Chapter 5 - Finance

5.1 - Compound Interest

Simple Interest: Interest earned on the original investment amount only

$$\implies I = Prt$$

$I =$ the interest earned, $P =$ the amount invested (principal), $r =$ the interest rate (in dec. form), and $t =$ the time of investment.

So, the accumulated amount (future value), $A$, of the investment is equal to

Ex: Find the accumulated amount at the end of 8 months on a $1200 deposit paying simple interest at a rate of 7% per year.

Compound Interest: Interest earned on both the original investment amount plus previously added interest.

$$\implies A = P \left(1 + \frac{r}{m}\right)^{mt}$$

$A =$ the accumulated amt. (FV), $P =$ the principal (PV), $r =$ the nominal interest rate per year (in dec. form), $m =$ the number of conversion periods per year and $t =$ the number of years of investment.
Compound Interest on the Calculator

1. Go to FINANCE and select TVMSolver.

2. Fill in the variables according to the following:
   - \( N = mt \) (the total number of times the account is compounded during the investment time)
   - I\% = interest rate in \% form
   - PV = \( P \) (principal)
   - PMT = payments made on the account
   - FV = \( A \) (the accumulated amount = the future value)
   - P/Y = the number of payments made per year
   - C/Y = \( m \) = the number of conversion periods per year
   - PMT: [END] BEGIN
     **Either PV or FV must be negative if both are input.**

3. Move your cursor to the variable you are solving for and press [ALPHA [ENTER] and the answer will appear where the cursor is located.

**Ex:** How much money would you have after 5 years if you deposited $500 in an account paying 8\% interest per year, compounded quarterly?

**Ex:** How much money should you deposit in an account paying 5\% interest per year compounded monthly, so that you’ll have $5000 in 10 years?
Continuously Compounded Interest: $A = Pe^{rt}$

Effective Rate of Interest (Effective Annual Yield): The simple interest rate that would produce the same accumulated amount in one year as the nominal rate compounded $m$ times a year.

$$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1$$

On the calculator...

1. Go to FINANCE and select `EFF`.
2. Give the arguments as follows: `EFF(r, m)` where $r$ is given in % form

**Ex:** What is the effective annual yield on an account paying 6% interest per year compounded monthly?

**Ex:** Of the two options below, which is the better investment?

A: 8% compounded semi-annually

B: 7.9% compounded daily
5.2 - Annuities

**Annuity**: a sequence of payments made at regular time intervals

In this class, we will assume all payments are equal.

**Ex:**

We will also assume all annuities we are dealing with are

*ordinary, certain, and simple.*

**Future Value of an Annuity** - looking for how much money will be in an account after depositing equal amounts over a fixed time interval.

**Ex:** Bob deposits $60 at the end of each month into a savings account earning interest at the rate of 6% per year compounded monthly.

(a) How much will he have on deposit in his account at the end of 10 years, assuming he makes no withdrawals during that period?

(b) How much interest does Bob earn?
Present Value of an Annuity - you are making payments to zero a loan (or reduce to a desired amount) and you are looking to find how much the loan was worth in the beginning.

**Ex:** Sally made a down payment of $5000 toward the purchase of a new car. To pay the balance, she secured a loan at the rate of 4.9% per year compounded monthly. Under the terms of her finance agreement, she is required to make payments of $450/month for 48 months. What is the cash price of the car?
5.3 - Amortization and Sinking Funds

Amortization: gradually paying off a loan

Ex: What monthly payment is required to amortize a loan of $50,000 over 20 years, if interest at the rate of 8% per year is charged on the unpaid balance at the end of each month?

Ex: John buys a computer with a cash price of $2500. Assume he makes a down payment of 10% of the cash price and secures financing for the balance at a rate of 12% per year compounded monthly.

(a) What will his monthly payment be if the computer is financed over 2 years?

(b) How much interest will John pay in this situation?
Sinking Funds - placing money periodically into an account to accumulate a desired amount at a future date

**Ex:** Mark’s parents anticipate that his first year of college will cost $12,000. Knowing Mark’s first year of college is 4 years away, determine the amount of money they should deposit into an account each month making 7.4% per year compounded monthly, if they intend on having the money ready to pay for his first year when he starts college.