Section 7.5 Compound Interest

Interest can be computed in several different ways including simple interest and compound interest. Interest can be compounded annually, quarterly, monthly, daily, etc. Interest can also be compounded continuously. We won't cover that in this course. These formulas can be used for investments and credit cards.

Simple Interest: $I = Prt$
I is the interest paid; P is the principal amount invested or borrowed (starting amount)
r is the rate as a DECIMAL
t is the amount of time

Compound Interest: $FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$
FV is the future value; PV is the present value invested or borrowed (starting amount)
r % is the rate (NOT as a decimal)
k is the number of compounding periods per year (annually = 1, quarterly = 4, monthly = 12, etc)
n is the number of years

Example: How much money would you have if you initially invest $50 at 4.8% interest compounded monthly for 3 years?

Compound Interest: $FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$

FV = ?
PV = $50
r = 4.8% = 4.8
k = 12 (monthly)
n = 3 years

Be sure to show what you are putting in the calculator... that is your work! And unless otherwise specified, always round money to 2 decimal places.

$$FV = 50 \times \left(1 + \frac{4.8}{(100 \times 12)}\right)^{(12\times 3)} = \$57.73$$

Example: How much money would you have if you initially invest the same $50 at 4.8% simple interest for 3 years? How does that compare to compounding it monthly?

Simple Interest: $I = Prt$

I = ?
P = $50
r = 4.8% = 0.048
t = 3 years

Be sure to show what you are putting in the calculator... that is your work!

$I = 50(0.048)(3) = 7.20$

Total would be $57.20. This is $0.53 less than monthly

Example: How much money would you need to invest initially at 12% interest compounded quarterly for 6 years to end up with $5000?

Compound Interest: $FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$

FV = $5000
PV = ?
r = 12% = 12
k = 4 (quarterly)
n = 6 years

$$5000 = PV \times \left(1 + \frac{12}{(100 \times 4)}\right)^{(4\times6)}$$

$$5000 = PV \times (2.03 \ldots)$$

$$5000 \div ANS = PV$$

PV = $2459.67

Example: What interest rate would you need to invest $1000 to double your money in 5 years? Assume you are compounding monthly.

Compound Interest: $FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$

FV = $2000 (double)
PV = $1000
r = ?
k = 12 (monthly)
n = 5 years

$$2000 = 1000 \times \left(1 + \frac{r}{(100 \times 12)}\right)^{(12\times5)}$$

$$2 = \left(1 + \frac{r}{1200}\right)^{60}$$

Now solve by graphing... $y_1 = 2$

$$y_2 = \left(1 + \frac{x}{1200}\right)^{60}$$

$$r \approx 13.943328$$

So 14% (13.9 wouldn't be enough)