

UNIT

3

BUSINESS MATHEMATICS

- ▶ Profit and Loss
- ▶ Discount
- ▶ Business Partnership

After completion of this unit, the students will be able to:

- ▶ Know the:
 - Cost price (CP) as the price, an article is purchased for.
 - Selling price (SP) as the price, an article is sold for.
- ▶ Identify the following relations regarding profit (when $SP > CP$):

$$\begin{aligned}
 &\bullet \text{ Profit} = SP - CP, \quad \bullet SP = \text{Profit} + CP, \quad \bullet CP = SP - \text{Profit}, \\
 &\bullet \text{ Profit \%} = \frac{\text{Profit}}{CP} \times 100, \quad \bullet \text{ Profit} = \frac{CP \times \text{Profit \%}}{100}, \quad \bullet SP = CP \times \left(\frac{100 + \text{Profit \%}}{100} \right), \quad \bullet CP = \frac{100 \times SP}{100 + \text{Profit \%}}
 \end{aligned}$$

- ▶ Identify the following relations regarding loss (when $SP < CP$):

$$\begin{aligned}
 &\bullet \text{ Loss} = CP - SP, \quad \bullet SP = CP - \text{Loss}, \quad \bullet CP = \text{Loss} + SP, \\
 &\bullet \text{ Loss \%} = \frac{\text{Loss}}{CP} \times 100, \quad \bullet \text{ Loss} = \frac{CP \times \text{Loss \%}}{100}, \quad \bullet SP = CP \times \left(\frac{100 - \text{Loss \%}}{100} \right), \quad \bullet CP = \frac{100 \times SP}{100 - \text{Loss \%}}
 \end{aligned}$$

- ▶ Solve real life problems involving profit and loss.
- ▶ Recognize marked price (MP) or list price of an article.
- ▶ Identify the following relations regarding discount:

$$\begin{aligned}
 &\bullet \text{ Discount} = MP - SP, \quad \bullet SP = MP - \text{Discount}, \\
 &\bullet \text{ Discount \%} = \frac{\text{Discount}}{MP} \times 100, \quad \bullet SP = MP \times \left(\frac{100 - \text{Discount \%}}{100} \right), \quad \bullet MP = \frac{100 \times SP}{100 - \text{Discount \%}}
 \end{aligned}$$

3.1 PROFIT AND LOSS

Traders purchase and sell goods and services. The traders may earn profit or incur losses. We use arithmetic to calculate cost of goods purchased and profit or loss incurred by traders.

In order to calculate costs, profit and loss, in our daily life, we use arithmetics. This is being done by purchasing some articles from different shops every day.

3.1.1 Cost Price and Selling Price

The price at which a particular item is purchased by shopkeepers is called the cost price. It is denoted by "CP".

The price at which an article is sold out to the customer by the shopkeeper is called the selling price. Selling price is denoted by "SP".

3.1.2 Profit

If the selling price of an article is greater than its cost price, then the profit is earned. Profit is denoted by "P". The following mathematical relations exist between profit, selling price, cost price and profit percentage.

$$\text{Profit} = \text{Selling Price} - \text{Cost Price}$$

$$P = SP - CP$$

$$SP = P + CP$$

$$\text{Profit \%} = \frac{\text{Profit}}{CP} \times 100 \Rightarrow \text{Profit} = \frac{CP \times \text{Profit \%}}{100}$$

Here $SP = \text{Profit} + CP$

Therefore $SP = \frac{CP \times \text{Profit \%}}{100} + CP$

or $SP = CP \times \left(\frac{\text{Profit \%} + 100}{100} \right)$

and $CP = SP \times \left(\frac{100}{100 + \text{Profit \%}} \right)$

EXAMPLE-1

A bicycle was purchased for Rs.3450 and sold for Rs.3850.
Find the profit percentage.

SOLUTION:

$$CP \text{ of the bicycle} = \text{Rs. } 3450$$

$$SP \text{ of the bicycle} = \text{Rs. } 3850$$

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

$$= \text{Rs. } 3850 - \text{Rs. } 3450$$

$$= \text{Rs. } 400$$

$$\text{Profit \%} = \left(\frac{\text{Profit} \times 100}{CP} \right) \%$$

$$= \left(\frac{400 \times 100}{3450} \right) \%$$

$$= 11.59\% \approx 11.6\%$$

EXAMPLE-2

A trader earns a profit of 20 % by selling a chair for Rs.2700.
Find the cost price of the chair.

SOLUTION: Let the cost price of the chair be Rs.100.

$$\text{Then profit} = \text{Rs. } 20 \text{ (i.e. } 20\%)$$

$$\text{Hence } SP = CP + P$$

$$\text{Therefore } SP = 100 + 20 = \text{Rs. } 120$$

$$\text{If } SP \text{ is Rs. } 120, \text{ then } CP = \text{Rs. } 100$$

$$\text{If } SP \text{ is Re. } 1, \text{ then } CP = \text{Rs. } \frac{100}{120}$$

$$= \text{Rs. } \frac{5}{6}$$

$$\text{If } SP \text{ is Rs. } 2700, \text{ then } CP = \text{Rs. } \left(2700 \times \frac{5}{6} \right)$$

$$= \text{Rs. } \frac{13500}{6}$$

$$\text{Cost price} = \text{Rs. } 2250$$

Alternate method:

We have the following formula to find cost price

$$CP = \left(\frac{100}{100 + \text{Profit \%}} \right) \times SP$$

$$= \text{Rs.} \left(\frac{100}{100 + 20} \right) \times 2700$$

$$= \text{Rs.} \frac{100 \times 2700}{120}$$

$$= \text{Rs.} \frac{13500}{6}$$

$$\text{Cost price} = \text{Rs.} 2250$$

EXAMPLE-3

If a television is purchased for Rs.6590 and sold for Rs.6850.
Find the profit percentage.

SOLUTION: Given

$$CP = \text{Rs.} 6590$$

$$SP = \text{Rs.} 6850$$

$$\text{Profit} = 6850 - 6590$$

$$\text{Profit} = \text{Rs.} 260$$

$$\text{Profit \%} = \left(\frac{\text{Profit} \times 100}{CP} \right) \%$$

$$= \left(\frac{260 \times 100}{6590} \right) \%$$

$$= 3.94\% \approx 4\%$$

EXAMPLE-4

If the selling price of 10 articles is equal to the cost price of 11 articles. Find the profit percentage.

SOLUTION: Let the cost price of each article be Re.1.

Then cost price of 10 articles = Rs.10

Then cost price of 11 articles = Rs.11

SP of 10 articles = CP of 11 articles

Therefore, selling price of 10 articles = Rs.11

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

Therefore,

$$\text{Profit} = \text{Rs.}(11 - 10) = \text{Rs.}1$$

$$\text{Profit \%} = \left(\frac{\text{Profit}}{\text{CP}} \times 100 \right) \%$$

Thus,

$$\begin{aligned} \text{Profit \%} &= \left(\frac{1}{10} \times 100 \right) \% \\ &= 10\% \end{aligned}$$

EXAMPLE-5

By selling 100 oranges, a vendor gains the selling price of 20 oranges. Find the profit percentage.

SOLUTION: Let the cost price of each orange be Re.1.

$$\begin{aligned} \text{Now } \text{SP of 100 oranges} &= \text{CP of 100 oranges} + \text{profit} \\ &= \text{CP of 100 oranges} + \text{SP of 20 oranges} \end{aligned}$$

Therefore SP of 80 oranges = CP of 100 oranges.

$$= \text{Rs.}100$$

$$\text{CP of 80 oranges} = \text{Rs.}80$$

Therefore

$$\text{Profit} = \text{Rs.}(100 - 80) = \text{Rs.}20$$

Thus

$$\begin{aligned} \text{Profit \%} &= \left(\frac{\text{Profit}}{\text{CP}} \times 100 \right) \% = \left(\frac{20}{80} \times 100 \right) \% \\ &= \left(\frac{1}{4} \times 100 \right) \% \\ &= 25\% \end{aligned}$$

EXAMPLE-6

A book is sold for Rs. 650 at a profit of 30%.

Find the cost price.

SOLUTION:

If there is a profit of 30% and the cost price is CP.

$$\begin{aligned}\text{Then} \quad CP &= \frac{100 \times SP}{100 + \text{profit \%}} \\ &= \frac{100 \times 650}{100 + 30} \\ &= \frac{65000}{130} \\ &= \text{Rs. } 500\end{aligned}$$

Thus cost price of book is Rs. 500

EXAMPLE-7

On an electronic shop a shopkeeper sells a room heater for

Rs. 2100 gaining $\frac{1}{6}$ of its cost price. Find his profit percentage.

SOLUTION:

$$\text{Let} \quad CP = \text{Rs. } x$$

$$\text{Profit} = \text{Rs. } \frac{x}{6}$$

$$\begin{aligned}\text{Therefore,} \quad SP &= \text{Profit} + CP = \text{Rs. } \left(\frac{x}{6} + x \right) \\ &= \text{Rs. } \left(\frac{7x}{6} \right)\end{aligned}$$

$$\text{Therefore,} \quad \frac{7x}{6} = 2100$$

$$\begin{aligned}x &= \frac{2100}{7} \times 6 \\ &= 300 \times 6 \\ &= \text{Rs. } 1800\end{aligned}$$

Therefore,

$$CP = \text{Rs.}1800, SP = \text{Rs.}2100$$

$$\text{Profit} = \text{Rs.}(2100 - 1800) = \text{Rs.}300$$

$$\text{Profit \%} = \left(\frac{P}{CP} \times 100 \right) \%$$

$$\text{Profit \%} = \left(\frac{300}{1800} \times 100 \right) \%$$

$$= \left(\frac{1}{6} \times 100 \right) \%$$

$$= 16.66 \%$$

Thus,

$$\text{Profit \%} = 16.67 \%$$

EXAMPLE-8

A shopkeeper bought 100 hockey balls for Rs.40 each. He sells 20 of them at a profit of 5%. At what profit percent must he sell the remaining so as to get profit 20% on the whole?

SOLUTION: CP of 20 hockey balls = Rs.(40 × 20)

$$= \text{Rs.}800$$

$$\text{Profit on 20 balls} = 5 \%$$

$$SP \text{ of 20 balls} = \text{Rs.} \left(\frac{105}{100} \times 800 \right)$$

$$= \text{Rs.}840$$

Now,

$$CP \text{ of 100 balls} = \text{Rs.}(40 \times 100)$$

$$= \text{Rs.}4000$$

$$\text{Required profit} = 20 \%$$

$$\text{Required SP} = \text{Rs.} \left(\frac{120}{100} \times 4000 \right)$$

$$= \text{Rs.}4800$$

Therefore, desired SP of 80 balls = Rs. (4800 - 840)

$$= \text{Rs. } 3960$$

$$\text{CP of 80 balls} = \text{Rs. } (40 \times 80)$$

$$= \text{Rs. } 3200$$

$$\text{required gain on 80 balls} = \text{Rs. } (3960 - 3200)$$

$$= \text{Rs. } 760$$

$$(\text{Required profit})\% = \left(\frac{\text{Profit}}{\text{CP}} \times 100 \right)\% = \left(\frac{760}{3200} \times 100 \right)\%$$

$$= \left(\frac{760}{32} \right)\%$$

$$= \left(\frac{190}{8} \right)\%$$

$$= 23.75\%$$

3.1.3 Loss

If the sales price of an article is less than its cost price, then there is always a loss. The following mathematical relations exist between loss, selling price, cost price and loss percentage.

$$\text{Loss} = \text{Cost Price} - \text{Selling Price}$$

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

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

$$\text{CP} = \text{Loss} + \text{SP}$$

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100.$$

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

$$\text{SP} = \text{CP} \times \left(\frac{100 - \text{Loss \%}}{100} \right)$$

$$\text{CP} = \frac{100 \times \text{SP}}{100 - \text{Loss \%}}$$

EXAMPLE-1

Daniyal buys 6 sweets at a rupee and sells them, 8 sweets for a rupee. Find his loss percentage.

SOLUTION: L.C.M of 6 and 8 is 24.

Let us suppose that Daniyal buys 24 sweets.

$$CP \text{ of 24 sweets} = Rs. \left(\frac{1}{6} \times 24 \right) = Rs. 4$$

$$SP \text{ of 24 sweets} = Rs. \left(\frac{1}{8} \times 24 \right) = Rs. 3$$

$$\begin{aligned} \text{Loss} &= CP - SP \\ &= Rs. (4 - 3) = Re. 1 \end{aligned}$$

$$\begin{aligned} \text{Thus, } \text{Loss \%} &= \frac{\text{loss}}{CP} \times 100 \\ &= \frac{1}{4} \times 100 = 25\% \end{aligned}$$

EXAMPLE-2

A shopkeeper sold two radios at Rs. 1020 each, On one he gains 20% and on another he loses 20%.

How much does he gain or lose in the whole transaction?

SOLUTION: In case of first radio:

$$SP = Rs. 1020, \quad \text{Profit} = 20\%$$

$$\begin{aligned} \text{Therefore, } CP &= Rs. \left(\frac{100}{120} \times 1020 \right) \\ &= Rs. (10 \times 85) \\ &= Rs. 850 \end{aligned}$$

In case of second radio:

$$SP = Rs. 1020, \quad \text{Loss} = 20\%$$

$$\begin{aligned} \text{Therefore, } CP &= Rs. \left(\frac{100}{80} \times 1020 \right) \\ &= Rs. \left(\frac{5}{4} \times 1020 \right) \\ &= Rs. (5 \times 255) \\ &= Rs. 1275 \end{aligned}$$

$$\text{Total cost of both the radios} = \text{Rs. } 850 + \text{Rs. } 1275$$

$$= \text{Rs. } 2125$$

$$\text{Total sale price of both the radios} = \text{Rs. } (1020 \times 2)$$

$$= \text{Rs. } 2040$$

$$\text{Loss in whole transaction} = \text{Rs. } (2125 - 2040)$$

$$= \text{Rs. } 85$$

$$\text{Thus, Loss \%} = \left(\frac{85}{2125} \times 100 \right) \%$$

$$= 4\%$$

$$\text{Loss \%} = 4\%$$

EXAMPLE-3

A bicycle dealer sells a bicycle at a profit of 8%. Had he sold it for Rs. 75 less he would have lost 2%. Find the cost price of the bicycle.

SOLUTION: Let the CP = Rs. x .

$$\text{Hence } SP = CP \left(\frac{\text{Profit \%} + 100}{100} \right)$$

when $SP > CP$

$$\begin{aligned} \text{Therefore selling price at a profit of 8\%} &= \text{Rs. } \left(\frac{108}{100} \times x \right) \\ &= \text{Rs. } \left(\frac{27}{25} x \right) \end{aligned}$$

$$SP = CP \left(\frac{100 - \% \text{ Loss}}{100} \right), \text{ when } SP < CP$$

$$SP \text{ at a loss of 2\%} = \text{Rs. } \left(\frac{98}{100} \times x \right) = \text{Rs. } \frac{49}{50} x$$

$$\text{Difference between the selling prices} = \text{Rs. } \left(\frac{27}{25} x - \frac{49}{50} x \right)$$

$$= \text{Rs. } \left(\frac{54x - 49x}{50} \right)$$

$$= \text{Rs. } \frac{5x}{50} = \text{Rs. } \frac{x}{10}$$

$$\text{But } \text{Rs. } \frac{x}{10} = 75 \text{ (given)}$$

$$\Rightarrow x = 75 \times 10$$

$$\Rightarrow x = \text{Rs. } 750$$

Thus, the cost price of the bicycle is Rs. 750.

EXAMPLE-4

A boy bought a book for Rs. 575 and sold it for Rs. 320. What was his loss percentage?

SOLUTION: CP of the book = Rs. 575

SP of the book = Rs. 320

Loss = CP - SP

$$= \text{Rs. } (575 - 320)$$

$$= \text{Rs. } 255$$

$$\text{Loss percentage} = \left(\frac{\text{loss}}{\text{cost price}} \times 100 \right) \%$$

$$= \left(\frac{255}{575} \times 100 \right) \%$$

$$= \left(\frac{51}{115} \times 100 \right) \%$$

$$= \left(\frac{5100}{115} \right) \% = 44.34 \%$$

3.1.4 Real Life Problems

In our daily life when we go to the market to purchase different sort of items like books, cloth, grocery, ready-made garments, electronics etc., we experience about CP, SP, Profit and Loss.

Let us consider the following examples for this purpose.

EXAMPLE-1

A shopkeeper sells a fan for Rs. 1520. At what price should he sell it to get a profit of 15%?

SOLUTION: Let the cost price is Rs. 100. Then a profit of 15% means, that the selling price is:

$$\text{Rs. } (100 + 15) = \text{Rs. } 115$$

$$\text{when CP} = \text{Rs. } 100, \text{ then SP} = \text{Rs. } 115$$

$$\text{when CP} = \text{Rs. } 1, \text{ then SP} = \text{Rs. } \frac{115}{100}$$

$$\text{when CP} = \text{Rs. } 1520, \text{ then SP} = \text{Rs. } \frac{115}{100} \times 1520$$

$$= \text{Rs. } 23 \times 76 = \text{Rs. } 1748$$

EXAMPLE-2

While selling a shirt for Rs. 960, the shopkeeper lost 20%.
For what price should he sell to get 35% profit?

SOLUTION: Let CP = Rs. 100

$$\text{Loss} = \text{Rs. } 20$$

$$\text{SP} = \text{Rs. } (100 - 20)$$

$$= \text{Rs. } 80$$

when, SP is Rs. 80 then CP = Rs. 100

$$\text{when, SP is Re. 1 then CP} = \text{Rs. } \frac{100}{80}$$

$$\text{when, SP is Rs. 960, then CP} = \text{Rs. } \frac{100}{80} \times 960$$

$$= \text{Rs. } 100 \times 12$$

$$= \text{Rs. } 1200$$

Thus the CP of the shirt is Rs. 1200.

Again let the CP = Rs. 100

Profit 35% means, SP = Rs. 135

$$\text{when, CP} = \text{Re. } 1, \text{ then SP} = \text{Rs. } \frac{135}{100}$$

$$\text{when, CP} = \text{Rs. } 1200, \text{ then SP} = \text{Rs. } \frac{135}{100} \times 1200$$

$$= \text{Rs. } 1620$$

Hence the shirt should be sold for Rs. 1620
to make a profit of 35%.

EXERCISE - 3.1

- 1- Find the *SP*, when
 - (i) $CP = \text{Rs. } 950$, $\text{Profit} = 10\%$
 - (ii) $CP = \text{Rs. } 1540$, $\text{Loss} = 5\%$
 - (iii) $CP = \text{Rs. } 9600$, $\text{Profit} = 10\%$
 - (iv) $CP = \text{Rs. } 126000$, $\text{Loss} = 5\%$
 - (v) $CP = \text{Rs. } 480$, $\text{Profit} = 3\%$
 - (vi) $CP = \text{Rs. } 760$, $\text{Loss} = 4\%$
- 2- Haris purchased a car for $\text{Rs. } 248000$ and spent $\text{Rs. } 12000$ on its denting and painting. He sold that at a profit of 5% . What did the customer pay to Haris?
- 3- Find the *CP*, when
 - (i) $SP = \text{Rs. } 672$, $\text{Profit} = 5\%$
 - (ii) $SP = \text{Rs. } 851$, $\text{Loss} = 8\%$
 - (iii) $SP = \text{Rs. } 1755$, $\text{Profit} = 12\frac{1}{2}\%$
 - (iv) $SP = \text{Rs. } 2640$, $\text{Loss} = 12\%$
 - (v) $SP = \text{Rs. } 100$, $\text{Profit} = 33\frac{1}{2}\%$
- 4- A shop-keeper gains a profit of 7% by selling a dinner set for $\text{Rs. } 3852$. If he sells it for $\text{Rs. } 4050$, find his profit percentage.
- 5- The selling price of 12 articles is equal to the cost price of 15 articles. Find profit percentage.
- 6- Find the cost price, if a fan is sold for $\text{Rs. } 1470$, to get a profit $\frac{1}{6}$ of its cost price.
- 7- A man sold an almirah at a profit of $7\frac{1}{2}\%$, had he sold it for $\text{Rs. } 209$, he would have lost 2% . For how much the man purchased it?
- 8- Three chairs are purchased at $\text{Rs. } 450$ each. One of these is sold at a loss of 10% . At what price should the other two be sold so as to gain 20% on the whole transaction?

3.2 DISCOUNT

A deduction offered on the marked price or the list price of goods by the seller to the purchaser is called discount.

3.2.1 Marked Price (MP) and List Price

The printed price on the tag or wrapper of the article is called marked price (MP). The price of an article given in the list provided by the manufacturer to the trader is called list price (LP).

$$\text{Discount} = \text{List Price or Marked Price} \times \text{Discount \%}$$

$$\text{Discount} = \text{Marked Price} - \text{Sale Price.}$$

$$= \text{MP} - \text{SP}$$

$$\text{or Discount} = \text{List Price} - \text{Sale Price.}$$

$$= \text{LP} - \text{SP}$$

3.2.2 Relations Regarding Discount

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

$$= \text{MP} - \text{SP}$$

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

$$\text{SP} = \text{MP} - \text{Discount}$$

$$\text{Discount \%} = \frac{\text{Discount}}{\text{MP}} \times 100$$

$$\text{Sale Price} = \text{Marked Price} \times \left(\frac{100 - \text{Discount \%}}{100} \right)$$

$$\text{SP} = \text{MP} \times \left(\frac{100 - \text{Discount \%}}{100} \right)$$

$$\text{MP} = \frac{100 \times \text{SP}}{100 - \text{Discount \%}}$$

3.2.3 Real Life Problems

EXAMPLE-1

The marked price of a toy is Rs.750 and 2% discount is offered on cash payment. What cash payment one should pay for the toy?

SOLUTION:

Marked price of the toy = Rs.750, Discount rate = 2%

$$\begin{aligned}\text{Discount} &= (\text{Discount \%} \times \text{MP}) = \text{Rs.} \left(\frac{2}{100} \times 750 \right) \\ &= \text{Rs.} 15\end{aligned}$$

$$\text{SP} = \text{MP} - \text{Discount}$$

$$\text{SP} = \text{Rs.}(750 - 15) = \text{Rs.} 735$$

Thus Rs. 735 should be paid to purchase the toy.

EXAMPLE-2

An article is sold for Rs.1000 after allowing a discount of 7% on the marked price. Find its marked price.

SOLUTION: Let the marked price be Rs.100

Discount allowed on it = 7% of Rs.100

$$\begin{aligned}&= \frac{7}{100} \times 100 \\ &= \text{Rs.} 7\end{aligned}$$

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

$$\text{Selling Price} = \text{Rs.}(100 - 7) = \text{Rs.} 93$$

If SP is Rs.93, its marked price = Rs.100.

$$\text{If SP is Re.1, its marked price} = \text{Rs.} \frac{100}{93}$$

$$\begin{aligned}\text{If SP is Rs.1000, its marked price} &= \text{Rs.} \left(\frac{100}{93} \times 1000 \right) \\ &= \text{Rs.} 1075.27\end{aligned}$$

$$\text{Thus, MP} = \text{Rs.} 1075.27$$

EXAMPLE-3

A television dealer marks a television with a price which is 20% more than the cost price and offers of 10 % discount on it. Find the profit percentage.

SOLUTION: Let the CP be Rs.100

$$MP = \text{Rs.}(100 + 20)$$

$$= \text{Rs.}120$$

$$10\% \text{ of Rs.}120 = \frac{10}{100} \times 120$$

$$\text{Discount} = \text{Rs.}12$$

Therefore,

$$SP = \text{Rs.}(120 - 12)$$

$$= \text{Rs.}108$$

$$\begin{aligned} \text{Thus, Profit Percentage} &= (SP - CP)\% = (108 - 100)\% \\ &= 8\% \end{aligned}$$

EXAMPLE-4

A shopkeeper offers a discount of 15% on the marked price. How much more the cost price must he mark on his goods to gain a profit of 19 %?

SOLUTION: Let the cost price be. Rs.100

$$\text{Then gain} = 19\% \text{ of Rs.}100 = \text{Rs.}19$$

$$\text{Therefore } SP = \text{Rs.}(100 + 19)$$

$$= \text{Rs.}119$$

$$\text{When MP is Rs.}100, \text{ then } SP = 100 - 15 = \text{Rs.}85$$

$$\text{If SP is Rs.}85, \text{ then MP} = \text{Rs.}100$$

$$\text{If Re.1 is the SP, then MP} = \text{Rs.}\left(\frac{100}{85}\right)$$

$$\text{If Rs.}119 \text{ is the SP, then MP} = \text{Rs.}\left(\frac{100}{85} \times 119\right)$$

$$= \text{Rs.}140$$

Thus shopkeeper must mark his goods 40 % above the cost price.

EXAMPLE-5

During January sales, a departmental store offers a discount of 10% on marked prices. What is the purchase price of a dinner set with marked price as Rs. 8450?

SOLUTION: Discount of 10% on a MP of Rs. 8450

$$\begin{aligned} &= MP \times 10\% \\ &= 8450 \times \frac{10}{100} \\ &= \text{Rs. } 845 \end{aligned}$$

$$\text{Purchase Price} = \text{Marked Price} - \text{Discount}$$

$$= \text{Rs. } (8450 - 845)$$

$$= \text{Rs. } 7605$$

EXAMPLE-6

A bicycle dealer offers a discount of 10% and still makes a profit of 26%. What is the actual cost of a bicycle, with marked price as Rs. 840?

SOLUTION: MP = Rs. 840

$$\text{Discount} = 10\% \times MP = \text{Rs. } \left(\frac{10}{100} \times 840 \right) = \text{Rs. } 84$$

$$SP = \text{Rs. } (840 - 84) = \text{Rs. } 756$$

$$\text{Profit} = 26\%$$

$$CP = \frac{100}{100 + \text{Profit \%}} \times SP$$

$$\text{Therefore, } CP = \text{Rs. } \left(\frac{100}{100 + 26} \times 756 \right)$$

$$= \text{Rs. } \left(\frac{100}{126} \times 756 \right)$$

$$= \text{Rs. } (100 \times 6)$$

$$= \text{Rs. } 600$$

EXERCISE - 3.2

- 1- Find the selling price, when,
 - (i) $MP = \text{Rs. } 728$, $\text{Discount} = 6\%$
 - (ii) $MP = \text{Rs. } 2760$, $\text{Discount} = 5\%$
 - (iii) $MP = \text{Rs. } 395.75$, $\text{Discount} = 8\%$
- 2- Find the marked price when,
 - (i) $SP = \text{Rs. } 515.20$, $\text{Discount} = 8\%$
 - (ii) $SP = \text{Rs. } 858$, $\text{Discount} = 12\%$
 - (iii) $SP = \text{Rs. } 2400$, $\text{Discount} = 4\%$
- 3- The marked price of a ceiling fan is $\text{Rs. } 720$. It is sold for $\text{Rs. } 684$. What percentage discount is being allowed?
- 4- The marked price of washing machine is $\text{Rs. } 3640$. During sale season it is sold for $\text{Rs. } 3367$. Find the discount percentage.
- 5- The marked price of a book is $\text{Rs. } 480$. The shopkeeper offers a discount of 10% and still gains 8% . Find the price at which the shopkeeper purchased it.
- 6- A trader marks his goods in such a way that after allowing a discount of 10% , he gains 15% . If an article costs him $\text{Rs. } 720$, what is its marked price?
- 7- The list price of a TV is $\text{Rs. } 12600$. A discount of 5% is allowed on it. Further for cash payment a second discount of 2% is given. How much cash payment is to be made for buying it?
- 8- If 15% discount on MP of a heater is allowed and still makes a profit of 2% . If it is sold on MP , what is profit percentage?

$$\text{Total loss} = \text{Rs. } 10,00,000$$

$$\text{Loss of the first share holder} = \frac{2}{10} \times 10,00,000 = \text{Rs. } 200,000$$

$$\text{Loss of the second share holder} = \frac{3}{10} \times 10,00,000 = \text{Rs. } 300,000$$

$$\text{Loss of the third share holder} = \frac{5}{10} \times 10,00,000 = \text{Rs. } 500,000$$

EXAMPLE-3

Rs. 3720 are to be divided into three shares in such a way that 1st share would be double, triple to the 2nd and 5 times to the 3rd are equal.

SOLUTION: Let the 1st, 2nd and 3rd shares be x, y and z respectively. According to the condition of the question.

$$2x = 3y = 5z$$

$$\frac{2x}{30} = \frac{3y}{30} = \frac{5z}{30} \quad (\text{dividing by 30, the L.C.M of 2, 3 and 5})$$

$$\frac{x}{15} = \frac{y}{10} = \frac{z}{6}$$

$$\text{Therefore } x : y : z = 15 : 10 : 6$$

$$\begin{aligned} \text{Sum of ratios} &= 15 + 10 + 6 \\ &= 31 \end{aligned}$$

$$\begin{aligned} \text{1st share} &= \text{Rs. } 3720 \times \frac{15}{31} \\ &= \text{Rs. } 120 \times 15 \\ &= \text{Rs. } 1800 \end{aligned}$$

$$\begin{aligned} \text{2nd share} &= \text{Rs. } 3720 \times \frac{10}{31} \\ &= \text{Rs. } 120 \times 10 \\ &= \text{Rs. } 1200 \end{aligned}$$

$$3\text{rd share} = \text{Rs.} 3720 \times \frac{6}{31}$$

$$= \text{Rs.} 120 \times 6$$

$$= \text{Rs.} 720$$

$$\text{Check: } \text{Rs.} 1800 + \text{Rs.} 1200 + \text{Rs.} 720 = \text{Rs.} 3720$$

EXAMPLE-4

Jamila and Alia enter into partnership and their shares are in the ratio of $\frac{1}{2} : \frac{1}{3}$. After 4 months, Jamila withdraws half of her capital and after 8 months more, a profit of Rs. 500 is divided. What is Jamila's share of profit?

SOLUTION: Ratio of Profit = $\frac{1}{2} : \frac{1}{3} = 3 : 2$

They must put their capital in the same ratio. If Jamila puts Rs. 300, then Alia puts Rs. 200. After 4 months Jamila withdraws half of her capital.

$$\text{After 8 months profit earned} = \text{Rs.} 500$$

$$\text{Jamila's investment for 4 months} = 300 \times 4$$

$$= \text{Rs.} 1200$$

$$\text{Jamila's investment for the next 8 months} = \frac{1}{2} \times (300) \times 8$$

$$= \text{Rs.} 150 \times 8$$

$$= \text{Rs.} 1200$$

$$\text{Jamila's investment for 12 month} + \text{Rs.} 1200 = \text{Rs.} 1200$$

$$= \text{Rs.} 2400$$

$$\text{Alia's investment for 12 month} = 200 \times 12$$

$$= \text{Rs.} 2400$$

Since, the investment for each is the same,

$$\text{thus Jamila's profit in Rs.} 500 = \frac{1}{2} \times 500$$

$$= \text{Rs.} 250$$

EXAMPLE-5

Umer and Ali purchased a plot with an investment of Rs. 3,00,000 and Rs.5,00,000 respectively. On selling the plot they got a profit of Rs. 2,20,000. Find the share of each in profit.

SOLUTION:

$$\begin{array}{lcl} \text{Umer} & & \text{Ali} \\ \text{invested} & & \text{invested} \\ 3,00,000 & : & 5,00,000 \\ & & 3 : 5 \end{array}$$

$$\text{Ratio of profit} = 3 : 5$$

$$\text{Sum of the ratios} = 3 + 5 = 8$$

$$\text{Total profit} = \text{Rs. } 2,20,000$$

$$\text{Umer's share in profit} = \frac{2,20,000}{8} \times 3$$

$$= 27500 \times 3$$

$$= \text{Rs. } 82,500$$

$$\text{Ali's share in profit} = \frac{2,20,000}{8} \times 5$$

$$= 27500 \times 5$$

$$= \text{Rs. } 1,37,500$$

EXERCISE - 3.3

- 1- Distribute Rs. 200,000 as a profit in a business regarding three persons, if their shares are in the ratio 3:2:5.
- 2- If Ali, Daniyal and Abdullah earned 15 % profit against an investment of Rs. 750,000. Find the profit of each if their shares are in the ratio 2:3:5.
- 3- Distribute Rs. 720 as profit amongst three people, so that their shares are in the ratio 3:4:5.

- 4- Three persons invested an amount of Rs. 3,000,000 in a business with shares ratio 2:3:7. They earned a profit of Rs. 600,000. If they are interested to wind up their business, what amount every share holder would get?
- 5- Three members of a firm distribute the profit Rs. 67,200 among themselves in the ratio 2:3:7. What is the biggest share of the profit?
- 6- A sum of money is divided among three persons, A, B and C in the ratio 10:7:5 respectively. If "B" gets Rs. 14 more than "C". How much will "A" get and what is the total sum of money?

Review Exercise-3

1- Encircle the correct answer.

i. Profit is earned when:

- (a) $SP = CP$ (b) $SP < CP$ (c) $SP > CP$ (d) none of these

ii. Loss is there when:

- (a) $SP = CP$ (b) $SP < CP$ (c) $SP = MP$ (d) $SP > CP$

iii. Profit % = ? where $SP > CP$

- (a) $\frac{\text{profit}}{CP}$ (b) $\frac{\text{profit}}{CP} \times 100$
 (c) $\frac{CP \times \text{profit \%}}{100}$ (d) $\frac{100 \times SP}{100 + \text{profit \%}}$

iv. $SP = ?$ where $SP > CP$

- (a) $\text{Profit} - CP$ (b) $\left(\frac{100 + \text{profit \%}}{100} \right) \times CP$
 (c) $CP - \text{Loss}$ (d) $\frac{CP \times \text{loss \%}}{100}$

v. $CP = ?$

- (a) $\frac{100 \times SP}{100 + \text{profit \%}}$ (b) $\text{loss} - SP$
 (c) $MP + \text{discount}$ (d) $\frac{\text{discount} \times 100}{MP}$

2- Fill in the blanks.

- The price at which a particular item is purchased is called _____
- The price at which an article is sold out is called _____
- When $SP > CP$, $CP = SP - ?$ _____
- When $SP < CP$, $Loss \% =$ _____
- $MP = \frac{100 \times SP}{?}$ _____

- A shopkeeper gains a profit of 8% by selling a washing machine for Rs. 12000. If he sells it for Rs. 10,500, find his loss percentage.
- If there is a 10% discount on marked price of a television and still makes a profit of 5%. If it is sold in marked price, what is profit percentage?
- Distribute Rs. 33,000 as a profit in a business regarding three persons, if their shares are in the ratio 3:5:3.
- Three members of a firm distribute the profit amounting Rs. 1,44,000 among themselves in the 3:4:5.
 - What is the biggest share of the profit?
 - What is the smallest share of the profit?

SUMMARY

- ✦ The price at which a particular item is purchased is called cost price. It is denoted by "CP".
- ✦ The price at which an article is sold out is called the sale price. It is denoted by "SP".
- ✦ If the selling price of an article is greater than its cost price, then the difference of these two is the profit earned. It is denoted by "P".
- ✦ If the selling price of an article is less than its cost price, then the difference of these two is the loss. It is denoted by "L".
- ✦ Some times a rebate is declared on the selling price of an article, this rebate is called the discount.
- ✦ The price tagged on a card of each and every article in a shop is known as the marked price, It is denoted by "MP".