# An A.P.P. (Attendee Participation Packet)

for

## Advanced Algebra with Financial Applications: An Alternative 3rd or 4th Year Math Course for Struggling Students (Grades 10-12)

#### **NEW Seminar Presented by Robert Gerver**

Presidential Awardee for Excellence in Mathematics Teaching

Specifically Designed for all Mathematics Teachers, Mathematics Chairs, Math Interventionists, and Administrators Working with Students in Grades 10-12

- An alternative, advanced algebra-based full-year course option for struggling students who may not be mathematically ready for Algebra 2 and/or precalculus
- **Effective ways to incorporate** algebra, geometry, trigonometry, graphing, probability, and statistics into units driven by financial concepts
- How to strengthen skills and self-confidence to increase the mathematical readiness, skill set, and mindset needed for tackling current and future math courses
- A comprehensive classroom-tested curriculum designed to motivate, engage, and raise the bar for struggling math students





"Breakouts" 1-9	Pages 1-8
"All Together Now" 1-7	Pages 9-14

## Break Out #1: Finance Warm-Up

What is the largest amount of money you could have, in coins, and not be able to make change for a dollar?

## **Break Out #2:**

Popular first topics are automobiles, stocks, and discretionary expenses—things kids buy.

What might be your favorite pick for the first topic? Why? Which is the first one you'd leave out if time was an issue?

- Discretionary Expenses
- Banking
- Credit
- Owning an Automobile
- Employment Basics/Income Taxes
- Independent Living
- Investing/Starting Your Own Business
- Budgeting/Retirement Planning

## **Breakout #3:**

#### **Exchange ideas on these questions:**

- What graphing/calculator software are your students currently using?
- How do you display screens when teaching?
- What are you most comfortable with?
- Are you looking to make changes?
- Is the technology choice a departmental or personal decision for your own classes?

## **Break Out #4:**

**Finance Warm-Up** 

- Three people pay \$10 each (total \$30) to check into a hotel.
- The manager realizes that they were overcharged and gives \$5 to the bellboy to return to the three people.
- The bellboy decides to return \$1 to each of the three people and keeps \$2 for himself.
- The three people each paid \$9 for their room, for a total of \$27.
- The bellboy received \$2. The three people originally paid a total of \$30. What happened to the other dollar?

### **Breakout #5:**



The four prices add to 7.11 and they multiply to 7.11.

Two of the prices are \$3.16 and \$1.25. Find the other two prices using Algebra 1 skills.

## **Breakout #6:**

## Discuss the pros and cons of each type of question. What are your preferences?

#### TESTING VOCABULARY: TRUE/FALSE

Collision insurance is sold on a deductible basis.

The deductible is the amount the insurance company pays for the damage from an accident.

It is a first budget to the control of the budget ways callising.

If you smash your car into a fire hydrant, your collision insurance pays for the damage to the hydrant.\_\_\_\_

If you are sued because you permanently injured somebody, your bodily injury liability will cover the lawsuit.\_\_\_\_\_

If your car is stolen and you don't have comprehensive insurance, you will get no money from your insurance company.\_\_\_\_\_

#### TESTING VOCABULARY: FILL-IN SENTENCES with No Word Bank

A person who is paid \_\_\_\_\_ gets 24 paychecks per year.

In 2022, the government will take out 1.45% of your pay for \_\_\_\_.

If you are hurt on the job, can't work, and need money for your medical bills, you are covered by insurance.

If you are hurt while NOT working, and are injured and can't work, you can receive money if you have insurance.

Jack earns \$15 per hour and worked 40 hours last week. His \_\_\_\_\_ pay was \$600.

In 2022, the government took out 6.2% of your pay for \_\_\_\_\_ is another name for Social Security.

If you lose your job through no fault of your own, you may be able to collect \_\_\_\_\_.

#### TESTING VOCABULARY: FILL-IN SENTENCES With Word Bank

collateral	cosigner	finance charge
credit union	life insurance company	consumer finance company
commercial bank	repossession	promissory note
1. An organization	that gives loans to member	ers only is a
2. A pawnshop will	always want	before lending you any money.
3. A		gives loans to people with poor credit ratings.
4. A	t	akes responsibility for paying back someone else's loan.
5. Another name fo	r interest is	
<ol><li>Another name fo</li></ol>	r interest is	·

#### TESTING VOCABULARY: FILL-IN PARAGRAPHS - with or without Word Bank

Part 3: "At the scene of the accident" fill-ins.

Tom took his car to a Yankee game. While he was at the game, someone side-swiped his car. Tom doesn't know who hit him. What covers the damage to the car, estimated at \$25007 ff Tom has \$SSO decubles, how much wait was the pay to have the damage face? How much wait his insurance company pay?

Also, someone spray-painted "Red Sox' on his car. What insurance covers the damage too his car's paint?

#### TESTING VOCABULARY: MATCHING

- dividend
   corporate bond
   debenture
- corporation
   short sale
- short sale
   interest
- a) ownership is represented by shares of stock
- b) a way to make money when the price of a stock falls
- c) a bond not backed up by collateral
- d) a loan to a corporation

g) the face value of a bond

e) profit split amongst shareholders f) money paid for the use of money

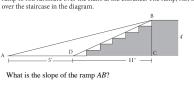
#### TESTING VOCABULARY: MULTIPLE CHOICE

The money paid to an insurance company for an automobile insurance policy is called a

- a) deductible
- b) premium
- c) benefit
- d) claim

#### TESTING MATHEMATICS: MULTIPLE-MULTIPLE CHOICE

The Gray family is moving into a new home and they are using a wooden ramp to roll furniture over the stairs at the entrance. The ramp, AB, is shown over the staircase in the diagram.



b)  $\frac{1}{4}$ 

a) 0.25

#### TESTING VOCABULARY: ALWAYS/SOMETIMES/NEVER

An auto insurance premium is  $\underline{\text{A/S/N}}$  paid semi-annually.

The mean of a distribution is  $\underline{\text{A/S/N}}$  equal to the median.

It is  $\underline{\text{A/S/N}}$  necessary to purchase bodily-injury liability insurance if you insure a car in New York State.

If you purchase a new car from a dealer in New York State, you A/S/N pay sales tax.

#### TESTING MATHEMATICS: GRID-IN

The equation for a demand curve is q = -12p + 2000, where p is the price and q is the quantity sold. How many widgets would be demanded at a price of \$20?



#### TESTING MATHEMATICS: TABLE FILL-INS

d)  $\frac{4}{16}$ 

Principal	Loan Term In years	Monthly payment	TOTAL NUMBER OF MONTHLY PAYMENTS	Total of All Payments Expressed Algebraically	Total Interest Expressed Algebraically
\$25,000	pyears	М			
\$10,000	6 years	М			
\$H	x years			Ť	
\$P	10 years			Ť	
\$P	x years			Y	
\$12,000	30 years			т	

#### TESTING MATHEMATICS: SCAFFOLDED LONG ANSWERS

1-6. Mollie has a job in which regularly works 40 hours per week, and earns \$21 per hour. She receives "time and a half" for each hour over 40. Last week she worked 47 hours.

- 1. What was her regular salary?\_\_
- 2. How many overtime hours did she work?\_\_
- What was her overtime hourly rate?\_\_\_\_\_
- 4. What was her total overtime pay?\_\_\_\_\_
- 5. What was her total gross pay for the week?
- 6. How much did her boss pay into her FICA?\_\_\_

#### TESTING MATHEMATICS: FREE RESPONSE LONG ANSWERS

Mollie has a job in which she regularly works 40 hours per week, and earns \$21 per hour. She receives "time and a half" for each hour over 40. Last week she worked 47 hours. How much did her boss take out for FICA?

## **Breakout #7:**

Have you ever assigned projects in your math classes? Which projects below intrigue you the most? (There are dozens more projects—this is a sampler.)

## PROJECTS ARE WORTHWHILE ALTERNATIVE ASSESSMENTS AND EXTRA CREDIT OPTIONS

- Price your own funeral
- Price a new car
- Price auto insurance
- Interview a banker
- Comparison shop loans
- Build a clinometer
- Interview a pharmacist
- · Price a wedding
- Interview a stock broker
- Create a home inventory
- Interview a stockbroker
- · Research failed inventions

- Price and plan a road trip
- Research patents and trademarks
- Comparison shop supermarkets
- Compare national vs. store brand items
- Price banking services
- Research FICO scores
- Interview insurance agent
- Price car leasing
- Research unemployment insurance
- Price a home closing for a house you pick
- Interview property tax assessor
- Research failed inventions
- Compare generic vs. name brand drugs

## **Breakout #8:**

Justin is doing a statistical analysis to check if sports cars in his town are involved in more accidents than other types of cars. He polls 315 randomly selected parents of students in his high school and gets the results shown in the table below.

	Sports Car (S)	Sedan (SD)	Sport Utility Vehicle (SUV)	Total
Had an accident (A)	50	69	31	150
Never had an accident (N)	55	45	65	165
Total	105	114	96	315

Do sports cars get into more accidents than all cars in general? Do sports cars get into more accidents than non-sports cars?

## **Breakout #9:**

#### What is the APR for this payday loan?

- I = interest,
- P = principal,
- R = annual interest rate expressed as a decimal
- THE LOAN INTEREST / is \$20 + \$20 = \$40.
- THE LOAN AMOUNT P is \$200.
- THE LOAN LENGTH T is 14 DAYS, which is 14/365 of a year.
- USE THE SIMPLE INTEREST FORMULA I = PRT AND SOLVE FOR R

 $Payday APR = \frac{Loan Interest}{Loan Amount} \div \frac{Loan Length in days}{365} \times 100$ 

#### All Together Now #1:

**Live on the Document Camera: Credit Card Numbe** 

# What digit would *d* have to be for the following number to be a legitimate credit card number?

3797 3263 1120 179*d* 

<i>x</i> 2		x2		<i>x</i> 2		<i>x</i> 2		x2		x2		<i>x</i> 2		x2	
3	7	9	7	3	2	6	3	1	1	2	0	1	7	9	d
															d

All Together Now #2:

**Live on the Document Camera: Counterintuition** 

On her birthday, Helene, a mathematics teacher, bought a jacket at Loehmann's, a store that gives customers 10% off on their birthday.

- The jacket was discounted 25% for a holiday sale.
- The cashier first took off 10% off the original price, and then took off 25% off the reduced price. Helene requested that the store first take off the 25%, then the 10%, since she felt she wanted 25% off the larger amount.
- Which arrangement gives her the lowest price?

## All Together Now #3: Live on the Document Camera: Always/Sometimes/Never

- An auto insurance premium is <u>A/S/N</u> paid semi-annually.
- The mean of a distribution is <u>A/S/N</u> equal to the median.
- It is <u>A/S/N</u> necessary to purchase bodily-injury liability insurance if you insure a car in New York State.
- Your collision insurance will <u>A/S/N</u> cover the damage to a car you hit.

#### All Together Now #4:

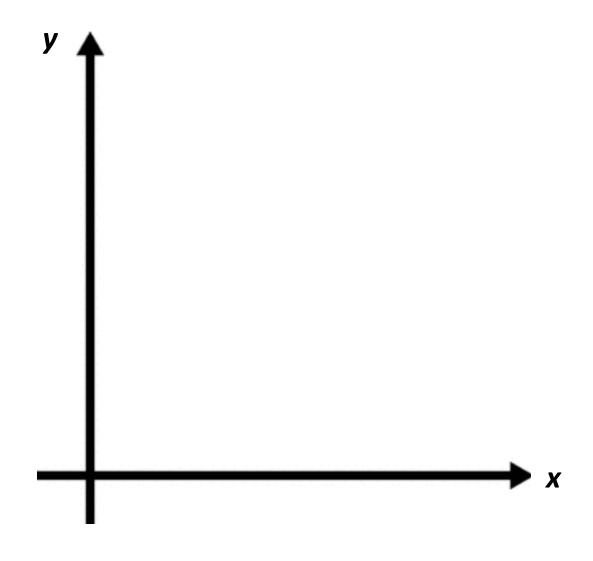
#### Live on the Document Camera: The Average Daily Balance

Elena Kaye 44 Central Avenue Onesburg, TX										
ACCOUNT INFORMATION										
Account Num	Number 07-3458-1299 Billing Date 13 Nov Payment Due 5 Dec									
TRANSACTI	ONS					DEBITS / C	REDITS (-)			
25 Oct	House Depo	ot			_		\$67.00			
29 Oct	Bubble Wra	p Shipping Co.			_		\$55.00			
5 Nov	Payment -\$160.00									
SUMMARY	Previous Balance	Payments / Credits	New Purchases	Late Charge	Finance Charge	New Balance	Minimum Payment			
	\$829.30	-\$160.00	\$122.00	\$0.00	\$12.09	\$803.39	\$59.00			
Total Credit Line \$ 3,000.00 Total Available Credit \$ 2,196.61				Average Daily Balance	# Days in Billing Cycle	APR	Monthly Periodic Rate			
				854.46	31	16.98%	1.415%			

## All Together Now #5: Live on the Document Camera: The Social Security Function

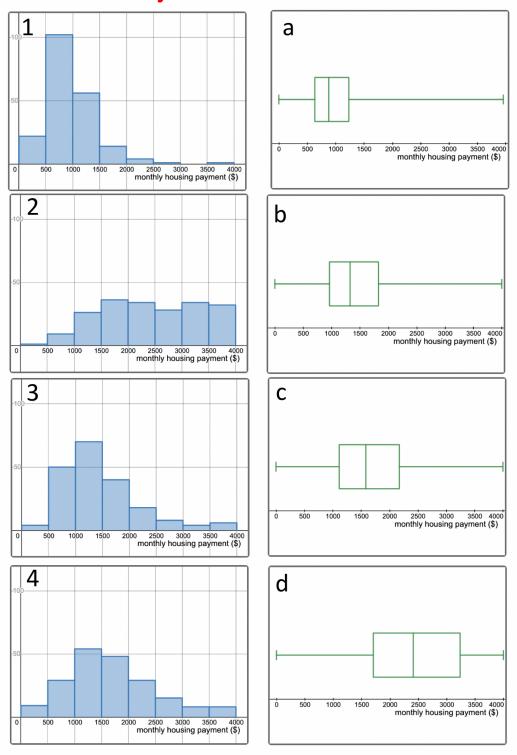
In 2024, the government will take out 6.2% of your income, but only up until you have earned \$168,600. Then you are done for the year.

Express the 2024 Social Security function as a piecewise function and sketch its graph.



## All Together Now #6: Live on the Document Camera: NGPF Worksheet

Match the histogram with the boxplot for this survey of 200 people. A good hint is, "Examine the median of each." Would you give this hint or let the students try it first with no hints?



## All Together Now #7: Live on the Document Camera: Expected Value

#### **EXPECTED VALUE AND LIFE INSURANCE**

How do life insurance companies make profit from term insurance policies?

Financial Algebra Page 638--Examples 5 and 6

The Umbrella State Insurance Company sells a 5-year term insurance policy with face value of \$150,000 to a 41-year-old man for an annual premium of \$648. What is the profit the company receives from selling this policy for each age at death?

If the company sold 10,000 of the same policies, what would their expected profit be for the 10,000 policies?

Age at death	41	42	43	44	45	Age ≥ 46
Profit at end of each year						
Mortality rate	0.0026	0.0029	0.0031	0.0034	0.0037	0.9843