## 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?

**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.

$$\underset{(\$)}{\boxed{\begin{array}{c}\text{Simple}\\\text{Interest}\end{array}}} = \underset{(\$)}{\boxed{\text{Principal}}} \times \underset{(\%\text{ per yr})}{\boxed{\begin{array}{c}\text{Annual Interest}\\\text{Rate}\end{array}}} \times \underset{(\text{Years})}{\boxed{\text{Time}}}$$

$$I = Prt$$

### 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.**

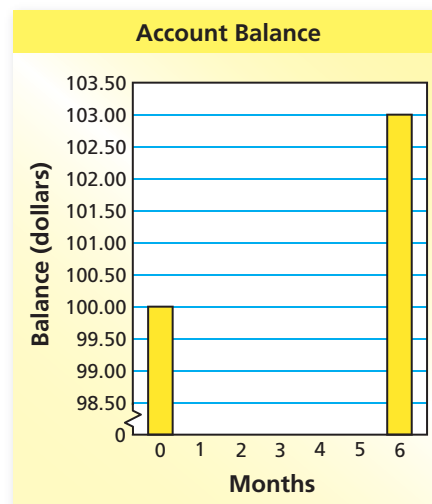a.    $I = Prt$            Write simple interest formula

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

       $= 3$                Multiply.

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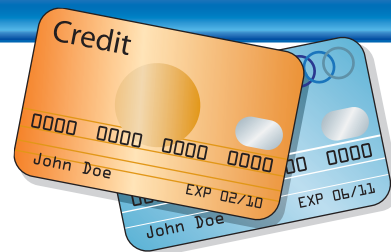
b.

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

**Account Balance**

## 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.
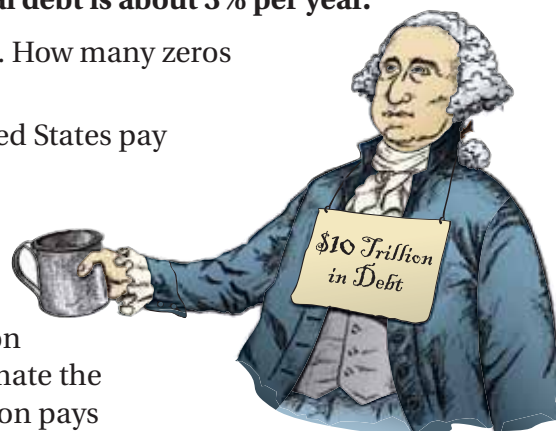
## What Is Your Answer?

**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.

**Check It Out**
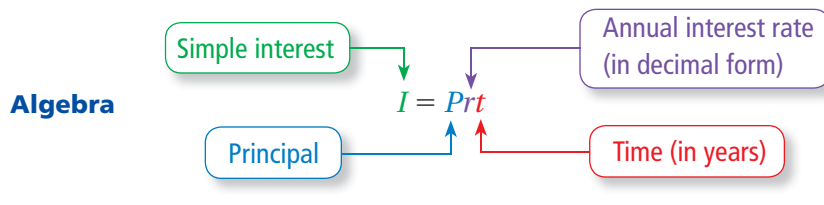Lesson Tutorials
BigIdeasMath.com

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.

Simple interest ————→
Annual interest rate (in decimal form) ————→

**Algebra**                     $I = Prt$

Principal ————→          ↑ ↑ ←———— Time (in years)

---

**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%.

🔊 **Multi-Language Glossary at BigIdeasMath✓com.**

## On Your Own

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?

1.5%
Less than $500

2.0%
$500-$5000

3.0%
More than $5000
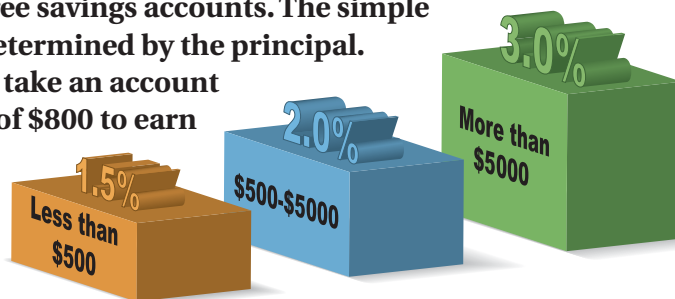
The pictogram shows that the interest rate for a principal of $800 is 2%.

$I = Prt$  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

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?

## ✓ 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?
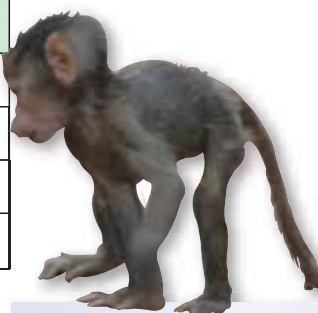
*Certificate of Deposit*

This certificate is the original Specimen and valid document from the treasury and Security department of this here trust financial group & associates. The agreement herein construed are thorough, correct and binding on the parties. Alterations made on this...... after it has been legally issued......

**Promotional Rate 5.6% Simple Interest**

DIRECTOR'S SIGNATURE

**Find the amount paid for the loan.**

**④ 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 |

**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?

*Zoo Trip*

| | |
|---|---|
| Tickets | 67.70 |
| Food | 62.34 |
| Gas | 45.50 |
| Total Cost | ? |

**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?

**11.8% Simple Interest Equal monthly payments for 2 years.**

**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.**

**38.** $\dfrac{4}{9} = \dfrac{12}{x}$

**39.** $\dfrac{15}{36} = \dfrac{n}{12}$

**40.** $\dfrac{m}{6.5} = \dfrac{14}{26}$

**41.** $\dfrac{2.4}{z} = \dfrac{3}{11.25}$

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

    Ⓐ $-4$      Ⓑ $-1.5$      Ⓒ $1.5$      Ⓓ $4$