- **Sinking Fund**
  - The purpose of sinking fund is to create a fund when a big liability is to be repaid at the end of a known period like redemption of debentures that entails a huge cash outflow to the firm.

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

  - A = Annuity; FV Future value; r = rate of interest
  - The formula for sinking fund is reciprocal of the compound value annuity.

- A Company has issued debentures of Rs. 50 lakh to be repaid after 7 years. How much should the company invest in a sinking fund, earning 12 percent in order to repay Debentures?

$$50,00,000 * \left[\frac{0.12}{(1+0.12)^7 - 1} \right] = Rs.495,867.77$$

- Your father has promised to give you Rs. 1,00,000 in cash on your 25th birthday. Today is your 16th birthday. He wants to know the following things:

    (a) If he decides to make annual payments into a fund after one year, how much cash will each have to be if the fund pays 8 percent?

    (b) If he decides to invest a lump sum in the account after one year and let it compound annually, how much will be the lump sum?

    (c) If in (a) the payments are made in the beginning of the year, how much will be value of annuity?

- A).

$$100,000 \left[\frac{0.08}{(1+0.08)^9 - 1} \right] = Rs.8,008$$

- Father has to contribute Rs. 8.008 every year, commencing from his 17th birthday. He has to contribute for 9 birthdays as 16th birthdays are already over.

- Compound Value of A lump sum : P $(1 + I)^n$
  - P = Principal at the beginning of the period

$$100,000 = P*(1+0.08)^8 = P*1.8509$$

$$P = \frac{100,000}{1.8509} = Rs.54.027$$

- Suppose you deposit Rs. 900 per month into an account that pays 4.8% interest, compounded monthly. How much money will you have after 9 months?

$$FV = A\frac{(1+i)^n - 1}{i}$$

$$i = 0.048 / 12 = 0.0004$$

$$n = 12 * (9 / 12) = 9$$

$$FV = 900 * \frac{(1 + 0.0004)^9 - 1}{0.0004}$$

$$= Rs.8112.97$$

- Suppose you have opened a long-term account with Rs. 2000 in it. The account earns 6.2% interest, compounded monthly and you deposit Rs. 50 every month for the next 20 years. How much will be in the account at the end of those 20 years?

- In this case, we have already deposited Rs. 2000 in the account when you start making the periodic deposits.

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

$$n = 12$$

- In this case, Rs. 2000 was already in the account .

$$FV = 2000 * (1 + \frac{0.062}{12})^{12*20} = 6889.20$$

$$n = 12$$

- No that Rs. 50 per month for 20 years is like the part of a sinking fund.
- The formula of sinking fund to see how much that will be worth 20 years from now:

$$FV = 50 * \frac{(1 + \frac{0.062}{12})^{12*20} - 1}{0.062/12} = 23,657.42$$

- The total amount in the account after 20 years will be the sum of what we got from the original Rs. 2000
- The total amount from our monthly deposits will be 6889.20+23657.42=30,546

- Suppose you want to open an education account for the youngest child in your family/relatives and would like to have Rs. 75000 after 15 years. You find an account that pays 5.5% interest, compounded semi-annually and you would like to deposit money in the account every six months. How large must each deposit be in order to reach your saving goal?

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

- Semi-annually, 2 times per year, so n =2

$$PV = 75000 * \frac{0.056/2}{(1+0.056/2)^{2*15} - 1} = 1628.19$$

We must 1628 every six months to have 75000 in the account after 15 years.

- Suppose you have just won the lottery and decide to take the 20 year annuity option. The lottery commission invests his winnings in an account that pays 4.8% interest, compounded annually. Each year for those 20 years, you receive a check from the lottery commission for Rs. 250,000. What is the present value of your winnings? What is the total amount of money that you will get over the 20 year period.

$$PV = 250000 * \frac{1 - (1 + 0.048)^{-20}}{0.048} = Rs.3169070.90$$

Income Statement in Million	
Rupees	
Revenue	100
Costs of goods sold	70
other costs	10
EBIT	20
Taxes	4
Interest expense	5
Earnings	11
Number of share	2 million@32

Balance Sheet (annual average in millions)

Current Assets		
	Cash	2
	Marketable securities	1
	Receivables	3
	Inventory	9
Total Current assets		15
Total long-term assets		175
Total assets		190
Current liabilities		5
Long-term debt		95
Total debt		100
Owner's Equity		90

- Find the following ratios
  1. Current ratio
  2. Quick ratio
  3. Cash ratio
  4. Asset turnover ratio
  5. Inventory turnover ratio
  6. Debt/asset ratio
  7. Equity multiplier
  8. Times-Interest-Earned Ratio
  9. Net profit margin
  10. ROE
  11. Earning Yields
  12. PE ratio

- **Current ratio** = currents/current liabilities
  - Measures short-term debt paying ability

- **Quick ratio** = (cash + marketable securities + receivables)/current liabilities
  - A refined measure of the short-term debt-paying ability of the firm.
  - Measures short-term solvency

- **Cash ratio** = (cash + market securities)/current liabilities
  - This ratio shows the company's ability to repay its short-term debt.

- **Asset turnover ratio**: Revenue/assets
  - This ratio shows how efficiently a company can use its assets to generate sales.

- **Inventory turnover ratio**= cost of goods sold/inventory
  - Evaluation of efficiency in producing and selling goods and adequacy of controls on inventory holding
- **Debt to asset ratio** = total debt/total assets
  - Depicts extent of total debt financing in business.

- **Equity multiplier** = Assets/Equity
  - It measures financial leverage.
  - Companies finance their operations with equity or debt, so a high equity multiplier indicates that a larger portion of asset financing is attributed to debt.

- **Times-interest-earned (TIE) ratio** = EBIT/(Interest Expense)
  - company's ability to meet its debt obligations.
  - The interest expense includes the total interest payable on bonds and other contractual debt.
  - TIE indicates how many times a company can cover its interest charges on a pre-tax earnings basis.

- **Net profit margin** = Earnings/Revenue
  - It shows how much of each dollar collected by a company as revenue translates into profit.

- **RoE** = Total Earnings/Total equity
  - Return on equity measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.

- **Earning yield** = earnings per share/price per share
  - The earnings yield (which is the inverse of the P/E ratio) shows the percentage of each dollar invested in the stock that was earned by the company.

- **Price-Earnings Ratio (P/E Ratio)** = price per share/earnings per share
  - It shows the dollar amount an investor can expect to invest in a company in order to receive one dollar of that company's earnings.

- **Current ratio** = currents/current liabilities = 15/5=3
- **Quick ratio** = (cash + marketable securities + receivables)/current liabilities =6/5=1.2
- **Cash ratio** = (cash + market securities)/current liabilities=3/5=0.6
- **Asset turnover ratio**: Revenue/assets=100/190=0.53
- **Inventory turnover ratio**= cost of goods sold/inventory=70/9=7.78
- **Debt to asset ratio** = total debt/total assets = 100/190 = 0.53
- **Equity multiplier** = Assets/Equity = 190/90=2.11

- **Times-interest-earned ratio** = EBIT/(Interest Expense) = 20/5=4

- **Net profit margin** = Earnings/Revenue = 11/100=0.11

- **RoE** = Total Earnings/Total equity = 11/90=0.12

- **Earning yield** = earnings per share/price per share =(11/2)/32=0.17

- **P/E ratio** = price per share/earnings per share = 32/(11/2)=5.82

- In the corporate finance, we analyse four types of ratios
  - **Liquidity Ratios**: They measure the firm's ability to meet current obligations
  - **Leverage Ratios**: These ratios show the proportion of debt and equity in financing the firm's assets.
  - **Activity Ratios**: They reflect the firm's efficiency in utilising the assets
  - **Profitability Ratios**: These ratios measure overall performance and effectiveness of the firm.

- **Liquidity Ratios:**
  - **Current Ratio**
  - Quick Ratio
  - Cash ratio

- **Leverage ratio**

    1. **Debt-Equity Ratio**
        - Total debt/total equity or total long-term debt/net worth
        - Net worth = Equity share capital + preference share capital + reserves and surpluses

    2. **Debt-Equity Ratio**
        - Total debt ratio: Total debt/ total assets

                = Long-term debts + Current liabilities/Total debts + Net worth

    3. Interest Coverage ratio: The interest coverage ratio is used to test the firm's debt-servicing capacity.

    Interest coverage = EBDIT/Interest

    The higher the IC ratio, better it is both for the firm and lenders.

- **Activity Ratios**
  - Inventory turnover ratio is also known as stock turnover ratio
    - Inventory Turnover Ratio = Cost of goods sold/Average inventory at cost
    - Average inventory = Opening stock + closing stock/2
    - Costs of goods sold: Opening stock + Purchases – Closing stock
      = Net Sales – Gross profit

    - A higher ratio is an indication that the firm is moving the stocks better so profitability, in such a situation, would be more.

- **Days of Inventory holdings:**
  - **Number of days of inventory holdings = 360/Inventory turnover ratio**

- **Total Assets Turnover Ratio**
  - **Sales/ total assets**

  The idea is that if the firm manages the assets more efficiently, sales would be more and equally profits would be up

- **Profitability ratios**
  - **Gross Profit Ratio** = Sales-cost of goods sold*100/sales
    - Gross profit*100/Sales
  - **Net Profit Ratio** = [Profit after tax/Sales]*100
    - Net profit is obtained, after deducting operating expenses, interest and taxes from gross profit
  - **Operating Expenses Ratios:** To identify the cause of fall or rise in net profit, each operating expense ratio is to be calculated
    - Operating expense ratio = Operating expense/Sales

- **Return on Total Assets**: EBIT/Total Assets

- **Return on Equity** = Profit after tax – Preference dividend/Equity shareholders funds

- **Earnings per Share** = Net profit after tax preference dividend/Number of equity shares outstanding

- **Price Earnings Ratio** = Market price per equity share/Earnings per equity share