English Spanish

B.1 Simple and Compound Interest

Essential Question How can you find the balance in an account that earns simple interest or compound interest?

1 ACTIVITY: Comparing Simple and Compound Interest

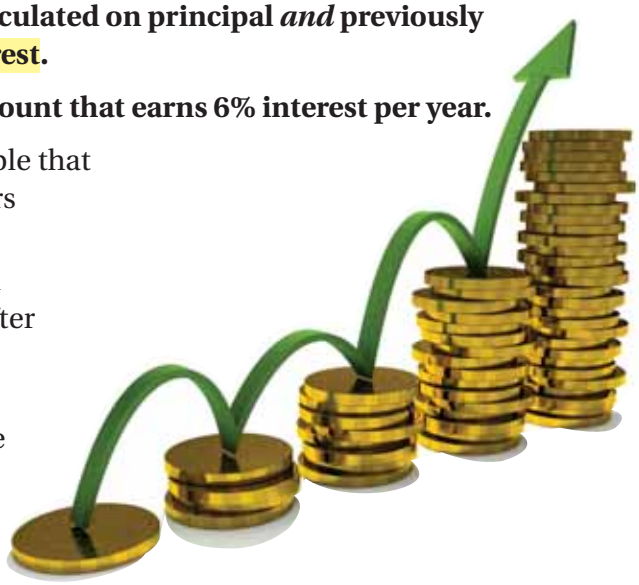
Work with a partner. Interest that is calculated only on principal is simple interest. Interest that is calculated on principal *and* previously earned interest is compound interest.

You deposit $1000 in a savings account that earns 6% interest per year.

a. Copy and complete the first table that shows the balance after 10 years with simple interest.

b. Copy and complete the second table that shows the balance after 10 years with interest that is compounded annually.

c. Which type of interest gives the greater balance?



$I = Prt$
$= 1000(0.06)(1)$

Simple Interest			
t	Principal	Annual Interest	Balance at End of Year
1	$1000.00	$60.00	$1060.00
2	$1000.00	$60.00	$1120.00
3			
4			
5			
6			
7			
8			
9			
10			

Compound Interest			
t	Principal and Interest	Annual Interest	Balance at End of Year
1	$1000.00	$60.00	$1060.00
2	$1060.00	$63.60	$1123.60
3			
4			
5			
6			
7			
8			
9			
10			

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2 ACTIVITY: Comparing Simple and Compound Interest

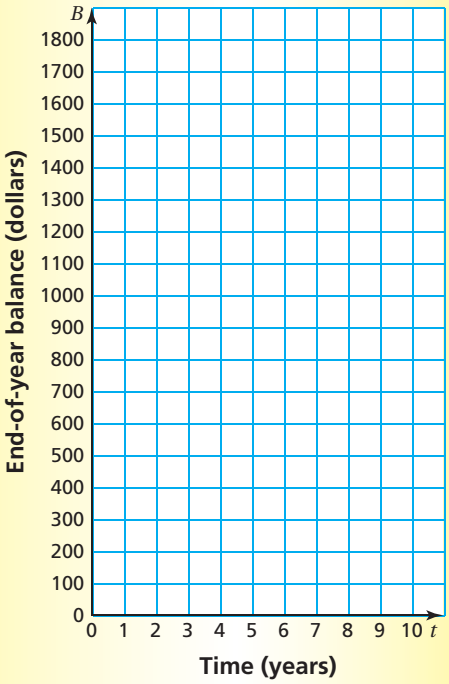
Work with a partner.

a. Graph the end-of-year balances for each type of interest in Activity 1.

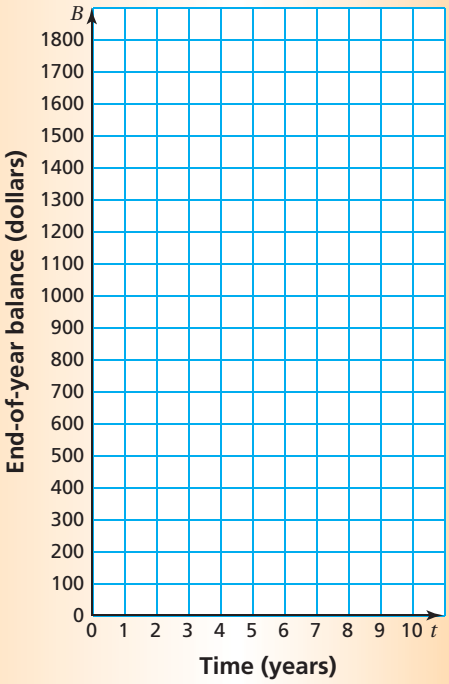
b. Which graph is linear? Explain your reasoning.

c. For the linear graph, write a linear function that represents the balance after t years.

Simple Interest



Compound Interest



What Is Your Answer?

3. **IN YOUR OWN WORDS** How can you find the balance in an account that earns simple interest or compound interest?

4. Use what you learned in Activity 2. About how many years will it take for the balance to double with simple interest? with compound interest?

Practice Use what you learned about simple and compound interest to complete Exercise 3 on page A14.

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B.1 Lesson

Check It Out
Lesson Tutorials
BigIdeasMath.com

Key Vocabulary
compound interest, *p. A13*

Key Idea

Balance in a Simple Interest Account

The balance B of an account that earns simple interest is

$$B = P(1 + rt).$$

Balance: B — Principal: P — Annual interest rate (in decimal form): r — Time (in years): t

Remember

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

EXAMPLE 1 Comparing Simple Interest Accounts

You deposit $275 in a savings account that earns 4% simple interest per year. Your friend deposits $300 in a savings account that earns 2% simple interest per year. (a) Write and graph two equations for the balance B in each account after t years. Describe the equations. (b) Are the account balances ever equal? Explain.

a.

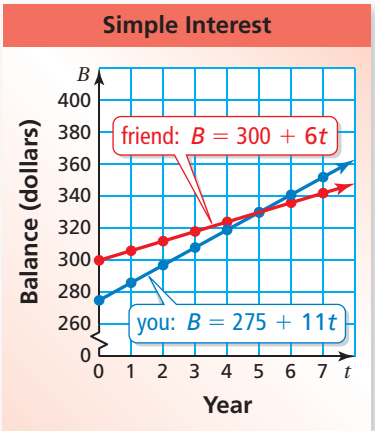
You		*Your Friend*
$B = P(1 + rt)$	Write balance formula.	$B = P(1 + rt)$
$= 275(1 + 0.04t)$	Substitute values.	$= 300(1 + 0.02t)$
$= 275 + 11t$	Simplify.	$= 300 + 6t$

Reading

Notice that both equations are of the form

$y = mx + b$.

Graph the equations. Your account balance increases at a constant rate of $11 per year. Your friend's account balance increases at a constant rate of $6 per year.



b. Yes, the graphs appear to intersect when $t = 5$. So, after 5 years, the accounts are equal.

On Your Own

Now You're Ready
Exercise 4

1. **WHAT IF?** In Example 1, your friend deposits $600 in the account. Are the account balances ever equal? Explain.

Multi-Language Glossary at BigIdeasMath.com

English Spanish

Compound interest is interest earned on the principal *and* on the previously earned interest.

EXAMPLE 2 Calculating Compound Interest

You deposit $400 in an account that earns 3.5% interest compounded annually. What is the account balance after 2 years?

Interest for 1st year: $I = Prt$ — Write simple interest formula.

$= 400(0.035)(1)$ — Substitute.

$= 14$ — Simplify.

The account balance after 1 year is $400 + $14 = $414.

Interest for 2nd year: $I = Prt$ — Write simple interest formula.

$= 414(0.035)(1)$ — Substitute. Use 414 for P.

$= 14.49$ — Simplify.

∴ The account balance after 2 years is $414 + $14.49 = $428.49.

Study Tip

The simple interest formula $I = Prt$ can be used to find the balance in an account that earns compound interest.

EXAMPLE 3 Comparing Simple and Compound Interest

You want to invest $8000 for 3 years. Which account should you choose?

- **Account A earns 4% simple interest per year.**
- **Account B earns 4% interest compounded annually.**

Make two tables that show the account balances for 3 years.

Account A			
Year	Principal	4% Simple Interest	Balance at End of Year
1	$8000	$320	$8320
2	$8000	$320	$8640
3	$8000	$320	$8960

Account B			
Year	Principal and Interest	4% Compound Interest	Balance at End of Year
1	$8000.00	$320.00	$8320.00
2	$8320.00	$332.80	$8652.80
3	$8652.80	$346.11	$8998.91

∴ Account B earns $8998.91 − $8960 = $38.91 more than Account A after 3 years. So, you should choose Account B.

On Your Own

Now You're Ready
Exercises 5, 6, and 8

2. In Example 2, what is the account balance after 5 years?
3. In Example 3, how much more does Account B earn than Account A after 2 more years?

English Spanish

B.1 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

1. **VOCABULARY** What type of interest is money earned only on the principal?
2. **WRITING** How are simple interest and compound interest similar? How are they different?

Practice and Problem Solving

3. You deposit $500 in a savings account that earns 3% interest per year.
   a. Copy and complete the tables that show the balances after 5 years with simple interest and compound interest.
   b. Which type of interest gives the greater balance?

Simple Interest			
t	Principal	Annual Interest	Balance at End of Year
1	$500	$15	$515
2	$500	$15	$530
3			
4			
5			

Compound Interest			
t	Principal and Interest	Annual Interest	Balance at End of Year
1	$500	$15.00	$515.00
2	$515	$15.45	$530.45
3			
4			
5			

1 4. You deposit $600 in a savings account that earns 4% simple interest per year. Your friend deposits $400 in a savings account that earns 5% simple interest per year.
   a. Write and graph two equations for the balance B in each account after t years.
   b. Are the account balances ever equal? Explain.

2 5. You deposit $1200 in a savings account that earns 5.4% interest compounded annually. What is the account balance after 3 years?

6. You deposit $300 in a savings account that earns 7.2% interest compounded annually. What is the account balance after 2 years?

7. **ERROR ANALYSIS** Describe and correct the error in finding the balance of the simple interest account after two years.

✗ Principal: $700 Rate: 3% per year

t	Principal	Annual Interest	Balance at End of Year
1	$700.00	$21.00	$721.00
2	$721.00	$21.63	$742.63

8. INVESTMENT The owners of a company want to invest $12,000 for 4 years.

a. Which account should they choose? Explain.

- Account A earns 5% simple interest per year.
- Account B earns 5% interest compounded annually.

b. How much more do they earn by choosing the better account?

9. GAMES After 7 years at 3% simple interest per year, your savings account earns $63.

a. What is the principal?

b. How much money do you have left after buying the video game system?

10. DIRT BIKE Your friend borrows $1050 from you to buy a new dirt bike. Your friend pays you back the principal plus 7.25% simple interest per year in 3 years. How much money do you earn?

11. Critical Thinking You want to deposit $600 in a savings account. Account A earns 3.5% simple interest per year. Account B earns 3.3% interest compounded annually.

a. Which account should you choose if you invest your money for 3 years? 6 years? Explain.

b. After how many years is the balance in Account B greater than the balance in Account A?

c. After how many years is the difference between the account balances greater than $5?

Fair Game Review What you learned in previous grades & lessons

Simplify the expression. SECTION 9.2

12. $12^2 \cdot 12^5$ **13.** $(1.5x^2)^3$ **14.** $3p^4 \cdot 2.4p^8$ **15.** $(5.4d^9)^2$

16. MULTIPLE CHOICE The ratio of the number of students with Attention Deficit Hyperactivity Disorder to the number of students in an entire school is 1 : 20. What percent of students in the school have Attention Deficit Hyperactivity Disorder? SKILLS REVIEW HANDBOOK

(A) 5% (B) 8%

(C) 20% (D) 25%