

2-10

Applications of Percents



Objectives

Use common applications of percents.

Estimate with percents.

Vocabulary

commission principal
interest tip
sales tax

Who uses this?

Sales representatives use percents to calculate their total pay.

A **commission** is money paid to a person or a company for making a sale. Usually the commission is a percent of the sale amount.

EXAMPLE 1 Business Application

Caution!

You must convert a percent to a decimal or a fraction before doing any calculations with it.

Ms. Barns earns a base salary of \$42,000 plus a 1.5% commission on sales. Her total sales one year were \$700,000. Find her total pay for the year.

$$\begin{aligned}
 \text{total pay} &= \text{base salary} + \text{commission} && \text{Write the formula for total pay.} \\
 &= \text{base salary} + \% \text{ of total sales} && \text{Write the formula for commission.} \\
 &= 42,000 + 1.5\% \text{ of } 700,000 && \text{Substitute values given in the problem.} \\
 &= 42,000 + (0.015)(700,000) && \text{Write the percent as a decimal.} \\
 &= 42,000 + 10,500 && \text{Multiply.} \\
 &= 52,500 && \text{Add.}
 \end{aligned}$$

Ms. Barns's total pay was \$52,500.



1. A telemarketer earns \$350 per week plus a 12% commission on sales. Find her total pay for a week in which her sales are \$940.

Interest is the amount of money charged for borrowing money, or the amount of money earned when saving or investing money. **Principal** is the amount borrowed or invested. Simple interest is interest paid only on the principal.

Simple Interest Paid Annually

$$\text{Simple interest} \rightarrow I = Prt \leftarrow \text{Time in years}$$

↑ Principal ↑ Interest rate per year as a decimal

EXAMPLE 2 Finance Application

- A** Find the simple interest paid annually for 2 years on a \$900 loan at 16% per year.

$$\begin{aligned}
 I &= Prt && \text{Write the formula for simple interest.} \\
 I &= (900)(0.16)(2) && \text{Substitute known values. Write the interest rate as a decimal.} \\
 I &= 288
 \end{aligned}$$

The amount of interest is \$288.

Helpful Hint

When you are using the formula $I = Prt$ to find simple interest paid annually, t represents time in years. One month is $\frac{1}{12}$ year. In Example 2B, $t = \frac{3}{12}$.

- B** After 3 months the simple interest earned annually on an investment of \$7000 was \$63. Find the interest rate.

$$I = Prt$$

Write the formula for simple interest.

$$63 = (7000)(r)\left(\frac{3}{12}\right)$$

Substitute the given values.

$$63 = 1750r$$

Multiply $7000\left(\frac{3}{12}\right)$. Since r is multiplied by

$$\frac{63}{1750} = \frac{1750r}{1750}$$

1750, divide both sides by 1750 to undo the multiplication.

$$0.036 = r$$

The interest rate is 3.6%.



- 2a.** Find the simple interest earned after 2 years on an investment of \$3000 at 4.5% interest earned annually.

- 2b.** The simple interest paid on a loan after 6 months was \$306. The annual interest rate was 8%. Find the principal.

A **tip** is an amount of money added to a bill for service. It is usually a percent of the bill before *sales tax* is added. **Sales tax** is a percent of an item's cost.

Sales tax and tips are sometimes estimated instead of calculated exactly. When estimating percents, use percents that you can calculate mentally.

- Find 10% of a number by moving the decimal point one place to the left.
- Find 1% of a number by moving the decimal point two places to the left.
- Find 5% of a number by finding $\frac{1}{2}$ of 10% of the number.

EXAMPLE 3 Estimating with Percents

- A** The dinner check for Maria's family is \$67.95. Estimate a 15% tip.

Step 1 First round \$67.95 to \$70.

Step 2 Think: $15\% = 10\% + 5\%$

$$10\% \text{ of } \$70 = \$7.00 \quad \text{Move the decimal point one place left.}$$

Step 3 Think: $5\% = 10\% \div 2$

$$= \$7.00 \div 2 = \$3.50$$

Step 4 $15\% = 10\% + 5\%$

$$= \$7.00 + \$3.50 = \$10.50$$

The tip should be about \$10.50.

- B** The sales tax rate is 6.25%. Estimate the sales tax on a shirt that costs \$29.50.

Step 1 First round 6.25% to 6% and \$29.50 to \$30.

Step 2 Think: $6\% = 6(1\%)$

$$1\% \text{ of } \$30 = \$0.30 \quad \text{Move the decimal point 2 places left.}$$

Step 3 $6\% = 6(1\%)$

$$= 6(\$0.30) = \$1.80$$

The sales tax is about \$1.80.

Helpful Hint

A 6.25% sales tax rate means that for every \$100 you spend, you would pay \$6.25 in sales tax.

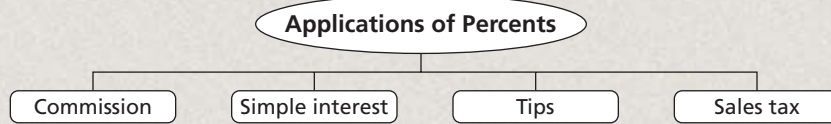


- 3a.** Estimate a 15% tip on a check for \$21.98.

- 3b.** Estimate the tax on shoes that cost \$68.50 when the sales tax rate is 8.25%

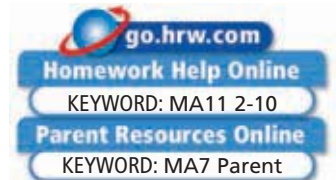
THINK AND DISCUSS

1. Explain how commission, interest, sales tax, and tips are alike.
2. When the sales tax rate is 8.25%, the tax on a \$10 purchase is \$0.83. Is the tax on \$20 twice as much? Explain.
3. **GET ORGANIZED** Copy and complete the graphic organizer. In each box, write an example of each type of application and find the answer.



2-10

Exercises



GUIDED PRACTICE

1. **Vocabulary** How are *commission* and *tips* alike? How are they different?

SEE EXAMPLE 1
p. 139

2. A sales representative earns a 2.5% commission on sales. Find the commission earned when the total sales are \$80,700.
3. Karen earns a salary of \$28,600 per year plus a 4.25% commission on sales. Find her total earnings for a year when the sales are \$310,000.

SEE EXAMPLE 2
p. 139

4. Find the amount of simple interest earned after 2 years on \$480 invested at a 7% annual interest rate.
5. Find the number of years it would take for \$1200 to earn simple interest of \$324 at an annual interest rate of 6% per year.
6. Find the total amount owed after 6 months on a loan of \$900 at an annual simple interest rate of 8.5%.

SEE EXAMPLE 3
p. 140

7. Estimate a 15% tip on a \$42.65 check.
8. Estimate the tax on a \$198 stereo when the sales tax is 5.25%.

PRACTICE AND PROBLEM SOLVING

Independent Practice

For Exercises	See Example
9–10	1
11–13	2
14–15	3

Extra Practice

Skills Practice p. S7
Application Practice p. S29

9. A boat salesperson earns a 2.5% commission on the sale of each boat. Find the commission earned on a boat that sells for \$18,500.
10. A cell phone distributor earns a yearly salary of \$28,000 plus a 17.5% commission on sales. Find the total earnings for a year when the sales are \$38,000.
11. Find the simple interest paid after 3 months on a loan of \$9700 borrowed at an annual interest rate of 11%.
12. After 8 months, \$750 simple interest was owed on a loan of \$9000. Find the annual interest rate.

13. How long will it take \$680 to earn \$102 in simple interest at an annual interest rate of 3%?
14. Estimate the tip on a \$19.65 check using a tip rate of 15%.
15. Estimate the tax on tires that cost \$498 with a 6.25% sales tax.

Use $I = Prt$ to complete the table. All interest rates are annual.

	I	$=$	P	\times	r	\times	t
16.	■		\$8275		13%		3 years
17.	\$3969		■		10.5%		9 months
18.	\$23.75		\$950		■		6 months
19.	\$380		\$4750		4%		■



Technology



Koopa is a Gulf Coast box turtle from Hartford, Connecticut. His paintings have sold for hundreds of dollars at online auctions.

20. Chris has \$21.50. He wants a book for \$5.85 and a CD for \$14.99. The sales tax is 6.25%.
 - a. How could Chris estimate whether he has enough to buy the book and the CD?
 - b. Does he have enough money to buy the book and the CD?
21. **Technology** An online auction company charges sellers a commission fee of 5.25% of an item's final selling price. If you sell an item for \$55, what fee will you pay to the auction company? Show that your answer is reasonable.
22. **Business** Sometimes business partners do not share the ownership of a business equally. Instead, they each own a percent of the business, and each receives that percent of the profits. Alvarez, Brown, and Chow are partners in a business that earned \$500,000. Alvarez owns 40% of the business. Chow received \$175,000.
 - a. How much money did Alvarez and Brown each receive?
 - b. What percent of the business is owned by Brown? by Chow?
23. **Write About It** Lewis invested \$1000 at 3% annual simple interest for 4 years. Lisa invested \$1000 at 4% annual simple interest for 3 years. Explain why Lewis and Lisa earned the same amount of interest.
24. **Critical Thinking** To estimate a tip of 15%, Amy tips \$1.00 for every \$6.00 in the total bill. Is this method reasonable? Why or why not?
25. **ERROR ANALYSIS** Which solution is incorrect? Explain the error.

A

4% of 240
$0.4 \cdot 240$
96

B

4% of 240
$0.04 \cdot 240$
9.6

MULTI-STEP TEST PREP



26. This problem will prepare you for the Multi-Step Test Prep on page 152.
 - a. Juan is shopping for a new CD player. He finds one he likes for \$225. The sales tax is 7.5%. What will be the total cost of the CD player?
 - b. The salesperson tells Juan that a sale starts tomorrow, and the CD player will be reduced to \$157.50. What is the total cost, including tax, that Juan will pay if he buys the CD player tomorrow?
 - c. How much will Juan save if he buys the CD player tomorrow?

27. Which account earns the most simple interest after 1 year? Assume that interest is paid annually.
- (A) \$5000 at 8% per year (C) \$8000 at 4.8% per year
 (B) \$10,000 at 4% per year (D) \$4000 at 10.2% per year
28. Craig earns \$200 per week plus 8% commission on sales. Joan earns \$150 per week plus 12% commission on sales. Last week, both had sales of \$1500. Who earned more money?
- (F) Craig earned more than Joan. (H) Both earned the same amount.
 (G) Joan earned more than Craig. (J) Cannot be determined
29. **Short Response** If 2% of a number is 300, what is 6% of the number? Explain how you got your answer.

CHALLENGE AND EXTEND

30. **Multi-Step** A lunch check for Mark and a friend was \$19.50 before the 6% sales tax was added. Mark wants to leave a tip of at least 20%. He has no coins, and he does not want to wait for change. What is the least amount he should leave to pay the check, tax, and tip?
31. The final cost of an item was \$50. This included 6% sales tax. What was the price of the item before tax?

Finance A stockbroker earns a commission based on the amount of a transaction according to the table below.

Stockbroker's Commissions				
Transaction	\$0–\$10,000	For each additional dollar up to \$20,000	For each additional dollar up to \$40,000	For each additional dollar over \$40,000
Commission	0.5%	0.4%	0.3%	0.2%

For example, the commission on a transaction of \$11,000 is 0.5% of \$10,000 plus 0.4% of \$1000. Use the table for Exercises 32–34.

32. Find the amount of commission earned on a transaction of \$15,000.
33. Find the amount of commission earned on a transaction of \$21,000.
34. Find the amount of commission earned on a transaction of \$100,000.

SPIRAL REVIEW

Compare. Write $<$, $>$, or $=$. (Lesson 1-5)

35. $\sqrt{65}$ \square 8 36. 7 \square $\sqrt{51}$ 37. 9 \square $\sqrt{80}$ 38. $\sqrt{196}$ \square 14

Solve each equation. Check your answer. (Lesson 2-6)

39. $|x - 7| = 5$ 40. $|3x| + 5 = 14$ 41. $8|3x - 10| - 12 = 20$

Find each value. Round to the nearest tenth if necessary. (Lesson 2-9)

42. 40% of 60 is what number? 43. What percent of 26 is 13?
 44. 22 is what percent of 99? 45. 80% of what number is 64?