

# Review of Financial Mathematics

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## Notation

$A$ = Future Value	$n$ = Number of times compounded annually
$P$ = Present Value	$N$ = Number of payments
$r$ = Interest Rate (annual)	$m$ = Amount of payment
$t$ = Time (in years)	

## Interest Formulae

### Simple Interest

$$\begin{aligned}\text{Interest: } I &= Prt \\ \text{Future Value: } A &= P + I = P(1 + rt)\end{aligned}$$

### Compound Interest

$$\begin{aligned}\text{Future Value: } A &= P \left(1 + \frac{r}{n}\right)^{nt} \\ \text{Present Value: } P &= A \left(1 + \frac{r}{n}\right)^{-nt} \\ \text{Continuous Compounding: } A &= Pe^{rt}\end{aligned}$$

## Installment Buying (Add-on Interest)

$$\begin{aligned}\text{Interest: } I &= Prt \\ \text{Amount to repay: } A &= P(1 + rt) \\ \text{Number of payments: } N &= 12t \\ \text{Amount of payment: } m &= \frac{A}{N} \\ \text{Annual Percentage Rate: } APR &= \frac{2Nr}{N + 1}\end{aligned}$$

## Annuities and Amortization

$$\begin{aligned}\text{Future Value: } A &= m \left[ \frac{(1 + \frac{r}{n})^{nt} - 1}{\frac{r}{n}} \right] \\ \text{Present Value: } P &= m \left[ \frac{1 - (1 + \frac{r}{n})^{-nt}}{\frac{r}{n}} \right] \\ \text{Sinking Fund: } m &= \frac{A(\frac{r}{n})}{(1 + \frac{r}{n})^{nt} - 1} \\ \text{Amortization: } m &= \frac{P(\frac{r}{n})}{1 - (1 + \frac{r}{n})^{-nt}}\end{aligned}$$