Finite Math - Spring 2019
Lecture Notes - 2/19/2019

Homework

- Section 3.1 - 9, 11, 15, 16, 18, 20, 22, 24, 26, 29, 34, 39, 50, 55, 58, 63, 71, 79, 81

Section 3.1 - Simple Interest

Suppose you make a deposit or investment of P dollars or you take out a loan of P dollars. The amount P is called the *principal*.

All of these things have an *interest rate* attached to them, essentially rent on the money, which is paid as *interest*.

Simple Interest. Simple interest is computed as

where $I =$ interest, $P =$ principal, $r =$ annual simple interest rate (written as a decimal), and $t =$ time in years.

Example 1. *Suppose you deposit* $\$2,000$ *into a savings account with an annual simple interest rate of* 6%. *How much interest will accrue after* 6 *months?*

Solution.

Future Value. Often, we might be more curious about how much will be in the account or how much will be owed on the loan after a certain period. This amount is called the *future value*. Another name for principal is *present value*. It is found by simply adding the original investment/loan amount to the interest accrued.

Definition 1 (Future Value).

and in a simplified form

where $A =$*future value,* $P =$*principal/present value,* $r =$ *annual simple interest rate,* $t =$ *time in years.*

Example 2. *Suppose you take out a $10,000 loan at a simple annual interest rate of 3.2%. How much would be due on the loan after 10 months?*

Solution.

Example 3. *You make an investment of $3,000 at an annual rate of 4.5%. What will be the value of your investment after 30 days? (Assume there are 360 days in a year.)*

We can also use the formulas to predict what interest rate we need or how much principal to take out/deposit.

Example 4. *You're looking to invest $5,000 and make $100 in interest after 10 weeks. What annual rate on your investment will you need to accomplish this?*

Solution.

Example 5. *You invest* $4,000 *at an annual rate of* 3.9%. *How long will it take for the investment to be worth* $5,000*? Give your answer in years, correct to 2 decimal places.*

One often uses a brokerage firm when making investments, many of which charge you a fee based on the transaction amount (principle) when both buying AND selling stocks.

Example 6. *Suppose a brokerage firm uses the following commission schedule*

Principal	Commission
Under $3,000	$25+1.8% of principal
$3,000 - $10,000	$37+1.4% of principal
Over $10,000	$107+0.7% of principal

An investor purchases 450 *shares of a stock at* $21.40 *per share, keeps the stock for* 26 *weeks, then sells the stock for* $24.60 *per share. What was the annual interest rate earned on the investment?*

Example 7. *Suppose a brokerage firm uses the following commission schedule*

Principal	Commission
Under $3,000	$32+1.8% of principal
$3,000 - $10,000	$56+1% of principal
Over $10,000	$106+0.5% of principal

An investor purchases 75 shares of a stock at $37.90 per share, keeps the stock for 150 days, then sells the stock for $41.20 per share. What was the annual interest rate earned on the investment? (Again, assume a 360-day year.)

Average Daily Balance.

A common method for calculating interest on a credit card is to use the *average daily balance method*. As the name suggests, the average daily balance is computed, then the interest is computed on that.

Example 8. *A credit card has an annual interest rate of 19.99% and interest is calculated using the average daily balance method. If the starting balance of a 30-day billing cycle is $523.18 and purchases of $147.98 and $36.27 are posted on days 12 and 25, respectively, and a payment of $200 is credited on day 17, what will be the balance on the card at the start of the next billing cycle?*

Example 9. *A credit card has an annual interest rate of* 19.99% *and interest is calculated using the average daily balance method. If the starting balance of a 28-day billing cycle is* $696.21 *and purchases of* $25.59, $19.95, *and* $97.26 *are posted on days* 6, 13, *and* 25, *respectively, and a payment of* $140 *is credited on day* 8, *what will be the balance on the card at the start of the next billing cycle?*

Solution.