Compound Interest Formula

Understanding Notes:

- Compound Interest is the interest calculated on the principal and also on the accumulated interest of previous periods.
- The formula helps in easily finding the total amount and the interest earned over time.
- In Compound Interest, after every compounding period, the interest gets added to the principal.

Important Points:

- Principal (P) = Original sum of money
- Rate (R) = Rate of interest per annum
- Time (T) = Number of years
- Amount (A) = Total money after interest is added
- Compound Interest (CI) = Amount (A) – Principal (P)
- Formula for Amount when compounded annually:

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

- For Half–Yearly Compounding:

  Rate becomes $\frac{R}{2}$ and Time becomes 2T

- For Quarterly Compounding:

  Rate becomes $\frac{R}{4}$ and Time becomes 4T

Different Types of Examples with Solutions:

Example Easy (Annual Compounding 1 year)

➢ **Find the amount and CI on ₹3000 at 5% p.a. for 1 year.**

Solution: $A = 3000 \times \left(1 + \frac{5}{100}\right)^{1}$

$= 3000 \times \frac{105}{100}$

$= 3000 \times 1.05$

= ₹3150

CI = 3150 – 3000 = ₹150

Example Easy (Annual Compounding 2 years)

- **Find the amount and CI on ₹4000 at 6% p.a. for 2 years.**

Solution: A = $4000 \times \left(1 + \frac{6}{100}\right)^2$

= $4000 \times \left(\frac{106}{100}\right)^2$

= $4000 \times \left(\frac{53}{50}\right) \times \left(\frac{53}{50}\right)$

= $4000 \times \frac{2809}{2500}$

= ₹4494.40

CI = 4494.40 – 4000 = ₹494.40

Example Moderate (Find Principal when Amount and CI given)

- **Amount after 2 years at 5% p.a. is ₹2205. Find the Principal.**

Solution: A = P × $\left(1 + \frac{5}{100}\right)^2$

P = $2205 \times \left(\frac{100}{105}\right)^2$

P = $2205 \times \left(\frac{20}{21}\right) \times \left(\frac{20}{21}\right)$

P = $2205 \times \frac{400}{441}$

P = ₹2000

Example Moderate (Half–Yearly Compounding)

- **Find the amount and CI on ₹5000 at 10% p.a. compounded half–yearly for 1 year.**

Solution: Rate per half year = $\frac{10}{2}$ = 5%

Time = 1 × 2 = 2 half–years

A = $5000 \times \left(1 + \frac{5}{100}\right)^2$

= $5000 \times \left(\frac{21}{20}\right) \times \left(\frac{21}{20}\right)$

= $5000 \times \frac{441}{400}$

= ₹5512.50

CI = 5512.50 – 5000 = ₹512.50

Example Moderate (Quarterly Compounding):

- **Find the amount and CI on ₹8000 at 8% p.a. compounded quarterly for 1 year.**

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

Time = 1 × 4 = 4 quarters

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

$= 8000 \times \left(\frac{102}{100}\right)^4$

$= 8000 \times \left(\frac{51}{50}\right)^4$

$= 8000 \times \frac{1061201}{1000000}$

= ₹8490.41

CI = 8490.41 – 8000 = ₹490.41

Summary Points:

- Use $A = P \times \left(1 + \frac{R}{100}\right)^T$ for yearly compounding.
- Adjust rate and time properly for half–yearly and quarterly compounding.
- Compound Interest = Amount – Principal.
- Compound Interest grows faster than Simple Interest over time.
- Always read the question carefully to check if compounding is yearly, half–yearly, or quarterly.