Unit Overview
Many Americans—both teenagers and adults—do not make responsible financial decisions. Learning to be responsible with money means looking at what you earn compared to what you spend. Learning to invest for future needs is also part of being financially responsible. In this unit, you will discover how to apply your knowledge of mathematics to help you make wise financial decisions both now and in the future. As you study this unit, you will apply what you have learned to real-world issues in saving, borrowing, and planning for a college education.

Key Terms
As you study this unit, add these and other terms to your math notebook. Include in your notes your prior knowledge of each word, as well as your experiences in using the word in different mathematical examples. If needed, ask for help in pronouncing new words and add information on pronunciation to your math notebook. It is important that you learn new terms and use them correctly in your class discussions and in your problem solutions.

Academic Vocabulary
- installment credit
- revolving credit
- principal
- interest
- term
- simple interest
- compound interest
Getting Ready

Write your answers on notebook paper. Show your work.

1. Calculate.
   a. $0.19 \times 980$
   b. $0.06 \times 750$
   c. $0.055 \times 1800$

2. Write each percent as a decimal.
   a. 5.2%
   b. 4.8%
   c. 18.4%
   d. 19.7%

3. Write each decimal as a percent.
   a. 0.046
   b. 0.035
   c. 0.059
   d. 0.195

4. Explain how fractions and decimals are related.

5. Compute. Use what you know about order of operations.
   a. $0.07 \times 840 + 40$
   b. $50 + 8% \times 720$
   c. $1800 \times 0.197 + 60$
   d. $0.058 \times 920 + 75 + 38$

6. Calculate the percentages.
   a. 46.75% of 850
   b. 79.44% of 1324

7. Divide.
   a. $670 \div 0.05$
   b. $885 \div 0.07$

8. Subtract.
   a. $408.20 - 124.12 - 38.42$
   b. $520.50 - 70.55 - 29.48$
   c. $105.30 - 12.79 - 19.24 - 46.75$
An important part of personal financial literacy is learning how to use credit wisely. Overuse of credit is not good, but at some point most people need to make a large purchase, such as a house or car. That usually involves borrowing money by taking out a loan. Other reasons to borrow include money for college or to start a business.

Whether you are borrowing a small amount or a large one, there are costs to using credit. Two popular types of credit are installment credit, which requires set payments, and revolving credit, in which payments may vary each month. Personal loans and mortgages are examples of installment credit, while credit card balances are an example of revolving credit. The cost of using credit depends on the amount borrowed, the interest rate, and the length of the loan.

- The principal \(P\) is the total money borrowed.
- Interest rates \(R\) are fixed or variable. A fixed rate stays the same for the term of the loan. A variable rate changes as other interest rates in the economy change. It can go up or down. Variable rates are often used for home mortgages.
- The term \(T\) is the length of time for which you borrow the money. Most personal loans have a term of 1 to 5 years. Mortgage loans (for buying a house or condominium) are commonly made for 15, 20, or 30 years.

There are several ways to calculate interest. One is simple interest, for which the formula is \(I = P \times R \times T\), or \(I = PRT\).

### Example A

You want to borrow $800 to take a vacation. You plan to pay the loan back in 6 months. The interest rate is 4.5% per year. What is your total cost?

**Step 1:** Convert the interest percent to a decimal. \(0.045\)

**Step 2:** Apply the interest formula. \(800 \times 0.045 \times 0.5 = 18\)

**Step 3:** Add the principal and interest. \(800 + 18 = 818\)

### Try These A

a. Calculate the interest on $1200 at 3.9% for a year.
b. What is the principal if you have interest of $75 and a rate of 5%?
c. What is the interest on $2400 at 5.5% for 8 months?
If you look at advertisements in local papers, you may see stores offering credit to customers. Some stores do not charge interest if you repay the loan within a specific time, such as in 3 months. This is sometimes advertised as “90 days same as cash.” Others may charge interest, which will be stated as an annual rate, such as 3.4% per year. Lenders check your credit history and whether you are a good credit risk before deciding to give you a loan. If you have a poor credit history, you may have to pay a higher interest rate.

1. **Apply mathematics to everyday life.** You want to buy a large-screen television for $1500 on credit. The interest rate is 4.2%, and you will need to pay off the loan in 6 months.
   a. How much interest will you pay for 6 months if you are paying simple interest?
   
   b. What will be your monthly payment to repay the loan plus interest?

2. If you changed the term of the loan to 18 months, what is the effect on the interest cost and on your monthly payments?

3. A borrower takes out a loan of $1500 at 6% for one year. But this loan is compounded quarterly (every three months). The borrower plans to repay the principal and interest at the end of the year. Part of the table has been filled in. Complete the table to figure out the cost of this loan.

<table>
<thead>
<tr>
<th>Time</th>
<th>Balance</th>
<th>Interest @ 6%</th>
<th>New Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>1500.00</td>
<td>22.50</td>
<td>1522.50</td>
</tr>
<tr>
<td>June</td>
<td>1522.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Compare the cost of a loan with simple interest to the cost of a loan with compound interest. What do you notice about the differences in the two ways of calculating interest?

Credit cards charge compound interest if you do not pay the full balance each month. Each month’s bill includes the balance remaining from the previous bill, interest, and new purchases. (In addition, some cards also charge a yearly fee.) You are required to pay only a minimum amount (about 2% plus any interest and fees) each month. However, paying only the minimum each month is not a wise credit decision, because the interest costs will add up quickly, adding to the cost of your original purchase.
An important date on this statement is the payment due date. The credit card company must receive payment by this date or a late fee will be charged. If you write a check, you should mail it several days before the due date to avoid late fees. Late payments also affect your credit record and may make financial institutions wary about giving you a loan or a credit card.

5. What is the minimum payment for this statement?

6. How does this credit card statement show financial responsibility by the credit card holder? Explain your reasoning.

7. Assume you have a credit card balance of $954.96. The minimum payment due is $21.20. What balance will be carried over to the next month's statement?

8. If you pay only the minimum on the balance in Item 7 each month and do not make additional charges, how long will it take you to pay off the balance? Assume an 18% annual percentage rate (APR) and a minimum monthly payment of 2% of the balance plus interest. Create a table to show the interest and each monthly payment.
9. Analyze the situation in Item 8 in terms of financial responsibility. What is the most responsible decision you could make in this case? The least responsible?

10. What are the benefits of being financially responsible? What are the costs of financial irresponsibility?

Credit cards and personal loans are a form of short-term borrowing. People also borrow for much longer periods of time to buy cars or homes. Like credit cards, the interest rates are stated as annual percentage rates (APR). The APR includes both the interest and any fees and costs added to the amount of the principal. For example, home mortgage loans have application fees and other costs in addition to the amount of the principal.

APRs give borrowers the true cost of borrowing because they include all the costs related to the loan. Comparing the APRs of different lenders allows borrowers to compare the true costs of a loan and to select the one with the lowest cost. Lenders are required to calculate a loan’s APR and provide borrowers with that information.

You can also use free online calculators to enter the amount you want to borrow, the term, and the interest rate. These online calculators will determine the monthly payments you need to make to repay the loan. A number of websites provide an online calculator. The online calculator includes tools that let you check the costs of loans at different rates and terms. An example is www.thecalculatorsite.com. Your teacher may suggest others, or you may search for online loan calculators. Some sites have specific calculators for loan repayments, car loans, and credit card payments.

11. Select and use tools. Use an online calculator to calculate the monthly payments and total cost of these cases.

   a. $5500 car loan for two years at 4% interest

   b. $4000 loan for four years at 6% interest compounded quarterly with an extra yearly payment of $50

   c. Months to pay off a credit card balance of $2,485 and total interest paid at 19% APR with monthly payments of $40
Lesson 36-1
The Cost of Borrowing

You can pay for purchases with cash or different forms of credit. The advantage of cash is lower cost because you pay no interest. The disadvantage is that you may need a repair, for example, and not have the cash to pay for it. Credit allows you to buy items and pay for them over time. Disadvantages are the interest cost if balances are not paid off each month and buying more than you can afford. Late payments or non-payments also affect your ability to get credit.

12. Identify when you would use cash and credit for purchases. Explain each method and why it is an advantage or disadvantage in the situation.

Check Your Understanding

13. Both the interest rate and the loan length affect the cost of borrowing. Use online calculators as needed for the following calculations.
   a. You borrow $3000 for five years (60 months) at an interest rate of 6%. If you make monthly payments of $58, what is the total cost of your loan?
   b. You borrow $3000 for five years at an interest rate of 8.5%. Your monthly payments are $61.55. What is the total cost of this loan?
   c. You borrow $3000 for three years at an interest rate of 6%. Your monthly payments are $91.27. How does the term affect the total cost of your loan?

14. Explain how interest rate and the term of the loan affect the cost of credit.

15. Write an explanation of the cost of using credit irresponsibly.

LESSON 36-1 PRACTICE

16. Compare how simple interest and compound interest affect the total interest on a loan.

17. Identify and explain the advantages and disadvantages of different methods of paying for purchases.

18. Use a problem-solving model. You borrow $2500 for five years (60 months) at an interest rate of 5%. Your monthly payment is $47.18.
   a. What will be the total cost of your loan?
   b. You borrow $2500 for three years (36 months) at the same 5% interest rate. Now your monthly payment is $74.93. What will be the total cost of this loan?

19. Your credit card statement has a balance of $295.60.
   a. What would the minimum payment be at 18% interest?
   b. How much would you pay if you pay the full balance by the due date?
   c. Think about this situation with a much larger debt, such as a credit card balance of $12,800. How would paying a larger amount each month affect the total interest paid and the length of time to pay off the balance? What would be financially responsible?
Learning Targets:

- Compare simple and compound interest and how they affect savers and borrowers.
- Explain the importance of regular saving for the future.
- Outline a financial plan to pay for college.

SUGGESTED LEARNING STRATEGIES: Marking the Text, Create a Plan, Graphic Organizer

In the previous lesson, you used simple interest to calculate the cost of using credit. Interest is also paid on savings accounts. You might save money through a savings account, through investments in the stock market, or through investments in college savings accounts.

If a bank quotes a rate of 4 percent on a savings account, then money in the account is earning interest at a rate of 4 percent per year. Most banks, though, use a compound rate, which means that they add the interest to savings several times a year.

Example A

You have a savings account with $400 in it. The account earns 3.5% per year. The bank compounds—that is, adds the interest—4 times a year.

Step 1: Calculate the simple interest on $400.

\[ I = 400 \times 0.035 \times 1 = 14 \]

Step 2: For the first quarter, divide $14 by 4.

\[ 14 \div 4 = 3.50 \]

Step 3: Add the principal and interest.

\[ 400 + 3.50 = 403.50 \]

Step 4: Calculate interest on the new principal.

\[ 403.50 \times 0.035 = 14.12 \]

With compounding, the interest on your savings also earns interest throughout the year. The more frequent the compounding, the more interest you earn.

Try These A

a. Calculate the simple interest for a year on $5000 invested at 4.5%.

b. Calculate the compound interest on $5000 invested at 4.5% when the interest is compounded each quarter.

c. How does compounding interest benefit a saver?

Although you must be at least 16 or 18 years old to have your own checking account, you can start a savings account at any age.

Whether you are borrowing or saving, two things are true:

- Simple interest grows slowly.
- Compound interest can grow much faster, depending on how often the interest is compounded. Interest is often compounded monthly, quarterly, or semiannually.
Compound interest makes borrowing expensive, but it works in your favor when you save over a long period of time. Saving or investing even small amounts of money over time can build up a sizable amount of money for your future.

1. Suppose you start saving for college by putting some of your allowance and money earned from chores into a savings account. If you save $15 a month for 5 years, how much money would you have if your account earns simple interest of 4% per year?

2. What conclusions can you draw about the advantages of saving a specific amount of money each month?

3. You have decided to save $40 every month, starting at the beginning of the year. The account carries a 4% interest rate, compounded twice a year. Complete the table to find savings and interest for two years. (Remember that interest is 4% per year, not 4% per 6 months.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Deposit</th>
<th>Balance</th>
<th>Interest</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] June</td>
<td>$240 ($40 × 6)</td>
<td>$240</td>
<td>$4.80</td>
<td>$244.80</td>
</tr>
<tr>
<td>[1] December</td>
<td>$240</td>
<td>$484.80</td>
<td>$9.70</td>
<td></td>
</tr>
<tr>
<td>[2] December</td>
<td>$240</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For long-term savings, most people look for a savings account that pays compound interest. When calculating compound interest over several years, it is easier to use an online interest calculator. An example of such a calculator may be found at www.thecalculatorsite.com. Choosing the compound interest calculator at that website will allow you to experiment with different savings plans. You will need to enter the following information:

- **Base amount**: This amount is the beginning savings you have when you open a savings account, for example, $100. If you are starting with no savings, enter 0.
- **Annual interest rate**: Put in the interest rate offered by a local bank or other financial institution.
- **Calculation period**: This number is the number of years you plan to save. The default is years, but you can also change this to months.
- **Regular monthly deposit**: This number is the amount you plan to deposit in your savings account each month.
- **Compounding interval**: This space allows you to enter the frequency of compounding, whether daily, monthly, quarterly, half yearly, or yearly.
4. Use the online interest calculator to evaluate long-term savings plans.
   a. If you save $20 per month for 10 years at 4.5% compounded quarterly, how much will you have at the end of 10 years?

   b. If you change your monthly savings to $40, how much would you have at the end of 10 years?

   c. Change the number of years to 15, and recalculate the savings.

Saving for college or for retirement are long-term goals for many people. To help determine a savings plan, it is important to know approximately what your college costs will be or the amount of money you will need for retirement. Both require regular savings and wise money management.

You may be interested in saving for college. Keep in mind that most people also use other ways than just savings for paying college costs, such as student loans, work-study programs, and grants and scholarships.

5. **Create and use representations.** Choose three schools you think you might like to attend. Choose one two-year school, such as a community college, and two different kinds of four-year schools—a public, state-supported university and a private college or university. Remember in choosing public schools that costs will be different for in-state students (meaning you are a resident of the state) versus out-of-state students.
   a. Research (online or in person) the estimated costs for tuition, room and board, and other expenses at each of the three schools. Then make a plan for at least your first year.
   b. Discuss with your family the kind of financial help they can give. You might suggest that you both begin a savings plan now, if you have not already done so. Estimate the amount of family contribution and create a plan for saving that amount.

**Research Tip:** If you are researching online, the College Board has information that you may find useful in estimating costs. Remember that the costs listed at this site are averages. The costs for the specific schools that you may want to attend will vary.

See [https://bigfuture.collegeboard.org/pay-for-college/college-costs/college-costs-faqs](https://bigfuture.collegeboard.org/pay-for-college/college-costs/college-costs-faqs)
c. Create a chart similar to this to record costs and possible savings.

<table>
<thead>
<tr>
<th>COSTS</th>
<th>Tuition</th>
<th>Room/board</th>
<th>Other/fees</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-year college</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public university</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private college</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAVINGS PLAN</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family or other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER INCOME</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants/scholarships</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work-study jobs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student loans</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Check Your Understanding**

6. Explain how simple and compound interest are calculated.

7. Explain how saving even small amounts each month can build to substantial amounts over a period of years.

8. What items should you include in making a plan for your education?

**LESSON 36-2 PRACTICE**

9. If you save $50 a month, but keep it in cash or a box in your house, how much will you have at the end of three years?

10. If you save $50 a month in a savings account that pays simple interest of 2%, what will your balance be at the end of one year?

11. **Select and use tools.** If you save $50 a month in a bank savings account that pays 2%, compounded semiannually (twice a year), how much will you have at the end of three years? Use an online calculator.

12. Calculate the simple interest on a one-year loan for $1800 at 4.4%.

13. **Communicate mathematical ideas.** In Items 9–11, which approach would be the most financially responsible? Explain your reasoning and give examples to support it.

14. Who benefits most from compound interest?
   A. borrowers
   B. savers
   C. lenders
   D. both b and c
**ACTIVITY 36 PRACTICE**

1. What factors influence the cost of a loan to a borrower?

2. Calculate simple interest on a loan of $4500 at a rate of 5.5% for 6 months.

3. You borrow $3000 for five years (60 months) at a simple interest rate of 4%. Your monthly payment is $55.25.
   - a. What will be the total cost of your loan?
   - b. You borrow $3000 for three years (36 months) at the same 4% interest rate. Now your monthly payment is $88.57. What will be the total cost of this loan?
   - c. Which factor made the most difference in the cost of this loan?

4. Explain the difference between simple and compound interest.

5. Who benefits most from compound interest—lenders, borrowers, or savers? Explain.

6. Complete this table to calculate the interest on an account of $1,000 at 6% interest compounded quarterly for two years with no additional deposits. How much will this saver have earned at the end of two years?

<table>
<thead>
<tr>
<th>Year</th>
<th>Balance</th>
<th>Interest @ 6%</th>
<th>New Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] March</td>
<td>1000</td>
<td>15</td>
<td>1015</td>
</tr>
<tr>
<td>June</td>
<td>1015</td>
<td>15.23</td>
<td>1030.23</td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
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<tr>
<td>June</td>
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<td>September</td>
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<tr>
<td>December</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Describe the different methods you might use to pay for purchases, and explain the advantages and disadvantages of each.

8. Give an example of being financially responsible and describe the benefits. Give an example of being financially irresponsible and describe the potential costs.

**MATHEMATICAL PRACTICES**

*Use a Problem-Solving Model*

9. Assume that you will need some savings to attend a college of your choice. Estimate the costs and create different savings plans to reach a savings goal for each of these situations.
   - a. Two-year public college with annual tuition and fees of $2,713. Books and supplies are $1,133. Assume living at home rather than in a dorm or apartment. Transportation to and from school will be $1,500 a year.
   - b. Four-year public college with annual tuition of $7,605 plus books and supplies of $1,200 per year. Assume living at home and transportation costs of $1,500 per year.
   - c. Determine how much more you would need to save for college if you added a cost for room and board of $7,500 per year.