

**TOPIC**

Sales - COGS = GP.

SL - GL = 20L

$$EBIT - \text{Int. Tax} = PAT$$

$$15L - 2L - 2.6L = 10,40,000$$

## Profitability Ratios Formula

$$\text{Gross Profit Margin} = \frac{\frac{20L}{50L} \times 100}{\text{Sales}} = 40\%$$

$$\frac{15L}{50L} \times 100 = 30\% \quad \text{Operating Profit Margin} = \frac{\text{EBIT}}{\text{Sales}} \times 100$$

$$\text{Net Profit Margin} = \frac{\text{PAT}}{\text{Net Income}} \times 100 = \frac{10,40,000}{50,00,000} \times 100 = 20.8\%$$

$$\text{Return on Assets} = \frac{\text{PAT}}{\text{Net Income}} \times 100 = \frac{10,40,000}{100L} \times 100 = 10.40\%$$

$$\text{Return on Equity} = \frac{\text{PAT}}{\frac{\text{Net Income}}{\text{Shareholder's Equity}}} = \frac{10,40,000}{30,00,000} \times 100 = 34.67\%$$

## TOPIC

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

"₹1 blocked in stock generates sales of ₹10."

$$\Rightarrow \frac{10L}{1L} = 10 \text{ times}$$

$$\boxed{\text{DTR}} \quad \text{Receivables Turnover Ratio} = \frac{\text{Credit Sales}}{\text{Average Accounts Receivable}}$$

$$\Rightarrow \frac{35L}{7L} = 5 \text{ times}$$

"₹1 blocked in debtor generates ₹5 Sales"

Eg:- Sales = 50L  
 Op. Stock = 3L  
 Cl. Stock = 5L  
 Gr. P. Ratio = 20%  
 Cash Sale = 30% ~  
 Op. debt. = 6L  
 Cl. debt = 8L

IRR  
 } DTR

- \* Cogs = 50L - 20% = 40L
- \* Avg. Stock =  $\frac{\text{Op.} + \text{Cl.}}{2} = \frac{3L + 5L}{2} = 4L$
- \* Credit Sales = 50L - 30% = 35L
- \* Avg. Debtor =  $\frac{\text{Op.} + \text{Cl.}}{2} = \frac{6L + 8L}{2} = 7L$

## TOPIC



$$\text{Average Collection Period Formula} = \frac{365 \text{ Days}}{\text{Average Receivable Turnover Ratio}} = \frac{365}{5 \text{ times}} = 73 \text{ days}$$

Time taken to collect money



## TOPIC

Some Imp. Ratio for Bank Purpose

$$\textcircled{1} \text{ fixed charge ratio} = \frac{\text{EBIT}}{\text{Interest} + \text{Ref. Div.}} = \frac{15,00,000}{200000 + 14,000} = 4.41 \text{ times}$$

[Best if Above 1.5 : 1]

$$\textcircled{2} \text{ DSCR} \quad [\text{Debt Service Coverage Ratio}] = \frac{\text{EBIT}}{\text{Interest} + \frac{\text{Installment Principal Amount}}{5}} = \frac{15,00,000}{200000 + 40000} = 2.5 \text{ times}$$

⇒  $\frac{15,00,000}{200000 + 40000} = 2.5 \text{ times}$

$$= \frac{\text{EBIT} + \text{Depreciation}}{\text{Int.} + \frac{\text{Installment Principal Amount}}{5}}$$

$$\textcircled{3} \text{ Dividend Yield Ratio} = \frac{\text{DPS}}{\text{MPS}} = \frac{9 \times 60}{90} = \frac{5.4}{90} = 6-1.$$

eg:- EPS = 9 Payout @ 60% MPS 90 find D YR

[e.g.: 10% loan 2000,000 and 14% PSC 10L and EBIT 1500000  
loan to be repaid in 5 years]

## TOPIC

- ⇒ Fixed Asset Ratio =  $\frac{\text{Fixed Asset}}{\text{Long term liability}}$  =  $\frac{\text{Your}}{\text{Sour.}}$  - 0.8 times,  $\leq$
- e.g.: FA =  $\frac{\text{Your.}}{\text{Sour.}}$   $\Rightarrow$  Building  
 $\frac{=}{LTL} = \frac{\text{Your.}}{\text{Sour.}}$   $\Rightarrow$  mach.  
 $\Rightarrow$  furniture
- FA Ratio  $\leq 1$  is good
- ⇒ Debt-equity Ratio =  $\frac{\text{long term Debt}}{\text{Shareholders fund}}$  =  $\frac{30L}{15L}$  =  $2:1$   
 Best  $2:1$
- e.g.: Debenture = 10L  
 $\frac{=}{\text{Bond}} = 10L$   
 $\times \text{Bank std} = 5L$
- $\frac{ESC = 5L}{\text{Shareholder fund}}, \frac{RIS = 5L}{\text{Shareholder fund}}, \frac{\text{Profit} = 5L}{\text{Shareholder fund}}$

## TOPIC

⇒ Current Ratio =  $\frac{\text{Current Asset}}{\text{Current Liability}}$

eg:- Cash 8L  
Debtors 12L  
Stock 10L

$$\frac{8L + 12L}{10L} = \frac{20L}{10L} = 2:1$$

$\frac{\text{Current Asset}}{\text{Current Liability}} = \frac{30L}{15L} = 2:1$

Best Ratio = 2:1

(creditor 8L  
Bank overd 7L)  $\frac{15L}{15L}$

⇒ Liquidity Ratio (Quick Ratio) =  $\frac{\text{Quick Asset}}{\text{Current Liability}}$

\* Quick Asset = CA - Stock - Prepaid Exp.

eg:-  $30L - 10L - 5L = 15L$

$$\frac{\text{CA}}{15L} = \frac{30L - 10L - 5L}{15L} = 1:1$$

Best 1:1

⇒ Acid test Ratio :-  $\frac{\text{Cash} + \text{Market Sec.} + \text{Debtors}}{\text{Current Liability}} = \frac{3+2.5+2}{15L} = 0.5:1$

eg:- Cash 3L  
market 2.5L  
Deb 2L

CL = 15L

Best Ratio 0.5:1

**TOPIC**

- ⇒ EMI ↘
- ⇒ Double Period ↘
- ⇒ Simple Interest - Compound Int.
- ⇒ Annuity ↘

## **Unit 2 - Financial Mathematics — Calculation of Interest And Annuities**

## TOPIC

Eg:- Personal loan 1,00,000 @ 12-1. P.a. Time 1Y. EMI ?

$$\Rightarrow \frac{P \times r}{12} = \frac{1000 \times 1.1}{12} = \frac{1000 \times 1.1}{12}$$

$$\Rightarrow \frac{(P \times r) \times \frac{(1+r)^n}{(1+r)^n - 1}}{12} = \frac{100000 \times 1.1 \times \frac{(1+0.01)^{12}}{(1+0.01)^{12} - 1}}{12}$$

$$1 + r = 1 + 0.01 \Rightarrow 1000 \times \frac{1.1268}{0.1268} = 8887$$

$$\Rightarrow \boxed{1.01} \boxed{\times} \boxed{\frac{1}{12 \text{ times}}} \div \boxed{0.1268} \boxed{\times} \boxed{1000} \boxed{=} \boxed{8887}$$

↓  
Calculator

$$EMI = \frac{(1+r)^n}{(1+r)^n - 1} \times (P \times r)$$

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

$$(1.01) \boxed{\times} \frac{1}{12 \text{ times}} \approx 1.1268 \dots$$

$$= \frac{1.1268 \dots - 1}{0.1268} \approx$$

## TOPIC

$$\text{Time } \frac{10 \text{ years}}{12} = \boxed{\frac{10}{12} \text{ months}}$$

$$E = P \times r \times \frac{(1 + r)^n - 1}{(1 + r)^n}$$

Where,  $\boxed{20L}$   $\times \frac{24.1\%}{12} = \boxed{2.1\%} = \boxed{0.02}$

$$120 = \boxed{\frac{n}{12} \times 10}$$

$E$  is the EMI

$P$  is the principal amount

$r$  is the monthly rate of interest

$n$  is the number of months

$$\underline{20,00,000 \times 2.1\% = 40000}$$

$$(1+0.02) \quad \begin{matrix} 12 \\ \times \end{matrix} \quad \begin{matrix} 10 \\ \div \end{matrix} \quad \begin{matrix} 9.765 \\ = \end{matrix} \quad \begin{matrix} 40.000 \\ \times \end{matrix} \quad \begin{matrix} 44096 \\ = \end{matrix}$$

$\boxed{1.02} \quad \boxed{1.2682 \dots}$

$\boxed{1.02} \quad \boxed{10.765}$

$\boxed{1.024} \quad \boxed{44096}$

$$\Rightarrow (20L \times 2.1\%) \times \frac{(1.02)^{120}}{(1.02)^{120} - 1}$$

## TOPIC

↳ Doubling Period :- e.g. ₹ 200 invested @  $\frac{12}{1}$ %, Time taken to double it?

$$\text{The Rule of 72} = \frac{72}{\text{Rate of Return (\%)}} \Rightarrow \frac{72}{12} = 6 \text{ year}$$

$$\text{If ROI} = 8\% = \frac{72}{8} = 9 \text{ year}$$

$$\text{Ex} \rightarrow \frac{\text{SI} \rightarrow 50,00,000 \times 0.46\%}{23000} = 10y @ \frac{5.5\%}{12} = \frac{0.46\%}{100} = 0.0045 + 1 = (1.0045)^{100}$$

$$1.0045 \times \frac{1}{1.055} \times \frac{1}{1.7139} = 0.7139 \times 2.4007 = 23000 = 55218$$

## TOPIC

### SIMPLE INTEREST?

$$\text{Interest} = \boxed{\text{Principal} \times \text{Rate} \times \text{Time}}$$

Illustration

1. The amount of total interest to be paid,
2. The total amount to be paid back after 2 years,

Given: Principal: ' $P$ ' = Rs 60,000, Interest rate: ' $R$ ' = 12% = 0.12, Repayment time: ' $T$ ' = 2 years

Part 1: Find the amount of interest paid. Interest: ' $I$ ' =  $PRT$

$$= \underline{60,000} \times \underline{0.12} \times \underline{2}$$
$$\text{Interest} = \underline{\underline{14,400}}$$

## TOPIC

Int. = 12

60000

Part 2: Find the total amount to be paid back. Total repayments = Principal + Interest

$$= \underline{60,000} + \underline{14,400} \approx$$

$$= \underline{74,400} \Rightarrow \text{Repay Value}$$

COMPOUND INTEREST > Simple Interest =

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

$$\begin{aligned} & \frac{60,000 \times (1 + 0.12)^2}{=} \\ & = 75264 \\ & - (60,000) \end{aligned}$$

$$\text{Interest} \boxed{15264} \approx$$

Special Note: When interest is compounded continually compound interest equation takes the form

$$\boxed{A = Pe^{rt}} \quad \text{where } e \text{ is approximately } \underline{2.71828}$$

Constant Value

e.g.: -  $P = \underline{60,000}$   $I = \underline{12\%}$  and Time = 2y and compounding continually  
find Repay Amount and Interest (given:  $e^{0.24} = 1.30$ )

$$\Rightarrow P e^{rt} \Rightarrow \frac{60,000}{P} \times \frac{e^{0.12 \times 2}}{e^{rt}} = 60,000 \times \underline{e^{0.24}} = \underline{60000 \times 1.30} = \boxed{78000}$$

-60,000

## TOPIC

### FIXED AND FLOATING INTEREST RATES

✓ Fixed Rate: In the fixed rate, the rate of interest is fixed. Q 107.

✓ Floating Rate: In the floating rate or variable rate, the rate of interest changes, depending upon the market conditions. ↑ ↑

### FRONT-END AND BACK-END INTEREST RATES

↳ not in India



EMI ⇒ Famous in India

If the interest is deducted from the principal amount and only the net amount is disbursed, it is called front-end interest. The normal practice in banking industry is to charge back-end interest rate which means that the full amount of the loan is disbursed and the interest is charged subsequently on monthly/quarterly/agreed basis.

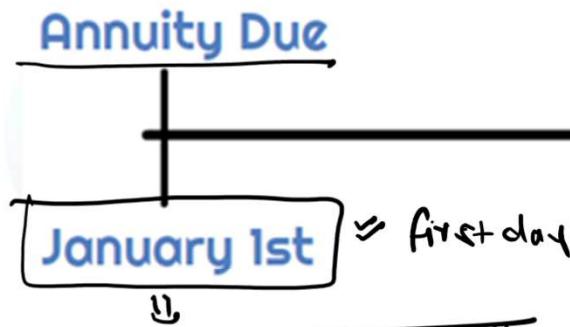
$$\text{Front end: } \underline{\underline{50,00,000 + 20,00,000}} \Rightarrow \text{Loan Amount } 70,00,000 - \underline{\underline{20,00,000}} = \underline{\underline{50,00,000}}$$

$$\text{Back End: } \underline{\underline{\text{P} + I}} = \underline{\underline{\text{EMI}}} \checkmark$$

## TOPIC

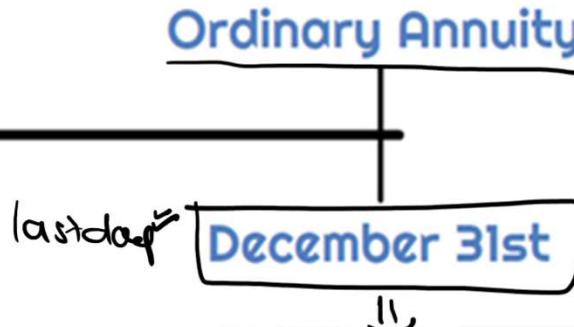
# Ordinary Annuity vs Annuity Due

For annuity due, payment is due at the beginning of each period (e.g. January 1st). For an ordinary annuity, payment is due at the end of each period (e.g. December 31st)



$$\text{Future Value} = C \times \left[ \frac{(1+r)^n - 1}{r} \right] (1+r)$$

$$\text{Present Value} = C \times \left[ \frac{(1+r)^n - 1}{r(1+r)^n} \right]$$



$$\text{Future Value} = C \times \left[ \frac{(1+r)^n - 1}{r} \right]$$

$$\text{Present Value} = C \times \left[ \frac{(1+r)^n - 1}{r(1+r)^n} \right]$$

Annuity  
↓  
Fix Amount ⇒ Fix time  
↓  
⇒ Annually

<u>C</u> = Cash flow
<u>r</u> = Rate of Int.
<u>n</u> = Time Period

## TOPIC

eg Cash flow = 50000 r = 12%. Time Sy

$$\frac{1.12}{12} \times \frac{1}{5} = 1.12 \times 0.12 \times 50000 =$$

$$FV(0A) \Rightarrow C \times \left[ \frac{(1+r)^n - 1}{r} \right] = 50,000 \times \left[ \frac{(1+0.12)^5 - 1}{0.12} \right] = 3,17,642$$
  

$$PV(0A) \Rightarrow C \times \left[ \frac{(1+r)^n - 1}{r(1+r)^n} \right] = \frac{3,17,642}{1.12} \div 5 \text{ times} = 1,80,239$$
  

$$FV(AD) \Rightarrow C \times \left[ \frac{(1+r)^n - 1}{r} \right] \times (1+r) = 3,17,642 \times 1.12 = 3,55,759$$
  

$$PV(AD) \Rightarrow C \times \left[ \frac{(1+r)^n - 1}{r(1+r)^n} \right] \times (1+r) = 1,80,239 \times 1.12 = 2,01,868$$

## TOPIC

### Illustration

10,00,000

$$\Rightarrow FV = (1+r)^n$$
$$PV = \frac{1}{(1+r)^n}$$

The population of an industrial town is increasing by 5% every year. If the present population is 1 million, estimate the population five years hence. Also, estimate the population three years ago.

### Solution

Present population, P = 1 million, rate of increase = 5% per annum

Hence, the population after 5 years =  $10,00,000 (1.05)^5 = 12,76,280$

Population three years ago =  $10,00,000 / (1.05)^3 = 8,63,838$

Since the population three years ago, compounded at 5 per cent, is equal to 1 million, today.  $\Rightarrow FV = \frac{10L}{1.05} \times (1+0.05)^5 = 12,76,280$

$$FV = \frac{1.05}{1.05} \times \frac{1}{4} \times 10L =$$
  
$$PV = \frac{1}{1.05} = \frac{1}{3 \text{time}} \times 10L$$

$$\Rightarrow PV = \frac{10,00,000 \times 1}{(1+0.05)^3} = 8,63,838$$