

Consumer Math Success Kit

Second Edition

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CHAPTER TWO

Borrowing Money

Promissory Notes

Short-term Loans

Collateral Loans

Installment Loans (I)

Installment Loans (II)

Mortgage Loans

2. Promissory Notes

One way to borrow money is with a promissory note. A promissory note is an agreement between two people or between a financial institution and a person. The lender agrees to loan the borrower a certain amount of money for a certain period of time. If interest is charged on the note, it is said to be an **interest-bearing note**. The amount of interest collected on the note can be calculated from the following formula:

$$\text{Interest (i)} = \text{Principal (p)} \times \text{Rate (r)} \times \text{Time (t)}$$

The following examples show how to calculate the interest on a promissory note.

- **Example 1:**

Jane has asked to borrow money from her Aunt Alma. The terms Jane suggests are a loan of \$500 for a period of 6 months at 12% interest per year. What total amount of money would Jane have to pay back at the end of the 6-month period? How much of this would be interest?

Solution:

$$\begin{aligned} \text{Interest} &= \text{Principal} \times \text{Rate} \times \text{Time} \\ &= \$500 \times 12\% \text{ per year} \times \frac{1}{2} \text{ year (6 months)} \\ &= \$30 \end{aligned}$$

$$\begin{aligned} \text{Total amount due at end of 6 months} &= \text{Principal} + \text{Interest} \\ &= \$500 + \$30 \\ &= \$530 \end{aligned}$$

- **Example 2:**

Ariadne has received a loan from the Sunbeam National Bank for \$2000. The loan is for 18 months and was issued at a rate of 14.8%. What total amount of interest will Ariadne have to pay on this loan?

Solution:

$$\begin{aligned} \text{Interest} &= \text{Principal} \times \text{Rate} \times \text{Time} \\ &= \$2000 \times 14.8\% \times 1.5 \text{ years} \\ &= \$444 \end{aligned}$$

The total amount Ariadne will have to pay back at the end of 18 months is equal to the principal plus the interest, or

$$\begin{aligned} \text{Total amount due} &= \$2000 + \$444 \\ &= \$2444 \end{aligned}$$



Practice Problems

Borrowing Money

2. Promissory Notes

1. Kurt has taken a 6-month loan from his Uncle Dave. The loan is for \$1000 and will carry an interest rate of 8%. How much interest will Kurt owe at the end of the 6-month period?

2. Andrea has agreed to loan her friend Eddie \$250 for a period of 18 months at a rate of 10%. How much interest will Eddie have to pay on this loan?

3. The Acme State Bank is offering personal loans for a period of two years at a rate of 11.4% simple interest. If Mrs. Durrell borrows \$500 on this plan, how much interest will she have to pay for the loan?

What is the total amount of money she will have to pay the bank at the end of two years?

4. Diane has taken out a loan for \$1500 from the Sunbeam National Bank. The interest rate for the loan is 12.9% and is for a period of 15 months. What is the total amount of money Diane will have to pay back at the end of 15 months?

5. Simon's loan from the Sunbeam Bank is for \$4500 at an interest rate of 1.3% per month. How much will he have to pay back if he repays the loan at the end of 6 months?

At the end of 12 months? _____

At the end of 18 months? _____

6. Listed below are five promissory notes from the Sunbeam Bank. Determine the amount of interest due on each note when it is repaid.

	Amount of Loan	Interest Rate	Time of Loan	
(a)	\$1000	8%	1 year	_____
(a)	\$2000	9.6%	6 months	_____
(a)	\$ 500	11.3%	6 months	_____
(a)	\$3000	14.8%	18 months	_____
(a)	\$4500	15.1%	18 months	_____

3. Short-term Loans

Banks often loan money for a period of 30, 60, or 90 days. These are called **short-term loans**. Interest on the loan is calculated and deducted from the amount given to the borrower. Thus, a person who borrows \$1000 on a short-term loan may actually receive only \$960 from the bank. The other \$40 would be interest on the loan, deducted in advance. The amount actually received by the borrower (\$960 in this example) is called the **proceeds** of the loan. This kind of loan may also be called a **noninterest-bearing loan**.

The following examples show how to solve problems with short-term loans.

● **Example 1:**

Violet received a 60-day short-term loan of \$850 from The Women's Bank. The interest on this loan is 12.8% per annum (per year) and is deducted from the face value of the loan. What are the proceeds due Violet on this loan?

Solution:

$$\begin{aligned} \text{The proceeds} &= \text{Face value of loan} - \text{Interest} \\ \text{Interest} &= \text{Principal} \times \text{Rate} \times \text{Time} \\ &= \$850 \times 12.8\% \text{ per annum} \times \frac{60}{360} \text{ year} \\ &= \$18.13 \\ \text{The proceeds} &= \$850.00 - \$18.13 \\ &= \$831.87 \end{aligned}$$

● **Example 2:**

Peter's request for a short-term loan in the amount of \$2500 was approved by the Plymouth State Bank. The proceeds for the loan, \$2420.62, must be paid back in 90 days. What is the interest rate on this loan?

Solution:

$$\begin{aligned} \text{Amount of interest} &= \text{Face value of loan} - \text{Proceeds} \\ &= \$2500.00 - \$2420.62 \\ &= \$79.38 \end{aligned}$$

$$\begin{aligned} \text{Rate of interest} &= \frac{\text{Interest}}{\text{Principal} \times \text{Time}} \\ &= \frac{\$79.38}{\$2500 \times \frac{1}{4} (90 \text{ days})} \\ &= 12.7\% \end{aligned}$$



Practice Problems

Borrowing Money

3. Short-term Loans

- The Sterling Finance Company offers special commercial loans at the rate of 18.93% per year for 6-, 12-, or 18-month periods. How much interest would be owed on a \$1500 loan for each of these three time periods?

- The Women’s Bank has issued Grant a 90-day short-term loan in the amount of 15.8% interest. The amount of the loan is \$4500. Calculate the interest on this loan and the proceeds due Grant.

- The Star State Bank issues 30-, 60-, and 90-day notes at a rate of 17.5% interest. What would be the proceeds and the interest on a \$500 loan under each of these?

- The short-term loan which Grace received from the Women’s Bank for \$1500 over a 90-day period brought her proceeds of \$1449.37. How much interest and what rate of interest did she pay on this loan?

- Joella’s 60-day loan from the Star State Bank is for \$850. The proceeds she received from the loan are \$839.30. What is the interest rate on this loan?

- The table below shows the amount of interest, proceeds, total loan and/or time of loan for some short-term loans granted by the Star State Bank. Calculate the unknown quantity or quantities in each case.

	Amount of Loan	Proceeds	Interest	Rate of Interest	Time
(a)	\$1000	_____	_____	10.5%	30 days
(a)	\$2000	_____	_____	17.4%	60 days
(a)	\$2500	_____	_____	9.9%	90 days
(a)	\$5000	_____	\$110.83	_____	60 days
(a)	\$2750	\$2671.62	_____	_____	90 days



4. Collateral Loans

Loans are sometimes made if a person has something of value to offer as **collateral**. Collateral means that if the loan is not repaid, the bank or lender can keep the property given as collateral. A house, land, stocks, bonds, and insurance are often used as collateral. The term **demand loan** may also be used for collateral loans. The term means that the lender can ask for (“demand”) its money back at any time. If the borrower does not return the money, he or she loses the collateral on the loan. The examples below illustrate the mathematics of collateral or demand loans.

- **Example 1:**

The Acme State Bank holds a demand note from Wendell Motley for \$4000 dated January 3. Interest on the note is 14.9% per annum (per year). It is due to be paid back on August 14 the same year. How much interest will Wendell have to pay on this note?

Solution:

The first problem here is to find the number of days covered by the loan. From January 3 to August 14 would be:

January	28 days	May	31 days
February	28 days	June	30 days
March	31 days	July	31 days
April	30 days	August....	14 days

Total: 223 days

For banking purposes, the **commercial year** is usually taken as having 360 days. So the length of time covered by the loan is $\frac{223}{360}$ year. Then,

$$\begin{aligned} \text{Interest} &= \text{Principal} \times \text{Rate} \times \text{Time} \\ &= \$4000 \times 14.9\% \text{ per year} \times \frac{223}{360} \text{ year} \\ &= \$369.19 \end{aligned}$$

- **Example 2:**

A second demand note held by the Acme Bank with Wendell was for \$3500. It was issued on March 15 and called in on June 15. At that time, Wendell paid back a total of \$3636.85. What was the interest rate on this note?

Solution:

From March 15 to June 15 is 92 days, or $\frac{92}{360}$ year. So,

$$\begin{aligned} \text{Interest rate} &= \frac{\text{Amount of Interest}}{\text{Principal} \times \text{Time}} \\ &= \frac{\$136.85 (= \$3636.85 - \$3500.00)}{\$3500 \times \frac{92}{360}} \\ &= 15.3\% \end{aligned}$$



Practice Problems

Borrowing Money

4. Collateral Loans

1. Robert has borrowed \$2500 on a demand note from the First National Bank at a rate of 16.7% per annum. The note was approved on March 15 and falls due on September 9. How much interest will Robert have to pay on this note?

2. The chart below lists the principal and other information about some collateral loans from the Acme State Bank. In each example, calculate the quantity indicated by the blank lines.

	Principal	Date Issued	Date Called In	Interest Rate	Amount of Interest	Total Repaid
(a)	\$1000	1/15	2/15	10.0%	_____	_____
(a)	\$1000	2/3	4/8	10.8%	_____	_____
(a)	\$1500	6/9	9/14	11.5%	_____	_____
(a)	\$2250	7/10	10/5	13.8%	_____	_____
(a)	\$1750	4/18	10/19	14.1%	_____	_____
(a)	\$3500	3/8	11/1	11.9%	_____	_____
(a)	\$2000	3/15	11/9	9.8%	_____	_____
(a)	\$2000	3/18	11/10	_____	\$142.20	_____
(a)	\$5000	6/21	11/20	_____	_____	\$5282.39
(a)	\$2500	7/15	_____	12.3%	_____	\$2611.04



5. Installment Loans (I)

Long-term loans are usually not repaid all at once. Instead, the borrower pays back a portion of the loan each month. Money borrowed on a car loan, for example, may be paid back in 24, 36, or 48 monthly payments. Each monthly payment consists of two parts: a payment towards the principal and an interest payment. Principal is the amount of money loaned the borrower. In some kinds of installment loans, the interest is calculated on the unpaid balance due on the loan. In this method, the monthly payment will be different (less) each month. As the amount still owed (the balance remaining on the principal) becomes less, the interest also becomes less. The example below illustrates this method.

- **Example:**

Henry borrows \$1250 from the Apple Growers Credit Union at 16.1% per year for a period of six months. Interest is calculated on the unpaid balance of the loan. What are the monthly payments on this loan?

Solution:

The monthly payments will be different each month. But they will all be calculated the same way:

$$\text{Monthly interest} = \text{Unpaid balance} \times \text{Rate} \times \text{Time}$$

For the first month, this will be:

$$\begin{aligned} \text{Interest, Month 1} &= \$1250 \times 16.1\% \text{ per year} \times \frac{1}{12} \text{ year} \\ &= \$16.77 \end{aligned}$$

$$\begin{aligned} \text{Payment, Month 1} &= \text{One sixth of principal} + \text{Interest} \\ &= \frac{1}{6} \times \$1250 + \$16.77 \\ &= \$208.33 + \$16.77 \\ &= \$225.10 \end{aligned}$$

Now, the balance due for the second month is:

$$\$1250.00 - \$208.33 = \$1041.67$$

So the interest due for Month 2 is:

$$\begin{aligned} \text{Interest} &= \$1041.67 \times 16.1\% \times \frac{1}{12} \\ &= \$13.98 \end{aligned}$$

And the payment due is:

$$\begin{aligned} \text{Amount due} &= \$208.33 + \$13.98 \\ &= \$222.31 \end{aligned}$$

Calculations for the remaining months are made in the same way. The interest payments and total payments for the last four months of the loan are as follows:

$$\text{Month 3: } \$208.33 + \$11.18 = \$219.51$$

$$\text{Month 4: } \$208.33 + \$ 8.39 = \$216.72$$

$$\text{Month 5: } \$208.33 + \$ 5.59 = \$213.92$$

$$\text{Month 6: } \$208.33 + \$ 2.80 = \$211.13$$



Practice Problems

Borrowing Money

5. Installment Loans (I)

1. Bob has received a three-year loan toward the purchase of a new car. The loan is for \$3500 at an annual rate of 14.67% interest, with the interest calculated on the unpaid balance of the loan. What will be the monthly payments for the first six months of this loan?

2. Sybil has applied for a four-year car loan in the amount of \$6500. The interest rate would be 15.1% per annum over the four-year period. The interest is calculated on the unpaid balance of the loan. What will be the monthly payments for the first six months of the loan?

3. The Sharpee Appliance Company arranges financing for the purchase of most items it sells. In all cases, the interest charged on the installment loan is calculated on the unpaid balance of the loan. What would be the first three months' payments for each of the following loans?

(a) \$2500 for 2 years at 9.8% per year. _____

(a) \$1500 for 18 months at 13.1% per year. _____

(a) \$1750 for 15 months at 11.8% per year. _____

(a) \$950 for 12 months at 10.8% per year. _____

(a) \$750 for 9 months at 9.9% per year. _____

4. Abner's loan for his motorcycle is for 18 months, with interest calculated on the unpaid balance of the loan. The loan is for \$1250 at an annual rate of 18.1%. What will be his total payments for the first four months of the loan?

5. The Kar King Used Car Lot is having a special sale this month. It will finance any vehicle purchased with an installment loan on which the interest is calculated on the unpaid balance of the loan. Andrea is interested in an older model selling at \$1050. If she takes a two-year installment loan at 15.5%, what will her payments be in the first four months of the loan?



6. Installment Loans (II)

Many expensive items, like cars, major appliances, and property, are purchased on installment loans. An installment loan is not paid back all at once, as most loans are. Instead, it is paid back in monthly payments called **installments**. The monthly payments can be calculated in different ways. One way is to calculate the interest over the full term of the loan and then add that interest to the principal at the beginning. This total—principal plus total interest—is then divided by the number of months covered by the loan. Every monthly payment is the same, and the loan is called a **level-payment loan**. The first example below shows how the monthly payments are calculated for a level-payment loan. The second example shows how the interest rate for such a loan can be found.

- **Example 1:**

Veronica applies for a 36-month car loan for \$3500 from the Barstow National Bank at an annual rate of 15.2%. The interest is calculated and added to the loan principal before determining monthly payments. Calculate Veronica's monthly payments on this loan.

Solution:

The interest on this loan can be calculated as usual:

$$\begin{aligned} \text{Interest} &= \text{Principal} \times \text{Rate} \times \text{Time} \\ &= \$3500 \times 15.2\% \text{ per year} \times 3 \text{ years} \\ &= \$1596 \end{aligned}$$

$$\begin{aligned} \text{Total cost of loan} &= \text{Principal} + \text{Interest} \\ &= \$3500 + \$1596 \\ &= \$5096 \end{aligned}$$

Divided among 36 equal monthly payments, each payment would amount to:

$$\$5096 \div 36 = \$141.56$$

- **Example 2:**

Sammy's 24-month car loan costs him \$149.80 per month for a car he could have purchased for \$2800 cash. How much interest did he pay overall, and what was the interest rate on this loan?

Solution:

$$\begin{aligned} \text{Total interest} &= \text{Total cost of loan} - \text{Purchase price} \\ &= 24 \times \$149.80 - \$2800 \\ &= \$3595.20 - \$2800.00 \\ &= \$795.20 \end{aligned}$$

$$\begin{aligned} \text{Interest rate} &= \frac{\text{Total interest}}{\text{Principal} \times \text{Time}} \\ &= \frac{\$795.20}{\$2800 \times 2} \\ &= 14.2\% \end{aligned}$$



Practice Problems

Borrowing Money

6. Installment Loans (II)

1. The Kowalski Cycle Shop is offering to finance the sale of motorcycles with 24-month loans at an annual rate of 19.4%. The interest is calculated and added to the loan principal before monthly payments are determined. How much would the monthly payments be for loans of
 (a) \$1000? _____ (b) \$2500? _____ (c) \$5000? _____

2. Calculate the amount of interest on each of the following loans and the monthly payment, if the total interest and principal due is divided equally among the number of months shown:
 - (a) \$1000 @ 12% for one year: _____
 - (a) \$500 @ 12% for 6 months: _____
 - (a) \$2000 @ 18% for 6 months: _____
 - (a) \$3500 @ 17% for one year: _____
 - (a) \$450 @ 18% for 18 months: _____
 - (a) \$550 @ 15.5% for one year: _____
 - (a) \$2000 @ 14.7% for 6 months: _____
 - (a) \$350 @ 16.2% for 8 months: _____
 - (a) \$750 @ 14.9% for 15 months: _____
 - (a) \$1350 @ 11.9% for 48 months: _____

3. Roscoe's 12-month loan on his stereo set costs him \$86.67 a month. Had he paid cash, he could have purchased the set for \$895. What rate of interest was charged on this loan?

4. Amy has received a 30-month car loan with monthly payments of \$275.00. The purchase price of the car was \$6250.00. What rate of interest is she paying on this loan?

5. Karl, the Kar King, is offering three installment plans for the purchase of late-model cars from his company. The purchase price, length of loan, and monthly payment for three of these plans are given below. What is the interest rate for each of the three purchase plans?
 - (a) Purchase price: \$9520; 24-month loan; payments of \$502.97. _____
 - (a) Purchase price: \$8875; 36-month loan; payments of \$350.81. _____
 - (a) Purchase price: \$9979; 48-month loan; payments of \$298.54. _____