

# 2

## Banking

### INTRODUCTION

In ancient times, the rich and powerful persons who could defend themselves and their property used to keep the savings and valuables (ornaments) of the common people and charged some money for rendering this service. With the passage of time, it was realised that the deposited money could be used to lend to the needy persons as all the depositors do not withdraw their money at the same time. In due course of time, the moneylenders (rich persons) started paying some nominal rate of interest to the depositors and charging very high rate of interest from the borrowers. In this way they made huge profits by utilising the deposits of the common people. To keep the savings of the people in safe custody, **banks** came into existence.

**A bank is an institution which mainly carries on the business of getting deposits and lending money.**

The rate of interest which a bank charges from the borrowers is usually higher than the one it pays to the depositors. Now-a-days, apart from the business of taking deposits and lending money, many other financial transactions are also carried by banks.

Some functions of banks are given below:

- (i) getting deposits.
- (ii) lending money.
- (iii) transferring money from one place to another.
- (iv) providing traveller cheques and foreign exchange to the tourists.
- (v) renting deposit vaults (lockers) to keep valuables in safe custody.
- (vi) accepting payments for public utility services such as electricity bills, water bills, phone bills, house tax, sales tax, income tax, salaries of employees etc.

### Different types of bank accounts

The banks offer different schemes under which we can open our accounts. Mainly, the four different types of bank accounts offered by a bank are:

- (i) Savings Bank Account.
- (ii) Current Bank Account.
- (iii) Fixed Deposit Account.
- (iv) Recurring (or cumulative) Deposit Account.

In this chapter, we shall be dealing only with the **recurring (or cumulative) deposit account**. We shall learn the computation of interest and maturity value (abbreviated 'MV') by using the formula:

$$I \text{ (interest)} = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100} \text{ and}$$

$$MV \text{ (maturity value)} = P \times n + I.$$

## 2.1 RECURRING (OR CUMULATIVE) DEPOSIT ACCOUNT

To boost the savings among the people of small and middle income groups, there are recurring (or cumulative) time deposit schemes in banks and post offices. Under this scheme, an investor deposits a fixed amount (in multiples of ₹5) every month for a specified number of months (usually, in multiples of 3) and on expiry of this period (called **maturity period**), he gets the amount deposited by him together with the interest (usually, compounded quarterly at a fixed rate) due to him. The amount received by the investor on the expiry of the specified period is called **maturity value**.

The rate of interest is revised from time to time.

### 2.1.1 Calculation of interest on recurring deposit

Calculation of interest on a recurring deposit using compound interest is cumbersome and time consuming work. However, we shall calculate interest on recurring deposit using simple interest.

**Note** If  $n$  is a natural number, then

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2} \quad \dots(i)$$

*For example,*

$$1 + 2 + 3 + \dots + 30 = \frac{30(30+1)}{2} = 15 \times 31 = 465.$$

### 2.1.2 To find equivalent principal for one month for the whole deposit

Suppose a man deposits ₹250 per month in a recurring deposit for one year. Clearly in this recurring deposit, the amount deposited in the first month (₹250) will remain with the bank for 12 months *i.e.* it (₹250) will earn interest for 12 months. The amount deposited in the 2nd month will earn interest for 11 months and so on.

Thus,

- ₹250 for 12 months = ₹(250 × 12) for one month
- ₹250 for 11 months = ₹(250 × 11) for one month
- ₹250 for 10 months = ₹(250 × 10) for one month
- ₹250 for 9 months = ₹(250 × 9) for one month
- ₹250 for 8 months = ₹(250 × 8) for one month
- ₹250 for 7 months = ₹(250 × 7) for one month
- ₹250 for 6 months = ₹(250 × 6) for one month
- ₹250 for 5 months = ₹(250 × 5) for one month
- ₹250 for 4 months = ₹(250 × 4) for one month
- ₹250 for 3 months = ₹(250 × 3) for one month
- ₹250 for 2 months = ₹(250 × 2) for one month
- ₹250 for 1 month = ₹(250 × 1) for one month

Therefore, for the whole deposit, we have:

*Equivalent principal for one month*

$$= ₹250 \times (12 + 11 + 10 + \dots + 1)$$

$$= ₹250 \times \frac{12(12+1)}{2}$$

(Using formula (i))

$$= ₹(250 \times 6 \times 13) = ₹19500.$$

### 2.1.3 Calculation of maturity amount on recurring deposit

The interest on the recurring deposit account can be calculated by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$

where  $I$  is the (simple) interest,  $P$  is the money deposited per month,  $n$  is the number of months for which the money has been deposited and  $r$  is the (simple) interest rate percent per annum.

The maturity value on a recurring deposit account can be calculated by using the formula:

$$MV = P \times n + I$$

where  $MV$  is the maturity value,  $P$  is the money deposited per month,  $n$  is the number of months for which the money has been deposited and  $I$  is the (simple) interest.

**Note** All calculations are based on simple interest.

Calculation of (simple) interest and the maturity value (or amount) on a recurring (cumulative) deposit is illustrated with the help of following examples:

#### Illustrative Examples

**Example 1** Katrina opened a recurring deposit account with a Nationalised Bank for a period of 2 years. If the bank pays interest at the rate of 6% per annum and the monthly instalment is ₹1000, find the:

- (i) interest earned in 2 years. (ii) matured value. (2015)

**Solution.** In this recurring deposit account, ₹ 1000 will earn interest for 24 months, ₹ 1000 will earn interest for 23 months and so on.

∴ Equivalent principal for one month

$$= ₹ 1000 \times (24 + 23 + 22 + \dots + 1)$$

$$= ₹ 1000 \times (1 + 2 + 3 + \dots + 24)$$

$$= ₹ 1000 \times \frac{24(24+1)}{2}$$

$$= ₹ (1000 \times 12 \times 25) = ₹ 300000.$$

(Using formula (i))

(i) Interest on ₹ 300000 for 1 month at the rate of 6% p.a.

$$= ₹ \left( 300000 \times \frac{1}{12} \times \frac{6}{100} \right) = ₹ 1500$$

∴ Interest earned in 2 years = ₹ 1500.

(ii) Total amount deposited = ₹ (1000 × 24) = ₹ 24000

∴ Matured value = total money deposited + interest earned  
= ₹ 24000 + ₹ 1500 = ₹ 25500.

**Alternative method (using formula directly)**

Here,  $P$  = money deposited per month = ₹ 1000.

$n$  = number of months for which the money is deposited =  $2 \times 12 = 24$  and

$r$  = simple interest rate percent per annum = 6.

(i) Using the formula:  $I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$ , we get

$$I (\text{interest}) = ₹ \left( 1000 \times \frac{24 \times 25}{2 \times 12} \times \frac{6}{100} \right) = ₹ 1500.$$

(ii) Using the formula:

$$\begin{aligned}MV &= P \times n + I, \text{ we get} \\ \text{Matured value} &= ₹ (1000 \times 24) + ₹ 1500 \\ &= ₹ 24000 + ₹ 1500 = ₹ 25500.\end{aligned}$$

**Example 2** Arvind deposits ₹1600 per month in a cumulative account for 3 years at the rate of 9% p.a. simple interest. Find the amount Arvind will get at the time of maturity.

**Solution.** Here,  $P$  = money deposited per month = ₹1600,

$n$  = number of months for which the money is deposited =  $3 \times 12 = 36$  and

$r$  = simple interest rate percent per annum = 9.

Using the formula:  $I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$ , we get

$$I = \left( 1600 \times \frac{36 \times 37}{2 \times 12} \times \frac{9}{100} \right) = ₹ 7992.$$

Using the formula:

$$\begin{aligned}MV &= P \times n + I, \text{ we get} \\ \text{maturity value} &= ₹ (1600 \times 36) + ₹ 7992 \\ &= ₹ 57600 + ₹ 7992 = ₹ 65592.\end{aligned}$$

∴ The amount Arvind will get at the time of maturity = ₹ 65592.

**Example 3** Mohan deposits ₹80 per month in a cumulative deposit account for six years. Find the amount payable to him on maturity, if the rate of interest is 6% per annum.

(2006)

**Solution.** Here,  $P$  = money deposited per month = ₹80,

$n$  = the number of months for which the money is deposited  
=  $6 \times 12 = 72$  and

$r$  = interest rate percent per annum = 6.

Using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹ \left( 80 \times \frac{72 \times 73}{2 \times 12} \times \frac{6}{100} \right) = ₹ 1051.20$$

Using the formula:  $MV = P \times n + I$ , we get

$$\begin{aligned}\text{maturity value} &= ₹ (80 \times 72) + ₹ 1051.20 \\ &= ₹ 5760 + ₹ 1051.20 = ₹ 6811.20\end{aligned}$$

Hence, the amount payable to Mohan on maturity = ₹ 6811.20

**Example 4** Ahmed has a recurring deposit account in a bank. He deposits ₹2500 per month for 2 years. If he gets ₹66250 at the time of maturity, find

(i) the interest paid by the bank.

(ii) the rate of interest.

(2011)

**Solution.** (i) Here,  $P$  = money deposited per month = ₹2500 and

$n$  = the number of months for which the money is deposited  
=  $2 \times 12 = 24$ .

∴ Total money deposited by Ahmed = ₹(2500 × 24) = ₹60000.

The money which Ahmed gets at the time of maturity = ₹66250.

$$\therefore \text{The interest paid by the bank} = ₹66250 - ₹60000 \\ = ₹6250.$$

(ii) Let the rate of interest be  $r\%$  per annum, then by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$₹6250 = ₹2500 \times \frac{24(24+1)}{2 \times 12} \times \frac{r}{100}$$

$$\Rightarrow 6250 = 25 \times 25 \times r$$

$$\Rightarrow 6250 = 625 r \Rightarrow r = 10.$$

Hence, the rate of interest = 10% per annum.

**Example 5** Shobana has a cumulative time deposit account in State Bank of India. She deposits ₹500 per month for a period of 4 years. If at the time of maturity she gets ₹28410, find the rate of (simple) interest.

**Solution.** Here,  $P$  = money deposited per month = ₹500 and

$n$  = the number of months for which the money is deposited

$$= 4 \times 12 = 48.$$

Let the rate of interest be  $r\%$  per annum, then by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹500 \times \frac{48 \times 49}{2 \times 12} \times \frac{r}{100} = ₹490r.$$

Total money deposited by Shobana = ₹(500 × 48) = ₹24000.

$\therefore$  The amount of maturity = total money deposited + interest

$$= ₹24000 + ₹490 r$$

$$= ₹(24000 + 490 r).$$

According to given,  $24000 + 490 r = 28410$

$$\Rightarrow 490 r = 4410 \Rightarrow r = 9.$$

Hence, rate of (simple) interest = 9% p.a.

**Example 6** Richard has a recurring deposit account in a post office for 3 years at 7.5% p.a. simple interest. If he gets ₹8325 as interest at the time of maturity, find

(i) the monthly instalment

(ii) the amount of maturity.

(2017)

**Solution.** Here,  $n$  = the number of months for which the money is deposited

$$= 3 \times 12 = 36 \text{ and}$$

$r$  = interest rate percent per annum = 7.5

(i) Let the monthly instalment be ₹ $x$ , then  $P = ₹x$ .

Using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹x \times \frac{36 \times 37}{2 \times 12} \times \frac{7.5}{100} = ₹ \frac{3 \times 37}{2} \times \frac{15}{200} \times x = ₹ \frac{333}{80} x.$$

According to given,  $\frac{333}{80} x = 8325 \Rightarrow x = 25 \times 80 = 2000.$

Hence, the monthly instalment = ₹2000.

(ii) Total amount deposited by Richard = ₹(2000 × 36) = ₹72000.

$$\begin{aligned}\therefore \text{Amount of maturity} &= \text{total amount deposited} + \text{interest} \\ &= ₹72000 + ₹8325 \\ &= ₹80325.\end{aligned}$$

**Example 7** Mr. Britto deposits a certain sum of money each month in a Recurring Deposit Account of a bank. If the rate of interest is 8% per annum and Mr. Britto gets ₹8088 from the bank after 3 years, find the value of his monthly instalment. (2013)

**Solution.** Here,  $n$  = the number of months for which the money is deposited  
 $= 3 \times 12 = 36$  and

$r$  = interest rate percent per annum = 8.

Let the monthly instalment be ₹ $x$ , then  $P = ₹x$ .

Using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹x \times \frac{36 \times 37}{2 \times 12} \times \frac{8}{100} = ₹\frac{111}{25}x.$$

Total money deposited by Mr. Britto = ₹( $x \times 36$ ) = ₹36 $x$ .

$\therefore$  The amount of maturity = total money deposited + interest

$$= ₹36x + ₹\frac{111}{25}x = ₹\frac{1011}{25}x.$$

But the amount of maturity = ₹8088 (given)

$$\Rightarrow \frac{1011}{25}x = 8088 \Rightarrow \frac{x}{25} = 8 \Rightarrow x = 200.$$

Hence, the monthly instalment = ₹200.

**Example 8** Priyanka has a recurring deposit account of ₹1000 per month at 10% per annum.

If she gets ₹5550 as interest at the time of maturity, find the total time for which the account was held. (2018)

**Solution.** Here,  $P$  = money deposited per month = ₹1000 and

$r$  = rate of interest per annum = 10.

Let the account be held for  $n$  months, then by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹1000 \times \frac{n(n+1)}{2 \times 12} \times \frac{10}{100} = ₹100 \times \frac{n(n+1)}{2 \times 12}.$$

$$\text{According to given, } 100 \times \frac{n(n+1)}{24} = 5550$$

$$\Rightarrow n(n+1) = \frac{24 \times 5550}{100} \Rightarrow n(n+1) = 12 \times 111$$

$$\Rightarrow n^2 + n - 1332 = 0 \Rightarrow (n-36)(n+37) = 0$$

$$\Rightarrow n = 36, -37 \text{ but } n \text{ cannot be negative}$$

$$\Rightarrow n = 36.$$

Hence, the account was held for 36 months i.e. 3 years.

**Example 9** Beena has a cumulative deposit account of ₹400 per month at 10% per annum simple interest. If she gets ₹30100 at the time of maturity, find the total time for which the account was held.

**Solution.** Here,  $P$  = money deposited per month = ₹400 and  
 $r$  = interest rate percent per annum = 10.

Let the account be held for  $n$  months, then by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}, \text{ we get}$$

$$I = ₹400 \times \frac{n(n+1)}{2 \times 12} \times \frac{10}{100} = ₹ \frac{5n(n+1)}{3}.$$

Total money deposited by Beena = ₹(400 ×  $n$ ) = ₹400 $n$ .

∴ The amount of maturity = total money deposited + interest

$$= ₹400n + ₹ \frac{5n(n+1)}{3}$$

$$= ₹ \frac{1200n + 5n(n+1)}{3} = ₹ \frac{5n^2 + 1205n}{3}.$$

According to given,  $\frac{5n^2 + 1205n}{3} = 30100$

$$\Rightarrow 5n^2 + 1205n - 90300 = 0 \Rightarrow n^2 + 241n - 18060 = 0$$

$$\Rightarrow (n - 60)(n + 301) = 0$$

$$\Rightarrow n = 60, -301 \text{ but } n \text{ cannot be negative}$$

$$\Rightarrow n = 60.$$

Hence, the account was held for 60 months *i.e.* 5 years.

## EXERCISE 2

- ✓ 1 Shweta deposits ₹350 per month in a recurring deposit account for one year at the rate of 8% p.a. Find the amount she will receive at the time of maturity.
- ✓ 2 Saloni deposited ₹150 per month in a bank for 8 months under the Recurring Deposit Scheme. What will be the maturity value of his deposits, if the rate of interest is 8% per annum? (2007)
- ✓ 3 Mrs. Goswami deposits ₹1000 every month in a recurring deposit account for 3 years at 8% interest per annum. Find the matured value. (2009)
- ✓ 4 Sonia had a recurring deposit account in a bank and deposited ₹600 per month for  $2\frac{1}{2}$  years. If the rate of interest was 10% p.a., find the maturity value of this account. (2018)
- ✓ 5 Kiran deposited ₹200 per month for 36 months in a bank's recurring deposit account. If the bank pays interest at the rate of 11% per annum, find the amount she gets on maturity? (2012)
- ✓ 6 Haneef has a cumulative bank account and deposits ₹600 per month for a period of 4 years. If he gets ₹5880 as interest at the time of maturity, find the rate of interest.
- ✓ 7 David opened a Recurring Deposit Account in a bank and deposited ₹300 per month for two years. If he received ₹7725 at the time of maturity, find the rate of interest per annum. (2008)
- ✓ 8 Mr. Gupta opened a recurring deposit account in a bank. He deposited ₹2500 per month for two years. At the time of maturity he got ₹67500. Find :
  - (i) the total interest earned by Mr. Gupta.
  - (ii) the rate of interest per annum. (2010)

9. Shahrukh opened a Recurring Deposit Account in a bank and deposited ₹800 per month for  $1\frac{1}{2}$  years. If he received ₹15084 at the time of maturity, find the rate of interest per annum. (2014)
10. Mohan has a recurring deposit account in a bank for 2 years at 6% p.a. simple interest. If he gets ₹1200 as interest at the time of maturity, find:  
 (i) the monthly instalment  
 (ii) the amount of maturity. (2016)
11. Mr. R.K. Nair gets ₹6455 at the end of one year at the rate of 14% per annum in a recurring deposit account. Find the monthly instalment. (2005)
12. Samita has a recurring deposit account in a bank of ₹2000 per month at the rate of 10% p.a. If she gets ₹83100 at the time of maturity, find the total time for which the account was held.

**Hint.** Let the account be held for  $n$  months, then

$$2000n + 2000 \times \frac{n(n+1)}{2 \times 12} \times \frac{10}{100} = 83100.$$

## Multiple Choice Questions

Choose the correct answer from the given four options (1 to 4):

1. If Sharukh opened a recurring deposit account in a bank and deposited ₹800 per month for  $1\frac{1}{2}$  years, then the total money deposited in the account is  
 (a) ₹11400 (b) ₹14400 (c) ₹13680 (d) none of these
2. Mrs. Asha Mehta deposit ₹250 per month for one year in a bank's recurring deposit account. If the rate of (simple) interest is 8% per annum, then the interest earned by her on this account is  
 (a) ₹65 (b) ₹120 (c) ₹130 (d) ₹260
3. Mr. Sharma deposited ₹500 every month in a cumulative deposit account for 2 years. If the bank pays interest at the rate of 7% per annum, then the amount he gets on maturity is  
 (a) ₹875 (b) ₹6875 (c) ₹10875 (d) ₹12875
4. John deposited ₹400 every month in a bank's recurring deposit account for  $2\frac{1}{2}$  years. If he gets ₹1085 as interest at the time of maturity, then the rate of interest per annum is  
 (a) 6% (b) 7% (c) 8% (d) 9%

## Summary

### Recurring (or cumulative) deposit account

Recurring (or cumulative) deposit account is a time deposit scheme in banks (or post offices) to boost the savings among the people of small and middle income groups. Under this scheme, an investor deposits a fixed amount (in multiples of ₹5) every month for a specified number of months (usually, in multiples of 3) and on the expiry of this period (called **maturity period**), he/she gets the amount deposited by him/her together with the interest due to him/her. The amount received by the investor on the expiry of the specified period is called **maturity value**.

The rate of interest is revised from time to time.



❑ **Calculation of interest on a recurring deposit account**

The interest on a recurring deposit account can be calculated by using the formula:

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$

where  $I$  is the (simple) interest earned,  $P$  is the money deposited every month,  $n$  is the number of months for which the money has been deposited and  $r$  is the (simple) interest rate percent per annum.

❑ **Calculation of maturity amount on a recurring deposit account**

The maturity value (or amount) on a recurring deposit account can be calculated by using the formula:

$$MV = P \times n + I$$

where  $MV$  is the maturity value,  $P$  is the money deposited every month,  $n$  is the number of months for which the money has been deposited and  $I$  is the (simple) interest earned on the recurring deposit account.

### Chapter Test

- 1 Mr. Dhruv deposits ₹600 per month in a recurring deposit account for 5 years at the rate of 10% per annum (simple interest). Find the amount he will receive at the time of maturity.
- 2 Ankita started paying ₹400 per month in a 3 year recurring deposit. After six months her brother Anshul started paying ₹500 per month in a  $2\frac{1}{2}$  years recurring deposit. The bank paid 10% p.a. simple interest for both. At maturity who will get more money and by how much?
- 3 Shilpa has a 4 year recurring deposit account in Bank of Maharashtra and deposits ₹800 per month. If she gets ₹48200 at the time of maturity, find
  - (i) the rate of (simple) interest.
  - (ii) the total interest earned by Shilpa.
- 4 Mr. Chaturvedi has a recurring deposit account in Grindlay's Bank for  $4\frac{1}{2}$  years at 11% p.a. (simple interest). If he gets ₹101418.75 at the time of maturity, find the monthly instalment.
- 5 Rajiv Bhardwaj has a recurring deposit account in a bank of ₹600 per month. If the bank pays simple interest of 7% p.a. and he gets ₹15450 as maturity amount, find the total time for which the account was held.