SIMPLE AND COMPOUND INTEREST

Definition

Interest	Interest is the amount to be paid on the borrowed money or the amount received on the money lent
Principal	The borrowed money or the lent money is called Principal.
Amount	The sum of the interest and the principal is called the Amount.
Interest Rate	The rate at which the interest is charged on the principal is called Rate of Interest.
Time	The period for which the money is borrowed or deposited is called Time.

Interest can be classified in two types:

1) Simple Interest
2) Compound Interest

Simple Interest

When the interest is calculated only on the Principal for every year, it is called Simple Interest.

Simple Interest can be calculated by the formula:

$$SI = \frac{P \times R \times T}{100}$$

Where, P = Principal, r = Rate of interest per year, t = Time period in years

Points to Remember

- When the time period is given in months, we convert it into year by dividing it by 12.
- When the time period is given in days, we convert it into year by dividing it by 365.

Q1. Rs.1080 invested for 3 months gave an interest of Rs.27. The simple rate of interest per annum was:

Solution: 3 months

$=\frac{3}{12}$years

SI = $\frac{PRT}{100}$

⇒ 27 = (1080 × r × 3/12)/100

⇒ 27 = (90 × r × 3)/100

⇒ 27 = 270r/100

∴ r = 10%.

Compound Interest

It is the interest paid on the original principal amount and the accumulated past interest.

Formulas related to compound Interest:

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

CI = A - P

Points to Remember

- When rate is compounded half yearly, then we take rate half and time double, then A=P $(1 + \frac{\left(\frac{R}{2}\right)}{100})^{2T}$
- When rate is compounded quarterly, then we take rate one fourth and time 4 times, Then A= P$(1 + \frac{\left(\frac{R}{4}\right)}{100})^{4T}$
- If rate of compound interest differs from year to year, then A= P $(1+\frac{R1}{100})(1 + \frac{R2}{100})(1 + \frac{R3}{100})$

Q2. Find compound interest on Rs.50000 at 12% per annum for 1 year if compounded half yearly.

Solution:

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

$=50000(1 + \frac{\frac{12}{2}}{100})^{2\times1}$

$=50000(\frac{106}{100})^2$

= Rs 56180

∴ C.I. = A – P = 56180 – 50000 = Rs 6180.

Q3. What will be the amount if a sum of Rs.25000 is placed at CI for 3 years while rate of interest for the first, second, and third years is 4%, 8%, and 10%, respectively?

Solution.

$A = P (1 + r_1/100) (1 + r_2/100) (1 + r_3/100)$

$= 25000 (1 + 4/100) (1 + 8/100) (1 + 10/100)$

$= 25000 (104/100) (108/100) (110/100) = 30888.$

Tree-method

In this method we assume principle (on the basis of rate and time given) such that it eases our calculation part and at the end we compare it to the value given in question to get the required answer.

For example – If 10% interest rate is given for 2 years then we will assume principle as Rs. 100 and if times is 3 years, then we will assume principle as Rs. 1000. It is done to avoid any calculation in decimal form.

Q4. Find compound interest for principal Rs 10000, time = 3 years and rate = 10%.

Solution.

Normal Method:

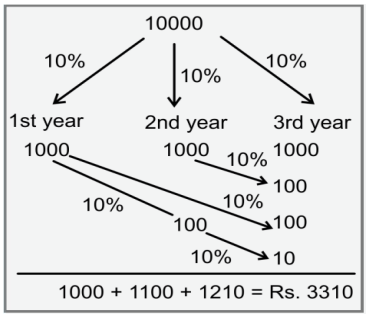
Amount= $P(1 + \frac{r}{100})^t$

= $10000 (1 + \frac{10}{100})^3$

=Rs 13310

C.I. = A − P = 10000 − 13310 = Rs. 3310

Tree Method:



Step 1: Take principle (Rs 10000 here).

Step 2: For year at 10%, interest =

Rs. 1000

For 2nd year, total interest =

interest on principle +

interest on interest of 1st year =

1000 + 100 = Rs. 1100

For 3rd year, total interest =

interest on principle +

interest on interest of 1st year +

interest on interest of 2nd year =

1000 + 100 + 100 + 10 = Rs. 1210

Step 3: Add all interests = 1000 + 1100 + 1210 = Rs. 3310.

Effective Rate Method

Effective rate for 3 years at rate of 10% = $3a.3a^2a^3$ = 33.1 %
Hence, compound interest = 10000 × 33.1% = Rs. 3310.

Q5. Rs.9200 is invested at compound interest at the rate of 25% per annum for 2 years.

Solution.

Normal Method:

Compound interest = $P \times [(1 + r/100)^t - 1]$

Compound interest earned = $9200 \times [(1 + 25/100)^2 - 1] = 9200 \times 0.5625 = Rs.\ 5175$

Effective Rate method:

Effective rate = $x + y + xy/100 = 25 + 25 + (25 \times 25)/100 = 56.25\%$

Hence, C.I. = $9200 \times 56.25\% = Rs\ 5175$

Q6. What will be the difference between the compound interest and simple interest on Rs.3000 at 10% rate of interest for 2 years?

Solution.

$D = PR^2/10^4$

$\Rightarrow D = (3000 \times 10^2)/10000$

$\therefore \quad D = Rs.30$

Installment

Q7. The oven set is bought on 4 yearly installments at 10% simple interest. If equal instalments of Rs.2500 are made then find the amount to be paid as the price of the oven set.

Solution:

Given rate = 10% and time = 4 years

Let installment be Rs 100

Then, price = 1^{st} payment + 2^{nd} payment + 3^{rd} payment + 4^{th} payment = 100 + 110 + 120 + 130 = 460

Comparing with given installment, we get price, $P = 2500 \times 460/100 = Rs.11500$