

## Worksheet 23 (Finance 3): Credit Cards and Mortgages

Group names: \_\_\_\_\_

Instructions: You must use spreadsheets for the problems on the first page. You are encouraged to use spreadsheets for the back page, but you can also use a calculator if you choose.

1. An Alaska Airlines Bank of America Credit Card charges an APR of 16.99% on purchases. The minimum monthly payment is \$25 or 1% of the balance on the account, whichever is larger<sup>1</sup>.

Suppose you have \$1500 in purchases on the credit card and you put no more purchases on the card.

- (a) What is the minimum monthly payment for this balance? 25

$$0.01(1500) = 15, \text{ so we must pay } \$25$$

- (b) How much interest is charged in the first month? \$21.24

$$1500(0.1699) = 21.24$$

- (c) If you pay the minimum monthly payment in month 1, how much is your balance in month 2? \$1496.23

$$1500 - 21.24 = 1496.26$$

- (d) Suppose you pay \$100/month to your credit card bill. Use a spreadsheet to determine how long it will take you to pay off the balance.

- i. How many months did it take to pay off your balance? 17

$$\text{How many years? } 17/12 = 1.42 \text{ years, or } 1 \text{ year } 5 \text{ months}$$

- ii. How much money did you pay in total? \$1696.72

$$= 16(100) + 96.72$$

- iii. How much of your payment was interest? 196.71

$$= 1696.72 - 1500$$

- (e) Suppose you only paid \$25/month to the bill.

- i. How many months did it take to pay off your balance? 80

$$\text{How many years? } 6 \text{ years } 8 \text{ months}$$

- ii. How much money did you pay in total? \$2947.42

- iii. How much of your payment was interest? \$1447.42

*almost as much as we borrowed originally!*

<sup>1</sup>The balance is usually compounded daily, even though the payments are monthly. We are pretending that the balance is compounded monthly for this problem.

2. The Chase Freedom Unlimited credit card has a variable APR of 18.99% to 28.49%, based on your creditworthiness and other factors.

- (a) If you had a balance of \$1500, you were charged an APR of 28.49%, and you made monthly payments of \$25, how much would you owe at the end of the first month?

1510.61 Interest in 1<sup>st</sup> month = \$35.62

- (b) How much would you owe at the end of the first year? 1645.36

- (c) What does that say about how long it would take to pay off your balance, if you only paid \$25/month?

You will never pay off this card because the interest accrued is more than the minimum payment!

3. The formulas for computing information about a loan are as follows:

$P$ = principal / starting amount	$r$ = annual interest rate (APR)
$I$ = interest	$n$ = number of compounding periods per year
$A$ = final amount	$t$ = length of the loan, in years
	$d$ = regular loan payment

Loan amount given payment	payment given loan amount
$P = \frac{d \left( 1 - \left( 1 + \frac{r}{n} \right)^{(-nt)} \right)}{\left( \frac{r}{n} \right)}$	$d = \frac{P \left( \frac{r}{n} \right)}{\left( 1 - \left( 1 + \frac{r}{n} \right)^{(-nt)} \right)}$

Suppose you want to pay off the \$1500 credit card charge in a certain amount of time, given monthly payments and compounding ( $n = 12$ ). You can think of the \$1500 as a loan. What does your monthly payment need to be (find  $d$ ) to pay off your credit card in:

- (a) 3 years? 53.47

$$d = \frac{(1500) \left( \frac{0.1699}{12} \right)}{\left( 1 - \left( 1 + \frac{0.1699}{12} \right)^{(-12 \cdot 3)} \right)}$$

Check your answer by doing the previous fill-down computation. You should get that you owe 0 after 36 months.

- (b) 1 year? 136.80

(I made the spreadsheet calculate this.)

Check your answer by doing the previous fill-down computation. You should get that you owe 0 after 12 months.

- (c) 6 months? 262.53

Check your answer by doing the previous fill-down computation.

4. Suppose you want to buy a house that costs \$200,000 (after your downpayment). Suppose you can get a 30-year fixed rate mortgage at a 6.940% APR (this is a current rate).

(a) What will your monthly payment be? (You know  $P$ , you want  $d$ ; assume  $n = 12$ .)  
\_\_\_\_\_

$$d = \frac{200000 \left( \frac{0.0694}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0694}{12} \right)^{-12 \cdot 30} \right)} = \$1322.56$$

(b) How would your previous answer change if mortgage rates went ~~down~~ <sup>down</sup> to 4% APR?  
\_\_\_\_\_

$$\$954.83$$

- (c) With that same 30-year fixed rate mortgage at a 6.940% APR, if you can afford a monthly mortgage payment of \$800, how much money can you afford to spend on a house? (You know  $d$ , you want  $P$ .) \_\_\_\_\_

$$P = \frac{\left( 1 - \left( 1 + \frac{0.0694}{12} \right)^{-12 \cdot 30} \right)}{\left( \frac{0.0694}{12} \right)} = \$120978$$

- (d) How much of a mortgage can you take out if you can afford a monthly payment of \$1000? \_\_\_\_\_

$$\$151222$$

(spreadsheet!)

- (e) If you had a mortgage on a \$200,000 house with a monthly payment of \$1323, and instead you paid \$1500 every month, how quickly would you be able to repay the mortgage?

This is a fill-down calculation.

You would pay off the mortgage in 256 months,  
or 21 years 4 months. Better than 30 !