Financial Formulas

Simple Interest: P is the present value or loan amount, A is the future value or total amount, r is the annual interest rate as a decimal, t is the time in years, and I is the simple interest earned.

Interest	Future Value	Present Value	Interest Rate	Time
$I = Prt$	$A = P(1+rt)$	$P = \frac{A}{1+rt}$ **OR** $P = \frac{I}{rt}$	$r = \frac{I}{Pt}$ **OR** $r = \frac{A-P}{Pt}$	$t = \frac{I}{Pr}$ **OR** $t = \frac{A-P}{Pr}$

Compound Interest: P is the present value or loan amount, A is the future value or total amount, r is the annual nominal interest rate as a decimal, m is the number of compounding periods per year, n is the total number of compounding periods, I is the compound interest earned, t is the time in years, and i is the interest rate per compounding period.

Interest Rate per Period	Future Value	Interest Earned	Present Value	Effective Rate
$i = \frac{r}{m}$ **OR** $i = \sqrt[n]{\frac{A}{P}} - 1$	$A = P(1+i)^n$ **OR** $A = P(1+\frac{r}{m})^{mt}$	$I = P\left[(1+i)^n - 1\right]$ **OR** $I = P\left[(1+\frac{r}{m})^{mt} - 1\right]$	$P = \frac{A}{(1+i)^n}$ **OR** $P = \frac{A}{(1+\frac{r}{m})^{mt}}$	$r_{\text{effective}} = (1+\frac{r}{m})^m - 1$
Number of Compounding Periods	**Time in Years**			
$n = \frac{\log\left(\frac{A}{P}\right)}{\log(1+i)}$	$t = \frac{\log\left(\frac{A}{P}\right)}{m \cdot \log(1+i)}$			

Ordinary Annuity: Pmt is the payment, FV is the future value, PV is the present value, i is the interest rate per period as a decimal, n is the total number of payments, m is the number of payments per year, and t is the amount of time in years.

Future Value	Payment or Sinking Fund	Present Value
$FV = Pmt\left[\frac{(1+i)^n - 1}{i}\right]$	$Pmt = FV\left[\frac{i}{(1+i)^n - 1}\right]$	$PV = Pmt\left[\frac{1-(1+i)^{-n}}{i}\right]$
Total Number of Payments	**Time in Years**	
$n = \frac{\log\left(\frac{FV}{Pmt} \cdot i + 1\right)}{\log(1+i)}$	$t = \frac{\log\left(\frac{FV}{Pmt} \cdot i + 1\right)}{m \cdot \log(1+i)}$	

Amortization: PV is the loan amount, Pmt is the payment, Bal is the approximate remaining balance on the loan, i is the interest rate per period as a decimal, n is the total number of payments, $IPmt$ is the approximate interest portion of a payment, $PPmt$ is the approximate principal portion of a payment, I is the approximate total interest paid, m is the number of payments per year, t is the time in years, and k is a payment number.

Payment	Approximate Remaining Balance after the k^{th} Payment	Approximate Interest Portion of the k^{th} Payment
$Pmt = PV\left[\frac{i}{1-(1+i)^{-n}}\right]$	$Bal = \underbrace{Pmt}_{\text{unrounded}}\left[\frac{1-(1+i)^{k-n}}{i}\right]$ **OR** $Bal = PV\left[\frac{1-(1+i)^{k-n}}{1-(1+i)^{-n}}\right]$	$IPmt = \underbrace{Pmt}_{\text{unrounded}}\left[1-(1+i)^{k-1-n}\right]$ **OR** $IPmt = i \cdot PV\left[\frac{1-(1+i)^{k-1-n}}{1-(1+i)^{-n}}\right]$

Approximate Principal Portion of the k^{th} Payment	Loan Amount	Approximate Number of Payments
$PPmt = Pmt - \underbrace{Pmt}_{\text{unrounded}}\left[1-(1+i)^{k-1-n}\right]$ **OR** $PPmt = i \cdot PV\left[\frac{(1+i)^{k-1-n}}{1-(1+i)^{-n}}\right]$	$PV = Pmt\left[\frac{1-(1+i)^{-n}}{i}\right]$	$n = \frac{log\left(\frac{Pmt}{Pmt - PV \cdot i}\right)}{log(1+i)}$

Approximate Time in Years	Approximate Total Interest Paid	Approximate Payment Number for a Remaining Balance
$t = \frac{log\left(\frac{Pmt}{Pmt - PV \cdot i}\right)}{m \cdot log(1+i)}$	$I = n \cdot Pmt - PV$ **OR** $I = PV\left[\frac{ni}{1-(1+i)^{-n}} - 1\right]$	$k = n + \frac{log\left(1 - \frac{Bal \cdot i}{\underbrace{Pmt}_{\text{unrounded}}}\right)}{log(1+i)}$