**Bonds**  
People buy bonds as a way to earn money. If a $1500 bond earns 4% *simple interest* per year on its purchase price, how much will it earn in interest after 2 years?

The amount earned or paid for the use of money is called **interest**. The amount of money deposited or borrowed is the **principal**. Interest that is earned or paid only on the principal is called **simple interest**. The percent of the principal earned or paid per year is the **annual interest rate**.

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**Simple Interest Formula**

Simple interest \( I \) is given by the formula

\[
I = Prt
\]

where \( P \) is the principal, \( r \) is the annual interest rate (written as a decimal), and \( t \) is the time in years.

---

**Example 1**  
**Finding Simple Interest**

Find the interest earned after 2 years for the bond described above.

**Solution**

\[
I = Pt
\]

\[
= (1500)(0.04)(2)
\]

\[
= 120
\]

**Answer**  
The bond will earn $120 in interest after 2 years.

---

**Checkpoint**

1. A $1000 bond earns 6% simple annual interest. What is the interest earned after 4 years?
**Balance** When an account earns interest, the interest is added to the money in the account. The **balance** $A$ of an account that earns simple annual interest is the sum of the principal $P$ and the interest $Prt$.

$$A = P + Prt \quad \text{or} \quad A = P(1 + rt)$$

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**Example 2** **Finding an Interest Rate**

**Summer Job** You get a summer job at a bakery. Suppose you save $1400 of your pay and deposit it into an account that earns simple annual interest. After 9 months, the balance is $1421. Find the annual interest rate.

**Solution**

Because $t$ in the formula $A = P(1 + rt)$ is the time in years, write 9 months as $\frac{9}{12}$, or $\frac{3}{4}$ year. Then solve for $r$ after substituting values for $A$, $P$, and $t$ in $A = P(1 + rt)$.

$$A = P(1 + rt) \quad \text{Write formula for finding balance.}$$

$$1421 = 1400 \left[ 1 + r \left( \frac{3}{4} \right) \right] \quad \text{Substitute.}$$

$$1421 = 1400 + 1050r \quad \text{Distributive property}$$

$$21 = 1050r \quad \text{Subtract 1400 from each side.}$$

$$0.02 = r \quad \text{Divide each side by 1050.}$$

**Answer** The annual interest rate is 2%.

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**Checkpoint**

Find the unknown quantity for an account that earns simple annual interest.

1. **A**, **P** = $1000, **t** = 2 years
2. **A** = 7, **P** = $1424.50, **r** = 2.5%, **t** = 2 years
3. **A** = ?, **P** = $1424.50, **r** = ?, **t** = 6 months

**Compound Interest** **Compound interest** is interest that is earned on both the principal and any interest that has been earned previously. Suppose you deposit $50 into a savings account that earns 2% interest compounded annually. The table below shows the balance of your account after each of 3 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Principal at start of year</th>
<th>Balance at end of year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$50(1 + 0.02) = 50(1 + 0.02)^1$</td>
</tr>
<tr>
<td>2</td>
<td>$50(1 + 0.02)^1$</td>
<td>$50(1 + 0.02)^1 \cdot (1 + 0.02) = 50(1 + 0.02)^2$</td>
</tr>
<tr>
<td>3</td>
<td>$50(1 + 0.02)^2$</td>
<td>$50(1 + 0.02)^2 \cdot (1 + 0.02) = 50(1 + 0.02)^3$</td>
</tr>
</tbody>
</table>

The table above suggests a formula, shown on the next page, for finding the balance of an account that earns interest compounded annually.
Chapter 7
Percents

1. In the simple interest formula $I = Prt$, what does $P$ represent?

2. How is compound interest different from simple interest?

For an account that earns simple annual interest, find the interest and the balance of the account.

3. $P = \$500$, $r = 7\%$, $t = 4$ years

4. $P = \$2500$, $r = 3\%$, $t = 9$ months

Find the unknown quantity for an account that earns simple annual interest.

5. $A = \$563$, $P = \$500$, $r = \ ?$, $t = 7$ years

6. $A = \$1670$, $P = \$1600$, $r = 3.5\%$, $t = \ ?$

7. **Savings Account** You deposit $\$700$ into a savings account that earns 2\% interest compounded annually. Find the balance of the account after 4 years. Round your answer to the nearest cent.

Compound Interest Formula

When an account earns interest compounded annually, the balance $A$ is given by the formula

$$A = P(1 + r)^t$$

where $P$ is the principal, $r$ is the annual interest rate (written as a decimal), and $t$ is the time in years.

Example 3

Calculating Compound Interest

You deposit $\$1500$ into an account that earns 2.4\% interest compounded annually. Find the balance after 6 years.

Solution

$$A = P(1 + r)^t$$

Write formula.

$$= 1500(1 + 0.024)^6$$

Substitute.

$$= 1729.38$$

Use a calculator.

Answer The balance of the account after 6 years is about $\$1729.38$.

Note Worthy

In your notes, you can make a concept grid that includes a definition, characteristics, an example, and a nonexample of compound interest. Your concept grid should have the formula for calculating compound interest.
In the following exercises, you may find it helpful to use a calculator for compound interest.

For an account that earns simple annual interest, find the interest and the balance of the account.

8. $P = 1250, \ r = 4\%, \ t = 10 \text{ years}$

9. $P = 325, \ r = 7\%, \ t = 8 \text{ years}$

10. $P = 600, \ r = 2.7\%, \ t = 4.5 \text{ years}$

11. $P = 3200, \ r = 3.5\%, \ t = 3.5 \text{ years}$

12. $P = 100, \ r = 8\%, \ t = 6 \text{ months}$

13. $P = 495, \ r = 5\%, \ t = 21 \text{ months}$

14. **Loan** You loan your brother $300 and charge him 2% simple annual interest. He promises to repay you one year later. How much will your brother have to pay you?

15. The table shows three accounts that earn simple annual interest. Copy and complete the table by finding the unknown quantity.

<table>
<thead>
<tr>
<th>Balance</th>
<th>Principal</th>
<th>Interest rate</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5,000</td>
<td>$4,000</td>
<td>5%</td>
<td>?</td>
</tr>
<tr>
<td>$11,160</td>
<td>?</td>
<td>8%</td>
<td>36 \text{ months}</td>
</tr>
<tr>
<td>$3,207</td>
<td>$3,000</td>
<td>?</td>
<td>18 \text{ months}</td>
</tr>
</tbody>
</table>

16. Suppose you deposit $800 into an account that earns simple annual interest. After 2 years, the account balance is $900. Find the annual interest rate.

17. **Error Analysis** A $200 bond earns 5.5% simple annual interest. Describe and correct the error in finding the total interest earned after 6 months.

18. $P = 800, \ r = 5\%, \ t = 3 \text{ years}$

19. $P = 2200, \ r = 7\%, \ t = 8 \text{ years}$

20. $P = 1750, \ r = 2.3\%, \ t = 4 \text{ years}$

21. $P = 680, \ r = 6.2\%, \ t = 10 \text{ years}$

22. **Bonds** A certain bond pays simple annual interest directly to the investor every 6 months. Suppose an investor purchases this bond for $5000 at a 4.5% annual interest rate. What is the total amount of interest paid after 6 months? 18 months? 30 months?

23. **Compare** The accounts below earn interest compounded annually. Which account will have the greater balance in the given time?

<table>
<thead>
<tr>
<th>Account A</th>
<th>Account B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal: $150</td>
<td>Principal: $150</td>
</tr>
<tr>
<td>Interest rate: 3.25%</td>
<td>Interest rate: 6.5%</td>
</tr>
<tr>
<td>Time: 20 \text{ years}</td>
<td>Time: 10 \text{ years}</td>
</tr>
</tbody>
</table>

24. **Writing** Does the amount of interest earned each year increase, decrease, or stay the same in a simple interest account? in a compound interest account? Explain your answers.
25. **Extended Problem Solving** You deposit $1000 into an account that earns 5% simple annual interest, and your friend deposits $1000 into an account that earns 5% interest compounded annually.

   a. **Calculate** Copy and complete the table.

<table>
<thead>
<tr>
<th>Years</th>
<th>Simple interest account balance</th>
<th>Compound interest account balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>20</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

   b. **Graph** Make a scatter plot of the data. Show the time in years on the x-axis and the account balance on the y-axis. Plot points representing the simple interest account balance in blue and the compound interest account balance in red.

   c. **Compare** Describe how the graph of the simple interest balance is different from the graph of the compound interest balance.

26. You deposit $1400 into an account that earns 4% interest compounded annually. You check the balance of the account after 5 years. By about what percent did the balance of the account change over those 5 years?

27. **Critical Thinking** How long will it take you to double your principal when you deposit it into an account that earns 10% simple annual interest? Explain how you found your answer.

28. **Challenge** At the start of every year, you deposit $3000 into an account that earns 7% interest compounded annually.

   a. What is the balance at the end of the second year? third year?

   b. Will you have enough money at the end of the fifth year to buy a car that costs $18,000? Explain your reasoning.

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### Mixed Review

**Solve the equation. Check your solution.** *(Lesson 3.3)*

29. $5x + 9 = 2x + 6$

30. $-5y - 13 = 7 - 15y$

**Find the least common multiple of the numbers.** *(Lesson 4.4)*

31. 3, 7

32. 9, 45

33. 12, 18

34. 40, 50

35. **Video Game** You buy a video game that is on sale for 15% off the original price of $35. Find the sale price. *(Lesson 7.6)*

36. **Multiple Choice** A $1200 bond earns 8.5% simple annual interest. What is the interest earned after 15 months?

   A. $15.30  
   B. $127.50  
   C. $1275  
   D. $1530

37. **Multiple Choice** You deposit $3500 into an account that earns 10% interest compounded annually. What is the balance after 2 years?

   F. $700  
   G. $4200  
   H. $4235  
   I. $7000