



Comparing quantities

Exercise 8.1

Understanding ratios and percentages



This basket contains
20 apples and 5 oranges

5 : 20 can also be
written as $\frac{5}{20}$

So the ratio of oranges to apples = 5 : 20

$$\therefore \frac{\cancel{5}^1}{\cancel{20}^4} = \frac{1}{4}$$

This implies, the number of oranges are $\frac{1}{4}$ th of apples.

Understanding ratios and percentages



The ratio of apples to oranges = 20 : 5

$$\therefore \frac{4}{1} \frac{20}{5} = \frac{4}{1}$$

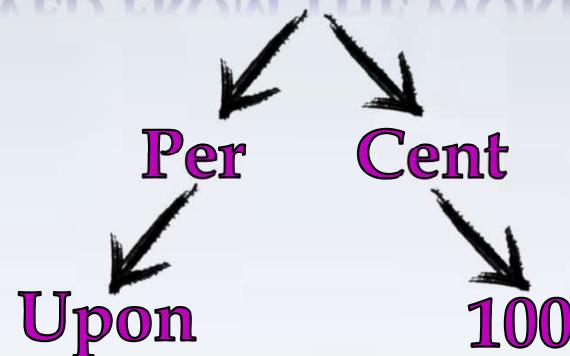
20 : 5 can also be written as $\frac{20}{5}$

This implies the number of apples are 4 times the number of oranges.

$$\begin{aligned}\text{Total no of fruits in the basket} &= \text{Number of apples} + \text{Number of oranges} \\ &= 20 + 5 \\ &= 25\end{aligned}$$

PERCENTAGE

DERIVED FROM THE WORD PERCENT



∴ A ratio with denominator 100 is a percentage .

Symbolically written as $\frac{0}{0}$.

The two '0' of 100

For example

$$\frac{62}{100} = 62 \%$$

$$\frac{75}{100} = 75 \%$$

$$\frac{100}{100} = 100 \%$$

Now calculating the percentage of oranges.

No. of oranges is 5

$$\frac{\cancel{1} \cancel{5}}{\cancel{1} \cancel{5} 25} \times \frac{\cancel{100}^{20}}{100} = \frac{20}{100} = 20\%$$

Total no. of fruits is 25

∴ The percentage of oranges
= 20%

Let us look at examples where percentage is used in our daily life.

86 percent of Literate people
in Mumbai and suburbs.



Q Find the ratio of the following

(a) Speed of a cycle 15 km per hour to the speed of scooter 30 km per hour.

Sol.

$$\text{Speed of cycle} = 15 \text{ km per hour}$$

$$\text{Speed of scooter} = 30 \text{ km per hour}$$

$$\therefore \text{Ratio} = \frac{\text{Speed of cycle}}{\text{Speed of scooter}}$$

$$= \frac{\cancel{15}^1}{\cancel{30}^2}$$

$$= \frac{1}{2}$$

Comparison by division

∴ Ratio of speed of cycle to the speed of scooter is 1 : 2.

Q Find the ratio of the following

(b) 5 m to 10 km

Sol.

$$1 \text{ km} = 1000 \text{ m}$$

$$\begin{aligned}10 \text{ km} &= 10 \times 1000 \text{ m} \\&= 10000 \text{ m}\end{aligned}$$

$$\begin{aligned}\text{Ratio of } 5 \text{ m to } 10000 \text{ m} &= \frac{5}{10000} \\&= \frac{1}{2000}\end{aligned}$$

$$\therefore \text{Ratio of } 5 \text{ m to } 10 \text{ km} = 1 : 2000$$

Units are
not same

Convert bigger
unit to smaller

Q Find the ratio of the following

(c) 50 paise to Rs 5

Sol.

$$1 \text{ Rs} = 100 \text{ paise}$$

$$\begin{aligned}5 \text{ Rs} &= 5 \times 100 \text{ paise} \\&= 500 \text{ paise}\end{aligned}$$

Units are
not same

Convert bigger
unit to smaller

$$\begin{aligned}\text{Ratio of 50 paise to 500 paise} &= \frac{1}{\cancel{50}} : \frac{\cancel{500}}{10} \\&= \frac{1}{10}\end{aligned}$$

∴

$$\text{Ratio 50 paise to Rs 5} = 1 : 10$$

Q Convert the following ratios to percentages.

(a) $3 : 4$

Sol.

$$\begin{aligned} 3 : 4 &= \frac{3}{4} \\ &= \frac{3 \times 100}{4 \times 100} \\ &= \frac{75}{100} \\ \therefore 3 : 4 &= 75\% \end{aligned}$$

Percentage is a
special ratio with
denominator 100

Q Convert the following ratios to percentages.

(b) 2 : 3

Sol.

$$\begin{aligned} 2:3 &= \frac{2}{3} \\ &= \frac{2 \times 100}{3 \times 100} \\ &= \frac{200}{3 \times 100} \end{aligned}$$

A blackboard with a brown frame. Inside, the number 66 is at the top. Below it, 3 goes into 6, with a quotient of 2 written above the line. A subtraction line follows, with 18 under 6, resulting in a remainder of 20. Another subtraction line follows, with 18 under 20, resulting in a remainder of 2. The number 2 is written below the last remainder.

$$\begin{array}{r} 66 \\ 3) 200 \\ - 18 \\ \hline 20 \\ - 18 \\ \hline 2 \end{array}$$

∴

$$2:4 = 66 \frac{2}{3}\%$$

Q

Express each of the following as a fraction:

(a) 36 %

Sol.

$$36 \% = \frac{36}{100} \cancel{9}^{\underline{25}}$$

∴

$$36 \% = \frac{9}{25}$$

(b) 120 %

Sol.

$$120 \% = \frac{120}{100} \cancel{6}^{\underline{5}}$$

∴

$$120 \% = \frac{6}{5}$$

Q

Express each of the following as a fraction:

(c) 0.8 %

Sol.

$$0.8 \% = \frac{0.8}{100}$$

$$= \frac{0.8 \times 10}{100 \times 10}$$

$$= \frac{8}{1000} \cancel{125}^1$$

∴

$$\boxed{0.8 \% = \frac{1}{125}}$$

Q

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

Sol.

$$\% \text{ of students who are good in Mathematics} = 72\%$$

$$\begin{aligned}\therefore \% \text{ of students who are not good in Mathematics} &= (100 - 72)\% \\ &= 28\%\end{aligned}$$

$$\therefore \text{No. of students who are not good in Mathematics} = 28\% \text{ of total students}$$

$$\begin{aligned}&= \frac{7}{100} \times 25 \\ &\quad \cancel{\times} \frac{1}{1} \\ &= 7\end{aligned}$$

$$\therefore \text{No. of students who are not good in Mathematics} = 7$$

Q

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.

$$\text{Number of matches won by the team} = 10$$

$$\therefore \text{\% of matches won by the team} = 40\%$$

$$\therefore 40\% \text{ of [Total number of matches]} = 10$$

$$\frac{40}{100} \times [\text{Total number of matches}] = 10$$

~~Total number of matches~~ = $10 \times \frac{100}{40}$
= 25

$$\therefore \text{The total number of matches played} = 25$$

Q

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

$$\therefore \frac{25}{100} \times [\text{Total money in beginning}] = 600$$

$\therefore \text{Total money in beginning} = 600 \times \frac{100}{25}$

$= 600 \times 4$

$= 2400$

Total money in beginning = Rs. 2400

Q

If 60% people in a city like cricket, 30% like football and the remaining like other games, then what percent 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. % of people who like cricket = 60%

% of people who like football = 30%

\therefore % of people who like other games = $[100 - 60 - 30]\%$
= $[100 - 90]\%$

\therefore % of people who like other games = 10%

Total no. of people in the city = $50,00,000$

\therefore No. of people who like cricket = 60% of total students
= $\frac{60}{100} \times 50,00,000$
= $30,00,000$

\therefore No. of people who like football = 30% of total students
= $\frac{30}{100} \times 50,00,000$
= $15,00,000$

\therefore No. of people who like other game

$$\begin{aligned}&= 10\% \text{ of total students} \\&= \frac{10}{100} \times 50,00,000 \\&= 5,00,000\end{aligned}$$

\therefore % of people who like other games is 10%.
No. of people who like cricket, football and other games are $30,00,000$, $15,00,000$ and $5,00,000$ respectively.

Exercise 8.2

Finding Increase or Decrease %

We often come across statement as



Finding Increase or Decrease %

When increase or decrease is given in %,

- (1) We have to calculate the amount of Increase / decrease.
- (2) Add the amount in Step (1) to original price, if there is an increase
Subtract the amount in Step (1) to original price, if there is a decrease

Example :

- O The price of the scooter was Rs.34000 last year. If it has increased by 20% this year, what is the price now ?

Sol :

$$\text{Original price of the scooter} = \boxed{\text{Rs. 34000}}$$

$$\text{Increase in \%} = 20\%$$

$$20\% \text{ of original price} = \boxed{20\% \text{ of } 34000}$$

$$\begin{aligned} &= \frac{20}{100} \times 34000 \\ &= 20 \times \underline{34000} \\ &= 6800 \end{aligned}$$

Here, increase \% is given.
Hence we will calculate
the amount of increase

$$\begin{aligned} \text{New price} &= \boxed{\text{Original price} + \text{Increase}} \\ &= 34000 + 6800 \\ &= \boxed{\text{Rs 40,800}} \end{aligned}$$



Q

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

Sol. Let the original salary be Rs x

$$\begin{aligned}\therefore \text{Increase in salary} &= 10\% \text{ of } x \\ &= \frac{10}{100} \times x \\ &= \frac{x}{10}\end{aligned}$$

New salary = Rs. 154000

$$\text{Original salary} + \text{Increase} = 154000$$

$$\therefore \frac{x + \frac{x}{10}}{1} = 154000$$

$$\therefore 10x + x = 154000$$

$$\begin{aligned}\therefore \frac{11x}{10} &= 154000 \\ x &= 154000 \times \frac{10}{11} \\ x &= 140000\end{aligned}$$

The original salary is Rs. 1,40,000

Q

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

Sol.

$$\text{Number of visitors on Sunday} = 845$$

$$\text{Number of visitors on Monday} = 169$$

$$\begin{aligned}\text{Decrease in the number of visitors} &= \text{No. of visitors on Sunday} - \text{No. of visitors on Monday} \\ &= 845 - 169 \\ &= 676\end{aligned}$$

$$\begin{aligned}\therefore \text{Per cent decrease} &= \frac{4}{52} \times \frac{20}{100} \\ &= 4 \times 20 \\ &= 80\%\end{aligned}$$

Percent decrease in the people visiting the Zoo on Monday is 80%

WHAT IS DISCOUNT ?

The **difference** between the **marked price** and the **selling price** is called **discount**.

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



Remember

The rate of discount is usually given as a percent

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

$$\text{Discount} = \text{Marked price} \times \text{Discount percent}$$



Two ways of calculating discount :

Discount = Marked price – Selling price

Discount = Marked price × Discount percent

Other important formulae :

Selling price = Marked price – Discount

Marked price = Selling price + Discount

Rate of discount = $\frac{\text{Discount}}{\text{Marked price}} \times 100$

Q

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

Sol. Total marked price = $1,450 + 2 \times 850$
= $1,450 + 1,700$
= **Rs 3,150**

Discount % = 10%

Discount = 10% of marked price
= $\frac{10}{100} \times 3150$
= **315**

Sale Price = Marked Price - Discount
= $3150 - 315$

\therefore Sale Price = Rs 2835

\therefore The customer will have to pay Rs 2,835.

Q

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

Sol. Let the marked price be **Rs. 100**

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

$$\begin{aligned}\text{Discount} &= \frac{20}{100} \times \text{marked price} \\ &= \frac{20}{100} \times 100 \\ &= \text{Rs. } 20\end{aligned}$$

$$\begin{aligned}\text{Sale Price} &= \text{Marked Price} - \text{Discount} \\ &= 100 - 20\end{aligned}$$

$$\therefore \text{Sale Price} = \text{Rs } 80$$

Marked price	Sale price
100	80
x	1600

$$\therefore 100 \times 1600 = 80 \times x$$

$$\therefore \frac{100 \times 1600}{80} = x$$

$$\therefore x = 2000$$

The marked price is
Rs 2000.

WHAT IS PRICE?

The value of any product expressed in terms of money is called its price.

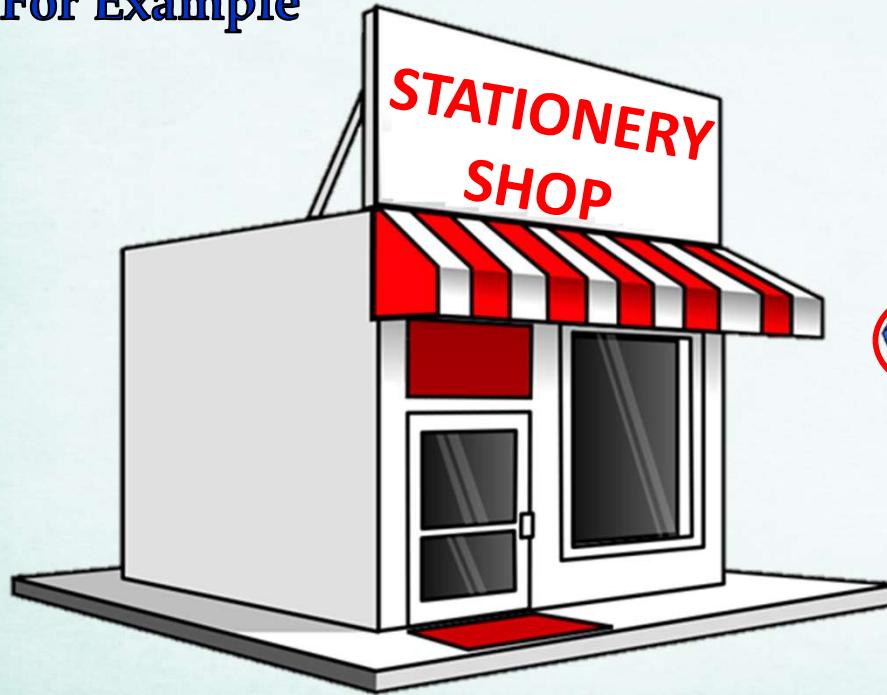


CONCEPTS

1. Cost price

The amount for which an article is bought is called its cost price.

For Example



Vishal bought a box of pencil .

Rs. 100 is the cost price



Here Rs. 100 denotes the amount for which the pencil box can be bought

CONCEPTS

2. Selling price

The amount for which an article is sold, is called its selling price.

Vishal decided to sell that box of pencil to his friend at Rs. 110.

Rs. 110 is the selling price

Vishal bought a box of pencil .

Rs. 100 is the cost price



Here Rs. 110 denotes the amount for which Vishal is ready to sell his pencil box.

CONCEPTS

3. Profit

When the selling price is greater than cost price, then there is a profit

Vishal decided to sell that box of pencil to his friend at Rs. 110.

Rs. 110 is the selling price



Profit = Selling price – Cost price

$$\begin{aligned} \text{Profit} &= 110 - 100 \\ &= 10 \end{aligned}$$

Here, selling price is greater than the cost price .

Vishal bought a box of pencil .

Rs. 100 is the cost price



CONCEPTS

3. Loss

When the cost price is greater than selling price, then there is a Loss.

Vishal decided to sell that box of pencil to his friend at Rs. 80.

Vishal bought a box of pencil .

Rs. 100 is the cost price

Rs. 80 is the selling price for Vishal



$$\begin{aligned}\text{Loss} &= \text{Cost price} - \text{Selling price} \\ \text{Loss} &= 100 - 80 \\ &= 20\end{aligned}$$

Here, Cost price is greater than the selling price .



EXERCISE

- Akshay bought something for Rs. 70 and sold it for Rs. 90.
What was his profit or loss ?

Sol :

Here , **Cost Price (CP) = Rs. 70**

Selling Price (SP) = Rs. 90

Here, CP < SP

∴ Akshay made a profit

$$\text{Profit} = \text{SP} - \text{CP}$$

$$= 90 - 70$$

$$= 20$$

∴ **Profit is Rs. 20**



CALCULATING PROFIT OR LOSS PERCENT.

Ex.1 Ravi bought rice for Rs.500 and sold it for Rs.700. Whereas Sham bought rice for Rs. 1000 and sold it for Rs. 1200. Which of the transactions was more profitable?



Profit secured by Ravi

$$\begin{aligned} &= \text{S.P.} - \text{C.P.} \\ &= 700 - 500 \\ &= \text{Rs. } 200 \end{aligned}$$

Profit secured by Sham

$$\begin{aligned} &= \text{S.P.} - \text{C.P.} \\ &= 1200 - 1000 \\ &= \text{Rs. } 200 \end{aligned}$$

The profit in each transaction is Rs. 200.



So lets find the percentage

That is why we must find
out the profit percent.

CALCULATING PROFIT OR LOSS PERCENT.

Ravi On C.P. of Rs. 500, Profit Rs. 200



On C.P. Rs. 100, Profit = ?

Let profit on CP of Rs. 100 be x

$$\text{Then, } \frac{500}{100} \cancel{\times} \frac{200}{x}$$

$$500 \times x = 200 \times 100$$

$$\frac{500 \times x}{500} = \frac{200 \times 100}{500}$$

Dividing both the sides by 500

$$\frac{200 \times 100}{500} \cancel{\times} \frac{20}{500}$$

$$x = 40$$

$$\text{Profit percent} = 40$$

On C.P. of Rs. 1000, Profit Rs.200

Sham



On C.P. of Rs. 100, Profit = ?

Let profit on CP on Rs. 100 be y

$$\text{Then, } \frac{1000}{100} \cancel{\times} \frac{200}{y}$$

$$1000 \times y = 200 \times 100$$

$$\frac{1000 \times y}{1000} = \frac{200 \times 100}{1000}$$

$$\therefore y = \frac{200}{100}$$

Dividing both the sides by 1000

$$y = 20$$

$$\therefore \text{Profit percent} = 20$$

It shows that Ravi's transaction was more profitable than sham's.

FORMULÆ

$$\text{Loss percent} = \frac{\text{Loss}}{\text{CP}} \times 100$$

We have formula to calculate percent profit and percent loss

$$\text{Profit percent} = \frac{\text{Profit}}{\text{CP}} \times 100$$

Q

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

Sol. Cost price of 80 articles = **Rs 2400**

$$\begin{aligned}\therefore \text{Profit} &= \text{16% of Cost price} \\ &= \frac{16}{100} \times 2400 \\ &= \text{Rs 384}\end{aligned}$$

Selling price of 80 articles = **C.P.** + **Profit**

$$\begin{aligned}&= 2400 + 384 \\ &= \text{Rs 2784}\end{aligned}$$

$$\begin{aligned}\therefore \text{Selling price of 1 article} &= \frac{2784}{\cancel{80}^{348} \cancel{10}} \\ &= \frac{348}{10} \\ &= \text{Rs 34.80}\end{aligned}$$

∴ The selling price of one article is Rs 34.80

Q

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

Sol. Cost price of an article = **Rs 15500**

Amount spent on repairs = **Rs 450**

$$\begin{aligned}\text{Total cost} &= \text{Rs } 15500 + \text{Rs } 450 \\ &= \text{Rs } 15950\end{aligned}$$

\therefore Profit % = 15%

Profit = **15% of 15950**

$$\begin{aligned}&= \frac{15}{100} \times 15950 \\ &= \frac{15 \times 1595}{10}\end{aligned}$$

$$= \frac{23925}{10}$$

$$= \text{Rs } 2392.50$$

Selling price = **C.P. + Profit**

$$\begin{aligned}&= 15950 + 2392.50 \\ &= \text{Rs } 18342.50\end{aligned}$$

\therefore The selling price of the article is **Rs 18342.50**

Q

A VCR and TV were bought for Rs 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. For VCR

$$CP = \text{Rs } 8000$$

$$\text{Loss} = 4\% \text{ of C.P.}$$

$$= \frac{4}{100} \times 8000$$

$$= \text{Rs } 320$$

$$SP = \text{C.P.} - \text{Loss}$$

$$= 8000 - 320$$

$$= \text{Rs } 7680$$

For TV

$$CP = \text{Rs } 8000$$

$$\text{Profit} = 8\% \text{ of C.P.}$$

$$= \frac{8}{100} \times 8000$$

$$= \text{Rs } 640$$

$$SP = \text{C.P.} + \text{Profit}$$

$$= 8000 + 640$$

$$= \text{Rs } 8640$$

$$\text{Total CP} = \text{C.P. of VCR} + \text{C.P. of TV}$$

$$= \text{Rs } 8000 + \text{Rs } 8000$$

$$= \text{Rs } 16000$$

$$\text{Total SP} = \text{S.P. of VCR} + \text{S.P. of TV}$$

$$= \text{Rs } 7680 + \text{Rs } 8640$$

$$= \text{Rs } 16320$$

$\therefore SP > CP$

$$\text{Profit} = \text{S.P.} - \text{C.P.}$$

$$= \text{Rs } 16320 - \text{Rs } 16000$$

$$= \text{Rs } 320$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

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

$$= 2$$

∴ Profit % on the whole transaction is 2%

A milkman sold two of his buffaloes for Rs. 20,000 each.

Q 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. S.P. of each buffalo = Rs. 20,000

$$\therefore \text{S.P. of two buffaloes} = \text{Rs. } 20,000 \times 2 \\ = \text{Rs. } 40,000$$

One buffalo is sold at 5% gain.

When C.P. = Rs. 100, S.P. = $100 + 5 = \text{Rs. } 105$

C.P.	S.P.
100	105
x	20000

$$\therefore 100 \times 20000 = 105 \times x$$

$$\therefore \frac{100 \times 20000}{105} = x$$

$$\therefore x = \frac{400000}{21}$$

$$\therefore x = \text{Rs. } 19047.62$$

$\therefore \text{C.P. of one buffalo} = \text{Rs. } 19047.62$

Other buffalo is sold at 10% loss.

When C.P. = Rs. 100,

$$\text{S.P.} = 100 - 10 = \text{Rs. } 90$$

C.P.	S.P.
100	90
m	20000

$$\therefore 100 \times 20000 = 90 \times m$$

$$\therefore \frac{100 \times 20000}{90} = m$$

$$\therefore m = \frac{200000}{9}$$

$$\therefore m = \text{Rs. } 22222.22$$

$\therefore \text{C.P. of other buffalo} = \text{Rs. } 22222.22$

A milkman sold two of his buffaloes for Rs. 20,000 each.

Q 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.

S.P. of one buffalo = Rs. 20000

\therefore

S.P. of other buffalo = Rs. 20000

$$\begin{array}{r} 22222.22 \\ - 18 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 20 \\ - 18 \\ \hline 2 \end{array}$$

One buffalo is sold at 5% gain.

When C.P. = 100

C.P.	S.P.
100	105
x	20000

$$\therefore 100 \times 20000 = 105 \times m$$

$$100 \times 20000 = 105m$$

$$\therefore \frac{100 \times 20000}{105} = m$$

$$\therefore \frac{200000}{21} = m$$

$$\therefore m = \frac{200000}{21}$$

$$\therefore m = 22222.22$$

S.P. of one buffalo = Rs. 20000

\therefore S.P. of other buffalo = Rs. 20000

$$\begin{array}{r} 19047.619 \\ - 21 \\ \hline 189 \end{array}$$

$$\begin{array}{r} 189 \\ - 100 \\ \hline 89 \end{array}$$

$$\begin{array}{r} 89 \\ - 84 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 5 \\ - 160 \\ \hline 155 \end{array}$$

$$\begin{array}{r} 155 \\ - 147 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 8 \\ - 130 \\ \hline 122 \end{array}$$

$$\begin{array}{r} 122 \\ - 126 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 6 \\ - 40 \\ \hline 34 \end{array}$$

$$\begin{array}{r} 34 \\ - 21 \\ \hline 13 \end{array}$$

$$\begin{array}{r} 13 \\ - 190 \\ \hline 177 \end{array}$$

$$\begin{array}{r} 177 \\ - 189 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 8 \\ - 1 \\ \hline 7 \end{array}$$

P.C. of one buffalo = Rs. 19047.62

P.C. of one buffalo = Rs. 19047.62

Other buffalo is sold at 10% loss.

When C.P. = Rs. 100,

$$\text{S.P.} = 100 - 10 = \boxed{\text{Rs. 90}}$$

C.P.	S.P.
100	90
m	20000

$$100 \times 20000 = 90 \times m$$

$$90 \times 20000 = m$$

$$90 = m$$

$$m = \frac{200000}{9}$$

$$m = \boxed{\text{Rs. 22222.22}}$$

P.C. of other buffalo = Rs. 22222.22

Q

A milkman sold two of his buffaloes for Rs. 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.

C.P. of one buffalo = Rs. 19047.62

C.P. of other buffalo = Rs. 22222.22

S.P. of two buffaloes = Rs. 40,000

$$\text{Total C.P.} = 19,047.62 + 22,222.22$$

$$= \boxed{\text{Rs. } 41,269.84}$$

Since C.P. > S.P.

∴ Overall it is a loss

$$\text{Loss} = \boxed{\text{C.P.}} - \boxed{\text{S.P.}}$$

$$= 41,269.84 - 40,000.00$$

$$= \boxed{\text{Rs. } 1,269.84}$$

∴ **A milkman made an overall loss of Rs 1,269.84**

ESTIMATION IN PERCENTAGES :

Bill Amount = ` 577.80

Discount = 15 %

Steps :

(i) Round off the bill to the nearest tens
of ` 577.80,

` 577.80, will be
changed to ` 580.

(ii) Find 15% of this.

$$\begin{aligned} & \boxed{15\% \text{ of } 580} \\ & = \frac{\cancel{1} \cancel{5}}{\cancel{100}} \times \cancel{580} \\ & = \boxed{87} \end{aligned}$$

How would you estimate
the amount to be paid?

$$\begin{aligned} & \text{The final amount to be paid} \\ & = \text{Bill Amount} - \text{Discount} \\ & = 580 - 87 \\ & = 493 \end{aligned}$$

SALES TAX/VALUE ADDED TAX

TAX INVOICE							
Supplier's Details		Invoice Details					
Tally POWER OF SIMPLICITY		Invoice No. 5 Delivery Note DN0032 Supplier's Ref. NT005					
Buyer Rajhans Enterprises #34, 2nd Main Raichur		Dated 29-Apr-2013 Mode/Terms of Payment Immediate Other Reference(s) Buyer's Order No. PO7817 Despatch Document No. DDC8918 Despatched through KA 61 GH 7181 Terms of Delivery					
		Dated 19-Apr-2013 Dated 29-Apr-2013 Destination Raichur					
Sl. No.	Description of Goods	MRP/ Marginal	VAT %	Quantity	Rate per	Amount	
1	Tobacco	250.00/Kgs	17	72 Kgs	280.00 Kgs	20,160.00	
					17 %	3,060.00	
	Total			72 Kgs		₹ 23,220.00	
Amount Chargeable (in words)				E. & O.E			
INR Twenty Three Thousand Two Hundred Twenty Only				VAT %	Assessable Value	VAT Amount	
				17 %	18,000.00	3,060.00	
VAT Amount (in words)							
INR Three Thousand Sixty Only (₹ 3,060.00)							

These days however,
the prices include
the tax known as Value
Added Tax (VAT).

It is a tax on goods and services
is added to the value of the bill.

The VAT amount is given to the government.
The VAT amount is given to the customer and
given to the government.

by the government on
the sale of an item.

means Sales Tax,

ways on

when

item and

is added to the value of the bill.

Q

The price of a TV is Rs 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. Cost (sale price) of the TV = **Rs 13,000**

Rate of sales tax = 12%

$$\begin{aligned}\therefore \text{Sales tax} &= \frac{12}{100} \text{ of sale price} \\ &= \frac{12}{100} \times 13000 \\ &= \text{Rs 1560}\end{aligned}$$

$$\begin{aligned}\text{Bill Amount} &= \text{Sale price} + \text{Sales tax} \\ &= 13000 + 1560 \\ &= \text{Rs 14,560}\end{aligned}$$

∴ Vinod will have to pay Rs 14,560 for the TV.

Q

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

Sol. Let the marked price be **Rs. 100**

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

$$\text{VAT} = \text{8% of marked price}$$

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

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

$$\begin{aligned}\text{Sale Price} &= \text{Marked Price} + \text{VAT} \\ &= 100 + 8\end{aligned}$$

$$\therefore \text{Sale Price} = \text{Rs 108}$$

Marked price	Sale price
100	108
x	5400

$$\therefore 100 \times 5400 = 108 \times x$$

~~$$\begin{array}{r} 100 \\ \times 5400 \\ \hline 250 \\ 500 \\ \hline 540000 \end{array}$$~~

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

~~$$\begin{array}{r} 108 \\ 54 \\ \hline 27 \\ 54 \\ \hline 0 \end{array}$$~~

$$x = 5000$$

The marked price is Rs. 5000

Exercise 8.3



We need
large amount
of money
for...



If money is
not available,
what do we
do?

The amount we
borrow is called
as loan or the
principal.

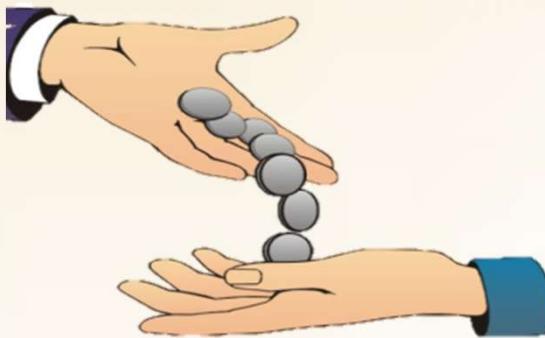


We will borrow
from the **Bank**

Before we proceed ahead we need to be familiar with some terms.

Principal (P)

Amount borrowed from the bank or deposited in the bank



Rate of interest (R)

This is the rate at which interest is charged.



No. of years (N)

The period for which the amount is borrowed or deposited.



Amount (A)

The amount which includes principal & interest.



Sir! I want a loan of Rs. 10,000/- for the period of 2 years

Principal Amount = Rs 10,000
Rate of interest = 10 p.c.p.a
Period = 2 years.

Sir ! we charge 10% p.a. as a rate of interest



While returning
the loan to the
bank, we pay
a bigger amount

This bigger
amount consists of
loan(principal)+
interest

Interest is paid as
a charge for
borrowing money
from the bank.

INTEREST

Simple Interest

Paying the same amount of interest every year.

The principal amount will be the same for all the years.

From second year onwards, the principal changes as it includes interest of the previous year

Compound Interest

Interest changes every year

The principal amount will change every year

INTEREST

Simple Interest

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

I - Simple Interest

P - Principal Amount

R - Rate of interest

N - No. of years (period)

$$A = P + I$$

A - Amount

Compound Interest

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

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

Q

Calculate the amount and compound interest on

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

Sol.

$$P = \text{Rs. } 10,800$$

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

$$R = 12 \frac{1}{2}\% \text{ p.a.} = \frac{25}{2}\%$$

$$\begin{aligned} \text{Amount} &= P \left(1 + \frac{R}{100}\right)^N \\ &= 10800 \left(1 + \frac{\frac{25}{2}}{100}\right)^3 \\ &= 10800 \left(1 + \frac{1.25}{2 \times 100}\right)^3 \\ &= 10800 \left(1 + \frac{1}{8}\right)^3 \end{aligned}$$

$$\begin{aligned} &= 10800 \left(\frac{8+1}{8}\right)^3 \\ &= 10800 \left(\frac{9}{8}\right)^3 \\ &\stackrel{675 \cancel{1050}}{=} 10800 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8} \\ &= \frac{492075}{32} \end{aligned}$$

$$\begin{aligned} \therefore A &= \text{Rs } 15377.34 \\ \text{C.I.} &= A - P \\ \therefore \text{C.I.} &= 15377.34 - 10800 \\ &= \text{Rs } 4577.34 \\ \therefore \text{The Amount is Rs. } 15377.34 \text{ and} \\ \text{Compound Interest is Rs } 4577.34 \end{aligned}$$

$\begin{array}{r} 15377.34 \\ 32 \overline{)492075} \\ - 32 \\ \hline 172 \\ - 160 \\ \hline 120 \\ - 96 \\ \hline 247 \\ - 224 \\ \hline 235 \\ - 224 \\ \hline 110 \\ - 96 \\ \hline 140 \\ - 128 \\ \hline 12 \end{array}$

Q

Calculate the amount and compound interest on

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

Sol.

$$P = \text{Rs } 18000$$

$$R = 10\% \text{ p.a.}$$

$$N = 2 \frac{1}{2} \text{ years, } A = ?$$

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

$$= 18000 \left(1 + \frac{10}{100}\right)^2 \left[1 + \frac{10 \times \frac{1}{2}}{100}\right]$$

$$= 18000 \left[\frac{1 \times 10}{100}\right]^2 \left[\frac{1 \times 5}{100}\right]$$

$$= 18000 \left[\frac{100 + 10}{100}\right]^2 \left[\frac{100 + 5}{100}\right]$$

$$= 18000 \left[\frac{110}{100}\right]^2 \left[\frac{105}{100}\right]^{20}$$

$$= \cancel{18000}^{\color{red}9} \times \frac{11}{10} \times \frac{11}{10} \times \frac{21}{20}$$

$$\therefore A = \text{Rs } 22869$$

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

$$\therefore \text{C.I.} = 22869 - 18000 \\ = \text{Rs } 4869$$

**The Amount is Rs. 22869 and
Compound Interest is Rs 4869**

Q

Calculate the amount and compound interest on

(c) Rs 62,500 for $1\frac{1}{2}$ years at 8% per annum compounded half yearly

Sol.

$$P = \text{Rs. } 62500$$

$$N = 1 \frac{1}{2} \text{ years} = 3 \text{ half years}$$

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

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

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

$$= 62500 \left(\frac{100 + 4}{100}\right)^3$$

$$= 62500 \left(\frac{104}{100}\right)^3$$

$$= 62500 \left(\frac{26}{25}\right)^3$$

$$\begin{aligned} &= 62500 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \\ &= 4 \times 26 \times 26 \times 26 \end{aligned}$$

$$\therefore A = \text{Rs. } 70,304$$

While calculating interest for half years we take half of the rate

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

$$= 70,304 - 62,500$$

$$= \text{Rs. } 7,804$$

The Amount is Rs 70,304 and Compound Interest is Rs 7,804

Q

Calculate the amount and compound interest on

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

Sol.

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

$$N = 1 \text{ year} = 2 \text{ half years}$$

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

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

$$= 8000 \left(1 + \frac{\frac{9}{2}}{100} \right)^2$$

$$= 8000 \left(1 + \frac{9}{2 \times 100} \right)^2$$

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

$$= 8000 \left[\frac{200 + 9}{200} \right]^2$$

$$= 8000 \left[\frac{209}{200} \right]^2$$

$$= 8000 \times \frac{209}{200} \times \frac{209}{200}$$

$$= \frac{87362}{10}$$

$$\therefore A = \text{Rs } 8736.2$$

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

$$\therefore \text{C.I.} = 8736.2 - 8000 \\ = \text{Rs. } 736.2$$

**The Amount is Rs. 8736.2 and
Compound Interest is Rs 736.2**

Q

Calculate the amount and compound interest on

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

Sol. $P = \text{Rs. } 10,000$

$$N = 1 \text{ year} = 2 \text{ half years}$$

$$R = 8\% \text{ p.a} = 4\% \text{ per half yearly}$$

$$A = P \left[1 + \frac{R}{100} \right]^N$$

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

$$= 10000 \left[\frac{100 + 4}{100} \right]^2$$

$$= 10000 \left[\frac{104}{100} \right]^2$$

$$= 10000 \times \frac{104}{100} \times \frac{104}{100}$$

While calculating interest
 for half years we take
 half of the rate

$$\therefore A = \text{Rs } 10816$$

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

$$= 10816 - 10000$$

$$= \text{Rs } 816$$

The Amount is Rs 10816 and
 Compound Interest is Rs 816

Kamala borrowed Rs 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.

$$\text{Principal (P)} = \text{Rs. } 26,400$$

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

$$N = 2 \text{ years and } 4 \text{ months}$$

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

$$= 26400 \left(1 + \frac{15}{100}\right)^2$$

$$= 26400 \left(\frac{100 + 15}{100}\right)^2$$

$$= 26400 \left(\frac{115}{100}\right)^2$$

$$= \frac{66 \cancel{132}}{\cancel{26400}} \times \frac{23}{\cancel{20}} \times \frac{23}{\cancel{20}}$$

$$= 66 \times 23 \times 23$$

$$\therefore A = \text{Rs. } 34,914$$

$$N = \frac{4}{12} = \frac{1}{3} \text{ years}$$

Interest for 4 months

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

$$= \frac{34914 \times 15 \times \frac{1}{3}}{100}$$

$$= \frac{34914 \times 15 \times \frac{5}{100}}{13 \times 100}$$

$$= \frac{174570}{100}$$

$$\therefore \text{S.I.} = \text{Rs } 1745.7$$

Total amount

$$= A + \text{S.I.}$$

$$= 34,914 + 1745.7$$

$$= \text{Rs } 36659.70$$

Kamala will have to pay Rs 36,659.70 at the end of 2 years and 4 months to clear the loan

Q

Fabina borrows Rs 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 ?

$$\text{Sol. } P = \text{Rs. } 12,500$$

$$R = 12\% \text{ p.a.}$$

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

$$\begin{aligned} S.I. &= \frac{P \times R \times N}{100} \\ &= \frac{12500 \times 12 \times 3}{100} \end{aligned}$$

$$= 125 \times 12 \times 3$$

$$\therefore S.I. = \text{Rs } 4500$$

$$R = 10\% \text{ p.a.}$$

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

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

$$= 12500 \left(\frac{100 + 10}{100} \right)^3$$

$$= 12500 \left(\frac{110}{100} \right)^3$$

$$= 12500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$= \frac{166375}{10}$$

$$\therefore A = \text{Rs. } 16637.5$$

Compound Interest

$$= A - P$$

$$= 16637.5 - 12,500$$

$$= \text{Rs } 4137.50$$

Difference

$$= S.I. - C.I.$$

$$= 4500 - 4137.50$$

$$= \text{Rs } 362.50$$

. . . Fabina pays Rs 362.50 more interest.

Q

I borrowed Rs 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?

$$\text{Sol. } P = \text{Rs. 12,000}$$

$$R = 6\% \text{ p.a.}$$

$$N = 2 \text{ years}$$

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

$$= \frac{12000 \times 6 \times 2}{100}$$

$$= 120 \times 6 \times 2$$

$$\therefore \text{S.I.} = \text{Rs 1440}$$

$$\begin{aligned} A &= P \left(1 + \frac{R}{100} \right)^N \\ &= 12000 \left(1 + \frac{6}{100} \right)^2 \\ &= 12000 \left(\frac{100+6}{100} \right)^2 \\ &= 12000 \left(\frac{106}{100} \right)^2 \\ &= 12000 \times \frac{24}{50} \times \frac{53}{50} \\ &= \frac{67416}{5} \\ \therefore A &= 13483.2 \end{aligned}$$

Compound Interest

$$= A - P$$

$$= 13483.2 - 12,000$$

$$= \text{Rs. 1,483.2}$$

Difference

$$= C.I. - S.I.$$

$$= 1,483.2 - 1440$$

$$= \text{Rs. 43.20}$$

**I would have to pay
Rs. 43.20 extra**

$$13483.2$$

$$\begin{array}{r} 5) 67416 \\ - 5 \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ - 15 \\ \hline \end{array}$$

$$\begin{array}{r} 24 \\ - 20 \\ \hline \end{array}$$

$$\begin{array}{r} 41 \\ - 40 \\ \hline \end{array}$$

$$\begin{array}{r} 16 \\ - 15 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ - 10 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \hline \end{array}$$

Q

Vasudevan invested Rs. 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. $P = \text{Rs. } 60,000$

$R = 12\% \text{ p.a.} = 6\% \text{ p.a (compounded half yearly)}$

$N = 6 \text{ months} = 1 \text{ half-year (compounded half yearly)}$

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

$$= 60000 \left[\frac{1 + \cancel{6}}{\cancel{100}} \right]^1$$

$$= 60000 \left[\frac{100 + 6}{100} \right]^1$$

$$= 60000 \left[\frac{106}{100} \right]^1$$

$$= -60000 \times \frac{53}{50}$$

$$\therefore A = \text{Rs. } 63600$$

∴ Vasudevan would get Rs. 63,600 after 6 months.

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

Q

(i) after 6 months?

(ii) after 1 year?

Sol. $P = \text{Rs. } 60,000$

$R = 12\% \text{ p.a.} = 6\% \text{ p.a (compounded half yearly)}$

$N = 1 \text{ year} = 2 \text{ half-years (compounded half yearly)}$

$$A = P \left[1 + \frac{R}{100} \right]^N$$

$$= 60000 \left[\frac{1 + \frac{6}{100}}{1} \right]^2$$

$$= 60000 \left[\frac{100 + 6}{100} \right]^2$$

$$= 60000 \left[\frac{106}{100} \right]^2$$

$$= 60000 \left[\frac{53}{50} \right]^2$$

$$= \cancel{60000} \times \frac{\cancel{53}}{50} \times \frac{\cancel{53}}{50}$$

$$\therefore A = \text{Rs. } 67,416$$

Vasudevan would get Rs. 67,416 after 1 year.

Arif took a loan of Rs. 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:

Q

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

Sol.

$$\text{Principal (P)} = \text{Rs. } 80,000$$

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

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

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

$$= 80000 \left(1 + \frac{10}{100}\right)^1 \left(1 + \frac{10 \times \frac{1}{2}}{100}\right)$$

$$= 80000 \left[1 \cancel{\times} \frac{10}{100}\right] \left[1 \cancel{\times} \frac{5}{100}\right]$$

$$= 80000 \left[\frac{100 + 10}{100}\right] \left[\frac{100 + 5}{100}\right]$$

$$= \cancel{80000} \times \frac{110}{100} \times \frac{105}{100}$$

$$= 400 \times 11 \times 21$$

$$\therefore A = \text{Rs } 92400$$

Arif took a loan of Rs. 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:

Q

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

Sol. Principal (P) = **Rs. 80,000**

Total amount = **92400**

Rate (R) = 10% = **5%** p.a (compounded half yearly)

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

$$\begin{aligned} A &= P \left(1 + \frac{R}{100} \right)^N \\ &= 80000 \left(\frac{1 + \cancel{5}}{\cancel{100}} \right)^3 \\ &= 80000 \left(\frac{100 + 5}{100} \right)^3 \\ &= 80000 \left(\frac{105}{100} \right)^3 \end{aligned}$$

$$\begin{aligned} &= \cancel{80000}^{\frac{10}{20} \times 10} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \\ &= 10 \times 21 \times 21 \times 21 \end{aligned}$$

$$\begin{aligned} \therefore A &= \text{Rs. 92610} \\ \text{Difference} &= \text{Amount} - \text{Total amount} \\ &= 92610 - 92400 \\ &= \text{Rs. 210} \end{aligned}$$

Difference in amount is Rs. 210

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

- Q** (i) The amount credited against her name at the end of the second year
(ii) The interest for the 3rd year

Sol. Principal (P) = **Rs. 8,000**

Rate (R) = **5%**

N = **2** year

$$\begin{aligned}
A &= P \left(1 + \frac{R}{100}\right)^N \\
&= 8000 \left[1 + \frac{5}{100}\right]^2 \\
&= 8000 \left[\frac{100+5}{100}\right]^2 \\
&= 8000 \left[\frac{105}{100}\right]^2 \\
&= 8000 \left[\frac{21}{20}\right]^3 \\
&= \cancel{8000} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \\
&= 20 \times 21 \times 21 \\
\therefore A &= \text{Rs. 8820}
\end{aligned}$$

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

- Q** (i) The amount credited against her name at the end of the second year
(ii) The interest for the 3rd year

Sol.

$$\text{Principal (P)} = \text{Rs. 8,000}$$

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

$$N = 3 \text{ year}$$

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

$$= 8000 \left(1 + \frac{5}{100} \right)^3$$

$$= 8000 \left(\frac{100+5}{100} \right)^3$$

$$= 8000 \left[\frac{105}{100} \right]^3$$

$$= 8000 \left[\frac{21}{20} \right]^3$$

$$= \cancel{8000}^{\cancel{2}^1} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}}$$

$$= 21 \times 21 \times 21$$

$$\therefore A = \text{Rs. 9261}$$

$$\therefore \text{Interest for 3rd year} = A - P$$

$$= 9261 - 8820$$

$$= \text{Rs. 441}$$

$$\text{Total amount} = 8820$$

Find the amount and the compound interest on Rs.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 have got if it was compounded annually ?

While calculating interest for half years we take half of the rate

Sol. P = **Rs. 10,000**

$$N = 1\frac{1}{2} \text{ years} = 3 \text{ half years}$$

$$R = 10\% \text{ p.a.} = 5\% \text{ half yearly}$$

$$A = P \left[1 + \frac{R}{100} \right]^N$$

$$= 10000 \left[\frac{1 + \cancel{5}}{\cancel{1} \times \cancel{100}} \right]^3$$

$$= 10000 \left[\frac{100 + 5}{100} \right]^3$$

$$= 10000 \left[\frac{105}{20} \right]^3$$

$$\begin{aligned} &= 10000 \left(\frac{21}{20} \right)^3 \\ &= \cancel{10000} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}} \\ &= \frac{46305}{4} \end{aligned}$$

$$\therefore A = \boxed{\text{Rs } 11,576.25}$$

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

$$= 11,576.25 - 10,000$$

$$= \text{Rs. } 1,576.25$$

11576.25

$$\begin{array}{r} 4) 46305 \\ - 4 \\ \hline 06 \\ - 4 \\ \hline 23 \\ - 20 \\ \hline 30 \\ - 28 \\ \hline 25 \\ - 24 \\ \hline 10 \\ - 8 \\ \hline 20 \\ - 20 \\ \hline 0 \end{array}$$

Find the amount and the compound interest on Rs.10,000

for $1 \frac{1}{2}$ years at 10% per annum, compounded half yearly.

Q

Would this interest be more than the interest he would get if it was compounded annually ?

Sol.

$$P = \text{Rs. } 10,000$$

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

$$R = 10\% \text{ p.a.}$$

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

$$= 10000 \left(1 + \frac{10}{100} \right)^1 \left(1 + \frac{10 \times \frac{1}{2}}{100} \right)$$

$$= 10000 \left[\frac{1 \times 10}{100} \right] \left[\frac{1 \times 5}{100} \right]$$

$$= 10000 \left[\frac{100 + 10}{100} \right] \left[\frac{100 + 5}{100} \right]$$

$$= \cancel{10000} \times \frac{110}{100} \times \frac{105}{100}$$

$$= 110 \times 105$$

$$\text{C.I.} = 1,576.25$$

$$\therefore A = \text{Rs } 11550$$

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

$$= 11550 - 10000$$

$$= \text{Rs } 1550$$

∴ Yes, interest Rs. 1,576.25 is more than Rs. 1,550.

Find the amount which Ram will get on Rs. 4,096, if he gave

Q it for 18 months at $12 \frac{1}{2}\%$ per annum, interest being compounded half yearly.

Sol. $P = \text{Rs. } 4096$

$N = 18 \text{ months} = 3$ (compounded half yearly)

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

$$\begin{aligned}\text{Amount} &= P \left[1 + \frac{R}{100} \right]^N \\ &= 4096 \left[1 + \frac{\frac{25}{4}}{100} \right]^3 \\ &= 4096 \left[1 + \frac{1}{4 \times 100} \right]^3 \\ &= 4096 \left[1 + \frac{1}{16} \right]^3\end{aligned}$$
$$\begin{aligned}&= 4096 \left[\frac{16+1}{16} \right]^3 \\ &= 4096 \left[\frac{17}{16} \right]^3 \\ &= 4096 \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16} \\ \therefore A &= \text{Rs. } 4,913\end{aligned}$$

$\therefore \text{Ram will get on Rs. } 4,913$

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

Q

(i) Find the population in 2001

(ii) What would be its population in 2005

Sol.

$$A = 54000$$

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

$$N = 2 \text{ years}$$

$$\text{Amount} = P_{2001} \left(1 + \frac{R}{100}\right)^N$$

$$\therefore 54000 = P_{2001} \left(1 + \frac{\frac{1}{20}}{100}\right)^2$$

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

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

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

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

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

$$= \frac{2400000}{49}$$

$$\therefore P_{2001} = \text{Rs } 48,980 \text{ approx.}$$

48979.59

49) 2400000

- 196

440

- 392

480

- 441

390

- 343

470

- 441

290

- 245

450

- 441

9

Q. The population of a place increased to 54,000 in 2003

at a rate of 5% per annum

Q

(i) Find the population in 2001

(ii) What would be its population in 2005

Sol.

$$A = 54000$$

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

$$N = 2 \text{ years}$$

$$A_{2005} = P_{2005} \left(1 + \frac{R}{100}\right)^N$$

$$\therefore A_{2005} = 54000 \left(1 + \frac{\frac{1}{20}}{\frac{5}{100}}\right)^2$$

$$\therefore A_{2005} = 54000 \left(\frac{1}{20} + \frac{1}{20}\right)^2$$

$$\therefore A_{2005} = 54000 \left(\frac{20+1}{20}\right)^2$$

$$\therefore A_{2005} = 54000 \left(\frac{21}{20}\right)^2$$

$$\therefore A_{2005} = \cancel{54000}^{\cancel{270} \cancel{135}} \times \frac{21}{\cancel{20}} \times \frac{21}{\cancel{20}}$$

$$\therefore A = \text{Rs. } 59535$$

Hence population in 2005 would be 59,535.

Q

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.

$$A = 5,06,000$$

$$R = 2.5\% \text{ p.a.}$$

$$N = 2 \text{ years}$$

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

$$\therefore A = 506000 \left(1 + \frac{2.5}{100} \right)^2$$

$$\therefore A = 506000 \left(1 + \frac{\cancel{25}}{\cancel{1000}} \right)^2$$

$$\therefore A = 506000 \left(1 + \frac{1}{40} \right)^2$$

$$\therefore A = 506000 \left(\frac{41}{40} \right)^2$$

$$\therefore A = \cancel{506000}^{1265} \times \frac{41}{\cancel{40}} \times \frac{41}{\cancel{40}}$$

$$= \frac{2126465}{4}$$

$$\therefore A = 531616.25$$

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

531616.25

$$\begin{array}{r}
 4) 2126465 \\
 - 20 \\
 \hline
 12 \\
 - 12 \\
 \hline
 06 \\
 - 4 \\
 \hline
 24 \\
 - 24 \\
 \hline
 06 \\
 - 4 \\
 \hline
 25 \\
 - 24 \\
 \hline
 10 \\
 - 8 \\
 \hline
 20 \\
 - 20 \\
 \hline
 0
 \end{array}$$

Q

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

Sol.

$$A = 42,000$$

\because Value of scooter reduces after one year

$\therefore R$ is negative

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

$$N = 1 \text{ years}$$

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

$$\therefore A = 42000 \left(1 + \frac{(-8)}{100} \right)^1$$

$$\therefore A = 42000 \left(1 - \frac{\frac{2}{25}}{\frac{8}{100}} \right)^1$$

$$\therefore A = 42000 \left(1 - \frac{2}{25} \right)^1$$

$$\therefore A = 42000 \left[\frac{25 - 2}{25} \right]^1$$

$$\therefore A = 42000 \left[\frac{23}{25} \right]^1$$

$$\therefore A = \cancel{42000} \times \frac{23}{\cancel{25} \cdot 5_1}$$

$$= 1680 \times 23$$

$$\therefore A = 38640$$

\therefore Hence, the value of scooter after one year is Rs 38,640.

Additional sums

Q

A nursery has 5000 plants. 5% of the plants are roses and 1% are mango plants. What is the total number of other plants ?

Sol.

We have,

$$\text{Total number of plants} = 5000$$

$$\text{Number of rose plants} = \frac{5}{100} \times \text{Total plants}$$

$$= \frac{5}{100} \times 5000$$

$$= 250$$

$$\text{Number of mango plants} = \frac{1}{100} \times \text{Total plants}$$

$$= \frac{1}{100} \times 5000$$

$$= 50$$

$$\therefore \text{Number of other plants} = 5000 - 250 - 50 \\ = 5000 - 300$$

$$\therefore \text{Number of other plants} = 4700$$

The total no. of other plants are 4700.

Q

Out of her total income Mrs. Sharma spends 20 % on house rent and 70 % of the rest on household expenditure. If she saves Rs. 1800, what is the total income ?

Sol. Let the total income be Rs. 100

$$\text{Expenditure on house rent} = 20\% \text{ of Rs. } 100 = \boxed{\text{Rs. } 20}$$

$$\therefore \text{Balance money} = \text{Rs. } (100 - 20) = \boxed{\text{Rs. } 80}$$

$$\text{Household expenditure} = \boxed{70\% \text{ of } \text{Rs. } 80}$$

$$= \frac{70}{100} \times 80 \\ = \boxed{\text{Rs. } 56}$$

$$\text{Saving} = \text{Rs. } (80 - 56) = \boxed{24}$$

marked price	sale price
100	24
x	1800

$$= \frac{20}{100} \times 100 \\ = \boxed{\text{Rs. } 20}$$

$$\therefore 100 \times 1800 = 24 \times x$$

$$\therefore \frac{100 \times 1800}{24} = x \\ \therefore x = 7500$$

**Total income when savings is
Rs. 1800 is Rs. 7500**

Q

If the cost price of 18 mangoes is the same as the selling price of 16 mangoes, find the gain percent.

Sol. Let the cost price of each mango be Rs. 1.

$$\text{C.P. of 18 mangoes} = \text{Rs. } 18$$

$$\text{C.P. of 18 mangoes} = \text{S.P. of 16 mangoes}$$

$$\therefore \text{S.P. of 16 mangoes} = 18$$

$$\therefore \text{C.P. of 16 mangoes} = 16$$

$$\begin{aligned}\therefore \text{Gain} &= \text{S.P.} - \text{C.P.} \\ &= 18 - 16 \\ &= \text{Rs. } 2\end{aligned}$$

Now,

$$\text{Gain \%} = \left[\frac{\text{Gain}}{\text{C.P.}} \times 100 \right] \%$$

$$\begin{aligned}\therefore \text{Gain \%} &= \left[\frac{2}{16} \times 100 \right] \% \\ &= 12.5 \%\end{aligned}$$

$$\therefore \text{Gain \%} = 12.5 \%$$

$$\text{Gain} = \boxed{\text{S.P.} - \text{C.P.}} \quad ?$$

12 . 59
$\overline{8) 100}$
- 8
20
$\overline{- 16}$
40
$\overline{- 40}$
0

Q

A man purchases two fans for Rs. 2160. by selling one fan at a profit of 15% and the other at a loss of 9% he neither gains nor losses in the whole transaction. Find the cost price of each fan.

Sol. Let the cost of price of first fan be Rs. x .

$$\text{Cost price of second fan} = \text{Rs. } (2160 - x)$$

It is given that,

In the whole transaction, the man neither gains nor loses.

$$\therefore \text{Profit on sale of first fan} = \text{Loss in the sale of second fan}$$

$$\therefore 15\% \text{ of } x = 9\% \text{ of } \text{Rs. } (2160 - x)$$

$$\therefore \frac{15}{100} \times x = \frac{9}{100} \times (2160 - x)$$

$$\therefore 15x = 9(2160 - x)$$

$$\therefore 15x = 19440 - 9x$$

$$15x + 9x = 19440$$

$$24x = 19440$$

$$x = \frac{19440}{24}$$

$$x = 810$$

$$\therefore \text{C.P. of first fan} = \text{Rs. } 810$$

$$\therefore \text{Cost price of second fan}$$

$$= (2160 - x)$$

$$= (2160 - 810)$$

$$= \text{Rs. } 1350$$

The cost price of first fan is Rs. 810 and second fan is Rs. 1350.

Q

Vijay obtains a loan of Rs. 64000 against his fixed deposits. If the rate of interest be 2.5 paise per rupee per annum, calculate the compound interest payable after 3 years.

$$\text{Sol. } A = 64000$$

$$R = 2.5 \text{ paise per rupee p.a.}$$

$$\therefore R = (2.5 \times 100) \text{ paese per hundred rupees p.a.}$$

$$\therefore R = \left(\frac{2.5 \times 100}{100} \right) \text{ Rs. per hundred rupees p.a.}$$

$$\therefore R = 2.5 \% \text{ p.a.}$$

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

$$A = P \left[1 + \frac{R}{100} \right]^N$$

$$\therefore A = 64000 \left[1 + \frac{2.5}{100} \right]^3$$

$$\therefore A = 64000 \left[1 + \frac{\frac{1}{40}}{100} \right]^3$$

$$\therefore A = 64000 \left[\frac{1 + \frac{1}{40}}{1} \right]^3$$

$$\therefore A = 64000 \left[\frac{41}{40} \right]^3$$

$$\therefore A = 64000 \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40}$$

$$\therefore A = 68921$$

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

$$= 68921 - 64000$$

$$= \text{Rs. 4921}$$

Hence, compound interest payable after 3 years is 4921.

Q

Find the compound interest on Rs. 1000 at the rate of 10% per annum for 18 months when interest is compound half-yearly.

Sol. P = **Rs. 1000**

$$R = 10\% \text{ p.a.} = 5\% \text{ half years}$$

$$R = 18 \text{ months} = 3\% \text{ half yearly}$$

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

$$= 1000 \left(\frac{1 + \frac{5}{100}}{1}\right)^3$$

$$= 1000 \left(\frac{100 + 5}{100}\right)^3$$

$$= 1000 \left(\frac{105}{100}\right)^3$$

$$= 1000 \left(\frac{21}{20}\right)^3$$

While calculating interest for half years we take half of the rate

$$= 1000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= \frac{9261}{8}$$

$$\therefore A = \text{Rs } 11,57.63$$

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

$$= 11,57.63 - 1000$$

$$= \text{Rs. } 157.63$$

1157.625

$$\begin{array}{r}
 1157.625 \\
 - 89261 \\
 \hline
 12 \\
 - 8 \\
 \hline
 46 \\
 - 40 \\
 \hline
 61 \\
 - 56 \\
 \hline
 50 \\
 - 48 \\
 \hline
 20 \\
 - 16 \\
 \hline
 40 \\
 - 40 \\
 \hline
 0
 \end{array}$$