Math 1090 Project 2

(Work in groups of two to four.)

Names _____

_____

_____

_____

Present Value

PART 1: Setup.

This schedule shows a record of payments, interest paid, and a running balance. This schedule also allows for extra payments to be made, and it keeps track of the amount of principle being paid. The fixed values at the beginning of the spreadsheet are: the amount of the loan (formatted as "currency" in cell C2), the annual interest rate (APR formatted as "percentage" with at least 3 decimal places in cell C3), the time for the loan (in cell E2), and the number of payments per year (in cell E3). The minimum payment to complete the loan according to its program is figured in cell C5 from these values using an amortization formula like the one at the bottom of page 345 in the text College Algebra in Context by

Harshbarger and Yocco, $R = A\left[\dfrac{i}{1-(1+i)^{-n}}\right]$, which would be

=C2*C3/E3/(1-(1+C3/E3)^-(E2*E3)) and formatted as "currency."

	A	B	C	D	E	F
1	LOAN	PAYMENTS				
2		Loan Amount		Time (years)		
3		Interest Rate		Payments per Year		
4						
5		Payment Amount				
6	Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
7						
8						
9						

It is good to start the schedule before the first payment, so enter a zero in cell A7, and in cell F7 enter =C2, the amount to pay at the beginning of the loan. In cell A8 and enter the formula =1+A7. In cell B8, enter =$C$5; remember the $'s keep this reference to this cell as the formula is copied down, so be sure to include them. In cell C8 enter =C7 to copy whatever the previous amount is. In cell D8 enter =$C$3*F7/$E$3 (the APR × balance ÷ number of payments per year) so that all the formulas copies from here will continue to refer to the interest rate in C3 divided by the number of payments per year times the amount in the account at the end of the previous month–in cell F7 now. In cell E8 enter =B8–D8 (the $ payment – $ interest). Finally, in cell F8 enter =F7–C8–E8 (the previous balance – extra payment – principle paid), and format cells B7 to F8 as "currency."

Example: To check if the formulas are correct, enter 232000 in C2, 0.05375 in C3, 20 in E2, and 12 in E3. Your spreadsheet should now look like the following:

	A	B	C	D	E	F
1	LOAN	PAYMENTS				
2		Loan Amount	$323,000.00	Time (years)	20	
3		Interest Rate	5.375%	Payments per Year	12	
4						
5		Payment Amount	$1,579.56			
6	Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
7	0	— —	— —	— —	— —	$232,000.00
8	1	$1,579.56	0.00	$1,039.17	$540.40	$231,459.60
9						

When all the formulas are correct, highlight cells A8:F8, select Copy from the Edit menu, then highlight cells A9:F247, and use the Enter key to see all 240 payments.

PART 2: Assignment

1a. Adapt this spreadsheet to develop an amortization schedule for a 4-year car loan if $16,700 is borrowed at 8.2%, compounded monthly. Enter 16700 in cell C2, 0.082 in cell C3, and 4 in cell E2. [1]

b. Using the spreadsheet above, row 55 shows the 48th payment, so in cell A56 enter the word TOTAL, in cell B56 hit the summation icon **Σ** in the menu bar at the top of the spreadsheet to find the total amount paid from B8:B55. Also enter the total amount of interest paid in cell D56, and the total amount of principle paid in cell E56. (The remaining balance after making the last payment should be zero, and there is no total for the remaining balances.)

c. Adjust the page margins and **print the complete spreadsheet on one page**.

d. **Write a few sentences explaining what you observed in constructing your spreadsheet for this loan schedule**.

2a. Adapt your spreadsheet to develop an amortization schedule for a 10-year mortgage loan, of $80,000 at 7.2%, compounded monthly. There is no extra payment in this problem, so that column has not been included. **Do not print the whole schedule. Only write the amounts of each payment, interest paid, principle paid, and remaining principle for the 1st, the 60th, the last payments, plus the totals, in the table below.** [2]

Payment	Reg. Payment	Interest	Principle Paid	Balance remaining
1				
60				
120				$0.00
total				— —

b. Change the number of payments per year to 24, divide the amount of each payment in half, and look at twice the total number of payments so that the spreadsheet approximates how the loan would be repaid if it was paid back semimonthly. Use this new spreadsheet to

write the amounts of interest paid, principle paid, and remaining principle for only the 1st, the 60th, the 120th, the 180th, the last payments, plus the totals.

Payment	Reg. Payment	Interest	Principle Paid	Balance remaining
1				
60				
120				
180				
240				$0.00
total				— —

c. Write a few sentences explaining what you observed, including the total interest paid, when payments are made twice a month instead of once a month.

3a. A recent college graduate brought a new car by borrowing $18,000 at 8.4%, compounded monthly, for five years. Adapt your spreadsheet to make the amortization schedule and use it to fill in the table below. [3]

	Loan Amount	$18,000.00	Time (years)	5	
	Interest Rate	8.4%	Payments per Year	12	
	Payment Amount				
Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
0	— —	— —	— —	— —	$18,000.00
1		$0.00			
15		$0.00			
30		$0.00			
60		$0.00			$0.00
total		$0.00			— —

b. Enter "15" in cell C8 to investigate how a $15 extra payment will effect repaying the loan.. Note: The remaining balance goes to zero before sixty payments are made. Identify which number payment that occurs. Be sure to add the total "extra payments" at the bottom of column C to the total amount paid at the bottom of column B. **Fill in the amounts of interest paid, principle paid, and remaining principle for the 1st, 15th, 30th, and the last payment for the schedules with the extra principle paid.**

	Loan Amount	$18,000.00	Time (years)	5	
	Interest Rate	8.4%	Payments per Year	12	
	Payment Amount				
Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
0	— —	— —	— —	— —	$18,000.00
1		$15.00			
15		$15.00			
30		$15.00			
(last number)		$?			$0.00
total		$?			— —

c. Write a few sentences explaining what you observed, including the total interest paid, when payments are made twice a month instead of once a month.

4a. A young couple buying their first home borrows $85,000 for thirty years at 7.2%, compounded monthly. **Write the amounts of interest paid, principle paid, and remaining principle for the 1st, the 12th, the 60th, and the last payment**. [4]

	Loan Amount	$85,000.00	Time (years)	30	
	Interest Rate	7.2%	Payments per Year	12	
	Payment Amount				
Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
0	— —	— —	— —	— —	$18,000.00
1		$0.00			
12		$0.00			
60		$0.00			
120		$0.00			
240		$0.00			
360		$0.00			$0.00
total		$0.00			— —

b. Suppose they make the required payment for the first twelve months. However, with the twelfth payment only, they are also able to pay an extra $1000. Print the adjusted schedule and answer how many payments, and how much money, will they save because of this single extra payment? (Note: The extra $1000 is made on the 12th payment only, and be sure to add the extra payment to the total paid.)

	Loan Amount	$85,000.00	Time (years)	30	
	Interest Rate	7.2%	Payments per Year	12	
	Payment Amount				
Payment	Reg. Payment	Extra Pay	Interest	Principle Paid	Balance remaining
0	— —	— —	— —	— —	$18,000.00
1		$0.00			
12		$0.00			
13		$1000.00			
60		$0.00			
120		$0.00			
240		$0.00			
(last number)		$0.00			$0.00
total		$1000.00			— —

c. Write a few sentences explaining what you observed, including the total interest paid, compared to what the total interest would have been without the extra payments. Make the comparison in both absolute terms ($'s) and relative terms (% difference).

Part III: Reflection

Did this project change the way you think about buying a home or a car? Write one paragraph stating what ideas changed and why. If this project did not change the way you think, write how this project gave further evidence to support your existing opinion about buying a home or a car. Be specific.

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[1] Based on problem #35, page 483, Harshbarger & Reynolds, Mathematical Applications, 7th ed.
[2] Based on problem #36, page 483, Harshbarger & Reynolds, Mathematical Applications, 7th ed.
[3] Based on problem #37, page 483, Harshbarger & Reynolds, Mathematical Applications, 7th ed.
[4] Based on problem #38, page 483, Harshbarger & Reynolds, Mathematical Applications, 7th ed.