

# FINANCE FORMULAS

Business Math

## Variables

**I**: interest

**r**: annual interest rate (given as a %)

**m**: number of compounding periods per year

**i**: interest rate per period ( $i = r/m$ )

**t**: number of years

**n**: total number of periods ( $n = tm$ )

**P**: principal or present value

(amount borrowed or deposited)

**A**: future value of a lump sum

**S**: future value of an annuity

**n**: total periodic payments (in an annuity)

**R**: the periodic payment in an annuity

## Simple Interest

Interest  $I = Prt$

## Compound Interest

Periodic:  $A = P(1 + i)^n$

Continuous:  $A = Pe^{rt}$

Effective Rate:  $r_E = \left(1 + \frac{r}{m}\right)^m - 1$

## Annuities

A sequence of equal payments made at equal periods of time is called an annuity.

**Ordinary Annuity:** the payments are made at the *end* of each period

Future Value:  $S = R \left[ \frac{(1+i)^n - 1}{i} \right]$

Present Value:  $P = R \left[ \frac{1 - (1+i)^{-n}}{i} \right]$

**Annuity Due:** the payments are made at the *beginning* of each period.

Future Value:  $S = R \left[ \frac{(1+i)^{n+1} - 1}{i} \right] - R$

Present Value:  $P = R + R \left[ \frac{1 - (1+i)^{-(n-1)}}{i} \right]$

**Amortization Payments:** payments that are divided into equal amounts for the duration of the loan

$$R = \frac{P \cdot i}{1 - (1 + i)^{-n}}$$