MATH 1070Q: Mathematics for Business and Economics

Lecture Slides

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CAPS/SSS
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Topic 3: Percents and Discounts, Markups, Taxes, and Simple Interest

Reminders and To-Do

- Quiz (Topic 2) at the beginning of class.
- Topic 3 will cover sections 6.2 and 6.3 of the text.
- Worksheet 3 at the end of class.
- Quiz (Topic 3) will be on Thursday morning.

Reminder

Your first SC exam is next Monday and will cover topics 1-4. Continue to review previous topics this week to take advantage of the second chance. Some notes:

- Remember there are no "quiz" or "exam" grades. You are only graded on each topic.
- The grade for a given topic is the highest score between that topic's quiz and that topic's portion on the SC exam.

Percent Change

Sometimes it is helpful to measure a change in value as a percent change. For example, going from 10 to 20 is a 100% increase. Going from 10 to 5 is a 50% decrease.

Definition

The percent change of a number n_i to a number n_f is

$$n_f = n_i(1 \pm p)$$

where p is the percent, written as a *decimal*. If the number went up (down), it is called a percent increase (decrease).

You must decide when to use $+$ (increase) and when to use $-$ (decrease).

Example: Percent Increase

A store buys their bags of flour from a wholesale vendor at a price of \$2 per bag. In order to turn a profit, they markup the price by 15%. What is the price they sell the flour for?

Example: Percent Decrease

You go to the store and pick out a pair of shoes that cost \$30. You have a coupon for 20% off. How much do you pay?

Example

The UConn bookstore buys a math textbook from the publisher for $160. They markup the price by 97%. How much do you pay for the book?

Example: Finding Percent Increase

If there are 250 students in a class in January, and 300 students in March, what is the percent change from January to March?

Example: Decrease

If there are 250 students in a class in January, and 225 students in March, what is the percent change from January to March?

Sales Tax

In most places, any purchase made is subject to sales tax.

Interaction of Tax and Discounts/Markups

Since sales tax is applied to *purchases*, and coupons/discounts/markups are applied before you make the payment, sales tax takes effect after any discounts/markups.

Example

You have a 20%-off coupon for a take-out place. Sales tax in this county is 6.25%. You want to buy a chicken sandwich for $18.00.

1. What is the pre-tax total for the chicken sandwich?
2. What is the total you'll pay?

Interest

A bank will use your deposited money to make more money for themselves, e.g. by investing it. You are entitled to a portion of those earnings.

Definition

Interest is money paid for the privilege of being able to use someone else's money.

Note that interest goes both ways: if you take out a loan, you will owe the loaner interest!

Financial Terminology

Definition

1. The principal is the amount of money originally being deposited or loaned out (the base amount).
2. The interest rate is the percentage used to determine an interest payment.
3. If an interest payment uses the interest rate with only the principal, then the account is said to be earning simple interest.

Remark: We will learn later that most interest is compound, which means the interest rate looks at the current value of the account (instead of the principal).

Calculating Simple Interest

Formula: Simple Interest Formula

If P is the principal, r the interest rate (written as a decimal), and t the time period in years, then the simple interest earned is given by

$$I = Prt.$$

Example

An account has an initial deposit of \$500, paid 5% interest annually. How much interest has the account earned after 3 years? How much interest was earned after 3 months?

Example

You deposit \$800 into a bank account with a simple interest rate of 3%. What is the amount of interest you earn after 6 months?

Solving for the Interest Rate

Much like other problems we have worked on, we can use algebra to solve for other parts of the formula.

Example

Let's say you deposited \$1000 into an account, and after 2 years, you've earned \$140 in simple interest. What is the interest rate?

Future/Maturity Value

Definition

The total amount of money you have (or owe) is called the future value (or maturity value):

$$A = P + I.$$

Since $I = Prt$, we have two other equivalent formulas for future/maturity value:

Formula: Future/Maturity Value

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

Example

You deposit \$2 000 into a bank account with a 4% simple interest rate. What is the future value of the account after 18 months?

Present Value

How much money to start with?

A family wants to invest into an account earning 10% simple interest annually to pay for their newborn's future college. How much money should they invest *today* to have \$25 000 by the time their kid is 18?

Definition

The amount of money needed to invest *now* in order to reach a prescribed future value is called the present value:

$$P = \frac{A}{1 + rt}$$

Note: Mathematically, present value and principal are the same.

Loans and Partial Payments

Sometimes one has to take out a large loan and it may not be possible to pay it all off at once. One may opt to do partial payments, i.e. paying only part of the loan at a time.

When a partial payment is made, interest is prioritized. Any money remaining in the partial payment can then go towards the principal.

Example

A loan of \$10 000 is taken out with a simple interest rate of 7%. After 30 days, a partial payment of \$1 000 is made.

1. How much of the payment goes toward the interest?
2. How much of the payment goes toward the principal?
3. What is the remaining balance, i.e. how much left you owe on the loan?