4.8 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. Money paid for the use of money is _____.
2. The amount of money being invested or borrowed is known as the _____.
3. Money borrowed and paid back in one payment is calculated with _____ interest.
4. In the formula $I = P \cdot r \cdot t$, the units for time must be in _____ .
5. If interest is compounded four times per year, it is said to be compounded _____.
6. Interest paid on interest earned is known as _____ interest.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. In the simple interest formula, the rate can be written as a decimal number or a fraction.
8. Simple interest can be compounded monthly or quarterly.
9. Interest cannot be earned on interest, only the principal.
10. Inflation can be treated in the same manner as simple interest.

Applications

Solve each problem using the formula for simple interest. Round your answer to the nearest cent, if necessary. Assume 1 year equals 360 days. See Examples 1 through 5.

1. What is the simple interest paid on $500 at 6% for one year?
2. What is the simple interest paid on $2000 at 8% for one year?
3. What will be the interest earned in one year on a savings account of $800 if the bank pays 4% interest?
4. If interest is paid at 6% for one year, what will a principal of $1800 earn?
5. How much interest would be paid on a loan of $5000 at 8% for 6 months?
6. How much interest would be paid on a loan of $3000 at 5% for 9 months?
7. Stacey loaned her brother $1500 for 8 months at 10% interest. How much interest did she earn?
8. Find the simple interest paid on a savings account of $2800 for 120 days at 3.5%.
9. If you were to borrow $1000 at 5% for nine months, how much interest would you pay?
10. What principal will earn $50 in interest if it is invested at 6% for one year?

11. What principal will earn $50 in interest if it is invested at 8% for 90 days?

12. What principal will earn $75 in interest if it is invested for 60 days at 9%?

13. What principal will earn $75 in interest if it is invested at 5% for 6 months?

14. What principal would have to be invested at 8% for 60 days to earn interest of $500?

15. How long will it take for $1000 invested at 5% to earn $50 in simple interest?

16. What length of time will it take to earn $70 in simple interest if $2000 is invested at 7%?

17. How many days must you leave $1000 in a savings account at 5.5% to have a balance of $1011?

18. If interest is paid at 6% for one year, what will a principal of $1800 earn?

19. If a principal of $900 is invested at a rate of 4% for 90 days, what will be the interest earned?

20. If you borrow $750 for 30 days at 9%, how much interest will you pay?

21. How much interest would be paid on a 60-day loan of $500 at 4%?

22. What interest rate would you be paying if you borrowed $1000 for 6 months and paid $60 in interest?

23. What rate of interest is charged if a loan of $2500 for 90 days is paid off with $2562.50?

24. A friend wants to borrow $500 from you for 8 months and is willing to pay you interest at 6%. How much would he owe you at the end of the 8 months?

25. If you charge $1000 worth of merchandise at a local department store at 18% interest, how much will you owe at the end of 60 days?

26. A bank decides to loan $5 million to a contractor to build new homes. How much interest will the bank earn in one year if the interest rate is 9.2%?

27. Every 6 months a stock pays 10% in dividends (interest on investment). What will be the earnings of $14,600 invested for 6 months? (Remember, the rates of interest are given as annual rates.)

28. A credit card company has $120 million loaned to its customers at 18.9%. How much interest will it earn in one month?

29. A department store keeps $15 million in merchandise in stock. If the store pays interest at 9% on a bank loan for this stock, how much interest will the store pay in 3 months' time?

30. You buy an oven on sale from $500 to $450, but you don't make a payment for 60 days and are charged interest at a rate of 18%.

a. How much do you pay for the oven by waiting 60 days to pay?

b. How much do you save by buying the oven on sale? (Sales tax is not included here.)

31. Carlos has a savings account with a balance of $25,000.

a. If the savings account is drawing interest at 8%, how much interest will he earn in 6 months?

b. How long must he leave the money in the account to earn $1500?

32. A savings account of $5300 is left for 90 days drawing interest at a rate of 5%.

a. How much interest is earned?

b. What is the amount in the account at the end of 90 days?

33. If you charge $1000 worth of merchandise at a local department store at 18% interest, how much will you owe at the end of 60 days?

34. Ms. Lee accumulated $240,000 and she wants to live on the interest each year. If she needs $2000 a month to live on, what interest rate must she earn on her money?

35. Mr. Smith has a savings account of $2500 that draws 4.5% interest. How many days will it take for him to earn $75?

36. A small airline company borrowed $7.5 million to buy some new airplanes. The loan rate was 7.5%, and the airline paid $562,500 in interest. What was the length of time of the loan?

37. Determine the missing item in each row.

Principal	Rate	Time	Interest
$400	16%	90 days	**a.**
b.	15%	120 days	$5.00
$560	12%	**c.**	$5.60
$2700	**d.**	40 days	$25.50

38. Determine the missing item in each row.

Principal	Rate	Time	Interest
$600	15%	30 days	**a.**
$500	18%	**b.**	$15.00
$450	**c.**	90 days	$22.50
d.	10%	30 days	$1.50

Solve each problem by repeatedly using the formula for calculating simple interest. Round your answer to the nearest cent, if necessary. See Examples 6 and 7.

39. You loan your cousin $2000 at 5% compounded annually for 3 years. How much interest will your cousin owe you?

a. First year: $I = 2000 \cdot 0.05 \cdot 1 =$ _____

b. Second year: $I =$ _____ $\cdot 0.05 \cdot 1 =$ _____

c. Third year: $I =$ _____ $\cdot 0.05 \cdot 1 =$ _____

d. The total interest is _____.

40. John borrowed \$5000 from his uncle at 6% compounded annually for 4 years. How much interest will he owe his uncle at the end of 4 years?

a. First year: $I = 5000 \cdot 0.06 \cdot 1 =$ _____

b. Second year: $I =$ _____ $\cdot 0.06 \cdot 1 =$ _____

c. Third year: $I =$ _____ $\cdot 0.06 \cdot 1 =$ _____

d. Fourth year: $I =$ _____ $\cdot 0.06 \cdot 1 =$ _____

e. The total interest is _____.

41. If \$9000 is deposited in a savings account at 4% compounded monthly, what will be the balance in the account in 4 months?

a. First month: $I = 9000 \cdot 0.04 \cdot \frac{1}{12} =$ _____

b. Second month: $I =$ _____ $\cdot 0.04 \cdot \frac{1}{12} =$ _____

c. Third month: $I =$ _____ $\cdot 0.04 \cdot \frac{1}{12} =$ _____

d. Fourth month: $I =$ _____ $\cdot 0.04 \cdot \frac{1}{12} =$ _____

e. The total interest earned is _____.

f. The balance in the account is _____.

42. Jeremy put \$3500 in a savings account at 5.5% compounded quarterly for 6 months. What will be the balance on the account at the end of 6 months?

a. First quarter: $I = 3500 \cdot 0.055 \cdot \frac{1}{4} =$ _____

b. Second quarter: $I =$ _____ $\cdot 0.055 \cdot \frac{1}{4} =$ _____

c. The total interest earned is _____.

d. The balance in the account is _____.

43. Your cousin loans you \$3000 compounded annually at 4% for 4 years. How much interest will your cousin owe you?

44. Keri borrowed \$4000 from her aunt compounded annually at 5% for 6 years. How much interest will she owe her aunt at the end of 6 years?

45. If \$9000 is deposited in a savings account compounded monthly at 4%, what will be the balance in the account in 3 months?

46. If interest is calculated at 10% compounded quarterly, what will be the value of \$15,000 in 9 months?

Solve each problem by using the compound interest formula. Round your answer to the nearest cent, if necessary. See Examples 8 through 10.

47. You deposit \$1500 at 4% to be compounded semiannually. How much interest will you earn in 3 years?

48. A principal of \$2500 is deposited at 6% to be compounded monthly. How much will the account be worth in 6 months?

49. Suppose you can invest $10,000 at an interest rate of 10%.

- **a.** What will be the interest on $10,000 compounded daily at 10% for one year?
- **b.** What is the difference between this and simple interest at 10% for one year?

50. Suppose you can invest $5000 at an interest rate of 8%.

- **a.** Find the value of $5000 compounded quarterly at 8% for 4 years.
- **b.** What do you think the difference in interest would be if the money were compounded daily: about $5, $20, or over $100?
- **c.** Find the exact difference in interest.

51. Suppose $20,000 is invested in a savings account.

- **a.** What would the value of the savings account be at the end of 5 years if interest were calculated at 7% compounded annually?
- **b.** How much more would be earned if the interest were compounded daily?

52. Suppose $3000 is invested in a savings account.

- **a.** Suppose the money is invested at 5% and compounded monthly for one year. Find the accumulated value.
- **b.** Is the accumulated amount the same if the original principal of $3000 is compounded annually for 12 years? If not, what is the difference?

53. Suppose $5000 is invested at an interest rate of 12%.

- **a.** Calculate the interest in one year on $5000 compounded monthly at 12%.
- **b.** Suppose the interest is compounded semiannually. Is the accumulated value the same?
- **c.** If not, explain why not in your own words.

54. Suppose $20,000 is invested in a savings account.

- **a.** What will be the value of a $20,000 savings account at the end of 3 years if interest is calculated at 10% compounded annually?
- **b.** Suppose the interest is compounded semiannually. What is the value? Is the value the same?
- **c.** If not, explain why not in your own words.

55. Suppose $10,000 is invested into a high-yield savings account.

- **a.** Calculate the interest earned in one year on $10,000 compounded monthly at 14%.
- **b.** What is the difference between this and simple interest at 14% for 1 year?

56. Suppose that $50,000 is invested in a certificate of deposit for 5 years and the interest rate is 8%.

- **a.** What will be the interest earned if it is compounded monthly?
- **b.** How much more interest would be earned if it were compounded daily?

57. Suppose you have $25,000 to invest.

a. Find the value of $25,000 compounded daily at 5% for 20 years.

b. Do you think that the amount will be doubled or more than doubled if the rate is doubled to 10%?

c. Find the amount if the rate is 10%.

Find the amount (A) and the interest (I) for the given information.

	Compounding Period	Principal	Annual Rate	Time	A	$I = A - P$
58.	Quarterly	$1000	10%	5 yr	**a.**	**b.**
59.	Monthly	$1000	10%	5 yr	**a.**	**b.**
60.	Daily	$1000	10%	5 yr	**a.**	**b.**
61.	Monthly	$5000	7.5%	10 yr	**a.**	**b.**
62.	Daily	$25,000	8%	20 yr	**a.**	**b.**
63.	Daily	$25,000	12%	20 yr	**a.**	**b.**

Solve. Round your answer to the nearest cent, if necessary. See Examples 11 and 12.

64. Kevin is currently spending $1300 per month on rent and utilities. Assuming an annual inflation rate of 3%, how much should he plan to spend on rent and utilities per month 2 years from now?

65. In 2013, the average price for a gallon of milk was $3.00, and the average price for a loaf of bread was $2.50. If the inflation rate was 6% per year, how much did these items cost in 2016?

66. Sam receives a cost-of-living raise equal to inflation each year. If inflation was steady at 5% annually, and his current yearly income is $56,800, what was Sam's yearly income 4 years ago?

67. The current market value of Kayla's car is $24,000. She plans to trade in her current car and buy a new one in 5 years. If the car depreciates at 12% per year, what will be the market value of her car when she is ready to trade it in?

68. Stephen has a fishing boat that he bought 3 years ago. He has decided to sell it, and the boat is valued at $8500. If the yearly rate of depreciation for his boat is 13.2%, how much did he originally pay for the boat?

69. Gavin bought a new truck last year for $29,900. This year, he decided that he wants to trade it in for a smaller car. He can resell the truck for 26,500. What was the rate of depreciation for the year?

70. A house is appraised at $125,000. Assuming 3% constant inflation, what will be its value, to the nearest thousand dollars, in 30 years?

71. If a new pickup truck is valued at $18,000, what will be its value in 3 years if it depreciates 22% each year?

72. Suppose that an apartment complex is purchased for $1,500,000. For property tax purposes, the land is considered to be 30% of the value of the property. For income tax purposes, the owners are allowed to depreciate the value of the buildings by 5% per year. What will be the value of the apartment complex (buildings and land) in 10 years? (**Note:** This will not be the market value, but it will form the basis for capital gains taxes when the property is sold.)

Writing & Thinking

73. List the four parts involved in the simple interest formula. In your own words, define each one.

74. Compare and contrast simple interest with compound interest.

75. **a.** What will be the value of $10,000 compounded weekly at 10% for 3 years?

b. Use your calculator to choose values for t to use in the formula until you find approximately how many years of daily compounding are needed for the value to accumulate to $20,000.

t	$A = P\left(1+\frac{0.10}{365}\right)^{365t}$	A

Collaborative Learning

With the class separated into teams of two to four students, each team is to analyze the following problem related to compound interest. Each team leader is to discuss the results found by the team and how the team arrived at these results. A general classroom discussion should follow with the class coming to an understanding of the concepts of present value and future value.

76. Suppose that you would like to set aside some money today for your child's college education. Your child is 3 years old and would be starting college at the age of 18. What amount should you invest today (called the present value) at 8% compounded daily to accumulate $40,000 (called the future value) for your child's education?

In groups of three to four students, work through the following problem. Discuss your answers in class.

77. Three monthly incomes are listed in the table and each receives a yearly cost-of-living raise.

a. Find each monthly income after 5 years for annual inflation rates of 4%, 6%, and 8%. Round to the nearest cent.

Monthly Income	4%	6%	8%
$2000			
$2500			
$4000			

b. Discuss the difference between starting with a $2000 monthly income with an 8% yearly pay raise and starting with a $4000 monthly income with a 4% yearly pay raise. (**Hint:** Compare each starting monthly income with the monthly income after 5 years.)

c. Suppose that the cost-of-living increases at a rate of 6% each year and you only received a 4% raise each year. Discuss how this might affect your way of living and what actions you might take.