

## Exercise 8.3

### Question 1:

Calculate the amount and compound interest on:

(a) ₹ 10,800 for 3 years at  $12\frac{1}{2}\%$  per annum compounded annually.

(b) ₹ 18,000 for  $2\frac{1}{2}$  years at 10% per annum compounded annually.

(c) ₹ 62,500 for  $1\frac{1}{2}$  years at 8% per annum compounded annually.

(d) ₹ 8,000 for 1 years at 9% per annum compounded half yearly. (You could the year by year calculation using S.I. formula to verify).

(e) ₹ 10,000 for 1 years at 8% per annum compounded half yearly.

### Answer 1:

(a) Here,

Principal (P) = ₹ 10800, Time ( $n$ ) = 3 years,

Rate of interest (R) =  $12\frac{1}{2}\% = \frac{25}{2}\%$

$$\text{Amount (A)} = P \left(1 + \frac{R}{100}\right)^n$$

$$= 10800 \left(1 + \frac{25}{2 \times 100}\right)^3$$

$$= 10800 \left(1 + \frac{1}{2 \times 4}\right)^3$$

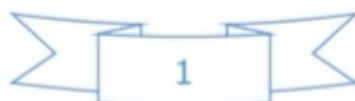
$$= 10800 \left(1 + \frac{1}{8}\right)^3$$

$$= 10800 \left(\frac{9}{8}\right)^3$$

$$= 10800 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8}$$

$$= ₹ 15,377.34$$

$$\text{Compound Interest (C.I.)} = A - P = ₹ 10800 - ₹ 15377.34 = ₹ 4,577.34$$



(b) Here,

Principal (P) = ₹ 18,000, Time ( $n$ ) =  $2\frac{1}{2}$  years, Rate of interest (R) = 10% p.a.

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 18000 \left(1 + \frac{10}{100}\right)^2 \\&= 18000 \left(1 + \frac{1}{10}\right)^2 \\&= 18000 \left(\frac{11}{10}\right)^2 \\&= 18000 \times \frac{11}{10} \times \frac{11}{10} \\&= ₹ 21,780\end{aligned}$$

Interest for  $\frac{1}{2}$  years on ₹ 21,780 at rate of 10% =  $\frac{1}{2} \times \frac{21780 \times 10 \times 1}{100} = ₹ 1,089$

Total amount for  $2\frac{1}{2}$  years = ₹ 21,780 + ₹ 1089 = ₹ 22,869

Compound Interest (C.I.) = A - P = ₹ 22869 - ₹ 18000 = ₹ 4,869

(c) Here,

Principal (P) = ₹ 62500, Time ( $n$ ) =  $1\frac{1}{2} = \frac{3}{2}$  years = 3 half-years (compounded half yearly)

Rate of interest (R) = 8% = 4% (compounded half yearly)

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 62500 \left(1 + \frac{4}{100}\right)^3 = 62500 \left(1 + \frac{1}{25}\right)^3 \\&= 62500 \left(\frac{26}{25}\right)^3 \\&= 62500 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} = ₹ 70,304\end{aligned}$$

Compound Interest (C.I.) = A - P = ₹ 70304 - ₹ 62500 = ₹ 7,804

(d) Here,

Principal (P) = ₹ 8000, Time ( $n$ ) = 1 years = 2 half-years(compounded half yearly)

Rate of interest (R) = 9% =  $\frac{9}{2}$ % (compounded half yearly)

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 8000 \left(1 + \frac{9}{2 \times 100}\right)^2 \\&= 8000 \left(1 + \frac{9}{200}\right)^2 \\&= 8000 \left(\frac{209}{200}\right)^2 \\&= 8000 \times \frac{209}{200} \times \frac{209}{200} \\&= ₹ 8,736.20\end{aligned}$$

$$\text{Compound Interest (C.I.)} = A - P = ₹ 8736.20 - ₹ 8000 = ₹ 736.20$$

(e) Here,

Principal (P) = ₹ 10,000, Time ( $n$ ) = 1 years = 2 half-years (compounded half yearly)

Rate of interest (R) = 8% = 4% (compounded half yearly)

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 10000 \left(1 + \frac{4}{100}\right)^2 \\&= 10000 \left(1 + \frac{1}{25}\right)^2 \\&= 10000 \left(\frac{26}{25}\right)^2 \\&= 10000 \times \frac{26}{25} \times \frac{26}{25} = ₹ 10,816\end{aligned}$$

$$\text{Compound Interest (C.I.)} = A - P = ₹ 10,816 - ₹ 10,000 = ₹ 816$$



### Question 2:

Kamala borrowed ₹ 26,400 from a Bank to buy a scooter at a rate of 15% p.a. compounded yearly. What amount will she pay at the end of 2 years and 4 months to clear the loan?

(**Hint:** Find A for 2 years with interest is compounded yearly and then find SI on the 2<sup>nd</sup> year amount for  $\frac{4}{12}$  years).

### Answer 2:

Here,

Principal (P) = ₹ 26,400, Time ( $n$ ) = 2 years 4 months, Rate of interest (R) = 15% p.a.

$$\begin{aligned}\text{Amount for 2 years (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 26400 \left(1 + \frac{15}{100}\right)^2 \\&= 26400 \left(1 + \frac{3}{20}\right)^2 \\&= 26400 \left(\frac{23}{20}\right)^2 \\&= 26400 \times \frac{23}{20} \times \frac{23}{20} \\&= ₹ 34,914\end{aligned}$$

$$\begin{aligned}\text{Interest for 4 months} &= \frac{4}{12} = \frac{1}{3} \text{ years at the rate of 15\%} \\&= \frac{1}{3} \times \frac{34914 \times 15 \times 1}{100} = ₹ 1745.70\end{aligned}$$

$$\begin{aligned}\therefore \text{Total amount} &= ₹ 34,914 + ₹ 1,745.70 \\&= ₹ 36,659.70\end{aligned}$$



### Question 3:

Fabina borrows ₹ 12,500 per annum for 3 years at simple interest and Radha borrows the same amount for the same time period at 10% per annum, compounded annually. Who pays more interest and by how much?

#### Answer 3:

Here,

Principal (P) = ₹ 12,500, Time (T) = 3 years, Rate of interest (R) = 12% p.a.

$$\text{Simple Interest for Fabina} = \frac{P \times R \times T}{100} = \frac{12500 \times 12 \times 3}{100} = ₹ 4,500$$

Amount for Radha, P = ₹ 12,500, R = 10% and  $n = 3$  years

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 12500 \left(1 + \frac{10}{100}\right)^3 \\&= 12500 \left(1 + \frac{1}{10}\right)^3 \\&= 12500 \left(\frac{11}{10}\right)^3 \\&= 12500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \\&= ₹ 16,637.50\end{aligned}$$

$$\therefore \text{C.I. for Radha} = A - P = ₹ 16,637.50 - ₹ 12,500 = ₹ 4,137.50$$

$$\text{Here, Fabina pays more interest} = ₹ 4,500 - ₹ 4,137.50 = ₹ 362.50$$

### Question 4:

I borrows ₹ 12,000 from Jamshed at 6% per annum simple interest for 2 years. Had I borrowed this sum at 6% per annum compound interest, what extra amount would I have to pay?

#### Answer 4:

Here,

Principal (P) = ₹12,000, Time (T) = 2 years, Rate of interest (R) = 6% p.a.

$$\text{Simple Interest} = \frac{P \times R \times T}{100} = \frac{12000 \times 6 \times 2}{100} = ₹ 1,440$$

Had he borrowed this sum at 6% p.a., then

$$\begin{aligned} \text{Compound Interest} &= P \left( 1 + \frac{R}{100} \right)^n - P \\ &= 12000 \left( 1 + \frac{6}{100} \right)^2 - 12000 \\ &= 12000 \left( 1 + \frac{3}{50} \right)^2 - 12000 \\ &= 12000 \left( \frac{53}{50} \right)^2 - 12000 \\ &= 12000 \times \frac{53}{50} \times \frac{53}{50} - 12000 \\ &= ₹ 13,483.20 - ₹ 12,000 \\ &= ₹ 1,483.20 \end{aligned}$$

$$\text{Difference in both interests} = ₹ 1,483.20 - ₹ 1,440.00 = ₹ 43.20$$

### Question 5:

Vasudevan invested ₹ 60,000 at an interest rate of 12% per annum compounded half yearly. What amount would he get:

- (i) after 6 months?
- (ii) after 1 year?

### Answer 5:

Here, Principal (P) = ₹ 60,000,

Time (n) = 6 months = 1 half-year (compounded half yearly)

Rate of interest (R) = 12% = 6% (compounded half yearly)

$$\text{Amount (A)} = P \left( 1 + \frac{R}{100} \right)^n$$





$$\begin{aligned}
 &= 60000 \left(1 + \frac{6}{100}\right)^1 \\
 &= 60000 \left(1 + \frac{3}{50}\right)^1 \\
 &= 60000 \left(\frac{53}{50}\right)^1 \\
 &= 60000 \times \frac{53}{50} = ₹ 63,600
 \end{aligned}$$

After 6 months Vasudevan would get amount ₹ 63,600.

- (ii) Here, Principal (P) = ₹ 60,000,  
 Time ( $n$ ) = 1 year = 2 half-years (compounded half yearly)  
 Rate of interest (R) = 12% = 6% (compounded half yearly)

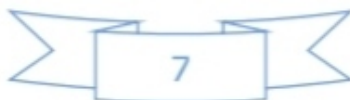
$$\begin{aligned}
 \text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\
 &= 60000 \left(1 + \frac{6}{100}\right)^2 \\
 &= 60000 \left(1 + \frac{3}{50}\right)^2 \\
 &= 60000 \left(\frac{53}{50}\right)^2 \\
 &= 60000 \times \frac{53}{50} \times \frac{53}{50} = ₹ 67,416
 \end{aligned}$$

After 1 year Vasudevan would get amount ₹ 67,416.

### Question 6:

Arif took a loan of ₹ 80,000 from a bank. If the rate of interest is 10% per annum, find the difference in amounts he would be paying after  $1\frac{1}{2}$  years if the interest is:

- (i) compounded annually.  
 (ii) compounded half yearly.



### Answer 6:

(i) Here,

Principal (P) = ₹ 80,000, Time ( $n$ ) =  $1\frac{1}{2}$  years, Rate of interest (R) = 10%

$$\begin{aligned}\text{Amount for 1 year (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 80000 \left(1 + \frac{10}{100}\right)^1 \\&= 80000 \left(1 + \frac{1}{10}\right)^1 \\&= 80000 \left(\frac{11}{10}\right)^1 \\&= ₹ 88,000\end{aligned}$$

$$\text{Interest for } \frac{1}{2} \text{ year} = \frac{88000 \times 10 \times 1}{100 \times 2} = ₹ 4,400$$

$$\text{Total amount} = ₹ 88,000 + ₹ 4,400 = ₹ 92,400$$

(ii) Here, Principal (P) = ₹ 80,000,

Time ( $n$ ) =  $1\frac{1}{2}$  year = 3 half-years (compounded half yearly)

Rate of interest (R) = 10% = 5% (compounded half yearly)

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 80000 \left(1 + \frac{5}{100}\right)^3 \\&= 80000 \left(1 + \frac{1}{20}\right)^3 \\&= 80000 \left(\frac{21}{20}\right)^3 \\&= 80000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹ 92,610\end{aligned}$$

$$\text{Difference in amounts} = ₹ 92,610 - ₹ 92,400 = ₹ 210$$



### Question 7:

Maria invested ₹ 8,000 in a business. She would be paid interest at 5% per annum compounded annually. Find:

- (i) The amount credited against her name at the end of the second year.
- (ii) The interest for the third year.

### Answer 7:

- (i) Here,

Principal (P) = ₹ 8000, Rate of Interest (R) = 5%, Time ( $n$ ) = 2 years

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 8000 \left(1 + \frac{5}{100}\right)^2 \\&= 8000 \left(1 + \frac{1}{20}\right)^2 \\&= 8000 \left(\frac{21}{20}\right)^2 \\&= 8000 \times \frac{21}{20} \times \frac{21}{20} = ₹ 8,820\end{aligned}$$

- (ii) Here,

Principal (P) = ₹ 8000, Rate of Interest (R) = 5%, Time ( $n$ ) = 3 years

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 8000 \left(1 + \frac{5}{100}\right)^3 \\&= 8000 \left(1 + \frac{1}{20}\right)^3 \\&= 8000 \left(\frac{21}{20}\right)^3 \\&= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹ 9,261\end{aligned}$$

Interest for 3<sup>rd</sup> year = A - P = ₹ 9,261 - ₹ 8,820 = ₹ 441

### Question 8:

Find the amount and the compound interest on ₹ 10,000 for  $1\frac{1}{2}$  years at 10% per annum, compounded half yearly.  
Would this interest be more than the interest he would get if it was compounded annually?

### Answer 8:

Here,

Principal (P) = ₹ 10000, Rate of Interest (R) = 10% = 5% (compounded half yearly)

Time (n) =  $1\frac{1}{2}$  years = 3 half-years (compounded half yearly)

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 10000 \left(1 + \frac{5}{100}\right)^3 \\&= 10000 \left(1 + \frac{1}{20}\right)^3 \\&= 10000 \left(\frac{21}{20}\right)^3 \\&= 10000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹ 11,576.25\end{aligned}$$

$$\text{Compound Interest (C.I.)} = A - P = ₹ 11,576.25 - ₹ 10,000 = ₹ 1,576.25$$

If it is compounded annually, then

Here, Principal (P) = ₹ 10000, Rate of Interest (R) = 10%, Time (n) =  $1\frac{1}{2}$  years

$$\begin{aligned}\text{Amount (A) for 1 year} &= P \left(1 + \frac{R}{100}\right)^n \\&= 10000 \left(1 + \frac{10}{100}\right)^1 \\&= 10000 \left(1 + \frac{1}{10}\right)^1 \\&= 10000 \left(\frac{11}{10}\right)^1\end{aligned}$$

$$= 10000 \times \frac{11}{10} = ₹ 11,000$$

$$\text{Interest for } \frac{1}{2} \text{ year} = \frac{11000 \times 1 \times 10}{2 \times 100} = ₹ 550$$

$$\therefore \quad \text{Total amount} = ₹ 11,000 + ₹ 550 = ₹ 11,550$$

$$\text{Now, } \quad \text{C.I.} = A - P = ₹ 11,550 - ₹ 10,000 = ₹ 1,550$$

Yes, interest ₹ 1,576.25 is more than ₹ 1,550.

### Question 9:

Find the amount which Ram will get on ₹ 4,096, if he gave it for 18 months at  $12\frac{1}{2}\%$  per annum, interest being compounded half yearly.

#### Answer 9:

Here, Principal (P) = ₹ 4096,

Rate of Interest (R) =  $12\frac{1}{2}\% = \frac{25}{2}\% = \frac{25}{4}\%$  (compounded half yearly)

Time (n) = 18 months =  $1\frac{1}{2}$  years = 3 half-years (compounded half yearly)

$$\begin{aligned} \text{Amount (A)} &= P \left( 1 + \frac{R}{100} \right)^n \\ &= 4096 \left( 1 + \frac{25}{4 \times 100} \right)^3 \\ &= 4096 \left( 1 + \frac{1}{4 \times 4} \right)^3 \\ &= 4096 \left( \frac{17}{16} \right)^3 \\ &= 4096 \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16} \\ &= ₹ 4,913 \end{aligned}$$

**Question 10:**

The population of a place increased to 54,000 in 2003 at a rate of 5% per annum

- (i) Find the population in 2001.
- (ii) What would be its population in 2005?

**Answer 10:**

- (i) Here,  $A_{2003} = 54,000$ ,  $R = 5\%$ ,  $n = 2$  years  
Population would be less in 2001 than 2003 in two years.  
Here population is increasing.

$$\therefore A_{2003} = P_{2001} \left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow 54000 = P_{2001} \left(1 + \frac{5}{100}\right)^2$$

$$\Rightarrow 54000 = P_{2001} \left(1 + \frac{1}{20}\right)^2$$

$$\Rightarrow 54000 = P_{2001} \left(\frac{21}{20}\right)^2$$

$$\Rightarrow 54000 = P_{2001} \times \frac{21}{20} \times \frac{21}{20}$$

$$\Rightarrow P_{2001} = \frac{54000 \times 20 \times 20}{21 \times 21}$$

$$\Rightarrow P_{2001} = 48,980 \text{ (approx.)}$$

- (ii) According to question, population is increasing.  
Therefore population in 2005,

$$\begin{aligned} A_{2005} &= P \left(1 + \frac{R}{100}\right)^n \\ &= 54000 \left(1 + \frac{5}{100}\right)^2 \\ &= 54000 \left(1 + \frac{1}{20}\right)^2 \\ &= 54000 \left(\frac{21}{20}\right)^2 \\ &= 54000 \times \frac{21}{20} \times \frac{21}{20} = 59,535 \end{aligned}$$

Hence population in 2005 would be 59,535.

**Question 11:**

In a laboratory, the count of bacteria in a certain experiment was increasing at the rate of 2.5% per hour. Find the bacteria at the end of 2 hours if the count was initially 5,06,000.

**Answer 11:**

Here, Principal (P) = 5,06,000, Rate of Interest (R) = 2.5%, Time ( $n$ ) = 2 hours

After 2 hours, number of bacteria,

$$\begin{aligned}\text{Amount (A)} &= P \left(1 + \frac{R}{100}\right)^n \\&= 506000 \left(1 + \frac{2.5}{100}\right)^2 \\&= 506000 \left(1 + \frac{25}{1000}\right)^2 \\&= 506000 \left(1 + \frac{1}{40}\right)^2 \\&= 506000 \left(\frac{41}{40}\right)^2 \\&= 506000 \times \frac{41}{40} \times \frac{41}{40} = 5,31,616.25\end{aligned}$$

Hence, number of bacteria after two hours are 531616 (approx.).

**Question 12:**

A scooter was bought at ₹ 42,000. Its value depreciated at the rate of 8% per annum. Find its value after one year.

**Answer 12:**

Here, Principal (P) = ₹ 42,000, Rate of Interest (R) = 8%, Time ( $n$ ) = 1 years

$$\begin{aligned}\text{Amount (A)} &= P \left(1 - \frac{R}{100}\right)^n \\&= 42000 \left(1 - \frac{8}{100}\right)^1\end{aligned}$$

$$\begin{aligned}A &= 42000(1 - 2/25). \\ &= 42000 \times 23/25. \\ &= \text{Rs } 38640\end{aligned}$$