

Chapter 2. Compound Interest (Without using formula)

Exercise 2(A)

Solution 1:

(i) Principal for 1st year = Rs. 3500

R = 10%

$$\text{Interest for 1}^{\text{st}} \text{ year} = \frac{3500 \times 10 \times 1}{100}$$

= Rs. 350

Amount after 1st year = Rs. 3500 + 350

= Rs. 3850

Principal for 2nd year = 3850

$$\text{Interest for 2}^{\text{nd}} \text{ year} = \frac{3850 \times 10 \times 1}{100} = 385$$

Amount after 2nd year = 3850 + 385

= 4235

Compound interest = 350 + 385

= Rs. 735

(ii) Principal for 1st year = Rs. 6000

R = 5%

$$\text{Interest for 1}^{\text{st}} \text{ year} = \frac{6000 \times 5 \times 1}{100} = \text{Rs. 300}$$

Amount after 1st year = 6000 + 300 = 6300

Principal for 2nd years = Rs. 6300

$$\text{Interest for 2}^{\text{nd}} \text{ year} = \frac{6300 \times 5 \times 1}{100} = \text{Rs. 315}$$

Amount after 2nd year = 6300 + 315 = Rs. 6615

Principal for 3rd year = 6615

$$\text{Interest for 3}^{\text{rd}} \text{ year} = \frac{6615 \times 5 \times 1}{100}$$

$$\text{Amount after 3}^{\text{rd}} \text{ year} = \frac{33075}{100} = 330.75.$$

= 6615 + 330.75 = Rs. 6945.75

Compound interest = 300 + 315 + 330.75

= Rs. 945.75

Solution 2:

(i) for 1st year

P = Rs. 8000

R = 15%

T = 1 year.

$$\text{Interest} = \frac{8000 \times 15 \times 1}{100} = \text{Rs. } 1200$$

Amount = 8000 + 1200 = Rs. 9200

For 2nd year.

P = Rs. 9200, R = 15%, T = 1 year.

$$I = \frac{9200 \times 15 \times 1}{100} = \text{Rs. } 1380$$

Amount = 9200 + 1380 = 10580

For final $\frac{1}{2}$ year

P = Rs. 10580, R = 15%, T = $\frac{1}{2}$ year

$$I = \frac{10580 \times 15 \times 1}{100 \times 2} = \frac{79350}{100} = 793.50$$

Amount = 10580 + 793.50

= Rs. 11373.50

Amount in $2\frac{1}{2}$ years = Rs. 11373.50

P = 8000

Compound interest = 11373.50 - 8000

= Rs. 3373.50

(ii) for 1st years

P = Rs. 20000, R = 10%, T = 1 year

$$\text{Interest (I)} = \frac{20000 \times 10 \times 1}{100} = \text{Rs. } 2000$$

Amount (A) = 20000 + 2000

= Rs. 22,000 for 2nd year =

P = Rs. 22000, R = 10%, and T = 1 year.

$$I = \frac{22000 \times 10 \times 1}{100} = \text{Rs. } 2200$$

A = 22000 + 2200 = Rs. 24200

For final $\frac{1}{4}$ th fo year.

P = 24200, R = 10%, T = $\frac{1}{4}$ year

$$I = \frac{24200 \times 10 \times \frac{1}{4}}{100 \times 4} = \frac{60500}{100} = \text{Rs. } 605$$

A = 24200 + 605 = Rs. 24805.

Amount in $2\frac{1}{4}$ years. = Rs. 24805.

Compound interest = 24805 - 20000

= Rs. 4805

Solution 3:

(i)

For 1st year

P = Rs. 4600

R = 10%

T = 1 year.

$$I = \frac{4600 \times 10 \times 1}{100} = \text{Rs. } 460$$

A = 4600 + 460 = Rs. 5060

For 2nd year

P = Rs. 5060

R = 12%

T = 1 year.

$$I = \frac{5060 \times 12 \times 1}{100} = \frac{60720}{100} = 607.20$$

A = 5060 + 607.20 = Rs. 5667.20

Compound interest = 5667.20 - 4600

= Rs. 1067.20

Amount after 2 years = Rs. 5667.20

(ii)

For 1st year

P = Rs. 16000

R = 10%

T = 1 year

$$I = \frac{16000 \times 10 \times 1}{100} = \text{Rs. } 1600$$

A = 16000 + 1600 = 17600

For 2nd year,

P = Rs. 17600

R = 14%

T = 1 year

$$I = \frac{17600 \times 14 \times 1}{100} = \frac{246400}{100} = \text{Rs. } 2464.$$

$$A = 1760 + 2464 = \text{Rs. } 20064$$

For 3rd year,

$$P = \text{Rs. } 20064$$

$$R = 15\%$$

$$T = 1 \text{ year}$$

$$I = \frac{20064 \times 15 \times 1}{100} = 3009.60$$

$$\text{Amount after 3 years} = 20064 + 3009.60$$

$$= \text{Rs. } 23073.60$$

$$\text{Compound interest} = 23073.60 - 16000$$

$$= \text{Rs. } 7073.60$$

Solution 4:

For 1st years

$$P = \text{Rs. } 2400$$

$$R = 5\%$$

$$T = 1 \text{ year}$$

$$I = \frac{2400 \times 5 \times 1}{100} = 120$$

$$A = 2400 + 120 = \text{Rs. } 2520$$

For 2nd year

$$P = \text{Rs. } 2520$$

$$R = 5\%$$

$$T = 1 \text{ year}$$

$$I = \frac{2520 \times 5 \times 1}{100} = \text{Rs. } 126$$

$$A = 2520 + 126 = \text{Rs. } 2646$$

For final $\frac{1}{2}$ year,

$$P = \text{Rs. } 2646$$

$$R = 5\%$$

$$T = \frac{1}{2} \text{ year}$$

$$I = \frac{2646 \times 5 \times 1}{100 \times 2} = \text{Rs. } 66.15$$

$$\text{Amount after } 2\frac{1}{2} \text{ years} = 2646 + 66.15$$

$$= \text{Rs. } 2712.15$$

$$\text{Compound interest} = 2712.15 - 2400$$

$$= \text{Rs. } 312.15$$

Solution 5:

For 1st year

$$P = \text{Rs. } 8000$$

$$R = 10\%$$

$$T = 1 \text{ year}$$

$$I = \frac{8000 \times 10 \times 1}{100} = 800$$

$$A = 8000 + 800 = \text{Rs. } 8800$$

For 2nd year

$$P = \text{Rs. } 8800$$

$$R = 10\%$$

$$T = 1 \text{ year}$$

$$I = \frac{8800 \times 10 \times 1}{100}$$

$$\text{Compound interest for 2nd years} = \text{Rs. } 880$$

Solution 6:

For 1st year

P = Rs. 2500

R = 12%

T = 1 year

$$I = \frac{2500 \times 12 \times 1}{100} = \text{Rs. } 300$$

Amount = 2500 + 300 = Rs. 2800

For 2nd year

P = Rs. 2800

R = 12%

T = 1 year

$$I = \frac{2800 \times 12 \times 1}{100} = \text{Rs. } 336$$

Amount = 2800 + 336 = Rs. 3136

Amount repaid by A to B = Rs. 2936

The amount of watch = Rs. 3136 - Rs. 2936 = Rs. 200

Solution 7:

$$\begin{aligned}\text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{50,000 \times 6 \times 1}{100} \\ &= \text{Rs. } 3,000\end{aligned}$$

Amount for the first year = Rs. 50,000 + Rs. 3,000 = Rs. 53,000

$$\begin{aligned}\text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{53,000 \times 8 \times 1}{100} \\ &= \text{Rs. } 4,240\end{aligned}$$

Amount for the second year = Rs. 53,000 + Rs. 4,240 = Rs. 57,240

$$\begin{aligned}\text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{57,240 \times 10 \times 1}{100} \\ &= \text{Rs. } 5,724\end{aligned}$$

Amount for the third year = Rs. 57,240 + Rs. 5,724 = Rs. 62,964

Hence, the amount will be Rs. 62,964.

Solution 8:

$$\begin{aligned}\text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{75,000 \times 15 \times 1}{100} \\ &= \text{Rs. } 11,250\end{aligned}$$

Amount for the first year = Rs. 75,000 + Rs. 11,250 = Rs. 86,250

$$\begin{aligned}\text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{86,250 \times 15 \times 1}{100} \\ &= \text{Rs. } 12,937.5\end{aligned}$$

Amount for the second year = Rs. 86,250 + Rs. 12,937.5 = Rs. 99,187.5

$$\begin{aligned}\text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{99,187.5 \times 15 \times 1}{100} \\ &= \text{Rs. } 14,878.125\end{aligned}$$

Amount for the third year = Rs. 99,187.5 + Rs. 14,878.125 = Rs. 1,14,065.625

Hence, the sum Meenal will get at the end of the third year is Rs. 1,14,065.625.

Solution 9:

To calculate S.I.

P=Rs18,000; R=10% and T=1year

$$\text{S.I.} = \text{Rs. } \frac{18,000 \times 10 \times 1}{100} = \text{Rs. } 1,800$$

To calculate C.I.

For 1st half-year

P= Rs18,000; R=10% and T= 1/2year

$$\text{Interest} = \text{Rs. } \frac{18,000 \times 10 \times 1}{100 \times 2} = \text{Rs. } 900$$

Amount= Rs18,000+ Rs900= Rs18,900

For 2nd year

P= Rs18,900; R= 10% and T= 1/2year

$$\text{Interest} = \text{Rs. } \frac{18,900 \times 10 \times 1}{100 \times 2} = \text{Rs. } 945$$

Amount= Rs18,900+ Rs945= Rs19,845

∴ Compound interest= Rs19,845- Rs18,000= Rs1,845

∴ His gain= Rs1,845 - Rs1,800= Rs45

Solution 10:

$$\begin{aligned}\text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{4,000 \times 8 \times 1}{100} \\ &= \text{Rs. } 320\end{aligned}$$

Amount for the first year = Rs. 4,000 + Rs. 320 = Rs. 4,320

$$\begin{aligned}\text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{4,320 \times 10 \times 1}{100} \\ &= \text{Rs. } 432\end{aligned}$$

Amount for the second year = Rs. 4,320 + Rs. 432 = Rs. 4,752

$$\begin{aligned}\text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{4,752 \times 10 \times 1}{100} \\ &= \text{Rs. } 475.20\end{aligned}$$

Amount for the third year = Rs. 4,752 + Rs. 475.20 = Rs. 5,227.20

So, the compound interest = Rs. 5,227.20 – Rs. 4,000 = Rs. 1,227.20

Hence, the sum Meenal will get at the end of the third year is Rs. 1,227.20.

Exercise 2(B)**Solution 1:**

For 1st year

P = Rs. 4000

R = 8

T = 1 year

$$I = \frac{4000 \times 8 \times 1}{100} = 320$$

A = 4000 + 320 = Rs. 4320

For 2nd year

P = Rs. 4320

R = 8%

T = 1 year

$$I = \frac{4320 \times 8 \times 1}{100} = \text{Rs. } 345.60$$

A = 4320 + 345.60 = 4665.60

Compound interest = Rs. 4665.60 – Rs. 4000
= Rs. 665.60

$$\text{Simple interest for 2 years} = \frac{4000 \times 8 \times 2}{100}$$

= Rs. 640

Difference of CI and SI = 665.60 – 640

= Rs. 25.60

Solution 2:

For 1st year

P = Rs. 12500

R = 12%

T = 1 year

$$I = \frac{12500 \times 12 \times 1}{100} = \text{Rs. } 1500$$

$$A = 12500 + 1500 = \text{Rs. } 14000$$

For 2nd year

P = Rs. 1400

R = 15%

T = 1 year

$$I = \frac{14000 \times 15 \times 1}{100} = \text{Rs. } 2100$$

$$A = 1400 + 2100 = \text{Rs. } 3500$$

For 3rd year

P = Rs. 3500

R = 18%

T = 1 year

$$I = \frac{3500 \times 18 \times 1}{100} = \text{Rs. } 630$$

$$A = 3500 + 630 = \text{Rs. } 4130$$

Difference between the compound interest of the third year and first year

$$= \text{Rs. } 630 - \text{Rs. } 1500$$

$$= \text{Rs. } -870$$

Solution 3:

Let money be Rs100

For 1st year

P=Rs100; R=8% and T= 1year

$$\text{Interest for the first year} = \text{Rs} \frac{100 \times 8 \times 1}{100} = \text{Rs} 8$$

$$\text{Amount} = \text{Rs} 100 + \text{Rs} 8 = \text{Rs} 108$$

For 2nd year

P=Rs108; R=8% and T= 1year

$$\text{Interest for the second year} = \text{Rs} \frac{108 \times 8 \times 1}{100} = \text{Rs} 8.64$$

$$\text{Difference between the interests for the second and first year} = \text{Rs} 8.64 - \text{Rs} 8 = \text{Rs} 0.64$$

Given that interest for the second year exceeds the first year by Rs.96

When the difference between the interests is Rs0.64, principal is Rs100

$$\text{When the difference between the interests is Rs96, principal} = \text{Rs} \frac{96 \times 100}{0.64} = \text{Rs} 15,000$$

Solution 4:

Given that the amount for the first year = Rs. 5,000

Rate per annum = 12%

$$\text{Interest on Rs. 5,000} = \frac{12}{100} \times \text{Rs. 5,000} = \text{Rs. 600}$$

So, amount at the end of the first 6 months

$$= \text{Rs. 5,000} + \text{Rs. 600}$$

$$= \text{Rs. 5,600}$$

Amount left to be paid = Rs. 5,600 - Rs. 1,800

$$= \text{Rs. 3,800}$$

$$\text{Interest on Rs. 3,800} = \frac{12}{100} \times \text{Rs. 3,800} = \text{Rs. 456}$$

So, amount at the end of the next 6 months

$$= \text{Rs. 3,800} + \text{Rs. 456}$$

$$= \text{Rs. 4,256}$$

Amount left to be paid = Rs. 4,256 - Rs. 1,800

$$= \text{Rs. 2,456}$$

$$\text{Interest on Rs. 2,456} = \frac{12}{100} \times \text{Rs. 2,456} = \text{Rs. 294.72}$$

So, amount at the end of the next 6 months

$$= \text{Rs. 2,456} + \text{Rs. 294.72}$$

$$= \text{Rs. 2750.72}$$

Hence, the third payment he has to make at the end of 18 months in order to clear the entire loan is Rs. 2750.72.

[*Note: The solution has been solved as per the question

[that is rate per 6 months].

However, the answer at the back is solved with 'rate per annum'.

So, the answers do not match.]

Solution 5:

Given that the amount borrowed = Rs. 6,000

Rate per annum = 5%

$$\text{Interest on Rs. 6,000} = \frac{5}{100} \times \text{Rs. 6,000} = \text{Rs. 300}$$

So, amount at the end of the first year

$$= \text{Rs. 6,000} + \text{Rs. 300}$$

$$= \text{Rs. 6,300}$$

Amount left to be paid = Rs. 6,300 - Rs. 1,200

$$= \text{Rs. 5,100}$$

$$\text{Interest on Rs. 5,100} = \frac{5}{100} \times \text{Rs. 5,100} = \text{Rs. 255}$$

So, amount at the end of the second year

$$= \text{Rs. 5,100} + \text{Rs. 255}$$

$$= \text{Rs. 5,355}$$

Amount left to be paid = Rs. 5,355 - Rs. 1,200

$$= \text{Rs. 4,155}$$

Hence, the amount of the loan outstanding at the beginning of the third year is Rs. 4,155.

Solution 6:

Let principal (p = Rs. 100

R = 10%

T = 1 year

$$SI = \frac{100 \times 10 \times 1}{100} = \text{Rs. } 10$$

Compound interest payable half yearly

R = 5% half yearly

$$T = \frac{1}{2} \text{ year} = 1 \text{ half year}$$

For first $\frac{1}{2}$ year

$$I = \frac{100 \times 5 \times 1}{100} = \text{Rs. } 5$$

$$A = 100 + 5 = \text{Rs. } 105$$

For second $\frac{1}{2}$ year

$$P = \text{Rs. } 105$$

$$I = \frac{105 \times 5 \times 1}{100} = \text{Rs. } 5.25$$

Total compound interest = 5 + 5.25

= Rs. 10.25

Difference of CI and SI = 10.25 - 10

= Rs. 0.25

When difference in interest is Rs. 10.25, sum = Rs. 100

$$\text{If the difference is Rs. 1, sum} = \frac{100}{0.25}$$

$$\text{If the difference is Rs. } = 180, \text{sum} = \frac{100}{0.25} \times 180$$

$$= \text{Rs. } 72000$$

Solution 7:

Let the original cost of the machine = Rs. 100

∴ Depreciation during the 1st year = 15% of Rs. 100 = Rs. 15

Value of the machine at the beginning of the 2nd year

$$= \text{Rs. } 100 - \text{Rs. } 15$$

$$= \text{Rs. } 85$$

∴ Depreciation during the 2nd year = 15% of Rs. 85 = Rs. 12.75

Now, when depreciation during 2nd year = Rs. 12.75, original cost = Rs. 100

⇒ when depreciation during 2nd year = Rs. 5,355

$$\text{original cost} = \text{Rs. } \frac{100}{12.75} \times 5,355 = \text{Rs. } 42,000$$

Hence, original cost of the machine is Rs. 42,000.

Solution 8:

(i) For 1st years

P = Rs. 5600

R = 14%

T = 1 year

$$I = \frac{5600 \times 14 \times 1}{100} = \text{Rs. } 784$$

(ii) Amount at the end of the first year

$$= 5600 + 784$$

$$= \text{Rs. } 6384$$

(iii) For 2nd year

P = 6384

R = 14%

T = 1 year

$$I = \frac{6384 \times 14 \times 1}{100}$$

$$= \text{Rs. } 803.76$$

$$= \text{Rs. } 894 \text{ (nearly)}$$

Solution 9(i):

The principal, P = Rs. 48,000

$$\begin{aligned} \text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{48,000 \times 10 \times 1}{100} \\ &= \text{Rs. } 4,800 \end{aligned}$$

So, amount at the end of the first year

$$= \text{Rs. } 48,000 + \text{Rs. } 4,800$$

$$= \text{Rs. } 52,800$$

$$\begin{aligned} \text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{52,800 \times 10 \times 1}{100} \\ &= \text{Rs. } 5,280 \end{aligned}$$

So, amount at the end of the second year

$$= \text{Rs. } 52,800 + \text{Rs. } 5,280$$

$$= \text{Rs. } 58,080$$

$$\begin{aligned} \text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{58,080 \times 10 \times 1}{100} \\ &= \text{Rs. } 5,808 \end{aligned}$$

Hence, the difference between the interest for the second and third year is
 Rs. 5,808 – Rs. 5,280 = Rs. 528.

Solution 9(ii):

$$\begin{aligned}\text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{50,000 \times 10 \times 1}{100} \\ &= \text{Rs. } 5,000\end{aligned}$$

$$\begin{aligned}\text{Amount at the end of the first year} \\ &= \text{Rs. } 50,000 + \text{Rs. } 5,000 \\ &= \text{Rs. } 55,000\end{aligned}$$

$$\begin{aligned}\text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{55,000 \times 12 \times 1}{100} \\ &= \text{Rs. } 6,600\end{aligned}$$

$$\begin{aligned}\text{Amount at the end of the second year} \\ &= \text{Rs. } 55,000 + \text{Rs. } 6,600 \\ &= \text{Rs. } 61,600\end{aligned}$$

$$\begin{aligned}\text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{61,600 \times 14 \times 1}{100} \\ &= \text{Rs. } 8,624\end{aligned}$$

$$\begin{aligned}\text{Total of the interests earned during first and third years} \\ &= \text{Rs. } 5,000 + \text{Rs. } 8,624 \\ &= \text{Rs. } 13,624\end{aligned}$$

Solution 10:

Savings at the end of every year = Rs. 3000

For 2nd year

P = Rs. 3000

R = 10%

T = 1 year

$$I = \frac{3000 \times 10 \times 1}{100} = 300$$

$$A = 3000 + 300 = \text{Rs. } 3300$$

For third year, savings = 3000

$$P = 3000 + 3300 = \text{Rs. } 6300$$

R = 10%

T = 1 year

$$I = \frac{6300 \times 10 \times 1}{100} = \text{Rs. } 630$$

$$A = 6300 + 630 = \text{Rs. } 6930$$

Amount at the end of 3rd year

$$= 6930 + 3000$$

$$= \text{Rs. } 9930$$

Solution 11:

The amount borrowed = Rs. 10,000

$$\begin{aligned}\text{Interest for the first year} &= \frac{P \times R \times T}{100} \\ &= \frac{10,000 \times 5 \times 1}{100} \\ &= \text{Rs. 500}\end{aligned}$$

So, amount at the end of the first year

$$= \text{Rs. 10,000} + \text{Rs. 500}$$

$$= \text{Rs. 10,500}$$

The man pays 35% of Rs. 10,500 at the end of the first year

$$= \frac{35}{100} \times 10,500 = \text{Rs. 3,675}$$

So, amount left to be paid

$$= \text{Rs. 10,500} - \text{Rs. 3,675} = \text{Rs. 6,825}$$

$$\begin{aligned}\text{Interest for the second year} &= \frac{P \times R \times T}{100} \\ &= \frac{6,825 \times 5 \times 1}{100} \\ &= \text{Rs. 341.25}\end{aligned}$$

So, amount at the end of the second year

$$= \text{Rs. 6,825} + \text{Rs. 341.25}$$

$$= \text{Rs. 7,166.25}$$

The man pays 42% of Rs. 7,166.25 at the end of the second year

$$= \frac{42}{100} \times 7,166.25 = \text{Rs. 3,009.825}$$

So, amount left to be paid

$$= \text{Rs. 7,166.25} - \text{Rs. 3,009.825} = \text{Rs. 4,156.425}$$

$$\begin{aligned}\text{Interest for the third year} &= \frac{P \times R \times T}{100} \\ &= \frac{4,156.425 \times 5 \times 1}{100} \\ &= \text{Rs. 207.82125}\end{aligned}$$

So, amount at the end of the third year

$$= \text{Rs. 4,156.425} + \text{Rs. 207.82125}$$

$$= \text{Rs. 4,364.24625}$$

Hence, he must pay Rs. 4,364.24625 at the end of the third year in order to clear the debt.

Solution 12:

For 1st year

P = Rs8,000; R = 10% and T = 1 year

$$\text{Interest} = \text{Rs} \frac{8000 \times 10 \times 1}{100} = \text{Rs}800$$

$$\text{Amount} = \text{Rs}8,000 + \text{Rs}800 = \text{Rs}8,800$$

For 2nd year

P = Rs8,800 + Rs8,000 = Rs16,800; R = 10% and T = 1 year

$$\text{Interest} = \text{Rs} \frac{16,800 \times 10 \times 1}{100} = \text{Rs}1,680$$

$$\text{Amount} = \text{Rs}16,800 + \text{Rs}1,680 = \text{Rs}18,480$$

∴ Total saving at the beginning of 3rd year

$$= \text{Rs}18,480 + \text{Rs}8,000$$

$$= \text{Rs}26,480 \text{ Ans.}$$

Exercise 2(C)**Solution 1:**

$$\begin{aligned} \text{Rate of interest} &= \frac{\text{Difference in the interest of the two consecutive periods} \times 100}{\text{C.I. of preceeding year} \times \text{Time}} \% \\ &= \frac{(7410 - 5700) \times 100}{5700 \times 1} \% \\ &= 30\% \end{aligned}$$

Solution 2:

∴ Difference between the C.I. of two successive half-years

$$= \text{Rs}760.50 - \text{Rs}650 = \text{Rs}110.50$$

⇒ Rs110.50 is the interest of one half-year on Rs650

$$\therefore \text{Rate of interest} = \text{Rs} \frac{100 \times I}{P \times T} \% = \frac{100 \times 110.50}{650 \times \frac{1}{2}} \% = 34\%$$

Solution 3:

(i) Amount in two years = Rs5,292

Amount in three years = Rs5,556.60

∴ Difference between the amounts of two successive years

$$= \text{Rs}5,556.60 - \text{Rs}5,292 = \text{Rs}264.60$$

⇒ Rs264.60 is the interest of one year on Rs5,292

$$\therefore \text{Rate of interest} = \text{Rs} \frac{100 \times I}{P \times T} \% = \frac{100 \times 264.60}{5,292 \times 1} \% = 5\%$$

(ii) Let the sum of money = Rs100

∴ Interest on it for 1st year = 5% of Rs100 = Rs5

⇒ Amount in one year = Rs100 + Rs5 = Rs105

Similarly, amount in two years = Rs105 + 5% of Rs105

$$= \text{Rs}105 + \text{Rs}5.25$$

$$= \text{Rs}110.25$$

When amount in two years is Rs110.25, sum = Rs100

$$\Rightarrow \text{When amount in two years is Rs5,292, sum} = \text{Rs} \frac{100 \times 5,292}{110.25}$$

$$= \text{Rs}4,800$$

Solution 4:

(i) C.I. for second year = Rs1,089

C.I. for third year = Rs 1,197.90

∴ Difference between the C.I. of two successive years

= Rs1,197.90 - Rs1089 = Rs108.90

⇒ Rs108.90 is the interest of one year on Rs1089

$$\therefore \text{Rate of interest} = \text{Rs} \frac{100 \times I}{P \times T} \% = \frac{100 \times 108.90}{1089 \times 1} \% = 10\%$$

(ii) Let the sum of money = Rs100

∴ Interest on it for 1st year = 10% of Rs100 = Rs10

⇒ Amount in one year = Rs100 + Rs10 = Rs110

Similarly, C.I. for 2nd year = 10% of Rs110

= Rs11

When C.I. for 2nd year is Rs11, sum = Rs100

$$\Rightarrow \text{When C.I. for 2nd year is Rs1089, sum} = \text{Rs} \frac{100 \times 1089}{11} = \text{Rs}9,900$$

Solution 5:

For 1st year

P = Rs8,000; A = 9,440 and T = 1 year

Interest = Rs9,440 - Rs8,000 = Rs1,440

$$\text{Rate} = \frac{I \times 100}{P \times T} \% = \frac{1,440 \times 100}{8,000 \times 1} \% = 18\%$$

For 2nd year

P = Rs9,440; R = 18% and T = 1 year

$$\text{Interest} = \text{Rs} \frac{9,440 \times 18 \times 1}{100} = \text{Rs}1,699.20$$

Amount = Rs9,440 + Rs1,699.20 = Rs11,139.20

For 3rd year

P = Rs11,139.20; R = 18% and T = 1 year

$$\text{Interest} = \text{Rs} \frac{11,139.20 \times 18 \times 1}{100} = \text{Rs}2,005.06$$

Solution 6:

For 1st half-year

P = Rs15,000; A = Rs15,600 and T = $\frac{1}{2}$ year

Interest = Rs15,600 - Rs15,000 = Rs600

$$\text{Rate} = \frac{I \times 100}{P \times T} \% = \frac{600 \times 100}{15,000 \times \frac{1}{2}} \% = 8\% \text{ Ans.}$$

For 2nd half-year

P = Rs15,600; R = 8% and T = $\frac{1}{2}$ year

$$\text{Interest} = \text{Rs} \frac{15,600 \times 8 \times \frac{1}{2}}{100} = \text{Rs}624$$

Amount = Rs15,600 + Rs624 = Rs16,224

For 3rd half-year

P = Rs16,224; R = 8% and T = $\frac{1}{2}$ year

$$\text{Interest} = \text{Rs} \frac{16,224 \times 8 \times \frac{1}{2}}{100} = \text{Rs}648.96$$

Amount = Rs16,224 + Rs648.96 = Rs16,872.96 Ans.

Solution 7:

For 1st year

P=Rs12,800; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{12,800 \times 10 \times 1}{100} = \text{Rs}1,280$$

$$\text{Amount} = \text{Rs}12,800 + \text{Rs}1,280 = \text{Rs}14,080$$

For 2nd year

P=Rs14,080; R=10% and T= 1 year

$$\text{Interest} = \text{Rs} \frac{14,080 \times 10 \times 1}{100} = \text{Rs}1,408$$

$$\text{Amount} = \text{Rs}14,080 + \text{Rs}1,408 = \text{Rs}15,488$$

For 3rd year

P=Rs15,488; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{15,488 \times 10 \times 1}{100} = \text{Rs}1,548.80$$

$$\text{Amount} = \text{Rs}15,488 + \text{Rs}1,548.80 = \text{Rs}17,036.80$$

Solution 8:

(i) C.I. for second year = Rs864

C.I. for third year = Rs933.12

∴ Difference between the C.I. of two successive years

$$= \text{Rs}933.12 - \text{Rs}864 = \text{Rs}69.12$$

⇒ Rs69.12 is the interest of one year on Rs864

$$\therefore \text{Rate of interest} = \text{Rs} \frac{100 \times I}{P \times T} \% = \frac{100 \times 69.12}{864 \times 1} \% = 8\% \text{ Ans.}$$

(ii) Let the sum of money = Rs100

∴ Interest on it for 1st year = 8% of Rs100 = Rs8

$$\Rightarrow \text{Amount in one year} = \text{Rs}100 + \text{Rs}8 = \text{Rs}108$$

Similarly, C.I. for 2nd year = 8% of Rs108

$$= \text{Rs}8.64$$

When C.I. for 2nd year is Rs8.64, sum = Rs100

$$\Rightarrow \text{When C.I. for 2nd year is Rs8.64, sum} = \text{Rs} \frac{100 \times 864}{8.64} = \text{Rs}10,000$$

$$\text{Interest for 1st year} = \text{Rs} \frac{10,000 \times 8 \times 1}{100} = \text{Rs}800$$

$$\text{Principal for 4th year} = \text{Rs}10,000 + \text{Rs}800 + \text{Rs}864 + \text{Rs}933.12$$

$$= \text{Rs}12,597.12$$

∴ Interest for 4th year = 8% of Rs12,597.12

$$= \text{Rs}1,007.77 \text{ Ans.}$$

Solution 9:

(i) Amount in three years = Rs20,160

Amount in four years = Rs24,192

∴ Difference between the amounts of two successive years

= Rs24,192 - Rs20,160 = Rs4,032

⇒ Rs4,032 is the interest of one year on Rs20,160

∴ Rate of interest = $\text{Rs} \frac{100 \times I}{P \times T} \% = \frac{100 \times 4032}{20,160 \times 1} \% = 20\%$

(ii) Let amount in two years = Rs100

And amount in three years = Rs100 + 20% of Rs100

= Rs100 + Rs20

= Rs120

When amount in 3 years is Rs120, amount in two years = Rs100

⇒ When amount in 3 years is Rs20,160, sum = $\text{Rs} \frac{100 \times 20,160}{120} = \text{Rs}16,800$ Ans.

(iii) Amount in 5 years = Rs24,192 + 20% of Rs24,192

= Rs24,192 + Rs4,838.40

= Rs29,030.40

Solution 10:

(i) For 1st year

P = Rs8,000; R = 7% and T = 1 year

Interest = $\text{Rs} \frac{8,000 \times 7 \times 1}{100} = \text{Rs}560$

Amount = Rs8,000 + Rs560 = Rs8,560

Money returned = Rs3,560

Balance money for 2nd year = Rs8,560 - Rs3,560 = Rs5,000

For 2nd year

P = Rs5,000; R = 7% and T = 1 year

Interest paid for the second year = $\text{Rs} \frac{5,000 \times 7 \times 1}{100} = \text{Rs}350$ Ans.

(ii) The total interest paid in two years = Rs350 + Rs560

= Rs910 Ans.

(iii) The total amount of money paid in two years to clear the debt

= Rs8,000 + Rs910

= Rs8,910 Ans.

Solution 11:

(i)

Difference between depreciation in value between the first and second years

$$₹4,000 - ₹3,600 = ₹400$$

$$\Rightarrow \text{Depreciation of one year on ₹4,000} = ₹400$$

$$\Rightarrow \text{Rate of depreciation} = \frac{400}{4000} \times 100\% = 10\%$$

(ii)

Let ₹100 be the original cost of the machine.

$$\text{Depreciation during the 1}^{\text{st}} \text{ year} = 10\% \text{ of ₹100} = ₹10$$

When the value depreciates by ₹10 during the 1st year, Original cost = ₹100

$$\Rightarrow \text{When the depreciation during 1}^{\text{st}} \text{ year} = ₹4,000,$$

$$\text{Original cost} = \frac{100}{10} \times 4000 = 40000$$

The original cost of the machine is ₹40,000.

(iii)

Total depreciation during all the three years

$$= \text{Depreciation in value during (1}^{\text{st}} \text{ year} + 2^{\text{nd}} \text{ year} + 3^{\text{rd}} \text{ year)}$$

$$= ₹4,000 + ₹3,600 + 10\% \text{ of } (₹40,000 - ₹7,600)$$

$$= ₹4,000 + ₹3,600 + ₹3,240$$

$$= ₹10,840$$

The cost of the machine at the end of the third year

$$= ₹40,000 - ₹10,840 = ₹29,160$$

Solution 12:

Cost of machine = Rs32,000

Depreciation rate every year = 5%

$$\therefore \text{Cost of machine after one year} = \text{Rs32,000} - 5\% \text{ of Rs32,000}$$

$$= \text{Rs32,000} - \text{Rs1,600}$$

$$= \text{Rs30,400}$$

$$\therefore \text{Cost of machine after two years} = \text{Rs30,400} - 5\% \text{ of Rs30,400}$$

$$= \text{Rs30,400} - \text{Rs1,520}$$

$$= \text{Rs28,880}$$

$$\therefore \text{Total depreciation in two years} = \text{Rs32,000} - \text{Rs28,880}$$

$$= \text{Rs3,120 Ans.}$$

Solution 13:

Let the sum of money be Rs 100

Rate of interest= 10%p.a.

Interest at the end of 1st year= 10% of Rs100= Rs10

Amount at the end of 1st year= Rs100 + Rs10= Rs110

Interest at the end of 2nd year=10% of Rs110 = Rs11

Amount at the end of 2nd year= Rs110 + Rs11= Rs121

Interest at the end of 3rd year=10% of Rs121= Rs12.10

∴ Difference between interest of 3rd year and 1st year

=Rs12.10- Rs10=Rs2.10

When difference is Rs2.10, principal is Rs100

When difference is Rs252, principal = $\frac{100 \times 252}{2.10}$ =Rs12,000 Ans.

Solution 14:

For 1st year

P= Rs10,000; R=10% and T= 1year

Interest= Rs $\frac{10,000 \times 10 \times 1}{100}$ =Rs1,000

Amount at the end of 1st year=Rs10,000+Rs1,000=Rs11,000

Money paid at the end of 1st year=30% of Rs10,000=Rs3,000

∴ Principal for 2nd year=Rs11,000- Rs3,000=Rs8,000

For 2nd year

P=Rs8,000; R=10% and T= 1year

Interest= Rs $\frac{8,000 \times 10 \times 1}{100}$ = Rs800

Amount at the end of 2nd year=Rs8,000+Rs800= Rs8,800

Money paid at the end of 2nd year=30% of Rs10,000= Rs3,000

∴ Principal for 3rd year=Rs8,800- Rs3,000=Rs5,800 Ans.

Solution 15:

For 1st year

P= Rs10,000; R=10% and T= 1year

Interest= Rs $\frac{10,000 \times 10 \times 1}{100}$ =Rs1,000

Amount at the end of 1st year=Rs10,000+Rs1,000=Rs11,000

Money paid at the end of 1st year=20% of Rs11,000=Rs2,200

∴ Principal for 2nd year=Rs11,000- Rs2,200=Rs8,800

For 2nd year

P=Rs8,800; R=10% and T= 1year

Interest= Rs $\frac{8,800 \times 10 \times 1}{100}$ = Rs880

Amount at the end of 2nd year=Rs8,800+Rs880= Rs9,680

Money paid at the end of 2nd year=20% of Rs9,680= Rs1,936

∴ Principal for 3rd year=Rs9,680- Rs1,936=Rs7,744 Ans.

Exercise 2(D)

Solution 1:

Let principal (p) = Rs. 100

For 1st year

P = Rs. 100

R = 10%

T = 1 year

$$I = \frac{100 \times 10 \times 1}{100} = \text{Rs. } 10$$

A = 100 + 10 = Rs. 110

For 2nd year

P = Rs. 110

R = 11%

T = 1 year

$$I = \frac{110 \times 11 \times 1}{100} = \text{Rs. } 12.10$$

A = 110 + 12.10 = Rs. 122.10

If Amount is Rs. 122.10 on a sum of Rs. = 100

$$\text{If amount is Rs. 1, sum} = \frac{100}{122.10}$$

$$\begin{aligned} \text{If amount is Rs. 6593.40, sum} &= \frac{100}{122.10} \times 6593.40 \\ &= \text{Rs. } 5400 \end{aligned}$$

Solution 2:

Let the value of machine in the beginning = Rs. 100

For 1st year depreciation = 10% of Rs. 100 = Rs. 10

Value of machine for second year = 100 - 10
= Rs. 90

For 2nd year depreciation = 10% of 90 = Rs. 9

Value of machine for third year = 90 - 9
= Rs. 81

For 3rd year depreciation = 15% of 81

= Rs. 12.15

Value of machine at the end of third year = 81 - 12.15

= Rs. 68.85

Net depreciation = Rs. 100 - Rs. 68.85

= Rs. 31.15

Or 31.15%

Solution 3:For 1st half-year

P=Rs12,000; R=10% and T=1/2 year

$$\text{Interest} = \text{Rs} \frac{12,000 \times 10 \times 1}{100 \times 2} = \text{Rs}600$$

$$\text{Amount} = \text{Rs}12,000 + \text{Rs}600 = \text{Rs}12,600$$

$$\text{Money paid at the end of 1st half year} = \text{Rs}4,000$$

$$\text{Balance money for 2nd half-year} = \text{Rs}12,600 - \text{Rs}4,000 = \text{Rs}8,600$$

For 2nd half-year

P=Rs8,600; R=10% and T=1/2 year

$$\text{Interest} = \text{Rs} \frac{8,600 \times 10 \times 1}{100 \times 2} = \text{Rs}430$$

$$\text{Amount} = \text{Rs}8,600 + \text{Rs}430 = \text{Rs}9,030$$

$$\text{Money paid at the end of 2nd half-year} = \text{Rs}4,000$$

$$\text{Balance money for 3rd half-year} = \text{Rs}9,030 - \text{Rs}4,000 = \text{Rs}5,030$$

For 3rd half-year

P=Rs5,030; R=10% and T=1/2 year

$$\text{Interest} = \text{Rs} \frac{5,030 \times 10 \times 1}{100 \times 2} = \text{Rs}251.50$$

$$\text{Amount} = \text{Rs}5,030 + \text{Rs}251.50 = \text{Rs}5,281.50$$

Solution 4:

Let Principal= Rs 100

For 1st year

P=Rs100; R=10% and T=1year

$$\text{Interest} = \text{Rs} \frac{100 \times 10 \times 1}{100} = \text{Rs}10$$

$$\text{Amount} = \text{Rs}100 + \text{Rs}10 = \text{Rs}110$$

For 2nd year

P=Rs110; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{110 \times 10 \times 1}{100} = \text{Rs}11$$

$$\text{Amount} = \text{Rs}110 + \text{Rs}11 = \text{Rs}121$$

For 3rd year

P=Rs121; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{121 \times 10 \times 1}{100} = \text{Rs}12.10$$

$$\text{Sum of C.I. for 1st year and 3rd year} = \text{Rs}10 + \text{Rs}12.10 = \text{Rs}22.10$$

When sum is Rs22.10, principal is Rs100

$$\text{When sum is Rs}2,652, \text{ principal} = \text{Rs} \frac{100 \times 2652}{22.10} = \text{Rs}12,000 \text{ Ans.}$$

Solution 5:

Let original value of machine=Rs100

For 1st year

P=Rs100; R=12% and T= 1year

$$\text{Depreciation in 1}^{\text{st}} \text{ year} = \text{Rs } \frac{100 \times 12 \times 1}{100} = \text{Rs}12$$

Value at the end of 1st year=Rs100 - Rs12=Rs88

For 2nd year

P= Rs88; R=12% and T= 1year

$$\text{Depreciation in 2}^{\text{nd}} \text{ year} = \text{Rs } \frac{88 \times 12 \times 1}{100} = \text{Rs}10.56$$

When depreciation in 2nd year is Rs10.56, original cost is Rs100

$$\text{When depreciation in 2}^{\text{nd}} \text{ year is Rs2,640, original cost} = \frac{100 \times 2640}{10.56}$$

$$= \text{Rs}25,000$$

Solution 6:

Let ₹x be the sum.

$$\text{Simple Interest(I)} = \frac{x \times 8 \times 1}{100} = 0.08x$$

Compound interest

For 1st year:

P = ₹x, R = 8% and T=1

$$\Rightarrow \text{Interest(I)} = \frac{x \times 8 \times 1}{100} = 0.08x$$

For 2nd year:

P = ₹x+₹0.08x = ₹1.08x

$$\Rightarrow \text{Interest(I)} = \frac{1.08x \times 8 \times 1}{100} = 0.0864x$$

The difference between the simple interest and compound interest at the rate of 8% per annum compounded annually should be ₹64 in 2 years.

$$\Rightarrow ₹0.08x - ₹0.0864x = ₹64$$

$$\Rightarrow ₹0.0064x = ₹64$$

$$\Rightarrow x = ₹10000$$

Hence the sum is ₹10000.

Solution 7:

For 1st year

P=Rs13,500; R=16% and T= 1year

$$\text{Interest} = \text{Rs } \frac{13,500 \times 16 \times 1}{100} = \text{Rs}2,160$$

$$\text{Amount} = \text{Rs}13,500 + \text{Rs}2,160 = \text{Rs}15,660$$

For 2nd year

P=Rs15,660; R=16% and T= 1year

$$\text{Interest} = \text{Rs } \frac{15,660 \times 16 \times 1}{100} = \text{Rs}2,505.60$$

$$= \text{Rs}2,506$$

Solution 8:

For 1st year

P=Rs48,000; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{48,000 \times 10 \times 1}{100} = \text{Rs}4,800$$

$$\text{Amount} = \text{Rs}48,000 + \text{Rs}4,800 = \text{Rs}52,800$$

For 2nd year

P=Rs52,800; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{52,800 \times 10 \times 1}{100} = \text{Rs}5,280$$

$$\text{Amount} = \text{Rs}52,800 + \text{Rs}5,280 = \text{Rs}58,080$$

For 3rd year

P=Rs58,080; R=10% and T= 1year

$$\text{Interest} = \text{Rs} \frac{58,080 \times 10 \times 1}{100} = \text{Rs}5,808$$

Solution 9:

Let x% be the rate of interest charged.

For 1st year:

P = ₹12,000, R = x% and T = 1

$$\Rightarrow \text{Interest}(I) = \frac{12000 \times x \times 1}{100} = 120x$$

For 2nd year:

After a year, Ashok paid back ₹4,000.

P = ₹12,000 + ₹120x - ₹4,000 = ₹8,000 + ₹120x

$$\Rightarrow \text{Interest}(I) = \frac{(8000 + 120x) \times x \times 1}{100} = (80x + 1.20x^2)$$

The compound interest for the second year is ₹920

$$\text{₹}(80x + 1.20x^2) = \text{₹}920$$

$$\Rightarrow 1.20x^2 + 80x - 920 = 0$$

$$\Rightarrow 3x^2 + 200x - 2300 = 0$$

$$\Rightarrow 3x^2 + 230x - 30x - 2300 = 0$$

$$\Rightarrow x(3x + 230) - 10(3x + 230) = 0$$

$$\Rightarrow (3x + 230)(x - 10) = 0$$

$$\Rightarrow x = -230/3 \text{ or } x = 10$$

As rate of interest cannot be negative so x = 10.

Therefore the rate of interest charged is 10%.

(ii)

For 1st year:

$$\text{Interest} = ₹120x = ₹1200$$

For 2nd year:

$$\text{Interest} = ₹(80x + 1.20x^2) = ₹920$$

The amount of debt at the end of the second year is equal to the addition of principal of the second year and interest for the two years.

$$\text{Debt} = \text{Rs.}8,000 + \text{Rs.}1200 + \text{Rs.}920 = \text{Rs.}10,120$$

Solution 10:

Total interest obtained in the first year = Rs. 1500

Interest for the second year – Total interest obtained in the first year

$$= \text{Rs. } 1,725 - \text{Rs. } 1,500$$

$$= \text{Rs. } 225$$

Rate of interest for the second year

$$= \frac{\text{Rs. } 225}{\text{Rs. } 1,500} \times 100 = 15\%$$

Interest for the third year – Interest for the second year

$$= \text{Rs. } 2,070 - \text{Rs. } 1,725$$

$$= \text{Rs. } 345$$

Rate of interest for the third year

$$= \frac{\text{Rs. } 345}{\text{Rs. } 1,725} \times 100 = 20\%$$

So, rate of interest for the second year and third year are 15% and 20% respectively.