Mathematics of Finance

* Simple Interest (S I)

$$\boxed{SI = \frac{P \times r \times t}{100}}$$

∵ P = Principal
r = rate of interest per annum
t = times in years

* Amount = P + S I

→ $A = P + \frac{Prt}{100}$ ∴ $\boxed{A = P\left(1 + \frac{rt}{100}\right)}$

* If an amount becomes m times in t years at r%
then,

$$\boxed{r = \frac{(m-1)}{t}}$$

* If a sum amounts to A_1 in t_1 years and A_2 in t_2 years

$\boxed{\text{Interest per year} = \frac{A_2 - A_1}{t_2 - t_1}}$, also $\boxed{r = \frac{A_2 - A_1}{A_1 t_2 - A_2 t_1}}$

* If a sum amounts to A_1 at r_1% p.a. and A_2 at r_2% p.a
at the same time then,

$$\boxed{t = \frac{A_2 - A_1}{A_1 r_2 - A_2 r_1}}$$

* Compound Interest → Principal keeps on changing for every interval of time.

$\boxed{CI = A - P}$ $\therefore$ $\boxed{CI = P\{(1+i)^n - 1\}}$

where, $\boxed{A = P(1+i)^n}$

$\boxed{n = m \times t}$ and $\boxed{i = \frac{r}{m \times 100}}$

$\because$ $m \rightarrow$ compounding factor

for annually take, $m = 1$

semi-annually, $m = 2$

quarterly, $m = 4$

monthly, $m = 12$

* C.I. for successive years at different rate of interest :

$\boxed{C.I = A - P}$ $\therefore$ $\boxed{A = P(1+i_1)^{n_1}(1+i_2)^{n_2}}$

* Difference between C.I and S.I.

For 2 years

$$\boxed{C.I - SI = \frac{Pr^2}{(100)^2}}$$

For 3 years.

$$\boxed{C.I - S.I = \frac{Pr^2(r+300)}{(100)^3}}$$

* Effective rate of interest :

$$\boxed{r_e = \{(1+i)^n - 1\} \times 100}$$

Mathematics of finance

- Simple Interest

$$\boxed{S.I = \frac{P \times r \times t}{100}}$$

∵ P = Principal amount
r = rate of interest
t = time in years.

If the time in month → divide by 12
" " " " in days → divide by 365

∴ Amount = P + S.I

∴ $A = P + \frac{Prt}{100}$ ∴ $\boxed{A = P\left(\frac{1+rt}{100}\right)}$

∴ $\boxed{r = \frac{k-1}{t}}$ ∵ k = amount (A)

★ If a sum amounts to A_1 in t_1 years and A_2 in t_2 years

Interest per year = $\frac{A_2 - A_1}{t_2 - t_1}$

also, $\boxed{r = \frac{A_2 - A_1}{A_1 t_2 - A_2 t_1}}$

★ —"— at r_1 %
—"— at r_2 %

∴ $\boxed{t = \frac{A_2 - A_1}{A_1 r_2 - A_2 r_1}}$

★ Compound Interest

$\boxed{C.I = A - P}$

$\boxed{C.I = P\left\{(1+i)^n - 1\right\}}$

where $\boxed{A = P(1+i)^n}$

∵ $\boxed{i = \frac{r}{m \times 100}}$ and $\boxed{n = m \times t}$

m → compounding factor
For annually, take m = 1
semi annually m = 2
quarterly m = 4
monthly m = 12

★ C.I for successive years at different rate of interest

$\boxed{C.I = A - P}$

$\boxed{A = P(1+i_1)^{n_1}(1+i_2)^{n_2}}$

* Difference between C.I and S.I

For 2 years

$$C.I - S.I = \frac{Pr^2}{(100)^2}$$

For 3 years

$$C.I - S.I = \frac{Pr^2(r+3n)}{(100)^3}$$

* Effective rate of interest

$$\boxed{r_e = \{(1+i)^n - 1\} \times 100}$$

* Annuity → regular payment at regular interval of time

• ordinary or regular annuity
If payment is done at the end of each payment interval

Future Value

$$A = R\left\{\frac{(1+i)^n - 1}{i}\right\}$$

∵ R = Regular Payment

Present Value

$$P.V = R\left\{\frac{1-(1+i)^{-n}}{i}\right\}$$

• Annuity Due or Immediate
If the payment is done at the begining of each payment interval.

$$A = R\left\{\frac{(1+i)^n - 1}{i}\right\}(1+i)$$

$$P.V = R\left\{\frac{1-(1+i)^{-n}}{i}\right\}(1+i)$$