

EXERCISE 2

1. Mrs. Goswami deposits ₹ 1000 every month in a recurring deposit account for 3 years at 8% interest per annum. Find the matured value.

Solution:

It is given that

Amount deposited by Mrs. Goswami = ₹ 1000

Rate of interest = 8% p.a.

Period (x) = 3 years = 36 months

We know that

Total principal for one month = $1000 \times [x(x+1)]/2$

Substituting the value of x

= $1000 \times (36 \times 37)/2$

By further calculation

= ₹ 666000

Interest = $PRT/100$

Substituting the values

= $(666000 \times 8 \times 1)/(100 \times 12)$

So we get

= ₹ 4440

So the amount of maturity = $P \times x + SI$

= $1000 \times 36 + 4440$

= $36000 + 4440$

= ₹ 40440

2. Sonia had a recurring deposit account in a bank and deposited ₹ 600 per month for 2½ years. If the rate of interest was 10% p.a., find the maturity value of this account.

Solution:

Its given that,

Amount deposited by Sonia per month = ₹ 600

Rate of interest (r) = 10% p.a.

Period (n) = 2½ years = 30 months

The interest earned during this period is calculated using the formula:

$I = P \times [n(n+1)/(2 \times 12)] \times r/100$

$I = 600 \times [30(30+1)/(2 \times 12)] \times 10/100$

= $600 \times [(30 \times 31)/(2 \times 12)] \times 1/10$

= $60 \times [(15 \times 31)/12]$

= $5 \times 15 \times 31$

$I = ₹ 2325$

$$\begin{aligned}\text{Maturity value (MV)} &= P \times n + I \\ \text{MV} &= ₹ (600 \times 30 + 2325) \\ &= ₹ (18000 + 2325) \\ &= ₹ 20325\end{aligned}$$

Hence, the maturity value of Sonia's account will be ₹ 20325.

3. 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?

Solution:

It is given that

Amount deposited by Kiran = ₹ 200

Rate of interest = 11% p.a.

Period (x) = 36 months

So the amount deposited in 36 months = $200 \times 36 = ₹ 7200$

We know that

Total principal for one month = $200 \times [x(x+1)]/2$

Substituting the value of x

$$= 200 \times (36 \times 37)/2$$

By further calculation

$$= ₹ 133200$$

Interest = $PRT/100$

Substituting the values

$$= (133200 \times 11 \times 1)/(100 \times 12)$$

So we get

$$= ₹ 1221$$

So the amount of maturity = $P \times x + SI$

$$= 7200 + 1221$$

$$= ₹ 8421$$

4. Haneef has a cumulative bank account and deposits ₹ 600 per month for a period of 4 years. If he gets ₹ 5590 as interest at the time of maturity, find the rate of interest per annum.

Solution:

Interest at the time of maturity = ₹ 5880

Amount deposited by Haneef = ₹ 600

Period (x) = 4 years = 48 months

We know that

Total principal for one month = $600 \times [x(x+1)]/2$

Substituting the value of x

$$= 600 \times (48 \times 49)/2$$

By further calculation

$$= ₹ 705600$$

Consider $r\%$ p.a. as the rate of interest

$$\text{Interest} = \text{PRT} / 100$$

Substituting the values

$$5880 = (705600 \times r \times 1) / (100 \times 12)$$

So we get

$$5880 = 588r$$

By further calculation

$$r = 5880 / 588 = 10$$

Hence, the rate of interest = 10% p.a.

5. 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.

Solution:

It is given that

$$\text{Amount deposited per month} = ₹ 300$$

$$\text{Period (x)} = 2 \text{ years} = 24 \text{ months}$$

$$\text{Amount received at the time of maturity} = ₹ 7725$$

Consider R as the rate percent

We know that

$$\text{Total principal for one month} = 300 \times [x(x+1)] / 2$$

Substituting the value of x

$$= 300 \times (24 \times 25) / 2$$

By further calculation

$$= ₹ 90000$$

$$\text{Interest} = \text{PRT} / 100$$

Substituting the values

$$= (90000 \times R \times 1) / (100 \times 12)$$

So we get

$$= 75R$$

So we get

$$300 \times 24 + 75R = 7725$$

By further calculation

$$7200 + 75R = 7725$$

$$75R = 7725 - 7200 = 525$$

$$R = 525 / 75 = 7$$

Hence, the rate of interest is 7% p.a.

6. 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.

Solution:

It is given that

Amount deposited by Mr. Gupta per month = ₹ 2500

Period (x) = 2 years = 24 months

Amount got at the time of maturity = ₹ 67500

We know that

Total principal for one month = $2500 \times [x(x+1)]/2$

Substituting the value of x

$$= 2500 \times (24 \times 25)/2$$

By further calculation

$$= ₹ 750000$$

Interest = Maturity value – x × deposit per month

Substituting the values

$$= 67500 - 24 \times 2500$$

$$= 67500 - 60000$$

$$= ₹ 7500$$

We know that

Period = 1 month = $1/12$ year

So the rate of interest = $(SI \times 100) / (P \times T)$

Substituting the values

$$= (7500 \times 100 \times 12) / (750000 \times 1)$$

$$= 12\%$$

7. Shahrukh opened a Recurring Deposit Account in a bank and deposited ₹ 800 per month for 1 ½ years. If he received ₹ 15084 at the time of maturity, find the rate of interest per annum.

Solution:

Amount deposited by Shahrukh per month = ₹ 800

We know that

No. of months (n) = $1 \frac{1}{2} = 3/2 \times 12 = 18$ months

We know that

Total principal for one month = $800 \times [x(x+1)]/2$

Substituting the value of x

$$= 800 \times (18 \times 19)/2$$

By further calculation

$$= ₹ 136800$$

Interest = $PRT/100$

Substituting the values

$$= (136800 \times r \times 1) / (100 \times 12)$$

So we get
 $= 114r$

So the amount of maturity $= P \times x + SI$

$$15084 = 800 \times 18 + 114r$$

By further calculation

$$114r = 15084 - 14400$$

$$114r = 684$$

$$r = 684/114 = 6\%$$

Hence, the rate of interest per annum is 6%.

8. Rekha opened a recurring deposit account for 20 months. The rate of interest is 9% per annum and Rekha receives ₹ 441 as interest at the time of maturity. Find the amount Rekha deposited each month.

Solution:

Here,

The number of months Rekha deposited (n) = 20

Rate of interest per annum (r) = 9%

Let the amount deposited by Rekha each month be ₹ x, then $P = ₹ x$

Now, we know that

$$\begin{aligned} I &= P \times [n(n+1)/(2 \times 12)] \times r/100 \\ &= x \times [20(20+1)/(2 \times 12)] \times 20/100 \\ &= x \times [20(21)/(2 \times 12)] \times 1/5 \\ &= x \times [(5 \times 21)/6] \times 1/5 \end{aligned}$$

According to given,

$$441 = x \times [(5 \times 21)/6] \times 1/5$$

$$2205 = x \times [(5 \times 21)/6]$$

$$x = (2205 \times 6)/(5 \times 21)$$

$$x = 126$$

Hence, the amount deposited by Rekha each month is ₹ 126.

9. 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 installment.

(ii) the amount of maturity.

Solution:

Interest at the time of maturity = ₹ 1200

Period (x) = 2 years = 24 months

Rate of interest = 6% p.a.

Consider ₹ P p.m. as the monthly deposit

We know that

$$\text{Interest} = P \times [x(x+1)] / (2 \times 12) \times r/100$$

Substituting the value of x

$$1200 = (P \times 24 \times 25) / 24 \times 6/100$$

By further calculation

$$1200 = 6/4P$$

By cross multiplication

$$P = (1200 \times 4) / 6 = 800$$

Here monthly deposit = ₹ 800

So the amount of maturity = $P \times x + SI$

$$= 800 \times 24 + 1200$$

$$= 19200 + 1200$$

$$= ₹ 20400$$

10. 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 installment.

Solution:

Consider ₹ P as the monthly installment

Period (x) = 1 year = 12 months

We know that

$$\text{Total principal for one month} = P \times [x(x+1)] / 2$$

Substituting the value of x

$$= P \times (12 \times 13) / 2$$

By further calculation

$$= 78P$$

$$\text{Interest} = PRT / 100$$

Substituting the values

$$= (78P \times 14 \times 1) / (100 \times 12)$$

So we get

$$= 0.91P$$

So the amount of maturity = $P \times x + SI$

$$6455 = P \times 12 + 0.91P$$

$$6455 = 12.91P$$

By further calculation

$$P = 6455 / 12.91 = ₹ 500$$

11. 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.

Solution:

Amount deposited in the account per month = ₹ 2000

Rate of interest = 10%

Consider period = n months

We know that

$$\text{Principal for one month} = 2000 \times n(n+1)/2 = 1000n(n+1)$$

$$\text{Interest} = [1000n(n+1) \times 10 \times 1]/[100 \times 12]$$

$$= [100n(n+1)]/12$$

$$\text{So the maturity value} = 2000 \times n + [100n(n+1)]/12$$

Substituting the values

$$2000n + [100n(n+1)]/12 = 83100$$

By further calculation

$$24000n + 100n^2 + 100n = 83100 \times 12$$

Dividing by 100

$$240n + n^2 + n = 831 \times 12$$

$$n^2 + 241n - 9972 = 0$$

We can write it as

$$n^2 + 277n - 36n - 9972 = 0$$

$$n(n+277) - 36(n+277) = 0$$

$$(n+277)(n-36) = 0$$

$$\text{Here } n+277 = 0$$

So we get

$$n = -277 \text{ which is not possible}$$

Similarly

$$n - 36 = 0 \text{ where } x = 36$$

So the period = 36 months or 3 years

Hence, the total time for which the account was held is 3 years.

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.

Solution:

It is given that

Amount deposited by Mr. Dhruv = ₹ 600

Rate of interest = 10% p.a.

Period (n) = 5 years = 60 months

We know that

Total principal for one month = $600 \times n(n+1)/2$

Substituting the value of n

= $600 \times (60 \times 61)/2$

So we get

= ₹ 1098000

Here Interest = $PRT/100$

Substituting the values

= $(1098000 \times 10 \times 1)/(100 \times 12)$

= ₹ 9150

So the amount of maturity = $600 \times 60 + 9150$

= $36000 + 9150$

= ₹ 45150

2. Ankita started paying ₹ 400 per month in a 3 years recurring deposit. After six months her brother Anshul started paying ₹ 500 per month in a 2 ½ years recurring deposit. The bank paid 10% p.a. simple interest for both. At maturity who will get more money and by how much?

Solution:

Case 1 – Ankita

Amount deposited per month = ₹ 400

Period (n) = 3 years = 36 months

Rate of interest = 10%

We know that

Total principal for one month = $400 \times n(n+1)/2$

Substituting the value of n

= $400 \times (36 \times 37)/2$

So we get

= ₹ 266400

Here Interest = $PRT/100$

Substituting the values

$$= (266400 \times 10 \times 1) / (100 \times 12)$$
$$= ₹ 2220$$

$$\text{So the amount of maturity} = 400 \times 36 + 2220$$
$$= 14400 + 2220$$
$$= ₹ 16620$$

Case 2 – Anshul

Amount deposited per month = ₹ 500

Period (n) = 2 ½ years = 30 months

Rate of interest = 10%

We know that

Total principal for one month = $500 \times n(n + 1) / 2$

Substituting the value of n

$$= 500 \times (30 \times 31) / 2$$

So we get

$$= ₹ 232500$$

Here Interest = $PRT / 100$

Substituting the values

$$= (232500 \times 10 \times 1) / (100 \times 12)$$

$$= ₹ 1937.50$$

So the amount of maturity = $500 \times 30 + 1937.50$

$$= 15000 + 1937.50$$

$$= ₹ 16937.50$$

We know that at maturity Anshul will get more amount

$$\text{So the difference} = 16937.50 - 16620 = ₹ 317.50$$

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

Solution:

It is given that

Amount deposited per month (P) = ₹ 800

Amount of maturity = ₹ 48200

Period (n) = 4 years = 48 months

Consider R% p.a. as the rate of interest

We know that

Total principal for one month = $800 \times n(n + 1) / 2$

Substituting the value of n

$$= 800 \times (48 \times 49) / 2$$

So we get

$$= ₹ 940800$$

Here the total deposit = $800 \times 48 = ₹ 38400$

Amount of maturity = ₹ 48200

So the interest earned = $48200 - 38400 = ₹ 9800$

(i) Rate of interest = $(SI \times 100) / (P \times T)$

Substituting the values

$$= (9800 \times 100 \times 12) / (940800 \times 1)$$

$$= 12.5\%$$

(ii) Total interest earned by Shilpa = ₹ 9800

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 Rs 101418.75 at the time of maturity, find the monthly installment.

Solution:

Consider ₹ x as the each monthly installment

Rate of interest = 11%

Period (n) = $4 \frac{1}{2}$ years = 54 months

We know that

$$\text{Total principal for one month} = x \times n(n + 1) / 2$$

Substituting the value of n

$$= x \times (54 \times 55) / 2$$

So we get

$$= 1485x$$

Here Interest = $PRT / 100$

Substituting the values

$$= (1485x \times 11 \times 1) / (100 \times 12)$$

$$= 13.6125x$$

So the amount of maturity = $54x + 13.6125x$

$$= 67.6125x$$

By equating the value

$$67.6125x = 101418.75$$

$$x = 101418.75 / 67.6125 = ₹ 1500$$

Hence, the deposit per month is ₹ 1500.

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.

Solution:

It is given that

Amount deposited per month (P) = ₹ 600

Rate of interest = 7% p.a.

Amount of maturity = ₹ 15450

Consider n months as the period

We know that

Total principal for one month = $600 \times n(n+1)/2$

By further calculation

$$= 600(n^2 + n)/2$$

$$= 300(n^2 + n)$$

Here Interest = $PRT/100$

Substituting the values

$$= (300(n^2 + 1) \times 7 \times 1)/(100 \times 12)$$

$$= 7/4(n^2 + n)$$

Amount of maturity = $600n + 7/4(n^2 + n)$

Substituting the values

$$600n + 7/4(n^2 + n) = 15450$$

By further calculation

$$2400 + 7n^2 + 7n = 61800$$

$$7n^2 + 2407n - 61800 = 0$$

We can write it as

$$7n^2 - 168n + 2575n - 61800 = 0$$

$$7n(n - 24) + 2575(n - 24) = 0$$

$$(n - 24)(7n + 2575) = 0$$

Here $n - 24 = 0$ where $n = 24$

Similarly

$$7n + 2575 = 0$$

Where $7n = -2575$

$n = -2575/7$ which is not possible as it is negative

Period (n) = 24 months or 2 years