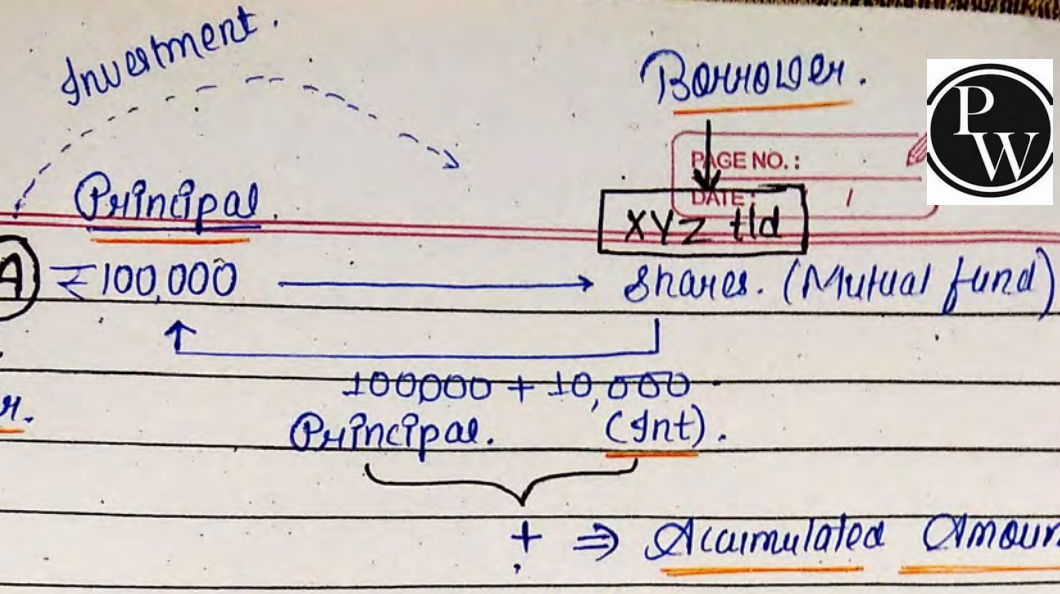

- Extra money on principal = Interest.
- Accumulated amt = Principal + Interest.
  ↓
  given by Borrower.
- Principal amount = given by lender. at first.
- Rate of Int in o/o age (R) = $\frac{\text{Interest}}{\text{Principal}} \times 100$
- Time period = Time for which principal amount is invested
  (generally per annum. when not specified)

Type of Interest

- Simple Interest
- Compound Interest

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(a) Simple Interest ⇒ $\frac{P \times R \times t}{100}$ [When R is in %]

$P \times i \times t$ [When R is in decimal]

here. $\left[i = \frac{R}{100}\right]$

(B). Accumulated Amount (A) in case of (SI) ⇒

$A = P + (I) \rightarrow SI.$

$A = P + (SI) \longrightarrow \frac{P \times R \times t}{100}$

$A = (P) + \left(\frac{P \times R \times t}{100}\right)$

$$A = P\left[1 + \left(\frac{Rt}{100}\right)\right]$$

- Simple Interest on Calculator →

→ $SI = P \times T \times R\ \%$. Trick.

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- **Accumulated Amount on Calculator -**

→ $A = (P \times T \times R\%) + P.$ trick

(ii) **Accumulated Amount for n^{th} year -**

n^{th} year = $A_n = P + n(SI_1)$

SI_1 = simple interest for 1 year.

and, $SI_1 = \frac{PRt}{100}$.

Example. ⇒ $A_3 = P + 3(SI_1)$.

$A_2 = P + 2(SI_1)$.

Lecture 02

(b) Compound Interest – (CI)

- CI = For next year Principal = Accumulated amt of previous year.

Ex- for 1st year.

$P = 1000$, $t = 1$ yrs

$R = 10.1$.

$CI_1 = \frac{P \times R \times t}{100}$

$= \frac{1000 \times 10 \times 1}{100} = 100$ ₹

$A = P + CI.$

$= 1000 + 100$

$= 1100$

for next year (2nd year).

P = Accumulated amount of 1st year.

$P. = 1100$

$R = 10\%$

$t = 1$ yr.

$I_2 = \frac{P \times R \times t}{100} = \frac{1100 \times 10 \times 1}{100} = 110$

and so on.

$$CI = I_1 + I_2 \ldots$$

(i) Accumulated Amount (A) in case of (CI) –

$$An = P\left(1 + \frac{R}{100}\right)^n.$$ nth year.

also, $A = P + CI$

then $CI = A - P$

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$CI = A - P \rightarrow P\left(1+\frac{R}{100}\right)^n$

$$CI = P\left(1+\frac{R}{100}\right)^n - P$$

- **Derivation of Accumulated amount formula :-**

for 1st year $\Rightarrow$ SI = CI.

$A_1 \Rightarrow$ Accumulated amt of SI = Accumulated amt of CI.

$$A_1 = P\left(1+\frac{R}{100}\right) \Rightarrow \text{as } t=1$$

2nd year onwards

$P_2 = A_1$

3rd year

$P_3 = A_2$

⋮

$n^{th} = P_n = A_{n-1}$

for any year.

$$A_n = P_n\left(1+\frac{R}{100}\right)^n$$

- Accumulated Amount in case of CI on calculator -

$A = P + \%\ + \%\ + \%\ \ldots$ (Then % for t times.)

⇐ Trick

- Compound Interest on calculator from Accumulated amount -

$CI = A - P.$

$CI = (P + \%\ + \%\ + \%\ldots) + \text{Principal.}$ (Then % for t times.)

Trick ⇒

- Conversion Period.

In previous situations time of annually so the P of next year was the accumulated amt of Previous year.

But if we want to take the Principal of next year is according to annually, semi annually, quarterly, monthly or

daily then,

Period	Conversion (C)	(no of conversion year) C.
1 yr	Annually (Jan → Jan)	1.
6 Month	Semi Annually (Jan → July → Jan)	2
3 Month	Quarterly (Jan → April → July → Oct → Jan)	4
Monthly	Every Month.	12
daily	Every day	365

- **Accumulated Amount in case of conversion period.**

$$A = P\left(1 + \frac{r}{c \times 100}\right)^{t \times c} \quad / \quad A = P(1+i)^n$$

$n = t \times c$, $i = \frac{r}{100c}$

- **Compound Interest in case of conversion Period**

$$CI = P\left[\left(1 + \frac{r}{c \times 100}\right)^{t \times c} - 1\right]$$

Or

$$CI = P\left[(1+i)^n - 1\right]$$

$i = \frac{r}{100c}$, $n = t \times c$

- **Accumulated Amount in case of conversion period on calculator →**

If conversion ~~is~~ semiannually, quarterly etc. and ~~it~~ r will be given according to p.a interest rate. in que. than

We can convert the rate in semiannually rate of interest as-

$\frac{r}{c}$ → (annual rate of interest

c → (conversion period)

then let as assume $\frac{r}{c}$ as Rolo.

$$Rolo = \frac{r}{c}..$$

on calculator.-

$$A = P + Rolo + Rolo + Rolo$$

(n times)

$$(n = t \times c)$$

- Compound Interest in Case of Conversion period on calculator →

considering Rolo the same as above

$CI = A - P.$

$$CI = P + \underbrace{R\% + R\% + R\% \text{ n times}}_{(n \overset{\downarrow}{=} t \times c)} - P.$$

Note :- If conversion period is not given assume that it is 1.

- formula for difference between CI & SI in general

$$CI - SI = P\left[\left(1 + \frac{r}{100}\right)^t - 1\right] - P.r.t$$

$$\left\{CI - SI = P\left[\left(1 + \frac{r}{100}\right)^t - 1 - rt\right]\right\}$$

Or.

You can separately calculate CI with the calculator trick as -

$$CI = P + \underbrace{R\% + R\% + R\% \text{ n times}} - P.$$

and SI = P × t × r%

and

than simply subtract.

CI with SI.