Installments in Simple Interest

Why someone gives installment paying for a buyer? It gives some flexibility for the buyer if he gets income on a monthly basis. Is there any advantage for the seller? Let us see how the installment works!

Suppose, there is a mobile phone for sale at Rs.10,000. There are two options for the seller. Accepting full money of Rs.10000 in one go, or take some down payment and receiving the remaining amount in "equated monthly/yearly installments".

If the seller receives the total amount on the purchase, he gets some interest on the sale money. If he sells it at monthly installment, he makes sure that he sets the installments such that he recovers the interest in several installments.

So the logic works like this: If the seller sold a product for t months, Total amount + interest he gets for t months on sale price = Total installments + interests generated on this installments for the remaining period.

For example, if the total loan for 10 months, the seller gets 6 months interest on the 4th installment.

$$P + \frac{P \times T \times R}{100 \times 12} = \begin{matrix}(x + \frac{xRt}{12 \times 100}) + (x + \frac{xR(t-1)}{12 \times 100}) + (x + \frac{xR(t-2)}{12 \times 100}) + \ldots . \\ + (x + \frac{xR2}{12 \times 100}) + (x + \frac{xR}{12 \times 100}) + x\end{matrix}$$

Note: The above formula is for monthly installments. If installment is asked per year, then no need to divide those terms with 12

Formula for installment calculation: $x = \frac{100P}{100n + \frac{n(n-1)r}{2}}$

Solved Examples

1. Samsung mobile phone is available for Rs.2500 cash or Rs.520 cash down payments followed by 4 equal installments. If the rate of interest charged is 25% per annum Simple interest, calculate the monthly installment

a. 520 b. 480 c. 550 d. None of these

Balance price to be paid in installments = Rs.1980

At the rate of r% per annum after 4 months, Rs.1980 will amount to Rs.

$$P + \frac{P \times T \times R}{100 \times 12} = 1980 + \frac{1980 \times 4 \times 25}{12 \times 100} = 2145 \quad \text{-----(1)}$$

Now, the total amount for the 4 installments at the end of fourth month will be

$$[(x + \frac{25x \times 3}{12 \times 100}) + (x + \frac{25x \times 2}{12 \times 100}) + (x + \frac{25x \times 1}{12 \times 100}) + x]$$

$$= 4x + \frac{25x}{1200}(1 + 2 + 3) = \frac{33x}{8}$$

.....(2)

From (1) and (2), Rs.2145 = $\frac{33x}{8}$

x = Rs.520

2. Gopal borrows Rs 1,00,000 from a bank at 10% p.a. simple interest and clears the debt in five years. If the installments paid at the end of the first, second, third and fourth years to clear the debt are Rs 10,000, Rs 20,000, Rs 30,000 and Rs 40,000 respectively, what amount should be paid at the end of the fifth year to clear the debt?

a. Rs 20,000 b . Rs 24,500 c. Rs 30,000 d. Rs 35,900

Sol: Always remember, In the case of simple interest, installment amount will always be reduced from principal and the interest will be calculated on the remaining principal.

Simple interest for the first year = $\frac{P \times T \times R}{100} = \frac{100000 \times 1 \times 10}{100}$ = Rs.10000

Amount after first instalment is paid = 1,00,000 - 10,000 = Rs 90,000

Simple interest for the second year = $\frac{P \times T \times R}{100} = \frac{90000 \times 1 \times 10}{100}$ = Rs.90,000

Amount after second instalment is paid = 90,000 - 20,000 = Rs 70,000

Simple interest for the third year = $\frac{P \times T \times R}{100} = \frac{70000 \times 1 \times 10}{100}$ = Rs.7000

Amount after third instalment is paid = 70,000 - 30,000 = Rs 40,000

Simple interest for the fourth year = $\frac{P \times T \times R}{100} = \frac{40000 \times 1 \times 10}{100}$ = Rs.4000

Amount after fourth instalment is paid = 40,000 - 40,000 = 0.

Balance of debt for the fifth year = simple interest for four years = 10,000 + 9,000 + 7,000 + 4,000 = Rs 30,000

3. A watch is sold for Rs.440 cash or for Rs.200 cash down payment together with Rs.244 to be paid after one month. Find the rate of interest charged in the installment scheme.

a. 10% b. 15% c. 20% d. 25%

Sol: Principal for the next month = 440 - 200 = 240

Amount paid after next month = 244

Therefore interest charged at Rs.240 = $\frac{240 \times 1 \times R}{12 \times 100} = 4$

Rate of interest (R) = 20% per annum

4. A cell phone is availabale for Rs. 600 or for Rs.300 cash down payment together with Rs.360 to be paid after two months. Find the rate of interest charged under this scheme.

a. 20% b. 50% c. 120% d. None

Amount as a principal for first and second month = 600 - 300 = Rs.300

Now, Interest = 360 - 300 = Rs.60

$60 = \frac{300 \times 2 \times r}{100 \times 12}$

r = 120%

5. Kishore purchases a track suit for Rs.2400 cash or for Rs.1000 cash down payments and two monthly installments of Rs.800 each. Find the rate of interest.

a. 75% b. 120% c. 50% d. None of these

Sol: Amount as a principal for 2 month = 2400 - 1000 = 1400

At the rate of r% per annum after 2 months, Rs.1400 will amount to Rs. $1400+\frac{1400\times r\times 2}{100\times 12}$ .....(1)

Again total amount for the 2 installments at the end of second month will be Rs.$[800+(800+\frac{800\times r\times 1}{100\times 12})]$ ..... (2)

From (1) and (2), we get $1400+\frac{2800\times r}{1200}=1600+\frac{800r}{1200}$

R = 120%

6. What annual installment will discharge a debt of Rs 2,360 due in four years at 12% p.a. simple interest?

a. 400 b. 500 c. 300 d. 600

Sol: Installments paid at the end of 1st, 2nd, 3rd and 4th years earn a simple interest at 12% p.a. for 3, 2, 1 and 0 years respectively.

Hence the respective installments amount to, (100 + 3 x 12), (100 + 2 x 12), (100 + 1 x 12) and 100, when annual installment is Rs 100.

Hence amount paid is Rs. 136 + Rs 124 + Rs 112 + Rs 100 i.e., Rs 472, when the annual installment is Rs.100

For an amount of Rs 2,360, annual installment = $\frac{2,360\times 100}{472}=Rs500$

7. Hiralal gave a loan of Rs. 20 to Ramlal and recovered it at the rate of Rs 3.50 for eight months, commencing from the end of 1st month. What is the effective rate of simple interest?

a. 60% b. 80% c. 20% d. 90%

Sol: Principal = Rs 20

Amount = Rs 3.50 x 8 = Rs 28

Interest = Rs 28 - Rs 20 = Rs 8

Time = 8 months = 8/12 years

$8=\frac{20\times 8\times r}{12\times 100}$

$r=\frac{12\times 100}{20}$ = 60% p.a.

8. Find the amount of equal installment, annual payment of which will discharge a debt of Rs. 848 due in 4 years at 4% p.a. of Simple interest.

Amount of each installment $=\frac{100P}{100n+\frac{n(n-1)r}{2}}$

$=\frac{848\times 100}{100\times 4+\frac{4\times 4\times 3}{2}}$

$=\frac{848\times 100}{424}$ = Rs. 200

9. Find the amount of debt that will be discharged by 5 equal installments of Rs. 200 each, if the debt is due in 5 year at 5% p.a.

We know that $x = \dfrac{100P}{100n + \dfrac{n(n-1)r}{2}}$

$\Rightarrow 200 = \dfrac{100P}{100 \times 5 + \dfrac{5(5-1)5}{2}} = \dfrac{100P}{500 + \dfrac{5.4.5}{2}}$

$\Rightarrow P = \dfrac{200}{100} \times (500 + 50) = 1100$