

Explore It!

Gerard compares the offers at two different banks to decide where he should open a savings account.

Lesson 4-6

Solve Simple Interest Problems

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Open a savings account - we'll add **\$100** to your first deposit!

MY BANK

When you open a savings account with us, we'll add 5% of your first deposit to the account!

New Bank

I can... apply percent reasoning to solve simple interest problems.

A. Draw a representation to show how much would be in the first savings account if Gerard's initial deposit were d dollars.

B. Draw a representation to show how much would be in the second savings account if Gerard's initial deposit were d dollars.

C. Use the two representations you drew to explain how the offers at the two banks are similar and how they are different.

Focus on math practices

Construct Arguments Gerard's first deposit is \$500. Which bank should he choose? Explain.

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Essential Question

How does simple interest show proportional reasoning and relate to the percent equation?

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EXAMPLE 1 Find Simple Interest

Victoria opens a savings account with a deposit of \$300. She will earn 1.6% simple interest each year on her money. How much interest will she earn over 5 years (assuming she does not add or take out any money)?

The initial amount is called the **principal**.

Interest that is applied to the initial amount only is called **simple interest**.

STEP 1 Use the percent equation to find the amount of interest earned in one year, s .

An **interest rate** is a percent used to calculate interest on the principal.

Interest amount = interest rate • principal • time

$$s = 0.016 \cdot 300$$

$$s = 4.80$$

The simple interest earned on the principal in one year is \$4.80.

STEP 2 Multiply the interest earned in one year by 5 to calculate the total interest Victoria will earn over 5 years.

4.80 • 5 = 24

Victoria will earn \$24 in interest over 5 years.

Try It!

Victoria has another account at the bank that pays $2\frac{1}{2}\%$ simple interest. How much interest will she earn in 8 years on an initial deposit of \$250 assuming she neither adds to nor withdraws from the account?

$2\frac{1}{2}\%$ interest expressed as a decimal is .

Interest after 1 year: $s = \text{input} \cdot \$ \text{input}$
= \$

Interest after 8 years: $s = \text{input} \cdot \text{input}$
= \$

Victoria will earn \$ in interest over 8 years.

Convince Me! Would the interest for the second year be the same if it were calculated on the total after the first year? Why or why not?

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EXAMPLE 2 Find the Percent of Interest

Maya's older sister got a loan to buy a used car for \$3,400. What is the interest rate on the loan?

STEP 1 Multiply the interest amount by 12 to find the interest for 1 year.

$$8.50 \cdot 12 = 102$$

STEP 2 Use the percent equation to find the interest rate.

$$\text{interest amount} = \text{interest rate} \cdot \text{loan amount}$$

$$102 = P \cdot 3,400$$

$$\frac{102}{3,400} = \frac{P \cdot 3,400}{3,400}$$

$$0.03 = P$$

The simple interest rate is 3% for 1 year.



Try It!

Another company will lend Maya's older sister \$4,000. Every month, she will pay \$11.88 in interest. What is the interest rate, rounded to the nearest tenth of a percent, for 1 year?

EXAMPLE 3 Find the Principal

Jake opened a savings account that earns 1.5% interest. Jake estimates that, assuming he neither adds to nor withdraws from his account, he will earn \$240 in interest after 10 years. How much did Jake deposit when he opened the account?

First, find the amount of interest for 1 year.

$$240 \div 10 = 24$$

Then, use the percent equation to find the initial deposit or principal, d .

$$\text{interest amount} = \text{interest rate} \cdot \text{initial deposit}$$

$$24 = 0.015 \cdot d$$

$$0.015 = \frac{d \cdot 0.015}{0.015}$$

$$1,600 = d$$

Jake deposited \$1,600.

Make Sense and Persevere

How can using an equation help make sense of the problem situation?



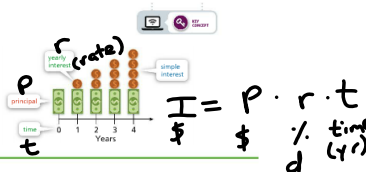
Calculating simple interest is a good way to estimate how much interest Jake will have in the bank after 10 years.

Try It!

Katelyn's older brother borrowed money for school. He took out a loan that charges 6% simple interest. He will end up paying \$720 in interest after 6 years. How much did Katelyn's brother borrow for school?

KEY CONCEPT

Simple interest represents a proportional relationship between the yearly interest and the principal, or initial amount. The ratio of yearly interest to principal is the interest rate.



Do You Understand?

1. **Reasoning** How does simple interest show proportional reasoning and relate to the percent equation?

2. **Reasoning** If the interest earned on an account after 2 years is \$15, how much would it be after 10 years? Why?

3. **Be Precise** Angelina is deciding which bank would give her the best simple interest rate on a \$300 deposit. One bank says that she will have \$30 in her account if she leaves the principal for 2 years. Is this enough information for Angelina to find the interest rate? Explain.

Do You Know How?

4. Find the missing value in each row. Use the percent equation.

Principal (P)	Interest Rate (r)	Time in years (t)	Interest Earned (I)
\$100	5%	3	\$15
\$500	4%		\$20
	10%	7	\$35
\$200		2	\$6

5. Anika's older cousin borrowed \$800 to repair her car. She will pay off the loan after 2 years by paying back the principal plus 4.5% simple interest for each year.

a. How much will she pay in interest? Show your work.

b. How much will she pay back altogether?

6. J.D. opened a savings account with \$425. After 2 years, the total interest he earned was \$10.20. What was the annual interest rate?

Handwritten work for problem 6:

$$I = P \cdot r \cdot t$$

$$10.20 = 425 \cdot r \cdot 2$$

$$\frac{10.20}{2} = \frac{850 \cdot r}{2}$$

$$5.10 = 425r$$

$$\frac{5.10}{425} = r$$

$$0.012 = r$$

$$1.2\% = r$$

The annual interest rate on the savings account is 1.2%.

$$\begin{aligned}
 \text{II) } I &= P \cdot r \cdot t \\
 I &= (500)(\underbrace{3.3\%}_{\sim 3.3})(4) \\
 I &= (500)(0.033)(4) \\
 I &= \$66
 \end{aligned}$$

$$I = P \cdot r \cdot t = (\$3000)(0.048)(1) = \$144$$

14. Reasoning A bank manager wants to encourage new customers to open accounts with initial deposits of at least \$3,000. He has posters made for the promotion.

- a. Under the new promotion, what is the minimum amount of interest a new account would make in one year if there were no withdrawals from the account?
- b. The manager wants to add the sentence, "Open an account with \$3,000 and earn at least \$120 interest each year!" to the poster. Do you agree? Explain.



≥ 120

15. Suppose you deposit \$100 in Account A with a simple interest rate of 3.4%, and \$300 in Account B with a simple interest rate of 1.8%. One year later, you get a bank statement that shows the interest for Account A is \$3.40 and the interest for Account B is \$540.00.

- a. Which account statement is incorrect?
- b. What may have been the bank's error?

16. Higher Order Thinking You have two different savings accounts. For Account A, the interest earned after 18 months is \$12.00. For Account B, the interest earned after 27 months is \$27.00.

- a. If the interest rate is 3.2% for Account A, how much is the principal?
- b. If the interest rate is 2.4% for Account B, how much is the principal?
- c. Which account earned you the most interest in the first year? Explain.

$$\begin{aligned}
 &\text{months} \\
 &\downarrow \\
 &\frac{\# \text{ Months}}{12}
 \end{aligned}$$

$$\begin{aligned}
 I &= P \cdot r \cdot t \\
 27 &= P \left[0.024 \cdot \left(\frac{27}{12} \right) \right]
 \end{aligned}$$

$$\begin{aligned}
 27 &= P \cdot (0.054) \\
 0.054 & \quad 0.054
 \end{aligned}$$

Assessment Practice

17. Which of these would earn the same interest as a \$150 principal at 4% annual interest for 2 years? Select all that apply.
- \$300 at 2% for 2 years
 - \$150 at 6% for 18 months
 - \$400 at 3% for 1 year
 - \$100 at 1% for 8 years
 - \$50 at 48% for 6 months

18. Dakota earned \$15.75 in interest in Account A and \$28.00 in interest in Account B after 21 months. If the simple interest rate is for 3.0% for Account A and 4.0% for Account B, which account had the greater principal? Explain.

see notes

$$\$500 = P$$

$$18) \quad I = P \cdot r \cdot t$$

Acc A

$$I = P \cdot r \cdot t$$

$$\$15.75 = P \cdot \underbrace{3\%}_3 \cdot \frac{21 \text{ mo}}{12}$$

$$\frac{21 \div 3}{12 \div 3} = \frac{7}{4} = 1\frac{3}{4} \\ 1.75$$

$$\$15.75 = P \cdot (0.03) \left(\frac{21}{12} \right)$$

$$\$15.75 = P \cdot \frac{\cancel{0.0325}}{\cancel{0.0325}}$$

$$\$300 = P$$

