Simple One-time Interest

$I = P_0 r \qquad A = P_0 + I = P_0 + P_0 r = P_0\left(1+r\right)$

I is the interest - A is the end amount: principal plus interest - P_0 is the principal (starting amount) - r is the interest rate (in decimal form. Example: 5% = 0.05)

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Compound Interest

$P_N = P_0\left(1+\frac{r}{k}\right)^{Nk}$ P_N is the balance in the account after N years. P_0 is the starting balance of the account(also called initial deposit, or principal) - r is the annual interest rate in decimal form - k is the number of compounding periods in one year.

annually (once a year), $k = 1$. Quarterly , $k = 4$. monthly, $k = 12$. Daily $k = 365$.

Annuity Formula

$P_N = \frac{d\left(\left(1+\frac{r}{k}\right)^{Nk}-1\right)}{\left(\frac{r}{k}\right)}$ P_N is the balance in the account after N years. d is the regular deposit (the amount you deposit each year, each month, etc.) r is the annual interest rate in decimal form.
k is the number of compounding periods in one year.

Payout Annuity Formula

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

P_0 is the balance in the account at the beginning (starting amount, or principal).
d is the regular withdrawal (the amount you take out each year, each month, etc.)
r is the annual interest rate (in decimal form. Example: 5% = 0.05)
k is the number of compounding periods in one year.
N is the number of years we plan to take withdrawals

Loans Formula

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

P_0 is the balance in the account at the beginning (the principal, or amount of the loan).
d is your loan payment (your monthly payment, annual payment, etc)
r is the annual interest rate in decimal form.
k is the number of compounding periods in one year.
N is the length of the loan, in years