Unit 4 -: Profit & loss, partnerships, S.I & C.I

4.1 Profit & loss

INTRODUCTION:

Nowadays, transactions have become a common feature of life. When a person deals in the purchase and sale of any item, he either gains or loses some amount generally. The aim of any business is to earn profit. The commonly used terms in dealing with questions involving sale and purchase are:

Cost Price: The cost price of an article is the price at which an article has been purchased. It is abbreviated as C.P.

Selling Price: The selling price of an article is the price at which an article has been sold. It is abbreviated as S.P.

Profit or Gain: If the selling price of an article is more than the cost price, there is a gain or profit. Thus, Profit or Gain= S.P. − C.P.

Loss: If the cost price of an article is greater than the selling price, the seller suffers a loss. Thus, Loss C.P. − S.P.
Note that profit and loss are always calculated with respect to the cost price of the item.

SOME BASIC FORMULA

(1) Profit on Rs.100 is gain percent .

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

(2) Loss on Rs.100 is loss percent .

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

(3) When the selling price and profit % are given :

$$\text{C.P} = \left(\frac{100}{100+Profit \%}\right) \times S.P$$

(4) When the cost and profit % are given :

$$\text{S.P} = \left(\frac{100+Profit \%}{100}\right) \times C.P$$

(5) When the cost and loss % are given :

$$\text{S.P} = \left(\frac{100-loss \%}{100}\right) \times C.P$$

(6) When the selling price and loss% are given :

$$\text{C.P} = \left(\frac{100}{100-loss \%}\right) \times S.P$$

Example 1: Mr. Sharma buys a cooler for ₹4500. For how much should he sell it to gain 8%?

Solution: We have, C.P. = ₹4500, profit % = 8%

$$\text{S.P} = \left(\frac{100+Profit \%}{100}\right) \times C.P = \left(\frac{100+8}{100}\right) \times 4500 = 4860$$

Example 2: By selling a fridge for ₹7200, Pankaj loses 10%. Find the cost price of the fridge.

Solution: We have, S.P. = ₹7200, Loss % = 10%

$$\text{C.P} = \left(\frac{100}{100-loss \%}\right) \times S.P = \left(\frac{100}{100-10}\right) \times 7200 = 8000$$

Example 3: By selling a pen for ₹99, Mohan gains $12\frac{1}{2}$%. Find out cost price of the pen.

Solution: Here, S.P. = 99, gain % = $12\frac{1}{2}$%

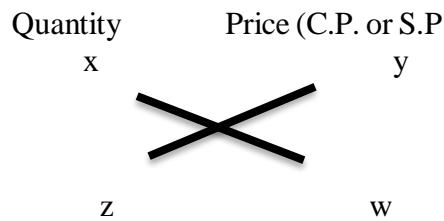$$\text{C.P} = \left(\frac{100}{100+Profit \%}\right) \times S.P = \left(\frac{100}{100+12.5}\right) \times 99 = 88$$

SOME USEFUL METHODS

- **If a man buys x items for ₹y and sells z items for ₹w, then the gain or loss per cent made by him is $(\frac{xw}{zy} - 1) \times 100$ %**

NOTE:

In the case of gain per cent, the result obtained bears positive sign whereas in the case of loss per cent the result obtained bears sign negative.

How to Remember?

Quantity   Price (C.P. or S.P

x   y

z   w

1. Cross-multiply the numbers connected by the arrows (xw and zy).
2. Mark the direction of the arrows for cross-multiplication. The arrow going down forms the numerator while

the arrow going up forms the denominator $\frac{xw}{zy}$

Example 4: If 11 oranges are bought for ₹10 and sold at 10 for ₹11, what is the gain or loss %?

Solution: Quantity   Price (C.P. or S.P.)
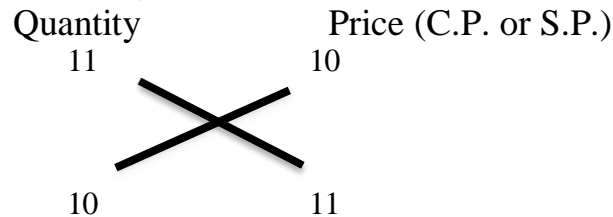
11   10

10   11

$$(\frac{xw}{zy} - 1) \times 100\ \% = (\frac{11 \times 11}{10 \times 10} - 1) \times 100 = 21\%$$

Example 5: A fruit seller buys apples at the rate of ₹12 per dozen and sells them at the rate of 15 for ₹12. Find out his percentage gain or loss.

Solution:

% gain or loss = $(\frac{xw}{zy} - 1) \times 100\ \% = (\frac{12 \times 12}{15 \times 12} - 1) \times 100 = -25\%$

- **If the cost price of m articles is equal to the selling price of n articles, then % gain or loss $= (\frac{m-n}{n}) \times 100$**

(If m>n, it is % gain and, if m<n, it is % loss)

Example 6: A shopkeeper professes to sell his goods on cost price, but uses 800 gm, instead of

1 Kg. What is his gain %?

Solution: Here, cost price of 1000gm is equal to selling price of 800gm ,

Profit % = $(\frac{m-n}{n}) \times 100 = (\frac{1000-800}{800}) \times 100 = 25\%$

Example 7 : If the selling price of 12 articles is equal to the cost price of 18 articles, what is the profit %?

Solution: Here, m = 18, n = 12

Profit % = $(\frac{m-n}{n}) \times 100 = (\frac{18-12}{12}) \times 100 = 50\%$

- **If an article is sold at a price $S.P._1$. then %gain or % loss is x and if it is sold at a price $S.P._2$ then % gain or % loss is y. If the cost price of the article is C.P., then**

$$\frac{S.P._1}{100+x} = \frac{S.P._2}{100+y} = \frac{C.P}{100} = \frac{S.P._1 - S.P._1}{x-y}$$

(where x or y is -ve, if it indicates a loss, otherwise it is +ve)

Example 8: By selling a radio for ₹1536, Suresh lost 20% What percent shall he gain or lose by selling it for ₹2000?

Solution: Here, $S.P._1$=1536, x= -20 (-ve sign indicates loss)

$S.P2$ = ₹2000, y=?

Using the formula: $\frac{S.P._1}{100+x} = \frac{S.P._2}{100+y}$

We get, $\frac{1536}{100-20} = \frac{2000}{100+y} \Rightarrow 100 + y = \frac{2000 \times 80}{1536} = 104\frac{1}{6} \Rightarrow y = 4\frac{1}{6}\%$

Thus, Suresh has a gain of $4\frac{1}{6}\%$ by selling it for ₹2000.

- **If 'A' sells an article to 'B' at a gain/loss of m% and 'B' sells it to 'C' at a gain/loss of n%. If 'C' pays ₹z for it to 'B', then the cost price for 'A' is**

$$C.P = [\frac{100^2z}{(100+m)(100+n)}]$$

where m or n is -ve of it indicates a loss, otherwise it is +ve.

Example 9 : Mohit sells a bicycle to Rohit at a gain of 10% and Rohit again sells it to Jyoti at a profit of 5%. If Jyoti pays ₹462 to Rohit, what is the cost price of the bicycle for Mohit?

Solution: Here, m = 10 n = 5, z=₹462.

Using the formula,

$$C.P = [\frac{100^2z}{(100+m)(100+n)}] = [\frac{100^2 \times 462}{(100+10)(100+5)}] = 400$$

Example 10 : 'A' sells a DVD to 'B' at a gain of17% and 'B' again sells it to 'C' at a loss of 25%. If 'C' pays ₹1053 to 'B', what is the cost price of the DVD to 'A'?

Solution: We have, m = 17 n = - 25 z = ₹1053.

$$C.P = \left[\frac{100^2 z}{(100+m)(100+n)}\right] = \left[\frac{100^2 \times 1053}{(100+17)(100-25)}\right] = 1200$$

- **When a person sells two similar items, one at a gain of say x%, and the other at a loss of x%, then the seller always incurs a loss given by:**

$$\textbf{Loss \%} = \left(\frac{\textit{Common Loss and Gain \%}}{10}\right)^2 = \left[\frac{x}{10}\right]^2$$

- **If a trader professes to sell his goods at cost price, but uses false weights, then**

$$\textbf{Gain \%} = \left[\frac{Error}{(True\ Value)-(Error)} \times 100\right]\%$$

Example 11 : Rajesh sold two horses for ₹1990 each; gaining 30% on the one and losing 30% on the other. Find out his total gain or loss percent.

Solution: Here, x = 30

Overall loss % $= \left[\frac{x}{10}\right]^2 = \left[\frac{30}{10}\right]^2 = 9\ \%$

- **% profit =**

1. **By selling 90 ball pens for ₹160 a person loses 20%. How many ball pens should be sold for ₹96 so as to have a profit of 20%?**

Solution : S.P. of 90 ball pens = ₹160

Loss % = 20%

∴ C.P. of 90 ball pens = [100/(100 – Loss%)] × Selling Price = [100/(100 – 20)] × 160

= (100 × 160)/80 = ₹200

C.P. of 1 ball pen = ₹ 20/9

⇒ Now we find how many pens should be sold for ₹96 to have a profit of 20%

Let us say, 'x' number of pens be sold for ₹96

Then, S.P. of x pens = ₹96

C.P of x pens = ₹(20/9)x

Profit = S.P – C.P. = 96 – 20x/9

Profit% = (Profit/ C.P.) × 100

$$\Rightarrow (\frac{96 - \frac{20x}{9}}{\frac{20x}{9}}) \times 100 = 20$$

X = 36

Therefore, 36 pens should be sold for ₹96 for a 20% profit.

2. **A shopkeeper takes 10% profit on his goods. He lost 20% of his goods during a theft. What is his loss per cent?**

Solution : Let the number of goods be 100 , and C.P of each item be Rs.1

∴ Total C.P. = ₹100

Profit% on each item = 10%

20% of goods are lost in a theft

Number of goods left = 80

Now, S.P. of 1 item = [(100 + 10)/100] × 1 = ₹1.10

S.P. of 80 items = 80 × ₹1.10 = ₹88

Loss = 100 − 88 = 12

Loss% = (12/100) × 100% = 12%

Thus, the shopkeeper bears 12% loss.

3. **A dishonest shopkeeper professes to sell cloth at the cost price, but he uses faulty meter rod. His meter rod measures 95 cm only. Find his gain per cent.**

Solution: Here, true measure = 100 cm. False measure = 95 cm.
Since the shopkeeper sells the cloth at cost price, x=0.
∴ Overall gain % is given by $\dfrac{100+g}{100+x} = \dfrac{\text{true measure}}{\text{Faulty measure}}$

$$\Rightarrow \frac{100+g}{100} = \frac{100}{95}$$

$$\Rightarrow g = \frac{1000}{95} - 100 = 5\frac{5}{19}\%$$

4. **The percentage profit earned by selling an article for Rs. 1920 is equal to the percentage loss incurred by selling the same article for Rs. 1280. At what price should the article be sold to make 25% profit?**

Solution: Let C.P. be Rs. x.
Then, $\dfrac{1920-x}{x} \times 100 = \dfrac{x-1280}{x} \times 100$
⇒1920 - x = x - 1280
⇒2x = 3200
⇒ x = 1600
Required S.P. = 125% of Rs. 1600 = Rs.$[\dfrac{125}{100} \times 1600] = Rs.\,2000$

5. **Arun sells an object to Benny at a profit of 15%, Benny sells that object to Chandan for ₹1012 and makes a profit of 10%. At what cost did Arun purchase the object?**
Solution:
Let the actual cost price at which Arun bought the object be x

When Arun sells the object to Benny

Profit % = 15%

∴ selling price of object = [(100 + 15)/100] × x = 1.15x

Now, this cost price of the object for Benny

When Benny sells the object to Chandan

Selling Price = ₹1012

Profit % = 10%

∴ Selling price = [(100 + 10)/100] × 1.15x

⇒ 1012 = [(100 + 10)/100] × 1.15x

⇒$x = \frac{1012 \times 1000}{11 \times 115}$
= ₹800

Therefore, the price at which Arun bought the object is ₹800.

6. **A shopkeeper takes 10% profit on his goods. He lost 20% of his goods during a theft. What is his loss per cent?**

Solution: Let the number of goods be 100, and

C.P. of each item be ₹1 ⇒ Total C.P. = ₹100

Profit% on each item = 10%

20% of goods are lost in a theft

Number of goods left = 80

Now, S.P. of 1 item = [(100 + 10)/100] × 1 = ₹1.10

S.P. of 80 items = 80 × ₹1.10 = ₹88

Loss = 100 – 88 = 12

Loss% = (12/100) × 100% = 12%

Thus, the shopkeeper bears 12% loss.

7. **A television and a washing machine were sold for ₹12500 each. If the television was sold at a gain of 30% and the washing machine at a loss of 30%. Find the overall profit% or loss% on the entire transaction?**

Solution: Using the above trick, here profit% is equal to loss%, that is $P = L$

∴ Loss% = $P^2/100 = 30^2/100 = 900/100 = 9\%$

8. **A dishonest shopkeeper pretends to sell his goods at cost price but uses false weights and gains $11^1/_9\%$. Find the false weight he is using instead of 1kg weight.**

Solution : Let the false weight be x gm.

Gain % = [(True weight – False weight)/ False weight]×100

⇒ $100/9$ = [(1000 – x)/x] × 100

⇒ 10 x = 9000

⇒ x = 900

∴ the shopkeeper is using weights of 900 gm instead of 1kg.

9. **In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?**

Solution : Let C.P.= Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420.

New C.P. = 125% of Rs. 100 = Rs. 125

New S.P. = Rs. 420.

Profit = Rs. (420 - 125) = Rs. 295.

Required percentage = $[\frac{295}{420} \times 100] \% = \frac{1475}{21}\% = 70\%$ *(approx)*

10. **A shopkeeper expects a gain of 22.5% on his cost price. If in a week, his sale was of Rs. 392, what was his profit?**

Solution: C.P. $= Rs.(\frac{100}{122.5} \times 392) = Rs. 320$

So , Profit = Rs. (392 - 320) = Rs. 72.

1. Mohan buys a watch for ₹350 and sells it for ₹392.Find out his percentage of profit.
(a) 9%   (b) 14% (c) 12%   (d) None of these 3.

2. A man buys 10 articles for ₹8 and sells them at 1.25 per article. His gain per cent is:
(a) 55%   (b) 40% (c) 561%   (d) None of these

3. Ramesh purchased a bicycle for ₹5200 and spent ₹800 on its repairs. He had to sell it for ₹5500. Find out his profit or loss per cent.
(a)loss 8 $\frac{1}{}$%   (b) 9%   (c) 7^1% gain   (d) None of these

4. A toothpaste labeled at ₹80 is sold for ₹68. The rate of discount is:
(a) 12%   (b) 15%   (c) 14%   (d) None of these

5. Sardar Singh bought 200 dozen oranges at ₹10 a dozen. He spent ₹500 on transportation. He sold them at ₹1 each. What was his profit or loss per cent?
(a) 4%   (b) 5%   (c) 6%   (d) None of these

6. Suresh buys a camera for ₹1800 and sells it at 10% loss. Find out its selling price.
(a) ₹1620   (b) ₹1650   (c) ₹1730   (d) None of these

7. Hemant purchased 120 rims of paper at ₹80 per rim. He spent ₹280 on transportation, paid octroi at the rate of 40 paise per rim and paid ₹72 to the coolie. If he wants to have a gain of 8%, the selling price per rim must be:
(a) ₹89   (b) ₹95   (c) ₹90   (d) None of these

8. Rajesh sells tape-recorder to Mihir at a loss of 10% and Mihir sells it to Shiv at a loss of   20%. If Shiv pays ₹1440 for it, at what price did Rajesh buy?
(a) ₹1920 (b) ₹1800   (c) ₹2000   (d) None of these

9. A man sells a scooter to his friend at 10% loss. If the friend sells it for ₹54000 and gains 20%, find out the original cost price of the scooter.
(a) ₹50000   (b) ₹40000   (c) ₹45000   (d) None of these

10. A manufacturer sells an article to a wholesale dealer at a profit of 20%. The wholesale dealer sells it to a retail merchant at a loss of 5%. Find out the resultant profit or loss.
(a) 14% loss   (b) 12% gain   (c) 14% gain   (d) None of these

4.2 Partnership

- When two or more than two persons run a business jointly, they are called partners and the deal is known as partnership.

Ratio of Divisions of Gains:

1. When investments of all the partners are for the same time, the gain or loss is distributed among the partners in the ratio of their investments.

   Suppose A and B invest Rs. x and Rs. y respectively for a year in a business, then at the end of the year:
   (A's share of profit) : (B's share of profit) = $x : y$.

2. When investments are for different time periods, then equivalent capitals are calculated for a unit of time by taking (capital x number of units of time). Now gain or loss is divided in the ratio of these capitals.

   Suppose A invests Rs. x for p months and B invests Rs. y for q months then,
   (A's share of profit) : (B's share of profit)= $xp : yq$.

Working and Sleeping Partners:

A partner who manages the the business is known as a working partner and the one who simply invests the money is a sleeping partner.

Example 1: **A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is:**

Solution : Let the total profit be Rs. 100.

After paying to charity, A's share = Rs. $(95 \times \frac{3}{5}) = Rs.\, 57$

If A's share is Rs. 57, total profit = Rs. 100**.**
If A's share Rs. 855, total profit = $(\frac{100}{57} \times 855) = 1500$

Example 2: A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.

Solution : For managing, A received = 5% of Rs. 7400 = Rs. 370.

Balance = Rs. (7400 - 370) = Rs. 7030.

Ratio of their investments = (6500 x 6) : (8400 x 5) : (10000 x 3)

$\quad$ = 39000 : 42000 : 30000

$\quad$ = 13 : 14 : 10

B's share = Rs.$(7030 \times \frac{14}{37}) = Rs.\,2660$

Example 3: Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?

Solution : Let their investments be Rs. x for 14 months, Rs. y for 8 months and Rs. z for 7 months respectively.
Then, $14x : 8y : 7z = 5 : 7 : 8$.

Now, $\frac{14x}{8y} = \frac{5}{7} \iff 98x = 40y \implies y = \frac{49}{20}x$

And , $\frac{14x}{7z} = \frac{5}{8} \iff 112x = 35z \implies z = \frac{16}{5}x$

x : y : z = x : $\frac{49}{20}x$: $\frac{16}{5}x$ = 20 : 49 : 64.

Example 4: A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?
Solution : A : B : C = (20,000 x 24) : (15,000 x 24) : (20,000 x 18) = 4 : 3 : 3.
B's share = Rs. $(25000 \times \frac{3}{10}) = Rs.\,7500$

Example 5 : **A and B started a partnership business investing some amount in the ratio of 3 : 5. C joined then after six months with an amount equal to that of B. In what proportion should the profit at the end of one year be distributed among A, B and C?**

Solution : Let the initial investments of A and B be $3x$ and $5x$.
A : B : C = ($3x$ x 12) : ($5x$ x 12) : ($5x$ x 6) = 36 : 60 : 30 = 6 : 10 : 5.

Example 6 : **The profit – sharing ratio of A to B is 4 : 11. If A invests 12000 rupees on the first day of the business, what should B invest after 6 months to maintain the profit – sharing ratio.**

Solution : The profit – sharing ratio = 4 : 11

The investment of A = 12000 for 12 months

Let the investment of B be x rupees for 6 months.

12000 * 12 : 6x = 4 : 11

144000 / 6x = 4 / 11

X = 144000 / 24 * 11 = 66000 rupees

Example 7: **A began a business with Rs. 85,000. He was joined afterwards by B with Rs. 42,500. For how much period does B join, if the profits at the end of the year are divided in the ratio of 3 : 1?**

Solution : Suppose B joined for x months.

Then, $\dfrac{85000 \times 12}{42500 \times x} = \dfrac{3}{1}$

$x = \dfrac{85000 \times 12}{42500 \times 3} = 8$

So, B joined for 8 months.

Example 8: Aman started a business investing Rs. 70,000. Rakhi joined him after six months with an amount of Rs.. 1,05,000 and Sagar joined them with Rs. 1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, 3 years after Aman started the business?
Solution :

Aman : Rakhi : Sagar = (70,000 x 36) : (1,05,000 x 30) : (1,40,000 x 24) = 12 : 15 : 16.

Example 9: Arun, Kamal and Vinay invested Rs. 8000, Rs. 4000 and Rs. 8000 respectively in a business. Arun left after six months. If after eight months, there was a gain of Rs. 4005, then what will be the share of Kamal?

Solution :

Arun : Kamal : Vinay = (8,000 x 6) : (4,000 x 8) : (8,000 x 8)

= 48 : 32 : 64

= 3 : 2 : 4.

Kamal's share = Rs $(4005 \times \frac{2}{9}) = Rs.\,890$

Example 10 : Simran started a software business by investing Rs. 50,000. After six months, Nanda joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit?

Solution : Simran : Nanda = (50000 x 36) : (80000 x 30) = 3 : 4.

Simran's share = Rs.$(24500 \times \frac{3}{7}) = Rs.\,10,500.$

4.3 Simple interest & Compound Interest

When a person borrows some money from another person, the lender has to sacrifice his present needs. So lender should compensate for this sacrifice. This compensation is known asinterest.

Simple interest

The borrower has to pay interest according to some percent(interest rate) of principle for the fixed period of time. This percentage is known as Interest Rate. For example, the rate of interest is 10% per annum means the interest payable on Rs 100 for one year is Rs 10.

Some Basic Formulas

If A = AmountP = Principle
I = Interest
T = Time in years
R = Rate of interest per year, thenAmount = Principle + Interest
A = P + I

$$\text{Simple Interest} = \frac{\text{Principle} \times \text{Rate} \times \text{Time}}{100}$$

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

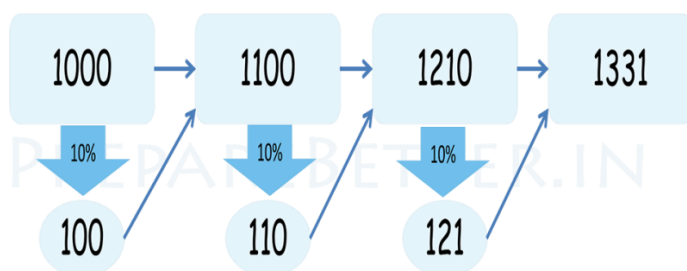$$R = \frac{I \times 100}{P \times T} \quad OR \quad P = \frac{I \times 100}{R \times T} \quad OR \quad T = \frac{I \times 100}{P \times R}$$

Compound Interest

In Compound Interest, every year interest value is added to principle and then interest is calculated on the amount.
To understand compound interest clearly, let's take an example.
Ram borrowed Rs 1000 from Sham for 3 years. What will be the interest value ?

Year	Principle	Interest (10%)	Amount
1st	1000	100	1100
2nd	1100	110	1210
3rd	1210	121	1331

Some Basic Formulas

If A = Amount
P = Principle
C.I. = Compound Interest
T = Time in years
R = Interest Rate Per Year

$$\text{C.I.} = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$$

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

Shortcut Formulas

If rate of interest is R1% for first year, R2% for second year and R3% for third year,
Then

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

Rule

If principle = P, Rate = R% and Time = T years, then
1. **If the interest is compounded annually:**

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

2. **If the interest is compounded half yearly (two times in year):**

$$A = P\left(1 + \frac{R/2}{100}\right)^{2T}$$

3. **If the interest is compounded quarterly (four times in year):**

$$A = P\left(1 + \frac{R/4}{100}\right)^{4T}$$

Example 1:
Find the simple interest on Rs. 7000 at 50/3% for 9 months.

Solution:

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{7000 \times 50 \times 9}{100 \times 12 \times 3} = 875$$

Example 2:

If A lends Rs.3500 to B at 10% p.a. and B lends the same sum to C at 11.5% p.a., then thegain of B (in Rs.) in a period of 3 years is

Solution:

$$\text{Gain of B} = \frac{3500 \times 11.5 \times 3}{100} - \frac{3500 \times 10 \times 3}{100}$$

$$= 157.50$$

Example 3:
An automobile financier claims to be lending money at simple interest, but he includes the interest every six months for calculating the principal. If he is charging an interest of10%, the effective rate of interest becomes:

Solution:
Let the sum be Rs.100 , then

$$\text{S.I. for first 6 months} = \text{Rs.}\left[\frac{100 \times 10 \times 1}{100 \times 2}\right] = \text{Rs.5}$$

$$\text{S.I. for last 6 months} = \text{Rs.}\left[\frac{105 \times 10 \times 1}{100 \times 2}\right] = \text{Rs. 5.25}$$

So, amount at the end of 1 year = Rs. (100 + 5 +5.25) = Rs.110.25

So, effective rate = (110.25 - 100) = 10.25%

Example 4:

A lent Rs. 5000 to B for 2 years and Rs. 3000 to C for 4 years on simple interest at the same rate of interest and received Rs. 2200 in all from both of them as interest. The rateof interest per annum is:

Solution:
Let the rate be R% per Annum

Then $[\frac{5000 \times 2 \times R}{100}] + [\frac{3000 \times 4 \times R}{100}] = 2200$

$\therefore 100R + 120R = 2200$

$R = \frac{2200}{220} = 10$

So, rate = 10%

Example 5:

A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs. 362.50 more is lent but at the rate twice the former. At the end ofthe year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

Solution:
Let the original rate be R%. Then, new rate = (2R)%

Note: Here original rate is for 1 year (s); the new rate is for only 4 months, i.e $\frac{1}{3}$ year

So, $[\frac{725 \times 1 \times R}{100}] + [\frac{362.50 \times 1 \times 2R}{100 \times 3}] = 33.50$

$(2175 + 725)R = 33.50 \times 100 \times 3$

$(2175 + 725)R = 10050$

$(2900)R = 10050$

R = 3.46

Example 6 : What is the difference between the compound interests on Rs. 5000 for $1\frac{1}{2}$ years at 4% per annum compounded yearly and half-yearly?

Solution:

C.I. when interest compounded yearly $= Rs. [5000 \times (1 + \frac{4}{100}) \times (1 + \frac{\frac{1}{2} \times 4}{100})]$

$$= Rs. (5000 \times \frac{26}{25} \times \frac{51}{50})$$

$$= Rs. 5304.$$

C.I. when interest is compounded half-yearly $= Rs. [5000 \times (1 + \frac{2}{100})^3]$

$$= Rs. (5000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50})$$

$$= Rs. 5306.04$$

Difference = Rs. (5306.04 - 5304) = Rs. 2.04

Example 7 : The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is:

Solution: Amount = Rs. (30000 + 4347) = Rs. 34347.

Let the time be n years.

Then, $30000 (1 + \frac{7}{100})^n = 34347$

$\Rightarrow (\frac{107}{100})^n = \frac{34347}{30000} = \frac{11449}{10000} = (\frac{107}{100})^2$

n = 2 years.

Example 8 : At what rate of compound interest per annum will a sum of Rs. 1200 become Rs. 1348.32 in 2 years?

Solution: Let the rate be R% p.a.

Then, $1200 \times (1 + \frac{R}{100})^2 = 1348.32$

$\Rightarrow (1 + \frac{R}{100})^2 = \frac{134832}{120000} = \frac{11236}{10000}$

$(1 + \frac{R}{100})^2 = (\frac{106}{100})^2$

$\Rightarrow 1 + \frac{R}{100} = \frac{106}{100}$

$\Rightarrow \mathbf{R = 6\%}$

Example 9 : Albert invested an amount of Rs. 8000 in a fixed deposit scheme for 2 years at compound interest rate 5 p.c.p.a. How much amount will Albert get on maturity of the fixed deposit?

Solution:

Amount = Rs. $[8000 \times (1 + \frac{5}{100})^2]$

$= Rs. (8000 \times \frac{21}{20} \times \frac{21}{20})$

$= Rs. 8820.$

EXERCISE:

1. A sum of money at simple interest amounts to Rs. 815 in 3 years and to
   Rs. 854 in 4years. The sum is:
   a) Rs. 650   b) Rs. 690   c) Rs. 698
   d) Rs. 700   e) None of these

2. Mr. Thomas invested an amount of Rs. 13,900 divided in two different
   schemes A and B at the simple interest rate of 14% p.a. and 11% p.a.
   respectively. If the total amount ofsimple interest earned in 2 years be Rs.
   3508, what was the amount invested in Scheme B?
   a) 6400   b) 6500   c) 7200   d) 7500

3. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as
   interest at 4.5%per annum of simple interest?
   a) 3.5 years   b) 4 years   c) 4.5 years   d) 5 years

4. Reena took a loan of Rs. 1200 with simple interest for as many years as the rate of
   interest.If she paid Rs. 432 as interest at the end of the loan period, what was the rate of
   interest?
   a) 3.6   b) 6   c) 18   d) Data indequate

5. A sum of Rs. 12,500 amounts to Rs. 15,500 in 4 years at the rate of
   simple interest.What is the rate of interest?
   a) 3%   b) 4%   c) 5%   d) 6%

6. An amount of Rs.1,00,000 is invested in two types of shares. The first
   yields an interest of 9% p.a. and the second, 11% p.a. If the total interest
   at the end of one year is $9 \frac{3}{4}$%, then the amount invested in each share
   was :
   a) Rs.52,500, Rs.47,500   b) Rs.62,500, Rs.37,500
   c) Rs.72,500, Rs.27,500   d) Rs.82,500, Rs.17.500
   e) None of these

7. The compound interest on a sum of money for 2 years is Rs.832 and the simple interest
   on the same sum for the same period is Rs.800. The difference between the compound
   Interest and the simple interest for 3 years will be;
   a) Rs.4   b) Rs.66.5   c) Rs.98.56   d) Data inadequate   e) None of these

8. On a sum of money, the simple interest for 2 years is Rs.660, while the compound interest is Rs.696.30, the rate of interest being the same in both the cases. The rate of interest is :

  a) 10%   b) 10.5%   c) 12%
  d) Data inadequate   e) None of these

9. A lends Rs.2500 to B and a certain sum to C at the same time at 7% p.a. simple interest. If after 4 years, A altogether receives Rs.1120 as interest from B and C, then the sum lent to C is :
  a) Rs.700   b) Rs.1500   c) Rs.4000
  d) Rs.6500   e) None of these

10. If a sum of money at simple interest doubles in 6 years, it will
  become 4 times in :
  a) 12 years   b) 14 years   c) 16 years
  d) 18 years   e) None of these

ANSWERS :

  1) C   2) A   3) B   4) B   5) D   6) B   7) C   8) E (11%)   9) B   10) D