Inquire: Applications for Percents

Overview

A percent is a ratio whose denominator is 100. We use “%” to show percents. Percents have a lot of practical applications relating to money. They can be used to add tax at the end of a meal, subtract out a discount for an exciting sale, and even calculate how much money the bank owes you for depositing your money in a savings account. By the end of the lesson, students will be able to apply percents to solve tax, discount, and simple interest problems.

Big Question: How can I apply percents to calculate tax, discounts, and interest?

Watch: Understanding Percentages

Everyone wants to save a little more money or has to buy a big purchase from time to time. Here are a few situations where you might see percents being used.

Let’s say you want to buy a used car for $5000. You can cover a down payment of $1800, but you are offered a loan of $3200 at 0.9% over 60 months. Would you know how much extra you are paying in interest?

What about when your bank sends you a letter in the mail letting you know they are doing a special promotion for their certificate of deposits. These are also called CDs. The letter states that if you deposit a minimum of $5,000 for at least 3 years, you will earn back 0.78% based on your principal. How much money would you earn from that special promotion?

Here is another situation that almost every working person must deal with: federal and state income taxes. In one year, you earned $10,000. This puts you at the 12% tax rate. If you have already paid $1500 in taxes, did you pay enough or do you owe more money?

Alright. Maybe you want something a little more short term. How about we go to the mall? You can go to the mall and see percents used everywhere.

You go to a store and see a sign that says, “Buy one shirt, get one 25% off!” You go to a store that is closing down and the sign says, “Everything must go! Everything in the store is 20% to 75% off!” A friend of yours shares that he owns a music store and he recently bought a guitar. He bought it at a wholesale price of $1200 and is going to mark it up 50% to turn a profit.
Having a better understanding of percents can help you navigate through situations like these. It can help you avoid serious financial mistakes and help you make wise investments.

What are some other situations where you have seen percents used?

Read: Tax and Discounts

Overview

In the following section, we will look at three applications for percents: tax, discounts, and simple interest.

Sales Tax

Sales tax and commissions are an application of percents used in our everyday lives. The sales tax is a percent of the purchase price.

How much do you pay for sales tax when you shop in your city or state? Sales tax is added to the purchase price of an item. See the figure below.

Notice that the sales tax is determined by computing a percent of the purchase price.

To find the sales tax, we must convert the sales tax rate from a percent to a decimal number and multiply the purchase price by the sales tax rate. Once the sales tax is calculated, it is added to the purchase price. The result is the total cost — what the customer pays.

Finding Sales Tax and Total Cost
1. Sales Tax = Tax Rate (as a decimal) • Purchase Price
2. Total Cost = Purchase Price + Sales Tax

Example 1
Cathy bought a bicycle in Washington, where the sales tax rate was 6.5% of the purchase price. What is the A) sales tax and B) total cost of a bicycle if the purchase price of the bicycle was $392?

A) To find the sales tax, we need to take the tax rate and convert it into a decimal. If we move the decimal two places to the left, we can convert 6.5% to the decimal 0.065.

Next, we will multiply the tax rate as a decimal by the purchase price. If we multiply 0.065 by 392, we get 25.48. This means the sales tax will be $25.48.

B) To find the total cost, we will need to add the purchase price with the sales tax. If we add $392 to $25.48, the total cost of the bicycle will be $417.48.

Example 2
Find A) the sales tax and B) the total cost: Kim bought a winter coat for $250 in St. Louis, where the sales tax rate was 8.2% of the purchase price.

A) To find the sales tax, we need to take the tax rate and convert it into a decimal. If we move the decimal two places to the left, we can convert 8.2% to the decimal 0.082.

Next, we will multiply the tax rate as a decimal by the purchase price. If we multiply 0.082 by 250, we get 20.5. This means the sales tax will be $20.50.

B) To find the total cost, we need to add the purchase price with the sales tax. If we add $250 to $20.50, the total cost of the bicycle will be $270.50.

Discount
Applications of discounts are common in retail settings. When you buy an item on sale, the original price of the item has been reduced by some dollar amount. The discount rate, usually given as a percent, is used to determine the amount of the discount. An amount of discount is a percent off the original price.

To determine the amount of a discount, we multiply the discount rate by the original price. We summarize the discount model in the box below.

Finding Discount and Sales Price
1. Discount = Discount Rate (as a decimal) • Original Price
2. Sale Price = Original Price - Discount

The sale price should always be less than the original price. In some cases, the amount of discount is a fixed dollar amount. Then, we just find the sale price by subtracting the amount of discount from the original price.

Example 3
Elise bought a dress that was discounted 35% off of the original price of $140. What was A) the amount of discount and B) the sale price of the dress?
A) Before we find the discount, we need to convert 35% into the decimal 0.35. Next, we will multiply 0.35 by the original price. If 0.35 \times 140 = 49, then the discount for the dress is $49.

B) To find the sale price, we need to subtract original price by the discount. If 140 - 49 = 91, then the sale price of the dress is $91.

Example 4
Sergio bought a belt that was discounted 40% from an original price of $29. Find A) the amount of discount and B) the sale price.

A) Before we find the discount, we need to convert 40% into the decimal 0.4. Next, we will multiply 0.4 by the original price. If 0.4 \times 29 = 11.6, then the discount for the belt is $11.60.

B) To find the sale price, we need to subtract original price by the discount. If 29 - 11.60 = 17.4, then the sale price of the belt is $17.40.

Reflect Poll: Percent Applications
Which application are you most excited to be able to perform?
- Computing the final total of a purchase with tax
- Finding out how much you saved from a discount
- Calculating how much interest you can earn in a savings account

Expand: Simple Interest

Solve Simple Interest Applications
Do you know that banks pay you to let them keep your money?

The money you put in the bank is called the principal, \( P \), and the bank pays you interest, \( I \). The interest is computed as a certain percent of the principal called the rate of interest, \( r \). The rate of interest is usually expressed as a percent per year, and is calculated by using the decimal equivalent of a percent. The variable for time, \( t \), represents the number of years the money is left in the account.

Equation for Simple Interest
\[ I = Prt \]

where

\[ I = \text{interest} \]
\[ P = \text{principal} \]
\[ r = \text{rate (as a decimal)} \]
\[ t = \text{time (as a year)} \]

The formula we use to calculate simple interest is \( I = Prt \). To use the simple interest formula we substitute in the values for variables that are given, and then solve for the unknown variable. It may be helpful to organize the information by listing all four variables and filling in the given information.
Example 1
Find the simple interest earned after 3 years on $500 at an interest rate of 6%.

Find the simple interest earned after 3 years on $500 at an interest rate of 6%. Let's organize the given information in a list:

I = ?
P = $500
r = 6% = 0.06
t = 3 years

We will use the simple interest formula (I = Prt) to find the interest. If we substitute the given information, be sure not to forget to use the percent in decimal form. This looks like I = (500)(0.06)(3). If I = 90, this means the simple interest is $90 over 3 years.

Example 2
Nathaly deposited $12,500 in her bank account where it will earn 4% interest. How much interest will Nathaly earn in 5 years?

We are asked to find the interest, I. Organize the given information in a list:

I = ?
P = $12,500
r = 4% = 0.04
t = 5 years

Once again, we will use the simple interest formula (I = Prt) to find the interest. If we substitute the given information, be sure not to forget to use the percent in decimal form. This looks like I = (12500)(0.04)(5). If I = 2500, this means the simple interest is $2500 over 5 years.

Lesson Toolbox

Additional Resources and Readings
A game that helps you practice finding sales tax.

A video overview about percentages.
- Link to resource: https://www.youtube.com/watch?v=JeVSmq1Nrpw

An article about calculating interest and how borrowing money works.
- Link to resource: https://www.mathsisfun.com/money/interest.html

Lesson Glossary

percent: a ratio whose denominator is 100; we use the % to show percent
sales tax: a percent of the purchase price
**discount**: a percent off the original price  
**principal**: money you put in the bank  
**interest**: the money the bank pays you for investing your money  
**rate of interest**: how much interest you gain based on a percent of the principal; expressed as a percent per year

### Check Your Knowledge

1. Find the sales tax: The cost of a pair of boots was $84. The sales tax rate is 5% of the purchase price.

2. Find the total cost: The cost of a microwave oven was $129. The sales tax rate is 7.5% of the purchase price.

3. Find the sales tax: The cost of a file cabinet is $250. The sales tax rate is 6.85% of the purchase price.

**Answer Key:**
1. 4.20  
2. $138.68  
3. $17.13  

### Citations

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