Year End Review: Financial Math (Units 4 & 5)

Simple interest is calculated as a percentage of the amount deposited or borrowed (the principal). The formula we use for simple interest is:

$I = Prt$ where I = Interest earned
P = Principal, the amount invested or borrowed
r = rate per year, as a decimal
t = time, in years

The future value of an investment can be determined by adding the principal to the amount of interest earned. The formula we use is:

$A = P + I$ or $A = P + Prt$ where A = future value

Example 1: Paula invested her summer earnings of $3000 at 2.4% simple interest, paid annually. How long will it take for the future value of the investment to grow to $3500?

$500 = 3000(0.024)t$

$t = 6.9$ yrs

Example 2: A principal of $16 500 is invested at simple interest for 15 years and grows to a future value of $20 000. Determine the interest rate.

$3500 = 16500(r)(15)$

$r = 0.014$

(1.4%)

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 3: William invests $1200 at 5.4% interest, compounded quarterly, for 2 years. Determine the future value of the investment.

$A = 1200\left(1+\frac{0.054}{4}\right)^{4\cdot 2}$

$= \$1335.89$

Example 4: Luis has invested $6000, which will grow to $8577.19 in 4 years. The interest is compounded monthly. What is the interest rate of Luis's investment, to the nearest tenth of a percent?

$8577.19 = 6000\left(1+\frac{r}{12}\right)^{4\cdot 12}$

$\sqrt[48]{1.43} = \sqrt[48]{\left(1+\frac{r}{12}\right)^{48}}$

$1.00747 = 1+\frac{r}{12}$

$0.00747 = \frac{r}{12}$ $\quad r = 0.0897 \quad (8.97\%)$

When monthly payments are made on an investment, a graphing calculator will be used.

Example 5: Determine the future value of annual payments of $6000 into an account that pays 4.9% interest, compounded annually, for 30 years.

N = 30
I% = 4.9
PV = 0
PMT = 6000
FV = ? $\Rightarrow \$391854.92$
P/Y = 1
C/Y = 1

Example 6: Determine the regular semi-annual payment required to have $20 000 at the end of 5 years if the investment earns 5.25% interest, compounded semi-annually.

N = 10
I% = 5.25
PV = 0
PMT = ? $\Rightarrow \$1774.96$
FV = 20000
P/y = 2
C/y = 2