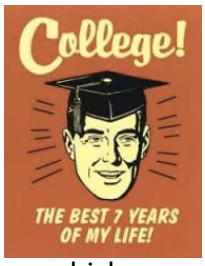
Exponential and Logarithmic Functions PBA Project
Algebra 2 Spring 2016
Ms. Lozada

Name: _____

Band: _____

The goal of this project is for you to get an idea of the kind of real-life expenses you will experience after you graduate from high school. You will research different aspects of your future life and then make calculations based on some options for college, your home, and your career and retirement. When you are done, there is a reflection and Independence Statement at the end. Enjoy!

College



Where do you want to attend for college? Choose a college and research its cost for all four years. Make sure you include room and board, books, and travel as well. Most colleges publish this information on their respective website. For example, NYU's website (where I went to college) has this page:

https://www.nyu.edu/content/dam/nyu/financialAid/documents/tuitiongeneral.pdf on which you learn that one-year of education is about $70,094. Scholarship please! I googled "NYU cost" to find that page.

College: _____ Annual Estimated Cost: _____

Bringin' Home the Bacon

There is a chance that you might not become a math teacher one day, so you need to find a career. Use a site like www.salary.com to see how much you might expect to make based on where you want to live. Use the "Free Salary Data" option. There are some ads to navigate through, but the site gives good data. Another site is Department of Labor's Bureau of Labor Statistics' Occupational Outlook handbook at http://www.bls.gov/ooh/. It has good information on what they do, work environment, how to become one, pay, and job outlook for careers but the salary tab is not as good as salary.com.

Zip Code: _____ Profession/Title: _____

Median starting salary: _____ Source: _____

Home is Where the Heart Is

Where would you like to live after college i.e. where are you going to "settle down" and buy something? Use a site like StreetEasy or Trulia to see how much you might expect to pay to buy a place. Do NOT look at rentals. It does not matter whether it is a house, condo, co-op, apartment, etc. How much does this place break the bank?

You're going to need a mortgage to afford it. Search "average home loan rates" and see what you can find for a 30-year, 0-point mortgage loan in the ZIP code in which you want to live. (There is a lot more affordable stuff outside of New York). There are plenty of calculators for this online.

City/State: _____ Zip Code: _____

Cost of residence: _____ Source: _____

30-year mortgage rate: _____ Source: _____

You will need this information for later.

Part 1: College

Given the college you chose, what is a reasonable four-year estimate of costs? _____
Assume you have secured student loans to be repaid on a monthly basis at an annual rate of 4.29% (the going rate for Federal Loans this year). You will start paying off your loans in November of the year you graduate. (You get a six-month grace period before it gets "real.") You will make a payment at the end of the month each month until your debt is no more.

Scenario 1: You pay 50% of the costs of college while you're in school and you take out loans for the remaining balance.	Present Value in November: _____

You pay off the loans over 10 years (the standard repayment period for student loans). Calculate your monthly payment using the Present Value Payment formula $A = \frac{r(PV)}{1-(1+r)^{-n}}$, where A is the monthly loan payment, r is the *monthly* loan rate (annual loan rate $\div$ 12 months), PV is the present value (i.e. the loan amount), and n is the number of pay periods (*in months*).

Monthly Payment: _____

Total amount paid over 10 years: _____ Total *interest* paid over 10 years: _____

Scenario 2: You pay 40% of the costs of college while you're in school and you take out loans for the remaining balance.	Present Value in November: _____

You pay off the loans over 10 years (the standard repayment period for student loans). Calculate your monthly payment using the Present Value Payment formula $A = \frac{r(PV)}{1-(1+r)^{-n}}$, where A is the monthly loan payment, r is the *monthly* loan rate (annual loan rate $\div$ 12 months), PV is the present value (i.e. the loan amount), and n is the number of pay periods (*in months*).

Monthly Payment: _____

Total amount paid over 10 years: _____ Total *interest* paid over 10 years: _____

Part 2: Bringin' Home the Bacon

Now you are going to look at your job and salary. This part of the project has the most estimation, but you should still be able to get a good idea of what is in your future.

Assume you get a 3% raise *each year* at your job (the average raise for 2014 and 2015 for most workers). Use the Compound Interest Formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A is the amount after t years, P is the initial principal, r is the annual rate (expressed as a decimal), compounded n times per year, to estimate your salary in your 10th year, 20th year, 30th year, and 40th year on the job.

10th year salary: _____ 20th year salary: _____

Part 2 continued….

30th year salary: _____ 40th year salary:_____

Part 3: Home is Where the Heart Is

Total Cost of the Home: _____ Annual Mortgage Rate:_____

Assume you take out a 30-year fixed rate mortgage at the annual rate you researched on page 2.

Scenario 1: You make a 10% down payment i.e. you pay 10% of the total cost of your home when you sign the mortgage and the Principal Value of the mortgage is the other 90% you did not pay.

A. Calculate the monthly mortgage payment (assume you make the payment at the end of the month) using the Present Value Payment formula from Part 1.

Monthly Mortgage Payment: _____

B. Calculate the total amount of money you will pay over the 30 years.

C. Calculate the total interest you will pay over the 30 years.

Total amount: _____ Total interest: _____

Scenario 2: You make a 20% down payment i.e. you pay 20% of the total cost of your home when you sign the mortgage and the Principal Value of the mortgage is the other 80% you did not pay.

A. Calculate the monthly mortgage payment (assume you make the payment at the end of the month) using the Present Value Payment formula from Part 1.

Monthly Mortgage Payment: _____

B. Calculate the total amount of money you will pay over the 30 years.

C. Calculate the total interest you will pay over the 30 years.

Total amount: _____ Total interest: _____

Analysis:

What was the difference between the two down payments in dollars?

How much did you save over the total term of the loan by paying that extra 10% upfront?

Part 4: Retirement

You should put money away for retirement as soon as possible. Google "average 401(k) return rate" and/or "average IRA return rate" and see what you can find. Some sites give clear information and some do not. www.interest.com is not a bad place to start.

Choose an annual rate that you think reflects an *average* based on what you found: _____

(Source: _____)

Using your annual income, determine how much you will earn each month: _____

Write down the monthly mortgage payment you found in Part 3, Scenario 2: _____

Determine your actual income per month after paying for housing: _____

Based on what you know about your income and the amount you'll be paying for your home, what amount will you contribute to your retirement each month? _____

Note: In 2014, the average person contributed approximately $4000 *per year* to a 401(k). Does not mean it's a good number, it is just what happened. Ideally, you want to contribute 10-15% of your salary each year.

Keep in mind that if you choose to have kids one day, they are not cheap (on average it costs $245,340 to raise a child to age 18). Cars are not either. (We are going to assume you contribute the same amount every period. In reality, you would not as your income grows, but use this for now.)

A. Using your annual rate and monthly contribution, determine the Future Value of your retirement account using the Future Value Formula $FV = P \times \frac{\left[\left(1+\frac{r}{n}\right)^{nt}-1\right]}{\left(\frac{r}{n}\right)}$, where FV is the Future Value, P is the regular monthly payment, r is the annual rate (as a decimal), n is the number of payment periods *per year*, and t is the number of years, after…

…35 years: …40 years: …45 years:

Future Value: _____ Future Value: _____ Future Value: _____

B. I hear that you should have 8 times your annual salary saved up to retire i.e. if you make $105,000 then you should have $840,000 in the bank before you retire. This has to do with the standard of living you have created, among other things.

Using your 40th year income before taxes (Hint: Part 2, 40th year salary), what is that 8x goal?

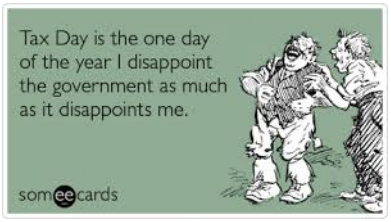
New Future Value: _____

Use this goal to determine the amount you should be paying into your retirement account each month. You know the rate (r) and the future value (FV), now you need to determine the regular monthly payment (P). Use 45 years for t.

Regular monthly payment: _____

How do the figures from A compare to the figures from B?

Part 5/BONUS: What about Taxes??



My mom always told me that, "The only two things you have to do in life are pay taxes and die." Thanks mom, I'm pretty sure you stole that quote from someone. So of all the dolla-dolla bills you earn, how much is really *yours* (according to the government)?

How much did you make after 20 years on the job (Hint: Part 2, 20th year salary): _____

You choose whether you are still "single and looking" or living "happily ever after" in marriage. If you are married, assume your spouse also makes the same exact income as you.

Are you a single or married joint filer?

_____

2016 Tax Brackets		
Tax Rate	**Single Filers**	**Married Joint Filers**
10%	$0-$9,275	$0-$18,550
15%	$9,276-$37,650	$18,551-$75,300
20%	$37,651-$91,150	$75,301-$151,900
28%	$91,151-$190,150	$151,901-$231,450
33%	$190,151-$413,350	$231,451-$413,350
35%	$413,351-$415,050	$413,351-$466,950
39.6%	$413,201 or more	$466,951 or more

Source: IRS

What tax rate bracket do you fall into? _____

(This is Federal taxes only, there are also state taxes. Plus taxes are way more complicated than this because the brackets work a little differently than what we are doing--they change each year, and are determined by a number of other factors you will learn about when you fill out the 1040 tax return form, such as dependents, deductions, and credits…get excited for that)

Which means how much of your income do you get to keep each year? _____

Just joking, you actually get to keep more money than what you just wrote down because taxes are marginal. Meaning, as a single filer in the 20% tax bracket, for the first $0-$9,275 you earn, you only pay 10% of that amount as taxes; for the next $9,276-$37,650 you earn, you only pay 15% of that amount as taxes; for the following $37,651-$91,150, you only pay 20% of the amount that is left over within your income bracket as taxes. So, if you are in the 20% tax bracket, you do NOT pay 20% of the whole amount between $0-$91,150. Make sense? Well let's try it out.

How much money do you pay in taxes at each tax rate (remember to use the correct single or married column)?

Tax Rate	Taxes owed from this bracket	Total Cumulative Taxes Owed
10%		
15%		
20%		
28%		
33%		
35%		
39.6%		

How much money do you actually take-home each year? _____

Using your actual take-home annual income, determine how much you will earn each month: _____

Write down the monthly mortgage payment you found in Part 3, Scenario 2: _____

Determine your actual take-home income per month after paying for housing: _____

This is the money you have to run your empire. Imagine if we considered state taxes too…not fun.

Part 6: Reflection

What are your reactions to the work you did for this project? What does it make you think of for your future?

Independence Statement

I understand that this project is part of what takes the place of the Regents exam at Beacon and as such, I am expected to complete it independently. I understand that I am allowed to use my notes and ask simple clarification questions (e.g. "What does this prompt mean?") but I am not allowed to have someone tell me how to do this.

I, _____, certify that I did not either give or receive help to complete this project. I understand that if it becomes known that I violated these conditions, I will receive no credit for this project.

_____ _____

Signature Date