8 Comparing Quantities

Learn and Remember

1. Discount is a reduction which is given on marked price.

   Discount = Marked price − Selling price.

2. Discount can also be calculated when discount percentage is given.

   Discount = Discount % × marked price.

3. Overhead expenses is an additional expenses, made after buying an article included in the cost price which is known as overhead expenses.

   CP = cost price of the article + overhead expenses

4. The amount of money which is charged on the sale of an item by the shop keeper and given to the government and is added to the bill amount, is known as Sales Tax. It is also known as value added tax (VAT).

   Sales Tax = Tax% of bill amount.

   $$\text{Sales Tax} = \frac{\text{C.P.} \times \text{Rate of Sales Tax}}{100}.$$

5. Interest is the extra money paid by the institutions like banks or post offices on money deposited with them. Interest is also paid by people when they borrow money.

6. Compound interest is the interest calculated on the previous year's amount (A = P + I), (I) is interest, A is amount when interest is compounded annually $A = P\left(1+\dfrac{R}{100}\right)^n$; P is principal, R is rate of interest, n is time period.

   (II) Amount when interest is compounded half yearly =

   $$P\left(1+\frac{R}{200}\right)^{2n}$$

   $\left\{\dfrac{R}{2}\right.$ is half yearly rate and $2n$ = number of 'half years'.

   (III) When R_1, R_2 and R_3 are different rates for first, second

and third year then amount

$$A = \left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right).$$

7. **Sale Tax (ST) and Value Added Tax (VAT)**

   ST means Sale Tax which is charged by the government on the sale of an item by the customer. Now a days, this Sale Tax is included with cost price of an item is known as Value Added Tax (VAT).

   Hence, (i) Bill amount = Cost Price + Sale Tax

   (ii) Sale Tax = $\dfrac{\text{C.P.} \times \text{Rate of ST}}{100}$

TEXTBOOK QUESTIONS SOLVED

EXERCISE 8.1 (Page −119-120)

Q1. 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

Sol. (a) Speed of cycle = 15 km/hr
   Speed of scooter = 30 km/hr
   Hence, ratio of speed of cycle to speed of scooter = 15 : 30
   $$= \frac{15}{30} = \frac{1}{2} = 1 : 2.$$

   (b) 5 m to 10 km
   ∵ 1 km = 1000 m
   ∴ 10 km = 10 × 1000 m = 10000 m
   Hence, ratio = 5 m : 10000 m
   $$= \frac{5}{10000} = \frac{1}{2000}$$
   $$= 1 : 2000.$$

   (c) 50 paise to ₹ 5
   ∵ ₹ 1 = 100 paise
   ∴ ₹ 5 = 5 × 100 = 500 paise
   Hence, ratio = 50 : 500
   $$= \frac{50}{500} = \frac{1}{10}$$
   $$= 1 : 10.$$

Q2. Convert the following ratios to percentages.

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

Sol. (a) 3 : 4

    Percentage of 3 : 4 = $\dfrac{3}{4} \times 100\% = 75\%$.

    (b) 2 : 3

    Percentage of 2 : 3 = $\dfrac{2}{3} \times 100\% = 66\dfrac{2}{3}\%$.

Q3. 72% of 25 students are good in mathematics. How many are not good in mathematics?

Sol. Total number of students = 25

72% of 25 students are good in mathematics.

Number of good students in mathematics = 72% of 25

$$= \dfrac{72}{100} \times 25 = 18$$

Number of students not good at mathematics = 25 – 18 = 7

Hence, percentage of students not good in mathematics

$$= \dfrac{7}{25} \times 100\% = 28\%.$$

Q4. 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?

Sol. Let total number of matches be x.

According to the given condition,

40% of the total matches = 10

Therefore,   40% of x = 10

or, $\dfrac{40}{100} \times x = 10$

$\Rightarrow$ $x = \dfrac{10 \times 100}{40} = 25.$

Hence, total number of matches are 25.

Q5. If Chameli had ₹ 600 left after spending 75% of her money, how much did she have in the beginning?

Sol. Let her money in the beginning be ₹ x.

According to the given condition,

$\therefore$ $x - 75\%$ of $x = 600$

$\Rightarrow$ $x - \dfrac{75}{100} \times x = 600$ $\Rightarrow x\left(1 - \dfrac{3}{4}\right) = 600$

$\Rightarrow$ $x\left(\dfrac{4-3}{4}\right) = 600$ $\Rightarrow x\left(\dfrac{1}{4}\right) = 600$

$\Rightarrow$ $x = 600 \times 4$ $\Rightarrow$ $x = 2400$

Hence, the money in the beginning was ₹ 2400.

Alternative method :

Percentage of money left = (100 – 75)% = 25%

$\therefore$ 25% of $x = 600$

$\Rightarrow$ $\dfrac{25}{100} \times x = 600$ $\Rightarrow$ $x = \dfrac{600 \times 100}{25}$

$\Rightarrow$ $x = 2400.$

Hence, the money in the beginning was ₹ 2400.

Q6. 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 are 50 lakh, find the exact number who like each type of game.

Sol. Number of people who like cricket = 60%

Number of people who like football = 30%

Number of people who like other games = 100% – (60% + 30%)

        = 100% – 90%

        = 10%

Number of people who like cricket = 60% of 50,00,000

        $= \dfrac{60}{100} \times 50,00,000$

        = 30,00,000

        = 30 lakh

Number of people who like football = 30% of 50,00,000

        $= \dfrac{30}{100} \times 50,00,000$

        = 15,00,000

        = 15 lakh

Number of people who like other games = 10% of 50,00,000

$$= \frac{10}{100} \times 50{,}00{,}000$$

$$= 5{,}00{,}000$$

$$= 5 \text{ lakh.}$$

EXERCISE 8.2 (Page –125)

Q1. A man got a 10% increase in his salary. If his new salary is ₹ 1,54,000, find his original salary.

Sol. 10% increase means that his new salary is (100 + 10) = 110, when original salary is ₹ 100.

Since, new salary is ₹ 110, then original salary = ₹ 100

When new salary is ₹ 1, then original salary = ₹ $\frac{100}{110}$

When new salary is 1,54,000, then original salary

$$= ₹ \frac{100 \times 1{,}54{,}000}{110}$$

$$= ₹ 1{,}40{,}000$$

Hence, original salary is ₹ 1,40,000. **Ans.**

Q2. 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?

Sol. On Sunday, people went to the Zoo = 845

On Monday, people went to the Zoo = 169

Number of the decrease in the people = 845 – 169 = 676

Decreased per cent = $\frac{676 \times 100}{845} = \frac{6700}{845} = ₹ 80\%$

Percent decrease in the people visiting the Zoo = 80%.

Q3. A shopkeeper buys 80 articles for ₹ 2,400 and sells them for a profit of 16%. Find the selling price of one article.

Sol. No. of articles = 80

C.P. of articles = ₹ 2400

Profit = 16%

Since, cost price of articles ₹ 100, then selling price

$$= ₹ 116$$

When C.P. is ₹ 1, then S.P. $= ₹ \frac{116}{100}$

When C.P. is ₹ 2400, then S.P. $= ₹ \frac{116 \times 2400}{100}$

$$= ₹ 2784$$

Hence, S.P. of 80 articles $= ₹ 2784$

S.P. of 1 article $= ₹ \frac{2784}{80} = ₹ 34.80$

S.P. of each article is ₹ 34.80.

Q4. 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.

Sol. Given, C.P. = ₹ 15,500, repair cost = ₹ 450

Total C.P. = ₹ 15500 + ₹ 450 = ₹ 15950

Let C.P. be ₹ 100, then S.P. = ₹ 100 + ₹ 15 = ₹ 115

Now, when C.P. is 100, then S.P. = 115

When C.P. is ₹ 1, then   S.P. $= \frac{115}{100}$

When S.P. is ₹ 15950, then   S.P. $= ₹ \frac{115 \times 15950}{100}$

$$= \frac{1834250}{100}$$

$$= ₹ 18342.50.$$

Q5. 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 per cent on the whole transaction.

Sol. Given cost price of VCR = ₹ 8000

Cost price of TV = ₹ 8000

Total cost of both articles = ₹ 8000 + ₹ 8000 = ₹ 16,000

VCR is sold at 4% loss.

Let C.P. of each article be ₹ 100

S.P. of VCR = 100 – 4 = ₹ 96

Now, when C.P. is ₹ 100, then S.P. = ₹ 96

When C.P. is ₹ 1, then S.P. = ₹ $\frac{96}{100}$

When C.P. is ₹ 8000, then S.P. = ₹ $\frac{96 \times 8000}{100}$ = ₹ 7680

T.V. is sold at 8% profit.

When C.P. of TV be ₹ 100, then S.P. = ₹ 100 + ₹ 8 = ₹ 108

When C.P. is ₹ 100, then S.P. = ₹ 108

When C.P. is ₹ 1, then S.P. = ₹ $\frac{108}{100}$

When C.P. is ₹ 8,000, then S.P. = ₹ $\frac{108 \times 8,000}{100}$ = ₹ 8,640

Total S.P. = ₹ 7,680 + ₹ 8,640 = ₹ 16,320

Since   S.P. > C.P.

Hence,   profit = S.P. – C.P.

                = ₹ 16320 – ₹ 16000

                = ₹ 320

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

          = $\frac{32000}{16000}$ = 2%.

Q6. 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?

Sol. Given rate of discount on all items = 10%

M.P. of a pair of jeans = ₹ 1450

M.P. of a shirt = ₹ 850

Discount on a pair of jeans = $\frac{\text{Rate} \times \text{M.P.}}{100} = \frac{1450 \times 10}{100}$

                = ₹ 145

S.P. of a pair of jeans = ₹ 1450 – ₹ 145 = ₹ 1305

M.P. of two shirts = 2 × ₹ 850 = ₹ 1700

Discount on two shirts = $\frac{\text{Rate} \times \text{M.P.}}{100} = \frac{10 \times 1700}{100}$ = ₹ 170

S.P. of two shirts = ₹ 1700 – ₹ 170 = ₹ 1530

The customer had to pay = ₹ 1305 + ₹ 1530 = ₹ 2,835.

                                     Ans.

Q7. 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. (Hint: Find CP of each)

Sol. Given, S.P. of each buffalo = ₹ 20,000

S.P. of two buffaloes = ₹ 20,000 × 2 = ₹ 40,000

One buffalo is sold at 5% gain.

Let C.P. be ₹ 100, then S.P. = ₹ 100 + ₹ 5 = ₹ 105

When S.P. is ₹ 105, then C.P. = ₹ 100

When S.P. is ₹ 20,000, then   C.P. = $\frac{₹ 100 \times 20,000}{105}$

                      = ₹ $\frac{2,000,000}{105}$

                      = ₹ 19,047.619

                      = ₹ 19,047.62

Another buffalo is sold at loss of 10%.

Let C.P. be ₹ 100, then S.P. = ₹ 100 – ₹ 10 = ₹ 90

When S.P. is ₹ 90, then C.P. = ₹ 100

When S.P. is ₹ 20,000 then   C.P. = ₹ $\frac{100 \times 20,000}{90}$

                      = $\frac{20,00,000}{90}$

                      = ₹ 22,222.22

Total   C.P. = ₹ 19,047.62 + ₹ 22,222.22

               = ₹ 41,269.84

Since,   C.P. > S.P.

          Loss = C.P. – S.P.

              = ₹ 41,269.84 – ₹ 40,000

              = ₹ 1,269.84.

Q8. 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.

Sol. Given, C.P. = ₹ 13,000, S.T. rate = 12%

Here, Sale Tax rate 12% means purchaser has to pay ₹ 12 on each ₹ 100.

So, S.P. for purchaser = ₹ 100 + ₹ 12 = ₹ 112

When, C.P. is ₹ 100, then   S.P. = ₹ 112

When C.P. is ₹ 13,000 then   S.P. = ₹ $\dfrac{13,000 \times 112}{100}$

                                       = ₹ $\dfrac{14,56,000}{100}$

                                       = ₹ 14,560

Alternate Method

Sale Tax = $\dfrac{\text{C.P.} \times \text{Rate}}{100}$

         = $\dfrac{13000 \times 12}{100} = \dfrac{156000}{100}$ = ₹ 1560

Hence,   S.P. = C.P. + Sale Tax

                   = ₹ 13,000 + ₹ 1,560

                   = ₹ 14,560. **Ans.**

Q9. 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.

Sol. Given, S.P. = ₹ 1,600, Rate of discount = 20%

Let M.P. be ₹ 100.

20% discount means,

On M.P. ₹ 100, customer is given ₹ 20 off.

So, S.P. = ₹ 100 – ₹ 20 = ₹ 80

When S.P. is ₹ 80 then M.P. = ₹ 100

When S.P. is ₹ 1600, then M.P. = ₹ $\dfrac{100 \times 1600}{80}$

                              = ₹ $\dfrac{160000}{80}$

                              = ₹ 2,000

Hence, M.P. is ₹ 2,000. **Ans.**

Q10. I purchased a hair-dryer for ₹ 5,400 including 8% VAT. Find the price before VAT was added.

Sol. Given, C.P. = ₹ 5400

Rate of VAT = 8%

Let C.P. without VAT is ₹ 100 then price including VAT is
(₹ 100 + ₹ 8) = ₹ 108.

When price including VAT is ₹ 108, then original price = ₹ 100

Hence, price including VAT is ₹ 5400, then the original price

= ₹ $\dfrac{100 \times 5400}{108}$ = ₹ $\dfrac{540000}{108}$

= ₹ 5,000.

EXERCISE 8.3 (Page –133-134)

Q1. Calculate the amount and compound interest on

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

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

(c) ₹ 62,500 for $1\dfrac{1}{2}$ 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 S.I. formula to verify).

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

Sol. (a) Given,   P = ₹ 10800, n = 3 years

                       R = $12\dfrac{1}{2}$ % = $\dfrac{25}{2}$ %

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

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

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

           = 10800 $\left(1 + \dfrac{1}{8}\right)^3$ = 10800 × $\left(\dfrac{9}{8}\right)^3$

           = 10800 × $\dfrac{9}{8}$ × $\dfrac{9}{8}$ × $\dfrac{9}{8}$ = 10800 × $\dfrac{729}{512}$

$$= \frac{7873200}{512} = ₹\ 15,377.34$$

$$CI = A - P = ₹\ 15377.34 - ₹\ 10800 = ₹\ 4,577.34.$$

(b) P = ₹ 18000, $n = 2\frac{1}{2}$ years, R = 10% p.a.

First, we have to find amount for 2 years.

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

$$= 18,000\left(1 + \frac{10}{100}\right)^2 = 18,000\left(1 + \frac{1}{10}\right)^2$$

$$= 18,000 \times \frac{11}{10} \times \frac{11}{10}$$

$$= \frac{21,78,000}{100} = ₹\ 21,780$$

Interest for $\frac{1}{2}$ year on ₹ 21780 at rate of 10%

$$= \frac{21,780 \times 10 \times 1}{100 \times 2} = ₹\ 1,089$$

Total amount for $2\frac{1}{2}$ years at rate of 10%

$$= ₹\ 21,780 + ₹\ 1,089$$

$$= ₹\ 22,869$$

C.I. = A – P = ₹ 22,869 – ₹ 18,000 = ₹ 4,869.

(c) Given, P = ₹ 62,500, $n = 1\frac{1}{2}$ years $= \frac{3}{2}$ years, R = 8%

Since, interest is compounded half yearly

So, $n = \frac{3}{2} \times 2 = 3$ half years

$$R = \frac{8}{2} = 4\% \text{ half yearly}$$

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

$$= 62,500\left(1 + \frac{4}{100}\right)^3$$

$$= 62,500\left(1 + \frac{1}{25}\right)^3 = 62,500 \times \left(\frac{26}{25}\right)^3$$

$$= 62,500 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$A = ₹\ 70,304.$$

$$C.I. = A - P$$

$$= ₹\ 70,304 - ₹\ 62,500 = ₹\ 7,804$$

(d) Given, P = ₹ 8,000, R = 9%, $n = 1$ year

Since, interest is compounded half yearly.

So, $n = 2 \times 1 = 2$ half years

$$R = \frac{9}{2} = \frac{9}{2}\% \text{ half yearly}$$

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

$$= 8,000\left(1 + \frac{9}{2 \times 100}\right)^2 = 8,000\left(1 + \frac{9}{200}\right)^2$$

$$= 8,000 \times \left(\frac{209}{200}\right)^2 = 8,000 \times \frac{209}{200} \times \frac{209}{200}$$

$$= ₹\ 8,736.20$$

$$C.P. = A - P$$

$$= ₹\ 8,736.20 - ₹\ 8,000.00$$

$$= ₹\ 736.20.$$

(e) Given, P = ₹ 10,000, T = 1 year, R = 8% per annum $= \frac{8}{2}$

$$= 4\%$$

Since, interest is compounded half yearly.

$$n = 1 \times 2 = 2 \text{ half yearly}$$

$$R = \frac{8}{2} = 4\% \text{ half yearly}$$

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

$$= 10,000\left(1 + \frac{4}{100}\right)^2 = 10,000\left(1 + \frac{1}{25}\right)^2$$

$$= 10,000 \times \left(\frac{26}{25}\right)^2 = 10,000 \times \frac{26}{25} \times \frac{26}{25}$$

$$= \frac{67,60,000}{625} = 10,816$$

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

$$= ₹\ 816.$$

Q2. 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 2nd year amount for $\frac{4}{12}$ years).

Sol. Given, P = ₹ 26,400, R = 15%, n = 2 years 4 months

First, we have to calculate amount for two years.

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

$$= 26,400\left(1 + \frac{15}{100}\right)^2 = 26,400\left(1 + \frac{3}{20}\right)^2$$

$$= 26,400\left(\frac{23}{20}\right)^2 = 26,400 \times \frac{23}{20} \times \frac{23}{20}$$

$$= ₹\ 34,914$$

Interest for 4 months = $\frac{4}{12}$ years = $\frac{1}{3}$ years at rate of 15%

$$= \frac{34,914 \times 15 \times 1}{100 \times 3} = ₹\ 1745.70$$

Total amount = ₹ 34,914 + ₹ 1745.70 = ₹ 36,659.70.

Q3. 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?

Sol. Amount for Fabina,

Given, P = 12,500, R = 12%, T = 3 years

Simple interest for Fabina $= \dfrac{\text{P} \times \text{R} \times \text{T}}{100}$

$$= \frac{12,500 \times 12 \times 3}{100} = \frac{4,50,000}{100}$$

$$= ₹\ 4,500$$

Amount for Radha,

Given P = 12,500, R = 10%, n = 3 years

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

$$= 12,500\left(1 + \frac{10}{100}\right)^3 = 12,500\left(1 + \frac{1}{10}\right)^3$$

$$= 12500 \times \left(\frac{11}{10}\right)^3 = 12,500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$= ₹\ 16,637.5$$

C.I. for Radha = A – P

$$= ₹\ 16,637.5 - ₹\ 12,500 = ₹\ 4,137.5$$

Fabina pays more interest

$$= ₹\ 4,500 - ₹\ 4,137.5$$

$$= ₹\ 362.5 = ₹\ 362.50.\ \textbf{Ans.}$$

Q4. 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?

Sol. Given, P = ₹ 12000, R = 6% p.a., T = 2 years

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

$$= \frac{12,000 \times 6 \times 2}{100} = ₹\ 1,440$$

Had he borrowed this sum at 6% p.a. then by using below formula, for C.I.,

$$= ₹\ 816.$$

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

$$= 12,000\left(1 + \frac{6}{100}\right)^2 = 12,000 \times \left(\frac{106}{100}\right)^2$$

$$= 12,000 \times \frac{106}{100} \times \frac{106}{100}$$

$$= ₹\ 13,483.2$$

$$\text{C.I.} = \text{A} - \text{P}$$

$$= ₹\ 13,483.2 - ₹\ 12,000 = ₹\ 1,483.2$$

Difference in both interest = ₹ 1,483.2 – ₹ 1,440 = ₹ 43.20.

He would have to pay ₹ 43.20 extra amount.

Q5. 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?**

Sol. (*i*) Given, P = ₹ 60,000, R = 12% p.a.

When interest is compounded half yearly.

$$\text{R} = \frac{12}{2} = 6\% \text{ half yearly}$$

$$n = 6 \text{ months} = \frac{6}{12} \times 2 = 1 \text{ half year}$$

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

$$= 60,000\left(1 + \frac{6}{100}\right)^1$$

$$= 60,000 \times \frac{106}{100} = ₹\ 63,600$$

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

(*ii*) Given, P = ₹ 60,000, R = 12%, T = 1 year

When interest is compounded half yearly.

$$\text{R} = \frac{12}{2} = 6\% \text{ per half yearly}, n = 2\text{T} = 2 \times 1 = 2 \text{ half years}$$

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

$$= 60,000\left(1 + \frac{6}{100}\right)^2 = 60,000 \times \left(\frac{106}{100}\right)^2$$

$$= 60,000 \times \frac{106}{100} \times \frac{106}{100} = 60,000 \times \frac{106}{100} \times \frac{106}{100}$$

$$= \frac{67,41,60,000}{10,000} = ₹\ 67,416$$

After 1 year Vasudevan would get ₹ 67,416.

Q6. 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.**

Sol. (*i*) Given, P = ₹ 80,000, R = 10% p.a., $n = 1\frac{1}{2}$ years

First we will calculate the amount for 1 year.

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

$$= 80,000\left(1 + \frac{10}{100}\right)^1$$

$$= 80,000 \times \left(1 + \frac{1}{10}\right)^1$$

$$= 80,000 \times \frac{11}{10} = ₹\ 88,000$$

Interest for $\frac{1}{2}$ year at rate of 10% on

$$₹\ 88,000 = ₹\ \frac{88,000 \times 10 \times 1}{100 \times 2} = 4400$$

Total amount = ₹ 88,000 + ₹ 4,400 = ₹ 92,400.

(*ii*) When compound interest compounded semi-annually then,

$$\text{R} = \frac{10}{2} = 5\%, n = 2\text{T} = 2 \times \frac{3}{2} = 3 \text{ half years}$$

$$\text{A} = \text{P}\left(1 + \frac{\text{R}}{100}\right)^n = 80,000\left(1 + \frac{5}{100}\right)^3$$

$$= 80,000 \left(1+\frac{1}{20}\right)^3 = 80,000 \left(\frac{21}{20}\right)^3$$

$$= 80,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹\,92,610$$

Difference in amounts = ₹ 92,610 – ₹ 92,400 = ₹ 210.

Q7. 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.

Sol. (i) Given, P = ₹ 8000, R = 5%, T = 2 years

Amount after two years

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

$$= 8,000\left(1+\frac{5}{100}\right)^2 = 8,000 \times \left(1+\frac{1}{20}\right)^2$$

$$= 8,000 \times \left(\frac{21}{20}\right)^2 = 8,000 \times \frac{21}{20} \times \frac{21}{20}$$

$$= ₹\,8,820$$

(ii) Amount after three years

$$P\left(1+\frac{R}{100}\right)^n = 8,000\left(1+\frac{5}{100}\right)^3$$

$$= 8,000\left(1+\frac{1}{20}\right)^3 = 8,000 \times \left(\frac{21}{20}\right)^3$$

$$= 8,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= ₹\,9,261$$

Interest for 3rd year = ₹ 9,261 – ₹ 8,820 = ₹ 441.

Q8. 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?

Sol. Given, P = ₹ 10,000, R = 10% = $\frac{10}{2}$ = 5% half yearly

$$n = T = 1\frac{1}{2} = \frac{3}{2} \times 2 = 3 \text{ half years}$$

$$A = P\left(1+\frac{R}{100}\right)^n = 10,000\left(1+\frac{5}{100}\right)^3$$

$$= 10,000\left(1+\frac{1}{20}\right)^3 = 10,000 \times \left(\frac{21}{20}\right)^3$$

$$= 10,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= \frac{9,26,10,000}{80000} = ₹\,11,576.25$$

C.I. = A – P = 11,576.25 – 10,000 = ₹ 1,576.25

If it is compounded annually, then

First we will calculate the amount for one year

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

$$= 10000\left(1+\frac{10}{100}\right)^1 = 10000 \times \frac{110}{100} = ₹\,11000$$

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

Total amount = ₹ 11000 + ₹ 550 = ₹ 11550

C.I. = 11,550 – 10,000 = 1,550

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

Q9. Find the amount which Ram will get on ₹ 4096, if he gave it for 18 months at $12\frac{1}{2}$ % per annum, interest being compounded half yearly.

Sol. Given, P = ₹ 4096, $n = T = 18$ months $= \frac{18}{6} = 3$ half years.

(Since 6 months = 1 half year)

$$R = 12\frac{1}{2}\% = \frac{25}{2}\% \text{ annually and } \frac{25}{2 \times 2} = \frac{25}{4} \text{ half yearly.}$$

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

$$= 4{,}096\left(1+\frac{25}{4\times100}\right)^3 = 4{,}096\left(1+\frac{1}{4\times4}\right)^3$$

$$= 4{,}096\left(1+\frac{1}{16}\right)^3 = 4{,}096\left(\frac{17}{16}\right)^3$$

$$= 4{,}096\times\frac{17}{16}\times\frac{17}{16}\times\frac{17}{16} = ₹\,4{,}913.$$

Q10. 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?

Sol. (*i*) Given, $A_{2003}=54000$, $R=5\%$, $n=T=2$ years

Population would be less in 2001 than 2003 in two years. Here population is increasing.

So, $\quad A_{2003}=P_{2001}\left(1+\frac{R}{100}\right)^2$

$$54{,}000 = P_{2001}\left(1+\frac{5}{100}\right)^2 = P_{2001}\left(1+\frac{1}{20}\right)^2$$

$$54{,}000 = P_{2001}\left(\frac{21}{20}\right)^2$$

$$P_{2001} = \frac{54{,}000\times400}{441}$$

$$= 48{,}979.59184 = 48{,}980 \text{ approximately.}$$

Therefore, population in 2001 was 48,980.

(*ii*) According to the question, population is increasing, so, population in 2005

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

$$= 54{,}000\left(1+\frac{5}{100}\right)^2$$

$$= 54{,}000\times\left(1+\frac{1}{20}\right)^2$$

$$= 54{,}000\times\frac{21}{20}\times\frac{21}{20}$$

$$= 59{,}535$$

Therefore, population in 2005 would be 59,535. **Ans.**

Q11. 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.

Sol. Given, $R=2.5\%$, $T=2$ hours, $P=5{,}06{,}000$

After two hours, number of bacteria

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

$$= 5{,}06{,}000\left(1+\frac{2.5}{100}\right)^2 = 5{,}0{,}6000\left(1+\frac{25}{1000}\right)^2$$

$$= 5{,}06{,}000\left(1+\frac{1}{40}\right)^2 = 5{,}06{,}000\times\left(\frac{41}{40}\right)^2$$

$$= \frac{5{,}06{,}000\times41\times41}{40\times40}$$

$$= 5{,}31{,}616.25$$

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

Q12. A scooter was bought at ₹ 42,000. Its value depreciated at the rate of 8% per annum. Find its value after one year.

Sol. Given, $P=₹\,42000$, $n=T=1$ year, $R=8\%$ per annum

$$A = P\left(1-\frac{R}{100}\right)^n = 42{,}000\left(1-\frac{8}{100}\right)^1 = 42{,}000\left(\frac{92}{100}\right)^1$$

$$= \frac{42{,}000\times92}{100} = 420\times92$$

$$= ₹\,38{,}640.$$

Hence, the value of scooter after one year is ₹ 38,640.

□□