

## Section 1.5 – Interest and Borrowing

- In Section 1.4 we saw how **Interest and Compound Interest** are calculated
- They are **fantastic** financial tools **when you are saving**
- But...
- If you are **borrowing**, if not managed well, they can have profound influence on life
- Recall:

### Simple Interest

$$I = Prt$$

### Compound Interest

$$A = P \left( 1 + \frac{r}{n} \right)^{n(t)}$$

When we talk about borrowing there are two main avenues that we will discuss:

1. Loans/Lines of Credit
2. Credit Cards

All of these styles of borrowing let you spend money you do not necessarily have. If it sounds too good to be true, it usually is. Be very careful with borrowing, these companies don't make money by lending money for free.

- In each scenario there will be information that you should look for:
  - Interest Rate (APR – Annual Percentage Rate)
  - Grace Period (Days to pay it off)
  - Additional Fees

### **Want Versus Need**

It is not an exaggeration that managing borrowing will be the most important thing you learn in your life. High interest rates and minimum payments can negatively affect your life significantly. If you get in trouble early in life, it can be a hurdle you may never be able to get over.

The main lesson...

**DO NOT BUY WHAT YOU CANNOT AFFORD!!!**

## Loans

- Loans are complex, there are subtleties like secured versus unsecured
  - A **secured loan** is tied to collateral, if you cannot pay the loan they can take the collateral (A Car Loan or a Home Mortgage)
  - **Unsecured loans** are not back by collateral (Credit Cards, Student Loans, etc.)
- Loans are not guaranteed, you need to demonstrate you are a good borrower
  - You have **good credit** (Have paid back previous debts on time and in full)
  - You have **equity** in your property being used as collateral
  - **Equity** is the difference between the value of personal property and the amount owing on it!

Loans can involve a lump sum yearly interest amount or involve compound interest over time. They can come from a bank, a friend, a relative, etc. but it is always good to set the guidelines of the borrowing.

**Example 1:** Nadine is going to lend her friend Sam \$600 to buy a sewing machine. Nadine and Sam have agreed that Sam will pay Nadine back in a year with 2% interest. How much will Sam owe Nadine?

**Solution 1:** Sam is paying Simple Interest:  $I = Prt$

$$P = \$600 \quad r = 0.02 \text{ (2\%)} \quad t = 1\text{yr}$$

$$I = Prt$$

$$I = (600)(0.02)(1)$$

$$I = \$12$$

Sam will pay Nadine the \$600 plus an additional \$12 interest. **Sam owes: \$612**

**Example 2:** Jason wants to start his own electrical company. He is applying for a secured loan from the bank to get the startup money, and he will use his car as collateral.

- Jason's car is worth \$45 000
- He has paid back most of it, he still owes \$15 000
- The bank will loan Jason 75% of the car's equity
- Other than the owing amount Jason has Good Credit and is in Good Standing

How much money will the bank lend Jason.

**Solution 2:** First calculate the amount of equity in Jason's car

$$\$45\,000 - \$15\,000 = \$30\,000$$

Next we need to take 75% of that amount. (Percent is like pennies: 75% = 0.75)

$$\$30\,000 \cdot 0.75 = \$22\,500$$

The bank will lend Jason: **\$22 500**

**Example 3:** If Jason borrows the \$22 500 from the bank at an interest rate of 5.8% compound daily and payable monthly. What will Jason's first payment be he if pays the interest owing and an additional \$500 to the principle.

**Solution 3:** In this case we are talking compound interest:  $A = P \left(1 + \frac{r}{n}\right)^{n(t)}$

$$P = \$22\,500 \quad r = 0.058 \text{ (5.8\%)} \quad n = 365 \quad t = \frac{1}{12} \text{ (One Month)}$$

$$A = 22\,500 \left(1 + \frac{0.058}{365}\right)^{365\left(\frac{1}{12}\right)}$$

$$A = 22\,500(1.004844647)$$

$$A = \$22\,609.00$$

That is the amount, but what is the interest?

$$I = A - P$$

$$I = \$22\,609 - \$22\,500 = \mathbf{\$109.00}$$

- It is important to remember that that will be the interest charged for the month. Depending on the contract of the loan, the interest is charged for a set number of months, or until the principal is paid off. That is why it is essential to pay extra to pay the borrowed amount down as quickly as possible.

Jason's first payment will be:  $\$109.00 + \$500 = \mathbf{\$609.00}$

- Some lenders will set-up auto payments that pay the interest and a chunk of the principle over a set number of months. Take advantage of those types of set-ups, but beware of hidden fees or outrageous interest rates. Again, if you can't afford it, think...

### DO I NEED IT?

**Line of Credit**

- A Line of Credit is an extension on account provided to a person by the bank
- It is similar to a loan, you are essentially withdrawing your account into the negatives
- Lines of credit are usually smaller amounts used for the short-term, but can be large quantities of money (See the Table below for a variety of examples)

Lines of Credit	Secured by	Credit Limit	Fees
Personal	Collateral/Unsecured	Revolving with set limit	None (Interest Charged)
Overdraft	Collateral	Usually less than \$5000	Monthly Fee and a Transactional Fee
Home Equity	Equity in the Home	Increases with Home Equity	None (Interest Charged)

**Example 1:** Hannah has an interior decorating business. She has an overdraft line of credit on her chequing account. Each overdraft transaction costs \$5, plus an interest rate of 21%/yr compounded daily.

If Hannah had three overdraft transactions totaling \$83 and she paid the money back in 10 days. How much did she have to pay?

**Solution 1:**

Transactions fees are \$5 *per day*: So Hannah paid –  $3 \cdot \$5 = \$15$

How much interest did she pay:

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \quad \rightarrow \quad A = 83 \left(1 + \frac{0.21}{365}\right)^{\left(\frac{10}{365}\right)365} \quad \rightarrow \quad A = 83(1.005768343) = \$83.48$$

**Hannah Pays: \$0.48 in interest and \$15 in transaction fees, so \$15.48 total**

**Example 2:** Nicollo borrowed \$4000 from his line of credit to travel. The interest charged was 5.75%/yr, compounded daily. After a year how much interest was charged?

**Solution 2:**

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \quad \rightarrow \quad A = 4000 \left(1 + \frac{0.0575}{365}\right)^{(1)365} \quad \rightarrow \quad A = 4000(1.059180474) = \$4236.72$$

**Interest = A – P** So Nicollo paid:  $4236.72 - 4000 = 236.72$  in interest

### Credit Cards (Compounded Daily, Paid Monthly)

- Credit Card bills are complex, full of fine print, and a little misleading
- You get a credit card bill at the end of each period (usually monthly)
- You have options to pay back all that is owing, a portion of it, or the **MINIMUM PAYMENT**

Credit cards come with a variety of features:

- ✓ Rewards Cards (Perks and Benefits of spending on the Card but higher interest rate)
- ✓ Fees (Annual or Monthly Fees, Fees for Withdrawing Cash)
- ✓ Charge Cards (Higher Fees but No Limit, must be paid in full each month)
- ✓ Limits (A set amount you are allowed to spend – At Max you get Declined)

Below is an example of a credit card bill and how to calculate the interest owing

## Your Credit Card Account Statement

Regardless of how much you pay (unless it's all of it), interest is charged on this amount.

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### Payment information

New Balance (including any Payment Plans)	\$555.50
Your Minimum Payment	\$15.00
Your Minimum Payment Due Date	October 14, 2020

■ **Estimated Time to Pay** Interest Rate: 19.99%

*The estimated time to pay your New Balance in full if you pay only the Minimum Payment each month is 4 year(s) and 10 month(s).*

$$P = \$555.50 \quad r = 0.1999 \text{ (19.99\%)} \quad n = 365 \quad t = 1$$

$$A = 555.50 \left( 1 + \frac{0.1999}{365} \right)^{365(1)}$$

$$A = 555.50(1.221213798)$$

$$A = \$678.38$$

$$I = A - P$$

$$I = 678.38 - 555.50$$

$$I = 122.88$$

**This is for a year**

$$122.88 \div 12 = 10.24$$

**This is for a month**

So add \$10.24 to the bill. Assuming you made no additional purchases, you now owe:

$$555.50 - 15 + 10.24 = \$550.74$$

The Credit Card company tells you how long it would take to pay off the total if you only pay the minimum payment.

It takes roughly 1 year for every \$100 owing. Absolute insanity!

## Section 1.5 – Practice Problems

### Loans and Lines of Credit

1. Ella is starting her own merchandising business, the bank extended her a line of credit up to \$10 000. She withdraws money in different periods over the year, the interest rate is 6.25%, compounded daily. Using the table below (two pages) calculate how much money Ella ended up paying in interest over the year.

Withdrawn Amount	Time	Amount $A = P \left(1 + \frac{r}{n}\right)^{nt}$	Interest $I = A - P$
\$5200	98 days		
\$2800	174 days		

\$2000	93 days		
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**Total Amount of Interest Ella paid is:**

2. Scott is a contractor and he buys supplies on his line of credit. The interest rate is 8.5%/yr and is compounded daily. The Dover family that Scott was working for paid late, their invoice was for \$3775.00. Scott took 45 days to pay his line of credit since he was paid late. He charges the clients for any interest accrued. How much interest did Scott charge the Dover family?

Workplace 11

3. Jennifer and Maia are buying a new car, they need to finance it (use a line of credit). They are being offered two different options.

Option 1: \$37 500 vehicle, 2.9% *interest/yr*, compounded monthly over five years

Option 2: \$37 500 vehicle, 2.5% *interest/yr*, compounded annually over seven years

Which option is the best and by how much money?

4. What are the advantages/disadvantages of a Home Equity line of credit?



5. Mark owes \$42 000 in student loans. The interest rate is  $16\%/yr$  and is compounded daily, paid monthly. Mark decides to get a personal line of credit of to pay the student loan off. The line of credit charges  $5.6\%/yr$  compounded daily and paid monthly. How much money did Mark owe off of his first month (January – 31 days) payment by switching to the line of credit.

### **Credit Cards**

6. Sara's credit card statement told her she could pay only a \$23.00 minimum payment even though she owes \$850. If her interest rate is  $17.99\%/yr$  compounded daily and paid monthly, she only pays the minimum payment and spends another \$200 before her next bill, how much will her bill be worth? How much interest did she pay? (26 days compounding period)(Refer to the example for starting steps).

7. Anil just got his first credit card, he went out and spent without thinking and was a little surprised when he received his first bill of \$645. His annual interest rate is 14.99%, compounded daily. If he paid back \$300, but did not spend any more money on the card the following month (Compound period 28 days), how much is his next bill going to be? How much interest did he pay? (Refer to the example)

8. Nathalie is considering a credit card to pay for gas for her work vehicle. She spends \$1450 on gas a year, the card offers a refund of 2% on all the gas she buys, but has an annual fee of \$50. Should she get the card?

Workplace 11

9. Why might you choose a card with a high interest rate or annual fee?

10. Why is it important to pay off the entire credit card balance every cycle.

**Section 1.5 – Answer Key**

1. \$204.76 in interest
2. \$39.76
3. Option 1 is better by \$1231.82
4. Answers vary – Has to do with value fluctuation
5. Saves \$413.35
6. Interest: \$11.93 New Total: \$1038.93
7. Interest: \$8.00 New Total: \$353
8. No it is not worth it: She receives \$29 back, annaul fee is 50. She is still down \$21
9. Answers will Vary
10. Answers will Vary