Finance Formulas
Math for Modern Technology
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Compound Interest

r = the annual interest rate
m = the number of interest payments per year
n = the total number of interest payments
P = the principal
F = the compound amount (balance)
r_{eff} = the effective rate

$$F = P\left(1 + \frac{r}{m}\right)^n \qquad P = \frac{F}{\left(1 + \frac{r}{m}\right)^n}$$

$$r_{\text{eff}} = \left(1 + \frac{r}{m}\right)^m - 1$$

Increasing Annuities

r = the annual interest rate
m = the number of payments per year
n = the total number of payments
p = the amount of one payment
F = the future value

$$F = \left[\frac{mp}{r}\right]\left[\left(1 + \frac{r}{m}\right)^n - 1\right]$$

$$p = \frac{rF}{m\left[\left(1 + \frac{r}{m}\right)^n - 1\right]}$$

Decreasing Annuities

r = the annual interest rate
m = the number of withdrawals per year
n = the total number of withdrawals
p = the amount of one withdrawal
PV = the present value

$$PV = \left[\frac{mp}{r}\right]\left[1 - \frac{1}{\left(1 + \frac{r}{m}\right)^n}\right]$$

$$p = \frac{rPV\left(1 + \frac{r}{m}\right)^n}{m\left[\left(1 + \frac{r}{m}\right)^n - 1\right]}$$

Amortization

r = the annual interest rate
m = the number of periods per year
n = the total number of payments
p = the amount of one payment
PV = the principal
B_k = the unpaid balance after k payments
P_k = the amount applied to the principal by the kth payment
I_k = the interest paid with the kth payment

$$p = \frac{rPV\left(1 + \frac{r}{m}\right)^n}{m\left[\left(1 + \frac{r}{m}\right)^n - 1\right]}$$

$$B_k = \left[\frac{mp}{r}\right]\left[1 - \frac{1}{\left(1 + \frac{r}{m}\right)^{n-k}}\right]$$

$$P_k = \frac{p}{\left(1 + \frac{r}{m}\right)^{n-k+1}}$$

$$I_k = p\left[1 - \frac{1}{\left(1 + \frac{r}{m}\right)^{n-k+1}}\right]$$

Add-On Method

r = the interest rate
m = the number of payments per year
n = the total number of payments
p = the amount of one payment
P = the principal
I_p = the interest paid with each payment
P_p = the principal paid with each payment

$$I_p = \frac{Pr}{m}$$

$$P_p = \frac{P}{n}$$

$$p = \frac{P}{n} + \frac{Pr}{m}$$