Computation of Compound Interest

Understanding Notes:

- Computation of Compound Interest means calculating the total interest earned or paid when interest is added back to the principal after every period.
- Each year, new interest is calculated on the increased principal (principal + previous interest).
- Compound Interest is different from Simple Interest because in CI, interest earns more interest.
- Compound Interest depends on Principal, Rate, Time, and the method of compounding (yearly, half–yearly, and quarterly).

Important Points:

- Formula for Amount (Annual Compounding):
- $A = P \times \left(1 + \frac{R}{100}\right)^T$
- Compound Interest (CI) = Amount (A) Principal (P)
- 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.
- Always check how the interest is compounded before starting calculation.

Different Types of Examples with Solutions:

Example Easy (Annual Compounding, 1 year)

Find the compound interest on ₹4000 at 5% p.a. for 1 year.

Solution: Amount = $4000 \times \left(1 + \frac{5}{100}\right)^{1}$ = $4000 \times \left(\frac{105}{100}\right)$ = 4000×1.05 = ₹4200 Cl = 4200 - 4000 = ₹200

Example Easy (Annual Compounding, 2 years):

Find the CI on ₹2500 at 4% p.a. for 2 years.

Solution: Amount = $2500 \times \left(1 + \frac{4}{100}\right)^2$

$$= 2500 \times \left(\frac{104}{100}\right)^2$$
$$= 2500 \times \left(\frac{26}{25}\right) \times \left(\frac{26}{25}\right)$$
$$= 2500 \times \frac{676}{625}$$
$$= ₹2704$$

CI = 2704 – 2500 = ₹204

Example Moderate (Half-Yearly Compounding, 1 year)

Find the CI on ₹6000 at 8% p.a. compounded half-yearly for 1 year.

Solution: Rate per half-year = $\frac{8}{2}$ = 4% Time = 1 × 2 = 2 half-years Amount = 6000 × $\left(1 + \frac{4}{100}\right)^2$ = 6000 × $\left(\frac{104}{100}\right)^2$ = 6000 × $\left(\frac{26}{25}\right)$ × $\left(\frac{26}{25}\right)$ = 6000 × $\frac{676}{625}$ = ₹6489.60 CI = 6489.60 - 6000 = ₹489.60

Example Moderate (Find Principal given Amount and Rate)

➤ The amount after 2 years at 6% p.a. is ₹5307.60. Find the principal.

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

A = P × $\left(\frac{106}{100}\right)^2$
A = P × $\left(\frac{53}{50}\right)$ × $\left(\frac{53}{50}\right)$
A = P × $\frac{2809}{2500}$

So,

$$\mathsf{P} = \frac{5307.60 \times 2500}{2809}$$

P = ₹4725

Example Moderate (Quarterly Compounding, 1 year)

Find the CI on ₹16000 at 8% p.a. compounded quarterly for 1 year.

Solution: Rate per quarter = $\frac{8}{4}$ = 2% Time = 1 × 4 = 4 quarters Amount = 16000 × $\left(1 + \frac{2}{100}\right)^4$ = 16000 × $\left(\frac{102}{100}\right)^4$ = 16000 × $\left(\frac{51}{50}\right)^4$ First, $\frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} = \frac{1061201}{1000000}$ Thus, Amount = 16000 × $\frac{1061201}{1000000}$ = ₹16979.22 Cl = 16979.22 - 16000 = ₹979.22

Summary Points:

- Always use the correct formula depending on yearly, half-yearly, or quarterly compounding.
- CI = Amount Principal.
- For half–yearly compounding, halve the rate and double the time.
- For quarterly compounding, divide rate by 4 and multiply time by 4.
- Compound Interest grows faster than Simple Interest because interest gets added to principal every period.