Interest Rate Calculations

INTEREST is the amount of money you pay to borrow money. It is calculated on the amount of money you borrow and for the length of time you want to borrow the money. The interest rate is figured as a percent of the total money borrowed.

Objectives:

1. Describe percentages and how they are calculated.
2. Explain applications using percentages.
3. Explain how to calculate interest.

Key Terms:

compound interest	percentage	simple interest
denominator	principal	time
interest	rate	
interest rate	ratios	

Calculating Percentages

Financial calculations performed in personal and business management involve percentages, ratios, interest rates, return on investment, and depreciation. A **percentage** is a fraction with 100 as the denominator. The **denominator** is the bottom number in a fraction. You can find a percentage by dividing the number by another number to find the decimal figure. Then multiply by 100. The formula for a percentage is $\frac{A}{B} \times 100 = \%$.

Examples of percentages: $9\% = \frac{9}{100}$; $53\% = \frac{53}{100}$; $16.5\% = \frac{16.5}{100}$

DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Cost of Depreciation

A car is one of the largest purchases you are likely to make. One of the largest costs associated with a new car is depreciation, which is the value your car will lose during its lifetime. The amount of depreciation varies from car to car. If you plan to keep your car fewer than five years, depreciation should be a consideration. But if you plan to keep your car longer, the resale value will decrease after five or 10 years, so depreciation should not be a major influence in your choice.

Depreciation affects the value of buildings, equipment, furniture, computers, trucks, and other purchases that will not last indefinitely. Land does not depreciate with age, wear, or market conditions because it is a fixed asset expected to last indefinitely.

Depreciation begins when your car is put into service. To calculate depreciation, consider the cost minus the amount you hope to sell it for. Divide that by the miles you plan to drive it or the years you plan to keep it. If the car costs $20,000, you plan to drive it for 100,000 miles and hope to sell it for $5,000 after driving it 20,000 miles each year, multiply the depreciation cost times the number of miles driven:

$20,000 minus $5,000 = $15,000, multiplied by 100,000 miles equals 15 cents per mile. 0.15 times 20,000 (miles driven the first year) = $3,000 depreciation the first year.

Percentages, decimals, and fractions are usually interchangeable. Always move the decimal point two places to the left when converting percentages to decimal form. Examples of percentages as decimals: 9% = 0.09; 53% = 0.53; 16.5% = 0.165.

Examples of converting fractions to percentages: $\frac{1}{4} = \frac{25}{100} = 25\%$; $\frac{3}{5} = \frac{60}{100} = 60\%$; $\frac{13}{10} = \frac{130}{100} = 130\%$; $\frac{37}{50} = \frac{74}{100} = 74\%$

Using Percentages

There are many times when you need to determine the percentage of a given number.

SAMPLE PROBLEMS

It is wise to practice in order to strengthen your skills in this area. Use the following problems and others you find online.

Example One

You want to determine the depreciation of a newly constructed storage building valued at $54,000. Your depreciation schedule recommends 20% depreciation this year. How will you determine that value?

Step 1: Convert the depreciation percentage to a decimal: 20% = 0.20.

Step 2: Multiply the value of the barn by the decimal amount: $54,000 × 0.20 = $10,800 depreciation for this year.

Example Two

You ordered 75 pounds of sweet potatoes. Out of the 75 pounds, you received 9 pounds of white potatoes. What percentage of the potatoes delivered were sweet potatoes?

Step 1: Divide the number of sweet potatoes received by the total number of pounds delivered. $(75 - 9 = 66. \frac{66}{75} = 0.88)$

Step 2: Convert the decimal form to a percentage. Move the decimal point two spaces to the right, and add a percent sign (%). Therefore, 0.88 = 88% of the potatoes were sweet potatoes.

Example Three

Your local fabric supply store has a special discount of 15% on cotton fabric. What is the net sale amount of a bolt of fabric regularly priced at $48?

Method 1

Step 1: Convert the discount percentage to a decimal.

15% = 0.15

Step 2: Multiply the regular price of the fabric by the sale discount.

$48 × 0.15 = $7.20 discount

Step 3: Subtract the discount from the regular price of the fabric.

$48 – $7.20 = $40.80 (the price you will pay with the discount)

Method 2

Step 1: Convert the discount percentage to a decimal.

15% = 0.15

Step 2: Subtract the decimal value from one.

$1 - 0.15 = 0.85$

Step 3: Multiply the sum from Step 2 times the regular price of the fabric.

So $0.85 \times \$48 = \$40.80$ (the price you will pay with the discount)

Example Four

You are considering the construction of a new warehouse for your business. According to a recent publication, real estate values in your county have dropped from $2,800 per acre last year to $2,350 per acre this year. What is the percentage change in real estate value between those two years?

Step 1: Subtract the price per acre this year from the price last year.

$\$2{,}800$ per acre $- \$2{,}350$ per acre $= \$450$ per acre decrease

Step 2: Divide the per acre decrease by the price from last year.

$\frac{\$450}{\$2{,}800}$ per acre decrease per acre last year value $= 0.1607$

Step 3: Move the decimal point two spaces to the right, and add a percent sign.

$0.1607 = 16.07\%$ change in the value of farm real estate

Calculating Interest

Interest is a cost involved when an item is purchased on credit or with borrowed money, or it can be an income when someone else uses your invested money. Use the formula I (interest) = Prt (principal or amount borrowed) × interest rate × time (length of time money is borrowed) to calculate the interest to be paid on a loan. Interest rates are calculated as percentages. Percent means per 100. The symbol 50% is read "fifty percent" and means 50 out of 100. Percentages can be converted into fractions and decimals. For instance, 50% becomes the decimal 0.50. As a fraction, it becomes $^{50}/_{100}$ and can be converted to the fraction $^{1}/_{2}$.

FIGURE 1. A student loan is a way to borrow money to finance your education. You will need to calculate the interest on the loan to know how much your education will cost.

INTEREST TYPES

Interest rate is the annual percent of change for borrowing money. Two major ways of calculating interest are simple and compound.

Simple Interest

Simple interest is a method, also called "add-in interest method," calculated by using the original principal for the entire time period (in years) at the determined rate. The formula for calculating simple interest: simple interest = principal × rate × time. The **principal** is the total dollar amount borrowed. The **rate** is the interest rate or percentage charged for using the principal. **Time** is the number of years the money is borrowed.

Compound Interest

Compound interest is a method based on the changing principal balance for the length of time the money was borrowed. This method results in higher payments because it accrues "interest on interest," which results in the principal increasing over time. Interest is paid more than once during a term. Money can be compounded annually, semiannually, monthly, or daily. The formula for determining future value on compound interest is future value = present value × (1 + rate) × term.

Ratios

Ratios are used in business when analyzing financial records, production strategies, and agricultural mechanization problems. **Ratios** are comparisons of two quantities. The comparisons can be of two like or unlike numbers.

Examples of financial ratios:

The current ratio in financial statements is the comparison of current assets to current liabilities. Current ratio $= \frac{\text{current assets}}{\text{current liabilities}} \left(\frac{\$80{,}000}{\$32{,}000} = \frac{2.50}{1}\right.$ = $2.50 in current assets for every $1 in liabilities).

Debt-equity ratio measures the relationship between owned and borrowed capital.

Debt-equity ratio $= \frac{\text{total liability}}{\text{net worth}} \left(\frac{\$180{,}000}{\$400{,}000} = \frac{0.45}{1}\right.$ or 45% [For every $0.45 in liabilities, there is $1 in equity or net worth.])

CALCULATING INTEREST

Calculating interest is necessary in your personal and your professional life. So it may be a good idea for you to practice with some examples.

Examples

1. Find the interest amount on $3,000 at 8% interest for one year.

   Step 1: Interest = principal × rate × time

   Step 2: Interest = 3,000 × 0.08 × 1 (Convert 8% to decimal form (0.08) for formula.)

   Step 3: Interest = $240 paid for the use of $3,000 for one year.

2. Find the future value (FV) of $5,000 invested at 6% for three years using simple interest.

   Step 1: Interest earned = principal × rate × time

   Step 2: Interest earned = 5,000 × 0.06 × 3 = $900 (Convert 6% to decimal form (0.06) using formula.)

   Step 3: Future value = interest earned + principal FV = $900 + $5,000, FV = $5,900.00.

3. Find the interest on $2,000 borrowed at 9% for 73 days.

   Step 1: Interest = principal × rate × time

   Step 2: Interest = $2{,}000 \times 0.09 \times (\frac{73}{365})$

   Convert 9% to decimal form (0.09) for the formula. Convert 73 days to years by dividing by 365 days/year.

   Step 3: Interest = 2,000 × 0.09 × 0.20 interest = $36

Compound Interest Example

You invest $1,000 at 8% compounded annually for five years. What is the future value?

Step 1: Future value = present value × $(1 + \text{rate})^n$. The reinvested amount is 1 within the formula; n = number of years.

Step 2: $FV = 1{,}000 \times (1 + 0.08)^5$

$FV = 1{,}000 \times (1.08 \times 1.08 \times 1.08 \times 1.08 \times 1.08)$

$FV = 1{,}000 \times 1.46933$

$FV = \$1{,}469.33$

Step 3: The interest earned can be calculated by subtracting the original investment of $1,000 from the future value of $1,469.33. Therefore, the amount of compounded interest earned in this example is $469.33.

FIGURE 2. You will want to shop around to find the best interest rate. Loan amounts vary when interest rates are configured with simple or compound interest.

Summary:

Financial calculations performed in business management and private purchases involve percentages, ratios, interest rates, return on investment, and depreciation. Depreciation is estimated as a percentage of the purchase price. You will convert the percentage to a decimal form. Multiply the value by the decimal to determine the depreciation amount.

Interest is a cost involved when an item is purchased on credit or with borrowed money. Interest is also the income your money earns from a bank savings account. Two major ways of calculating interest are simple and compound.

Checking Your Knowledge:

1. Define percentage, and explain the formula for determining percentages.
2. List three situations in which percentages are necessary in personal and business experiences.
3. Explain interest and interest rates.
4. What is the difference between simple and compound interest?
5. What is the term used to compare two like or unlike numbers?

Expanding Your Knowledge:

Buying a car is an exciting experience. Learn about the down payment, the term APR, and the different considerations you must make in deciding to buy a used or new car. The Internet is a great way to determine the kind of car you want and to compare loan and borrowing options from different manufacturers and dealers. You

can learn a lot by visiting manufactures' and dealers' websites. The more informed you are when you enter an auto showroom, the easier the transaction should be.

Web Links:

Calculating Percentages

http://www.wikihow.com/Calculate-Percentages

Compound Interest Calculator

http://www.thecalculatorsite.com/finance/calculators/compoundinterestcalculator.php

Interest

http://www.mathsisfun.com/money/interest.html

Borrowing Money

http://www.askmen.com/money/investing_100/146_investing.html