

8.1: Application: Loans

(The Bank Comes Knocking)

Almost everybody needs a little financial help from time to time. Perhaps you want to purchase a big-ticket item like a big-screen 3D HDTV without having the cash in full today to pay for it up front. However, the television is drastically on sale this week and if you wait to purchase it you will lose out and potentially have to pay full price next month. Or maybe as you flip through all of your bills you notice that though you will eventually have enough income to cover them, some of your payments fall due a few days before you will actually receive your income. What will you do for those few days until the income is deposited into your account?

Businesses also find themselves in similar situations. Maybe a supplier is offering a special deal on a product line, but the business does not have the cash to stock up. Also typical of business operations is that they make purchases in advance of sales, so they need to spend the money before they can receive the revenue to pay for their expenses. How can a business get access to short-term financing?

In this section, short-term financing in the form of demand loans is explored. This will include looking at loans where payments are variable as well as loans possessing fixed payments. The section ends by looking briefly at a loan you may already have—a student loan.

Demand Loans and Characteristics

A **demand loan** is a short-term loan that generally has no specific maturity date, can be paid at any time without any interest penalty, and where the lender can demand repayment in full at any time. It allows borrowing when needed and repayment when money permits, subject to the following six characteristics:

1. **Credit Limit.** This establishes the maximum amount that can be borrowed.
2. **Variable Interest Rate.** Almost all demand loans use variable simple interest rates based on the prime rate. Only the best, most secure customers can receive prime, while others usually get "prime plus" some additional amount.
3. **Fixed Interest Payment Date.** Interest is always payable on the same date each and every month. For simplicity, the payment is usually tied to a chequing or savings account, allowing the interest payment to occur automatically.
4. **Interest Calculation Procedure.** Interest is always calculated using a simple interest procedure based on the daily closing balance in the account. This means the first day but not the last day is counted.
5. **Security.** Loans can be secured or unsecured. **Secured loans** are those loans that are guaranteed by an asset such as a building or a vehicle. In the event that the loan defaults, the asset can be seized by the lender to pay the debt. **Unsecured loans** are those loans backed up by the general goodwill and nature of the borrower. Usually a good credit history or working relationship is needed for these types of loans. A secured loan typically enables access to a higher credit limit than an unsecured loan.
6. **Repayment Structure.** The repayment of the loan is either variable or fixed.
 - a. A variable repayment structure allows the borrower to repay any amount at any time, although a minimum requirement may have to be met such as "at least 2% of the current balance each month." A **current balance** is the balance in an account plus any accrued interest. **Accrued interest** is any interest amount that has been calculated but not yet placed (charged or earned) into an account.
 - b. A fixed repayment structure requires a fixed payment amount toward the current balance on the same date each and every month.

Types of Simple Interest Financing

While many types of financial tools use simple interest, these are the four most common:

1. **Personal Line of Credit (LOC).** A demand loan for individuals is generally unsecured and is granted to those individuals who have high credit ratings and an established relationship with a financial institution. Since it is unsecured, the credit limit is usually a small amount, such as \$10,000. Repayment is variable and usually has a minimum monthly requirement based on the current balance.

2. **Home Equity Line of Credit (HELOC).** This is a special type of line of credit for individuals that is secured by residential homeownership. Typically, an amount not exceeding 80% of the equity in a home is used to establish the credit limit, thus enabling an individual access to a large amount of money. The interest rates tend to follow mortgage interest rates and are lower than personal lines of credit. Repayment is variable, usually involving only the accrued interest every month.
3. **Operating Loans.** An operating loan is the business version of a line of credit. It may or may not be secured, depending on the nature of the business and the strength of the relationship the business has with the financial institution. Repayment can be either variable or fixed.
4. **Student Loans.** A loan available to students to pursue educational opportunities. Although these are long-term in nature, the calculation of interest on a student loan uses simple interest techniques. These loans are not true demand loans since a student loan cannot be called in at any time. Repayment is fixed monthly.

Repayment Schedules

When you work with short-term loans, regardless of the repayment structure, you should always set up a repayment schedule. A **repayment schedule** is a table that details the financial transactions in an account including the balance, interest amounts, and payments. Table 8.6 presents the table structure used for setting up a repayment schedule.

Date	Balance before Transaction (P)	Annual Interest Rate (r)	Number of Days (t)	Interest Charged (I)	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Start Date								(1)
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

Each number in the table corresponds to an entry below that explains how to use each column or row.

1. The first row appears if the schedule has an opening balance. In these instances, list the start date in the first column and the opening balance in the last column.
2. List the date of any transaction. This could include a payment, advance, interest rate change, or an accrued interest payment.
3. Carry this number forward from (1).
4. Record the interest rate that applies to the date interval in the first column.
5. Calculate the number of days between the date on the previous row and the current row. Remember to count the first day but not the last day. Express the number annually to match the interest rate.
6. Compute the interest charges for the date interval using Formula 8.1, $I = Prt$. Use (3), (4), and (5) as your values for the formula.
7. Enter the cumulative total of any unpaid or accrued interest as of the current row's date. This amount is the sum of (6) from the current row plus any number recorded in this column from the row above.
8. Enter the amount of the transaction occurring for this row of the table. Payments should be recorded as positives (credits) as they will decrease the balance, and advances should be recorded as negatives (debits) as they will increase the balance. If this is an interest payment date, one of the following two events will happen:
 - a. Only the interest payment occurs on this date. Copy the accrued interest from (7) into this column.
 - b. An additional payment or advance is made on this date. Add the accrued interest to the advance or payment, placing the sum into this column.

Regardless of which event happens, cross out the accrued interest amount in (7) as it is considered paid, so the accrued interest balance is reduced to zero once again.
9. One of two events will happen in this column:
 - a. On an interest payment date, subtract the accrued interest from the amount in (8).
 - b. On a date other than an interest payment date, any payment or advance will have its total amount applied to the principal. Therefore, carry the amount in (8) across to this column.
10. Subtract the amount in (9) from the amount in this column on the previous row to create the new balance in the account. Copy this amount to the next row in (3).



How It Works

Although the calculations of a repayment schedule are relatively straightforward, the complexity of the repayment schedule sometimes causes grief. When a repayment schedule is required, follow these steps:

Step 1: Set up the repayment schedule as per the example table.

Step 2: Record the start date and the opening balance for the loan.

Step 3: In chronological order, make new row entries in the schedule by filling in the details provided in the question. You require a new row in the table whenever one of the following three events occurs:

- a. A payment or advance is made.
- b. An interest payment date occurs.
- c. The interest rate changes.

Step 4: Starting with the first row, work left to right across the table, filling in all information. Pay particular attention to the nuances of the "Payment or Advance" and "Principal Amount" columns as discussed previously. Once a row is complete, move to the next row until you fill in the entire table.

Step 5: Calculate any totals requested such as total interest or total principal paid.



Important Notes

For simplicity in writing the numbers into repayment schedules and performing calculations, it is this textbook's practice to round all interest calculations to two decimals throughout the table. In real-world applications, you must keep track of all decimals in the account at all times.



Things To Watch Out For

Because of the size of the repayment schedule and the large amount of information involved in the calculations, the number-one error is what most people call a "silly" error. It means that a wrong date is recorded, a wrong amount is written down, a payment is recorded as an advance or vice versa, or simply the wrong button is pressed on a calculator. Take the time to ensure you read and record the correct numbers and that you pause when performing calculations. For example, advances mean the balance should get bigger, while payments mean the balance should get smaller. Just by thinking for a second about the basic principles of debt you should be able to catch those silly errors.

Example 5.1A: Operating Loan, Fixed Repayment

On July 15, when the prime rate was set at 4%, Canadian Footwear took out an operating loan from CIBC for \$8,000 at prime plus 1.25%. The terms of the loan require a fixed payment of \$1,500 on the 15th of every month until the loan is repaid. The prime rate climbed by 0.5% on September 29. Create a repayment schedule for the loan and calculate the total interest paid.

Plan

Create the repayment schedule for the loan and sum the interest charges for the entire operating loan.

Understand	<p>What You Already Know</p> <p>For a fixed repayment loan, capture three important categories of information:</p> <table border="1" style="width: 100%;"> <tr> <th style="width: 33%;">Opening Balance</th> <th style="width: 33%;">Payments</th> <th style="width: 33%;">Dates of Interest Rate Changes†</th> </tr> <tr> <td>July 15: \$8,000</td> <td>August 15: \$1,500 September 15: \$1,500 October 15: \$1,500 November 15: \$1,500 December 15: \$1,500 January 15: \$?????*</td> <td>July 15: 5.25% September 29: 5.75%</td> </tr> </table> <p>*Note: You can presume there is a payment on January 15 since the first five payments total up to \$7,500, which falls short of repaying the loan. The last payment, on January 15, is still unknown as it will be based on the remaining balance in the account plus any accrued interest. ‡ Calculated as prime plus 1.25%.</p>					Opening Balance	Payments	Dates of Interest Rate Changes†	July 15: \$8,000	August 15: \$1,500 September 15: \$1,500 October 15: \$1,500 November 15: \$1,500 December 15: \$1,500 January 15: \$?????*	July 15: 5.25% September 29: 5.75%	<p>How You Will Get There</p> <p>Step 1: Set up a repayment table. Step 2: Fill in the start date and opening balance. Step 3: Chronologically fill in all information, with one transaction per row of the table. Step 4: Work left to right and top to bottom throughout the table. Step 5: Once you have completed this step, sum the interest charges paid on the 15th of every month.</p>																																																																														
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Present	<p>To clear the operating loan it takes six payments: five of \$1,500 each and a final payment of \$618.25. The loan incurs total interest paid of \$118.25.</p>																																																																																									

Example 5.1B: HELOC, Variable Repayment, No Minimum Requirement

Lynne has access to a HELOC that requires only the payment of accrued interest on the first of every month. On March 1, the opening balance on her HELOC was \$15,000. She took advances of \$6,000 and \$10,000 on March 21 and May 4, respectively. She made additional payments of \$11,000 and \$15,000 on April 15 and June 17. The interest rate on her HELOC sits at prime plus 2%. On March 1, the prime rate was 3%. On April 26, it rose by 0.5%. Determine the total interest paid on her HELOC from March 1 to July 1.

Plan	This is a HELOC using simple interest. Calculate the total interest that she had to pay in March, April, May, and June and then sum the total interest paid.										
Understand	What You Already Know Capture five important categories of information:					How You Will Get There					
	Opening Balance		Advances		Payments			Step 1: Set up a repayment table. Step 2: Fill in the start date and opening balance. Step 3: Chronologically fill in all information, with one transaction per row of the table. Step 4: Work left to right and top to bottom throughout the table. Step 5: Once you have completed this step, sum the accrued interest payments on April 1, May 1, June 1, and July 1.			
	March 1: \$15,000		March 21: \$6,000 May 4: \$10,000		April 15: \$11,000 June 17: \$15,000						
Interest Payment Dates			Dates of Interest Rate Changes*								
April 1 May 1 June 1 July 1			March 1: 5% April 26: 5.5%								
*Calculated as prime plus 2%.											
Perform	Steps 1-4:										
	Date	Balance before Transaction (P)	Annual Interest Rate (r)	Number of Days (t)	Interest Charged (I = Prt)	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transact.		
	Mar 1		5%						\$15,000		
	Mar 21	\$15,000 (1)	5%	20/365 (2)	\$41.10 (3)	\$41.10 (4)	-\$6,000	-\$6,000 (5)	\$21,000 (6)		
	Apr 1	\$21,000	5%	11/365	\$31.64	\$72.74 (7)	\$72.74 (8)	\$0.00 (9)	\$21,000		
	Apr 15	\$21,000	5%	14/365	\$40.27	\$40.27	\$11,000	\$11,000	\$10,000		
	Apr 26	\$10,000	5%	11/365	\$15.07	\$55.34	\$0.00	\$0.00	\$10,000		
	May 1	\$10,000	5.5%	5/365	\$7.53	\$62.87	\$62.87	\$0.00	\$10,000		
	May 4	\$10,000	5.5%	3/365	\$4.52	\$4.52	-\$10,000	-\$10,000	\$20,000		
	June 1	\$20,000	5.5%	28/365	\$84.38	\$88.90	\$88.90	\$0.00	\$20,000		
	June 17	\$20,000	5.5%	16/365	\$48.22	\$48.22	\$15,000	\$15,000	\$5,000		
	July 1	\$5,000	5.5%	14/365	\$10.55	\$58.77	\$58.77	\$0.00	\$5,000		
Select calculations and comments from the above table: (1) This is the balance from the last column in the row above carried forward = \$15,000. (2) The date interval from the previous row to this row is March 1 to March 21: $t = 21 - 1 = 20$ days. (3) $I = Prt = \$15,000(0.05)(20/365) = \41.10 (4) The accrued interest from the row above plus (3). $\$0 + \$41.10 = \$41.10$ (5) Not an interest payment date, so the full payment is applied to principal = $-\$6,000$ (6) Previous balance in the column above minus the principal portion from (5). $\$15,000 - (-\$6,000) = \$21,000$ (7) The accrued interest from the row above plus interest from this row. $\$41.10 + \$31.64 = \$72.74$ (8) This is an interest payment date. Carry (7) across and cross it out, reducing the accrued interest balance to zero. (9) This is an interest payment date. Take (8) and subtract (7). $\$72.74 - \$72.74 = \$0.00$ Step 5: $\text{April 1} + \text{May 1} + \text{June 1} + \text{July 1} = \$72.74 + \$62.87 + \$88.90 + \$58.77 = \$283.28.$											
Present	The total interest paid on the HELOC from March 1 to July 1 is \$283.28.										

Example 5.1C: Personal LOC, Variable Repayment, with Minimum Requirement

Everlyne has a personal LOC with her bank with a maximum credit limit of \$10,000. The interest rate is prime plus 3.5%, and the current prime rate is 4.5%. Regardless of any account transaction activity, her bank requires on the first of every month for her to pay "the greater of 5% of the current balance or \$100" from her chequing account. She is allowed to exceed her maximum credit limit, but if she does the entire balance is subject to 21% interest until such time as the balance is restored below the credit limit. On October 1, the opening balance on her LOC was \$2,000. She took advances of \$5,000, \$6,000, and \$1,000 on October 21, November 13, and December 1, respectively. She made payments of \$1,000, \$3,000, and \$8,500 on November 1, November 20, and December 15, respectively. The prime rate decreased by 1/4% on November 5. Calculate her total required payments (not her voluntary payments) and the portion of those payments that went toward interest for the months of October, November, and December.

Plan Calculate a personal LOC using simple interest to determine the total required payments on November 1, December 1, and January 1 and the amount of interest included in those payments.

Understand

What You Already Know
 Capture five important categories of information:

Opening Balance	Advances	Payments
Oct 1: \$2,000	October 21: \$5,000 Nov. 13: \$6,000 December 1: \$1,000	November 1: \$1,000 November 20: \$3,000 December 15: \$8,500

Interest Payment Dates	Dates of Interest Rate Changes*
November 1 December 1 January 1	October 1: 8% November 5: 7.75% Interest rate jumps to 21% if credit limit is exceeded

*Calculated as prime plus 4.5%

How You Will Get There
 Step 1: Set up a repayment table.
 Step 2: Fill in the start date and opening balance.
 Step 3: Chronologically fill in all information, with one transaction per row of the table.
 Step 4: Work left to right and top to bottom throughout the table.
 Step 5: Sum the total required payments and the interest paid.

Perform

Steps 1-4:

Date	Balance before Transaction (P)	Annual Interest Rate (r)	Number of Days (t)	Interest Charged (I = Prt)	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Oct 1								\$2,000
Oct 21	\$2,000	8%	20/365	\$8.77	\$8.77	-\$5,000	-\$5,000	\$7,000
Nov 1	\$7,000	8%	11/365	\$16.88	\$25.65	\$1,000 + \$351.28 = \$1,351.28 (1)	\$1,325.63 (2)	\$5,674.37
Nov 5	\$5,674.37	8%	4/365	\$4.97	\$4.97	\$0.00	\$0.00	\$5,674.37
Nov 13	\$5,674.37	7.75%	8/365	\$9.64	\$14.61	-\$6,000	-\$6,000	\$11,674.37
Nov 20	\$11,674.37	21% (3)	7/365	\$47.02	\$61.63	\$3,000	\$3,000	\$8,674.37
Dec 1	\$8,674.37	7.75%	11/365	\$20.26	\$81.89	-\$1,000 + \$437.81 = -\$562.19 (4)	-\$644.08 (5)	\$9,318.45
Dec 15	\$9,318.45	7.75%	14/365	\$27.70	\$27.70	\$8,500	\$8,500	\$818.45
Jan 1	\$818.45	7.75%	17/365	\$2.95	\$30.65	\$100 (6)	\$69.35 (7)	\$749.10

	<p>Select calculations and comments from the table:</p> <p>(1) The required payment is the greater of 5% of the current balance or \$100 regardless of her monthly account activity. The current balance is $\\$7,000 + \\$25.65 = \\$7,025.65$. Five percent of that number is $\\$351.28$. The \$1,000 extra payment plus the required payment of $\\$351.28$ totals $\\$1,351.28$.</p> <p>(2) The $\\$1,351.28 - \\$25.65 = \\$1,325.63$ toward the principal. The accrued interest is now paid and is crossed out.</p> <p>(3) Note that by exceeding the credit limit of $\\$10,000$, she changes the interest rate to the penalty rate.</p> <p>(4) The current balance is $\\$8,674.37 + \\$81.89 = \\$8,756.26$, of which 5% is $\\$437.81$. Therefore, with an advance of $\\$1,000$ and a payment of $\\$437.81$ on the same date, the net daily result is an advance of $\\$562.19$.</p> <p>(5) $-\\$562.19 - \\$81.89 = -\\$644.08$, which is added to the principal. The accrued interest is paid and is crossed out.</p> <p>(6) The current balance is $\\$818.45 + \\$30.65 = \\$849.10$, of which 5% is $\\$42.46$, so pay $\\$100$ - the greater amount.</p> <p>(7) $\\$100 - \\$30.65 = \\$69.35$. The accrued interest is now paid and is crossed out.</p> <p>Step 5: Total Required Payments = Nov 1 + Dec 1 + Jan 1 = $\\$351.28 + \\$437.81 + \\$100.00 = \\889.09</p> <p>Total Interest Charges = Nov 1 + Dec 1 + Jan 1 = $\\$25.65 + \\$81.89 + \\$30.65 = \\138.19</p>
Present	<p>Throughout the months of October, November, and December, the total required payments on the LOC came to $\\$889.09$. Of that amount, $\\$138.19$ went toward the interest charges.</p>

Student Loans

A **student loan** is a special type of loan designed to help students pay for the costs of tuition, books, and living expenses while pursuing postsecondary education. The Canada Student Loans Program (CSLP) is administered by the federal government and run by the National Student Loan Service Centre (NSLSC) under contract to Human Resources and Skills Development Canada (HRSDC).

If and when you take out a student loan, the following characteristics are in place for full-time students (defined as having a 60% workload or more):

1. While you attend an educational institution, no interest is charged on your student loan nor are any payments required.
2. If you do not attend an educational institution for a continuous period of six complete months (called your grace period), you must start to repay your student loan. The fixed monthly payments are in an amount of your choosing, so long as you will repay the student loan within a maximum of 114 months. For example, if you graduate on May 3, the six-complete-month period is from June 1 to November 30 (inclusive). The first payment is due one month later on December 31 and each of the remaining payments at the end of every month thereafter.
3. During the six months, interest accrues on the student loan at a simple rate of prime + 2.5%. At the end of the grace period, the accrued interest is either converted to principal or paid in full at the student's option.
4. At the end of the grace period, you choose the interest rate on your loan. This choice cannot be changed at a future date. Your choices are as follows:
 - a. Variable interest rate of prime + 2.5%.
 - b. Fixed interest rate of prime + 5% (where prime is determined on the day that your grace period ends).
5. Interest is calculated on a simple interest basis using the exact number of days between each payment.
6. You can make variable payments at any time without any interest penalties.
7. The loan is not a demand loan. Therefore, the government is unable to demand that the loan be paid off before its due date.

The following characteristics are different for part-time students (those with less than a 60% workload):

1. While attending school, a part-time student is charged interest (prime + 2.5%) and must make monthly interest payments, starting with the first month after taking out the student loan.
2. During the six-month grace period, the student will still be making monthly interest payments. Therefore, at the end of the grace period there is no accrued interest and no decision to be made.



How It Works

Mathematically, a part-time student loan requires a repayment schedule no different from ones already shown. With respect to full-time student loans, before you can set up the repayment schedule you require an additional step, namely, calculating the opening balance:

Pre-Step 1: Calculate the balance of the student loan at the end of the grace period by applying simple interest to the principal using Formulas 4.1.1 or 4.1.2 as necessary. When you perform this calculation, carry all decimals throughout the

required calculations, rounding the balance only at the end. Based on the student's decision at the end of the grace period, the interest accrued over the six months will either be paid off or added to the principal.

Steps 1 through 5: These steps remain unchanged from repayment schedules. Note in step 3 that there can be no advances on a student loan when it is being repaid.

Example 5.1D: Your Student Loan

Rufaro has been a full-time student at the University of Manitoba for the past four years. She has just completed her bachelor of commerce degree from the Asper School of Business and her last day of exams was April 28. Her total student loan is \$30,000. She has decided to take her six-month grace period and convert it to principal, then start making payments of \$400 per month using the variable interest rate of prime + 2.5%. The current prime rate is 4.25%. On January 10, she will make an additional payment of \$250 toward her loan. On August 27 and again on February 22, the prime rate rises by 0.5%. Construct a repayment schedule displaying only the first six months of payments. Calculate the total interest on her student loan charged for the entire year (April 30 to April 30). Assume February has 28 days.

Plan You need to calculate a student loan using simple interest. First, determine the amount of interest charged during the grace period to calculate her balance owing, then set up the repayment schedule with the payments. Once you have completed this step, total the interest amounts from the table plus the grace period interest to arrive at the annual interest.

Understand

What You Already Know
Capture five important categories of information:

Opening Balance	Grace Period	Payments	Dates of Interest Rate Changes
\$30,000	May 1 to October 31 inclusive— interest charged to be converted to principal on October 31.	Nov. 30: \$400 Dec. 30: \$400 Jan. 10: \$250 Jan. 31: \$400 Feb. 28: \$400 Mar. 31: \$400 Apr. 30: \$400	May 1: 6.75% Aug. 27: 7.25% Feb. 22: 7.75%

*Calculated as prime plus 2.5%.

How You Will Get There
Pre-Step 1: Calculate the total simple interest charged May 1 to Oct. 31. Add this amount to the opening balance as per Rufaro's choice.
Step 1: Set up a repayment table.
Step 2: Fill in the start date and opening balance.
Step 3: Chronologically fill in all information, with one transaction per row of the table.
Step 4: Work left to right and top to bottom throughout the table.
Step 5: Sum the six amounts of interest paid at the end of every month from November 30 to April 30 inclusive, and add the total interest from the pre-step to arrive at the total interest charged for the year.

Perform

Pre-Step 1:

Date Range	Balance (P)	Annual Interest Rate (r)	Number of Days (t)	Interest Charged (I = Prt)
May 1 to Aug. 27	\$30,000	6.75%	31 + 30 + 31 + 26 = 118 days or 118/365	\$654.657534
Aug. 27 to Oct. 31 inclusive	\$30,000	7.25%	5 + 30 + 31 = 66 days or 66/365	\$393.287671
Total Simple Interest (rounded)				\$1,047.95

Adding to the balance, the starting balance becomes $\$30,000 + \$1,047.95 = \$31,047.95$.

Steps 1-4:								
Date	Balance before Transaction (P)	Annual Interest Rate (r)	Number of Days (t)	Interest Charged (I = Prt)	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Nov 1								\$31,047.95
Nov 30	\$31,047.95	7.25%	29/365	\$178.84	\$178.84	\$400.00	\$221.16	\$30,826.79
Dec 31	\$30,826.79	7.25%	31/365	\$189.82	\$189.82	\$400.00	\$210.18	\$30,616.61
Jan 10	\$30,616.61	7.25%	10/365	\$60.81	\$60.81	\$250.00	\$250.00	\$30,366.61
Jan 31	\$30,366.61	7.25%	21/365	\$126.67	\$187.48	\$400.00	\$212.52	\$30,154.09
Feb 22	\$30,154.09	7.25%	22/365	\$131.77	\$131.77	\$0.00	\$0.00	\$30,154.09
Feb 28	\$30,154.09	7.75%	6/365	\$38.42	\$170.19	\$400.00	\$229.81	\$29,924.28
Mar 31	\$29,924.28	7.75%	31/365	\$196.97	\$196.97	\$400.00	\$203.03	\$29,721.25
Apr 30	\$29,721.25	7.75%	30/365	\$189.32	\$189.32	\$400.00	\$210.68	\$29,510.57

Step 5: Total interest = \$1,047.95 + \$178.84 + \$189.82 + \$187.48 + \$170.19 + \$196.97 + \$189.32 = \$2,160.57

Present	Over the entire year, Rufaro will be charged \$2,160.57 of interest on her student loan.								
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Module 5.1 Exercises

Mechanics

Fill in the partial repayment schedules with the missing values.

- Woodgrain Industries took out an operating loan with RBC for \$20,000 at a fixed interest rate of 8% on September 14. The operating loan requires a monthly fixed payment of \$800 on the 14th of every month. Create the first three months of its repayment schedule.

Date	Balance before Transaction	Annual Interest Rate	Number of Days	Interest Charged	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Sep 14								\$20,000
Oct 14		8%				\$800		
Nov 14		8%				\$800		
Dec 14		8%				\$800		

- Gayle has a HELOC with MCAP Financial Corporation at an interest rate of prime + 3%. Her current balance owing on November 1 is \$13,750 and she is required to make interest-only payments on the first of every month. The prime rate is set at 3.75%. She makes one payment of \$2,500 on January 19. Create three months of her repayment schedule.

Date	Balance before Transaction	Annual Interest Rate	Number of Days	Interest Charged	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Nov 1								\$13,750
Dec 1		6.75%						
Jan 1		6.75%						
Jan 19		6.75%				\$2,500		
Feb 1		6.75%						

- Grant has a personal LOC with TD Canada Trust at prime + 4.5%, where the current prime rate is 3.75%. On March 31, his balance owing was \$5,000. On April 4 he advanced \$1,000 and on April 24 he paid \$2,250. The prime rate

declined by 0.5% on April 14. He is required to make the complete interest payment at the end of every month. Create the repayment schedule for April.

Date	Balance before Transaction	Annual Interest Rate	Number of Days	Interest Charged	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
Mar 31								\$5,000.00
Apr 4		8.25%				-\$1,000		
Apr 14		8.25%						
Apr 24		7.75%				\$2,250		
Apr 30		7.75%						

4. Amarjeet graduated from the University of Calgary on May 2 and has student loans totalling \$35,000. The prime rate upon graduation was 4.5%. He has decided to pay in full the interest charged during the grace period (i.e., he is not converting it to principal) before starting monthly payments of \$600 at the fixed interest rate. Calculate the total interest paid during the grace period and the first three months of his repayment schedule.

Date	Balance before Transaction	Annual Interest Rate	Number of Days	Interest Charged	Accrued Interest	Payment (+) or Advance (-)	Principal Amount	Balance after Transaction
June 1								\$35,000
Nov 30 (inclusive)		7%					\$0.00	
Dec 31		9.5%				\$600.00		
Jan 31		9.5%				\$600.00		
Feb 29		9.5%				\$600.00		

Applications

5. A \$7,500 demand loan was taken out on March 4 at a fixed interest rate of 7.72% with fixed monthly payments of \$1,200. The first monthly repayment is due April 4 and the 4th of every month thereafter. Prepare a full repayment schedule for the loan.
6. Paintball Paradise took out a \$17,500 operating loan on February 15 (in a non-leap year) at an interest rate of prime + 3.5% when the prime rate was 3.75%. The loan requires fixed monthly payments of \$3,000 each made on the 15th of the month starting with March 15. If Paintball Paradise plans to make an additional payment of \$4,500 (without penalty) on May 4 and the prime rate rises by 0.75% on June 28, construct a full repayment schedule for the loan.
7. Vertical Adventures has an open line of credit with a zero balance at its credit union using a fixed interest rate of 7.35%. On the last day of every month, the accrued interest must be paid. On July 8 and August 14, the company made advances of \$15,000 and \$12,000, respectively. On July 30, it made a payment of \$10,000. Vertical Adventures will restore its zero balance on August 31. Construct a full repayment schedule from July 8 to August 31.
8. Scotiabank approved a \$250,000 line of credit for Buhler Industries at prime + 1%. It requires only the repayment of accrued interest on the 27th of each month, which is automatically deducted from the chequing account of Buhler Industries. Buhler took out an advance on December 2 for \$200,000 and made a payment of \$125,000 on January 12. The prime rate was 6.5% initially and increased to 7.5% on January 4. Calculate the total interest charged to Buhler Industries on December 27 and January 27.
9. On May 9 Rainbow Daycare established an open line of credit with its bank and immediately withdrew \$25,000. The interest rate was set at prime + 4.75%, and the prime rate was 6.75%. The line of credit requires a payment on the 9th of every month in the amount of "\$1,000 or 5% of the current balance, whichever is greater." Rainbow Daycare took another advance of \$15,000 on June 2. It made a payment of \$28,000 on July 16. The prime rate decreased by 0.5% on June 30. Create a repayment schedule from May 9 to August 9 and calculate the total interest paid by Rainbow Daycare.

10. Lacy has a \$40,000 student loan when she graduates on May 4, and the prime rate is set at 5.25%. She has decided at the end of the grace period to convert the interest to principal, and she sets her fixed monthly payment at \$850. She opts for the variable rate on her student loan. Create the first four repayments of her repayment schedule. Calculate the total interest charged for both the grace period and the four payments combined. Assume February does not involve a leap year.
11. Genevieve has a \$32,000 student loan when she graduates on September 20, at which time the prime rate is 6%. She has decided at the end of the grace period to convert the interest to principal, and she sets her fixed monthly payment at \$910. She opts for the fixed rate on her student loan. The prime rate rises by 0.5% on November 3 and by another 0.5% on February 18. Create the first six repayments of her repayment schedule. Calculate the total interest charged for both the grace period and the six payments combined. Assume February has 29 days.

Challenge, Critical Thinking, & Other Applications

12. Home Run Sports has an operating loan with CIBC. The interest rate is set at prime + 3.25%, and on the 17th of every month a payment in the amount of 4% of the current balance is automatically taken from the borrower's chequing account. The prime rate is currently 5.75%. On March 7, Home Run Sports took a first advance of \$6,000. It took additional advances of \$10,000, \$8,000, and \$12,000 on March 28, April 17, and May 24, respectively. It made payments of \$4,000, \$2,500, and \$10,000 on April 10, May 17, and May 29. The prime rate increased by 0.25% on March 31 and by an additional 0.25% on May 31. Create a repayment schedule and calculate the total interest paid from March 7 to June 17.
13. Eyeland Optical has a line of credit with its credit union with an established credit limit of \$24,000 and interest set at prime + 4.1%. Eyeland Optical is allowed to exceed its credit limit, but if it does so the entire line of credit becomes subject to 28% interest. Payment terms require the repayment of the accrued interest only on the 11th of every month. On July 8, Eyeland Optical made its first withdrawal of \$10,000. It made further advances of \$15,000, \$15,000, and \$8,000 on August 11, August 20, and August 28, respectively. It made payments of \$3,500, \$2,000, and \$28,000 on July 31, August 15, and September 11, respectively. On October 11, Eyeland Optical restored a zero balance. The prime rate was initially 3.5%, rose by 0.25% on July 30, and declined by 0.5% on September 1. Create a repayment schedule and calculate the total interest charges from July 8 to October 11.
14. Pierre has a \$40,000 student loan when he graduates on December 22. The prime rate is currently 4.25%. He decides that at the end of the grace period he will convert the interest to principal, take the variable interest rate, and set his fixed monthly payment at \$750. The prime rate rises by 0.5% on each of February 15, April 15, June 30, August 15, and November 30. He makes additional payments of \$500 on each of September 3, October 21, and December 6. Create a repayment schedule and calculate the total interest charged to Pierre from January 1 to December 31. Assume February has 29 days.

15. Use the following information for a student loan (assume February does not involve a leap year):
 Prime Rate: 5% on June 1, rising by 0.25% on September 13, rising by 0.5% on January 25, rising by 1% on March 18.
 Grace Period: June 1 to November 30 (inclusive)
 Total Student Loan as of June 1: \$13,000
 Chosen Fixed Payment: \$350

There are essentially four options on this loan:

Option	Grace Period	Interest on November 30	Interest Rate
1	Pay it off		Variable
2	Convert to principal		Variable
3	Pay it off		Fixed
4	Convert to principal		Fixed

For each option, create a complete repayment schedule and calculate the total interest charges. How much less interest than the worst option does the best option incur?