Name _____ which class? M 12 & T/Th 11-12:15 OR M 4 & T/Th 3:30-4:45

Car decisions

goals for this lab: Dr. Sarah's MAT 1010: Introduction to Mathematics

- Explore applications of algebra in everyday life.
- Investigate real-world data and interpret key features.
- Utilize technology to adapt and use mathematical formulas that include cell referencing to answer real-world questions and interpret results.
- Communicate quantitative information using a variety of representations, including numerical, algebraic, and tables, in written documents.

Let's use our Excel table in another situation which will probably is relevant to many people—buying versus leasing a car and the income you need to do so!

1. Go to `https://www.kbb.com/` or find a car and its price some other way. Spend less than 5 minutes on this. On kbb, you can click on Car Values (Price New/Used) in the very top menu bar, and then follow the directions to choose a model, a make, and a year of a new car. You might also need to select a trim or other options and enter a zip code (28608 or your home zip code will do). After you Configure your Car, find a Fair Purchase Price and write it down. If you can't find that, copy down an Invoice or MSRP or other price. Also write down the model, make and year.

   Price: Model and Make: Year:

2. Go to the real-life rates assignment in ASULearn and write down an interest rate for a car loan. If you did not find one, search for a bank loan rate for a car now, for a 6-year loan, and write down the rate.

3. Download the Excel file **condocarlabsols.xls**. On your computer, the Excel file may come up automatically or you will open it yourself.

4. In North Carolina, you must pay a 3% "Highway Use Tax" whenever you buy a car. Add this to the price of your car to get your car's total price. Show work.

5. B1
   Click on B1 in your Excel sheet. You will see 105265 appear. Change the amount to match your car's total price in #4, and then hit return.

6. B2
   Click on B2 and then click up top in the formula bar next to the = sign. Assume that you will put 10% down on your car (since this is typical in real life for car loans). Then you will need a loan for 90% of the car's total price. You must change the loan to 90% of the car cost instead of 80% for a house, so do that and hit return:
   =0.9*B1

7. D1
   Click on D1 and then click up top next to the = sign. Change this to the rate in #2 divided by 12 (i.e. =rate/12). Don't forgot to write the percent as a decimal, like =0.0349/12 but use your rate.

8. B3
   By going to the formula bar, change the 360 (the number of house payments) to 72 (the number of car payments in 6 years ($72 = 6 \times 12$) so that the Excel loan payment formula reads
   =PMT(D1,72,-B2).

9. D3
   By going to the formula bar, change 360 to 72.
   =B3*72-B2
   Also, change the text next to it from total interest 30 years to total interest 6 years.

10. What is the number in B3, the End of Month Payment?

11. By-hand Verification of B3
    Set up the loan payment formula below with numbers and solve for the monthly loan payment. Be sure to use the loan amount in B2 rather than the full cost of the car. Then calculate the payment on your calculator. If you do not get the same answer as Excel, aside from perhaps slight rounding differences, then you should recheck both Excel and your by-hand work to see what you did wrong and resolve any differences.

    formula: calculator:

12. What is the number in D3, the total interest over 6 years?

13. By-hand Verification of D3
    Show the by-hand work for the total interest paid over 6 years?

14. Decision: Leasing for 3 years or Purchasing?
    You have the option of leasing your car for 3 years, and then giving the car back at the end of the 3 years. Monthly payments and upfront costs on a lease can be less expensive and allow you to drive a new car every few years. However, with leasing you are limited to a certain number of miles per year, or you must pay extra, and insurance costs can be higher. Most leases charge you as much as 25 cents per mile if you exceed the annual mileage limit—usually between 12,000 and 15,000 miles, and it is very expensive to break a lease early. Would you rather purchase or lease your car? Why?

15. Month 1 in the amortization table—by-hand formula, by-hand number, and comparison with Excel

    Fill in the following column by column B–E. (row 1): show by-hand formulas (like $84212 \times .0675/12$ for the interest paid the first month, but use your car's numbers) and (row 2) the corresponding numbers you obtain by-hand, like \$473.69. Then (row 3) comment on whether there any rounding differences or other differences from what Excel shows in the first row of the amortization table:

	A	B	C	D	E
	month #	end of month 1 payment	interest paid month 1	principal paid	new loan balance
by-hand formula	–	#11:			
by-hand number	1				
same as Excel?	yes				

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16. Debt-to-Income Ratio
    Assume the bank allows a 35% debt-to-income ratio and assume that you have the following monthly debts:
    monthly rent = $425.00
    monthly student loan payment = $80.00
    monthly insurance = $40.00
    monthly credit card minimum payments = $50.00
    car payment= monthly car payment amount in above chart =

    a) What is your total monthly debt (add the above, including your car payment)?

    b) What is the monthly income necessary for a 35% debt-to-income ratio? Set up the ratio
    $.35 = \dfrac{\text{total monthly debt}}{\text{monthly income necessary}}$. Then solve for the needed monthly income by cross multiplication and division. Show work.

    c) What is the necessary annual income (convert from monthly income)?

17. Paying Extra

    a) What if you can afford an extra $85 per month on the car payment? If you are stuck on where to begin in Excel, you can review the home decisions lab, which gave detailed instructions in questions #8.–11. for the same process as you will use here. Adapt the Excel file. What cell did you add the 85 to?

    b) Next, calculate the total interest over the life of the loan now. Careful: D3 will not give the correct answer since it assumes 72 months and it does not account for the negative balance the last month, so compute using the row with the last payment in Excel, just like we did in the home decisions lab questions 8.–11. Show work.

    c) Compare your response in b) to the total interest from #12 and address why the savings or loss makes sense in this context.