Note: Amount of an Annuity

An annuity is a series of equal payments made at regular time intervals. In most regular simple annuities, payments are made at the end of each compounding period. The amount of an annuity is the sum of the regular payment deposits plus interest. The formula for the amount of a regular annuity is:

\[
A = \frac{R \left[ (1 + i)^n - 1 \right]}{i}
\]

where \( A \) is the amount in dollars owed, \( R \) is the regular payment in dollars, \( i \) is the interest rate per compounding period as a decimal and \( n \) is the number of compounding periods. The only new variable we are introduced to in this formula is the \( R \). The other variables are used in the exact same way as they were in the compound interest formulas. For example,

Suppose Cory invests $50 at the end of each month for 2 years. The interest is 12% compounded monthly. How much interest will Cory make?

\[
\begin{align*}
0.12 & = 0.01 \\
12 & = 24 \\
\frac{R \left[ (1 + 0.01)^{24} - 1 \right]}{0.01} & = \frac{50 \left[ (1 + 0.01)^{24} - 1 \right]}{0.01} \\
A & = 1348.67
\end{align*}
\]

So the amount in the account is now $1348.67, but how much did Cory actually put in himself?

\[
24 \times 50 = 1200
\]

Cory actually put $1200 into the investment himself. So, how much is interest he earned?

\[
1348.67 - 1200 = 148.67
\]

Cory earned $148.67 interest.