

9. Simple and Compound Interest

EXERCISE 9(A)

Question 1.

Find the interest and the amount on:

- (i) Rs. 750 in 3 years 4 months at 10% per annum.
- (ii) Rs. 5,000 at 8% per year from 23rd December 2011 to 29th July 2012.
- (iii) Rs. 2,600 in 2 years 3 months at 1% per month.
- (iv) Rs. 4,000 in $1\frac{1}{3}$ years at 2 paise per rupee per month.

Solution:

(i) Given P = ₹750

$$\text{Time (T)} = 3\frac{4}{12} = 3\frac{1}{3}$$

$$= \frac{10}{3} \text{ years}$$

Rate (R) = 10%

$$\therefore \text{Interest (I)} = \frac{PRT}{100} = \frac{750 \times 10 \times \frac{10}{3}}{100}$$

$$= \frac{250 \times 10 \times 10}{100} = ₹250$$

$$\therefore \text{Amount (A)} = P + I = ₹750 + ₹250 = ₹1000$$

(ii) Principal (P) = ₹5000

Rate (R) = 8% p.a.

Time (T) = 23 December 2011 to 29 July 2012

Dec. Jan. Feb. March April May June July

8 31 29 31 30 31 30 29

$$\text{Total 219 days} = \frac{219}{365} \text{ years}$$

$$\therefore \text{Interest} = \frac{PRT}{100} = \frac{5000 \times 8 \times 219}{100 \times 365}$$

$$= 10 \times 8 \times 3 = ₹240$$

$$\therefore \text{Amount} = P + I = ₹5000 + 240 = ₹5240$$

(iii) Here P = ₹2,600

Time (T) = 2 years 3 months = 27 months

Rate (R) = 1% per month

$$\therefore \text{Interest} = \frac{P \times T \times R}{100} = \frac{2600 \times 27 \times 1}{100}$$

$$= 26 \times 27 = \text{Rs. } 702$$

$$\therefore \text{Amount} = \text{Rs. } (2600 + 702) = \text{Rs. } 3302$$

(iv) Here P = Rs. 4,000, Time (T) $1\frac{1}{3}$ year

$$= 1 \text{ year} + \frac{12}{3} \text{ months} = 16 \text{ months}$$

Rate (R) = 2 paise per rupee per month = 2% per month

$$\therefore \text{Interest (I)} = \frac{P \times T \times R}{100} = \frac{4,000 \times 2 \times 16}{100}$$

$$= 40 \times 32 = \text{Rs. } 1280$$

$$\therefore \text{Amount (A)} = P + I = \text{Rs. } 4000 + \text{Rs. } 1280 \\ = \text{Rs. } 5280$$

Question 2.

Rohit borrowed Rs. 24,000 at 7.5 percent per year. How much money will he pay at the end of 4th years to clear his debt ?

Solution:

Principal (P) = Rs. 24,000

Rate (R) = 7.5% P.A.

Time (T) = 4 years

$$\text{S.I.} = \frac{P \times T \times R}{100}$$

$$= \text{Rs. } \frac{24,000 \times 4 \times 7.5}{100}$$

$$= \text{Rs. } 240 \times 4 \times 7.5$$

$$= 240 \times 30 = \text{Rs. } 7200$$

Amount needed to clear the debt at the end of 4th year

$$= \text{Rs. } 24000 + \text{Rs. } 7200 = \text{Rs. } 3,1200$$

Question 3.

The interest on a certain sum of money is Rs. 1,480 in 2 years and at 10 per cent per year. Find the sum of money.

Solution:

Let P = Rs. x

Time (T) = 2 years

Rate (R) = 10%

$$\therefore \text{Interest} = \frac{P \times T \times R}{100} = \frac{x \times 2 \times 10}{100} = \frac{x}{5}$$

$$\frac{x}{5} = \text{Rs. } 1480 \quad (\text{Given})$$

$$\therefore x = 1480 \times 5 = \text{Rs. } 7400$$

Hence the money Rs. 7400

Question 4.

On what principal will the simple interest be Rs. 7,008 in 6 years 3 months at 5% per year ?

Solution:

Let Principal = Rs. P

$$\text{Time (T)} = 6 \text{ years } 3 \text{ months} = 6 \text{ year} + \frac{3}{12}$$

$$\text{year} = \frac{75}{12} = \frac{25}{4} \text{ year} = 6 \frac{1}{4} \text{ years}$$

Rate (R) = 5%

Simple interest = Rs. 7,008

We know that

$$\text{Simple interest} = \frac{P \times T \times R}{100}$$

$$\Rightarrow 7,008 = \frac{P \times \frac{25}{4} \times 5}{100} \Rightarrow P = \frac{7008 \times 100 \times 4}{25 \times 5}$$

$$= \frac{7008 \times 16}{5} = \frac{112128}{5} = \text{Rs. } 22425.60$$

Question 5.

Find the principal which will amount to Rs. 4,000 in 4 years at 6.25% Per annum.

Solution:

Let Principal = Rs. P, Time (T) = 4 years

$$\text{Rate} = 6\frac{1}{4} = \frac{25}{4}\%$$

$$\text{Simple Interest} = \frac{P \times T \times R}{100} = \frac{P \times \frac{25}{4} \times 4}{100} = \frac{P}{4}$$

$$\therefore \text{Amount} = P + \frac{P}{4} = \frac{5P}{4}$$

$$\frac{5P}{4} = 4000 \quad (\text{given})$$

$$\Rightarrow 5P = 4 \times 4000$$

$$P = \frac{4 \times 4000}{5} = 4 \times 800$$

$$\Rightarrow P = \text{Rs. } 3200$$

Hence principal = Rs. 3200

Question 6.

(i) At what rate per cent per annum will Rs. 630 produce an interest of Rs. 126 in 4 years ?

(ii) At what rate per cent per year will a sum double itself in $6\frac{1}{4}$ years ?

Solution:

(i) P = Rs. 630, I = Rs. 126, T = 4 years

$$R = \frac{100 \times I}{P \times T} = \frac{100 \times 126}{630 \times 4} = \frac{100}{20} = 5\%$$

(ii) Let P = Rs. 100

$$\therefore \text{Amount} = 2 \times \text{Rs. } 100 = \text{Rs. } 200$$

$$\text{Interest} = A - P$$

$$= \text{Rs. } 200 - \text{Rs. } 100 = \text{Rs. } 100$$

$$T = 6\frac{1}{4} \text{ years} = \frac{25}{4} \text{ years}$$

$$R = \frac{100 \times I}{P \times T} = \frac{100 \times 100}{100 \times \frac{25}{4}} \% = \frac{100 \times 100}{100} \times \frac{4}{25} = 16\%$$

Question 7.

(i) In how many years will Rs.950 produce Rs.399 as simple interest at 7% ?

(ii) Find the time in which Rs.1200 will amount to Rs.1536 at 3.5% per year.

Solution:

$$(i) \quad P = \text{Rs.}950$$

$$S.I. = \text{Rs.}399$$

$$R = 7\%$$

We know that :

$$T = \frac{100 \times I}{P \times R} = \frac{100 \times 399}{950 \times 7}$$
$$= \frac{10 \times 21}{5 \times 7} = 2 \times 3 = 6 \text{ years}$$

$$(ii) \quad A = \text{Rs.}1536$$

$$P = \text{Rs.}1200$$

$$I = A - P$$

$$= \text{Rs.}1536 - \text{Rs.}1200$$

$$= \text{Rs.}336$$

We know that :

$$T = \frac{100 \times I}{P \times R}$$

$$= \frac{100 \times 336}{1200 \times 3.5} = \frac{100 \times 336 \times 10}{1200 \times 35} \left[\because \frac{1}{3.5} = \frac{10}{35} \right]$$

$$= \frac{28 \times 10}{35} = 8 \text{ years}$$

Question 8.

The simple interest on a certain sum of money is $\frac{3}{8}$ of the sum in $6\frac{1}{4}$ years. Find the rate percent charged.

Solution:

$$\text{Let } P = \text{Rs. } 8$$

$$\text{S.I.} = \text{Rs. } \frac{3}{8} \times 8$$

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

$$T = 6\frac{1}{4} \text{ years} = \frac{25}{4} \text{ years}$$

We know that :

$$R = \frac{100 \times I}{P \times T}$$

$$= \frac{100 \times 3}{8 \times \frac{25}{4}} = \frac{100 \times 3}{8} \times \frac{4}{25} = 2 \times 3$$

$$= 6\%$$

Question 9.

What sum of money borrowed on 24th May will amount to Rs. 10210.20 on 17th October of the same year at 5 percent per annum simple interest.

Solution:

$$A = \text{Rs. } 10210.20$$

$$R = 5\% \text{ P.A.}$$

$$\begin{aligned}
 T &= \text{May} + \text{June} + \text{July} + \text{August} + \text{Sept.} + \text{Oct.} \\
 &= 7 + 30 + 31 + 31 + 30 + 17 \\
 &= \frac{146}{365} \text{ days} = \frac{2}{5} \text{ year}
 \end{aligned}$$

We know that :

$$P + I = A$$

$$\Rightarrow P + \frac{P \times R \times T}{100} = A$$

$$\Rightarrow P \left(1 + \frac{R \times T}{100} \right) = A$$

$$\Rightarrow P \left(1 + \frac{5 \times \frac{2}{5}}{100} \right) = \text{Rs. } 10210 \cdot 20$$

$$\Rightarrow P \left(1 + \frac{2}{100} \right) = \text{Rs. } 10210 \cdot 20$$

$$\Rightarrow P \times \frac{102}{100} = \text{Rs. } 10210 \cdot 20$$

$$\Rightarrow P = \text{Rs. } 10210 \cdot 20 \times \frac{100}{102}$$

$$\Rightarrow P = \text{Rs. } \frac{1021020}{102}$$

$$\Rightarrow P = \text{Rs. } 10010$$

\therefore Money to be borrowed = Rs.10010

Question 10.

In what time will the interest on a certain sum of money at 6% be $\frac{5}{8}$ of itself ?

Solution:

Let $P = \text{Rs. } 8$

$$\text{Interest} = \text{Rs. } 8 \times \frac{5}{8} = \text{Rs. } 5$$

$$R = 6\%$$

$$T = \frac{100 \times I}{P \times R}$$

$$= \frac{100 \times 5}{8 \times 6}$$

$$= \frac{500}{48} = \frac{125}{12} \text{ years}$$

$$= 10\frac{5}{12} \text{ years}$$

$$= 10 \text{ years } 5 \text{ months}$$

$$\left[\because \frac{5}{12} \text{ year} = \frac{5}{12} \times 12 \text{ months} = 5 \text{ months} \right]$$

$$\therefore \text{Time} = 10 \text{ years } 5 \text{ months}$$

Question 11.

Ashok lent out Rs.7000 at 6% and Rs.9500 at 5%. Find his total income from the interest in 3 years.

Solution:

In I case :

$$P = \text{Rs.}7000$$

$$R = 6\%$$

$$T = 3 \text{ years}$$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{7000 \times 6 \times 3}{100} \\ &= \text{Rs.}1260 \end{aligned}$$

In II case :

$$P = \text{Rs.}9500$$

$$R = 5\%$$

$$T = 3 \text{ years}$$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{9500 \times 5 \times 3}{100} \\ &= \text{Rs.}1425 \end{aligned}$$

$$\begin{aligned} \text{Total income from the interest} & \\ &= \text{Rs.}1260 + \text{Rs.}1425 \\ &= \text{Rs.}2685 \end{aligned}$$

Question 12.

Raj borrows Rs.8,000; out of which Rs. 4500 at 5% and remainder at 6%. Find the total interest paid by him in 4 years.

Solution:

Total sum borrowed by Raj = Rs.8000

In the First Case :

$$P = \text{Rs.}4500$$

$$R = 5\%$$

$$T = 4 \text{ years}$$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{4500 \times 5 \times 4}{100} \\ &= \text{Rs.}900 \end{aligned}$$

In the Second Case :

$$\begin{aligned} P &= \text{Rs.}8000 - \text{Rs.}4500 \\ &= \text{Rs.}3500 \end{aligned}$$

$$R = 6\%$$

$$T = 4 \text{ years}$$

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{3500 \times 6 \times 4}{100} \\ &= 35 \times 6 \times 4 = \text{Rs.}840 \end{aligned}$$

Total interest paid by Raj

$$= \text{Rs.}900 + \text{Rs.}840$$

$$= \text{Rs.}1740$$

Question 13.

Mohan lends Rs.4800 to John for $4\frac{1}{2}$ years and Rs.2500 to Shyam for 6 years and receives a total sum of Rs.2196 as interest. Find the rate percent per annum, it being the same in both the cases.

Solution:

In the first case :

$$P = \text{Rs.}4800$$

$$R = x\% \text{ (Suppose)}$$

$$T = 4\frac{1}{2} \text{ years} = \frac{9}{2} \text{ years}$$

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$= \text{Rs.} \frac{4800 \times x \times 9}{100 \times 2} = \text{Rs.} 24 \times x \times 9 = \text{Rs.} 216x$$

In the second case :

$$P = \text{Rs.}2500$$

$$R = x\%$$

$$T = 6 \text{ years}$$

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$= \text{Rs.} \frac{2500 \times x \times 6}{100} = \text{Rs.} 25 \times x \times 6$$

$$= \text{Rs.} 150x$$

According to statement,

$$\begin{aligned} \text{Interest in first case} + \text{Interest in second case} \\ = \text{Rs.} 2196 \end{aligned}$$

$$\therefore \text{Rs.} 216x + \text{Rs.} 150x = \text{Rs.} 2196$$

$$\Rightarrow \text{Rs.} 366x = \text{Rs.} 2196$$

$$\Rightarrow x = \frac{2196}{366}$$

$$\Rightarrow x = 6$$

$$\therefore \text{Rate} = 6\%$$

Question 14.

John lent Rs. 2550 to Mohan at 7.5 per cent per annum. If Mohan discharges the debt after 8 months by giving an old black and white television and Rs. 1422.50; find the price of the television.

Solution:

$$P = \text{Rs.}2550$$

$$R = 7.5\%$$

$$T = 8 \text{ months} = \frac{8}{12} \text{ years}$$

$$= \frac{2}{3} \text{ years}$$

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \text{Rs.}2550 \times 7.5 \times \frac{2}{3} \times \frac{1}{100}$$

$$= \text{Rs.} \frac{2550 \times 7.5 \times 2}{3 \times 100}$$

$$= \text{Rs.} \frac{2550 \times 5}{100}$$

$$= \text{Rs.} \frac{12750}{100}$$

$$= \text{Rs.}127.50$$

$$\text{Amount} = P + I$$

$$= \text{Rs.}2550 + \text{Rs.}127.50$$

$$= \text{Rs.}2677.50$$

$$\text{Mohan paid in cash} = \text{Rs.}1422.50$$

$$\text{Price of the television}$$

$$= \text{Amount} - \text{Paid in cash}$$

$$= \text{Rs.}2677.50 - \text{Rs.}1422.50$$

$$= \text{Rs.}1255$$

EXERCISE 9(B)

Question 1.

The interest on a certain sum of money is 0.24 times of itself in 3 years. Find the rate of interest.

Solution:

Let the sum borrowed = Rs. 100

Time = 3 years

Let rate of interest = $r\%$

$$\therefore \text{Interest} = \frac{100 \times 3 \times r}{100} \quad \left[\because \text{S.I.} = \frac{P \times R \times T}{100} \right]$$

$$= 3r = (0.24)(100) = 24$$

(Given)

$$\Rightarrow r = \frac{24}{3} = 8$$

Hence reqd. rate of interest = 8%

Question 2.

If ₹ 3,750 amount to ₹ 4,620 in 3 years at simple interest. Find:

(i) the rate of interest

(ii) the amount of Rs. 7,500 in $5\frac{1}{2}$ years at the same rate of interest

Solution:

(i) In first Case :

$$A = \text{Rs. } 4620 \quad P = \text{Rs. } 3750$$

$$I = A - P = \text{Rs. } 4620 - \text{Rs. } 3750 = \text{Rs. } 870$$

$$T = 3 \text{ years}$$

$$R = \frac{100 \times I}{P \times T} = \frac{100 \times 870}{3750 \times 3} = \frac{100 \times 290}{3750} = \frac{4 \times 29}{15}$$

$$= \frac{116}{15} = 7\frac{11}{15}\%$$

In Second Case :

$$P = \text{Rs. } 7500 \quad R = \frac{116}{15}\%$$

$$T = 5\frac{1}{2} \text{ years} = \frac{11}{2} \text{ years}$$

$$\begin{aligned} \text{Interest} &= \frac{P \times T \times R}{100} \\ &= \text{Rs. } \frac{7500 \times 11 \times 116}{2 \times 15 \times 100} = \frac{250 \times 116 \times 11}{100} \end{aligned}$$

$$= 10 \times 29 \times 11 = 290 \times 11 = \text{Rs. } 3190$$

$$\text{Amount} = \text{Rs. } 7500 + 3190 = \text{Rs. } 10,690$$

Question 3.

A sum of money, lent out at simple interest, doubles itself in 8 years. Find :

(i) the rate of interest

(ii) in how many years will the sum become triple (three times) of itself at the same rate per cent ?

Solution:

$$\text{Let } P = \text{Rs. } 100 \quad A = \text{Rs. } 200$$

$$I = \text{Rs. } 200 - \text{Rs. } 100 = \text{Rs. } 100, \quad T = 8 \text{ years}$$

$$R = \frac{100 \times I}{P \times T} = \frac{100 \times 100}{100 \times 8} = \frac{100}{8} = \frac{25}{2} \%$$

Now again $P = \text{Rs. } 100$

$$A = \text{Rs. } 300 \quad I = \text{Rs. } 300 - \text{Rs. } 100 \\ = \text{Rs. } 200$$

$$R = \frac{25}{2} \%$$

$$T = \frac{100 \times I}{P \times R} = \frac{100 \times 200}{100 \times \frac{25}{2}} = \frac{100 \times 200 \times 2}{100 \times 25} = 16 \text{ years}$$

So the given sum of money will become triple in 16 years.

Question 4.

Rupees 4000 amount to Rs.5000 in 8 years ; in what time will Rs.2100 amount to Rs.2800 at the same rate ?

Solution:

In first case :

$$A = \text{Rs. } 5000$$

$$P = \text{Rs. } 4000$$

$$I = A - P$$

$$= \text{Rs. } 5000 - \text{Rs. } 4000$$

$$= \text{Rs. } 1000$$

$$T = 8 \text{ years}$$

$$R = \frac{100 \times I}{P \times T}$$

$$= \frac{100 \times 1000}{4000 \times 8}$$

$$= \frac{25}{8} \%$$

In the second case :

$$A = \text{Rs.}2800$$

$$P = \text{Rs.}2100$$

$$I = \text{Rs.}2800 - \text{Rs.}2100 = \text{Rs.}700$$

$$R = \frac{25}{8} \%$$

$$T = \frac{100 \times I}{P \times R} = \frac{100 \times 700}{2100 \times \frac{25}{8}}$$

$$= \frac{100 \times 700 \times 8}{2100 \times 25} = \frac{32}{3} \text{ years} = 10 \frac{2}{3} \text{ years}$$

$$= 10 \frac{2}{3} \times 12 \text{ months} = 10 \frac{24}{3} \text{ months}$$

$$= 10 \text{ years } 8 \text{ months}$$

Question 5.

What sum of money lent at 6.5% per annum will produce the same interest in 4 years as Rs.7500 produce in 6 years at 5% per annum ?

Solution:

In first case :

$$P = \text{Rs.}7500$$

$$R = 5\%$$

$$T = 6 \text{ years}$$

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$= \text{Rs.} \frac{7500 \times 5 \times 6}{100}$$

$$= \text{Rs.}75 \times 5 \times 6$$

$$= \text{Rs.}2250$$

In second case :

According to the statement, interest = Rs.2250

$$R = 6.5\% \text{ P.A.}$$

$$T = 4 \text{ years}$$

$$P = \frac{100 \times I}{R \times T}$$

$$= \text{Rs.} \frac{100 \times 2250}{6.5 \times 4}$$

$$= \text{Rs.} \frac{225000}{26} = \text{Rs.} \frac{112500}{13}$$

$$= \text{Rs.}8653.85$$

Required principal = Rs.8653.85

Question 6.

A certain sum amounts to Rs.3825 in 4 years and to Rs.4050 in 6 years. Find the rate percent and the sum.

Solution:

In 6 years sum amounts to = Rs.4050

In 4 years sum amounts to = Rs.3825

$$\begin{aligned}\therefore \text{Interest of 2 years} &= \text{Rs.4050} - \text{Rs.3825} \\ &= \text{Rs.225}\end{aligned}$$

$$\begin{aligned}\text{Interest of 4 years} &= \text{Rs.} \frac{225}{2} \times 4 \\ &= \text{Rs.450}\end{aligned}$$

(\therefore Rs.225 is interest for 2 years)

Now

$$\begin{aligned}P &= A - I \\ &= \text{Rs.3825} - \text{Rs.450} \\ &= \text{Rs.3375}\end{aligned}$$

$$I = \text{Rs.450}$$

$$T = 4 \text{ years}$$

$$\begin{aligned}R &= \frac{100 \times I}{P \times T} \\ &= \frac{100 \times 450}{3375 \times 4} \\ &= \frac{45000}{13500} \% = \frac{450}{135} \% \\ &= \frac{10}{3} \% = 3\frac{1}{3} \%\end{aligned}$$

$$\therefore R = 3\frac{1}{3} \%$$

$$P = \text{Rs.3375}$$

Question 7.

At what rate percent of simple interest will the interest on Rs.3750 be one-fifth of itself in 4 years ? To what will it amount in 15 years ?

Solution:

$$P = \text{Rs.}3750$$

$$I = \text{Rs.}3750 \times \frac{1}{5}$$

$$= \text{Rs.}750$$

$$T = 4 \text{ years}$$

$$\begin{aligned} R &= \frac{100 \times I}{P \times T} \\ &= \frac{100 \times 750}{3750 \times 4} \\ &= \frac{100 \times 750}{3750 \times 4} \end{aligned}$$

$$= 5\%$$

$$\text{Again, } P = \text{Rs.}3750$$

$$\text{Interest of 4 years} = \text{Rs.}750$$

$$\text{Interest of 1 year} = \text{Rs.} \frac{750}{4}$$

$$\text{Interest of 15 years} = \text{Rs.} \frac{750}{4} \times 15$$

$$= \text{Rs.} \frac{750 \times 15}{4}$$

$$= \text{Rs.} \frac{5625}{2}$$

$$= \text{Rs.}2812.50$$

Amount in 15 years will be

$$= \text{Rs.}3750 + \text{Rs.}2812.50$$

$$= \text{Rs.}6562.50$$

\therefore Rate = 5%

Amount in 15 years will be

$$= \text{Rs.}6562.50$$

Question 8.

On what date will ₹ 1950 lent on 5th January, 2011 amount to ₹ 2125.50 at 5 percent per annum simple interest?

Solution:

$$P = \text{Rs.}1950$$

$$A = \text{Rs.}2125.50$$

$$R = 5\% \text{ p.a.}$$

$$I = A - P$$

$$= \text{Rs.}2125.50 - \text{Rs.}1950$$

$$= \text{Rs.}175.50$$

$$T = \frac{100 \times I}{P \times R}$$

$$= \frac{100 \times 175.50}{1950 \times 5}$$

$$= \frac{17550}{9750} = \frac{1755}{975} = \frac{117}{65}$$

$$= \frac{9}{5} \text{ years} = 1 \frac{4}{5} \text{ years}$$

$$= 1 \text{ years } 292 \text{ days}$$

$\therefore \frac{4}{5} \text{ years}$ $= \frac{4}{5} \times 365 \text{ days} = 292 \text{ days}$

Jan + Feb. + March + April + May + June + July

+ Aug. + Sept. + Oct.

$$(31-5) + 29 + 31 + 30 + 31 + 30 + 31 + 31 + 30 + 23$$

$$= 292 \text{ days}$$

\therefore Required date = 23rd October 2012

Question 9.

If the interest on Rs.2400 be more than the interest on Rs.2000 by Rs.60 in 3 years at the same rate percent ; find the rate.

Solution:

In first case :

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

$$R = x\% \text{ (Assume)}$$

$$T = 3 \text{ years}$$

$$\begin{aligned} \text{Interest} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{2400 \times x \times 3}{100} \\ &= \text{Rs.} 72x \end{aligned}$$

In second case :

$$P = \text{Rs.}2000$$

$$R = x\%$$

(Rate same as in first case)

$$T = 3 \text{ years}$$

$$\begin{aligned} \text{Interest} &= \frac{P \times R \times T}{100} \\ &= \text{Rs.} \frac{2000 \times x \times 3}{100} \\ &= \text{Rs.} 60x \end{aligned}$$

According to the statement,

$$72x = 60x + 60$$

$$\Rightarrow 72x - 60x = 60$$

$$\Rightarrow 12x = 60$$

$$\Rightarrow x = \frac{60}{12}$$

$$\Rightarrow x = 5$$

$$\therefore \text{Rate} = 5\%$$

Question 10.

Divide Rs. 15,600 into two parts such that the interest on one at 5 percent for 5 years may be equal to that on the other at $4\frac{1}{2}$ per cent for 6 years.

Solution:

Let one part = Rs. x
 \therefore Second part = Rs. $(15,600 - x)$
By the given condition

$$= \frac{x \times 5 \times 5}{100} = \frac{(15,600 - x) \times \frac{9}{2} \times 6}{100}$$

$$\Rightarrow 25x = 27 \times 15,600 - 27x$$

$$\Rightarrow 25x + 27x = 27 \times 15,600$$

$$\Rightarrow 52x = 27 \times 15,600$$

$$\Rightarrow x = \frac{27 \times 15,600}{52} = 27 \times 300 = 8100$$

Hence one part = Rs. 8100 and second part
Rs. $(15,600 - 8,100) = \text{Rs. } 7,500$

EXERCISE 9(C)**Question 1.**

A sum of Rs. 8,000 is invested for 2 years at 10% per annum compound interest. Calculate:

- (i) interest for the first year.
- (ii) principal for the second year.
- (iii) interest for the second year.
- (iv) final amount at the end of second year
- (v) compound interest earned in 2 years.

Solution:

(i) Here Principal (P) = Rs. 8,000

Rate of interest = 10%

$$\text{Interest for the first year} = \frac{8,000 \times 10 \times 1}{100}$$

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

(ii) \therefore Amount = Rs. 8,000 + Rs. 800 = Rs. 8,800

Thus Principal for the second year = Rs. 8,800

(iii) Interest for the second year

$$= \frac{8,800 \times 10 \times 1}{100} = \text{Rs. } 880$$

(iv) Amount at the end of second year = Rs. 8,800 + Rs. 880 = Rs. 9,680

(v) Hence compound interest earned in 2 years
= Rs. 9,680 - Rs. 8,000 = Rs. 1680

Question 2.

A man borrowed Rs. 20,000 for 2 years at 8% per year compound interest. Calculate :

- (i) the interest of the first year.
- (ii) the interest of the second year.
- (iii) the final amount at the end of second year.
- (iv) the compound interest of two years.

Solution:

Here Principal (P) = Rs. 20,000, Time = 1
year
Rate = 8%

$$(i) \therefore \text{Interest of the first year} = \frac{20,000 \times 8 \times 1}{100} \\ = \text{Rs. } 1600$$

(ii) \therefore Amount after one year
i.e. Principal for second year = Rs. 20,000 +
Rs. 1,600 = Rs. 21,600

$$\therefore \text{Interest for second year} = \frac{21,600 \times 8 \times 1}{100} \\ = 216 \times 8 = \text{Rs. } 1728$$

(iii) Final amount at the end of second year
= Rs. (21,600 + 1728) = Rs. 23,328

(iv) Interest of two years = Rs. 23,328 – Rs.
20,000 = Rs. 3,328

Question 3.

Calculate the amount and the compound interest on Rs. 12,000 in 2 years and at 10% per year.

Solution:

For 1st year

Principal (P) = Rs. 12,000

Rate (R) = 10%

Time (T) = 1 year

$$I = \text{Interest} = \frac{12,000 \times 10 \times 1}{100} = 120 \times 10 = \text{Rs.}$$

1200

$$\begin{aligned} \text{Amount} = P + I &= \text{Rs. } 12,000 + \text{Rs. } 1200 \\ &= \text{Rs. } 13,200 \end{aligned}$$

For 2nd year

P = Rs. 13,200, R = 10%, Time (T) = 1 year

$$\begin{aligned} \therefore \text{Interest} &= \frac{13,200 \times 10 \times 1}{100} = 132 \times 10 \\ &= \text{Rs. } 1320 \end{aligned}$$

$$\begin{aligned} \therefore \text{Amount in 2 years} &= \text{Rs. } (13,200) + (1320) \\ &= \text{Rs. } 14520 \end{aligned}$$

Compound interest in 2 years = Rs. 1200 + Rs. 1320 = Rs. 2520

[or directly = Rs. 14520 – Rs. 12000
= Rs. 2520]

Question 4.

Calculate the amount and the compound interest on Rs. 10,000 in 3 years at 8% per annum.

Solution:

For 1st year

Principal (P) = Rs. 10,000, Rate (R) = 8%

Time (T) = 1 year

$$\therefore \text{Interest} = \frac{10,000 \times 8 \times 1}{100} = 100 \times 8 = \text{Rs. } 800$$

For 2nd year

P = Rs. 10,000 + Rs. 800 = Rs. 10,800

Rate (R) = 8% Time (T) = 1 year

$$\therefore \text{Interest} = \frac{10,800 \times 8 \times 1}{100} = 108 \times 8 = \text{Rs. } 864$$

For 3rd year

$\therefore P = \text{Rs. } 10,800 + \text{Rs. } 864 = \text{Rs. } 11664,$
R = 8%, T = 1 year

$$\begin{aligned} \therefore \text{Interest} &= \frac{11664 \times 8 \times 1}{100} = \frac{11664 \times 2}{25} \\ &= \text{Rs. } 933.12 \\ \therefore \text{Amount} &= \text{Rs. } 11664 + 933.12 = \text{Rs. } 12597.12 \\ \text{Hence required amount} &= \text{Rs. } 12597.12 \\ \therefore \text{Compound interest} \\ &= \text{Rs. } 12597.12 - 10000 = \text{Rs. } 2597.12 \end{aligned}$$

Question 5.

Calculate the compound interest on Rs. 5,000 in 2 years ; if the rates of interest for successive years be 10% and 12% respectively.

Solution:

For 1st year

Principal (P) = Rs. 5,000, Rate (R) = 10%

Time (T) = 1 year

$$\therefore \text{Interest} = \frac{5,000 \times 10 \times 1}{100} = 50 \times 10 = \text{Rs. } 500$$

\therefore Amount at the end of 1st year = Rs. (5000 + 500) = Rs. 5500

For 2nd year

P = Rs. 5550, Rate 12%, T = 1 year

$$\therefore \text{Interest} = \frac{5500 \times 12 \times 1}{100} = 55 \times 12 = \text{Rs. } 660$$

\therefore Amount at the end of 2nd year

$$= \text{Rs. } 5500 + \text{Rs. } 660 = \text{Rs. } 6160$$

Hence compound interest = Rs. 6160 – Rs. 5000
= Rs. 1160

Question 6.

Calculate the compound interest on Rs. 15,000 in 3 years ; if the rates of interest for successive years be 6%, 8% and 10% respectively.

Solution:

For 1st year

Principal (P) = Rs. 15,000, Rate (R) = 6%

Time (T) = 1 year

$$\therefore \text{Interest} = \frac{15,000 \times 6 \times 1}{100} = 150 \times 6 = \text{Rs. } 900$$

\therefore Amount at the end of 1st year

$$= \text{Rs. } 15,000 + \text{Rs. } 900 = \text{Rs. } 15900$$

For 2nd year

P = Rs. 15900, R = 8%, T = 1 year

$$\therefore \text{Interest} = \frac{15,900 \times 8 \times 1}{100} = 159 \times 8 = \text{Rs. } 1272$$

\therefore Amount at the end of 2nd year

$$= \text{Rs. } (15900 + 1272) = \text{Rs. } 17172$$

For 3rd year

P = Rs. 17172, R = 10%, T = 1 year

$$\therefore \text{Interest} = \frac{17172 \times 10 \times 1}{100} = \text{Rs. } 1717.20$$

\therefore Amount at the end of 3rd year

$$= \text{Rs. } (17172 + 1717.20) = \text{Rs. } 18889.20$$

$$\therefore \text{Compound interest} = 18889.20 - 15,000 \\ = \text{Rs. } 3889.20$$

Question 7.

Mohan borrowed Rs. 16,000 for 3 years at 5% per annum compound interest. Calculate the amount that Mohan will pay at the end of 3 years.

Solution:

For 1st year

Principal (P) = Rs. 16,000, Rate (R) = 5%

Time (T) = 1 year

$$\therefore \text{Interest} = \frac{16,000 \times 5 \times 1}{100} = 160 \times 5 = \text{Rs. } 800$$

\therefore Amount at the end of 1st year = Rs. (16,000 + 800) = Rs. 16,800

For 2nd year

P = Rs. 16,800, R = 5%, T = 1 year

$$\therefore \text{Interest} = \frac{16,800 \times 5 \times 1}{100} = 168 \times 5 = \text{Rs. } 840$$

\therefore Amount at the end of 2nd year = Rs. (16,800 + 840) = Rs. 17,640

For 3rd year

P = 17,640, R = 5%, T = 1 year

$$\therefore \text{Interest} = \frac{17,640 \times 5 \times 1}{100} = \frac{17,640}{20} = \text{Rs. } 882$$

\therefore Amount at the end of 3rd year = Rs. (17,640 + 882) = Rs. 18,522

Hence reqd. amount = Rs. 18,522

Question 8.

Rekha borrowed Rs. 40,000 for 3 years at 10% per annum compound interest. Calculate the interest paid by her for the second year.

Solution:

For 1st year

Principal = Rs. 40,000, Rate = 10%, Time = 1 year

$$\therefore \text{Interest} = \frac{40,000 \times 10 \times 1}{100} = 400 \times 10 = \text{Rs. } 4000$$

\therefore Amount at the end of 1st year = Rs. (40,000 + 4000) = Rs. 44,000

For 2nd year

P = Rs. 44,000, R = 10%, T = 1 year

$$\therefore \text{Interest} = \text{Rs. } \frac{44,000 \times 10 \times 1}{100} = 440 \times 10 =$$

Rs. 4400

Thus interest earned in the second year = Rs. 4400

Question 9.

Calculate the compound interest for the second year on Rs. 15000 invested for 5 years at 6% per annum.

Solution:

Principal (P) = Rs. 15000

Rate (R) = 6% p.a.

Period (n) = 5 years

$$\text{Interest for the first year} = \frac{PRT}{100}$$

$$= \frac{15000 \times 6 \times 1}{100} = \text{Rs. } 900$$

$$\therefore \text{Amount for the first year} = \text{Rs. } 15000 + 900 \\ = \text{Rs. } 15900$$

Principal for the second year = Rs. 15900

$$\text{Interest for the second year} = \frac{15900 \times 6 \times 1}{100}$$

$$= 159 \times 6 = \text{Rs. } 954$$

Question 10.

A man invests Rs. 9600 at 10% per annum compound interest for 3 years. Calculate :

- (i) the interest for the first year.
- (ii) the amount at the end of the first year.
- (iii) the interest for the second year.
- (iv) the interest for the third year.

Solution:

Principal (P) = Rs. 9600

Rate (R) = 10% p.a.

Period (n) = 3 years

$$(i) \therefore \text{Interest for the first year} = \frac{PRT}{100}$$

$$= \frac{9600 \times 10 \times 1}{100} = \text{Rs. } 960$$

(ii) Amount at the end of first year

$$= P + \text{S.I.} = \text{Rs. } 9600 + 960 = \text{Rs. } 10560$$

(iii) Principal for the second year = Rs. 10560

$$\text{Interest for the second year} = \frac{10560 \times 10 \times 1}{100}$$

$$= \text{Rs. } 1056$$

$$\therefore \text{Amount after second year} = \text{Rs. } 10560 + 1056 = \text{Rs. } 11616$$

(iii) Principal for the third year = Rs. 11616

$$\text{Interest for the third year} = \frac{11616 \times 10 \times 1}{100}$$

$$116.16 \times 10 = \text{Rs. } 1161.60$$

Question 11.

A person invests Rs. 5,000 for two years at a certain rate of interest compounded annually. At the end of one year, this sum amounts to Rs. 5,600. Calculate :

- (i) the rate of interest per year.
- (ii) the amount at the end of the second year.

Solution:

Principal (P) = Rs. 5000

Period (T) = 2 years

Amount at the end of one year = Rs. 5600

$$\begin{aligned}\therefore \text{Interest for the first year} &= A - P \\ &= \text{Rs. } 5600 - 5000 = \text{Rs. } 600\end{aligned}$$

$$(i) \therefore \text{Rate of interest} = \frac{\text{S.I.} \times 100}{P \times T}$$

$$= \frac{600 \times 100}{5000 \times 1} = 12\% \text{ p.a.}$$

(ii) Principal for the second year = Rs. 5600

$$\begin{aligned}\text{Interest for the second year} &= \frac{5600 \times 12 \times 1}{100} \\ &= ₹672\end{aligned}$$

$$\begin{aligned}\therefore \text{Amount at the end of second year} \\ &= P + \text{S.I.} = 5600 + 672 = ₹6272\end{aligned}$$

Question 12.

Calculate the difference between the compound interest and the simple interest on ₹ 7,500 in two years and at 8% per annum.

Solution:

Principal (P) = ₹7500

Rate (R) = 8% p.a.

Period (T) = 2 years

$$\begin{aligned}\therefore \text{Simple interest} &= \frac{PRT}{100} = \frac{7500 \times 8 \times 2}{100} \\ &= ₹1200\end{aligned}$$

$$\begin{aligned}\text{Interest for the first year} &= \frac{7500 \times 8 \times 1}{100} \\ &= ₹600\end{aligned}$$

$$\begin{aligned}\therefore \text{Amount at the end of first year} &= P + \text{S.I.} \\ &= ₹7500 + ₹600 = ₹8100\end{aligned}$$

Principal for the second year = ₹8100

$$\begin{aligned}\therefore \text{Interest for the second year} &= \frac{8100 \times 8 \times 1}{100} \\ &= ₹648\end{aligned}$$

$$\begin{aligned}\therefore \text{Total C.I. for 2 years} &= ₹600 + ₹648 \\ &= ₹1248\end{aligned}$$

$$\begin{aligned}\therefore \text{Difference between C.I. and S.I. for 2 years} \\ &= ₹1248 - ₹1200 = ₹48\end{aligned}$$

Question 13.

Calculate the difference between the compound interest and the simple interest on ₹ 8,000 in three years and at 10% per annum.

Solution:

Principal (P) = ₹ 8000

Rate (R) = 10% p.a.

Period (T) = 3 years

$$\begin{aligned}\therefore \text{S.I. for 3 years} &= \frac{PRT}{100} = \frac{8000 \times 10 \times 3}{100} \\ &= ₹ 2400\end{aligned}$$

$$\begin{aligned}\text{Now, S.I. for 1st year} &= ₹ \frac{8000 \times 10 \times 1}{100} \\ &= 80 \times 10 \times 1 = ₹ 800\end{aligned}$$

$$\begin{aligned}\text{Amount for the first year} &= P + \text{S.I.} \\ &= ₹ 8000 + ₹ 800 = ₹ 8800\end{aligned}$$

Principal for the second year = ₹ 8800

$$\begin{aligned}\text{Interest for the second year} &= \frac{8800 \times 10 \times 1}{100} \\ &= ₹ 880\end{aligned}$$

$$\begin{aligned}\therefore \text{Amount after second year} &= ₹ 8800 + ₹ 880 \\ &= ₹ 9680\end{aligned}$$

Principal for the third year = ₹ 9680

Interest for the third year

$$= ₹ \frac{9680 \times 10 \times 1}{100} = ₹ 968$$

$$\begin{aligned}\therefore \text{C.I. for 3 years} &= ₹ 800 + ₹ 880 + ₹ 968 \\ &= ₹ 2648\end{aligned}$$

$$\begin{aligned}\therefore \text{Difference between C.I. and S.I. for 3 years} \\ &= ₹ 2648 - ₹ 2400 = ₹ 248\end{aligned}$$

Question 14.

Rohit borrowed ₹ 40,000 for 2 years at 10% per annum C.I. and Manish borrowed the same sum for the same time at 10.5% per annum simple interest. Which of these two gets less interest and by how much?

Solution:

Sum borrowed (P) = ₹40000

Rate (R) = 10% p.a. compounded annually

Time (T) = 2 years

$$\therefore \text{Interest for first year} = \frac{PRT}{100}$$

$$= ₹ \frac{40000 \times 10 \times 1}{100} = ₹4000$$

Amount after one year = ₹40000 + 4000

= ₹44000

Principal for the second year = ₹44000

\therefore Interest for the second year

$$= \frac{44000 \times 10 \times 1}{100} = ₹4400$$

\therefore C. Interest for 2 years = ₹4000 + 4400

= ₹8400

In second case,

Principal (P) = ₹40000

Rate (R) = 10.5% p.a.

Time (T) = 2 years

$$\therefore \text{S. Interest} = \frac{PRT}{100} = \frac{40000 \times 10.5 \times 2}{100}$$

$$= ₹ \frac{40000 \times 105 \times 2}{100 \times 10} = ₹8400$$

In both the cases, interest is same.

Question 15.

Mr. Sharma borrowed ₹ 24,000 at 13% p.a. simple interest and an equal sum at 12% p.a. compound interest. Find the total interest earned by Mr. Sharma in 2 years.

Solution:

Sum borrowed (P) = ₹24000

Rate (R) = 13% p.a.

Time (T) = 2 years

In case of simple interest,

$$\text{S. Interest for 2 years} = \frac{PRT}{100}$$

$$= ₹ \frac{24000 \times 13 \times 2}{100} = ₹6240$$

In case of compound interest,

$$\begin{aligned} \text{Interest for the first year} &= \frac{24000 \times 12 \times 1}{100} \\ &= ₹2880 \end{aligned}$$

Amount after first year

$$= ₹24000 + 2880 = ₹26880$$

$$\text{Interest for second year} = ₹ \frac{26880 \times 12 \times 1}{100}$$

$$= ₹ \frac{322560}{100} = ₹3225.60$$

$$\begin{aligned} \therefore \text{C.I. for 2 years} &= ₹2880 + 3225.60 \\ &= ₹6105.60 \end{aligned}$$

$$\begin{aligned} \text{Total interest} &= ₹6240 + 6105.60 \\ &= ₹12345.60 \end{aligned}$$

Question 16.

Peter borrows ₹ 12,000 for 2 years at 10% p.a. compound interest. He repays ₹ 8,000 at the end of first year. Find:

- (i) the amount at the end of first year, before making the repayment.
- (ii) the amount at the end of first year, after making the repayment.
- (iii) the principal for the second year.
- (iv) the amount to be paid at the end of second year, to clear the account.

Solution:

Sum borrowed = ₹12000

Rate (R) = 10% p.a. compound annually

Time (T) = 2 years

$$\text{Interest for the first year} = \frac{PRT}{100}$$

$$= \frac{12000 \times 10 \times 1}{100} = ₹1200$$

(i) Amount = ₹12000 + 1200 = ₹13200

Amount paid = ₹8000

(ii) Balance amount = ₹13200 – 8000 = ₹5200

(iii) ∴ Principal for the second year = ₹5200

(iv) Interest for the second year = $\frac{5200 \times 10 \times 1}{100}$

$$= ₹520$$

∴ Amount = ₹5200 + 520 = ₹5720

Question 17.

Gautam takes a loan of ₹16,000 for 2 years at 15% p.a. compound interest. He repays ₹9,000 at the end of first year. How much must he pay at the end of second year to clear the debt?

Solution:

Loan taken (P) = ₹16000

Rate (R) = 15% p.a.

Time (T) = 2 years

∴ Interest for the first year

$$= \frac{PRT}{100} = \frac{16000 \times 15 \times 1}{100} = ₹2400$$

Amount after one year = ₹16000 + 2400

$$= ₹18400$$

At the end of one year amount paid back

$$= ₹9000$$

Balance amount = ₹18400 – 9000

$$= ₹9400$$

Interest for the second year = $\frac{9400 \times 15 \times 1}{100}$

$$= ₹1410$$

Amount after second year = ₹9400 + 1410

$$= ₹10810$$

Question 18.

A certain sum of money, invested for 5 years at 8% p.a. simple interest, earns an interest of ₹ 12,000. Find:

(i) the sum of money.

(ii) the compound interest earned by this money in two years and at 10% p.a. compound interest.

Solution:

$$\text{Rate (R)} = 8\% \text{ p.a.}$$

$$\text{Period (T)} = 5 \text{ years}$$

$$\text{Interest (I)} = ₹ 12000$$

$$(i) \therefore \text{Sum} = \frac{I \times 100}{R \times T}$$

$$= ₹ \frac{12000 \times 100}{8 \times 5} = ₹ 30000$$

(ii) Rate (R) = 10% p.a.

$$\text{Time (T)} = 2 \text{ years}$$

$$\text{Principal (P)} = ₹ 30000$$

$$\text{Interest for the first year} = \frac{PRT}{100}$$

$$= ₹ \frac{30000 \times 10 \times 1}{100} = ₹ 3000$$

$$\therefore \text{Amount after one year} = ₹ 30000 + 3000 \\ = ₹ 33000$$

$$\text{Principal for the second year} = ₹ 33000$$

$$\text{Interest for the second year} = \frac{33000 \times 10 \times 1}{100}$$

$$= ₹ 3300$$

\therefore Compound Interest for two years

$$= ₹ 3000 + 3300 = ₹ 6300$$

Question 19.

Find the amount and the C.I. on ₹ 12,000 at 10% per annum compounded half-yearly.

Solution:

$$\text{Principal (P)} = ₹12,000$$

$$\text{Rate (r)} = 10\%$$

$$\text{Time (t)} = 1 \text{ years}$$

$$\text{Amount} = P \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹12,000 \times \left(1 + \frac{10}{200}\right)^2$$

$$= ₹12,000 \times \left(\frac{210}{200}\right)^2$$

$$= ₹12,000 \times \frac{21}{20} \times \frac{21}{20} = ₹13,230$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹13230 - ₹12000 = ₹1230$$

Question 20.

Find the amount and the C.I. on ₹ 8,000 in $1\frac{1}{2}$ years at 20% per year compounded half-yearly.

Solution:

$$\text{Principal (P)} = ₹8000$$

$$\text{Rate} = 20\%$$

$$\text{Time} = 1\frac{1}{2} \text{ years} = \frac{3}{2} \text{ years}$$

$$\text{Amount} = \text{Principal} \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹8000 \times \left(1 + \frac{20}{200}\right)^{\frac{3}{2} \times 2}$$

$$= ₹8000 \times \left(\frac{220}{200}\right)^3$$

$$= ₹8000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = ₹10648$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹10648 - ₹8000 = ₹2648$$

Question 21.

Find the amount and the compound interest on ₹ 24,000 for 2 years at 10% per annum compounded yearly.

Solution:

$$\text{Principal (P)} = ₹24,000$$

$$\text{Time (t)} = 2 \text{ years}$$

$$\text{Rate (r)} = 10\%$$

$$\text{Amount} = \text{Principal} \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹24,000 \times \left(1 + \frac{10}{200}\right)^{2 \times 2}$$

$$= ₹24,000 \times \left(\frac{210}{200}\right)^4$$

$$= ₹24,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= ₹29,172$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹29,172 - ₹24,000 = ₹5,172$$

Question 22.

Find the amount and the compound interest on ₹ 16,000 for 3 years at 5% per annum compounded annually.

Solution:

$$\text{Principal (P)} = ₹16,000$$

$$\text{Time (t)} = 3 \text{ years}$$

$$\text{Rate (r)} = 5\%$$

$$\text{Amount} = \text{Principal} \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹16,000 \times \left(1 + \frac{5}{200}\right)^{3 \times 2}$$

$$= ₹16,000 \times \left(\frac{205}{200}\right)^6$$

$$= ₹16,000 \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40}$$

$$= ₹18,555$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹18,555 - ₹16,000 = ₹2555$$

Question 23.

Find the amount and the compound interest on ₹ 20,000 for $1\frac{1}{2}$ years at 10% per annum compounded half-yearly.

Solution:

$$\text{Principal (P)} = ₹20,000$$

$$\text{Time (t)} = 1\frac{1}{2} \text{ years} = \frac{3}{2} \text{ years}$$

$$\text{Rate (r)} = 10\%$$

$$\text{Amount} = P \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹20,000 \times \left(1 + \frac{10}{200}\right)^{\frac{3}{2} \times 2}$$

$$= ₹20,000 \times \left(\frac{210}{200}\right)^3$$

$$= ₹20,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= ₹23,152.50$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹23,152.50 - ₹20,000 = ₹3,152.50$$

Question 24.

Find the amount and the compound interest on ₹ 32,000 for 1 year at 20% per annum compounded half-yearly.

Solution:

$$\text{Principal (P)} = ₹32,000$$

$$\text{Time (t)} = 1 \text{ year}$$

$$\text{Rate (r)} = 20\%$$

$$\text{Amount} = \text{Principal} \times \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2}$$

$$= ₹32,000 \times \left(1 + \frac{20}{200}\right)^{1 \times 2}$$

$$= ₹32,000 \times \left(\frac{11}{10}\right)^2$$

$$= ₹32,000 \times \frac{11}{10} \times \frac{11}{10} = ₹38,720$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹38,720 - ₹32,000 = ₹6,720$$

Question 25.

Find the amount and the compound interest on ₹ 4,000 in 2 years, if the rate of interest for first year is 10% and for the second year is 15%.

Solution:

$$\text{Principal (P)} = ₹4,000$$

$$\text{Time (t)} = 2 \text{ years}$$

$$\text{Rate (R}_1\text{)} = 10\% \text{ and rate (R}_2\text{)} = 15\%$$

$$\text{Amount} = P \left(1 + \frac{R_1}{100}\right) \left(1 + \frac{R_2}{100}\right)$$

$$= ₹4,000 \left(1 + \frac{10}{100}\right) \left(1 + \frac{15}{100}\right)$$

$$= ₹4,000 \times \frac{11}{10} \times \frac{23}{20} = ₹5060$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹5060 - ₹4000 = ₹1060$$

Question 26.

Find the amount and the compound interest on ₹ 10,000 in 3 years, if the rates of interest for the successive years are 10%, 15% and 20% respectively.

Solution:

$$\text{Principal (P)} = ₹10,000$$

$$\text{Time (t)} = 3 \text{ years}$$

$$\text{Rate (R}_1\text{)} = 10\%$$

$$\text{Rate (R}_2\text{)} = 15\%$$

$$\text{Rate (R}_3\text{)} = 20\%$$

$$\text{Amount} = P \left(1 + \frac{R_1}{100}\right) \left(1 + \frac{R_2}{100}\right) \left(1 + \frac{R_3}{100}\right)$$

$$= ₹10,000 \times \left(1 + \frac{10}{100}\right) \left(1 + \frac{15}{100}\right) \left(1 + \frac{20}{100}\right)$$

$$= ₹10,000 \times \frac{11}{10} \times \frac{23}{20} \times \frac{6}{5} = ₹15,180$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= ₹15,180 - ₹10,000 = ₹5180$$