Lesson Notes 4-2 Compound Interest Part I

Last lesson you learned how to calculate **simple interest**. If you don't use the interest earned, but rather keep it invested, new interest will be paid on the original amount and on the interest. You earn interest on the interest!

Interest can be compounded at different time periods:

Annually (once per year)
Semi-annually (twice per year)
Quarterly (4 times a year)
Monthly (12 time per year)
Daily (365 times per year)

Interest grows more quickly with compound interest than with simple interest. This is great when investing but not so great when borrowing.

The formula we use for compound interest is: $A = P\left(1+\left(\frac{r}{n}\right)\right)^{txn}$

where A = final amount (principal plus interest)
P = principal, or the amount invested or borrowed
r = annual percent rate of interest, expressed as a decimal
n = number of interest periods in a year
t = length of time money is invested or borrowed, in years

Example 1: Carl invested \$6500 at 5% per annum, compounded annually. How much money will he have, in total, after 6 years?

$= 6500\left(1+\left(\frac{0.05}{1}\right)\right)^{6\cdot 1}$

$= 6500(1.34) = 8710.62$

Example 2: Jan deposited \$1000 in the bank and it was to be compounded semi-annually at 7.5% per year. How much would he have if he left the money for 15 years?

$= 1000\left(1+\left(\frac{0.075}{2}\right)\right)^{15\cdot 2}$

$= \$3017.47$

Example 3: Kelly borrowed $12000 at 4% per year, compounded monthly for a term of 5 years. How much will he owe at the end of the term?

$= 12000\left(1 + \left(\frac{0.04}{12}\right)\right)^{12 \cdot 5}$

$= 14651.96$

Example 4: Brenda invested $125 000 at 8.5% per year, compounded semi-annually. How much will she have after 4 years?

$= 125000\left(1 + \left(\frac{0.085}{2}\right)\right)^{4 \cdot 2}$

$= 174388.77$

Example 5: How much interest did Brenda earn in example 4?

$174388.77 - 125000 = 49388.77$

To quickly estimate how long it takes for an investment to double in value, use the "Rule of 72": Divide 72 by the annual interest rates as a percent.

Example 6: Estimate the doubling time for each investment.

a. $5000 at 6%, compounded annually

$\frac{72}{6} = 12$

b. $5000 at 5%, compounded annually

$\frac{72}{5} = 14.4$