# Financial Math Formulas

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|---|---|
| Simple one-time interest<br>$I = P_0 r$<br>$A = P_0(1 + r)$ | Annuity<br>$P_n = \frac{d\left(\left(1 + \frac{r}{k}\right)^{nk} - 1\right)}{\left(\frac{r}{k}\right)}$ |
| Simple Interest over time<br>$I = P_0 rt$<br>$A = P_0(1 + rt)$ | Payout Annuity<br>$P_0 = \frac{d\left(1 - 1\left(1 + \frac{r}{k}\right)^{-nk}\right)}{\left(\frac{r}{k}\right)}$ |
| Compound interest<br>$P_n = P_0\left(1 + \frac{r}{k}\right)^{nk}$ | Loans<br>$P_0 = \frac{d\left(1 - 1\left(1 + \frac{r}{k}\right)^{-nk}\right)}{\left(\frac{r}{k}\right)}$ |
| Continuous compound interest<br>$P(t) = P_0 e^{rt}$ | Monthly Payments<br>$A = P_0\left(\frac{(r(1+r)^n)}{(1+r)^n - 1}\right)$ |

# Key:

- ★ $I$ - interest
- ★ $A$ - end amount
- ★ $P_0$ - Principle starting amount
- ★ $P_n$ balance in the account after n years
- ★ $n$ - the amount of time that has already passed
- ★ $r$ - interest rate as a decimal
- ★ $t$ - time in years
- ★ $k$ - number of compounding periods in a year (if compounded monthly k = 12)
- ★ $d$ - regular deposit
- ★ $e$ - the number e approximately 2.71