Credit Card Loans

SUBMITTED BY: Nina Hoe, University of Pennsylvania

SUBJECT(S): Computation

GRADE LEVEL(S): 9, 10, 11, 12

≡ OVERVIEW:

This is a two-part/two-day lesson. Each lesson should take approximately 40-45 minutes. This lesson begins with students discussing the concept of loans, and then specifically of credit card loans and their functions for borrowers and lenders. Students compute the first year of making the minimum payment on a credit card balance of $1,000 and answer questions about the process. Finally, students discuss and reflect on credit card loans in general and other alternatives.

≡ NBEA STANDARD(S):

- Computation, I. Mathematical Foundations
- Computation, II. Number Relationships and Operations
- Computation, III. Patterns, Functions, and Algebra
- Computation, VI. Problem-Solving Applications

≡ RELATED ARTICLES:

- "The Power of Plastic: What to Know about What You Owe"
- "The Fed Revealed: The Dangers of Monetary Policy"
- "Olivia Mitchell on Why Young Consumers Should Just Say No to Spending"
- "Budgeting Basics: Spending Less than You Earn"

Knowledge@Wharton Article: "More Savings, Less Plastic: Consumer Credit after the Crisis"

Common Core Standard(s):

- A-SSE.1. Interpret expressions that represent a quantity in terms of its context
- A-CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*

Objectives/Purposes: Students will understand the compounding interest and credit card loans.

Other Resources/Materials: Calculators

Activity:

Day 1

1. Whole Class Discussion: (10 mins if not reviewed previously)

Orient students to the idea of borrowing money, loans, and why people do these things.

1. Do you always have enough money to buy what you want to buy?
2. What do you do if want to make a purchase for something you do not have enough money for?
3. What are some examples of things that you, or any consumer, might want to buy and might not have enough money to buy outright?
4. How do people get access to money?
5. What is a loan?
6. What does it mean to loan someone money or to be a lender?
7. What does it mean to receive money from a lender or to be a borrower?
8. What are the incentives for banks or other entities to lend money to borrowers? (i.e. is this ever done for free?)

Use student definitions of a loan to articulate a succinct definition from which students can work.

Example: A **loan** is a type of debt, typically a sum of money that is borrowed and is expected to be paid back (in most cases) with **interest.** A loan involves a lender, who provides the money, and the borrower, who uses the money and then pays it back to the lender over a specified **term**

or period of time. The initial amount of money loaned from the lender to the borrower is the **principal**.

Banks or other entities DO NOT usually lend money for free. They charge **interest** on **loans**, which is how they generate **revenue**, or income. However, different types of loans are structured in different ways with different interest rates and payment plans. Generally, there are two types of loans – **secured** and **unsecured**. **Secured loans** mean that there is some sort of security for the lender, or collateral, in case the borrower does not pay the loan back. Examples of this are home loans or car loans, whereby if the borrower **defaults**, or fails to make appropriate payments, the lender could take the home or car and resell it to recover the money lent. There are also **unsecured loans**, where there is no collateral for the lender, so if the borrower fails to pay the loan or declares bankruptcy, then the lender may lose the money all together. Examples of this are credit card loans or personal loans. Generally, interest rates are *higher* for *unsecured loans* and *lower* for *secured loans*. Additionally, the **term**, or amount of time, the borrower will take to pay back the loan has an effect on the interest rate. Generally, *shorter term* loans will have *lower interest rates* than loans with *longer terms*. Also, a persons **credit rating**, may determine the interest rate s/he gets. A **credit rating** is an estimate of the ability of a person or organization to fulfill their financial commitments, based on a number of factors including previous dealings (i.e. do you have a history of not paying back loans?), income, etc..

2. Credit Card Loans (10 mins)

One common way people borrow money or take out loans is by charging expensive things to their **credit cards.**

10. Do you or anyone you know have a credit card?
11. How do credit cards work?/What are they?
12. What types of things are credit cards used to purchase?
13. What have you heard about credit card debt?
14. How do credit card companies make money?
15. What does it mean to default on a credit card payment?

Credit cards have different interest rates and fees associated with them, which depend on who you are and your **credit rating**. Generally, a credit card company allows you to borrow money for a 1-month period with no interest. In that way, the bank or credit card company extends you **credit**, which is the ability of a customer to obtain goods or services before payment, based on the trust that payment will be made in the future. However, if you need more than a month to pay this money back, you will have to pay interest. Credit card interest rates are usually very high, even if you have great credit, and the interest compounds not only monthly, but sometimes daily.

They typically range between 7 – 36% in the United States, around 50% in Brazil, and over 200% in developing countries.

16. Compare these to the interest rates that a bank might pay you if you deposited money with them/lent them money!!

Interest rate on a credit card is called **APR** – annual percentage rate.

Some credit cards have monthly and/or annual fees that must be taken into account. Given the plethora of credit card options, it is in the consumer's best interest not to ever accept, activate, or apply for any credit cards that have fees. There are many credit card options that do not charge any fees at all.

3. Small Group/Pair Activity:

Reading (15 mins)

Have students read "The Power of Plastic: What to Know about What You Owe"

Have students read "More Savings, Less Plastic: Consumer Credit after the Crisis" particularly focusing on pages 3 (starting with "For the majority of consumers…") – 4.

Also have them read "Olivia Mitchell on Why Young Consumers Should Just Say No to Spending" specifically focusing on her advice about credit cards.

With a partner, have them discuss:

1. What is debt?
2. How have credit cards been used by consumers in the past?
3. What have been the problems with this model?
4. In what ways is the industry expected to change? (look to the "More Savings" article.)
5. In what ways do you hope or expect consumers will change their behavior? (look to the Olivia Mitchell article)

Also discuss:

1. Are credit cards good or bad?

2. If you had money in a savings account, why might you choose to make a purchase with your credit card? What are the good reasons? *(Build credit, get rewards points, let the money in your savings account earn interest for as long as possible.)*

Although students should work in small groups or pairs, it may be helpful to start this exercise with students so that get comfortable with the calculations first.

Student Worksheet

Recall the formula for **simple interest**

$$I = P*r*t$$

where,

- I is the interest owed
- P is the principal amount outstanding
- r is the interest rate
- t is the time in years

Note: to express 1 month in terms of years, divide by 12, so that to calculate the interest over a period of 1 month, t = 1/12

$$A = P(1+\frac{r}{n})^{nt}$$

Recall the general form for **compound interest** (an **exponential growth model**) is the equation:

$$A = P(1+\frac{r}{12})^{12t}$$

where,

- P is the principal amount, or the original amount of money before any growth occurs
- r is the annual nominal interest rate or the **growth rate** in decimal form
- n is the number of times the interest is compounded per year
- t is the number of years, and A is the new amount

Formula for Interest Compounded Monthly:

$$MP = P * \frac{\frac{r}{n}(1+\frac{r}{n})^{nt}}{(1+\frac{r}{n})^{nt}-1}$$

You made a purchase of $1,000 on your credit card.

1. Brainstorms some things that cost $1,000. *(A plane ticket abroad, a flat screen TV, a computer, braces, a root canal!)*

2. You get your monthly credit card statement and are offered the option of making a minimum payment of $15 per month. If the credit card company charged you NO interest (which would never happen!) how many months would it take you to pay off the $1,000? *(67 months – over 5 years)*

3. BUT… Your credit card company has given you a moderate APR of 13%. With this interest rate, estimate the number of months do you think it would take you to pay off your balance of $1,000 if you paid $15 each month? *(Answers will vary.)*

4. How much do you think you will end up paying in interest in the end? *(Answers will vary.)*

5. If the 13% APR was a simple interest rate with no term (meaning you didn't have to pay it back in any specific amount of time) – how much would you pay in interest (let t = 1)? *($130)*

6. Is this number correct? Why or why not? *(Interest compounds monthly!!)*

7. What if you decided not to pay anything on this loan for 1-year? Using the formula for interest compounding monthly, calculate the amount of interest that you would accrue from not paying on the loan for one year. *(New amount would be $1138.03 – $1138.03 in interest in just 1 year.)*

(Begin Day 2 work if time allows)

Day 2

8. As mentioned, credit card loans are compounded. Begin to fill in the chart below to see what happens to your monthly payments of $15 each month with an APR of 13% compounded monthly. This assumes that you make NO MORE charges on your credit card.

To calculate the interest at each month interval – use the **simple interest formula**.

9. Why do you use the simple interest formula instead of the compound interest formula when you calculate each monthly payment?

Loan Amount = $1,000

APR = 13%

Monthly Payment = $15

Month	Balance (P)	Payment	Interest on Balance	Principal
0	1st: $1,000	$15.00	2nd:	3rd: Payment – Interest (I)
1	4th: Previous Balance – Principal			
1	$1,000	$15.00	$I = \$10.83$	$15.00 – $10.83 = $4.17
2	$1,000 – $4.17 = $995.83	$15.00	I = $10.78	$15.00 – $10.78 = $4.21

These calculations show that after the first month of this loan, the lender owes $10.83 in interest. However, you only are making a payment of $15.00, then as $10.83 of that goes to pay the interest for that month, only $4.17 is applied towards the actual loan balance. This process repeats each month. As the balance begins to go down slowly, so does the interest payment, and the payment that goes towards that balance (the principal column) starts to increase. Eventually the proportion of the $15.00 payment going towards the principal exceeds the interest.

Complete these calculations to see how much of the $1,000 balance you would pay off after 1 year of paying $15.00 per month.

Loan Amount = $1,000

APR = 13%

Monthly Payment = $15

Month	Balance (P)	Payment	Interest on Balance	Principal
0	$1,000	$15.00	1st:	2nd: Payment – Interest (*I*)
1	3rd: Previous Balance – Principal			
1	*1000.00*	*15.00*	*10.83*	*4.17*
2	*995.83*	*15.00*	*10.79*	*4.22*
3	*991.61*	*15.00*	*10.74*	*4.26*
4	*987.35*	*15.00*	*10.70*	*4.31*
5	*983.04*	*15.00*	*10.65*	*4.36*
6	*978.69*	*15.00*	*10.60*	*4.40*
7	*974.28*	*15.00*	*10.55*	*4.45*
8	*969.83*	*15.00*	*10.51*	*4.50*
9	*965.33*	*15.00*	*10.46*	*4.55*
10	*960.79*	*15.00*	*10.41*	*4.60*
11	*956.19*	*15.00*	*10.36*	*4.65*
12	*951.54*	*15.00*	*10.31*	*4.70*
Total	—	$180.00	*$126.91*	*$53.17*

10. What is your current balance? *($951.54)*

11. How much have you paid in interest so far? *($126.91)*

12. How much of the $1,000 have you paid off after 1 year (the total principal)? *($53.17)*

13. Do these numbers change your projection of the amount of time it will take you to pay this off? *(Answers will vary.)*

14. What percentage of your original balance do you have left? *(95% left – you only paid off 5% of this in a year.)*

In fact, paying off your credit card in this way will take you 119 months – that is almost 10 years. AND you will end up paying an additional $785.27 in interest.

15. After all is said and done, you borrowed $1,000 but had to pay the lender back $1,785.27. What percentage of your original loan did you end up paying back? *(179%)*

16. How do you think increasing or decreasing your monthly payments would affect:

- The time needed to pay back a loan? *(increase payments and decrease time)*
- The amount of interest paid? *(increase payments, continue to bring down the balance, decrease the amount of insurance owed.)*

17. In fact, *increasing* your monthly payment to $30.00 per month would *decrease* your number of payments to 41 months, and *decrease* the amount of interest you pay to $248. How do these numbers compare to making payments of $15.00 per month? *(You double your payment, but decrease your debt by over 3 times. Also time is also almost 1/3 less)*

18. Also, if you *decreased* your monthly payment to $11.00 per month, you would *increase* your number of payments to 393 months, and *increase* the amount of interest you pay to $3,333.51! How do these numbers compare to making payments of $15.00 per month? *(shows how much you pay in your monthly payment closely influences your interest owed, time, etc.)*

19. What if there was also a monthly fee of $5. How would that change the amount that you owe? *(add on $5 per month, for the first case scenario you would pay another $595.)*

20. How would an increase or decrease in your interest rate affect your payments?

21. Calculate the first 4 months of payment on this balance with an APR of 30%.

Loan Amount = $1,000

APR = 30%

Monthly Payment = _____

Month	Balance	Payment	Interest on Balance	Principal
1	$1,000.00			
2				
3				
4				

22. What does the payment need to be at the very least?
23. Try some different payment options.

Extending the Activity

Have students compute any other loans that might make sense. Choose a balance, APR, and monthly payment.

Tying It All Together:

Whole Class Discussion

1. Is taking a credit card loan a smart use of your money?
2. Why do people do this if the rates are so high?
3. What are ways to decrease the amount of interest you pay and thus the time that you are paying the loan?
4. What are other alternatives to taking a credit card loan?

Practice Outside of the Classroom:

Explain this concept to friends and family members who have credit cards but do not understand these concepts! (Probably most people J)

Sources/Resources: Wikipedia: Credit Card Interest