Concept of Compound Interest

Understanding Notes:

- Compound Interest (CI) is the interest calculated not only on the original principal but also on the interest added to it over time.
- In simple words, in Compound Interest, the interest becomes part of the principal for the next period.
- It is widely used in banks, investments, and loans.
- In Compound Interest, the amount grows faster compared to Simple Interest.

Important Points:

- **Principal (P):** Original sum of money.
- **Rate (R):** Interest rate per year.
- **Time (T):** Time in years.
- **Amount (A):** Total money after adding interest.
- Compound Interest (CI) = Amount – Principal
- Formula for Amount when interest is compounded annually:

$$\mathbf{A = P \times \left(1 + \frac{R}{100}\right)^{t}}$$

- Compound Interest = A – P
- When compounded half–yearly, rate becomes $\frac{R}{2}$ and time becomes 2T.

Different Types of Examples with Solutions:

Example Easy (1year, annual compounding)

➢ **Find the Compound Interest on ₹5000 at 8% per annum for 1 year.**

Solution: Amount = $5000 \times \left(1 + \frac{8}{100}\right)^{1}$

$= 5000 \times \left(\frac{108}{100}\right)$

$= 5000 \times 1.08$

= ₹5400

CI = 5400 – 5000 = ₹400

Example Easy (2 years, annual compounding)

➢ **Find the Compound Interest on ₹2000 at 5% per annum for 2 years.**

Solution: Amount = $2000 \times \left(1 + \frac{5}{100}\right)^2$

= $2000 \times \left(\frac{105}{100}\right)^2$

= $2000 \times \left(\frac{21}{20}\right) \times \left(\frac{21}{20}\right)$

= $2000 \times \frac{441}{400}$

= ₹2205

CI = 2205 – 2000 = ₹205

Example Moderate (Find Amount first, then CI)

- **Principal = ₹6000, Rate = 10% per annum, Time = 2 years. Find CI.**

Solution: Amount = $6000 \times \left(1 + \frac{10}{100}\right)^2$

= $6000 \times \left(\frac{110}{100}\right)^2$

= $6000 \times \left(\frac{11}{10}\right) \times \left(\frac{11}{10}\right)$

= $6000 \times \frac{121}{100}$

= ₹7260

CI = 7260 – 6000 = ₹1260

Example Moderate (Half–yearly compounding)

- **Find the Compound Interest on ₹8000 at 8% per annum compounded half–yearly for 1 year.**

Solution: Rate per half year = $\frac{8}{2}$ = 4%

Time = 1 × 2 = 2 half–years

Amount = $8000 \times \left(1 + \frac{4}{100}\right)^2$

= $8000 \times \left(\frac{104}{100}\right)^2$

= $8000 \times \left(\frac{26}{25}\right) \times \left(\frac{26}{25}\right)$

= $8000 \times \frac{676}{625}$

= ₹8652.80

CI = 8652.80 – 8000 = ₹652.80

Example Moderate (Find principal when CI and Amount given)

➢ **Compound Interest for 2 years at 5% p.a. is ₹512.50. Find the principal.**

Solution: Let Principal = P

Amount = $P \times \left(1 + \frac{5}{100}\right)^2$

= $P \times \left(\frac{21}{20}\right) \times \left(\frac{21}{20}\right)$

= $P \times \frac{441}{400}$

Now, CI = A – P = 512.50

So, A = P + 512.50

Thus,

$P \times \frac{441}{400} = P + 512.50$

Multiply both sides by 400:

441P = 400P + 205000

441P – 400P = 205000

41P = 205000

$P = \frac{205000}{41}$

P = ₹5000

Summary Points:

- In Compound Interest, interest is added to the principal every year or period.
- Formula: $A = P \times \left(1 + \frac{R}{100}\right)^T$
- CI = A – P
- For half–yearly compounding, divide rate by 2 and multiply time by 2.
- Compound Interest grows faster than Simple Interest over time.