

Chapter 6

Instalment

Instalments

Sometimes buyer is not able to purchase an article due to lack of money. Although they are in great need of the same. Businessmen starts selling their articles by installments. The purchaser need not to pay the entire amount at the time of purchase. A part of this is paid at the time of purchase and the rest is paid in easy installments may be monthly quarterly, half year or even annually. Flats and houses are also purchased in this scheme. some times loans are also returned to the bank or finance company by the installments.

ISNTALMENT BUYING (PURCHASE)

SCHEME:

Purchaser when pays whole amount of the article at the time of purchase it is called the cash price.

The part payment at the time of purchase done by the customer is called cash down payment.

Let us try some example to understand the problems:

Example 1. An electric iron 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 is the instalment scheme.

Solution:- Cash price of the iron = Rs. 440

In the instalment plan,
Cash down payment = Rs. 200

∴ The remaining price to be paid back in the instalment plane
has to its present value = Rs. 440 - Rs. 200
= Rs. 240

The instalment paid at the end of one month = Rs. 244.

∴ Interest charged on Rs. 240, for a period of one month = Rs.
244 - Rs. 240 = Rs. 4

Let rate of interest be $r\%$ p.a.

$$\therefore \frac{240 \times r \times 1}{100 \times 12} = 4 \quad \left[\because \text{month} = \frac{1}{12} \text{year} \right]$$

$$r = \frac{100 \times 12 \times 4}{240}$$

$$= 20\%$$

\therefore rate of interest charged under instalment plane = 20%.

Example 2. A cooler is available for Rs. 2400 cash or for Rs. 1200 cash down payment and two monthly instalments of Rs. 610 each. Find the rate of interest charged under the instalment plan.

Solution:- Cash price = Rs. 2400

Cash down payment = Rs. 1200

Balance to be paid in instalment = Rs. 2400 - Rs. 1200
= Rs. 1200

Let rate of interest charged be $r\%$ p.a.

$$\therefore \text{Interest} = \frac{1200 \times r \times 2}{100 \times 12} = 2r$$

Amount = Rs. (1200 + 2r) ----- (1)

First instalment of Rs.610

Paid after one month will at the end of second month amount to

$$\text{Rs} \left(610 + \frac{610 \times r \times 1}{100 \times 12} \right)$$

$$= \text{Rs} \left(610 + \frac{61r}{120} \right)$$

The two monthly instalments taken together will at the end of

two months amount to $\text{Rs} \left(610 + \frac{61r}{120} + 610 \right)$

$$= \text{Rs} \left(1220 + \frac{61r}{120} \right) \text{----- (2)}$$

From (1) and (2) we get

$$1200 + 2r = 1220 + \frac{61r}{120}$$

$$\text{Or, } 2r - \frac{61r}{120} = 1220 - 1200$$

$$\text{Or, } (240r - 61r) / 120 = 20$$

$$\text{Or } \frac{179r}{120} = 20$$

$$\begin{aligned} \text{Or, } r^0 &= (20 \times 120) / 179 \\ &= 13.41\% \end{aligned}$$

∴ Rate of interest charged under instalment plan is 13.41% per annum.

Example 3. A wrist which is marked at Rs. 970 cash or for Rs. 210 cash down payment followed by three equal monthly instalments. If the rate of interest charged under the instalment plan is 16% p.a; find the monthly instalment.

Solution:- Cash price = Rs. 970

Cash down payment Rs. 210

Balance to be paid in instalment

$$= \text{Rs. } 970 - \text{Rs. } 210$$

$$= \text{Rs. } 760$$

Rate = 16%

At the end of 3 months, Rs.760 will be amount to

$$\begin{aligned} &\text{Rs.} \left(760 + \frac{760 \times 16 \times 3}{100 \times 12} \right) \\ &= \text{Rs. } 790.40 \text{-----(1)} \end{aligned}$$

Let the monthly instalment be x.

At the end of 3 month, first instalment of Rs. x will amount to

$$\text{Rs.} \left(x + \frac{x \times 16 \times 2}{100 \times 12} \right)$$

The second instalment of Rs. x

will be amount to $Rs. \left(x + \frac{x \times 16 \times 1}{100 \times 12} \right)$

At the end of 3 months, all the three instalments will amount to

$$\begin{aligned} & Rs. \left[\left(x + \frac{x \times 16 \times 2}{100 \times 12} \right) + \left(x + \frac{x \times 16 \times 1}{100 \times 12} \right) + x \right] \\ &= Rs. \left[3x + \frac{16x}{1200} (2+1) \right] \\ &= Rs. \left[3x + \frac{x}{25} \right] \\ &= Rs. \frac{76x}{25} \text{----- (2)} \end{aligned}$$

from (i) and (ii) we get

$$\begin{aligned} \frac{76x}{25} &= 790.40 \\ x &= \frac{790.40 \times 25}{76} \\ &= Rs. 260 \end{aligned}$$

Example 4. A.T.V can be purchased for Rs. 24000 cash or for Rs. 8000 cash down payment and six equal monthly instalment of Rs. 2800 each. Calculate the rate of interest charged under the instalment plan.

Solution:-

Cash price = Rs. 24000

Cash down payment = Rs. 8000

Balance to be paid in instalment = Rs. 24000 - Rs. 8000

= Rs. 16000

Let rate of interest be $r\%$ p.a.

At the end of 6 month, Rs.16000 will be amount to

$$\begin{aligned} & Rs. \left(16000 + \frac{16000 \times r \times 6}{100 \times 12} \right) \\ & Rs. (16000 + 80r) \text{----- (1)} \end{aligned}$$

At the end of 6 month, first instalment of Rs. 2800 will amount to

$$Rs. \left(2800 + \frac{2800 \times r \times 5}{100 \times 12} \right)$$

Second instalment of Rs.2800 will amount to

$$Rs. \left(2800 + \frac{2800 \times r \times 4}{100 \times 12} \right)$$

Third instalment of Rs.2800 will amount to

$$Rs. \left(2800 + \frac{2800 \times r \times 3}{100 \times 12} \right)$$

Fourth instalment of Rs.2800 will amount to

$$Rs. \left(2800 + \frac{2800 \times r \times 2}{100 \times 12} \right)$$

Fifth instalment of Rs.2800 will amount to

$$Rs. \left(2800 + \frac{2800 \times r \times 1}{100 \times 12} \right)$$

At the end of six months, all the six instalment will amount to

$$Rs. 2800 \times 6 + \frac{2800 \times r}{100 \times 12} \times (5 + 4 + 3 + 2 + 1)$$

$$Rs. (16800 + 35r) \text{-----(2)}$$

From (1) and (2) we get

$$16000 + 80r = 16800 + 35r$$

$$45r = 800$$

$$r = 17.78\%$$

Hence rate of interest charged is 17.78%

Exercise - 9

1. A suitcase is listed at Rs.800. It is available for Rs. 500 cash down payment and Rs. 325 to be paid back after six months. Find the rate of interest charged under the instalment plan.
2. A table is available for Rs. 1800 cash or for Rs. 600 cash down payment followed by two monthly instalment of Rs. 610 each. Compute the rate of interest charged under the instalment plan.
3. An electric iron is available for Rs. 550 cash or for Rs. 250 cash down payment

followed by Rs. 305 to be paid after two months. Find the rate of interest charged under this scheme.

4. A pressure cooker is available for Rs. 500 cash or for Rs. 250 cash down payment together with Rs.260 after three months. Find the rate of interest charged under this scheme.

5. A wrist watch is sold for Rs. 960 cash or for Rs. 480 cash down payment and also two equal monthly instalments of Rs. 245 each. Calculate the rate of interest charged under two schemes.

6. A mixi is available for Rs. 1500 cash or for Rs. 360 cash down payment together with three equal monthly instalment of Rs. 390 each. Find the rate of interest charged under the instalment plan.

7. A scooter is available for Rs. 28000 cash or for Rs. 7400 cash down payment together with four equal monthly instalment of Rs. 5200 each. Find the rate of interest charged under the instalment scheme.

8. A cooking range can be bought for Rs. 2500 cash or for Rs. 520 cash down payment together with four equal monthly instalments. If the rate of interest be 25%p.a. find the monthly instalment.

9. A washing machine is listed at Rs. 6400 cash or for Rs. 1400 as cash down payment followed by five equal monthly instalment of Rs. 1030. Find the rate of interest charged under the instalement scheme.

10. A computer is available for Rs. 19,200 cash or for Rs. 4800 cash down payment followed by five monthly instalement of equal value . If the rate of interest is 12% p.a. find each instalment.

11. A typing machine can be purchased for Rs. 7200 cash or for Rs. 3040 cash down payment and five equal monthly instalment of Rs. 860 each. Calculate the rate of interest charged under the instalment plan.

12. An electric iron is available for Rs. 500 cash or for Rs. 150 cash down payment followed by 5 equal monthly instalement. If the rate of interest is 18% p.a. Calculates the monthly instalment.

13. An electric generator is available for Rs. 3900 cash or for 25% cash down payment together with eight monthly instalment of Rs. 3900 each. Find the rate of interest charged under this scheme.

14. A tractor is sold for Rs. 450000 cash or for Rs. 150000 cash down payment followed by ten equal monthly instalment of Rs. 32000 each. Calculate the rate of interest charged under instalment plan.

15. A video camera is available for Rs. 60000 cash or for 20% cash down payment followed by ten equal monthly instalment of Rs. 5000 each. What is the rate of interest under instalment plan?

16. A stereo is available for Rs. 5600 cash or for Rs. 1800 cash down payment together with ten equal monthly instalment of Rs. 400 each. Calculate the rate of interest charged under instalment plan.

Answers

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|------------------|-------------|----------------|
| (1) 16.67% | (2) 13.41% | (3) 10% |
| (4) 16% | (5) 16.78% | (6) 16% |
| (7) 4.69% | (8) Rs. 520 | (9) 12.24% |
| (10) Rs. 2964.70 | (11) 13.77% | (12) Rs. 73.06 |
| (13) 18.75% | (14) 15.38% | (15) 9.41% |
| (16) 12% | | |

Repayment of loans

In the previous section we dealt with the instalment scheme in which instalment are paid monthly and total period of instalment payment is less than one year. The interest charged is calculated as simple interest. In this section we shall study the problems of repayment of loans or Hire purchase of flats. The instalment is paid quarterly, half yearly or annually

Example 5. A man borrows Rs. 8160 from a bank and has to return in two equal annual instalments. If the rate of interest charged is 12.5% p.a. compounded annually, find the instalment.

Solution: - Let each yearly instalment be x.

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

As the instalment is equal and it includes principal and interest. Hence the value of principal must be different.

Let it be P_1 and P_2 such that

$$P_1 + P_2 = 8160$$

$$\therefore x = P_1 \left(1 + \frac{12.5}{100} \right)^1$$

$$= P_1 \left(\frac{1125}{1000} \right)^1$$

$$= P_1 \left(\frac{9}{8} \right)^1$$

$$\therefore P_1 = x \left(\frac{8}{9} \right)^1$$

$$\text{Similarly } P_2 = x \left(\frac{8}{9} \right)^2$$

$$P_1 + P_2 = 8160$$

$$x \left(\frac{8}{9} \right) + x \left(\frac{8}{9} \right)^2 = 8160$$

$$x \left(\frac{8}{9} \right) \left[1 + \frac{8}{9} \right] = 8160$$

$$x \left(\frac{8}{9} \right) \left(\frac{17}{9} \right) = 8160$$

$$\begin{aligned} \therefore x &= 8160 \times \frac{9}{8} \times \frac{9}{17} \\ &= \text{Rs. } 4860 \end{aligned}$$

\therefore Each instalment is Rs. 4860

Example 6. A loan has to be returned in two equal annual instalments. If the rate of interest is 16% p.a. compounded annually and each instalment is Rs. 1682, find the sum borrowed and the total interest charged.

Solution:-

$$\text{Let loan} = P_1 + P_2$$

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

$$1682 = P_1 (1 + 16/100)^1$$

$$= P_1 (116/100)^1$$

$$= P_1 (29/25)^1$$

$$\therefore P_1 = 1682 \left(\frac{25}{29} \right)^1$$

$$\text{Similarly, } P_2 = 1682 \left(\frac{25}{29} \right)^2$$

$$\begin{aligned} \therefore P_1 + P_2 &= 1682 \left(\frac{25}{29} \right)^1 + 1682 \left(\frac{25}{29} \right)^2 \\ &= 1682 \left(\frac{25}{29} \right) \left[1 + \frac{25}{29} \right] \\ &= 1682 \times \frac{25}{29} \times \frac{54}{29} \\ &= 2700 \end{aligned}$$

Loan = Rs. 2700

Interest charged = Rs. 1682 - Rs. 2700

= Rs. 664

Example 7. A computer is available for Rs. 39,300 cash or for Rs. 12,820 cash down payment and three equal half yearly instalments. If the dealer charges interest at the rate of 20% per annum compounded annually calculate each instalment.

Solution:- Let $P_1 + P_2 + P_3 = 39300 - 12820$

$$= 26480$$

$r = 20\%$ p.a.compounded annually

= 10% half yearly

Let each instalment be x

$$\begin{aligned} \therefore x &= P_1 \left(1 + \frac{10}{100} \right)^1 \\ &= P_1 \left(\frac{11}{10} \right)^1 \\ \therefore P_1 &= x \left(\frac{10}{11} \right)^1 \end{aligned}$$

$$\text{Similarly, } P_2 = x \left(\frac{10}{11} \right)^2 \quad \text{and} \quad P_3 = x \left(\frac{10}{11} \right)^3$$

$$P_1 + P_2 + P_3 = 26480$$

$$\therefore x\left(\frac{10}{11}\right)^1 + x\left(\frac{10}{11}\right)^2 + x\left(\frac{10}{11}\right)^3 = 26480$$

$$\text{Or, } x\left(\frac{10}{11}\right)\left[1 + \frac{10}{11} + \frac{100}{121}\right] = 26480$$

$$\text{Or, } x\left(\frac{10}{11}\right)\left[\frac{121+110+100}{121}\right] = 26480$$

$$\text{Or, } x\left(\frac{10}{11}\right)\left(\frac{331}{121}\right) = 26480$$

$$\begin{aligned}\therefore x &= 26480 \times \frac{11}{10} \times \frac{121}{331} \\ &= 10648\end{aligned}$$

\therefore each instalment = Rs. 10648

Exercise -10

1. Flats are available for Rs. 5,50,000 cash or Rs. 42,750 cash down payment and three equal yearly instalments. The interest is charged at the rate of 8% p.a. compounded annually. Calculate the value of each instalment.

2. A loan of Rs.3,90,200 is to be paid back in three equal annual instalments. Find the instalment if the rate of interest is 4% p.a. compounded annually.

3. A loan has to pay in two equal half yearly instalments of Rs.4945 each. If the rate of interest is 15% p.a. compounded semi-annually, find the principal and the total interest paid.

4. A car is available for Rs.4,02,200 cash or for Rs.1,50,000 cash down payment and 3 equal half yearly instalments. Find the value of each instalment if the rate of interest is 10% p.a. compounded half yearly.

5. A T.V. set is available for Rs.19,650 cash payment or for Rs.3,100 cash down payment and three equal annual instalment. If the rate of interest is 10% p.a compounded annually, calculate the amount of each instalment.

6. A man borrowed Rs.12750 which is to be paid back in two equal half yearly instalments. If the interest is compounded half yearly at 8% per annum, how much is each instalment?

7. A loan of Rs.10815 is to be paid back in three equal half yearly instalment. If the

interest is $13\frac{1}{3}\%$ p.a. compounded half yearly find the each instalment.

8. A loan was returned in three equal quarterly instalments of Rs.17576 each. If the rate of interest is 16% p.a. compounded quarterly find the loan and the total interest charged.

9. Flats are available for Rs.30,00,000 cash or for Rs.10,31,600 cash down payment and three equal quarterly and three equal quarterly instalment. If the rate of interest is 10% p.a. compounded quarterly, find each instalment and also the total interest paid.

10. A person borrowed some money on compounded interest and returned it is three years in equal annual instalments. If the rate of interest is 15% p.a. and annual instalment is Rs.486680 find the sum borrowed.

11. A housing society charges for a flat Rs. 16,00,000 or Rs. 5,85,500 cash downpayment and htree equal half yearly instalments. If the society charged 16% p.a. compounded half yearly, calculate the value of each instalment and the total interest charged.

Answers

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|-----------------------|---------------------------------|--------------------------------|
| (1) Rs. 1,96,830 | (2) Rs. 1,40,608 | (3) Rs. 8,879.07, Rs. 1,011 |
| (4) Rs. 92,610 | (5) Rs. 6,655 | (6) Rs. 6,760 |
| (7) Rs. 4,096 | (8) Rs. 48,775, Rs. 3,953 | (9) Rs. 3,93,660, Rs. 1,66,480 |
| (10) Rs. 11, 11, 2000 | (11) Rs. 3,93,660, Rs. 1,66,480 | |