

# Compound Interest

## EXERCISE - 1.1

Q1. Find the amount and the compound interest on Rs. 8000 at 5% per annum for 2 years.

Sol.

$$\text{Principal} = 8000$$

$$\text{Rate of interest} = 5\% \text{ p.a.}$$

$$\text{Interest for the first year} = \frac{\text{PTR}}{100} = \frac{8000 \times 5 \times 1}{100} = 400.$$

$$\text{Principal for the second year} = 8000 + 400 = 8400.$$

$$\text{Interest for the second year} = \frac{8400 \times 5 \times 1}{100} = 420.$$

$$\text{Amount after the second year} = 8400 + 420 = 8820.$$

$$\text{Total Compound Interest} = 8820 - 8000 = 820.$$

Q2. A person invests a Rs. 5600 at 14% p.a. Compound interest 2 years. find:

(i) the interest for the first year.

(ii) amount at the end of the first year.

(iii) the interest for the 2<sup>nd</sup> year, correct to the nearest rupee.

Sol.

$$\text{Principal} = 5600$$

$$\text{Rate of interest} = 14\% \text{ p.a.}$$

$$(i) \text{ Interest for the 1<sup>st</sup> year} = \frac{\text{PTR}}{100} = \frac{5600 \times 1 \times 14}{100} = 784.$$

$$(ii) \text{ Amount after one year} = 5600 + 784 = 6384.$$

$$(iii) \text{ Interest for the 2<sup>nd</sup> year} = \frac{6384 \times 14 \times 1}{100} = 893.76 = 894.$$

Q3. A man invests Rs. 46875 at 4% p.a. Compound Interest (CI) for 3 years. Calculate:

(i) the interest for the 1<sup>st</sup> year.

(ii) the amount standing to his credit at the end of the second year.

(iii) the interest for the third year.

Sol.

$$\text{principal} = 46875$$

$$\text{Rate of interest} = 4\% \text{ p.a.}$$

$$(i) \text{ Interest for the 1st year} = \frac{46875 \times 4 \times 1}{100} = 1875$$

$$\text{principal for the 2nd year} = 46875 + 1875 = 48750$$

$$\text{Interest for the 2nd year} = \frac{48750 \times 4 \times 1}{100} = 1950$$

$$(ii) \text{ Amount after second year} = 48750 + 1950 = 50700$$

$$(iii) \text{ Interest for the 3rd year} = \frac{50700 \times 4 \times 1}{100} = 2028$$

Q4. Calculate the CI for the second year on Rs. 8000 invested for 3 years at 10% p.a. Also find the sum due at the end of third year.

Sol.

$$\text{principal} = 8000 \quad \text{Rate of interest} = 10\% \text{ p.a.}$$

$$\text{Interest for the first year} = \frac{8000 \times 10 \times 1}{100} = 800$$

$$\text{principal for the second year} = 8000 + 800 = 8800$$

$$(i) \text{ Interest for the second year} = \frac{8800 \times 10 \times 1}{100} = 880$$

$$\text{principal for the 3rd year} = 8800 + 880 = 9680$$

$$\text{Interest for the third year} = \frac{9680 \times 10 \times 1}{100} = 968$$

$$(ii) \text{ Amount after the third year} = 9680 + 968 = 10648$$

Q5. Ramesh invests Rs 12800 for 3 years at the rate of 10% p.a. CI. Find: (i) the sum due to Ramesh at the end of the first year. (ii) the interest he earns for the second year. (iii) the total amount due to him at the end of 3 years.

Sol.

$$\text{Rate of interest} = 10\% \text{ p.a.}$$

$$\text{Interest for first year} = \frac{12800 \times 10 \times 1}{100} = 1280$$

$$\text{amount or sum due to Ramesh at the end of first year} \\ = 12800 + 1280 = 14080$$

$$(ii) \text{ principal for the 2nd year} = 14080$$

$$\text{Interest for 2nd year} = \frac{14080 \times 10 \times 1}{100} = 1408$$

(iii) principal for 3<sup>rd</sup> year =  $14080 + 1408 = 15488$ .

Interest for 3<sup>rd</sup> year =  $\frac{15488 \times 10 \times 1}{100} = 1548.80$

Amount due to him at the end of 3 years =  $15488 + 1548.80 = 17036.80$

Q6. The simple interest on a sum of money for 2 years at 4% p.a. is Rs. 340. find (i) the sum of money (ii) the compound interest on this sum for one year payable half yearly at the same rate.

sol. SI for 2 years = 340.

$SI = \frac{PRT}{100} \Rightarrow 170 = \frac{P \times 4 \times 1}{100} \Rightarrow P = 4250$

(i) the sum of money = 4250.

(ii) Since the rate of interest is 4% p.a.

the rate of interest half-yearly = 2%.

principal for the 1<sup>st</sup> half year = 4250

Interest for 1<sup>st</sup> half year =  $\frac{4250 \times 2 \times 1}{100} = 85$

Amount for 1<sup>st</sup> half year =  $4250 + 85 = 4335$ .

principal for 2<sup>nd</sup> half year = 4335.

Interest for 2<sup>nd</sup> half year =  $\frac{4335 \times 2 \times 1}{100} = 86.70$

Amount after one year =  $4335 + 86.70 = 4421.70$

Compound Interest after one year =  $4421.70 - 4250 = 171.70$

Q7. A person invests Rs. 10000 for two years at a certain rate of interest, compounded annually. At the end of one year this sum amounts to Rs. 11200. Calculate: (i) the rate of interest p.a. (ii) the amount at the end of second year.

sol. Investment = 10000, Time = 2 years, Amount (1 year) = 11200

(i) Interest =  $11200 - 10000 = 1200$ , Time = 1 year.

Interest =  $\frac{P \times R \times T}{100} \Rightarrow 1200 = \frac{10000 \times R \times 1}{100} \Rightarrow R = 12\%$

(ii) principal for 2<sup>nd</sup> year = 11200

$I = \frac{11200 \times 12 \times 1}{100} = 1344$

Amount =  $11200 + 1344 = 12544$ .

Q8. A man invests Rs. 5000 for 3 years at a certain rate of interest compounded annually. At the end of one year it amounts to Rs. 5600. Calculate: (i) The rate of interest p.a. (ii) The interest accrued in the 2<sup>nd</sup> year (iii) The amount at the end of the third year.

Sol.

$$\text{principal} = 5000$$

$$\text{let the rate of interest} = R\% \text{ p.a.}$$

$$\text{at the end of one year, interest} = \frac{PRT}{100} = \frac{5000 \times R \times 1}{100} = 50R.$$

$$\text{Amount} = 5000 + 50R.$$

$$5600 = 5000 + 50R \Rightarrow 50R = 600 \Rightarrow R = 12\%.$$

$$(i) \text{ Rate of interest} = 12\%.$$

$$(ii) \text{ Interest for the 2<sup>nd</sup> year} = \frac{5600 \times 12 \times 1}{100} = 672.$$

$$\text{Amount at the end of 2<sup>nd</sup> year} = 5600 + 672 = 6272.$$

$$\text{Interest for the 3<sup>rd</sup> year} = \frac{6272 \times 12 \times 1}{100} = 752.64.$$

$$\text{Amount after 3<sup>rd</sup> year} = 6272 + 752.64 = 7024.64.$$

Q9. Find the amount and the CI on Rs. 2000 at 10% p.a. for  $2\frac{1}{2}$  years.

Sol.

$$\text{principal (P)} = 2000$$

$$\text{Rate of interest (R)} = 10\% \text{ p.a.}$$

$$\text{period (n)} = 2\frac{1}{2} \text{ years.}$$

$$\begin{aligned} \text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n = 2000 \left(1 + \frac{10}{100}\right)^2 \left(1 + \frac{10}{2 \times 100}\right) \\ &= 2000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{21}{20} = 2541. \end{aligned}$$

$$\text{Interest} = 2541 - 2000 = 541.$$

Q10. Find the amount and CI on Rs. 50000 for  $1\frac{1}{2}$  years at 8% p.a. the interest being compound semi-annually.

Sol.

$$\text{Rate of interest} = 8\% \text{ p.a.}$$

$$\text{Rate of interest half-yearly} = 4\%.$$

$$\text{principal for 1<sup>st</sup> half year} = 50000$$

$$\text{Interest for 1<sup>st</sup> half year} = \frac{50000 \times 4 \times 1}{100} = 2000.$$

$$\text{Amount after 1<sup>st</sup> half year} = 50000 + 2000 = 52000.$$

principal for the 2<sup>nd</sup> half year = 52000.

$$\text{Interest for the 2<sup>nd</sup> half year} = \frac{52000 \times 4 \times 1}{100} = 2080$$

$$\text{Amount after 2<sup>nd</sup> half year} = 52000 + 2080 = 54080$$

principal for 3<sup>rd</sup> half year = 54080

$$\text{Interest of 3<sup>rd</sup> half year} = \frac{54080 \times 4 \times 1}{100} = 2163.20$$

$$\text{Amount after } 1\frac{1}{2} \text{ year} = 54080 + 2163.20 = 56243.20$$

$$\begin{aligned} \text{Compound interest for } 1\frac{1}{2} \text{ year} &= \text{final amount} - \text{principal} \\ &= 56243.20 - 50000 = 6243.20 \end{aligned}$$

Q11. Calculate the amount and the CI on Rs. 5000 in 2 years when the rate of interest for the successive years is 6% and 8% respectively.

Sol.

$$\text{principal} = 5000 \quad \text{Time} = 2 \text{ years}$$

Rate of interest for the 1<sup>st</sup> year = 6% and for the 2<sup>nd</sup> year = 8%

$$\begin{aligned} \text{Amount for 2 years} &= P \left(1 + \frac{R}{100}\right)^n \\ &= 5000 \left(1 + \frac{6}{100}\right) \left(1 + \frac{8}{100}\right) = 5000 \times \frac{53}{50} \times \frac{27}{25} = 5724 \end{aligned}$$

$$\text{Interest} = A - P = 5724 - 5000 = 724$$

Q12. Calculate the amount and the CI on Rs. 17000 in 3 years when the rate of interest for successive years is 10%, 10% and 14% respectively.

Sol.

$$\text{principal} = 17000 \quad \text{Time} = 3 \text{ years}$$

Rate of interest for the 3 successive years = 10%, 10% and 14%

$$\begin{aligned} \text{Amount after 3 years} &= P \left(1 + \frac{R}{100}\right)^n = 17000 \left(1 + \frac{10}{100}\right) \left(1 + \frac{10}{100}\right) \left(1 + \frac{14}{100}\right) \\ &= 17000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{57}{50} = \frac{117249}{5} = 23449.80 \end{aligned}$$

$$\text{Amount of CI} = A - P$$

$$= 23449.80 - 17000$$

$$= 6449.80$$

Q13. A Sum of Rs. 9600 is invested for 3 years at 10% p.a. at CI.

- (i) what is the Sum due at the end of 1<sup>st</sup> year.
- (ii) what is the Sum due at the end of 2<sup>nd</sup> year.
- (iii) find the CI earned in 2 years.
- (iv) Find the difference b/w the answers in (ii) and (i) and find the interest on this Sum for one year.
- (v) Hence write down the CI for the 3<sup>rd</sup> year.

Sol. Principal = 9600, Rate of interest = 10% p.a., Time = 3 years.

$$\text{Interest for the 1<sup>st</sup> year} = \frac{PRT}{100} = \frac{9600 \times 10 \times 1}{100} = 960.$$

$$(i) \text{ Amount after one year} = 9600 + 960 = 10560.$$

$$\text{Interest for the 2<sup>nd</sup> year} = \frac{10560 \times 10 \times 1}{100} = 1056.$$

$$(ii) \text{ Amount after 2 years} = 10560 + 1056 = 11616.$$

$$(iii) \text{ CI in 2 years} = 960 + 1056 = 2016.$$

$$(iv) \text{ The difference b/w answers in (ii) \& (i)} = 11616 - 10560 = 1056.$$

Interest on 1056 for 1 year at the rate of 10% p.a.

$$= \frac{1056 \times 10 \times 1}{100} = 105.60$$

$$(v) \text{ principal for the 3<sup>rd</sup> year} = 11616$$

$$\text{Interest} = \frac{11616 \times 10 \times 1}{100} = 1161.60$$

Q14. The SI on a certain Sum of money for 3 years at 10% p.a. is Rs. 1600. find the amount due and the CI on this Sum of money at the same rate after 3 years, interest being reckoned annually.

Sol. SI = 1600, Rate = 10% p.a., Time = 3 years.

$$SI = \frac{PRT}{100} \Rightarrow 1600 = \frac{P \times 10 \times 3}{100} \Rightarrow P = 8000$$

$$\text{Amount after 3 years} = P \left(1 + \frac{R}{100}\right)^n = 8000 \left(1 + \frac{10}{100}\right)^3$$

$$= 8000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = \text{Rs. } 10648.$$

$$CI = A - P = 10648 - 8000 = 2648.$$

Q15. A man invests Rs. 4000 for 3 years at CI. After one year the money amounts to Rs. 4320. Find the amount due at the end of 3 years.

sol. principal (P) = 4000, Amount (A) = 4320.

$$\text{Interest} = A - P = 4320 - 4000 = 320.$$

$$\text{Rate of Interest} = \frac{320 \times 100}{4000 \times 1} = 8\%$$

$$\begin{aligned} \text{Amount after 3 years} &= P \left(1 + \frac{R}{100}\right)^n = 4000 \left(1 + \frac{8}{100}\right)^3 \\ &= 4000 \times \frac{27}{25} \times \frac{27}{25} \times \frac{27}{25} = 5038.85 = 5039 \end{aligned}$$

Q16. A man borrowed Rs. 6000 at 5% CI. If he pays Rs. 1200 at the end of each year, find the amount outstanding at the beginning of the 3<sup>rd</sup> year.

sol. principal (P) = 6000, rate of interest = 5% p.a.

$$\text{Interest for the 1<sup>st</sup> year} = \frac{PRT}{100} = \frac{6000 \times 5 \times 1}{100} = 300.$$

$$\text{Amount after one year} = 6000 + 300 = 6300.$$

$$\text{Amount paid} = 1200$$

$$\text{Balance} = 6300 - 1200 = 5100$$

$$\text{Interest for 2<sup>nd</sup> year} = \frac{5100 \times 5 \times 1}{100} = 255.$$

$$\text{Amount for 2<sup>nd</sup> year} = 5100 + 255 = 5355.$$

$$\text{Amount paid} = 1200$$

$$\text{Balance} = 5355 - 1200 = 4155.$$

Q17. A man borrows Rs. 15000 at 14% p.a. CI. If he pays Rs. 400 at the end of first year and Rs. 5220 at the end of 2<sup>nd</sup> year, find the amount of loan outstanding at the beginning of the third year.

Sol.

principal (P) = 15000, Rate = 14%.

$$\text{Interest for the 1st year} = \frac{15000 \times 14 \times 1}{100} = 2100.$$

$$\text{Amount after 1st year} = 15000 + 2100 = 17100.$$

$$\text{Amount paid} = 4100.$$

$$\text{Balance} = 17100 - 4100 = 13000.$$

$$\text{Interest for the 2nd year} = \frac{13000 \times 14 \times 1}{100} = 1820.$$

$$\text{Amount after 2nd year} = 13000 + 1820 = 14820.$$

$$\text{Amount paid} = 5220.$$

$$\text{Balance} = 14820 - 5220 = 9600.$$

$$\text{Amount due at the beginning of 3rd year} = 9600.$$

Q18. Vikram borrowed Rs. 20000 from a bank at 10% p.a. SI. He lent it to his friend Venkat at the same rate but compounded annually. find his gain after  $2\frac{1}{2}$  years.

Sol. In the 1st case, principal = 20000, Rate = 10% p.a, period =  $2\frac{1}{2} = \frac{5}{2}$

$$SI = \frac{PRT}{100} = \frac{20000 \times 10 \times 5}{100 \times 2} = 5000$$

In the 2nd case, principal = 20000, Rate = 10% p.a.  
period =  $2\frac{1}{2}$  years at CI.

$$\begin{aligned} \text{Amount} &= P \left(1 + \frac{R}{100}\right)^n = 20000 \left(1 + \frac{10}{100}\right)^2 \left(1 + \frac{10}{2 \times 100}\right) \\ &= 20000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{21}{20} = 25410. \end{aligned}$$

Q19. Sachin invests Rs. 200000 for 2 years at 12% p.a. compounded annually. If the interest accrued is subject to income tax at 25% at the end of each year, find the amount he received at the end of 2 years.

Sol.

principal = 200000, Rate = 12% p.a.

$$\text{Interest for 1st year} = \frac{200000 \times 12 \times 1}{100} = 24000.$$



$$\text{Amount after 1st year} = 200000 + 24000 = 224000.$$

$$\text{Income tax at 25\%} = 24000 \times \frac{25}{100} = 6000.$$

$$\text{Balance Sum} = 224000 - 6000 = 218000.$$

$$\text{Interest for the 2nd year} = \frac{218000 \times 12 \times 1}{100} = 26160.$$

$$\text{Income tax at 25\%} = 26160 \times \frac{25}{100} = 6540.$$

$$\begin{aligned} \text{Amount after 2nd year} &= 218000 + 26160 - 6540 \\ &= 237620. \end{aligned}$$

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### EXERCISE - 1.2

Q1. Find the amount and the CI on Rs. 5000 for 2 years at 6% p.a. interest payable yearly.

Sol. principal (P) = 5000, Rate (R) = 6% p.a., period (n) = 2 years.

$$\text{Amount (A)} = P \left(1 + \frac{R}{100}\right)^n = 5000 \left(1 + \frac{6}{100}\right)^2 = 5000 \times \frac{53}{50} \times \frac{53}{50} = 5618.$$

$$\therefore \text{CI} = A - P = 5618 - 5000 = 618.$$

Q2. Find the amount and the CI on Rs. 8000 for 4 years at 10% p.a. interest reckoned yearly.

Sol. principal (P) = 8000, Rate = 10% p.a., period (n) = 4 years.

$$A = 8000 \left(1 + \frac{10}{100}\right)^4 = 8000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = 11712.80$$

$$\text{CI} = A - P = 11712.80 - 8000 = 3712.80.$$

Q3. If the interest is compounded half yearly, Calculate the amount when the principal is Rs. 7400, the rate of interest is 5% and the duration is one year.

Sol. principal (P) = 7400, Rate = 5% =  $\frac{5}{2}$ %.

time = 1 year = 2 half years.

$$\text{Amount} = 7400 \times \left(1 + \frac{5/2}{100}\right)^2 = 7400 \left(1 + \frac{2.5}{100}\right)^2 = 7400 \times \frac{102.5}{100} \times \frac{102.5}{100}$$

$$= 7774.625.$$

Q4. Find the amount and the CI on Rs. 5000 at 10% p.a. for  $1\frac{1}{2}$  years. CI reckoned semi-annually.

Sol. principal = 5000, R = 10% p.a. (or) 5% half yearly.

period =  $1\frac{1}{2}$  y (or) 3 half years.

$$A = 5000 \left(1 + \frac{5}{100}\right)^3 = 5000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = 5788.12$$

$$\text{CI} = A - P = 5788.12 - 5000 = 788.12.$$

Q5. Find the amount and the CI on Rs. 100000 compounded quarterly for 9 months at the rate of 4% p.a.

Sol. principal = Rs. 100000 , Rate = 4% p.a. (or) 1% quarterly.  
period = 9 months or 3 quarters

$$A = 100000 \left(1 + \frac{1}{100}\right)^3 = 100000 \times \frac{101}{100} \times \frac{101}{100} \times \frac{101}{100}$$
$$= 103030.10$$

$$CI = A - P = 103030.10 - 100000 = 3030.10$$

Q6. Find the difference b/w C.I and S.I on sum of Rs. 4800 for 2 years at 5% p.a. payable yearly.

Sol. principal = 4800 , Rate = 5% p.a. , period = 2 years.

$$SI = \frac{4800 \times 5 \times 2}{100} = 480$$

when compounded yearly,  $A = 4800 \left(1 + \frac{5}{100}\right)^2$

$$= 4800 \times \frac{21}{20} \times \frac{21}{20} = 5292.$$

$$CI = 5292 - 4800 = 492.$$

$$\text{Difference b/w CI and SI} = 492 - 480 = 12.$$

Q7. Find the difference between SI and CI on Rs. 2500 for 2 years at 4% p.a. CI being reckoned semi annually.

Sol. principal (P) = 2500 , Rate = 4% p.a. (or) 2% half yearly  
period (n) = 2 years (or) 4 half years.

$$SI = \frac{PRT}{100} = \frac{2500 \times 4 \times 2}{100} = 200.$$

when compounded semi annually,  $A = P \left(1 + \frac{R}{100}\right)^n$

$$= 2500 \left(1 + \frac{2}{100}\right)^4 = 2500 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}$$
$$= 2706.08$$

$$CI = A - P = 2706.08 - 2500 = 206.08.$$

$$\text{Difference b/w CI and SI} = 206.08 - 200 = 6.08.$$

Q8. Find the amount and the CI on Rs. 2000 in 2 years if the rate is 4% for the 1<sup>st</sup> year and 3% for the 2<sup>nd</sup> year.

Sol. principal (P) = 2000, Rate = 4% on 1<sup>st</sup> year and 3% for the 2<sup>nd</sup> year  
period (n) = 2 years.

$$\text{Amount} = P \left(1 + \frac{R}{100}\right)^n = 2000 \left(1 + \frac{4}{100}\right) \left(1 + \frac{3}{100}\right) = 2000 \times \frac{26}{25} \times \frac{103}{100} \\ = 2142.40$$

$$\text{CI} = A - P = 2142.40 - 2000 = 142.40$$

Q9. Find the CI on Rs. 3125 for 3 years if the rate of interest for the first, second and third year are respectively 4%, 5% and 6% p.a.

Sol. principal (P) = 3125, Rate = 4%, 5%, 6%  
period (n) = 3 years.

$$\text{Amount} = 3125 \left(1 + \frac{4}{100}\right) \left(1 + \frac{5}{100}\right) \left(1 + \frac{6}{100}\right) = 3125 \times \frac{26}{25} \times \frac{21}{20} \times \frac{53}{50} \\ = 3617.25$$

$$\text{CI} = A - P = 3617.25 - 3125 = 492.25$$

Q10. What the sum of money will amount to Rs. 1352 in 2 years at 4% CI p.a. compounded annually?

Sol. Amount (A) = 1352, Rate = 4% p.a., period = 2 years.

$$A = P \left(1 + \frac{R}{100}\right)^n \Rightarrow 1352 = P \left(1 + \frac{4}{100}\right)^2 \Rightarrow 1352 = P \times \frac{26}{25} \times \frac{26}{25} \\ \Rightarrow P = 1352 \times \frac{25}{26} \times \frac{25}{26} = 1250$$

$$\therefore \text{principal (P)} = 1250$$

Q11. What sum invested at 4% p.a. semi-annually amounts to Rs. 7803 at the end of one year?

Sol. Amount (A) = 7803, Rate = 4% p.a. (or) 2% semi-annually.  
period = 1 year (or) 2 half years.

$$A = P \left(1 + \frac{R}{100}\right)^n \Rightarrow 7803 = P \left(1 + \frac{2}{100}\right)^2 \Rightarrow P = 7803 \times \frac{50}{51} \times \frac{50}{51} \\ \Rightarrow P = 7500$$

$$\therefore \text{principal} = 7500$$

Q12. what sum invested for  $1\frac{1}{2}$  years compounded half-yearly at the rate of 4% p.a. will amount to Rs. 132651?

Sol. Amount (A) = 132651, Rate = 4% p.a. (or) 2% half yearly.  
period =  $1\frac{1}{2}$  years (or) 3 half years.

$$A = P\left(1 + \frac{R}{100}\right)^n \Rightarrow 132651 = P\left(1 + \frac{2}{100}\right)^3 = P\left(\frac{51}{50}\right)^3$$

$$\Rightarrow P = 132651 \times \frac{50}{51} \times \frac{50}{51} \times \frac{50}{51} = 125000$$

$$\therefore \text{principal} = 125000.$$

Q13. on what sum will the C.I. for 2 year at 4% p.a. be Rs. 5712?

Sol. C.I. = 5712, Rate = 4% p.a., period = 2 years.

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

$$C.I. = A - P = P\left(1 + \frac{R}{100}\right)^n - P = P\left[\left(1 + \frac{R}{100}\right)^n - 1\right]$$

$$\Rightarrow 5712 = P\left[\left(1 + \frac{4}{100}\right)^2 - 1\right] = P\left[\left(\frac{26}{25}\right)^2 - 1\right] = P\left[\frac{676}{625} - 1\right]$$

$$\Rightarrow 5712 = P\left[\frac{676 - 625}{625}\right] \Rightarrow P = 5712 \times \frac{625}{51} = 70000$$

$$\therefore \text{principal} = 70000$$

Q14. A man invests Rs. 1200 for 2 years at C.I. after 1 year the money amounts to Rs. 1275. find the interest for the 2<sup>nd</sup> year correct to the nearest rupee.

Sol. principal = 1200

after one year the amount = 1275.

$$\text{Interest for one year} = 1275 - 1200 = 75.$$

$$\text{Rate of interest} = \frac{SI \times 100}{P \times T} = \frac{75 \times 100}{1200 \times 1} = \frac{75}{12} = \frac{25}{4} = 6\frac{1}{4}\% \text{ p.a.}$$

Interest for the 2<sup>nd</sup> year on Rs. 1275 at the rate of  $\frac{25}{4}\%$ .

$$= \frac{PRT}{100} = \frac{1275 \times 25 \times 1}{100 \times 4} = \frac{1275}{16} = 79.70 = 80.$$

Q15. At what rate % p.a. CI will Rs. 2304 amount to Rs. 2500 in 2 years?

Sol. Amount = 2500, principal = 2304, period = 2 years.

let rate % = R% p.a.

$$A = P \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{2500}{2304} = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^2 = \frac{625}{576} \Rightarrow \left(1 + \frac{R}{100}\right)^2 = \left(\frac{25}{24}\right)^2$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{25}{24} \Rightarrow \frac{R}{100} = \frac{25}{24} - 1 = \frac{1}{24} \Rightarrow R = \frac{100}{24}$$

$$\Rightarrow R = \frac{25}{6} = 4\frac{1}{6} \% \text{ p.a.}$$

$\therefore$  Rate =  $4\frac{1}{6} \% \text{ p.a.}$

Q16. A Sum Compounded annually becomes  $\frac{25}{16}$  times of itself in 2 years. Determine the rate of interest p.a.

Sol. let the Sum (P) = x then amount (A) =  $\frac{25}{16}x$ .

period (n) = 2 years.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{25x}{16x} = \left(1 + \frac{R}{100}\right)^2 \Rightarrow \left(\frac{5}{4}\right)^2 = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{5}{4} \Rightarrow \frac{R}{100} = \frac{5}{4} - 1 \Rightarrow \frac{R}{100} = \frac{1}{4} \Rightarrow R = 25$$

$\therefore$  Rate of interest = 25% p.a.

Q17. At what rate % will Rs. 2000 amount to Rs. 2315.25 in 3 years at CI?

Sol. principal (P) = 2000, Amount (A) = 2315.25, period = 3 years.

let rate of interest = R% p.a.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{2315.25}{2000} = \left(1 + \frac{R}{100}\right)^3$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^3 = \frac{2315.25}{100 \times 2000} = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{21}{20} \Rightarrow \frac{R}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow R = 5\%$$

$\therefore$  Rate of interest = 5% p.a.

Q18. If Rs. 40000 amounts to Rs. 4860.25 in 2 years, CI payable half-yearly, find the rate of interest p.a.

Sol. principal (P) = 40000, Amount (A) = 48620.25

period (n) = 2 years = 4 half-years.

let the rate of interest = R% p.a. or  $\frac{R}{2}\%$  half yearly.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{48620.25}{40000} = \left(1 + \frac{R}{100}\right)^4$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^4 = \frac{48620.25}{100 \times 40000} = \frac{194481}{160000}$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^4 = \left(\frac{21}{20}\right)^4 \Rightarrow 1 + \frac{R}{100} = \frac{21}{20}$$

$$\Rightarrow \frac{R}{100} = \frac{21}{20} - 1 = \frac{1}{20} \Rightarrow R = 10$$

$\therefore$  Rate of interest = 10% p.a.

Q19. Determine the rate of interest for a sum that becomes  $\frac{216}{125}$  times of itself in  $1\frac{1}{2}$  years, compounded semi-annually.

Sol. let the principal (P) =  $x$ , Amount (A) =  $\frac{216}{125}x$ .

period (n) =  $1\frac{1}{2}$  years = 3 half years.

let the rate percent per year = 2R%.

$\therefore$  Rate half yearly = R%.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{216x}{125x} = \left(1 + \frac{R}{100}\right)^3 \Rightarrow \left(1 + \frac{R}{100}\right)^3 = \left(\frac{6}{5}\right)^3$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{6}{5} \Rightarrow \frac{R}{100} = \frac{1}{5} \Rightarrow R = 20\%$$

Rate % per year =  $2 \times 20 = 40\%$ .

Q20. At what rate % p.a. CI would Rs. 80000 amount to Rs. 88200 in 2 years, interest being compounded yearly. Also find the amount after 3 years at the above rate of CI.

Sol. Principal (P) = Rs. 80000, Amount (A) = 88200.

period (n) = 2 years.

let the rate of interest = R% p.a.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{88200}{80000} = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^2 = \frac{441}{400} = \left(\frac{21}{20}\right)^2 \Rightarrow 1 + \frac{R}{100} = \frac{21}{20}$$

$$\Rightarrow \frac{R}{100} = \frac{21}{20} - 1 = \frac{1}{20} \Rightarrow R = 5$$

$\therefore$  Rate = 5% p.a.

Qst. A Certain Sum amounts to Rs. 5292 in 2 years and to Rs. 5556.60 in 3 years at CI. find the rate and the Sum.

Sol. Amount after 2 years = 5292 and  
 amount after 3 years = 5556.60  
 Difference = 5556.60 - 5292 = 264.60  
 264.60 is interest on Rs. 5292 for 1 year  
 Rate % =  $\frac{SI \times 100}{P \times T} = \frac{264.60 \times 100}{5292 \times 1} = \frac{26460 \times 100}{100 \times 5292} = 5\%$   
 we know that  $A = P\left(1 + \frac{R}{100}\right)^n \Rightarrow 5292 = P\left(1 + \frac{5}{100}\right)^2$   
 $\Rightarrow 5292 = P\left(\frac{21}{20}\right)^2 \Rightarrow P = 5292 \times \frac{20}{21} \times \frac{20}{21} = 4800$   
 $\therefore$  principal = 4800.

Qst. A Certain Sum amounts to Rs. 798.60 after 3 years and Rs. 878.46 after 4 years. find the interest rate and the Sum.

Sol. Amount after 3 years = 798.60 and  
 amount after 4 years = 878.46.  
 Difference = 878.46 - 798.60 = 79.86.  
 79.86 is interest on 798.60 for 1 year.  
 Rate =  $\frac{79.86 \times 100}{798.60 \times 1} = 10\%$   
 $A = P\left(1 + \frac{R}{100}\right)^n \Rightarrow 798.60 = P\left(1 + \frac{10}{100}\right)^3 = P\left(\frac{11}{10}\right)^3$   
 $\Rightarrow P = \frac{79860}{100} \times \frac{10}{11} \times \frac{10}{11} \times \frac{10}{11}$   
 $\Rightarrow P = 600.$



Q23. In what time will Rs. 15625 amount to Rs. 17576 at 4% p.a. CI?

Sol. : Amount (A) = 17576, principal (P) = 15625, Rate = 4% p.a.

let period = n years

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{17576}{15625} = \left(1 + \frac{4}{100}\right)^n \Rightarrow \left(\frac{26}{25}\right)^3 = \left(\frac{26}{25}\right)^n$$

$$\therefore n = 3$$

\therefore Hence time = 3 years.

Q24. In what time will a sum of Rs. 1562.50 produce Rs. 195.10 at 4% p.a. CI?

Sol. principal (P) = 1562.50, CI = 195.10

$$\text{Amount (A)} = 1562.50 + 195.10 = 1757.60$$

Rate = 4% p.a.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{1757.60}{1562.50} = \left(1 + \frac{4}{100}\right)^n$$

$$\Rightarrow \left(\frac{26}{25}\right)^3 = \left(\frac{26}{25}\right)^n$$

$$\therefore n = 3$$

Hence time = 3 years.

Q25. Rs. 16000 invested at 10% p.a., compounded semi-annually, amounts to Rs. 18522. Find the time period of investment.

Sol. principal (P) = 16000, Amount (A) = 18522.

Rate = 10% p.a. (or) 5% Semi-annually.

let period = n half years.

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{18522}{16000} = \left(1 + \frac{5}{100}\right)^n$$

$$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^n \Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^n$$

$$\therefore n = 3 \text{ half years.}$$

\therefore Hence time =  $\frac{3}{2} = 1\frac{1}{2}$  years.

Q26. What Sum will amount to Rs. 2782.50 in 2 years at CI, if the rates are 5% and 6% for the successive years?

Sol. Amount (A) = 2782.50

Rate of 2 successive years = 5% and 6%

$$A = P \left(1 + \frac{R}{100}\right)^n \Rightarrow 2782.50 = P \left(1 + \frac{5}{100}\right) \left(1 + \frac{6}{100}\right)$$

$$\Rightarrow P = 2782.50 \times \frac{20}{21} \times \frac{50}{53} = 2500.$$

$\therefore$  principal = 2500.

Q27. A sum of money is invested at CI payable annually. The interest in two successive years is Rs. 225 and Rs. 240. Find:

(i) The rate of interest (ii) The original sum (iii) The interest earned in the third year.

Sol. Interest for the 1<sup>st</sup> year = 225. and Interest for the

2<sup>nd</sup> year = 240.

$$\text{Difference} = 240 - 225 = 15.$$

Rs. 15 is interest on Rs. 225 for 1 year.

$$\text{Rate} = \frac{SI \times 100}{P \times T} = \frac{15 \times 100}{225 \times 1} = \frac{20}{3} = 6\frac{2}{3}\% \text{ p.a.}$$

Q28. The difference between the compound and simple interest on a sum of money deposited for 2 years at 5% p.a. was Rs. 12. Find the sum of the money.

Sol. Let principal = 100, Rate = 5% p.a., period = 2 years.

$$SI = \frac{PRT}{100} = \frac{100 \times 5 \times 2}{100} = 10$$

$$\text{At compound interest, } A = P \left(1 + \frac{R}{100}\right)^n = 100 \left(1 + \frac{5}{100}\right)^2$$

$$= 100 \times \frac{21}{20} \times \frac{21}{20} = \frac{441}{4}$$

$$CI = A - P = \frac{441}{4} - 100 = \frac{41}{4}$$

$$\text{Difference b/w CI and SI} = \frac{41}{4} - 10 = \frac{1}{4}$$

If difference is Rs.  $\frac{1}{4}$  then sum = 100.

and if difference is Rs. 12, then sum =  $\frac{100 \times 4}{1} \times 12 = \text{Rs. } 4800$

Q29. The difference b/w the CI for a year payable half-yearly and the SI on a certain sum of money lent out at 10% for a year is Rs. 15. Find the sum of money lent out.

Sol. Let Sum = 100, Rate = 10% p.a (or) 5% half-yearly  
 period = 1 year (or) 2 half years.

$$A = P \left(1 + \frac{R}{100}\right)^n = 100 \left(1 + \frac{5}{100}\right)^2 = 100 \times \frac{21}{20} \times \frac{21}{20} = \frac{441}{4}$$

$$CI = A - P = \frac{441}{4} - 100 = \frac{41}{4}$$

$$SI = \frac{PRT}{100} = \frac{100 \times 10 \times 1}{100} = 10$$

Difference b/w CI and SI =  $\frac{41}{4} - 10 = \frac{1}{4}$   
 If difference is  $\frac{1}{4}$  then Sum = 100 and if difference is

$$\text{Rs. 15 then Sum} = \frac{100 \times 4 \times 15}{1} = 6000$$

Q30. The amount at CI which is calculated yearly on a certain sum of money is Rs. 1250 in one year and Rs. 1375 in two years. Calculate the rate of interest.

Sol. Amount after one year = 1250.

and amount after two years = 1375

$$\text{Difference} = 1375 - 1250 = 125.$$

$$\text{Rate of interest} = \frac{SI \times 100}{P \times T} = \frac{125 \times 100}{1250 \times 1} = 10\%$$

Q31. The SI on a certain sum for 3 years is Rs. 225 and the CI on the same sum at the same rate for 2 years is Rs. 153. Find the rate of interest and the principal.

Sol. SI for 3 years = 225

$$\text{and SI for 2 years} = \frac{225 \times 2}{3} = 150.$$

and CI for 2 years = 153.

$$\text{Difference} = 153 - 150 = 3.$$

Now Rs. 3 is interest on one year interest i.e., Rs. 75 for one year.

$$\text{Rate} = \frac{\text{SI} \times 100}{\text{P} \times \text{T}} = \frac{3 \times 100}{75 \times 1} = 4\%$$

Now SI for 3 years = 225. , Rate = 4% p.a.

$$\text{principal} = \frac{\text{SI} \times 100}{\text{R} \times \text{T}} = \frac{225 \times 100}{4 \times 3} = 1875.$$

Q32. Find the difference b/w CI on Rs. 8000 for  $1\frac{1}{2}$  years at 10% p.a. when compounded annually and Semi annually.

Sol. principal (P) = 8000 , Rate = 10% p.a. (or) 5% half-yearly.  
period =  $1\frac{1}{2}$  years (or) 3 half years.

In 1<sup>st</sup> case when compounded annually

$$A = P \left(1 + \frac{R}{100}\right)^n = 8000 \left(1 + \frac{10}{100}\right) \left(1 + \frac{5}{100}\right) \\ = 8000 \times \frac{11}{10} \times \frac{21}{20} = 9240.$$

$$\text{CI} = A - P = 9240 - 8000 = 1240.$$

In 2<sup>nd</sup> case, when compounded half-yearly.

$$A = 8000 \left(1 + \frac{5}{100}\right)^3 = 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = 9261$$

$$\text{CI} = 9261 - 8000 = 1261$$

$$\text{Difference between two CI} = 1261 - 1240 = 21.$$

Q33. A Sum of money is lent out at a CI for 2 years at 20% p.a. CI being reckoned yearly. If the same sum of money is lent out at CI at the same rate % p.a., CI being reckoned half-yearly it would have fetched Rs. 482 more by way of interest. Calculate the sum of money lent out.

Sol. let Sum = 100. , Rate = 20% p.a. (or) 10% half-yearly.  
period = 2 years or 4 half years.

In 1<sup>st</sup> case, when the interest is reckoned yearly then

$$A = 100 \left(1 + \frac{20}{100}\right)^2 = 100 \times \frac{6}{5} \times \frac{6}{5} = 144.$$

$$\therefore CI = A - P = 144 - 100 = 44$$

In 2<sup>nd</sup> case, when the interest is reckoned half yearly, then

$$A = 100 \left(1 + \frac{10}{100}\right)^4 = 100 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = 146.41.$$

$$CI = A - P = 146.41 - 100 = 46.41$$

$$\text{Difference b/w two CI} = 46.41 - 44 = 2.41$$

If difference is 2.41, then Sum = 100.

$$\text{and if difference is 482, then Sum} = \frac{100 \times 482}{2.41} = 20000.$$

Q34. A sum of money amounts to Rs. 13230 in one year and to Rs. 13891.50 in  $1\frac{1}{2}$  years at CI, compounded semi-annually. find the sum and the rate of interest p.a.

Sol. Amount after one year = 13230.

and amount after  $1\frac{1}{2}$  years = 13891.50

$$\text{Difference} = 13891.50 - 13230 = 661.50.$$

$$\text{Rate} = \frac{661.50 \times 100 \times 2}{13230 \times 1} = 10\% \text{ p.a.}$$

We know that  $A = P \left(1 + \frac{R}{100}\right)^n$

$$\Rightarrow 13230 = P \left(1 + \frac{10}{100}\right)^1$$

$$\Rightarrow P = 13230 \times \frac{10}{11}$$

$$\rightarrow P = 12027.30$$

$\therefore$  principal = 12027.30.