Center Scholarship Fund gives a graduation award of $250 to a graduating senior at North End High School. Currently the fund has a balance of $8,300 in an account that pays 5.2% interest compounded annually. Will the amount earned in annual interest be enough to pay for the award?

19. Kelly has d dollars in an account that pays 3.4% interest compounded weekly. Express her balance after one week algebraically.

20. 3-5 Compound Interest Formula

Exercises
Round to the nearest cent wherever necessary.

1. Mr. Mady opens a savings account with a principal p dollars that pays 4.11% interest compounded quarterly. Express his ending balance after one year algebraically.

2. Jeff deposits $2,300 at 3.13% interest compounded weekly. What will be his ending balance after one year?

3. Nancy has $4,111 in an account that pays 3.07% interest compounded monthly. What is her ending balance after two years?

4. Mr. Weinstein has a savings account with a balance of $19,211.34. It pays 4% interest compounded daily. What is his ending balance after three years, if no other deposits or withdrawals are made? How much interest does he earn over the three years?

5. If you invested $10,000 at 3.8% compounded hourly for five years, what would be your ending balance?

6. Danielle has a CD at Cross Bank. She invests $22,350 for four years at 4.55% interest compounded monthly. What is her ending balance? How much interest did she make?

7. Ms. Santoro is opening a one-year CD for $16,000. The interest is compounded daily. She is told by the bank representative that the annual percentage rate (APR) is 4.8%. What is the annual percentage yield (APY) for this account?

8. Knob Hill Savings Bank offers a one-year CD at 3.88% interest compounded daily. What is the APY for this account? Round to the nearest hundredth of a percent.

9. Kings Park Bank is advertising a special 5.08% APR for CDs. Kevin takes out a one-year CD for $24,000. The interest is compounded daily. Find the APY for Kevin’s account.

10. Imagine that you invest $100,000 in an account that pays 5.9% annual interest compounded monthly. What will your balance be at the end of 10 years?

11. Yuriy invests $88,000 in a CD that is locked into a 4.75% interest rate compounded monthly, for seven years. How much will Yuriy have in the account when the CD matures?
1-1 Business Organization

Key Words

- capital
- corporation
- limited liability
- partnership
- personally liable
- profit
- public corporation
- sole proprietorship
- shareholders
- shares of stock
- percent

Key Math Concepts

- Multiply a decimal by 100 to change it to a percent. Then insert a \( \% \) sign.
- Divide a percent by 100 to change it to a decimal. Then remove the \( \% \) sign.
- \[
    \text{amount of investment} \div \text{total investment} = \text{percent of investment}
    \]

Guided Exercises

1. The Metropolitan Corporation has issued a total of 2,400,000 shares. The North Side Investment Group owns 7.5% of these shares. How many shares does North Side own?

   \[
   \text{Total number of shares} \times \text{Percent} = \text{Number of shares owned}
   \]

   \[
   2,400,000 \times 0.075 = \text{Number of shares owned}
   \]

   North Side Investment Group owned \( \frac{180,000}{2,400,000} \) shares.

2. Enid, Eve, and Tammy have formed a partnership. The total investment was $400,000. Enid owns 35.4% and Eve owns 28.6% of the partnership. How much did Tammy invest?

   \[
   (\text{Enid} + \text{Eve} + \text{Tammy}) \% = 100\%
   \]

   \[
   \frac{\text{Total partnership}}{100} = 100
   \]

   \[
   100 - 35.4 - 28.8 = \text{Tammy invested}\%
   \]

   Tammy invested \( \frac{x}{100} \% \) in the partnership.

   \[
   \text{Amount of total investment} \times \text{Tammy's percent} = \text{Amount Tammy invested}
   \]

   \[
   \frac{x}{100} \times \frac{400,000}{100} = \text{Amount Tammy invested}
   \]

   Tammy invested \( \frac{23,600}{400,000} \) in the partnership.

Exercises

3. Three partners are investing a total of $1,200,000 in a new restaurant. Their investments are in the ratio of 6:8:11. How much did each invest?

4. Dennis owns 24% of a partnership. Bob owns 48% of the partnership. If Rich is the third partner, what percent of the partnership does he own? Write a simplified ratio to represent their investments in the partnership.

5. Angel owns \( \frac{5}{6} \) of a partnership in a bakery. What percent of the bakery does Angel own? Angel's partner, Lisa, owns the remaining portion of the bakery. Write a simplified ratio to represent Angel's ownership to Lisa's ownership in the bakery.

6. The Barnaby Corporation issued 2,700,000 shares of stock. How many shares must a shareowner own to have a majority of the shares?

7. Mike, Rob, Jon, and Kristy own shares in the Arlington Partnership in the ratio of \( abcd \) respectively. Arlington is now worth \( f \) dollars. Write an algebraic expression for the percent of the partnership that represents Mike's investment.
Financial Algebra

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Example 1

Michelle invests $15,000 in a partnership that has four other partners. The total investment of all partners is $240,000. What percent of the business does Michelle own?
Interactive Whiteboard Presentations

1. sole proprietorship
2. personally liable
3. partnership
4. capital
5. profit

1. A business that is owned by one person. A business owner who is personally responsible for the debts of the business whether or not there is a profit.

2. A business that is owned by more than one person; partners are each personally liable for the business.

4. Money that is used to start or expand a business.

5. When expenses are subtracted from revenue.
Chapter 1 Test

True/False
Indicate whether the statement is true or false.

1. In a reverse stock split, the number of outstanding shares is reduced while the market price per share stays the same.
2. Comanche Ltd closed at $15.69, a $0.45 decrease from the closing price the day before. This is a 2.0% decrease.
3. A crossover occurs when the moving average crosses over another, indicating that the faster moving average should be followed. Crossovers below a moving average average.
4. When there is a fractional part of a share, the company will buy or sell the fractional shares at the fraction of a share.
5. Vito owns 1,000 shares of a stock before the corporation instituted a 5-for-3 split. The stock was selling at $11.87 a share. Vito now has 300 shares of the stock that is worth $3,561.
6. Xavier bought 4,000 shares of XYZ stock at $17.37 per share. This price was the stock's closing price for the day. The trader for this transaction will appear in XYZ 40.
7. One share of Keno's common stock pays an annual dividend of $1.45. The stock price is $40.72. The stock yield at yesterday's closing price is about 3.6%.
8. Rebecca correctly calculated the 3-day SMA of these stock prices: $1.14, $1.27, and $1.30.
9. Leon purchased 5,000 shares of stock at a price of $14.45 a share. He sold them at $19.78 a share. His capital gain is about 58%.
10. Reasons placed a limit order. This means the specified price that the stock does not fall to that price, then they are not purchased.

Multiple Choice
Identify the choice that best completes the statement or answers the question.

11. The stock bar chart shows price and volume information for Medco He January 12. What was the opening price?

   - a. $45.92
   - b. $41.14
   - c. $41.60
   - d. $40.92

12. A candlestick chart is a type of stock price chart. The real body is displayed in black and white for that day. What does it mean if the real body is red?
   a. The stock closed higher than the opening price.
   b. The stock closed at the opening price.
   c. The stock closed lower than the opening price.
   d. The stock opened higher than the opening price.

13. On July 3, the ABC corporation closed at $45.67, This was a $0.47 increase from the closing price the day before. What percent change is this?
   a. +9.32%
   b. +1.09%
   c. +9.85%
   d. +0.79%

14. Eleanor purchased $2,568 worth of stock and paid a 0.5% fee. She sold the stock when the stock price increased to $3,298. Using an online broker that charged $7 per trade. What are her net proceeds?
   a. $735.54
   b. $735.68
   c. $735.48
   d. $735.52

23. McNeal buys 250 shares of stock for $12 a share and pays a 2% commission. She sells the stock 3 years later for $18 a share and pays a 1% commission. What are her net proceeds?
24. Quentin bought a number of shares for X dollars and paid a 1% commission. He sold the stock for Y dollars and paid a flat fee of $Y. Express Quentin's net proceeds algebraically.
25. Katelyn owns 140 shares of a stock that sells for $39 a share before a 1-for-3 split is announced. After the split, how many shares of the stock will Katelyn own and what will they be worth?
26. Mrs. Thomas owns 1/20 shares of a corporation that pays a quarterly dividend of $0.36 a share. How much in dividends did she receive last year?
27. The information was posted at the end of the trading day on June 12.

<table>
<thead>
<tr>
<th>52-week High</th>
<th>52-week Low</th>
<th>Stock</th>
<th>Last</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>66.95</td>
<td>50.34</td>
<td>ABC Inc</td>
<td>53.75</td>
<td>+ 0.50</td>
</tr>
<tr>
<td>120.00</td>
<td>100.50</td>
<td>XYZ Corp</td>
<td>207.21</td>
<td>+ 7.54</td>
</tr>
<tr>
<td>145.90</td>
<td>113.38</td>
<td>CAT Ltd</td>
<td>134.48</td>
<td>+ 8.92</td>
</tr>
</tbody>
</table>

What was the closing price of CAT Ltd on June 11?
28. A certain corporation listed their sales in 1600 as 1700. What was their actual volume in hundreds?
29. The information released on a particular corporation at closing shows a Chg of 2.35. What does this mean?
30. The stock bar chart shows the market action for Dell during the week of May 4.
On July 3, the ABC corporation closed at $43.67. This was a $0.47 increase from the close the day before. What percent change is this?

- a. +9.91%
- b. −1.09%
- c. +1.09%
- d. −1.07%