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4.4 Simple Interest

STATE STANDARDS
MA.7.A.1.2

Essential Question How can you find the amount of simple interest earned on a savings account? How can you find the amount of interest owed on a loan?

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Simple interest is money earned on a savings account or an investment. It can also be money you pay for borrowing money.

Write the annual interest rate in decimal form.

Simple Interest	=	Principal	×	Annual Interest Rate	×	Time
($)		($)		(% per yr)		(Years)

$I = Prt$

1 ACTIVITY: Finding Simple Interest

Work with a partner. You put $100 in a savings account. The account earns 6% simple interest per year. (a) Find the interest earned and the balance at the end of 6 months. (b) Copy and complete the table. Then make a bar graph that shows how the balance grows in 6 months.

a. $I = Prt$ Write simple interest formula

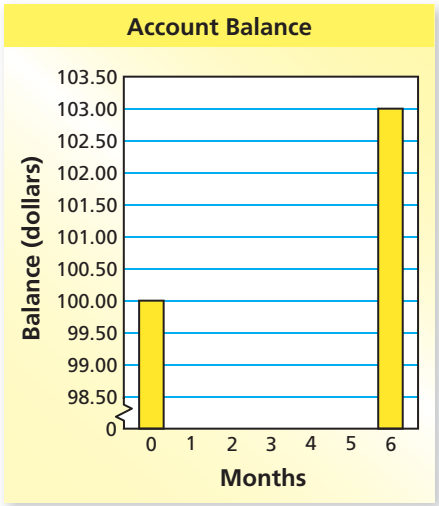
$= 100(0.06)\left(\frac{6}{12}\right)$ Substitute values.

$= 3$ Multiply.

∴ At the end of 6 months, you earn $3 in interest. So, your balance is $100 + $3 = $103.

b.

Time	Interest	Balance
0 month	$0	$100
1 month		
2 months		
3 months		
4 months		
5 months		
6 months	$3	$103



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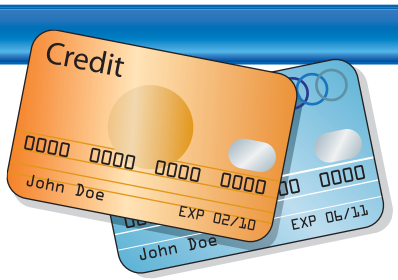
2 ACTIVITY: Financial Literacy



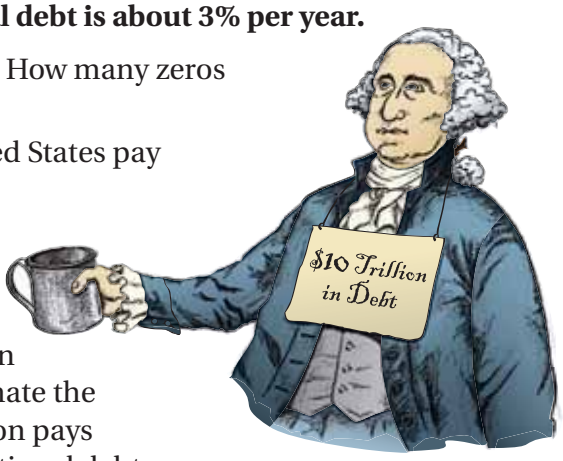
Work with a partner. Use the following information to write a report about credit cards. In the report, describe how a credit card works. Include examples that show the amount of interest paid each month on a credit card.

U.S. Credit Card Data

- A typical family in the United States owes about $5000 in credit card debt.
- A typical credit card interest rate is 18% to 20% per year. This is called the annual percentage rate.

3 ACTIVITY: The National Debt

Work with a partner. In 2010, the United States owed about $10 trillion in debt. The interest rate on the national debt is about 3% per year.



a. Write $10 trillion in decimal form. How many zeros does this number have?

b. How much interest does the United States pay each year on its national debt?

c. How much interest does the United States pay each day on its national debt?

d. The United States has a population of about 300 million people. Estimate the amount of interest that each person pays per year toward interest on the national debt.

What Is Your Answer?

4. IN YOUR OWN WORDS How can you find the amount of simple interest earned on a savings account? How can you find the amount of interest owed on a loan? Give examples with your answer.

Practice Use what you learned about simple interest to complete Exercises 4–7 on page 182.

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4.4 Lesson

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Key Vocabulary
interest, *p. 180*
principal, *p. 180*
simple interest, *p. 180*

Interest is money paid or earned for the use of money. The **principal** is the amount of money borrowed or deposited.

Key Idea

Simple Interest

Words **Simple interest** is money paid or earned only on the principal.

Algebra

$$I = Prt$$

Simple interest: I
Annual interest rate (in decimal form): r
Principal: P
Time (in years): t

EXAMPLE 1 Finding Interest Earned

You put $500 in a savings account. The account earns 3% simple interest per year. (a) What is the interest earned after 3 years? (b) What is the balance after 3 years?

a. $I = Prt$ Write simple interest formula.

$= 500(0.03)(3)$ Substitute 500 for P, 0.03 for r, and 3 for t.

$= 45$ Multiply.

∴ The interest earned is $45 after 3 years.

b. To find the balance, add the interest to the principal.

∴ So, the balance is $500 + $45 = $545 after 3 years.

EXAMPLE 2 Finding an Annual Interest Rate

You put $1000 in an account. The account earns $100 simple interest in 4 years. What is the annual interest rate?

$I = Prt$ Write simple interest formula.

$100 = 1000(r)(4)$ Substitute 100 for I, 1000 for P, and 4 for t.

$100 = 4000r$ Simplify.

$0.025 = r$ Divide each side by 4000.

∴ The annual interest rate of the account is 0.025, or 2.5%.

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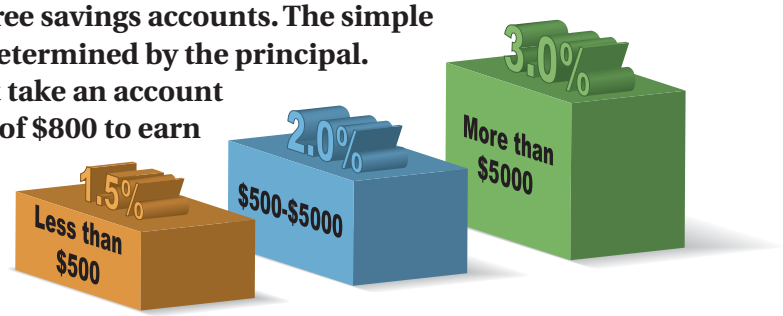
On Your Own

Now You're Ready
Exercises 4–16

1. In Example 1, what is the balance of the account after 9 months?
2. You put \$350 in an account. The account earns \$17.50 simple interest in 2.5 years. What is the annual interest rate?

EXAMPLE 3 Finding an Amount of Time

A bank offers three savings accounts. The simple interest rate is determined by the principal. How long does it take an account with a principal of \$800 to earn \$100 interest?



The pictogram shows that the interest rate for a principal of \$800 is 2%.

$I = Prt$ Write simple interest formula.

$100 = 800(0.02)(t)$ Substitute 100 for I, 800 for P, and 0.02 for r.

$100 = 16t$ Simplify.

$6.25 = t$ Divide each side by 16.

∴ The account earns \$100 in interest in 6.25 years.

EXAMPLE 4 Finding Amount Paid on a Loan

You borrow \$600 to buy a violin. The simple interest rate is 15%. You pay off the loan after 5 years. How much do you pay for the loan?

$I = Prt$ Write simple interest formula.

$= 600(0.15)(5)$ Substitute 600 for P, 0.15 for r, and 5 for t.

$= 450$ Multiply.

To find the amount you pay, add the interest to the loan amount.

∴ So, you pay \$600 + \$450 = \$1050 for the loan.

On Your Own

Now You're Ready
Exercises 17–27

3. In Example 3, how long does it take an account with a principal of \$10,000 to earn \$750 interest?
4. **WHAT IF?** In Example 4, you pay off the loan after 2 years. How much money do you save?

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4.4 Exercises

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Vocabulary and Concept Check

1. **VOCABULARY** Define each variable in $I = Prt$.
2. **WRITING** In each situation, tell whether you would want a *higher* or *lower* interest rate. Explain your reasoning.
   a. You borrow money
   b. You open a savings account
3. **REASONING** An account earns 6% simple interest. You want to find the interest earned on \$200 after 8 months. What conversions do you need to make before you can use the formula $I = Prt$?

Practice and Problem Solving

An account earns simple interest. (a) Find the interest earned. (b) Find the balance of the account.

1 4. \$600 at 5% for 2 years
5. \$1500 at 4% for 5 years
6. \$350 at 3% for 10 years
7. \$1800 at 6.5% for 30 months
8. \$700 at 8% for 6 years
9. \$1675 at 4.6% for 4 years
10. \$925 at 2% for 2.4 years
11. \$5200 at 7.36% for 54 months
12. **ERROR ANALYSIS** Describe and correct the error in finding the simple interest earned on \$500 at 6% for 18 months.

✗ $I = (500)(0.06)(18)$
$= \$540$

Find the annual simple interest rate.

2 13. $I = \$24$, $P = \$400$, $t = 2$ years
14. $I = \$562.50$, $P = \$1500$, $t = 5$ years
15. $I = \$54$, $P = \$900$, $t = 18$ months
16. $I = \$160.67$, $P = \$2000$, $t = 8$ months

Find the amount of time.

3 17. $I = \$30$, $P = \$500$, $r = 3\%$
18. $I = \$720$, $P = \$1000$, $r = 9\%$
19. $I = \$54$, $P = \$800$, $r = 4.5\%$
20. $I = \$450$, $P = \$2400$, $r = 7.5\%$
21. **BANKING** A savings account earns 5% annual simple interest. The principal is \$1200. What is the balance after 4 years?
22. **SAVINGS** You put \$400 in an account. The account earns \$18 simple interest in 9 months. What is the annual interest rate?
23. **CD** You put \$3000 in a CD (certificate of deposit) at the promotional rate. How long will it take to earn \$336 in interest?

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Find the amount paid for the loan.

24. $1500 at 9% for 2 years

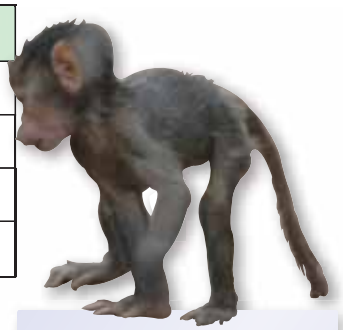
25. $2000 at 12% for 3 years

26. $2400 at 10.5% for 5 years

27. $4800 at 9.9% for 4 years

Copy and complete the table.

	Principal	Interest Rate	Time	Simple Interest
28.	$12,000	4.25%	5 years	
29.		6.5%	18 months	$828.75
30.	$15,500	8.75%		$5425.00
31.	$18,000		54 months	$4252.50



Zoo Trip

Tickets	67.70
Food	62.34
Gas	45.50
Total Cost	?

32. ZOO A family charges a trip to the zoo on a credit card. The simple interest rate is 12%. The charges are paid after 3 months. What is the total amount paid for the trip?

33. MONEY MARKET You deposit $5000 in an account earning 7.5% simple interest. How long will it take for the balance of the account to be $6500?

34. LOANS A music company offers a loan to buy a drum set for $1500. What is the monthly payment?

35. REASONING How many years will it take for $2000 to double at a simple interest rate of 8%? Explain how you found your answer.

36. LOANS You have two loans, for 2 years each. The total interest for the two loans is $138. On the first loan, you pay 7.5% simple interest on a principal of $800. On the second loan, you pay 3% simple interest. What is the principal for the second loan?

37. Critical Thinking You put $500 in an account that earns 4% annual interest. The interest earned each year is added to the principal to create a new principal. Find the total amount in your account after each year for 3 years.

Fair Game Review What you learned in previous grades & lessons

Solve the proportion. SECTION 3.5

38. $\frac{4}{9} = \frac{12}{x}$ **39.** $\frac{15}{36} = \frac{n}{12}$ **40.** $\frac{m}{6.5} = \frac{14}{26}$ **41.** $\frac{2.4}{z} = \frac{3}{11.25}$

42. MULTIPLE CHOICE What is the solution of $4x + 5 = -11$? SECTION 2.6

(A) -4 (B) -1.5 (C) 1.5 (D) 4