Compound Interest

March 6, 2020

1 Compound Interest

- Most investments and loans use compound interest.
- In compound interest, interest is added to the principal of the loan after each compounding period.
- Example: Suppose you borrow \$100.00 at 5% interest compounded annually. If you pay nothing on this loan, how much will you owe after 5 years?
- What kind of growth is this?
- What is the effective interest rate over the life of the loan?

2 Compound Interest Formula

- A compound interest transaction always has three parameters:
  1. P_0 - The principal amount of the transaction.
  2. r - The annual percentage rate (APR) of the transaction.
  3. k - The number of compounding periods per year
- To find a formula for the value of a compound interest transaction for a given number of compounding periods t we can apply the exponential growth formula:
$$P_n = P_0(1 + r)^n$$
- Typically, we view the life a loan in years and so we want to adjust this to allow us to calculate years. Really, what the above computes is compound interest if we compound exactly once per year.
- If we compound k times per year, the effective rate of each period becomes $\frac{r}{k}$.
- If we compound k periods over N years, we have Nk compounding periods.

- Putting this all together gives us the yearly compound interest formula:

$$P_N = P_0 \left(1 + \frac{r}{k}\right)^{Nk}$$

  Where the variables are:

  - P_0 - Principal
  - r - Annual Percentage Rate
  - k - The Number of Compound Periods per Year
  - N - The Number of Years

- Let's go online and shop for credit cards. Each row of the class will pick a card and find its terms. Then let's compute how much the balance on this card would be after the purchase of a Nintendo™Switch and make no payments for 2 years.