

Solve Problems with Percents



Getting the Idea

Percents are used for many things, such as the sale price of an item, the sales tax you pay on an item, and the interest earned on a bank deposit. Sometimes it is necessary to change a percent to a fraction or a decimal to solve a percent problem.

Example 1

What is 8% of 214?

Strategy **Change the percent to a decimal. Then multiply.**

Step 1

Change the percent to a decimal.

Remove the percent symbol. Move the decimal point two places to the left.

$$8\% \longrightarrow \underbrace{08.}_{\text{two places left}} \longrightarrow 0.08$$

Step 2

Multiply the decimal by 214.

The word “of” often implies multiplication.

$$0.08 \times 214 = 17.12$$

Solution **8% of 214 is 17.12.**

A **discount** is the amount of money that is taken off the original price of an item.

The **sale price** is the cost of the item after the discount has been applied.

Example 2

Debbie sees a pair of jeans that was originally priced at \$36. The jeans are on sale for 25% off. What is the sale price of the jeans?

Strategy **Change the percent to a fraction. Then multiply to find the discount.**

Step 1

Write an expression to represent the discount.

Find 25% of \$36.

So, find $25\% \times \$36$.

Step 2

Rename 25% as a fraction in simplest form.

$$25\% = \frac{25}{100} = \frac{1}{4}$$

Step 3

Find $\frac{1}{4}$ of \$36, the amount of the discount.

$$\frac{1}{4} \times \$36 = \frac{1}{\cancel{4}^1} \times \frac{\cancel{36}^9}{1} = \frac{1 \times 9}{1 \times 1} = \frac{9}{1} = \$9$$

So, the amount of the discount is \$9.

Step 4

Subtract the discount from the original price.

$$\$36 - \$9 = \$27$$

Solution **The sale price of the jeans is \$27.**

Sales tax is a tax based on the cost of an item. You can find sales tax in the same way you find the percent of a number.

Example 3

A DVD costs \$19.80. The sales tax is 7%. What is the cost of the DVD, with tax included?

Strategy

Find the amount of sales tax. Then add the tax to the cost of the DVD.

Step 1

Write an expression for finding the amount of tax.

Find 7% of \$19.80.

So, find $7\% \times \$19.80$.

Step 2

Change 7% to a decimal.

$$7\% = 0.07$$

Step 3

Multiply the decimal by the cost of the DVD.

$$0.07 \times \$19.80 = \$1.386$$

Round \$1.386 to \$1.39.

So, the tax is \$1.39.

Step 4

Add the sales tax to the cost of the DVD.

$$\$19.80 + \$1.39 = \$21.19$$

Solution

The cost of the DVD, with tax included, is \$21.19.

Interest is the amount of money the bank pays you for its use of the money in a savings account. Interest could also be the amount of money you pay a lender for the use of borrowed money.

The amount of money in your savings account or the amount you borrow is the **principal**. One type of interest is **simple interest**. To calculate simple interest, use the formula $I = prt$, where I represents simple interest, p represents the principal, r represents the rate of interest, and t represents time, in years.

Example 4

Jen deposited \$750 in her savings account. She had the money in the account for 18 months without making any deposits or withdrawals. The account earns 2% annual simple interest. How much money did Jen earn in simple interest?

Strategy Use the formula $I = prt$.

Step 1 Convert the time to years and the rate to a decimal.

$$\begin{aligned} 18 \text{ months} &= 1\frac{1}{2} \text{ years} = 1.5 \text{ years} \\ 2\% &\rightarrow 0.02 \end{aligned}$$

Step 2 Substitute the known values into the formula.

$$\begin{aligned} I &= prt \\ I &= \$750 \times 0.02 \times 1.5 \end{aligned}$$

Step 3 Multiply.

$$\begin{aligned} I &= \$750 \times (0.02 \times 1.5) \\ &= \$750 \times 0.03 \\ &= \$22.50 \end{aligned}$$

Solution Jen earned \$22.50 in simple interest.

To find the percent increase or the percent decrease, write the difference in amounts as the numerator of a fraction with the original amount as the denominator. Then change the fraction to a percent.

Example 5

A computer game that originally cost \$40 is on sale for \$28. What is the percent decrease in the price of the game?

Strategy Write a fraction to represent the decrease.

Step 1 Write and simplify a fraction.

$$\frac{\text{original price} - \text{sale price}}{\text{original price}} = \frac{\$40 - \$28}{\$40} = \frac{12}{40} = \frac{3}{10}$$

Step 2 Convert the fraction to a percent.

$$\frac{3}{10} = \frac{30}{100} = 30\%$$

Solution The percent decrease in the price of the game is 30%.

Example 6

A basketball team won 15 games during the 2008–2009 season. In the 2009–2010 season, the team won 21 games. What was the percent of increase in games won?

Strategy Write a fraction to represent the increase.

Step 1 Write and simplify a fraction.

$$\frac{\text{games won in 2009–2010} - \text{games won in 2008–2009}}{\text{games won in 2008–2009}} = \frac{21 - 15}{15} = \frac{6}{15} = \frac{2}{5}$$

Step 2 Convert the fraction to a percent.

$$\frac{2}{5} = 0.4 = 40\%$$

Solution The percent of increase in games won is 40%.

A **percent error** measures how far off an estimate is to the actual value. The percent error is the difference between an estimate and the actual value, divided by the actual value. Multiply by 100 to express the error as a percent.

Example 7

Johnny used mental math to estimate that 11×5 is approximately 50.

What is his percent error?

Strategy Find the actual value. Then calculate the percent error.

Step 1 Find the actual value of 11×5 .

$$11 \times 5 = 55$$

Step 2 Find the difference between the estimate and the actual value.

$$55 - 50 = 5$$

Step 3 Divide the difference by the actual value.

$$\frac{5}{55} \approx 0.09$$

Step 4 Convert the decimal to a percent.

$$0.09 \rightarrow 9\%$$

Solution Johnny's percent error is about 9%.



Coached Example

Angela and Sadie had dinner at a restaurant. Their bill was \$24.50. They left a 15% tip for their server. How much money did Angela and Sadie spend for their bill and tip?

To solve this problem, add the amount of the _____ and the amount of the _____.

The bill was \$_____.

To find the amount of the tip, first change _____ to a decimal.

$$\text{_____} \% \rightarrow \text{_____}$$

Then multiply the decimal by the amount of the _____.

$$\text{_____} \times \$\text{_____} = \$\text{_____}$$

Round the amount of the tip to the nearest cent. \$_____

Add the amount of the _____ and the amount of the _____.

$$\text{\$_____} + \text{\$_____} = \text{\$_____}$$

Angela and Sadie spent \$_____ for their bill and tip.



Lesson Practice

Choose the correct answer.

- What is 72% of 175?
 - 1.26
 - 12.6
 - 126
 - 1,260
- A computer that originally cost \$850 is on sale for 15% off. What is the sale price of the computer?
 - \$127.50
 - \$722.50
 - \$835.00
 - \$977.50
- There were 60 seventh-grade students who signed up for soccer tryouts last year. This year, 48 seventh-grade students signed up for tryouts. What is the percent decrease in the number of students from last year to this year?
 - 18%
 - 20%
 - 25%
 - 80%
- Pablo put \$1,260 into a savings account that earns 3% simple interest per year. He does not make any deposits or withdrawals. How much money will be in Pablo's account after 2 years?
 - \$75.60
 - \$1,297.80
 - \$1,335.60
 - \$8,820.00
- Mrs. Blake's bill at a restaurant was \$42.75. She wants to leave the waiter an 18% tip. How much will she pay in all, including the tip?
 - \$6.41
 - \$7.70
 - \$49.14
 - \$50.45
- Mr. Chung stayed four nights at a hotel. His bill was \$725 before the sales tax of 6% was added. How much was the sales tax?
 - \$43.50
 - \$45.00
 - \$46.50
 - \$49.00

7. In September, there were 16 members in the Music Club. In October, the number of members was 24. What was the percent increase from September to October?

- A. 20%
- B. 30%
- C. $33\frac{1}{3}\%$
- D. 50%

8. There are 120 students in the seventh grade. Seventy percent of these students are involved in extracurricular activities. How many seventh-grade students are **not** involved in an extracurricular activity?

- A. 36
- B. 50
- C. 70
- D. 84

9. Isme estimated that there are 50 students in the seventh-grade class. There are actually 40 students in the seventh-grade class.

A. What is Isme's percent error? Show your work.

B. Out of the 40 students in the seventh-grade class, 60% of the students carry a cell phone. What fraction of the students in the seventh-grade class carry a cell phone? How many students in the seventh-grade class carry a cell phone? Show your work.

10. Use numbers from the box to complete each equation.

35% of 120 = _____

12% of 50 = _____

55% of 40 = _____

- | |
|-----|
| 6 |
| 22 |
| 30 |
| 42 |
| 110 |

15. There are 80 members of the show choir. For a fund-raiser, 95% of the members raised money. Circle the number that makes the statement true.

4
15
55
74

members did **not** raise money for the fund-raiser.

16. Select True or False for each statement.

- A. A purse costs \$35.60 with sales tax of 5%. True False
The total cost of the purchase is \$37.38.
- B. A bicycle costs \$75.80 with sales tax of 6.5%. True False
The total cost of the purchase is \$91.25.
- C. A hat costs \$25.50 with sales tax of 6%. True False
The total cost of the purchase is \$27.03.
- D. A table costs \$198.20 with sales tax of 7%. True False
The total cost of the purchase is \$336.94.