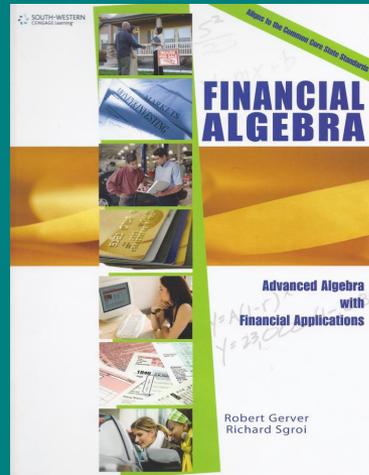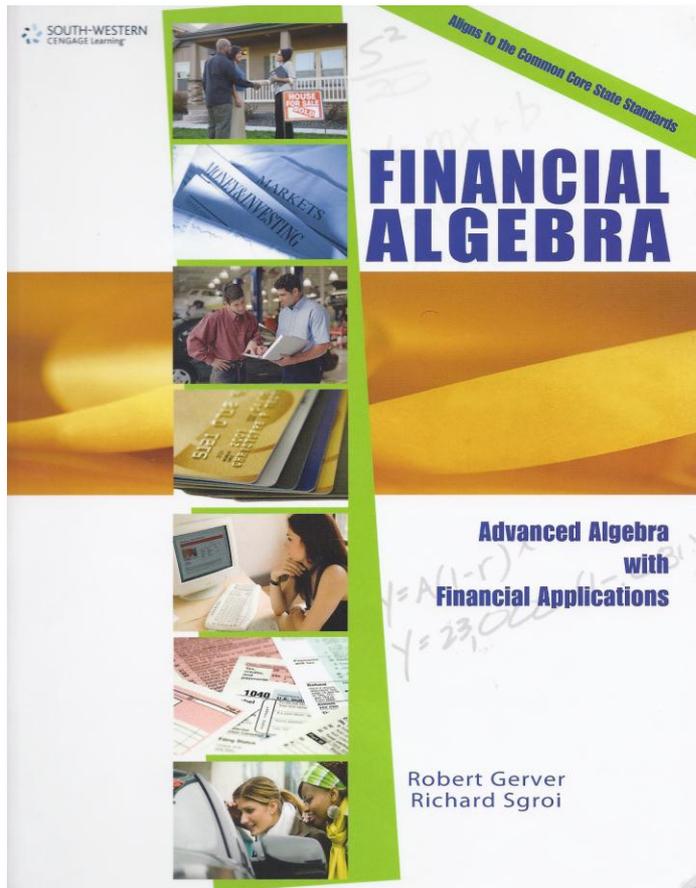# Advanced Algebra With Financial Applications: A 3rd/4th Year High School Math Course Using *Financial Algebra*

Richard Sgroi, Ph.D.
dr.rsgroi@gmail.com

Everything in this presentation, and much, much more, is contained in the textbook.

Financial Algebra

Gerver/Sgroi

WHICH ARE YOUNG ADULTS LIKELY TO KNOW MORE ABOUT?

APR or **APP?**

The Latest CD rate or The Latest CD?

%

iRS or **iRA** or **iPad?**

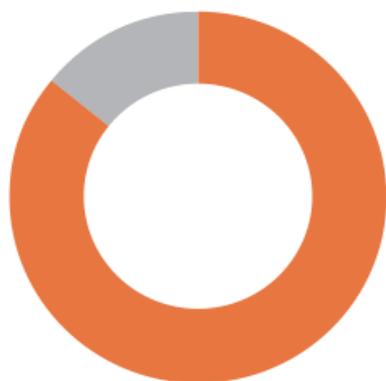**FICO** FICO SCORE 700 625 575 450 **FICA** SOCIAL SECURITY **FACEBOOK** f

2011 TEENS & MONEY SURVEY FINDINGS
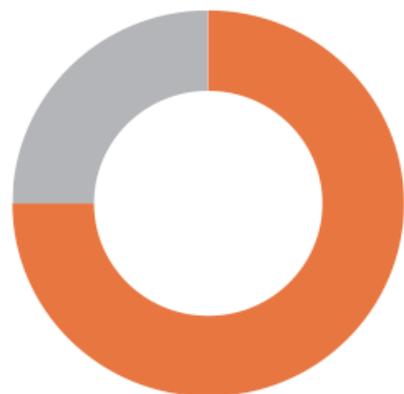
INSIGHTS INTO MONEY ATTITUDES, BEHAVIORS AND EXPECTATIONS OF 16- TO 18-YEAR-OLDS

MOST TEENS ARE INTERESTED IN LEARNING MORE ABOUT MONEY

86%

SAY THEY WOULD RATHER LEARN ABOUT MONEY MANAGEMENT IN A CLASS BEFORE MAKING MISTAKES IN THE REAL WORLD.

75%

SAY THAT LEARNING MORE ABOUT MONEY MANAGEMENT, INCLUDING BUDGETING, SAVING AND INVESTING, IS ONE OF THEIR TOP PRIORITIES.

WHAT *DO* YOU KNOW?

WHAT *SHOULD* YOU KNOW?

SURVEY SAYS……

Who won the World Series last year?

Who performed at the last Super Bowl half time show?

What collision deductible do you have on your car insurance?

What comedienne portrayed Sara Palin on SNL?

How much would $1000 grow into, at 100% interest, compounded continuously, for one year?

What was the average daily balance on your last credit card statement? How many days are in your billing cycle?

Name two of the judges on AMERICAN IDOL?

What is the difference between APR and APY?

What is a progressive tax system?

What was the highest Federal income tax rate in the 80s?

What is the best way to verify the existence of your belongings in case of theft or fire?

What is your FICO score?

The New York Times   April 9, 2010

- *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.*

From the Common Core State Standards for Mathematics
Appendix A:
Designing HS Math Courses Based on the CCSS

"A menu of challenging options should be available for students after their third year of math—and all students should be strongly encouraged to take math in all years of high school. Traditionally... students are expected to take precalc. This is a good and worthy goal, but should not be the only option...An array of challenging options will keep math relevant for students, and give them a new set of tools for their futures..."

A Radical Idea To Transform What Kids Learn In School *by Marion Brady*

America needs good mathematicians.

How many? The U.S. Bureau of Labor Statistics says, "Employment of mathematicians is expected to increase by 16 percent from 2010 to 2020. There will be competition for jobs because of the small number of openings in this occupation."

Take math teachers out of the mix, and the number of mathematicians America needs is tiny. If one kid in each high school in the country became a professional mathematician, it would glut the market.

Running every kid in America through the math gauntlet to get a handful of mathematicians is like buying a bakery to get a loaf of bread.

FINANCIAL LITERACY AND IGNORANCE
WHAT DO PEOPLE ACTUALLY KNOW ABOUT PERSONAL FINANCE? NOT MUCH, IT SEEMS…
Annamaria Lusardi, Dartmouth College
annalusardi.blogspot.com/

THREE REASONS TO TEACH FINANCIAL LITERACY IN SCHOOLS

1 – It is important to be financially literate BEFORE engaging in financial contracts and NOT AFTER!

2 – Financial knowledge is based on scientific concepts…and the groundwork for this sort of conceptual understanding is BEST LAID IN A FORMAL EDUCATIONAL SETTING.

3 – Current studies show that financial literacy is UNEQUALLY DISTRIBUTED in the young population…[We should] give everyone a chance to learn it.

THE
ALGEBRA / FINANCE
RELATIONSHIP

☑ **MATHEMATICAL MODELING**

☑ **INDEPENDENT & DEPENDENT VARIABLES**

☑ **MULTIPLE REPRESENTATIONS –**
VERBAL, PICTORIAL, GRAPHICAL, SYMBOLIC

☑ **USING STATISTICS TO ANALYZE DATA AND**
MAKE PREDICTIONS

REAL WORLD - REAL MATH

# AAWFA: What? Who? Where? Why? How? When?

- **What** is **AAWFA**?
- **Who** is the target audience for **AAWFA**?
- **Where** might **AAWFA** fit in the sequence?
- **Why** should a student take **AAWFA**?
- **Why** do students enjoy **AAWFA**?
- **How** does **AAWFA** differentiate instruction?
- **When** "are we ever going to use this?"

WHAT IS ADVANCED ALGEBRA WITH FINANCIAL APPLICATIONS?

- 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 employs **spreadsheets** and the **graphing calculator**.

--------TOPICS COVERED IN THE TEN CHAPTERS---------

-Investments- Starting Your Own Business- Banking

-Credit- Automobile Ownership- Employment Basics

-Income Taxes- Home Ownership- Retirement-Budgeting
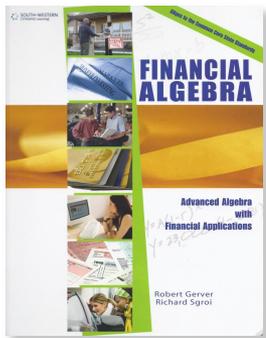
# WHO IS THE TARGET AUDIENCE?

- **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**

- **Students who failed Algebra 2, and need another math course.**

WHERE CAN AAWFA FIT IN THE SEQUENCE?

| Freshman	Sophomore	Junior	Senior
Algebra 1	AAWFA	Geometry	Algebra 2
Algebra 1	Geometry	AAWFA	Algebra 2
Geometry	Algebra 2	PreCalc/AAWFA	Calculus
Geometry	Algebra 2	AAWFA	Precalculus*
Algebra 1	Geometry	Algebra 2	AAWFA
-------TWO YEAR ALGEBRA------		Geometry	AAWFA
Algebra 1	--------TWO-YEAR GEOMETRY-----------		AAWFA

*Customize your senior course—a fall semester of matrices, polar coordinates, limits, etc., and then a spring semester of five topics of AAWFA—Automobiles, Employment, Income Taxes, Credit and Banking.

AAWFA can be taken concurrently with Geometry, Algebra 2, or Precalculus, and it can be taken as an ELECTIVE.
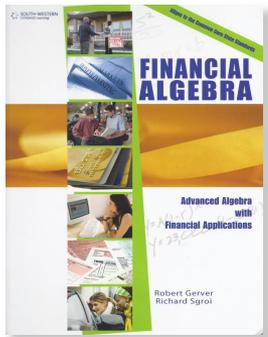
WHY SHOULD STUDENTS TAKE ADVANCED ALGEBRA WITH FINANCIAL APPLICATIONS?

- 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.
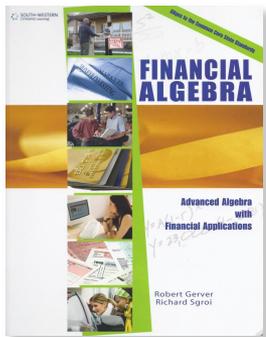
HOW DOES ADVANCED ALGEBRA WITH FINANCIAL APPLICATIONS DIFFERENTIATE INSTRUCTION?

- The problem sets generally graduate in difficulty level, making developing appropriate assignments a teacher-friendly process.

- Projects allow students to demonstrate knowledge in many alternative ways.

- Projects can be completed at many different skill levels.

- Sections and chapters can be skipped without loss of continuity.

- The course offering allows students to demonstrate mastery of rigorous math concepts in a format alternative to the traditional course path.

- Order of presentation of chapters can be changed.
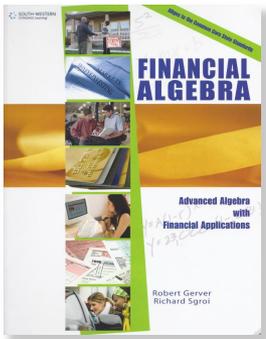
WHY DO STUDENTS LIKE ADVANCED ALGEBRA WITH FINANCIAL APPLICATIONS?

- It treats them like an adult with age-level interest material.
- It finally gives them a place to see where they NEED mathematics.
- It gives them a chance to use their mathematical skills to save them money.
- The motivational topics are of current interest to them.
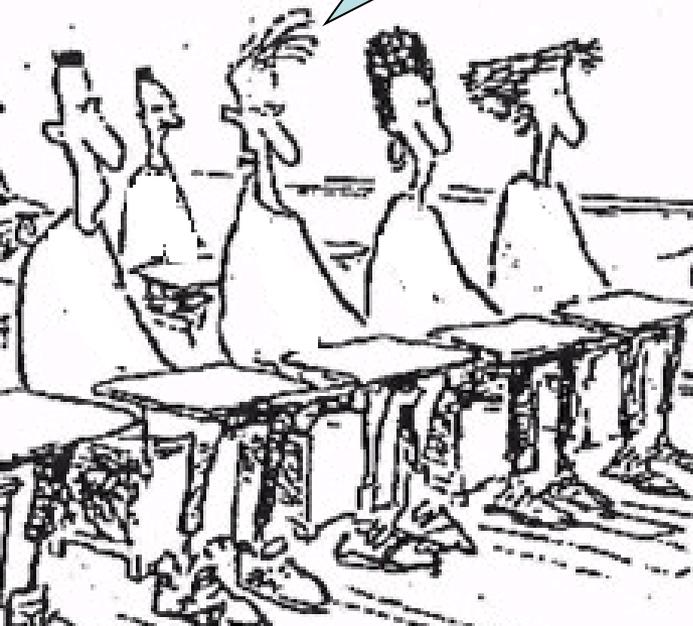- They have a chance to discuss, comment, and argue in a mathematics class.

WHERE IS FINANCIAL ALGEBRA BEING USED?

School	City	State
DENVER CENTER FOR INTL STUDIES	DENVER	CO
DENVER PUBLIC SCHOOL DIST 1	DENVER	CO
EAST HIGH SCHOOL	DENVER	CO
FRED N THOMAS CAREER EDUC CTR	DENVER	CO
GEORGE WASHINGTON HIGH SCHOOL	DENVER	CO
JOHN F KENNEDY		
NORTH HIGH SCH		
SOUTH HIGH SCH		
SOUTH HIGH SCH		
THOMAS JEFFERS		
WEST HIGH SCHO		
BERLIN HIGH SCH		
HENRY ABBOTT		
EAST HAVEN HIG		
HADDAM-KILLING		
ACADEMY OF INF		
EDWIN O SMITH		
STAPLES HIGH SC		
FRIENDSHIP COLL		
CAPE HENLOPEN		
INDIAN RIVER SC		
ORANGE CO SCH		
APOPKA HIGH SC		
WEKIVA HIGH SC		
AUBURNDALE HIG		
BARTOW SENIOR		
Not Specified		
SOUTH TECH CM		
SOUTH TECH CM		
MANATEE HIGH S		
MANATEE TECHN		
BRANFORD HIGH		
CENTRAL HIGH S		
HERNANDO HIGH		
NATURE COAST		
STAR EDUCATION		
COACHMAN FUND		
COUNTRYSIDE HI		
COCOA HIGH SCH		
SPACE COAST JR		
SPACE COAST JR		
COCOA BEACH JR		
Not Specified		
MONARCH HIGH S		
DIXIE CO HIGH SC		
PASCO HIGH SCH		
RIDGE COMM HIG		
MAINLAND HIGH		
SEABREEZE HIGH		
DELAND HIGH SC		
DELTONA HIGH S		
PINE RIDGE HIGH		
TRINITY CHRISTIA		
DUNEDIN HIGH SC		

School	City	State
EFFINGHAM CO SCHOOL DISTRICT		
PATRICK HENRY HIGH SCHOOL		
STOCKBRIDGE HIGH SCHOOL		
WOODLAND HIGH SCH		
WOODLAND HIGH SCH		
WORTH CO SCHOOL DISTRICT		
LIPSON-LEE HIGH SCHOOL		
THOMSON HIGH SCHOOL		
SANDY CREEK HIGH SCHOOL		
WASHINGTON-WILKES HIGH SCHOOL		
ETOWAH HIGH SCHOOL		
WOODSTOCK HIGH SCHOOL		
Not Specified		
NORTH POLK CMTY SCHOOL DIST		
AMES CMTY SCHOOL DISTRICT		
ANITA CMTY SCHOOL DISTRICT		
REMSEN-UNION ELEMENTARY SCHOOL		
BONNEVILLE JT S/D 93		
MOSCOW SCHOOL DISTRICT 281		
JEFFERSON JOINT SCH DIST 251		
CARBONDALE COMMUNITY HIGH SCH		
Not Specified		
AMUNDSEN HIGH SCHOOL		
CRISTO REY JESUIT HIGH SCHOOL		
ENGLEWOOD TECH PREP ACADEMY		
HARLAN COMMUNITY ACADEMY		
HUBBARD HIGH SCHOOL		
VON STEUBEN METRO SCIENCE CTR		
COLLINSVILLE AREA VOC CENTER		
THORNRIDGE HIGH SCHOOL		
YORK COMMUNITY HIGH SCHOOL		
ROCK ISLAND HIGH SCHOOL		
THORNWOOD HIGH SCHOOL		
NORTH SHORE COUNTRY DAY SCHOOL		
FRANKLIN CO CMTY SCH DIST		
FRANKLIN CO HIGH SCHOOL		
BISHOP DWENGER HIGH SCHOOL		
TERRE HAUTE NORTH VIGO HS		
TERRE HAUTE SOUTH VIGO HS		
BELOIT JR SR HIGH SCHOOL		
STANTON CO HIGH SCHOOL		
GREENWOOD HIGH SCHOOL		
SOUTH WARREN HIGH SCH		
Not Specified		
BEVERLY HIGH SCHOOL		
BILLERICA MEMORIAL HIGH SCHOOL		
NORTH CAMBRIDGE CATHOLIC HS		
B M C DURFEE HIGH SCHOOL		
HOPEDALE JR SR HIGH SCHOOL		
ST MARY'S JR-SR HIGH SCHOOL		
MANCHESTER ESSEX REGIONAL HS		
RICHARD MILBURN ACADEMY		
STONEHAM SCHOOL DISTRICT		
NORFOLK CO AGRICULTURAL HS		
MINNECHAUG REG HIGH SCHOOL		
WINCHESTER HIGH SCHOOL		

School	City	State
NEW LOTHROP SR HIGH SCHOOL	NEW LOTHROP	MI
NORTHVILLE PUBLIC SCHOOL DIST	NORTHVILLE	MI
DETROIT CATHOLIC CENTRAL H		
WESTERN SCHOOL DISTRICT		
PORTLAND HIGH SCHOOL		
REDFORD UNI		
LAKE SHORE		
WHITTEMORE		
HANNAHVILLE		
WAYZATA HIG		
ST LOUIS PAR		
ST THOMAS A		
MATH SCIENC		
MBS TEXTBO		
MCCLUER NO		
FAMILY CENT		
HOLLY SPRING		
FARGO SCHO		
BERTRAN		
Not Spec		
INTER-LA		
FREEHOL		
FREEHOL		
LAWRENC		
RED BAN		
EAST SID		
PASSAIC		
PHILLIPSE		
RED BAN		
RUMSON		
UNION CO		
MONTGO		
JONATHA		
WESTFIEL		
Not Spec		
ALBUQUE		
ALBUQUE		
CIBOLA H		
FREEDOM		
LA CUEV		
LOS PUEN		
ARCHWA		
ANIMAS		
GADSDEN		
ARTESIA		
ARTESIA		
BELEN CO		
CUBA IND		
GRANTS-		
CENTRAL		
V SUE CL		
WHITE PIN		
PERSHING CO		

School	City	State
SUSAN E WAGNER		
SUSAN E WAGNER		
TOTTENVILLE HIG		
SYRACUSE CITY S		
SYRACUSE CITY S		
WESTLAKE HIGH		
WAYLAND-COHO		
NASSAU BOCES T		
WESTMOREL AND		
SPRINGFIELD LOC		
SENECA EAST LO		
BEDFORD HIGH SC		
CHAGRIN FALLS E		
CLEVELAND SEN		

School	City	State
HILLSBORO SCHOOL DISTRICT 1J	HILLSBORO	OR
SOUTHERN OREGON ED SERV DIST	MEDFORD	OR
PHILOMATH HIGH SCHOOL	PHILOMATH	OR
MILWAUKIE HIGH SCHOOL	MILWAUKIE	OR
NORTHWEST TEXTBOOK	PORTLAND	OR
Not Specified	-	-
REYNOLDS HIGH SCHOOL	TROUTDALE	OR
TULPEHOCKEN JR SR HIGH SCHOOL	BERNVILLE	PA
CARBONDALE AREA JR SR HIGH SCH	CARBONDALE	PA
CLEARFIELD AREA HIGH SCHOOL	CLEARFIELD	PA
BEN FRANKLIN FRESHMAN ACADEMY	LEVITTOWN	PA
TRUMAN SENIOR HIGH SCHOOL	LEVITTOWN	PA
NORTHEASTERN SCHOOL DISTRICT	MANCHESTER	PA
CENTER AREA SCHOOL DISTRICT	MONACA	PA
CENTRAL VALLEY HIGH SCHOOL	MONACA	PA
MORRISVILLE BORO SCH DISTRICT	MORRISVILLE	PA
		PA
		PA
		PA
		PA
		PA
		SC
		TN
		TN
		TN
		TX
		TX
		TX
		TX

School	City	State
BETHEL SCHOOL DISTRICT 403	SPANAWAY	WA
ISSAQUAH SCHOOL DISTRICT 411	ISSAQUAH	WA
RENTON SCHOOL DISTRICT 403	RENTON	WA
RICHLAND SCHOOL DISTRICT 400	RICHLAND	WA
SEATTLE SCHOOL DISTRICT	SEATTLE	WA
SELAH HIGH SCHOOL	SELAH	WA
MEAD HIGH SCHOOL	SPOKANE	WA
Not Specified	-	-
SUMNER SCHOOL DISTRICT 320	SUMNER	WA
MOUNT RAINIER LUTHERN HS	TACOMA	WA
TACOMA SCHOOL DISTRICT 10	TACOMA	WA
TACOMA SCHOOL DISTRICT 10	TACOMA	WA
TOLEDO HIGH SCHOOL	TOLEDO	WA
VANCOUVER SCHOOL DISTRICT 37	VANCOUVER	WA
WALLA WALLA SCHOOL DIST 140	WALLA WALLA	WA
WARDEN SCHOOL DISTRICT 146-161	WARDEN	WA
WASHOUGAL SCHOOL DIST 112-6	WASHOUGAL	WA
WENATCHEE SCHOOL DISTRICT 246	WENATCHEE	WA
WINLOCK HIGH SCHOOL	WINLOCK	WA
A C DAVIS HIGH SCHOOL	YAKIMA	WA
D D EISENHOWER SENIOR HIGH SCH	YAKIMA	WA
WEST VALLEY SCH DISTRICT 208	YAKIMA	WA
YAKIMA SCHOOL DISTRICT 7	YAKIMA	WA
YELM CMTY SCHOOL DISTRICT 2	YELM	WA
YELM HIGH SCHOOL	YELM	WA
TOMORROW RIVER SCHOOL DISTRICT	AMHERST	WI
MOSINEE HIGH SCHOOL	MOSINEE	WI
D C EVEREST SENIOR HIGH SCHOOL	SCHOFIELD	WI
SOLON SPRINGS SCHOOL DISTRICT	SOLON SPRINGS	WI
SUN PRAIRIE AREA SCH DISTRICT	SUN PRAIRIE	WI
KANAWHA CO SCHOOL DISTRICT	CHARLESTON	WV
GRANT CO SCHOOL DISTRICT	PETERSBURG	WV

School	City	State
CRAIG CITY		
FAIRBANKS		
LA JOYA HI		
COLORADO		
DYSART HIG		
PONDEROS		
FREDONIA		
APOLLO HIG		
COPPER CA		
GLENDALE		
GLENDALE		
INDEPENDE		
JOSEPH CIT		
RAY UNIF S		
RAY UNIF S		
KINGMAN		
PAGE UNIFIE		
CORTEZ HIG		
MOON VAL		
MOUNTAIN		
PHOENIX U		
SIERRA LIN		
SUNNYSLO		
THUNDERB		
WASHINGT		
WILSON CH		
SIERRA VIS		
DYSART UN		
DYSART UN		
WILLOW CA		
CORONA D		
EDUCATION		
WESTVIEW		
TOLLESON		
ASS. SUPT		
JF FLANNE		
ALHAMBRA		
ALISO NIG		
ANAHEIM		
BANNING U		
HARBOR LE		
RIVER VALL		
ALHAMBRA		
ALHAMBRA		
SACRAMENTO CO OFC OF ED		
CAPISTRANO VALLEY HIGH S		
MARANATHA HIGH SCHOOL		
NATOMAS CHARTER SCHOOL		
SAN BERNARDINO CITY USD		
BONITA UNIFIED SCHOOL DISTRICT		
SAUGUS HIGH SCHOOL	SAUGUS	CA

School	City	State
SAN DIMAS	SAN DIMAS	CA

School	City	State
KEYS SCHOOL DISTRICT 6	PARK HILL	OK
PERKINS-TRYON SCHOOL DIST 56	PERKINS	OK
MERIDIAN TECHNOLOGY CENTER	STILLWATER	OK
CAREER TECH HS	TULSA	OK

Fall 2011: NYS Journal Article on Financial Algebra

Financial Algebra: Real-World, Real Math, Real Numbers

Robert Gerver
North Shore HS
Glen Head, NY

Richard Sgroi
Fox Lane HS (retired)
Bedford, NY

Most Americans aren't fluent in the language of money…It's clear that most of us need some help, preferably starting when we're still in school…All of this raises the question: How many schools even broach the topic? As it turns out, for a country that prizes personal responsibility, we're doing very little. - NY Times, April 9, 2010

What do we know? What should we know? What does the average person remember? We have given surveys to over a thousand adults and teenagers over the past few years, and received enlightening, but not surprising, answers to questions such as:

- What team won the last World Series?
- What famous Hollywood actress recently got married?
- What rock band played at the last Super Bowl?

December 2011: CA Journal Article

It's Time for a New "New Math"

by Robert Gerver, North Shore High School, New York
rgerver@optonline.net

In 1957, the Soviet Union christened the exploration of space by launching Sputnik I. Feeling relatively inadequate in science, the U.S. nervously reacted and, by the 1960s, the "new math" was instituted to upgrade mathematics education in the United States. (If you are too young to remember this, do an Internet search!) Parents struggled to help their children with mathematics homework,

figuring out the future value of a periodic $200 monthly deposit over 18 years, or finding the cusps of the graph of an absolute value function? Can we replace rigorous mathematics
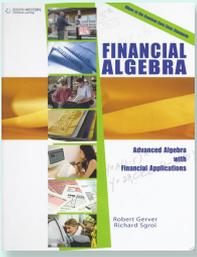
Two Key Approvals!
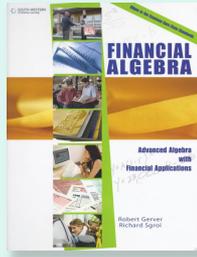
- **NCAA:** *Financial Algebra* has received NCAA approval as a "core" mathematics course, and can be used in a college-preparatory mathematics sequence by potential NCAA college applicants.

- **UC a - g:** *Financial Algebra* has received University of California "a – g" approval as a 'c' level, core mathematics course, *Advanced Algebra with Financial Applications*.

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.
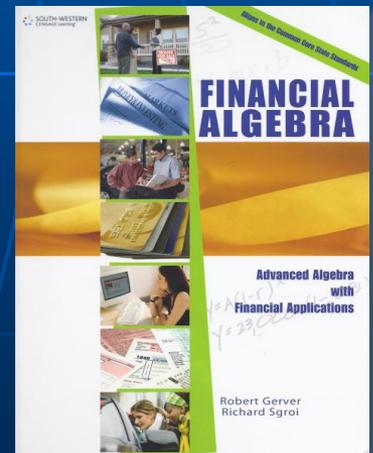
Scatterplots, linear regression, modified boxplots, outliers, mean, median, range, interquartile range:
What role can statistics play in negotiating an automobile purchase or sale?

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.

Price
$22,000
$19,000
$18,000
$16,700
$15,900

Mileage, x	Price, y
21,000	$22,000
30,000	$19,000
40,000	$18,000
51,000	$16,700
55,000	$15,900

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

8,500   14,500   23,000
9,200 11,000 13,000
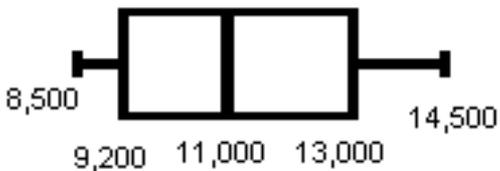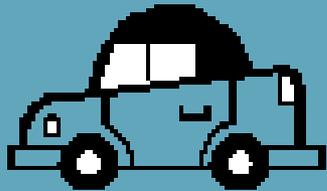
AUTOMOBILE INSURANCE

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?

What does this graph tell you?

(35.24, 23733.33)

amount
months
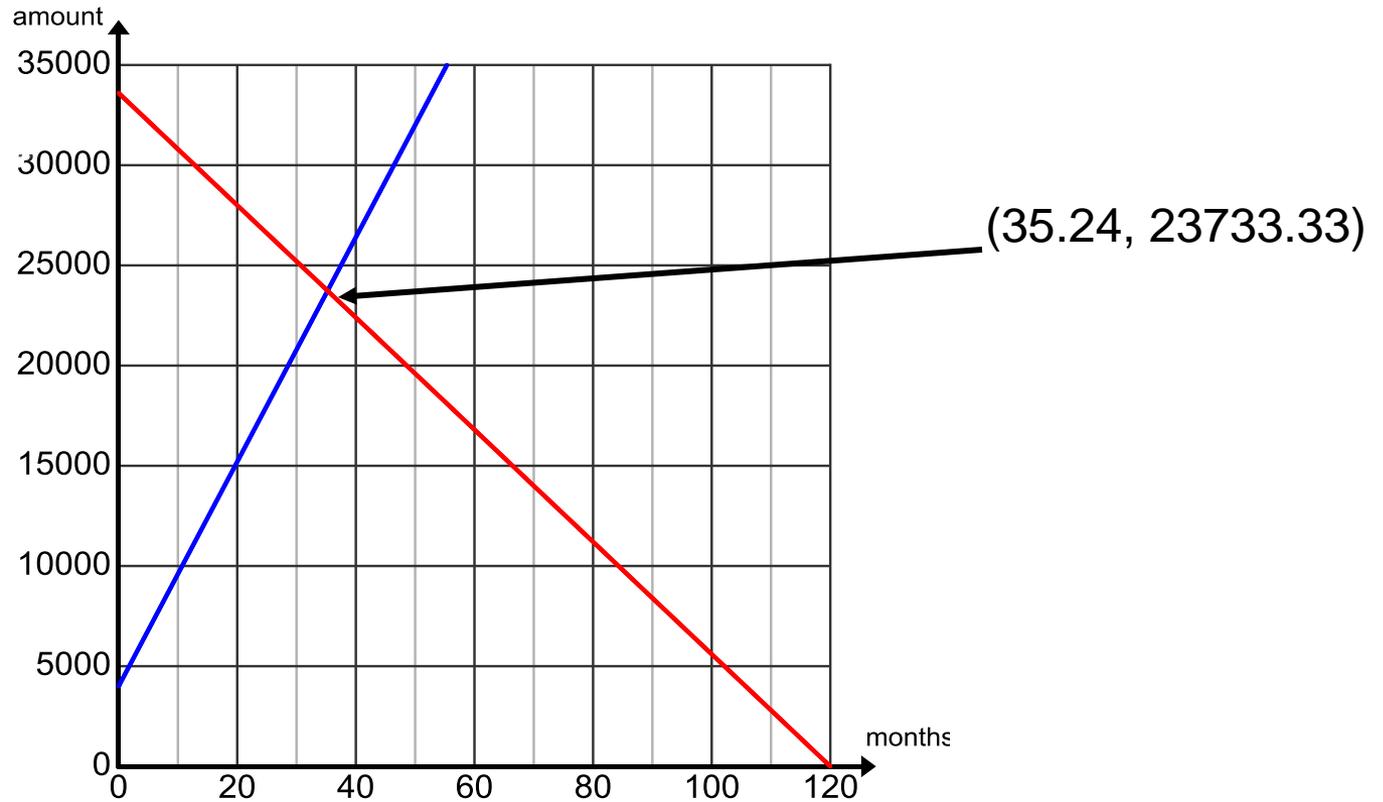
F(x) = 560x + 4000   G(x) = -280x +33600

AUTOMOBILE DEPRECIATION:
How does your car appreciate or depreciate; linearly, exponentially, or like a historical "bath tub"?
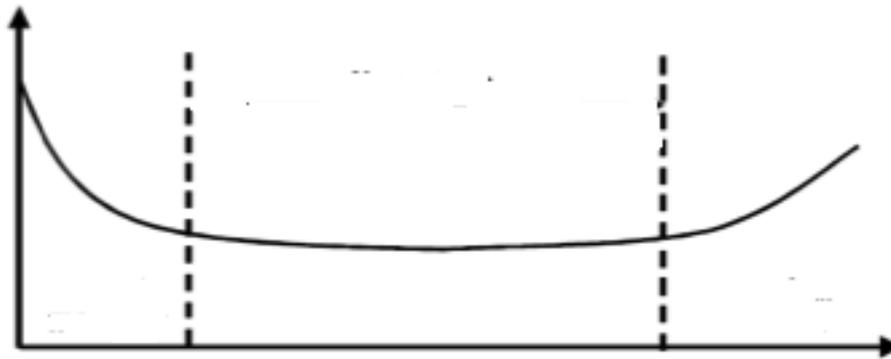
Interpreting a Linear System in the context of auto depreciation
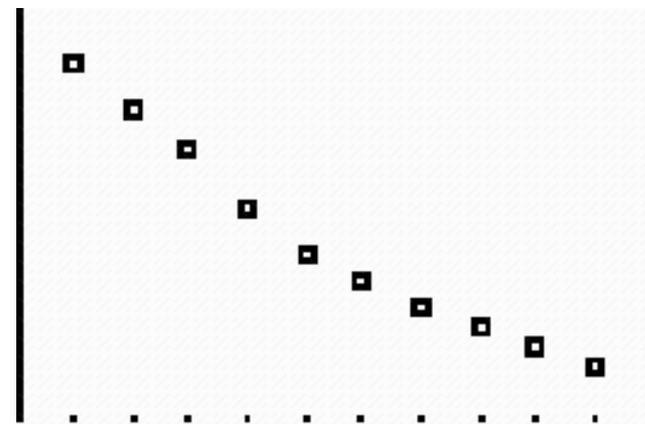
STRAIGHT LINE DEPRECIATION

- **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 payments and down payments* and *depreciation* over a fixed period of time?

(35.24, 23733.33)
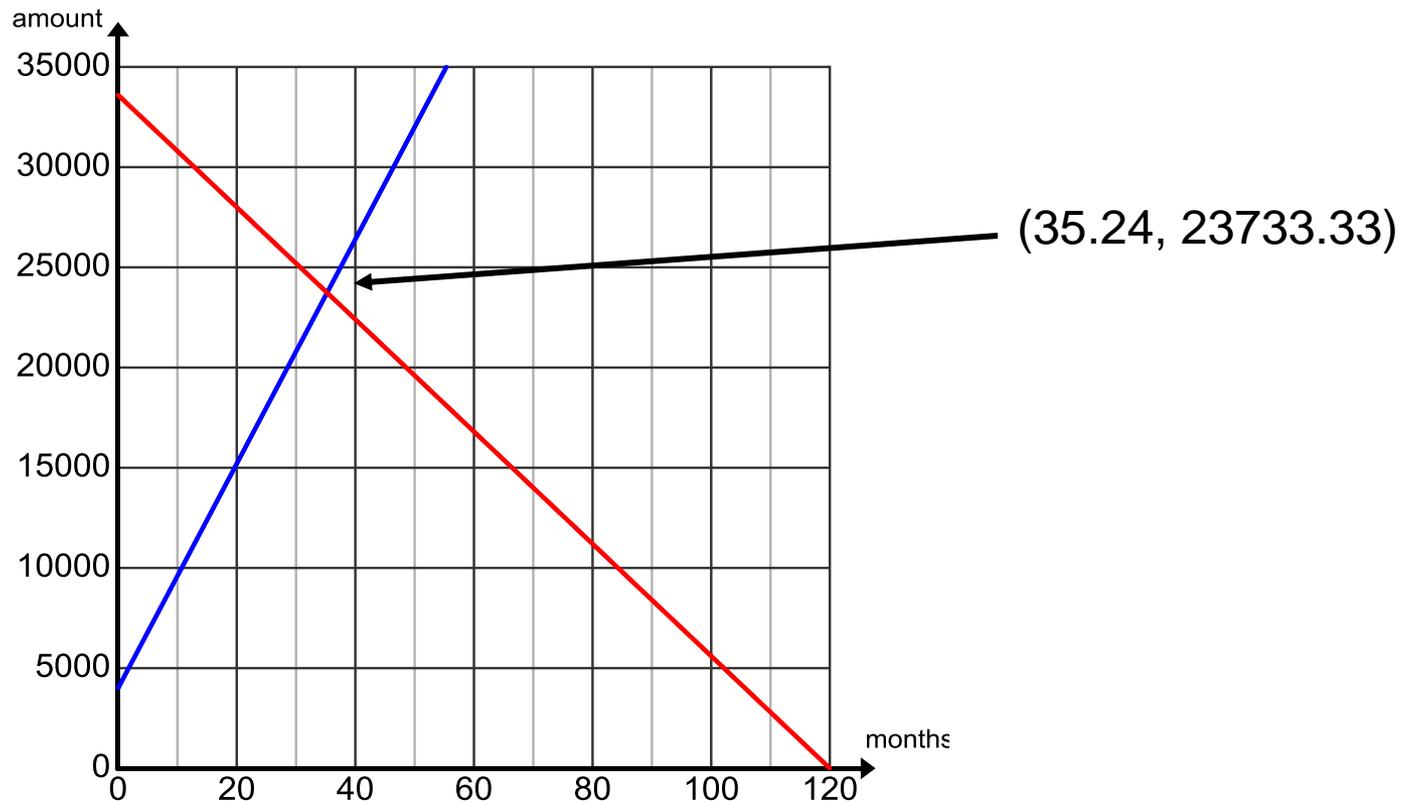
EXPONENTIAL DEPRECIATION-Students learn to model the fact that a car can lose a constant *percent* of its value each year.

AGE	VALUE		AGE	VALUE
1	24230		6	15245
2	22355		7	14075
3	20645		8	13100
4	18070		9	12325
5	16265		10	11525


```
L1      L2      L3      2
1       24230   ------
2       22355
3       20645
4       18070
5       16265
6       15245
7       14075
L2(1)=24230
```

```
ExpReg
y=a*b^x
a=25921.87218
b=.918620427
```
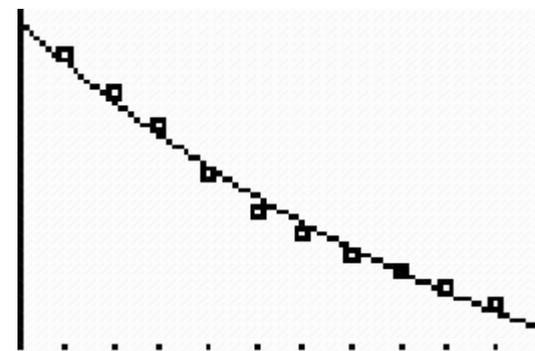
Your speed can determine your financial liability in an auto accident.

- ## 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 ¾ second!*

- ## A quadratic function:
    Braking Distance = 5(.1s)^2, where s = speed

- ## A square root function:
    Skid speed S = $\sqrt{30Dfn}$

S = speed entering skid; D = skid distance; f= drag factor (an index); n = braking efficiency (an index).

THE GEOMETRY OF YAW MARKS

$$S = \sqrt{15fr}$$

S: minimum speed
f: **drag factor**
r: **radius of yaw mark arc**

$$r = \frac{C^2}{8M} + \frac{M}{2}$$
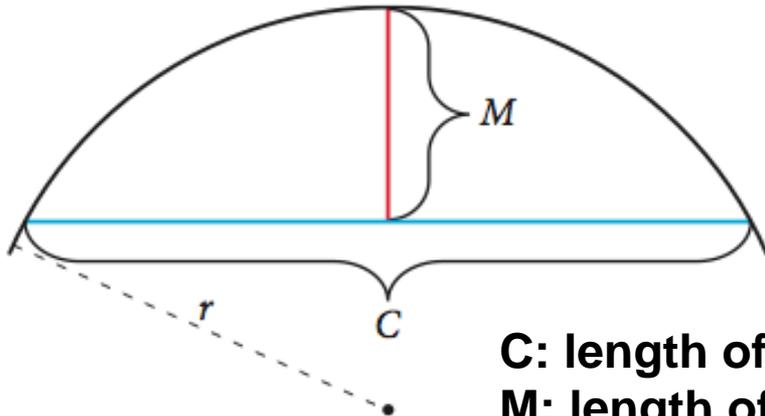
C: length of yaw mark chord
M: length of *middle ordinate*

As relatives and friends struggled to come to grips with the devastating loss of seven family members in a Bronx crash, a police investigation concluded yesterday their SUV was traveling 68 mph when it crashed into the highway median, damaging a tire and sending the vehicle skidding sideways across the roadway and over a guardrail.

A study of yaw marks on the parkway pavement, indicating sideways movement, led police to determine that the 2004 Honda Pilot's left-front tire struck the median on the Bronx River Parkway, causing the vehicle to travel laterally across three lanes of traffic before striking a curb and going airborne over a 4-foot metal fence.

Yaw marks covered in Section 5-9.

May, 2012 Bronx Car Crash

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. Later that day she is mailed a $34 check, 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.

Date→	Feb 10	Feb 11
Opening Balance	$1,234.98	$1,069.07
Deposit (+)	$34.00	$345.77
Withdrawal (-)	$200.00	---
Principal Used to Compute Interest	$1,068.98	$1,414.84
Day's Interest rounded to the nearest cent	$0.09	$0.12
Ending Balance- (also tomorrow's opening balance)	$1,069.07	$1,414.96

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.

CREDIT: Promissory note terms, loan interest, lending institutions, loans, credit ratings, computing average daily balances and finance charges on a credit card, credit worthiness.

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

$$M = \frac{\left(P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{12t} \right)}{\left(\left(1+\frac{r}{12}\right)^{12t} - 1 \right)}$$

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

What is that "FICA" box on your paystub?
SOCIAL SECURITY & MEDICARE PAYROLL TAXES

For 2011, the Social Security Tax maximum salary was $106,800. If the tax rate was 4.2% of all gross earnings up to this maximum,

a) Express the 2011 Social Security Tax as a piecewise function.

b) Draw the graph of this function.

c) Identify and interpret the coordinates of the cusp.

2010 SOCIAL SECURITY PIECEWISE FUNCTION

$$f(x) = \begin{cases} 0.062x \text{ if } x \le 106{,}800 \\ 6621.60 \text{ if } x > 106{,}800 \end{cases}$$
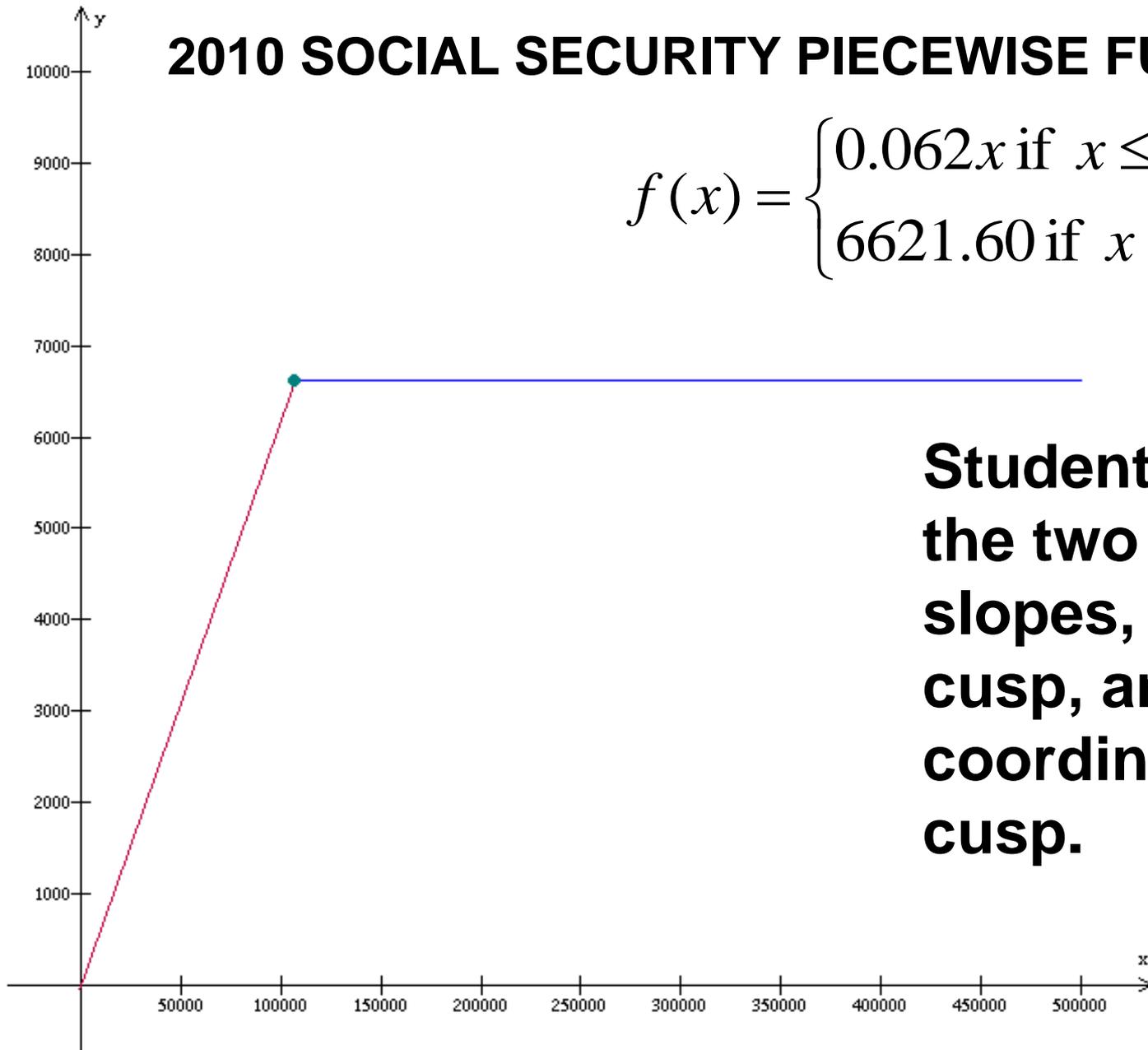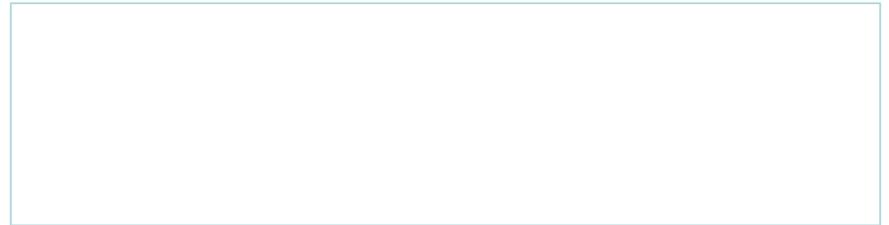
Students interpret the two different slopes, define a cusp, and give the coordinates of the cusp.

How can you model and graph the tax schedules?
FEDERAL TAXES

2011 Tax Rate Schedules

Schedule X—If your filing status is Single

If your taxable income is: Over—	But not over—	The tax is:	of the amount over—
$0	$8,500	.... 10%	$0
8,500	34,500	$850.00 + 15%	8,500
34,500	83,600	4,750.00 + 25%	34,500
83,600	174,400	17,025.00 + 28%	83,600
174,400	379,150	42,449.00 + 33%	174,400
379,150	....	110,016.50 + 35%	379,150

FINANCIAL ALGEBRA

If *t*(*x*) represents the entire tax liability function for married taxpayers filing jointly, then this tax schedule can be written in piecewise function notation as

$$t(x) = \begin{cases} .10x \text{ if } 0 < x \leq 8500 \\ .15(x-8500) + 850 \text{ if } 8500 < x \leq 34500 \\ .25(x-34500) + 4750 \text{ if } 34500 < x \leq 83600 \\ .28(x-83600) + 17025 \text{ if } 83600 < x \leq 174400 \\ .33(x-174400) + 42449 \text{ if } 174400 < x \leq 379150 \\ .35(x-379150) + 110016.50 \text{ if } x > 379150 \end{cases}$$

For taxable incomes over $174000 but not over $379150, the equation is stated as $t(x) = .33(x - 174400) + 42449$

Schedule X—If your filing status is **Single**

If your taxable income is:		The tax is:	of the amount over—
Over—	But not over—		
$0	$8,500	·········· 10%	$0
8,500	34,500	$850.00 + 15%	8,500
34,500	83,600	4,750.00 + 25%	34,500
83,600	174,400	17,025.00 + 28%	83,600
174,400	379,150	42,449.00 + 33%	174,400
379,150	·········	110,016.50 + 35%	379,150

Distribute and combine like terms to get   y = mx + b form:

$t(x) = 0.33x - 15103$

This is what the IRS uses on the tax worksheet:

Section A—Use if your filing status is **Single**. Complete the row below that applies to you.

Taxable income. If line 43 is—	(a) Enter the amount from line 43	(b) Multiplication amount	(c) Multiply (a) by (b)	(d) Subtraction amount	Tax. Subtract (d) from (c). Enter the result here and on Form 1040, line 44
At least $100,000 but not over $174,400	$	× 28% (.28)	$	$ 6,383.00	$
Over $174,400 but not over $379,150	$	× 33% (.33)	$	$ 15,103.00	$
Over $379,150	$	× 35% (.35)	$	$22,686.00	$

FINANCIAL ALGEBRA

How can profit be modeled as the difference between a quadratic and linear function?

Profit = Revenue – Expense

Students get q in terms of p from the demand function, combine like terms, and view the profit parabola algebraically and graphically as the difference between revenue and profit.
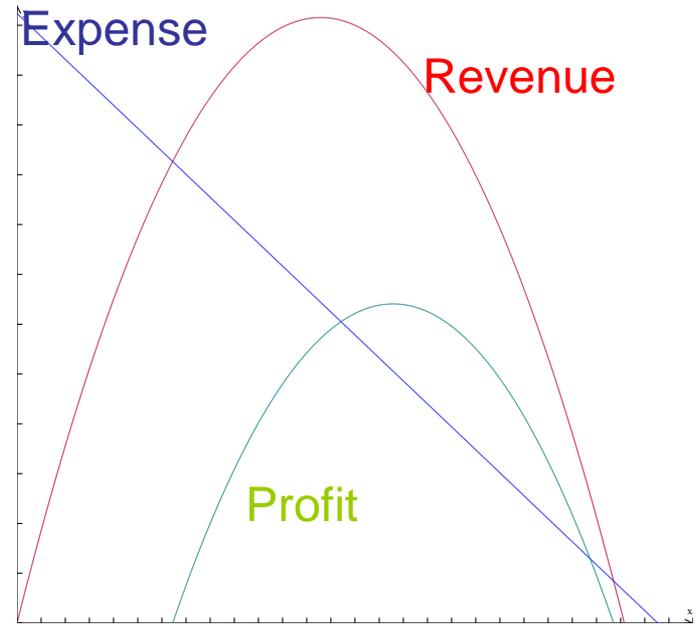
HOME OWNERSHIP: *How many BTU's do I need?*

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?

$$\text{BTU rating} \approx \frac{while}{60}$$

l, w, h = length, width, height
i = insulation (an index)
e = 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.

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

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

Students learn how to use algebra to set up cell formulas when creating spreadsheets for BUDGET, CASH FLOW, and DEBT REDUCTION analysis.

	A	B	C	D	E	F	G	H	I	J	K	L	M
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	**Income**												
2	Primary Employment	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
3	Secondary Employment	500	500	500	500	500	500	500	500	500	500	500	500
4	Other Income												
5	**Total Income**	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100
6													
7	**Fixed Expenses**												
8	Rent/Mortgage	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
9	Car Loan Payment	200	200	200	200	200	200	200	200	200	200	200	200
10	Education Loan Payment	150	150	150	150	150	150	150	150	150	150	150	150
11	Personal Loan Payment	80	80	80	80	80	80	80	80	80	80	80	80
12	Health Insurance Premium	50	50	50	50	50	50	50	50	50	50	50	50
13	Life Insurance Premium												
14	Car Insurance Premium	60	60	60	60	60	60	60	60	60	60	60	60
15	Homeowner's Insurance	50	50	50	50	50	50	50	50	50	50	50	50
16	Cable TV												
17	Life Insurance			150			150			150			150
18	Tuition	1,500							1,500				
19	Taxes		2,000							2,000			
20													
21	**Variable Expenses**												
22	Groceries (Food)	800	800	800	800	800	800	800	800	800	800	800	800
23	Dining Out	150	150	150	150	150	150	150	150	150	150	150	150
24	Fuel (Car)	160	160	160	160	160	160	160	160	160	160	160	160
25	Cell Phone	120	120	120	120	120	120	120	120	120	120	120	120
26	Land Line Phone												
27	Electricity	80	80	80	80	80	80	80	80	80	80	80	80
28	Water	30	30	30	30	30	30	30	30	30	30	30	30
29	Sewer												
30	Sanitation												
31	Medical												
32	Medical/Dental												600
33	Auto-related										700		
34	Home-related				250				250				
35	Vacation						1,200						
36	Gifts		200									200	
37	Contributions				400								
38	Repairs										600		
39	Entertainment	200	200	200	200	200	200	200	200	200	200	200	200
40	Savings	300	300	300	300	300	300	300	300	300	300	300	300
41	Debt Reduction	160	160	160	160	160	160	160	160	160	160	160	160
42	Other												

From The Common Core State Standards Document

Algebra - Reasoning with Equations and Inequalities

Represent and solve equations and inequalities graphically

Find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.

Functions - Interpreting Functions

Analyze functions using different representations

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Statistics and Probability - Interpret Categorical and Quantitative Data

Interpret Linear Models

Compute (using technology) and interpret the correlation coefficient of a linear fit.

How can you model a start-up business? You need to model **COST, DEMAND, REVENUE, and PROFIT**

L1	L2	L3	2
325	**8900**		
350	8800		
375	8650		
400	6700		
425	6500		
450	5000		
475	4500		

L2(2) =8900

1.
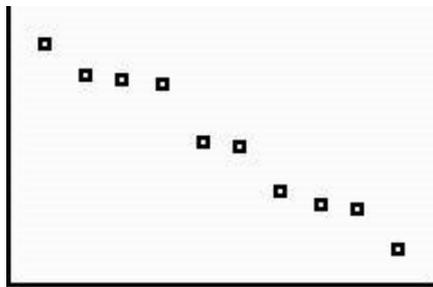
2.

```
LinReg(ax+b) L1,
L2
```

3.

```
LinReg
  y=ax+b
  a=-30.73939394
  b=19330
  r²=.9659385288
  r=-.9828217177
```

4.

```
Plot1 Plot2 Plot3
\Y1 =-30.74X+1933
0
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
```

5.

6.

SPREADSHEETS

p.248

Months	Expense	Depreciation			
0	4000	33600		Expense slope	560
20	15200	28000		Expense y-int	4000
40	26400	22400		Depr. Slope	-280
60	37600	16800		Depr. Y-int	33600
80	48800	11200			
100	60000	5600		X intersection	35.23809524
120	71200	0			23733.33333

GRAPHING WEBSITES

What are the essential elements of the 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!*"

Tons of teacher support and professional development!

- **Introduce *Financial Algebra* to your mathematics teachers via a department meeting presentation after school!**
- **A 45-minute pre-recorded, narrated webinar for each chapter is available to users!**
- **Financial Algebra List Serv**
- **Summer Institutes**
- **Companion website & ancillaries**
- **Direct author e-mail contact**
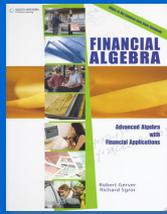
Webinars
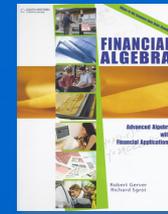
- **Each of the ten units has a 45-minute webinar that goes through the entire unit. A great way to orient yourself before you start the unit.**

- **There is also a general overview webinar.**

- **Links and descriptions are in your packets.** www.cengage.com/community/financialalgebra

- **You can copy today's presentation onto your thumb drive if you have one.**

www.cengage.com/community/financialalgebra

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[Select a chapter ... ▼]

Financial Algebra, Student Edition, 1st Edition

Book Overview

Chapter 1

🔒 **Instructor Solutions Manual**

🔒 **Lesson Plans**

🔒 **Power Points**

🔒 **Professional Development Webinars**

🔒 **Spreadsheets (Instructor)**

Crossword Puzzle

Dollars and Sense

Flashcards

Glossary

Spreadsheets

You Write the Story!

Graph

- - - - - - - - - - - - - - - - - -

Book Resources

🔒 **Annotated Instructor's Edition**

🔒 **Blackboard 6/7/8/9 test bank**
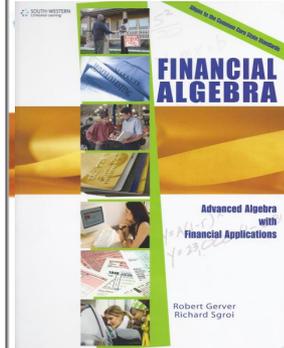
Robert K. Gerver, Richard J. Sgroi
ISBN-10: 0538449675
ISBN-13: 9780538449670
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Instructional Model

A relevant quote and chapter introduction set the stage for the topics covered in the chapter.

FINANCIAL ALGEBRA

Advanced Algebra with Financial Applications

Robert Gerver
Richard Sgroi

CHAPTER 1

The Stock Market

The safe way to double your money is to fold it over once and put it in your pocket.

Frank Hubbard, Journalist

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

What do you think Frank Hubbard meant in this quote?

What do you think?
Answers might include that gambling and the stock market can increase or decrease wealth significantly. Bank accounts do increase wealth, and are safe, but interest earned will not make you rich.

TEACHING RESOURCES
Instructor's Resource CD
ExamView® CD, Ch. 1
e-Homework, Ch. 1
www.cengage.com/school/math/financialalgebra

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.

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

Milton Friedman, American economist

1-4

Simple Moving Averages

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

HOW CAN STOCK DATA BE SMOOTHED?

Stock market prices can fluctuate greatly from trade to trade based upon a variety of external factors. You have already seen that the high and low for a day may not necessarily be near the day's opening or closing prices. Those differences often make it difficult to spot trends that are occurring over time. Smoothing techniques are statistical tools that allow an investor to reduce the impact of price fluctuations and to focus on patterns and trends. One such technique is known as a simple moving average (SMA). Simple moving averages are calculated by determining the arithmetic average (mean) closing price over a given period of time.

The graph shows the daily stock closing prices, 5-day SMA and 10-day SMA over a period of 30 trading days. Notice how the closing prices fluctuated from day to day and the moving average graphs smoothed out that data. The longer the moving average time interval, the smoother the graph appears to be.

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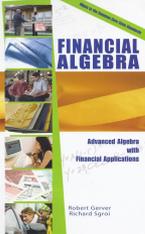
OUR FOCUS IS YOU!

Partner Do Now

Work with a partner.

Select one of the following quotes. Discuss how the quote might stimulate **mathematics** conversation.

- *"The safe way to double your money is to fold it over once and put it in your pocket."* *Chapter 1 The Stock Market*

- *"Never try to walk across a river just because it has an average depth of four feet."* *Section 1-4 Simple Moving Averages*

- *"To make a million, start with $900,000."* *Section 3-5 Compound Interest*

- *"It takes 8,460 bolts to assemble a car and one nut to scatter it all over the road* *Section 5-9 Accident Investigation Data*

- *"Life is what happens to you when you're busy making other plans."* *Section 9-4 Life Insurance*

Common Core State Standards Identified in the Table of Contents Too!

Contents

MATH TOPICS

Candlestick chart
Fractions, decimals, percents
Linear equation
Literal equation
Mean–arithmetic average

Percent increase and decrease
Ratio and proportion
Line graphs
Simple moving average
Spreadsheets and formulas

COMMON CORE

A-CED   Creating equations that describe numbers or relationships.
A-REL   Solve equations and inequalities in one variable.
A-SSE   Interpret the structure of expressions.
N-Q   Reason quantitatively and use units to solve problems.

MATH TOPICS

Causal relationship
Function–domain, range
Slope-intercept form
Linear regression
Parabola–vertex, axis of symmetry

Quadratic formula
Scatterplots and correlation
Spreadsheets and formulas
Transitive property of dependence

COMMON CORE

A-CED   Creating equations that describe numbers or relationships.
A-REL   Understand solving equations as a process of reasoning and explain the reasoning.
A-REL   Solve equations and inequalities in one variable.
A-REL   Solve systems of equations.
A-REL   Represent and solving equations and inequalities graphically.
A-SSE   Interpret the structure of expressions.
F-LF   Understand the concept of a function and use function notation.
F-LF   Interpret functions that arise in applications in terms of the context.
F-LF   Analyze functions using different representations.
N-Q   Reason quantitatively and use units to solve problems.
S-ID   Summarize, represent, and interpret data on two categorical and quantitative variables.
S-ID   Interpret linear models

MATH TOPICS

Exponential functions
Exponential base (e)
Exponential growth and decay
Formulas
Limits

Linear equations and inequalities
Order of operations
Recursive and iterative thinking: patterns growth, decline, compound interest

---

Financial Algebra aligns to the

Common Core State Standards Initiative - Mathematics

The Common Core State Standards provide clear and consistent guidelines so students, teachers, administrators, and parents have an awareness of the mathematics proficiencies expected. The standards are designed to be rigorous and relevant to the real world, reflecting the knowledge and skills that students need for future success.

Teach a parrot the terms "supply and demand" and you've got an economist.

Thomas Carlyle, Philosopher

Supply and Demand   2-3

Key Terms
- widget
- function
- demand function
- demand
- supply
- wholesale price
- markup
- retail price
- equilibrium
- shift

Objectives
- Understand the slopes of the supply and demand curves.
- Find points of equilibrium.

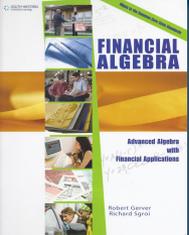**HOW DO MANUFACTURERS DECIDE THE QUANTITY OF A PRODUCT THEY WILL PRODUCE?**

Lesson Openers conveniently include the CCSS Domains and Standards covered in the lesson.

Comstock/Getty Images

The Common Core State Standards Domain and Standard are identified to demonstrate that *Financial Algebra* addresses at least one, if not several, core standards in each lesson.

A complete correlation of *Financial Algebra* to the Common Core State Standards for Mathematics is available on the community website.

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FOCUS IS YOU!

Instructional Model

Each section opens with the statement of an
ESSENTIAL QUESTION.

FINANCIAL ALGEBRA

Advanced Algebra with Financial Applications

Robert Gerver
Richard Sgroi

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?

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OUR FOCUS IS YOU!

Really? Really!
grasps students' attention by discussing a fascinating real-life topic related to the chapter content.

Really?

Corporations sometimes choose names that are personal, humorous, historical, or psychological. Below are some well-known corporations and how their name was established.

AMAZON.com was originally known as Cadabra.com. The name was changed by its founder Jeff Bezos. He selected Amazon as a corporate name because the Amazon River is known as the biggest volume river in the world. He also wanted a name that began with A so that alphabetically it would appear at the top of a list of similar corporations.

COCA-COLA is a name that has its origins in the flavoring used to make the product—coca leaves and Kola nuts. The founder, John Pemberton, changed the "K" in Kola to a "C" for appearance purposes.

ADIDAS is taken from the name of the company's founder Adolph (Adi) Dassler.

eBay was created by Pierre Omidyar, who originally wanted to use the name Echo Bay. The name was already taken by a gold mining company, so he shortened it to eBay.

XEROX comes from a Greek expression for "dry writing." The Xerox process was invented in 1937 by law student Chester Carlson.

Really!

FINANCIAL ALGEBRA

Advanced Algebra with Financial Applications

Robert Gerver
Richard Sgroi
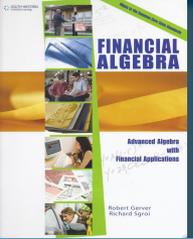
Each lesson begins with a discussion of terms and concepts related to the lesson topic.

The bad news is time flies. The good news is you're the pilot.
Michael Althsuler, businessman

1-7 Stock Transaction Fees

Objectives
- Compute the fees involved in buying and selling stocks.
- Become familiar with the basic vocabulary of stock trading.

Key Terms
- stockbroker
- broker fee
- commission
- discount broker
- at the market
- limit order
- net proceeds

HOW DO YOU BUY AND SELL STOCK?

You don't buy stock at a store. Shares of stock can only be purchased through licensed **stockbrokers**. If you decided to sell your shares, you couldn't bring them to school and sell them to someone in the cafeteria. You also cannot walk into a stock exchange to sell your shares. Only stockbrokers buy and sell stocks. They also give advice to investors. For their services, stockbrokers charge a broker fee. The **broker fee** can be a flat fee, which does not depend on the value of the transaction, or a commission, which does depend on the value of the transaction. A **commission** is a percentage of the value of the stock trade.

Some people make their own investment decisions. They read the financial newspapers and websites to learn about new developments in the stock market. They still must buy and sell through brokers, but they may decide to use a discount broker. **Discount brokers** charge low fees. They do not give investment advice. They only make stock transactions. Discount brokers are available online, by phone, and in person at their offices. An online trading account is convenient because the investor can access it 24 hours a day.

If you buy or sell **at the market**, you are instructing your broker to get the best available price. You can also place a **limit order**, which specifies the price you want to pay. If you put in a limit order to buy a stock only for a specific price, your broker will not make a purchase for any price higher than the price specified.
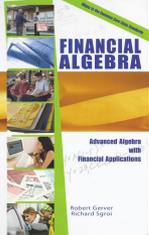
Skills and Strategies, teaches the math concepts through worked-out examples. Several examples teach each math concept step-by-step.

All math concepts are taught within **real-life context**. *When am I every going to use this in real-life?* is answered here!

Skills and Strategies

To compute the actual gain or loss for a given stock trade, you need to include the broker fees in your calculations.

EXAMPLE 1

Lee made two trades today through his online discount broker, We-Trade. We-Trade charges a fee of $12 per trade. Lee's first purchase was for $3,456 and his second purchase, later in the day, was for $2,000. How much did he spend on today's purchases, including broker fees?

SOLUTION Lee made two trades. He must pay two broker fees.

Fee × Number of trades   (2)($12) = $24

Lee paid $24 in broker fees. Next, find the sum of his purchases.

Add amount of both trades. $3,456 + $2,000 = $5,456

The purchase price of the stock was $5,456. Find the total spent.

Fee + Total purchase price $5,456 + $24 = $5,480

Lee spent $5,480 on today's trades using a discount broker.
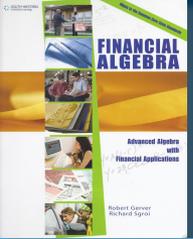
■ **CHECK YOUR UNDERSTANDING**
Garret made two trades in one day with his discount broker that charges $7 per trade. Garret's first purchase was for $1,790 and his second purchase was for $8,456. How much did he spend including broker fees?

EXAMPLE 2

Adriana purchased $7,000 worth of stock from a broker at Tenser Brokerage. The value of Adriana's portfolio is under $250,000. The current value of her portfolio is $11,567. What broker fee must she pay?

Tenser Brokerage Fee Schedule	Online Trades	Automated Telephone Trades	Trades Using a Broker
Portfolio Value less than $250,000	$15 per trade	Online fee plus $9.50	0.5% commission plus online fee
Portfolio Value greater than $250,000	$12 per trade	Online fee plus $9.50	0.4% commission plus online fee

SOLUTION Adriana's fees are in the first row since her portfolio is under $250,000. She is using a broker, so use the fees in the last column. First, multiply the percent as a decimal by the amount of stock and add $15.

CENGAGE Learning™

OUR FOCUS IS YOU!

Check Your Understanding
allows students to immediately practice the just-learned concept on their own.

Extend Your Understanding
provides an opportunity to solve a more challenging problem, based on the new skill.

EXAMPLE 2

Five years ago, Jessica bought 300 shares of a cosmetics company's stock for $34.87 per share. Yesterday she sold all of the shares for $41 per share. What was her capital gain?

SOLUTION Multiply to find the purchase price of all 300 shares. Multiply to find the selling price of all 300 shares. Subtract to find the capital gains.

Multiply 300 by purchase price.	$(300)($34.87) = $10,461$
Multiply 300 by selling price.	$(300)($41) = $12,300$
Subtract purchase price from selling price.	$12,300 - $10,481 = $1,819$

Jessica's gross capital gain was $1,819.

CHECK YOUR UNDERSTANDING

Kelvin bought 125 shares of stock for $68.24 per share. He sold them nine months later for $85.89 per share. What was his capital gain?

EXTEND YOUR UNDERSTANDING

Three years ago, Maxine bought 450 shares of stock for x per share. She sold them last week for y per share. Express her capital gain algebraically in terms of x and y.

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www.cengage.com/community/financialalgebra

OUR FOCUS IS YOU!

Carefully developed applications at the end of each lesson require students to apply concepts learned in the section.

Applications

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 x 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?

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.

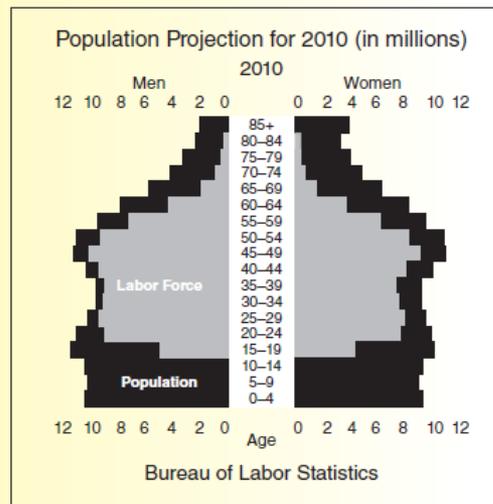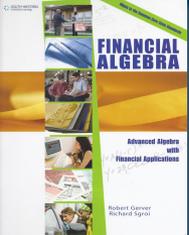|	A	B	C
	Price Per Share	Annual Dividend	Yield
2	37.12	1.51	
3	44.55	1.77	
4	65.29	2.01	
5	14.35	0.48	
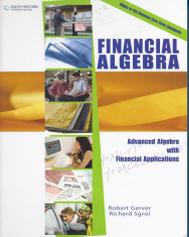
CHAPTER 9

Assessment

Real Numbers

You Write the Story!!

Write a short newspaper-type article centered on this chart below. You can find an electronic copy at www.cengage.com/school/math/financialalgebra. Copy it, and paste it into your article.
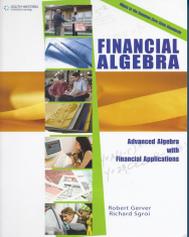
Population Projection for 2010 (in millions)

2010

Men / Women

Age

Labor Force

Population

Bureau of Labor Statistics

Reality Check

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.

Dollars and Sense   **Your Financial News Update**

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 s 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.

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WORKBOOK—Aligned with Textbook!

FINANCIAL ALGEBRA

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Richard Sgroi
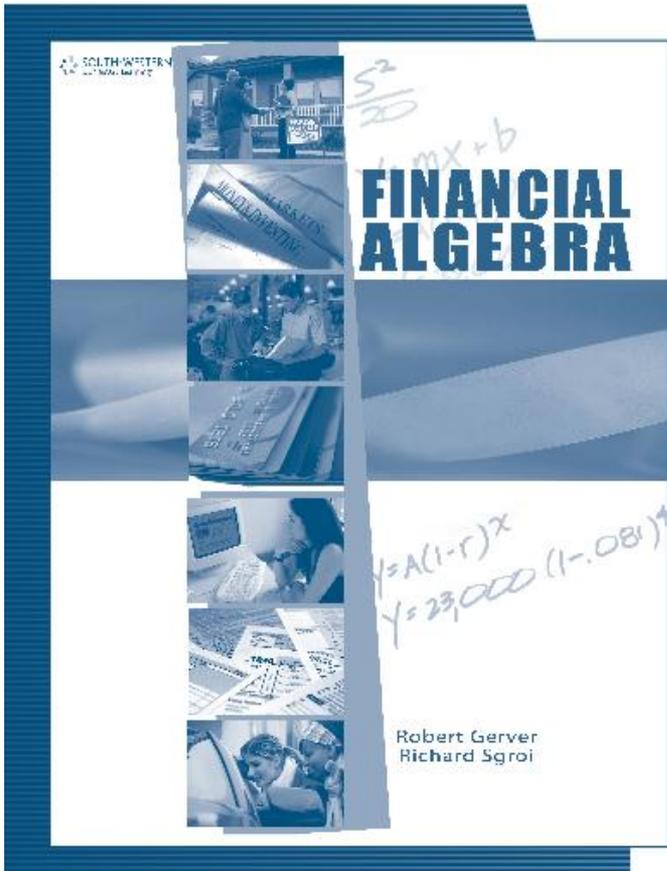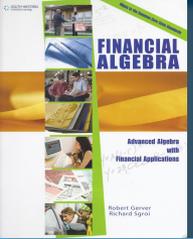
Name _____   Date _____

## 1-5   Stock Market Ticker

Exercises

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 4.2K @ 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
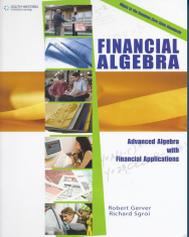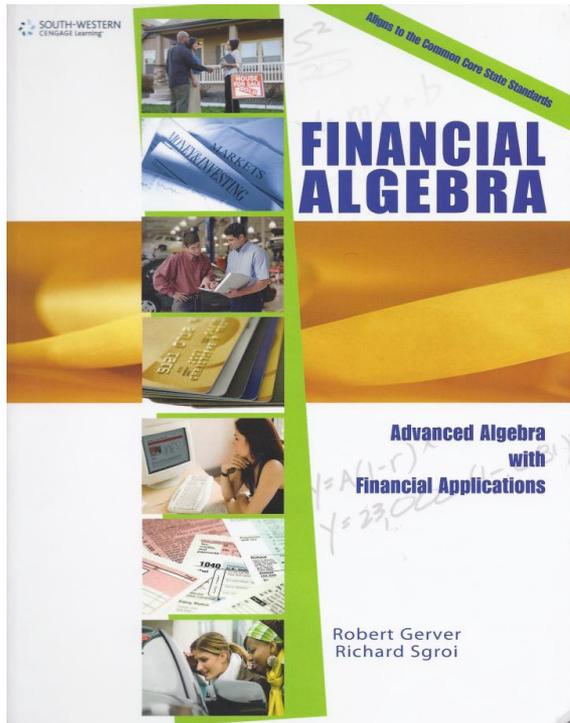
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- **Annotated Instructor's Edition**
- **Instructor's Resource CD**
  - **Lesson Plans, PowerPoints, and Workbook Answers**
- **ExamView Test Generator**
- **Interactive Whiteboard Presentations**
- **Solutions Manual**
- **Guided Practice CD**
- **Student Workbook**
- **Adobe eBook**
- **Companion Website**
- **Webinars & List Serve for teacher support**

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