

CBSE NCERT Solutions for Class 8 Mathematics Chapter 8**Back of Chapter Questions****Exercise 8.1**

1. Find the ratio of the following.

- (a) Speed of a cycle 15 km per hour to the speed of scooter 30 km per hour.
- (b) 5 m to 10 km
- (c) 50 paise to ₹ 5

Solution:

- (a) Given, Speed of a cycle is 15 km per hour
speed of scooter is 30 km per hour.

Hence, the ratio of the speed of cycle to the speed of scooter = $\frac{15}{30} = \frac{1}{2}$

$\frac{1}{2}$ is written as 1:2

- (b) Ratio of 5 m to 10 km = $\frac{5}{10000} = \frac{1}{2000}$

$\frac{1}{2000}$ is written as 1:2000 [\because 1 km = 1000 m]

- (c) Ratio of 50 paise to ₹ 5 = $\frac{50}{500} = \frac{1}{10}$

$\frac{1}{10}$ is written as 1:10 [\because 1 ₹ = 100 paise]

2. Convert the following ratios to percentages.

- (a) 3:4
- (b) 2:3

Solutions:

By unitary method:

- (a) Required % = $\frac{3}{4} \times 100 = 75\%$

- (b) Required % = $\frac{2}{3} \times 100 = \frac{200}{3}\% = 66\frac{2}{3}\%$

3. 72% of 25 students are interested in mathematics. How many are not interested in mathematics?

Solution:

Given, 72% of 25 students are good in mathematics.

Hence, the percentage of students who are not good in mathematics = $(100 - 72)\%$

$$= 28\%$$

Therefore, Number of students who are not good in mathematics = $\frac{28}{100} \times 25 = 7$

Thus, 7 students are not good in mathematics.

4. A football team won 10 matches out of the total number of matches they played. If their win percentage was 40, then how many matches did they play in all?

Solution:

Let the total number of matches played by the team be k .

It is given that the team won 10 matches and the winning percentage of the team was 40%.

Therefore, 40% of k is 10

$$\Rightarrow \frac{40}{100} \times k = 10$$

$$\Rightarrow k = 25$$

Hence, the team played 25 matches.

5. If Chameli had ₹ 600 left after spending 75% of her money, how much did she have in the beginning?

Solution:

Consider Chameli had total ₹ k in the beginning.

After spending 75%, she left with ₹ 600.

$$\Rightarrow 25\% \text{ of } k = 600$$

$$\Rightarrow \frac{25}{100} \times k = 600$$

$$\Rightarrow k = 2400$$

Thus, Chameli had ₹ 2400 in the beginning.

6. If 60% people in a city like cricket, 30% like football and the remaining like other games, then what per cent of the people like other games? If the total number of people is 50 lakh, find the exact number who like each type of game.

Solution:

$$\text{Remaining \%} = 100 - (60 + 30)$$

$$= 10\%$$

Therefore, 10% people like other games.

Since, total population is 50 lakhs,

Thus, number of people who like cricket is 60% of 50 lakh = $\frac{60}{100} \times 50$ lakhs = 30 lakhs

number of people who like football is 30% of 50 lakh = $\frac{30}{100} \times 50$ lakhs = 15 lakhs

number of people who like other games is 10% of 50 lakh = $\frac{10}{100} \times 50$ lakhs = 5 lakhs.

Exercise 8.2

1. A man got a 10% increase in his salary. If his new salary is ₹ 1,54,000. Find his original salary.

Solution:

Let the original salary be x .

Given that the increment in salary is 10%.

Thus, original salary + increment = new salary

$$\Rightarrow x + \frac{10}{100} \times x = 154000$$

$$\Rightarrow \frac{110x}{100} = 154000$$

$$\Rightarrow x = 154000 \times \frac{100}{110}$$

$$\Rightarrow x = 140000$$

Hence, the original salary is ₹ 140000.

2. On Sunday 845 people went to the Zoo. On Monday only 169 people went. What is the per cent decrease in the people visiting the Zoo on Monday?

Solution:

We know that, % decrease = $\frac{\text{Number of decrement in people}}{\text{Original number of people went on Sunday}} \times 100$

Number of decrement in people on Monday = $845 - 169 = 676$

$$\begin{aligned}\text{Hence, \% decrease} &= \frac{676}{845} \times 100 \\ &= 80\%\end{aligned}$$

3. A shopkeeper buys 80 articles for ₹ 2,400 and sells them for a profit of 16%. Find the selling price of one article.

Solution:

We know that, Selling Price = Cost Price + profit

$$\text{Total Cost Price for 1 article is } \frac{2400}{80} = 30$$

Profit = 16% of 30

$$= \frac{16}{100} \times 30$$

$$\Rightarrow \text{Profit} = ₹ 4.8$$

Hence, Selling Price for one article is ₹(30 + 4.8) = ₹ 34.80

4. The cost of an article was ₹ 15,500. ₹ 450 were spent on its repairs. If it is sold for a profit of 15%, find the selling price of the article.

Solution:

Given, the cost of an article was ₹ 15,500 and ₹ 450 were spent on its repairs.

So, Total Cost Price = original cost + repair cost

$$= 15500 + 450$$

$$= 15950$$

Given, profit of 15 %.

Thus, profit in ₹ = 15% of 15950

$$= \frac{15}{100} \times 15950$$

$$= ₹ 2392.50$$

Thus, Selling Price = Cost Price + profit

$$= 15950 + 2392.50$$

$$= ₹ 18342.50$$

Hence, the selling price of the article is ₹ 18342.50.

5. A VCR and TV were bought for ₹ 8,000 each. The shopkeeper made a loss of 4% on the VCR and a profit of 8% on the TV. Find the gain or loss percent on the whole transaction.

Solution:

Given Cost Price of a VCR = ₹ 8000

Loss on VCR = 4%

⇒ Selling price = 96% of Cost Price

$$\Rightarrow \text{Selling Price} = ₹ \left(\frac{96}{100} \times 8000 \right)$$

$$= ₹ 7680$$

Cost Price of a TV = ₹ 8000

Profit on TV = 8%

Selling Price of TV = 108% of Cost Price

$$= \frac{108}{100} \times 8000 = 8640$$

Therefore, total Cost Price = ₹ 16000

Total Selling Price = ₹ (8640 + 7680)

$$= 16320$$

Since Selling Price > Cost Price, thus it is a profit.

Profit = Selling Price – Cost Price

$$= ₹ 320$$

$$\text{Gain\%} = \frac{\text{Gain}}{\text{Cost Price}} \times 100$$

$$= \frac{320}{16000} \times 100$$

$$= 2\%$$

Hence, the shopkeeper had a profit of 2% in whole transaction.

6. During a sale, a shop offered a discount of 10% on the marked prices of all the items. What would a customer have to pay for a pair of jeans marked at ₹ 1450 and two shirts marked at ₹ 850 each?

Solutions:

Total marked price = ₹(1,450 + 2 × 850)

$$= ₹(1,450 + 1,700)$$

$$= ₹ 3,150$$

Given that, discount % = 10%

$$= ₹ \left(\frac{10}{100} \times 3150 \right) = ₹ 315$$

Also, Discount = Marked price – Sale price

$$\Rightarrow ₹ 315 = ₹ 3150 - \text{Sale price}$$

$$\therefore \text{Sale price} = ₹ (3150 - 315) = ₹ 2835$$

Hence, the customer will have to pay ₹ 2,835.

7. A milkman sold two of his buffaloes for ₹ 20,000 each. On one he made a gain of 5% and on the other a loss of 10%. Find his overall gain or loss.

Solution:

Given, Selling Price of each buffalo = ₹ 20000

Also, the milkman made a gain of 5% while selling one buffalo

\Rightarrow Selling Price = 105% of Cost Price

$$= ₹ \left(20000 \times \frac{100}{105} \right)$$

$$= ₹ 19,047.62$$

Now, second buffalo was sold at a loss of 10%.

\Rightarrow Selling Price = 90% of Cost Price

$$\therefore \text{Cost Price of other buffalo} = ₹ \left(20000 \times \frac{100}{90} \right)$$

$$= ₹ 22222.22$$

$$\text{Total Cost Price} = ₹ 19047.62 + ₹ 22222.22$$

$$= ₹ 41269.84$$

$$\text{Total Selling Price} = ₹ 20000 + ₹ 20000$$

$$= ₹ 40000$$

$$\text{Loss} = ₹ 41269.84 - ₹ 40000$$

$$= ₹ 1269.84$$

Hence, the overall loss of milkman was ₹ 1,269.84.

8. The price of a TV is ₹ 13,000. The sales tax charged on it is at the rate of 12%. Find the amount that Vinod will have to pay if he buys it.

Solution:

Given, tax charged at rate of 12%

$$\begin{aligned} \text{On ₹ 13000, the tax to be paid will be} &= ₹ \left(\frac{12}{100} \times 13000 \right) \\ &= ₹ 1560 \end{aligned}$$

$$\text{Required amount} = \text{Cost} + \text{Sales Tax} = ₹ 13000 + ₹ 1560 = ₹ 14560$$

Hence, Vinod will have to pay ₹ 14,560 for the T.V.

9. Arun bought a pair of skates at a sale where the discount given was 20%. If the amount he pays is ₹ 1,600, find the marked price.

Solution:

Let us assume that the marked price be x .

$$\text{Discount Percent} = \frac{\text{Discount}}{\text{Marked Price}} \times 100$$

$$\Rightarrow 20 = \frac{\text{Discount}}{x} \times 100$$

$$\Rightarrow \text{Discount} = \frac{20}{100} \times x = \frac{1}{5}x$$

Also, we know that,

$$\text{Discount} = \text{Marked price} - \text{Sale price}$$

$$\Rightarrow \frac{1}{5}x = x - ₹1600$$

$$\Rightarrow x - \frac{1}{5}x = ₹1600$$

$$\Rightarrow \frac{4}{5}x = ₹1600$$

$$\Rightarrow x = ₹ \left(1600 \times \frac{5}{4} \right) = ₹2000$$

Therefore, the marked price was ₹ 2000.

10. I purchased a hair-dryer for ₹ 5,400 including 8% VAT. Find the price before VAT was added.

Solution:

It is given that the price includes VAT.

Let the price before VAT was added be x .

Thus, total price = price before VAT added + VAT

$$\Rightarrow 5400 = x + 8\% \text{ of } x$$

$$\Rightarrow 5400 = \frac{108}{100}x$$

$$\Rightarrow x = \frac{100}{108} \times 5400$$

$$\Rightarrow x = ₹ 5000$$

Hence, price before VAT is added is ₹ 5000.

11. An article was purchased for ₹ 1239 including GST of 18%. Find the price of the article before GST was added?

Solution:

It is given that the price includes GST.

Let the price before GST was added be x .

Thus, total price = price before GST included + GST

$$\Rightarrow 1239 = x + 18\% \text{ of } x$$

$$\Rightarrow 1239 = \frac{118}{100}x$$

$$\Rightarrow x = \frac{100}{118} \times 1239$$

$$\Rightarrow x = ₹ 1050$$

Hence, price before GST is included is ₹ 1050.

Exercise 8.3

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 half yearly.

(d) ₹ 8,000 for 1 year at 9% per annum compounded half yearly.

(You could use the year by year calculation using SI formula to verify).

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

Solution:

(a) Given, $P = 10800$

Time = 3 yrs.

$$\text{Rate} = \frac{25}{2} \%$$

Thus, Amount is given by the formulae: - $P \left(1 + \frac{R}{100}\right)^n$

$$\begin{aligned} \Rightarrow A &= ₹ \left[10800 \left(1 + \frac{25}{200} \right)^3 \right] \\ &= ₹ \left[10800 \left(\frac{225}{200} \right)^3 \right] \\ &= ₹ \left(10800 \times \frac{225}{200} \times \frac{225}{200} \times \frac{225}{200} \right) \\ &= ₹ 15377.34375 \\ &= ₹ 15377.34 \end{aligned}$$

Hence, Compound Interest = $A - P$

$$\begin{aligned} &= ₹ (15377.34 - 10800) \\ &= ₹ 4,577.34 \end{aligned}$$

Therefore, Compound Interest is ₹ 4,577.34

(b) Given, $P = 18000$

$$\text{Rate} = 10\%$$

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

The amount obtained at the end of 2 years and 6 months can be calculated in two steps:

- (i) Calculate the amount for 2 years using the compound interest formula,
- (ii) Calculate the simple interest for 6 months on the amount obtained at the end of 2 years.

$$\text{Amount at the end of two years is given by: } A = ₹ \left[18000 \left(1 + \frac{10}{100} \right)^2 \right]$$

$$\begin{aligned} &= ₹ \left(18000 \times \frac{11}{10} \times \frac{11}{10} \right) \\ &= ₹ 21780 \end{aligned}$$

Now take $P=21780$, the Simple Interest for the next $\frac{1}{2}$ year will be calculated.

$$\text{Simple Interest} = ₹ \left(\frac{21780 \times \frac{1}{2} \times 10}{100} \right)$$

$$= ₹ 1089$$

$$\therefore \text{Interest for the first 2 years} = ₹ (21780 - 18000) = ₹ 3780$$

$$\text{And interest for the next } \frac{1}{2} \text{ year} = ₹ 1089$$

$$\therefore \text{Total Compound Interest} = ₹ 3780 + ₹ 1089 = ₹ 4,869.$$

$$A = P + \text{Compound Interest} = ₹ 18000 + ₹ 4869 = ₹ 22,869$$

(c) Given, $P = 62500$

$$\text{Rate} = 8\%$$

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

There will be 3 half years in $1\frac{1}{2}$ years.

$$\text{We know that, } A = P \left(1 + \frac{R}{100} \right)^n$$

$$\Rightarrow A = [62500 \left(1 + \frac{4}{100} \right)^3]$$

$$\Rightarrow A = ₹ \left(62500 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \right)$$

$$\Rightarrow A = ₹ 70304$$

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

$$= ₹ 70304 - ₹ 62500$$

$$= ₹ 7,804$$

(d) Given, $P = 8000$

$$\text{Rate} = 9\%$$

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

There are 2 half years in 1 year and rate would be $\frac{9}{2}\%$ for each half year.

We know that,

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

$$\Rightarrow A = [8000 \left(1 + \frac{9}{200} \right)^2]$$

$$\Rightarrow A = [8000 \left(\frac{209}{200}\right)^2]$$

$$\Rightarrow A = ₹ 8736.20$$

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

$$= ₹ 8736.20 - ₹ 8000$$

$$= ₹ 736.20$$

(e) Given, $P = 8000$

$$\text{Rate} = 8\%$$

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

$$\text{Rate} = 8\% \text{ per annum or } 4\% \text{ per half year}$$

$$\text{Number of years} = 1 \text{ year}$$

There are 2 half years in 1 year.

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

$$\Rightarrow A = [10000 \left(1 + \frac{4}{100}\right)^2]$$

$$\Rightarrow A = \left[10000 \left(1 + \frac{1}{25}\right)^2\right]$$

$$\Rightarrow A = ₹ \left(10000 \times \frac{26}{25} \times \frac{26}{25}\right)$$

$$\Rightarrow A = ₹ 10,816$$

Now,

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

$$= ₹ 10816 - ₹ 10000$$

$$= ₹ 816$$

Hence, the Compound Interest is ₹ 816

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?

Solution:

$$\text{Given, } P = 26400$$

$$\text{Rate} = 15\% \text{ p.a. compounded yearly}$$

Time = 2 years and 4 months

The amount obtained for 2 years and 4 months can be calculated in two steps

- (i) calculate the amount for 2 years using the compound interest formula,
- (ii) calculate the simple interest for 4 months on the amount obtained at the end of 2 years.

The amount obtained at the end of two years is given by: -

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

$$\Rightarrow A = ₹ \left[26400 \left(1 + \frac{15}{100}\right)^2\right]$$

$$\Rightarrow A = ₹ \left[26400 \left(1 + \frac{3}{20}\right)^2\right]$$

$$\Rightarrow A = ₹ \left(26400 \times \frac{23}{20} \times \frac{23}{20}\right)$$

$$\Rightarrow A = ₹ 34,914$$

Now take $P=34914$, the Simple Interest for the next $\frac{1}{3}$ years will be calculated.

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

$$= ₹ \left(\frac{34914 \times \frac{1}{3} \times 15}{100}\right)$$

$$= ₹ 1,745.70$$

Interest at the end of first two years = ₹ $(34914 - 26400) = ₹ 8,514$

And interest for the next $\frac{1}{3}$ years = ₹ 1,745.70

Total Compound Interest = ₹ $(8514 + ₹ 1745.70) = ₹ 10,259.70$

Amount = $P + \text{Compound Interest}$

= ₹ $26400 + ₹ 10259.70$

= ₹ 36,659.70

3. Fabina borrows ₹ 12,500 at 12% 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?

Solution:

Simple interest is given by: -

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

Interest paid by Fabina is given by: -

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

$$= ₹ \left(\frac{12500 \times 12 \times 3}{100} \right)$$

$$= ₹ 4,500$$

Amount paid by Radha at the end of 3 years is given by: -

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

$$\Rightarrow A = [12500 \left(1 + \frac{10}{100} \right)^3]$$

$$\Rightarrow A = ₹ 80000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100}$$

$$\Rightarrow A = ₹ 16,637.50$$

$$\text{Compound Interest} = A - P = ₹ 16637.50 - ₹ 12500 = ₹ 4,137.50$$

The total interest paid by Radha is ₹ 4,137.50 and by Fabina is ₹ 4,500.

Thus, Fabina pays more interest. ₹ 4500 - ₹ 4137.50 = ₹ 362.50

Hence, Fabina will have to pay ₹ 362.50 more.

4. I borrowed ₹ 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?

Solution:

Principal = ₹ 12000

Rate = 6% per annum

Time = 2 years

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

$$= ₹ \left(\frac{1200 \times 6 \times 2}{100} \right)$$

$$= ₹1,440$$

To find the compound interest, the amount (A) to be calculated is given by:

$$\begin{aligned} A &= P \left(1 + \frac{R}{100}\right)^n \\ &= \left[12000 \left(1 + \frac{6}{100}\right)^2\right] \\ &= ₹13,483.20 \end{aligned}$$

$$\begin{aligned} \therefore \text{Compound Interest} &= A - P \\ &= ₹13483.20 - ₹12000 \\ &= ₹1,483.20 \end{aligned}$$

$$\text{Compound Interest} - \text{Simple Interest} = ₹1,483.20 - ₹1,440 = ₹43.20$$

Thus, the extra amount to be paid is ₹43.20.

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?

Solution:

- (i) Principal = ₹60,000
Rate = 12% per annum = 6% per half year
Number of years (n) = 6 months = 1 half year

We know that,

$$\begin{aligned} A &= P \left(1 + \frac{R}{100}\right)^n \\ &= 60000 \left(1 + \frac{6}{100}\right)^1 \\ &= ₹63,600 \end{aligned}$$

- (ii) Now, there are 2 half years in 1 year.

So, $n = 2$

$$\begin{aligned} A &= P \left(1 + \frac{R}{100}\right)^n \\ &= \left[60000 \left(1 + \frac{6}{100}\right)^2\right] \end{aligned}$$

$$= ₹67,416$$

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.

Solution:

- (i) Principal(P) = ₹ 80,000

Rate = 10% per annum

Number of years (n) = $1\frac{1}{2}$ years

The amount obtained for 1 year and 6 months can be calculated by first calculating the amount at the end of 1 year using the Compound Interest formula, and then calculating the Simple Interest for 6 months on the amount obtained at the end of 1 year.

The amount for 1 is given by: -

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

$$\Rightarrow A = [80000 \left(1 + \frac{10}{100}\right)^1]$$

$$\Rightarrow A = ₹ 80000 \times \frac{11}{10}$$

$$\Rightarrow A = ₹ 88,000$$

By taking ₹ 88,000 as principal, the Simple Interest for the next $\frac{1}{2}$ year will be obtained as

$$\text{Simple Interest} = \frac{P \times R \times T}{100} = ₹ \left(\frac{88000 \times 10 \times \frac{1}{2}}{100}\right) = ₹ 4,400$$

$$\begin{aligned} \text{Interest obtained for the first year} &= ₹ 88000 - ₹ 80000 \\ &= ₹ 8,000 \end{aligned}$$

$$\text{Also, interest for the next } \frac{1}{2} \text{ year} = ₹ 4,400$$

$$\text{Total Compound Interest} = ₹ 8000 + ₹ 4,400 = ₹ 12,400$$

$$\text{Amount} = \text{Principal} + \text{Compound Interest}$$

$$= ₹ (80000 + 12400)$$

$$= ₹ 92,400$$

- (ii) The interest is compounded half yearly.

$$\text{Rate} = 10\% \text{ per annum} = 5\% \text{ per half year}$$

There will be three half years in $1\frac{1}{2}$ year

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

$$\Rightarrow A = [80000 \left(1 + \frac{5}{100}\right)^3]$$

$$\Rightarrow A = ₹ \left(80000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}\right)$$

$$\Rightarrow A = ₹ 92,610$$

The difference between the amounts = ₹ 92,610 – ₹ 92,400 = ₹ 210

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 3rd year.

Solution:

- (i) Given, Principal (P) = ₹ 8,000

$$\text{Rate} = 5\% \text{ per annum}$$

$$\text{Number of years } (n) = 2 \text{ years}$$

We know that,

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

$$\Rightarrow A = ₹ \left[8000 \left(1 + \frac{5}{100}\right)^2\right]$$

$$\Rightarrow A = ₹ \left[8000 \left(1 + \frac{1}{20}\right)^2\right]$$

$$\Rightarrow A = ₹ \left(8000 \times \frac{21}{20} \times \frac{21}{20}\right)$$

$$\Rightarrow A = ₹ 8,820$$

- (ii) The interest for the next one year, i.e. the third year, has to be calculated. By taking ₹ 8,820 as principal, the Simple Interest for the next year will be calculated.

$$\begin{aligned}\text{Simple Interest} &= \frac{P \times R \times T}{100} \\ &= ₹ \left(\frac{8820 \times 5 \times 1}{100} \right) \\ &= ₹ 441\end{aligned}$$

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?

Solution:

$$\text{Principal (P)} = ₹ 10,000$$

$$\text{Rate} = 10\% \text{ per annum}$$

$$= 5\% \text{ per half year}$$

$$\text{Number of years (n)} = 1\frac{1}{2} \text{ years}$$

There will be 3 half years in $1\frac{1}{2}$ years.

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

$$\Rightarrow A = ₹ \left[10000 \left(1 + \frac{5}{100} \right)^3 \right]$$

$$\Rightarrow A = ₹ \left[10000 \left(1 + \frac{1}{20} \right)^3 \right]$$

$$\Rightarrow A = ₹ \left(10000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \right)$$

$$\Rightarrow A = ₹ 11576.25$$

$$\text{Now, Compound Interest} = A - P$$

$$= ₹ 11576.25 - ₹ 10000$$

$$= ₹ 1,576.25$$

The amount obtained at the end of 1 year and 6 months is calculated by first calculating the amount for 1 year using the compound interest formula, and then calculating the

simple interest for duration of 6 months on the amount obtained at the end of 1 year.

The amount obtained at the end of the first year is calculated as given below:

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

$$\Rightarrow A = ₹ \left[10000 \left(1 + \frac{10}{100}\right)^1\right]$$

$$\Rightarrow A = ₹ \left[10000 \left(1 + \frac{1}{10}\right)^1\right]$$

$$\Rightarrow A = ₹ \left(10000 \times \frac{11}{10}\right)$$

$$\Rightarrow A = ₹ 11000$$

By taking ₹ 11,000 as the principal, the Simple Interest for the next $\frac{1}{2}$ year will be calculated

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

$$= ₹ \left(\frac{11000 \times 10 \times \frac{1}{2}}{100}\right)$$

$$= ₹ 550$$

$$\therefore \text{Interest for the first year} = ₹ 11000 - ₹ 10000 = ₹ 1,000$$

$$\therefore \text{Total compound interest} = ₹ 1000 + ₹ 550 = ₹ 1,550$$

Hence, the interest would be more when compounded half yearly than the interest when compounded annually.

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

Solution:

Given,

$$\text{Principal } (P) = ₹ 4,096$$

$$\text{Rate} = 12\frac{1}{2}\% \text{ per annum} = \frac{25}{4}\% \text{ per half year}$$

$$\text{Number of years } (n) = 18 \text{ months}$$

There will be 3 half years in 18 months.

Therefore,

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

$$\Rightarrow A = ₹ \left[4096 \left(1 + \frac{25}{400} \right)^3 \right]$$

$$\Rightarrow A = ₹ \left[4096 \left(1 + \frac{1}{16} \right)^3 \right]$$

$$\Rightarrow A = ₹ \left(4096 \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16} \right)$$

$$\Rightarrow A = ₹4913$$

Hence, the required amount is ₹ 4,913.

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?

Solution:

- (i) It is given that, population in the year 2003 = 54,000

Therefore,

$$54000 = (\text{population in 2001}) \times \left(1 + \frac{5}{100} \right)^2$$

Population in 2001 is given by: -

$$\text{Population in 2001} = \frac{54000}{\left(1 + \frac{5}{100} \right)^2}$$

$$\Rightarrow \text{Population in 2001} = \left(54000 \times \frac{20}{21} \times \frac{20}{21} \right)$$

$$\Rightarrow \text{Population in 2001} = 48980$$

Hence, the population in 2001 is 48980.

- (ii) Population in 2005 is given by: -

$$\text{Population in 2005} = 54000 \left(1 + \frac{5}{100} \right)^2$$

$$\Rightarrow \text{Population in 2005} = 54000 \left(1 + \frac{1}{20}\right)^2$$

$$\Rightarrow \text{Population in 2005} = \left(54000 \times \frac{21}{20} \times \frac{21}{20}\right)$$

$$\Rightarrow \text{Population in 2005} = 59535$$

Hence, the population in the year 2005 would be 59,535.

- 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.

Solution:

Given, the initial count of bacteria is given as 5,06,000.

Count of bacteria at the end of 2 hours is given by: -

$$\text{Count of bacteria} = 506000 \left(1 + \frac{2.5}{100}\right)^2$$

$$\Rightarrow \text{Count of bacteria} = 506000 \left(1 + \frac{1}{40}\right)^2$$

$$\Rightarrow \text{Count of bacteria} = \left(506000 \times \frac{41}{40} \times \frac{41}{40}\right)$$

$$\Rightarrow \text{Count of bacteria} = 531616 \text{ (approximately)}$$

Therefore, the count of bacteria at the end of 2 hours will be 5,31,616 (approximately).

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

Solution:

Given,

Principal = Cost Price of the scooter = ₹ 42,000

Depreciation = 8% of ₹ 42,000 per year

$$= ₹ \left(\frac{42000 \times 8 \times 1}{100}\right) = ₹ 3,360$$

Hence, Value after 1 year = ₹ 42000 – ₹ 3360 = ₹ 38,640.

