

## 3.8: Credit Cards

### Understanding Credit Cards

**Revolving credit** is an installment loan that remains open to debt increases and credits. These loans require a regular payment schedule but do not have a fixed amount that is being paid off. The balance of the loan changes as the credit is used for products and services as decided by the account holder.

**Credit cards** are used by a financial institution to give users access to a loan based on revolving credit. When a credit card is used, the account holder is borrowing money from the institution to make a purchase. The maximum a user can borrow is set by the financial institution based on the credit worthiness of the account holder. Each billing period (typically 25-30 days) the account accrues interest for any remaining balance based on the **average daily balance**. The interest is compounded each billing period, which is why it can be easy to get into debt when using credit cards.

### Credit Card Myths

#### Myth 1: Carrying a credit card balance can increase your credit score.

FALSE! Having a high balance on your cards can actually decrease your credit score since financial institutions see that you have a lot of debt. It is best to pay off the balance of the card every billing period if possible. If not, then keeping your total balance for all credit cards below 15% of the maximum you can borrow is the second-best idea.

#### Myth 2: Your income is a factor in your credit score.

FALSE! No institution knows your income except you, your employer, and the IRS. The only way an institution knows your income is if you disclose it to them.

#### Myth 3: Credit repair companies can fix your credit.

FALSE! Credit repair companies can only remove information from a credit report that is incorrect, which any user can do for free. Credit repair companies often will create a new loan to consolidate your debt into one payment. This does not necessarily improve your credit score.

#### Myth 4: Closing old credit cards can hurt your credit score.

FALSE/TRUE This one is a bit of both.

FALSE: If you have old credit cards that have high maximums that you do not use or excessive number of credit cards, it can be beneficial to close those since financial institutions look at how much debt you COULD get into if you maxed out all your cards.

TRUE: If you have old cards that are not being used, they will show on the credit report as an account that is in good standing which can help your credit score. Some financial institutions will close accounts that have not been used for an extended period of time.

#### Myth 5: Checking your credit score can hurt your credit score.

FALSE! When you check your personal credit score it is considered a soft inquiry. These inquiries do not affect your credit score. Everyone can request a free credit report from the three main credit reporting agencies once a year.

Applying for a loan or a new service that requires a credit check is considered a hard inquiry. These can negatively affect your score if there are several hard inquiries within a short period of time for different types of loans. For example: if you are applying to purchase a car at several financial institutions to find the best rate that may not affect your score negatively. If you apply for several different credit cards in a short period of time that will negatively affect your score.

### Average Daily Balance Method

#### Average Daily Balance

Since the balance of a revolving loan changes often, the typical way of determining interest cannot be used. A financial institution cannot charge interest for the entire billing period on money that was not borrowed at the beginning of that period. For this reason, financial institutions use the average balance over the length of the billing period.

$$\text{average daily balance} = \frac{\text{sum of unpaid balances for each day in the billing period}}{\text{number of days in the billing period}}$$

### ✓ Example 3.8.1

Victor got a new credit card. He made the following charges in the first billing cycle. Determine the average daily balance for his first billing period.

March 1	The first billing cycle begins.
March 3	He bought a jacket for \$55.
March 8	He went to the movies and spent \$42.
March 15	He put gas in his car and spent \$67.
March 21	He treated his family to dinner and spent \$73.
March 25	The billing cycle ended.

#### Solution

To determine the average daily balance we first need to find the sum of unpaid balances for each day in the billing period. The calendar below lists the balances for each day of the billing cycle.

March 1 - \$ 0.00	March 2 - \$ 0.00	March 3 - \$ 55.00	March 4 - \$ 55.00	March 5 - \$ 55.00
March 6 - \$ 55.00	March 7 - \$ 55.00	March 8 - \$ 97.00	March 9 - \$ 97.00	March 10 - \$ 97.00
March 11 - \$ 97.00	March 12 - \$ 97.00	March 13 - \$ 97.00	March 14 - \$ 97.00	March 15 - \$ 164.00
March 16 - \$ 164.00	March 17 - \$ 164.00	March 18 - \$ 164.00	March 19 - \$ 164.00	March 20 - \$ 164.00
March 21 - \$ 237.00	March 22 - \$ 237.00	March 23 - \$ 237.00	March 24 - \$ 237.00	March 25 - \$ 237.00

Begin on March 3<sup>rd</sup> since that is the first date with a balance to find the sum. The sum will be the numerator of the average daily balance fraction.

$$55 + 55 + 55 + 55 + 55 + 97 + 97 + 97 + 97 + 97 + 97 + 97 + 164 + 164 + 164 + 164 + 164 + 164 + 237 + 237 + 237 + 237 + 237 = 3123$$

The denominator will be the number of days in the billing cycle which, in this case, is 25 days.

$$\text{average daily balance} = \frac{3123}{25} = 125.92$$

Interest will be calculated on the amount \$125.92 since that is the average daily balance for this billing cycle.

### ✓ Example 3.8.2

Jasmine has had her credit card for several months. She only pays the minimum payment, which is 2% of the balance or \$10, whichever is more. Review the transactions of her latest billing cycle to determine the average daily balance. Then find the interest that will be charged to her account with a 7.99% APR and the minimum payment required.

June 1	The billing cycle begins with a balance of \$2750
June 5	She makes a payment of \$55.
June 6	She got a coffee and snacks \$27.
June 12	She put gas in her car and spent \$33.
June 17	She bought tickets to a concert \$119.
June 25	The billing cycle ended.

#### Solution

In this example, there is an existing balance and a payment is made. The payment will decrease the balance while purchases will increase the balance. Instead of using a calendar to determine the sum, we will use multiplication.

First determine when the balance changed and what the change was. Then determine how many days the account was at the balance.

June 1	\$2750.00
June 5	$\$2750 - \$55 = \$2695$
June 6	$\$2695 + \$27 = \$2722$
June 12	$\$2722 + \$33 = \$2755$
June 17	$\$2755 + \$119 = \$2874$
June 30	The billing cycle ended.

4 days	\$2750
1 day	\$2695
6 days	\$2722
5 days	\$2755
14 days	\$2874

This billing cycle has 30 days. The total number of days should add to 30. Now we can use multiplication to determine the sum of the daily balances.

$$\text{average daily balance} = \frac{4 \times 2750 + 1 \times 2695 + 6 \times 2722 + 5 \times 2755 + 14 \times 2874}{30} = \frac{84,038}{30} = 2801.27$$

To find the interest, use the  $I = Prt$  formula, where  $P$  is the average daily balance,  $r$  is the APR, and  $t$  is the time in years. Since this is a monthly account  $t = \frac{1}{12}$ .

$$I = 2801.27 \times 0.0799 \times \frac{1}{12} = 18.65$$

The interest is added to the balance before the minimum payment is determined. Recall that the minimum payment is either 2% or \$10, whichever is greater. The balance is the last value before the billing cycle ended. Do not use the average daily balance to calculate the minimum payment. Note: If the balance is paid in full by the end of the cycle, no interest is charged.

$$2874 + 18.65 = 2892.65 \times 0.02 = 57.85$$

The minimum payment due for this billing period is \$57.85.

### Try It 3.8.1

Refer to the following credit card transactions. Determine the average daily balance and the interest charged for this billing cycle for an account with a 24.99% APR. Find the final balance. Assume the account holder wanted to pay the credit card off in one year. Use the loan payment formula from the previous sections to determine how much should be paid each month if no additional charges are made to meet that goal.

May 1	The billing cycle begins with a balance of \$4212
May 4	A payment of \$25 is made.
May 12	A purchase of \$148 is made.
May 16	A purchase of \$16 is made.
May 17	A purchase of \$96 is made.
May 30	The billing cycle ended.

### Answer

Find the sum of the daily balances and divide by the number of days in the billing cycle.

$$\text{average daily balance} = \frac{3 \times 4212 + 8 \times 4187 + 4 \times 4335 + 1 \times 4351 + 13 \times 4447}{30} = \frac{125,634}{30} = 4187.80$$

Determine the interest for the current billing cycle.

$$I = 4187.80 \times 0.2499 \times \frac{1}{12} = 87.21$$

Use the loan payment formula to determine how much should be paid each month to pay off the credit card in one year.

The final balance would be  $4447 + 87.21 = 4534.21$  which will be used as  $P$ ,  $r = 24.99\% = 0.2499$ ,  $t = 1$ , and  $n = 12$ .

$$d = \frac{4534.24 \left( \frac{0.2499}{12} \right)}{\left[ 1 - \left( 1 + \frac{0.2499}{12} \right)^{-12 \times 1} \right]} = 430.93$$

It would require a monthly payment of \$430.93 to pay off the balance of the given credit card in one year if no additional charges are made.

## Buy Now, Pay Later: An Alternative to Credit Cards?

The payment method known as "Buy Now, Pay Later," or BNPL, has been around for many years, but has become popular recently due to the pandemic. As more consumers buy goods online, merchants have started offering BNPL options for making purchases. You can determine whether a company offers BNPL on the checkout page - you might be given the option to pay off the whole bill immediately or to break it up into regular installments, such as one payment per month. These payments are calculated using the **Add-On Interest Method**.

### Add-On Interest

Companies that charge interest for the use of a BNPL plan typically calculate interest on the entire amount borrowed, then add it to the principal. This total is then divided into equal-sized payments.

$$\text{size of payment} = \frac{\text{sum of amount borrowed and interest}}{\text{number of payments}}$$

More specifically, if the company uses a monthly payment plan, we can use the following formula.

$$\text{monthly payment} = \frac{P + I}{n}$$

where

- $P$  is the principal
- $I = Prt$  is the interest
- $r$  is the annual interest rate as a decimal
- $t$  is the length of time (in years) before the bill is fully paid off
- $n$  is the number of monthly payments

### Example 3.8.3

Jacques is looking to buy a \$2,000 couch online. The merchant selling the couch offers a BNPL option for purchasing, where the customer would pay 15% simple interest, and the bill would be spread out in four equal monthly payments. Calculate the amount of Jacques's monthly payment.

#### Solution

Since the couch costs \$2,000, the principal  $P$  is 2,000. The interest rate is  $r = 0.15$ . Since it will take 4 months (or  $\frac{1}{3}$  of a year) to pay off the bill,  $n = 4$  and  $t = \frac{1}{3}$ .

$$I = 2000 \times 0.15 \times \frac{1}{3} = 100$$

and

$$\text{monthly payment} = \frac{2,000 + 100}{4} = 525$$

So Jacques would pay \$525 in each of his monthly payments.

When would it be preferable to pay using Buy Now, Pay Later? In general, it is a good rule of thumb to avoid as much debt as possible, especially when for a non-essential item. But there are some situations when it might be better to use BNPL instead of, say, a credit card. You typically do not need to have a credit history to use BNPL, and many payment options charge zero interest. But be careful! These payment plans frequently charge late fees if you do not complete a payment on time, and it is easy to overspend.

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