A PROJECT-BASED LEARNING APPROACH TO FINANCIAL LITERACY

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Abstract

This thesis presents a project-based learning curriculum for students in Algebra 2, focused on financial literacy. The project includes topics such as mortgages, auto loans, student loans, annuity, salary, graphing calculator financial applications, and credit card interest.

Introduction

Pre-Calculus students can often solve trigonometric equations with ease, but they do not know what a mortgage is, nor should they be expected to know with the lack of financial applied mathematics included into the curriculum. The lack of financial literacy is evident by the amount of debt carried in American households, for example, credit card balances carried from one month to the next hit $443.96 billion in September 2019 (El Issa, 2019). “The average United States (US) household with revolving credit card debt has an estimated balance of $6,849, costing an average of $1,162 in annual interest” (El Issa, 2019, p. 1). Mathematics educators have the opportunity to incorporate finance into the mathematics they teach. This curriculum project was developed by an author with experience selling subprime mortgages prior to becoming a mathematics teacher. The goal of this curriculum project is to support other mathematics teachers in their efforts to integrate applied financial problems into their instruction so they can equip students with skills needed to make wise financial decisions.

Financial literacy is currently not integrated into secondary mathematics curriculum. This may attribute to 63% of Americans being financially illiterate (Kenton, 2019). The lack of financial literacy can lead to large amounts of debt and poor financial decisions such as high interest rates, subprime mortgages, and eventually bankruptcy (Kenton, 2019). A simple look at

the financial crisis of 2008 will show the nation-wide impact of the lack of understanding in mortgage products. Financial literacy is a problem in both developing and advanced economies and other nations globally, the U.S. ranked 14th in financial literacy (Zucchi, 2018).

The Federal Reserve Chairman, Alan Greenspan, was encouraging mathematics educators to teach finance to their students even before the financial crisis of 2008: "Although your students may not yet be managing a household budget, saving money to buy a house, starting up a small business, or making investment decisions for a pension plan, their financial success may begin in your classroom" (White, 2003, p. 486). While the responsibility of financial education has traditionally been left to parents and guardians, educators today are starting to see the need to incorporate finance into the curriculum. Schyler & Buckley's (2016) research states that 62% of teachers say financial education is not seen as critical for college and career readiness. Additionally, 78% say they need more appropriate curriculum. Bush, McGatha, and Bay-Williams (2012) discussed fitting financial literacy into the middle-school curriculum aligning their goals with Jump Start (Jump$tart), an organization dedicated to educating students about money matters. "The good news is: Half of the nation's schools require a financial literacy course. The bad news is, that course is not mandatory" (Murray, 2015, p. 1). The purpose of this curriculum project is to provide a financial literacy unit, specifically a budget project, for mathematics teachers that incorporates current technology for integration into an Algebra 2 curriculum.

Literature Review

The US economy, many of its citizens, and society overall is affected by poor financial decisions, which may reflect the lack of financial education in our K-12 school system. The financial crisis of 2008 is a prime example of a lack of understanding of mortgage products, and their long-term impact. Financial literacy is declining, while the digital generation is booming; educators can connect the two and increase financial literacy in our schools. “In 23 states and D.C. fewer than 5% of students were required to take a standalone semester of personal finance in 2018-2019” (NGPF, 2019, p. 4). Financial education is not widely seen as a need for college-readiness yet, financial responsibility among college students seems to be declining. American students in college are often so unprepared that some institutions have adopted holistic programs aimed at increasing their financial responsibility and wellness (McIntyre, 2016). However, some experts say that teaching financial literacy in college is too late; financial education needs to start earlier. Minorities, women and the least educated have some of the lowest financial literacy rates in the nation, a major concern for businesses that seek to attract a more diverse workforce as a business imperative (Schyler & Buckley, 2016). Secondary teachers should address the lack of knowledge in financial literacy. “Educators say financial education helps students learn to budget, to understand debt, to prepare for the future, and to think critically. Educators clearly view financial education as an opportunity to set their students on the right path for success later in life” (Schyler & Buckley, 2016, p. 14). Younger teachers, who are often struggling with their own loans and debt, see the value of financial education because they experienced the biggest economic recession since the Great Depression in 2008

(Schyler & Buckley, 2016). As financial literacy improves, our students will be better prepared for college-life and most importantly life after college that involves budgeting, loans, mortgages, credit cards, household incomes, and 401Ks (Kenton, 2019). Incorporating financial mathematics into the secondary curriculum is critical, yet simple.

There are current trends making financial literacy more important. For example, retirement planning has drastically changed due to the lack of pension plan offers from current employers. Pension plans funded the bulk of retirement for past generations but today employees are offered 401(k) plans to make investment decisions and decide how much to contribute (Zucchi, 2018). Longer lifespan for our generations creates a larger need for retirement planning, especially with social security income becoming very minimal. Technological advances have created many different financial products, companies, and influential factors that cause confusion for the consumer and their financial roadmap. There is an urgent need to change our secondary math curriculum to better prepare our students for their quickly-changing financial future; it is our duty as educators to not only prepare them for college and careers but also financial confidence.

"Educators see the value of teaching students to budget, prepare for the future and become better financial decision makers. But educators need more support to adequately teach these skills" (Schyler & Buckley, 2016, p. 3). What better place to look for support than the huge network of financial websites and resources available because of technology? Technological advances have created multiple exploration tools for our students to self-discover some amazing financial knowledge. For example, there is a google chrome add-on called Time is Money that

converts prices on a webpage to hours worked (Murray, 2015). The Living Wage Calculator is another tech tool where students can calculate their cost of living based on future household size and geographic location. The Dave Ramsey's mortgage calculator helps students to calculate their monthly mortgage payment which includes the breakdown of interest, principal, taxes, and insurance. Websites like Khan Academy will give our students on-demand and personalized learning experiences. Khan Academy also has lessons on financial math that includes videos and exercises. Interactive visualizations and explorations are paramount to our students today, for they are different than yesterday's students. "According to Jo Boaler and the team at Stanford Graduate School of Education's You Cubed, representing all mathematical concepts visually, and including visual activities at all grade levels, can greatly help students." (Schiraldi, 2018, p. 2). There are many websites and technology tools available at our fingertips and many more that will soon be created. The advances in technology will support students as they inquire about their own financial questions and create a sense of ownership that educators are trying to deliver.

"As technologies have developed, students already make common use of social networking sites, online communities along with the information repositories and sources already referred to" (Gordon & Brayshaw, 2008, p. 28). With the use of the internet and the guidance of an educator, financial math could excel in such a way to foster wonder, inquiry, and exploration of the topic to include budgeting, mortgages, loans, salaries, and annuities. Students will be able to build their own personalized package of learning by using the internet to research many simple financial topics they know little about. Through engaging and interactive media we can connect with our students and make the content come alive. We can also customize learning

experiences for students who may need additional support. When we incorporate technology into math education, our students will benefit.

"Overall, very few teachers incorporate financial education into their classrooms. While 92% of K-12 educators surveyed nationwide believe financial education should be taught in schools, only 12% do so" (Schyler & Buckley, 2016, p. 6). With the appropriate resources, teachers will be a driving force in improving the financial literacy of our entire nation. However, we must use the tools our students are comfortable with and teach them how to best use them to capitalize their effectiveness. It would be foolish to teach financial literacy without including the fascinating technology that our students literally hold in their hands daily.

Finance Curriculum

My thesis is a financial literacy budget project that can be used in an Algebra 2 math class as a way to combat the lack of financial literacy in our schools. Students will calculate loan terms for student, car, and home loans. They will calculate how much they should save every month to have a 20% down payment on a house in x months. Searching for an IRA and estimating their retirement sum is another skill students will learn. Students will produce a spreadsheet showing itemization of credit card payments and calculate how long it will take to pay it off. I will use project-based learning and the ultimate "test" will be quantitative results. I chose this topic for my thesis because I sold subprime mortgages before I became a teacher. It was during that time when I realized how little the average American knows about finances. My

goal is to equip our students with not just the skills they need to pass a regents exam but also the skills they need to make wise financial decisions that may impact them at a greater level.

College Loan

1. Complete some online research to find the interest rate of a subsidized Stafford college loan for this year.

2. Where do you choose to attend college?

3. How much does it cost per year (including tuition, room, and board)?

4. How many years will you spend there?

5. What will be the total cost?

6. Do you anticipate a scholarship or payment from a savings account?

7. Subtract your scholarship or upfront payments, the rest of the amount will be your total student loans at college graduation.

Assume that you borrow an amount P, which you will repay by taking out an amortized loan. You will make *m* periodic payments per year for *n* total payments and the annual interest rate is *r*. Then, you can find your payment by solving for *R* in the equation

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

In other words, $n = m * t$

Calculate your student loan payment:

Auto Loan

1. What is the average APR (annual percentage rate) of a car loan?

   What is the average term (number of months) of a car loan?

2. Your car is nearing the end of its life. You must purchase another one and it may be new or used. Search for a car online, what car did you find?

   Cost of car: $_____

3. Your present car may be used as a trade-in.

   Go to KellyBlueBook.com and find the trade-in value.

   (If you don't currently own a car, then pretend you own a 2012 Toyota Camry, 100,000 miles, 4DR Sedan, automatic.)

   What's the trade-in value of your current car? _____

   The amount you finance is the cost of your new car minus your trade-in value.

   Therefore you will be financing $_____ at ____% APR for _____ years compounded monthly.

Calculation:

$$P(1 + \frac{r}{m})^{n} = R(\frac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}})$$

Loan Payment:

Salary

What's your future job title?

What's the median starting salary of that job?

Monthly gross salary (gross means before taxes)

Taxes are deducted from your paycheck. Calculate each for your monthly salary.

10.28% Federal income tax: $_____

7.6% FICA tax $_____

4.9% State tax $_____

1% County tax $_____

Total taxes: $_____

Monthly net salary (take-home pay) = salary – total taxes = $_____

Retirement Savings

Age you start working:

Age you want to retire:

Total years of annuity (retirement - starting age):

Monthly contribution to annuity:

Your annuity is 7.5% APR.

Calculation:

Assume that we are making n regular payments, ß, into an annuity.The interest is being compounded m times a year and deposits are made at the end of each compounding period.The future value (or amount),of this annuity at the end of the n periods is given by the equation

$$A = R(\frac{(1+\frac{r}{m})^n-1}{\frac{r}{m}})$$

Yield at retirement age:

You plan to live to age _____.

You will be living off your retirement savings for _____ years (retirement age to death).

Your income will be $_____ per year.

House Loan (Mortgage)

You would like to purchase a house in 5 years that cost $_____.

The down payment is 10 percent of the purchase price: $_____.

How much do you need to save monthly in order to buy your house in 5 years? $_____.

When purchasing a home, you would finance purchase price - down payment) $_____

What is the average APR for a 30 year fixed rate mortgage?

Your mortgage term is for 30 years (360 months) at ____% APR

Calculation:

$$P(1+\frac{r}{m})^{n} = R(\frac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}})$$

Monthly payment $_____

With this payment, how much will you eventually pay for your house in 360 months?

(monthly payment x months + down-payment) $_____

Calculation:

Graphing Calculator

An amortization schedule shows how much of your payment goes to interest and principal; it also shows your remaining balance after each payment. A sample amortization schedule is shown below:

Amortization Schedule				
Period	**Payment**	**Interest**	**Principal**	**Balance**
0				$200,000.00
1	$1,297.20	$ 1,125.00	$172.20	$199,827.80
2	$1,297.20	$ 1,124.03	$173.16	$199,654.64
3	$1,297.20	$ 1,123.06	$174.14	$199,480.50
4	$1,297.20	$ 1,122.08	$175.12	$199,305.38
5	$1,297.20	$ 1,121.09	$176.10	$199,129.28
6	$1,297.20	$ 1,120.10	$177.09	$198,952.18

Field	Entry
N	30*12
I%	6.75/12
PV	200000
PMT	0
FV	0
P/Y	1
C/Y	1

Create an amortization schedule for your mortgage by first selecting [APPS] [ENTER] on your TI-84 calculator and option 1 TVM solver. Enter the information about your loan as shown to the left but with your specific numbers.

The explanations to the right describe each variable in detail.

Variable	Explanation
N	*Number of Periods* the money is invested–for now we will assume each period is one year.
I%	*Annual Interest Rate* that applies to our investment.
PV	*Present Value* of the investment
PMT	*Payment* made each period over the life of the investment
FV	*Future Value* of the investment
P/Y	*Payment Periods per Year*, i.e., are we investing weekly, monthly, etc.–for now we will assume each period is one year.
C/Y	*Compounding Periods per Year*, i.e., is our investment being compounded weekly, monthly, annually, etc.–for now we will assume it is compounded annually.
PMT:END BEGIN	*Payment Time*, i.e., are payments made at the end or the beginning of each period.

Variable	Entry
\Y1=	tvm_Pmt
\Y2=	ΣInt(X,X)
\Y3=	ΣPrn(X,X)
\Y4=	bal(X)

The next step is to set up the table with Payment, Interest, Principal, and Balance. Select the [y=] button and insert the four terms into each y_1 through y_4 as seen to the left. You should be able to see the table after selecting [2nd] [Graph]. Instead of arrowing through the table to see a higher number such as month 337, you may want to select [2nd] [Window] for TBLSET (table setup) and change TblStart to 337.

Future Value Annuity Problems:

Saving money at regular intervals and wanting to find your future value is a future value annuity problem. In other words, how much future value (FV) will you have after making payments (PMT) for N years and get I% interest per year.

To access the finance applications on your calculator press [APPS] [ENTER] and select option 1.TVM Solver… TVM stands for time value of money.

How much do you have after 3 years if you save $200 per year beginning next year and the interest rate is 12%?

N = 3 I% = 12 PMT = 200

Enter the appropriate values (remembering to press [ENTER] after each), move the cursor to the FV line, and then press [ALPHA] [ENTER]. Your screen should look like this:

N=3.00
I%=12.00
PV=0.00
PMT=-200.00
FV=0
P/Y=1.00

C/Y=1.00
PMT:END BEGIN

After you hit [ALPHA][ENTER] your screen should look like this:

N=3.00
I%=12.00
PV=0.00
PMT=-200.00
■FV=674.88
P/Y=1.00
C/Y=1.00
PMT:END BEGIN

In 3 years, your account will have $674.88.

Practice Problems:

How much will you have if you save $100.00 per year for 25 years at 8%?

How much will you have if you save $1000.00 per year for 5 years at 7%?

How much will you have if you save $1.00 per year for 50 years at 10%?

Time Annuity Problem:

Time annuity problems ask you how long it will take to achieve a financial objective:

For example, how long do you have to save $600 per year to get $2,000 if the interest rate is 5%?

You first want to decide if it's the future or present value that you are given. Since the example question describes saving to get $2000 then that is the future value. The next thing you want to decide is which variable are we solving for? In this case we are solving for time.

I% = 5 PMT = 600 FV = 2000

Enter the appropriate values (remembering to press [ENTER] after each), move the cursor to the N line, and then press [ALPHA] [ENTER].

How long do you save for?

Credit Cards

Read about credit cards at https://education.howthemarketworks.com/credit-cards/ (Smith, 2016).

Suppose you have a credit card with a balance of $2573 and an interest rate of 22.2% APR.

The minimum payment is $100.00.

The amount of interest due each month is figured as balance multiplied by r/n, where r is the rate and n is 12.

$$I = B * \frac{r}{n} = 2573 * \frac{.222}{12} = 47.60$$

Suppose you begin making a monthly payment of $100.00 Fill in the table.

Month	Current balance	Interest	Payment	Amount applied to principal
1	$2573.00	$47.60	$100.00	$52.40
2	$2573.00-$52.40 = $2520.60			
3				
4				

5				
6				
7				
8				
9				
10				
11				
12				

Will you ever be able to pay off this credit card? Explain.

Stock Market

Visit the website: http://www.howthemarketworks.com. "HowTheMarketWorks is the #1 FREE stock market game that allows users to create their own custom stock game and create educational lessons for their players" (HowTheMarketWorks, 2019). Teachers may set up their own classrooms, create contests, and assign content. Students can read about mutual funds at the following website: https://education.howthemarketworks.com/mutual-funds/ (HowTheMarketWorks Team, 2015).

Classroom Implications

I used this finance curriculum project with my own students and they were shocked by how much things actually cost. They were shocked to learn that federal taxes are a big deduction from their paychecks and that a down payment on a house is between 10 and 20 percent of the purchase price. After completing the project my students were able to make informed financial decisions such as deciding they will buy a used car instead of a brand new car. The part that needs more work is the loan payment calculation, students need more structure from the teacher to understand what they are solving for. More specifically, they need guidance on how to enter the formula into the calculator without misplacing parentheses; misplaced parentheses caused a lot of mistakes in their calculations. Next time, I would add in the cost of heat, electric, water, gas, internet, cell phone, car insurance, homeowner's insurance, and the cost of food. A post-college budget listing all of their expenses being paid for by their income will allow them to see how much cash they have leftover at the end of each month. Manipulating the loan payment

on a mortgage is another eye-opening tool and an important concept to learn. For example, if you pay an extra $200 a month on your mortgage you will pay off your house a number of months earlier and save a large amount of money in interest. Overall, even without those additions, the students increased their financial toolsets and are better equipped for making important financial decisions in the future.

Conclusion

My first career as a loan officer consisted of mortgage refinances for subprime customers who had equity in their home but a large amount of credit card debt. Day after day I watched hard-working people refinance their homes to 30 year mortgages at double digit interest rates. The lack of financial literacy I saw during my time there was shocking. My hope is that this curriculum project encourages other teachers to implement financial mathematics and literacy into their classroom. A successful implementation of financial mathematics is attained by using curriculum and tools that both teacher and student are comfortable with. As previously stated, it would be foolish to teach financial literacy without including the fascinating technology that our students literally hold in their hands daily. A combination of a finance curriculum such as this project and a useful mashup of technology-delivered financial resources would create an ideal formula. With financial education, teachers can begin to equip students with skills they need to make wise financial decisions in the future.

References

Bush, S.B., McGatha, M.B., Bay-Williams, J.M. (2012). Mathematics Teaching in the Middle School. February 2012, Vol. 17, Issue 6

El Issa, Erin. (2019). 2019 American Household Credit Card Debt Study. *NerdWallet.* Retrieved from https://www.nerdwallet.com/blog/average-credit-card-debt-household/

Glasmeier, A.K. & Massachusetts Institute of Technology. (2018). *Living Wage*. Retrieved from http://livingwage.mit.edu/

Gordon, N. & Brayshaw, M. (2008) "Inquiry based Learning in Computer Science teaching in Higher Education, Innovation in Teaching and Learning in Information and Computer Sciences", 7:1, 22-33, DOI: 10.11120/ital.2008.07010022 Retrieved from https://www.tandfonline.com/doi/pdf/10.11120/ital.2008.07010022?needAccess=true

HowTheMarketWorks (2019). *How The Market Works.* Retrieve from https://howthemarketworks.com

HowTheMarketWorks Team (2016). Mutual Funds. *How The Market Works.* Retrieved from https://education.howthemarketworks.com/mutual-funds/

Kenton, Will. (2019) "Financial Literacy". Retrieved from https://www.investopedia.com/terms/f/financial-literacy.asp

McIntyre, E. (2016). Tips, Tricks, and Solutions for Teaching Financial Literacy. Education Dive. Retrieved from https://www.educationdive.com/news/tips-tricks-and-solutions-for-teaching-financial-literacy/418117/

Murray, J. (2015). "Technology in the Classroom Tools for Financial Literacy Month". TeachHub.com. Retrieved from http://www.teachhub.com/technology-classroom-tools-financial-literacy-month

Next Gen Personal Finance (2019). "Who Has Access to Financial Education in American Today?" https://c212.net/c/link/?t=0&l=en&o=2368924-1&h=4123262011&u=https%3A%2F%2Fdrive.google.com%2Ffile%2Fd%2F0Bymvq1l-1i1HODJLUkR4VFplUDQ%2Fview&a=NGPF%27s+Access+To+Financial+Education+report

Scharaldi, K. (2018). "What are the benefits of using technology for math instruction?" Retrieved from https://www.texthelp.com/en-us/company/education-blog/march-2018/what-are-the-benefits-of-using-technology-for-math/

Schrenk, Lawrence P. (2012). "A Guide to Financial Applications on the TI-83/84 Plus Graphing Calculator". *Winona State University: College of Business.* Version 1.0 Retrieved from http://larryschrenk.com/Common/FinCalcGuideGraphing.docx

Schyler S. & Buckley E. (2016). "Bridging the Financial Literacy Gap: Empowering teachers to support the next generation". *PwC*. Retrieved from https://www.pwc.com/us/en/about-us/corporate-responsibility/assets/pwc-financial-education-report.pdf

Smith, Kevin. (2016). Credit Cards. *How the Market Works*. Retrieved from https://education.howthemarketworks.com/credit-cards/

Time is Money. (2019). *Google Chrome Extension.* Retrieved from

https://chrome.google.com/webstore/detail/time-is-money/ooppbnomdcjmoepangldchpmjhkeendl

White, W. (2003). "The Essential Fairness of a Mortgage Loan: Developing Financial Literacy". *Mathematics Teacher.*

Zucchi, K. (2018). "Why financial literacy is so important". *Investopedia*. Retrieved from https://www.investopedia.com/articles/investing/100615/why-financial-literacy-and-education-so-important.asp

Appendix

College Loan KEY

1. Complete some online research to find the interest rate of a subsidized Stafford college loan for this year.

   4.53%

2. Where do you choose to attend college?

   St. Lawrence University

3. How much does it cost per year (including tuition, room, and board)?

   $54,836

8. How many years will you spend there?

   4 years

9. What will be the total cost?

   $219,344

10. Do you anticipate a scholarship or payment from a savings account?

    Scholarship: **$32,000/year** or $136,000 over 4 years

11. Subtract your scholarship or upfront payments, the rest of the amount will be your total student loans at college graduation.

    $219,344 - $136,000 = **$83,344**

Calculate your student loan payment: term is 15 years or 180 months

$$P(1 + \frac{r}{m})^{n} = R(\frac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}})$$

$$83,344(1 + \frac{.0453}{12})^{180} = R(\frac{(1+\frac{.0453}{12})^{180}-1}{\frac{.0453}{12}})$$

$$164{,}218.4056 = R\ (257.0513007)$$

$$\boldsymbol{R = \$638.85}$$

Monthly college loan payment = **$638.85**

Auto Loan KEY

1. What is the average APR (annual percentage rate) of a car loan? **4.21%**

   What is the average term (number of months) of a car loan? **60 months**

2. Your car is nearing the end of its life. You must purchase another one and it may be new or used. Search for a car online, what car did you find? **2019 Honda Pilot Ex-L**

   Cost of car: **$37,760**

3. What's the trade-in value of your current car? **$11,200**

   The amount you finance is the cost of your new car - your trade-in value.

   Therefore you will be financing $**26,560** at **4.21** % APR for **5** years compounded monthly.

   Calculation:

$$P(1+\frac{r}{m})^{n} = R(\frac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}})$$

$$26,560(1+\frac{.0421}{12})^{60} = R(\frac{(1+\frac{.0421}{12})^{60}-1}{\frac{.0421}{12}})$$

$$32770.80193 = R(66.65285533)$$

$$\boldsymbol{R = \$491.66}$$

   Loan Payment: **$491.66**

Salary KEY

What's your future job title? **High School Math Teacher**

What's the median starting salary of that job? **$57,200**

Monthly gross salary (gross means before taxes) **$4,767**

Taxes are deducted from your paycheck. Calculate each for your monthly salary.

10.28% Federal income tax:	**$490.05**
7.6% FICA tax	**$362.29**
4.9% State tax	**$233.58**
1% County tax	**$47.67**
Total taxes:	**$1,133.59**

Monthly net salary (take-home pay) = salary – total taxes = 4,767 - 1,133.59 = **$3,633.41**

Retirement Savings KEY

Age you start working: **23**

Age you want to retire: **65**

Total years of annuity (retirement - starting age): 65 - 23 = **42 years**

Monthly contribution to annuity: **$120**

Your annuity is 7.5% APR.

Calculation:

n = 12*42 = 504 payments

$$A = R\left(\frac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}}\right)$$

$$A = 120\left(\frac{(1+\frac{.075}{12})^{504}-1}{\frac{.075}{12}}\right)$$

$$A = \$424,481.67$$

Yield at retirement age: **$424,481.67**

You plan to live to age **90**.

You will be living off your retirement savings for **25** years (retirement age to death).

Your income will be $\frac{\$424,481.67}{25} = \$16,979.27$ per year.

House Loan (Mortgage) KEY

You would like to purchase a house in **5** years that cost **$215,000**.

Down payment is between 10 and 15 percent of the purchase price: **$21,500.**

How much do you need to save monthly in order to buy your house in 5 years? **$358.33**

When purchasing a home, you would finance (purchase price - down payment) **$193,500**

What is the average APR for a 30 year fixed rate mortgage? **3.90%**

Your mortgage term is for 30 years (360 months) at **3.9**% APR

Calculation:

$$P(1+\tfrac{r}{m})^{n} = R(\tfrac{(1+\frac{r}{m})^{n}-1}{\frac{r}{m}})$$

$$193,500(1+\tfrac{.039}{12})^{360} = R(\tfrac{(1+\frac{.039}{12})^{360}-1}{\frac{.039}{12}})$$

$$622,273.9139 = R(681.81)$$

$$\boldsymbol{R = \$912.68}$$

Monthly payment: **$912.68**

With this payment, how much will you eventually pay for your house in 360 months?

(monthly payment)*(# of months) + (down-payment) = $**350,064.80**

Calculation: (912.68)(360) + 21,500 = 350,064.80

Graphing Calculator KEY

Future Value Annuity Practice Problems:

How much will you have if you save $100.00 per year for 25 years at 8%?

N=25.00
I%=8.00
PV=0.00
PMT=-100.00
FV=7310.59 ***(answer)***
P/Y=1.00
C/Y=1.00
PMT:END BEGIN

How much will you have if you save $1000.00 per year for 5 years at 7%?

N=5.00
I%=7.00
PV=0.00
PMT=-1000.00
FV=5750.74 ***(answer)***
P/Y=1.00
C/Y=1.00
PMT:END BEGIN

How much will you have if you save $1.00 per year for 50 years at 10%?

N=50.00
I%=10.00
PV=0.00
PMT=-1.00
FV=1163.91 ***(answer)***
P/Y=1.00
C/Y=1.00
PMT:END BEGIN

Time Annuity Practice Problem:

Your screen should look like this:

N=3.16 ***(answer)***
I%=5.00
PV=0.00
PMT=-600.00
FV=2000.00
P/Y=1.00
C/Y=1.00
PMT:END BEGIN

You would need to save for 3.16 years, or 3 years 2 months.

Credit Cards KEY

Month	Current balance	Interest	Payment	Amount applied to principal
1	$2573.00	$47.60	$100.00	$52.40
2	$2573.00-$52.40 = $2520.60	$46.63	$100.00	$53.37
3	$2520.60	$46.63	$100.00	$53.37
4	$2467.23	$45.64	$100.00	$54.36
5	$2412.87	$44.64	$100.00	$55.36
6	$2357.51	$43.61	$100.00	$56.39
7	$2301.13	$42.57	$100.00	$57.43
8	$2243.70	$41.51	$100.00	$58.49
9	$2185.21	$40.43	$100.00	$59.57
10	$2125.63	$39.32	$100.00	$60.68
11	$2064.96	$38.20	$100.00	$61.80
12	$2003.16	$37.06	$100.00	$62.94