9

INSTALMENT BUYING

You must have seen advertisements like, "Pay just ₹ 500 and take home a color TV, rest in easy instalments", or "buy a car of your choice by paying ₹ 50,000 and the balance in easy instalments". Such plans attract customers, specially the common man, who could not buy some costly articles like car, scooter, fridge, colour TV, etc. due to cash constraints. Under these plans, a fixed amount is paid at the time of purchase and the rest of the amount is to be paid in instalments, which may be monthly, quarterly, half yearly or yearly, as per the agreement signed between the customer and the seller.

Instalment purchase scheme, thus, enables a person to buy costly goods, on convenient terms of payment. Under this scheme, the customer, after making a partial payment in the beginning, takes away the article for use after signing the agreement to pay the balance amount in instalments. Such a scheme also encourages the buyer to save at regular intervals, so as to pay the instalments.

In this lesson, we shall study different types of instalment plans and shall find out how much easy they are, by calculating the interest charged under these plans.

OBJECTIVES

After studying this lesson, you will be able to

- *explain the advantages/disadvantages of buying a commodity under instalment plan;*
- *determine the amount of each instalment, when goods are purchased under instalment plan at a given rate of interest (simple interest);*
- *determine the rate of interest when the amount of each (equal) instalment and the number of instalments is given;*
- *determine the amount of each instalment under instalment plan when compound interest is charged yearly, half yearly or quarterly;*
- *solve problems pertaining to instalment plan.*

EXPECTED BACKGROUND KNOWLEDGE

- Simple interest and compound interest.
- Calculation of interest when the interest is calculated yearly, half yearly, quarterly or monthly..

9.1 INSTALMENT BUYING SCHEME-SOME DEFINITIONS

Cash Price: The cash price of an article is the amount which a customer has to pay in full for the article at the time of purchase.

Cash Down Payment: The amount to be paid (in cash) under an instalment plan at the time of purchase of a commodity, is called the **cash down payment**. It is the partial payment made by the customer at the time of signing the agreement and taking away the article for use.

Instalments: It is the amount which is paid by the customer at regular intervals towards the remaining part of the selling price of the article.

Interest under the Instalment Plan: In an instalment plan only part payment of the total cost is paid by the customer at the time of purchase. The remaining part of cost is paid on subsequent dates; and therefore the seller charges some extra amount for deferred payments. This extra amount is actually the interest charged on the amount of money which the customer ows to the seller at different times of payment of instalments.

9.2 TO FIND THE INTEREST IN AN INSTALMENT PLAN

Let us solve a few examples to illustrate the process.

Example 9.1: A Television set is sold for ₹ 20000 cash or for ₹ 6000 as cash down payment followed by ₹ 16800 after six months. Find the rate of interest charged under the instalment plan.

Solution: The cash price of the television = ₹ 20000

Cash down payment = ₹ 6000

Balance to be paid = ₹ 14000

∴ The present value of Rs. 16800 to be paid after 6 months = Rs. 14000

If the rate of interest per annum under instalment plan is r%, then

$$14000 + 14000 \times \frac{r}{100} \times \frac{6}{12} = 16800$$

$$\text{or } \frac{7r}{10} = 28 \text{ i.e., } r = 40, \text{ i.e. rate} = 40\%$$

Example 9.2: A table fan is sold for ₹ 450 cash or ₹ 210 cash down payment followed by two monthly instalments of ₹ 125 each. Find the rate of interest charged under the instalment plan.

Solution: Cash price of the table fan = ₹ 450

Cash down payment = ₹ 210

Balance to be paid = ₹ (450 – 210) = ₹ 240

Let the rate of interest charged under instalment plan be r% p.a. then

₹ 240 at the end of two months will become $= ₹ \left(240 + 240 \times \frac{r}{100} \times \frac{2}{12}\right)$

$= ₹ \left(240 + \frac{2r}{5}\right)$ ...(i)

₹ 125 paid after 1 month will amount to (after another 1 month)

$= ₹\ 125 + 125 \times \frac{r}{100} \times \frac{1}{12} = Rs. \left(125 + \frac{5r}{48}\right)$ ...(ii)

Amount for ₹ 125 paid after two months = ₹ 125 ...(iii)

$\therefore 240 + \frac{2r}{5} = 125 + \frac{5r}{48} + 125$ i.e., $\left(\frac{2}{5} - \frac{5}{48}\right) r = 10$

$\Rightarrow r = \frac{2400}{71} = 33.8$ (approx)

Hence, rate of interest = 33.8%

Alternative method:

Cash price of the fan = ₹ 450

Cash down payment = ₹ 210

Payment in 2 instalments = ₹ (125 × 2) = ₹ 250

Total amount paid under instalment plan = ₹ (210 + 250)

= ₹ 460

$\therefore$ Interest paid = ₹ (460 – 450) = ₹ 10

The Principal for the first month = ₹ (450 – 210) = ₹ 240

Principal for the 2nd month = ₹ (240 – 125) = ₹ 115

$\therefore$ Total Principal (for 1 month) = ₹ (240 +115) = ₹ 355

Thus we have

$$355 \times \frac{r}{100} \times \frac{1}{12} = 10, \text{ or, } r = \frac{10 \times 100 \times 12}{355}$$

$$= \frac{2400}{71} \approx 33.8$$

Hence, rate of interest = 33.8% p.a.

Example 9.3: A microwave oven is available for ₹ 9600 cash or for ₹ 4000 cash down payment and 3 monthly instalments of ₹ 2000 each. Find the rate of interest charged under the instalment plan.

Solution: Cash price of microwave oven = ₹ 9600

Cash down payment = ₹ 4000

Payment in 3 instalments = ₹ (3 × 2000) = ₹ 6000

Total amount paid under instalment plan = ₹ (4000 + 6000)

= ₹ 10000

$\therefore$ Interest paid = ₹ (10000 – 9600) = ₹ 400

Principal for 1st month = ₹ (9600 – 4000) = ₹ 5600

Principal for 2nd month = ₹ (5600 – 2000) = ₹ 3600

Principal for 3rd month = ₹ (3600 – 2000) = ₹ 1600

$\therefore$ Total Principal (for 1 month) = ₹ (5600 + 3600 + 1600)

= ₹ 10800

Thus, we have

$$10800 \times \frac{r}{100} \times \frac{1}{12} = 400 \Rightarrow 9r = 400 \text{ or } r = \frac{400}{9} \approx 44.4\%$$

So, rate of interest charged = 44.4%

Example 9.4: A computer is sold for ₹ 30,000 cash or ₹ 18000 cash down payment and 6 monthly instalments of ₹ 2150 each. Find the rate of interest charged under the instalment plan.

Solution: Cash price of the computer = ₹ 30000

Cash down payment = ₹ 18000

Payment in 6 instalments = ₹ (6 × 2150) = ₹ 12900

$\therefore$ Total amount paid under instalment plan = ₹ (18000 + 12900)

= ₹ 30900

$\therefore$ Interest paid = ₹ (30900 – 30000) = ₹ 900

Principal for 1st month = ₹ (30000 – 18000) = ₹ 12000

Principal for 2nd month = ₹ (12000 – 2150) = ₹ 9850

Principal for 3rd month = ₹ (9850 – 2150) = ₹ 7700

Principal for 4th month = ₹ (7700 – 2150) = ₹ 5550

Principal for 5th month = ₹ (5550 – 2150) = ₹ 3400

Principal for 6th month = ₹ (3400 – 2150) = ₹ 1250

$\therefore$ Total Principal for one month = ₹ (12000 + 9850 + 7700 + 5550 + 3400 + 1250)

= ₹ 39750

$\therefore$ We have

$$39750 \times \frac{r}{100} \times \frac{1}{12} = 900 \Rightarrow r = \frac{900 \times 12 \times 100}{39750} = \frac{1440}{53}$$

$$= 27.17\%$$

Thus, the rate of interest = 27.17% per annum.

Note: In Examples 2 to 4, observe that the Principal for the last month is less than the amount of the instalment. If interest is added to the last Principal, the sum will be equal to the amount of monthly instalment.

CHECK YOUR PROGRESS 9.1

1. A table is sold for ₹ 2000 cash or for ₹ 600 as cash down payment, followed by ₹ 1500 paid after 2 months. Find the rate of interest charged under the instalment plan.
2. A cycle is sold for ₹ 2700 cash or ₹ 600 as cash down payment, followed by 3 monthly instalments of ₹ 750 each. Find the rate of interest charged under the instalment plan.
3. A T.V. set is available for ₹ 21000 cash or for ₹ 4000 cash down payment and 6 equal monthly instalments of ₹ 3000 each. Calculate the rate of interest charged under the instalment plan.
4. Anil purchased a computer monitor priced at ₹ 6800 cash, under the instalment plan by making a cash down payment of ₹ 2000 and 5 monthly instalments of ₹ 1000 each. Find the rate of interest charged under the instalment plan.
5. A scooter can be purchased for ₹ 28000 cash or for ₹ 7400 as cash down payment followed by 4 equal monthly instalments of ₹ 5200 each. Find the rate of interest charged under instalment plan.

6. An air conditioner is sold for ₹ 20,000 cash or ₹ 12000 cash down payment followed by 4 monthly instalments of ₹ 2200 each. Find the rate of interest under the instalment plan correct upto one decimal place.
7. An article is available for ₹ 25000 cash or 20% cash down payment followed by 6 monthly instalments of ₹ 3750 each. Calculate the rate of interest charged under the instalment plan.

9.3 TO FIND THE AMOUNT OF INSTALMENT

Now, let us think the problem with the shopkeeper's angle. A shopkeeper purchases an article at some price and wants to offer an instalment plan to his customers, as he knows that more items can be sold in this way. Now he wishes to charge interest at a particular rate and wants to decide the cash down payment, the amount of equal instalments and the number of instalments.

Let us take some examples to illustrate the process.

Example 9.5: A ceiling fan is marked at ₹ 1940 cash or for ₹ 420 cash down payment followed by three equal monthly instalments. If the rate of interest charged under the instalment plan is 16% per annum, find the monthly instalment.

Solution: Cash price of ceiling fan = ₹ 1940

Cash down payment = ₹ 420

Let each instalment = ₹ x

$\therefore$ Amount paid in instalment plan = ₹ [420 + 3x]

$\therefore$ Interest paid = ₹ (420 + 3x – 1940) = ₹ (3x – 1520)

The buyer owes to the seller for first month = ₹ 1520

The buyer owes to the seller for 2nd month = ₹ (1520 – x)

The buyer owes to the seller for 3rd month = ₹ (1520 – 2x)

$\therefore$ Totol principal for one month = ₹ [4560 – 3x]

Rate of interest = 16%

$$\therefore (3x - 1520) = (4560 - 3x)\frac{16}{100}.\frac{1}{12}$$

$$25(3x - 1520) = (1520 - x)$$

i.e., $76x = 39520$

or $x = 520$

So, the amount of each instalment = ₹ 520

Example 9.6: A computer is available for ₹ 34000 cash or ₹ 20000 cash down payment together with 5 equal monthly instalments. If the rate of interest charged under the instalment plan is 30% per annum, calculate the amount of each instalment.

Solution: Cash price = ₹ 34000

Cash down payment = ₹ 20000

Balance to be paid in 5 equal instalments = ₹ 14000

Let each instalment be ₹ x

So, interest charged under instalment plan = ₹ $(5x - 14000)$

The buyer owes to the seller for

1st month	2nd month	3rd month	4th month	5th month
₹ 14000	₹ $(14000 - x)$	₹ $(14000 - 2x)$	₹ $(14000 - 3x)$	₹ $(14000 - 4x)$

Therefore, total principal for one month = ₹ $[70000 - 10x]$

So, $(5x - 14000) = (70000 - 10x) \times \frac{30}{100} \times \frac{1}{12}$

$40\ (5x - 14000) = 10(7000 - x)$

$20x - 56000 = 7000 - x$

or $21x = 63000$

or $x = 3000$

Thus, the amount of each instalment = ₹ 3000

Example 9.7: The cost of a washing machine is ₹ 12000. The company asks for ₹ 5200 in advance and the rest to be paid in equal monthly instalments. The rate of interest to be charged is 12% per annum. If a customer can pay ₹ 1400 each month, then how many instalments he will have to pay?

Solution: Let number of instalments be 'n'

Cash price of washing machine = ₹ 12000

Price under instalment plan = ₹ $(5200 + 1400n)$

$\therefore$ Interest charged = ₹ $(5200 + 1400n - 12000)$

= ₹ $(1400n - 6800)$

Principal owed each month is

First month = ₹ 6800

2nd month = ₹ 5400

3rd month = ₹ 4000

4th month = ₹ 2600

5th month = ₹ 1200

6th month = nil

Total for one month = ₹ 20000

So, $20000 \times \frac{12}{100} \times \frac{1}{12} = (1400n - 6800)$

1400 n = 7000 i.e. n = 5

Thus, the number of instalments = 5

CHECK YOUR PROGRESS 9.2

1. A scooter is available for ₹ 30000 cash or for ₹ 15000 cash down payment and 4 equal monthly instalments. If the rate of interest charged under the instalment plan is $33\frac{1}{3}\%$, find the amount of each instalment.
2. A microwave oven is available for ₹ 9600 cash or for ₹ 4000 cash down payment and 3 equal monthly instalments. If the rate of interest charged is $22\frac{2}{9}\%$ per annum, find the amount of each instalment.
3. An article is sold for ₹ 5000 cash or for ₹1500 cash down payment followed by 5 equal monthly instalments. If the rate of interest charged is 18% p.a., compute the amount of each monthly instalment.
4. An article is sold for ₹ 500 cash or ₹ 150 cash down payment followed by 5 equal monthly instalments. If the rate of interest charged is 18% per annum, compute the monthly instalment.

9.4 TO FIND CASH PRICE

Let us now take problems where we are to find the cash price of an article when in the instalment scheme, amount of each equal instalment, the rate of interest, the number of instalments and the amount of cashdown payment, are given.

Example 9.8: A bicycle is sold for ₹ 500 cash down payment and ₹ 610 after one month. If the rate of interest being charged is 20% p.a., find the cash price of the bicycle.

Solution: Cash down payment = ₹ 500

Amount of instalment paid after one month = ₹ 610

Rate of interest = 20%

Thus we have to find present value (i.e. Principal) of Rs. 610 paid after one month.

So, $610 = \left[(\text{Principal}) \times \frac{20}{100} \times \frac{1}{12} + \text{Principal}\right]$

$\Rightarrow 610 = \text{Principal}\left(1 + \frac{20}{1200}\right)$ or $\text{Principal} = ₹\ \frac{610 \times 1200}{1220}$

$= ₹\ 600$

$\therefore$ The cash price of bicycle = ₹ (500 + 600) = ₹ 1100

Example 9.9: A camera is sold for ₹ 2500 as cash down payment and ₹ 2100 after 3 months. If the rate of interest charged is 20% p.a., find the cash price of the camera.

Solution: Cash down payment = ₹ 2500

Instalment paid after 3 months = ₹ 2100

Rate of interest = 20% p.a.

So, Principal amount for ₹ 2100

$= ₹\ \frac{2100 \times 100}{100 + 20 \times \frac{3}{12}} = ₹\ \frac{2100 \times 1200}{1260}$

$= ₹\ 2000$

Therefore, cash price = ₹ (2500 + 2000) = ₹ 4500

Alternative Method:

Let cash price be ₹ x.

Cash down payment = ₹ 2500

Instalment paid = ₹ 2100

$\therefore$ Interest = ₹ (4600 – x)

Principal for the instalment = ₹ (x – 2500)

$\therefore (4600 - x) = (x - 2500) \times \frac{3}{12} \times \frac{20}{100} = \frac{x - 2500}{20}$

20(4600 – x) = x – 2500

or 21x = 92000 + 2500

or $21x = 94500$

or $x = 4500$

Hence, cash price = ₹ 4500

Example 9.10: A mixi was purchased by paying ₹ 360 as cash down payment followed by three equal monthly instalments of ₹ 390 each. If the rate of interest charged under instalment plan is 16% p.a., find the cash price of the mixi.

Solution: Let the cash price of the mixi be ₹ x

Cash down payment = ₹ 360

Amount paid in 3 instalments = ₹ (3×390) = ₹ 1170

Total paid = ₹ $(360 + 1170)$ = ₹ 1530

$\therefore$ Interest = ₹ $(1530 - x)$

Principal for 1st month = ₹ $(x - 360)$

Principal for 2nd month = ₹ $(x - 360 - 390)$ = ₹ $(x - 750)$

Principal for 3rd month = ₹ $(x - 750 - 390)$ = ₹ $(x - 1140)$

Total principal for one month = ₹ $[x - 360 + x - 750 + x - 1140]$

= ₹ $[3x - 2250]$

So, $(1530 - x) = (3x - 2250) \times \frac{1}{12} \times \frac{16}{100} = \frac{(x - 750)}{25}$

$25(1530 - x) = x - 750$

or $26x = 38250 + 750 = 39000$

or $x = \frac{39000}{26} = 1500$

Thus, the cash price of mixi = ₹ 1500

CHECK YOUR PROGRESS 9.3

1. A table was purchased by paying a cash down payment of ₹ 750 followed by ₹ 436 after a period of 6 months. If the rate of interest charged is 18% p.a., what is the cash price of the table?
2. A refrigerator was purchased for a cashdown payment of ₹ 7000 followed by a sum of ₹ 3180 after 3 months. If the rate of interest charged is 24% p.a., find the cash price of the refrigerator.

3. A cooking range is available for ₹ 520 cash down payment followed by 4 equal monthly instalments of ₹ 520 each. If the rate of interest charged is 25% per annum, find the cash price of the cooking range.
4. A ceiling fan was purchased for ₹ 210 as cash down payment followed by three equal instalments of ₹ 260 each. If the rate of interest charged under the instalment plan is 16% p.a., then find the cash price of the ceiling fan.
5. An electrical oven was purchased for ₹ 1500 cash down payment, followed by five equal monthly instalments of ₹ 440 each. If the rate of interest charged per annum under the instalment plan is 24%, find the cash price of the oven

9.5 PROBLEMS INVOLVING COMPOUND INTEREST

In instalment buying which involved monthly instalments with the total time period being less than a year, simple interest was used.

Sometimes the individuals take long-term loans, for purposes like, buying a house, a car or setting up a factory etc. In that case, the instalments are to be paid annually for a long period and therefore involves the use of compound interest. Even in instalment buying for a period less than a year, sometimes the seller charges compound interest when the instalments are semi annually or quarterly.

Now, we shall take some problems involving compound interest.

Example 9.11: A refrigerator is available for ₹ 12000 cash or ₹ 3600 cash down payment along with 2 equal half yearly instalments. If the dealer charges an interest of 20% p.a. compounded semi-annually, under the instalment plan, find the amount of each instalment.

Solution: Cash price of refrigerator = ₹ 12000

Cash down payment = ₹ 3600

Balance = ₹ 8400

Rate of interest = 20% p.a. or 10% semi-annually

Let each monthly instalment be ₹ x, then we shall find the present value (or the Principal) for each instalment.

Let P_1, P_2 be the present values of first, 2nd conversion period respectively.

$$\therefore \quad x = P_1\left(1+\frac{10}{100}\right)^1 \quad \text{and} \quad x = P_2\left(1+\frac{10}{100}\right)^2$$

$$\text{Therefore, } P_1 = \frac{10}{11}x \quad \text{and} \quad P_2 = \left(\frac{10}{11}\right)^2 x$$

$$\text{Thus, we have, } \frac{10}{11}x + \frac{100}{121}x = 8400$$

or $x = \frac{8400 \times 121}{210} = 4840$

Thus, the amount of each instalment = ₹ 4840.

Example 9.12: A washing machine was available for ₹ 15000 cash but was purchased under an instalment plan after paying ₹ 2250 as cash down payment followed by two equal half yearly instalments. If interest charged was 8% per annum compounded semi-annually, find the value of each instalment.

Solution: Cash price of the washing machine = ₹ 15000

Cash down payment = ₹ 2250

Balance to be paid = ₹ [15000 – 2250] = ₹ 12750

Rate of interest = 8% p.a. = 4% semi-annually

Let each instalment be ₹ x (semi-annually) and

P_1, P_2 be the present values respectively of the two instalments, then

$$\therefore\ x = P_1\left(1+\frac{4}{100}\right)^1 \text{ and } x = P_2\left(1+\frac{4}{100}\right)^2$$

$$\text{This gives } P_1 = \frac{25}{26}x \text{ and } P_2 = \left(\frac{25}{26}\right)^2 x$$

$$\text{Hence, } 12750 = \frac{25}{26}x + \left(\frac{25}{26}\right)^2 x = \frac{25}{26}x\left(1+\frac{25}{26}\right) = \frac{25}{26}.\frac{51}{26}x$$

$$\Rightarrow x = 12750 \times \frac{26}{25} \times \frac{26}{51} = 6760$$

Thus, each instalment = ₹ 6760.

Example 9.13: A juicer is available for ₹ 3500 cash but was sold under instalment plan where the purchaser agreed to pay ₹ 1500 cash down and 3 equal quarterly instalments. If the dealer charges interest at 12% p.a. compounded quarterly, find the amount of each instalment to the nearest rupee.

Solution: Cash price of the juicer = ₹ 3500

Cash down payment = ₹ 1500

Balance to be paid = ₹ (3500 – 1500) = ₹ 2000

Rate of interest = 12% p.a. = $\frac{12}{4}$ = 3% quarterly

Let the amount of each instalment be Rs. x and P_1, P_2, P_3 respectively be their present values, then

$$x = P_1\left(1+\frac{3}{100}\right), \quad x = P_2\left(1+\frac{3}{100}\right)^2 \text{ and } x = P_3\left(1+\frac{3}{100}\right)^3$$

$$P_1 = \frac{100}{103}x, \quad P_2 = \left(\frac{100}{103}\right)^2 x \text{ and } P_3 = \left(\frac{100}{103}\right)^3 x$$

$$\frac{100}{103}x+\left(\frac{100}{103}\right)^2 x+\left(\frac{100}{103}\right)^3 x = 2000 \Rightarrow \frac{100}{103}x\left[1+\frac{100}{103}+\left(\frac{100}{103}\right)^2\right] = 2000$$

$$x = 2000\times\frac{103}{100}\times\frac{(103)^2}{30909} = ₹\ 707$$

$\therefore$ Each instalment = ₹ 707

Example 9.14: A television set is sold for ₹ 7110 cash down payment along with 2 equal monthly instalments of ₹ 5581.50 each. If the dealer charges interest at 20% p.a. compounded monthly under the instalment plan, find the cash price of the television set.

Solution: Cash down payment = ₹ 7110

Amount of each monthly instalment = ₹ 5581.50 = ₹ $\frac{11163}{2}$

Rate of interest = 20% p.a. = $\frac{20}{12}$ monthly

Let P_1, P_2 be the Principals for 1st and 2nd instalment respectively

$$\frac{11163}{2} = P_1\left(1+\frac{20}{1200}\right) \text{ and } \frac{11163}{2} = P_2\left(1+\frac{20}{1200}\right)^2$$

This gives $P_1 = \frac{11163}{2}\times\frac{60}{61} = \text{Rs.}5490$ and $P_2 = \frac{11163}{2}\times\frac{60}{61}\times\frac{60}{61} = \text{Rs.}5400$

Thus, cash Price = ₹ [7110 + 5490 + 5400] = ₹ 18000

Example 9.15: A dealer offeres a micro-oven for ₹ 5800 cash. A customer agrees to pay ₹ 1800 cash down and 3 equal annual instalments. If the dealer charges interest at 12% p.a. compounded annually, what is the amount of each instalment.

Solution: Cash price of the micro-oven = ₹ 5800

Cash down payment = ₹ 1800

Balance to be paid = ₹ 4000

Rate of interest = 12% p.a. compounded annually

$\therefore$ Let Rs. x be the amount of each instalment and P_1, P_2, P_3 be the principals for each instalment respectively.

$$\therefore\ x = P_1\left(1+\frac{12}{100}\right),\quad x = P_2\left(1+\frac{12}{100}\right)^2 \text{ and } x = P_3\left(1+\frac{12}{100}\right)^3$$

$$\Rightarrow\ P_1 = \frac{25}{28}x,\ P_2 = \left(\frac{25}{28}\right)^2 x \text{ and } P_3 = \left(\frac{25}{28}\right)^3 x$$

$$\therefore \frac{25}{28}x + \left(\frac{25}{28}\right)^2 x + \left(\frac{25}{28}\right)^3 x = 4000$$

or $$\frac{25}{28}x\left(1+\frac{25}{28}+\frac{625}{784}\right) = 4000$$

or $$x = 4000\times\frac{28}{25}\times\frac{784}{2109} = ₹\ 1665.40$$

Hence each instalment = ₹ 1665.40

Example 9.16: A flat is available for ₹ 1600000 cash or ₹ 585500 cash down payment and three equal half yearly instalments. If the interest charged is 16% per annum compounded half yearly, calculate the value of each instalment. Find also the total interest charged.

Solution: Cash price of the flat = ₹ 1600000

Cash down payment = ₹ 585500

Balance to be paid = ₹ 1014500

Rate of interest = 16% per annum = 8% semi annually

Let the amount of each instalment be ₹ x and Let P_1, P_2 and P_3 be the Principals for each instalment respectively.

So, $$x = P_1\left(1+\frac{8}{100}\right) \text{ or } x = P_1\left(\frac{27}{25}\right) \text{ or } P_1 = x\left(\frac{25}{27}\right)$$

Similarly, $$P_2 = x\left(\frac{25}{27}\right)^2 \text{ and } P_3 = x\left(\frac{25}{27}\right)^3$$

$\therefore\ P_1 + P_2 + P_3 = 1014500$

$$x\left(\frac{25}{27}\right)+x\left(\frac{25}{27}\right)^2+x\left(\frac{25}{27}\right)^3=1014500$$

$$x\left(\frac{25}{27}\right)\left[1+\frac{25}{27}+\left(\frac{25}{27}\right)^2\right]=1014500$$

$$x.\frac{25}{27}.\frac{2029}{729}=1014500$$

$$x=\frac{1014500\times27\times729}{25\times2029}$$

$$= ₹\ 393660$$

Interest paid = ₹ [393660 × 3 – 1014500]

= ₹ [1180980 – 1014500]

= ₹ 166480.

CHECK YOUR PROGRESS 9.4

1. A bicycle is available for ₹ 1661 cash or by paying ₹ 400 cash down and balance in three equal half yearly instalments. If the interest charged is 10% per annum compounded semi-annually, find the instalment.

2. A washing machine is available for ₹ 15000 cash or ₹ 2000 cash down with two equal half yearly instalments. If the rate of interest charged is 16% per annum compounded half yearly, find the instalment.

3. Kamal purchased a computer in instalment plan by paying ₹ 5612.50 cash down followed by three equal quarterly instalments of ₹ 8788 each. If the rate of interest charged was 16% per annum, compounded quarterly, find the cash price of the computer. Also find the total interest charged.

4. A car was available for ₹ 70000 cash or by paying ₹ 21200 cash down along with three equal annual instalments. If the dealer charges interest of 25% per annum, compounded annually, find the amount of each instalment.

5. A microwave oven was purchased by paying a cash down payment of ₹ 2800 along with 2 equal annual instalments of ₹ 2420 each. If the rate of interest charged under the instalment plan was 10% p.a. compounded annually, find the cash price of the article.

LET US SUM UP

- Under an instalment scheme, the customer, after making a partial payment in the beginning takes away the article for use, after signing the agreement to pay the balance amount in instalments.
- Under instalment plan, the buyer pays some extra amount, which is **interest** on the deferred payments.
- Instalment scheme encourages the buyer to save at regular intervals, so as to pay the instalments.
- The price at which the article is available, if full payment is made in cash, is called the **cash price** of the article.
- The partial payment made at the time of purchase under instalment plan is called **Cash down payment.**
- The payments, which the buyer has to make at regular intervals, are called instalments.

TERMINAL EXERCISE

1. A sewing machine is available for ₹ 2600 cash payment or under an instalment plan for ₹ 1000 cash down payment and 3 equal monthly instalments of ₹ 550 each. Find the rate of interest charged under the instalment plan.
2. Anil purchased a typewriter priced at ₹ 8000 cash payment under the instalment plan by making a cashdown payment of ₹ 3200 and 5 equal monthly instalments of ₹ 1000 each. Find the rate of interest charged under the instalment plan.
3. A table is sold for ₹ 2000 cash or ₹ 500 as cash payment followed by 4 equal monthly instalments of ₹ 400 each. Find the rate of interest charged under the instalment plan.
4. A T.V. set has a cash price of ₹ 7500 or ₹ 2000 as cash down payment followed by 6 monthly instalments of ₹ 1000 each. Find the rate of interest charged under instalment plan.
5. An article is available for ₹ 7000 cash or for ₹ 1900 cash down payment and six equal monthly instalments. If the rate of interest charged is $2\frac{1}{2}$% per month, determine each instalment.
6. An article is sold for ₹ 1000 cash or Rs. 650 cash down payment followed by 5 equal monthly instalments. If the rate of interest charged is 18% per annum, compute the monthly instalment.

7. The selling price of a washing machine is ₹ 14000. The company asks for ₹ 7200 in advance and the rest to be paid in equal monthly instalments of ₹ 1400 each. If the rate of interest is 12% per annum, find the number of instalments.
8. A scooter is available for ₹ 30000 cash or for ₹ 15000 cash down payment and 4 equal monthly instalments. If the rate of interest charged under the instalment plan is $33\frac{1}{3}$%, find the amount of each instalment.
9. A plot of land is available for ₹ 200000 cash or ₹ 100000 cash down payment and 5 monthly instalments of ₹ 21000 each. Find the rate of interest charged under the instalment plan.
10. A steel almirah is marked for ₹ 3575 cash or ₹ 1600 as cash down payment and ₹ 420 per month for 5 months. Find the rate of interest under the instalment plan.
11. A watch is sold for ₹ 1000 cash or for ₹ 300 cash down payment followed by 5 equal monthly instalments. If the rate of interest charged is 18% p.a., compute the monthly instalment.
12. A computer is available for ₹ 34000 cash or ₹ 20000 cash down payment, together with 5 equal monthly instalments. If the rate of interest charged under instalment plan is 30% per annum, calculate the amount of each instalment.
13. Rita purchased a washing machine for ₹ 4000 cash down payment and 4 equal monthly instalments. The washing machine was also available for ₹ 15000 cash payment. If the rate of interest charged under the instalment plan is 18% per annum, find the amount of each instalment.
14. A ceiling fan is marked at ₹ 970 cash or ₹ 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.
15. A watch is available for ₹ 970 cash or for ₹ 350 as cash down payment followed by 3 equal monthly instalments. If the rate of interest is 24% per annum, find the monthly instalment.
16. A DVD player was purchsed by the customer with a cash down payment of ₹ 2750 and agreed to pay 3 equal half yearly instalments of ₹ 331 each. If the interest charged was 20% p.a. compounded half yearly, then find the cash price of the DVD player.
17. A flat can be purchased for ₹ 200000 cash from a housing society or on the terms that ₹ 67600 be paid in the beginning as cash down payment followed by three equal half yearly instalments. If the society charges interest at the rate of 20% per annum compounded semi-annually. If the flat is purchased under instalment plan, find each instalment.
18. A scooter was sold by a shopkeeper for cash down payment of ₹ 11000 alongwith 2 equal annual instalments of ₹ 6250 each. If the rate of interest charged was 25% per annum compounded annually, find the cash price of the scooter.

19. A computer is available for ₹ 78600 cash or for ₹ 25640 cash down payment and three equal quarterly instalments. If the dealer charges interest at the rate of 20% per annum compounded quarterly, find the value of each instalment.

20. A builder announces sale of flats each for ₹ 3000000 cash or ₹ 1031600 cash down payment and three equal quarterly instalments. If the rate of interest charged is 10% per annum compounded quarterly, compute the value of each instalment under the instalment scheme. Also find the total interest.

ANSWERS TO CHECK YOUR PROGRESS

9.1

1. 42.87% 2. $44\frac{4}{9}$ 3. $21\frac{1}{19}\%$ 4. $17\frac{1}{7}\%$ 5. 4.69%

6. 51.1% 7. 47.06%

9.2

1. ₹ 4000 2. $\frac{200}{9}$ 3. ₹ 775.77

4. ₹ 1934.55 4. ₹ 77.6 approx.

9.3

1. ₹ 1150 2. ₹ 10,000 3. ₹ 2500

4. ₹ 970 5. ₹ 3580

9.4

1. ₹ 463.05 2. ₹ 7290 3. ₹ 30,000, ₹ 1976.50

4. ₹ 25000 5. ₹ 7000

ANSWERS TO TERMINAL EXERCISE

1. $19\frac{1}{21}\%$ 2. $17\frac{1}{7}\%$ 3. $33\frac{1}{3}$ 4. $33\frac{1}{3}$

5. ₹ 920 6. ₹ 63.35 7. 5 8. ₹ 4000

9. 20.7% 10. 26.43% 11. ₹ 146.12 12. ₹ 3000

13. ₹ 2850.86 14. ₹ 366 (Approx) 15. ₹ 220 16. ₹ 6060

17. ₹ 53240 18. ₹ 20,000 19. ₹ 19448

20. ₹ 689210, ₹ 99230

Secondary Course Mathematics

Practice Work-Commercial Mathematics

Maximum Marks: 25 **Time : 45 Minutes**

Instructions:

1. Answer all the questions on a separate sheet of paper.
2. Give the following informations on your answer sheet

   Name

   Enrolment number

   Subject

   Topic of practice work

   Address
3. Get your practice work checked by the subject teacher at your study centre so that you get positive feedback about your performance.

Do not send practice work to National Institute of Open Schooling

1. By selling a school bag to a customer for ₹ 660, a shopkeeper makes a profit of 10%. The cost price (in rupees) of the school bag is 1

   (A) 625 (B) 600

   (C) 575 (D) 550

2. A customer purchases a radio set for ₹ 5400 after getting 10% discount on its list price. The list price of the radio set is 1

   (A) ₹ 5050 (B) ₹ 5800

   (C) ₹ 5950 (D) ₹ 6000

3. List price of a book is ₹ 300. A student purchases the book for ₹ 234. Percentage of discount is 1

   (A) 25 (B) 24

   (C) 22 (D) 20

4. The ratio (in simplest form) of 35 cm to 2 m is 1

   (A) 35: 2 (B) 35:200

   (C) 7:40 (D) 40:7

5. The difference in simple and compound interest for ₹ 2000 at 10% per annum in 2 years, compounded annually is 1

   (A) ₹ 20 (B) ₹ 200

   (C) ₹ 400 (D) ₹ 0

6. Determine the value of k if 20 : k :: 25 : 450. 2

7. If 120 is reduced to 96, what is the percentage reduction? 2

8. If the cost price of 15 articles is the same as the selling price of 12 articles, find the gain or loss percent in the transaction. 2

9. Find the single discount equivalent to the discount series of 20%, 15% and 10%. 2

10. Find the the sum of money which will amount to ₹ 26010 in six months at the rate of 8% per annum, when interest is compounded quarterly. 2

11. A sewing machine is available for ₹ 2600 cash or under instalment plan for ₹ 1000 cash down payment followed by 3 monthly instalments of ₹ 550 each. Find the rate of interest charged under the instalment plan. 4

12. A tree gains its height at the rate of 2% of what it was in the beginning of the month. If its height was 1.5 m in the beginning of January 2010, find the height at the end of April 2010.