handwrite car decisions during lab

Dr. Sarah's 1010: Introduction to Mathematics

instructions: Instead of collecting this, I'll answer questions during lab so that you can get feedback before the exam as you review and extend content. I will mark your participation on ASULearn.

goals:

- 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/` and 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). Find a price of the car and also write down the model, make and year.

   Price: Model and Make: Year:

2. 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 via price$\times(1 + .03)$.

3. Go back to the *research real-life rates* assignment on ASULearn and write down an interest rate for a car loan. If you did not find one previously, search for a bank loan rate for a car now and write down the rate.

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

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 #2, including sales tax, 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 so that it looks like
   =0.9*B1
   and then hit return. Don't forget that the equal sign needs to be in these formulas!

7. D1
   Click on D1 and then click up top next to the = sign. Change this to the rate in #3/12 (i.e. =rate/12). Don't forgot to write the percent as a decimal, like =.0249/12 but use your rate.

8. B3
   In 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
   In D3, by going to the formula bar, change 360 to 72 so that it looks like
   =B3*72-B2

10. C3
    Also, change the **text** in C3 from total interest 30 years to total interest 6 years.

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

12. By-hand verification of B3
    As a review and verification, 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.

    by-hand formula: by-hand calculator response:

    If you do not get approximately 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 (did you use the loan amount in B2? the rate as a decimal over 12? −72?). Resolve any differences.

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

14. By-hand verification of D3
    Show the by-hand work for the total interest paid over 6 years (=monthly payment×72 − loan)?

15. By-hand verification of row 6 (month 1) in the amortization table

    Fill in the following column by column C–E of by-hand formulas (like 84212 × .0675/12 for the interest paid the first month, but use your car's numbers) and below that (row 2) the corresponding number you obtain on a calculator, like $473.69, then below that (row 3) comment on whether there are any major differences from what Excel shows in the amortization table:

	A6	B6	C6	D6	E6
	month #	end of month 1 payment	interest paid month 1	principal paid	new balance
by-hand **formula**	1	formula is already in #12	formula:		
by-hand **number**	1	# is already in #12	number:		
approximately same as Excel?	yes	circle: yes or redo #12	circle: yes or redo	circle: yes or redo	circle: yes or redo

16. Paying Extra Each Month

    a) What if you can afford an extra $85 per month on the car payment? Adapt the Excel file so that you add the extra 85 to the end of B3 so that it looks like
    =PMT(D1,72,-B2) + 85
    What is the new monthly payment?

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 overbalance, during the new last month, so compute using the row with the last payment in Excel, with the 1st negative loan balance, just like we did in *handwrite home decisions hand in* questions 9.–11:
months × End of Month Payment − overbalance − loan amount. Show work.

c) Compare your response in b) to the total interest over 6 years from #13 and address why the savings or loss makes sense in this context.

17. Debt-to-Income Ratio
Assume the bank allows a 35% debt-to-income ratio

a) If your other monthly financial obligations are $1406, add your monthly car payment to this. Show work.

b) To understand what is the monthly income necessary for a 35% debt-to-income ratio, first set up the ratio $.35 = \frac{\text{total monthly debt}}{\text{monthly income necessary}}$ with your monthly financial obligations, including the car payment, filled in to the numerator, leaving the denominator unknown. Show this set up.

c) Then solve for the needed monthly income by cross multiplication and division. Show work.

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

18. 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?

Ask me any questions on this or the study guide before you leave!