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Formulas of Ch-4

★ S. I. ⇒ P × r × t

★ Amount = P + I
= P + Prt
= P(1 + rt)

★ let, A_2 is given & A_7 is given find r and P

$$\frac{A_2}{A_7} \rightarrow \frac{P(1+2r)}{P(1+7r)}$$

★

let, A_1 and t_1 and A_2 and t_2 is given find rate of interest.

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

★ let, A_1, t_1, A_2, t_2 are given find interest on 1 year

$$I \Rightarrow \frac{\text{Diff. of Amount}}{\text{Diff. of time}} = \frac{A_2 - A_1}{T_2 - T_1}$$

★ Find rate of interest to get double, triple, 4 times

To double = $r = \frac{1}{t}$

To triple = $r = \frac{2}{t}$

To 4 times = $r = \frac{3}{t}$

To get log i of any number →

- Type number
- Press '√' for 19 times
- Then substract '1'
- Then multiply with 2276.95

★ To get amount, if rate of compound interest for 1st year is r_1%, for year 2 is r_2%, for 3rd year is r_3% THEN,

$$\text{Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

★ With compounding

$$A = P(1+i_1)^{n_1}(1+i_2)^{n_2}(1+i_3)^{n_3}$$

★ To get Principal amount, when difference b/w C.I & S.I is given (D) if time is given (only used for 2-3 years)

When 2 years, $P = \frac{D \times 100^2}{r^2}$

When 3 years $P = \frac{D \times 100^3}{r^2(300+r)}$

★ Depreciation

$$S = P\left(1-\frac{r}{100}\right)^n$$

P → principal, r → rate of depreciation, n → useful life in years, S → scrap value

$$\text{Depreciation} = P - S$$

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★ Effective rate of interest $\Rightarrow \left[(1+i)^n - 1\right] \times 100$

$i = \frac{r}{m \times 100}$

$n = m \times t$

'm' means how many times in a year we getting

★ Annuity :-

Net amount = $A_1 + A_2 + A_3 + A_4$

A or Future value of ordinary annuity $\Rightarrow R\left[\frac{(1+i)^n - 1}{i}\right]$

Tricks for solving 'log'

(i) $a \log(x) = \log(x)^a$

(ii) $\log_b(x) = \frac{\log(x)}{\log(b)}$

(iii) $\log(AB) = \log(A) + \log(B)$

(iv) $\log(A/B) = \log(A) - \log(B)$

(v) $\log(x^n) = n \cdot \log(x)$

★ Present value of ordinary Annuity :-

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

$i = \frac{r}{m \times 100}$

★ Future Value of Annuity due or Annuity Immediate :-

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

★ Present Value of Annuity due or Annuity Immediate :-

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

★ Perpetuity :-

(Perpetuity doesn't have any future value)

Present value of Perpetuity :-

Type I

When equal payment is made at end of each payment period.

$P.V. \Rightarrow \frac{R}{i}$ (R: regular payment)

$i = \frac{r}{m \times 100}$

Type II

When equal payment is made at beginning of each payment period.

$P.V. = R + \frac{R}{i}$ (R: regular payment)

$i = \frac{r}{m \times 100}$

★ **Sinking Fund :-**

[Amount of ordinary Annuity = Sinking fund amount]

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

⟶ But, if interest is compounding at beginning. So,..

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

★ **Leasing :-**

At the end ...

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

At the beginning ....

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

★ **Growing Perpetuity :-**

$$P.V. = \frac{R}{i-g}$$

- i ← compounded interest rate (OR) Discount rate
- g → growth rate

★ **CAGR : or Compounded Annual Growth Rate :-**

⟶ averagised annual growth rate

$$CAGR = \left[\left(\frac{F.V.}{P.V.}\right)^{\frac{1}{n}} - 1\right] \times 100$$

n = time period of investment

★ Real Rate of Return :-

Real rate of return = Nominal rate of return - Inflation

★ Net Present Value :-

NPV = P.V. of Cash Inflow - P.V. of cash outflow

- If NPV is + or 0, then accept the proposal
- If NPV is -, then decline the proposal

★ Compound Interest (C.I.)

$C.I. \Rightarrow P[(1+i)^n - 1]$

$\text{Amount} \Rightarrow P(1+i)^n$