CHAPTER – 3

PERCENTAGES – PROFIT & LOSS – PARTNERSHIPS

PERCENTAGE

"Percent" implies "for every hundred". This concept is developed to make the comparison of fractions easier by equalising the denominators of all fractions to hundred.

For example, 7/11 as percentage is represented as $\frac{7}{11}=\frac{7\times100}{11\times100}=\frac{(7\times100)/11}{100}=\frac{63.63}{100}$ = 63.63%

Percentages can also be represented as decimal fractions. In such a case it is effectively equivalent to the proportion of the original quantity.

For example, 20% is the same as $\frac{20}{100}$, i.e, 0.2.

Any percentage can be expressed as a decimal fraction by dividing the percentage figure by 100 and conversely, any decimal fraction can be converted to percentage by multiplying it by 100.

PERCENTAGE INCREASE or DECREASE of a quantity is the ratio expressed in percentage of the actual INCREASE or DECREASE of the quantity to the original amount of the quantity, i.e.,

$$\text{PERCENTAGE INCREASE} = \frac{\text{Actual increase}}{\text{Original quantity}} \times 100$$

$$\text{PERCENTAGE DECREASE} = \frac{\text{Actual decrease}}{\text{Original quantity}} \times 100$$

For example, if the production of rice went up from 225 MT in 1993 to 242 MT in 1994, then the percentage increase in rice production from 1993 to 1994 is calculated as follows:

Actual increase = 242 – 225 = 17 MT
Percentage increase

$$= \frac{\text{Quality increased from 1993 to 1994}}{\text{Actual production of rice in 1993}} \times 100$$

$$= \frac{17}{225} \times 100 = 7^5/_9\%$$

Ratio of any two quantities also can be expressed as percentage.

For example, if the ratio of A and B is 3 : 2, we can say the ratio of A : B is 60% : 40%.

Whenever there is any percentage increase or decrease on a quantity, we can directly calculate the new value of the quantity instead of calculating the actual increase/decrease and then adding to/subtracting from the original quantity.
For example, if the increase on a value of 350 is 15%, the new quantity is 1.15 × 350 = 402.5 (where 1.15 = 1 + 0.15, 0.15 being the decimal equivalent of 15%).

If the production in 1994 is given as 400 MT and the increase from 1993 to 1994 is given to be 25%, then the production in 1993 will be equal to 400/1.25 = 320 MT (where 1.25 = 1 + 0.25, 0.25 being the decimal equivalent of 25%).
Similarly, if there is a decrease of 12% on a quantity of 225, then the new quantity will be equal to 225 × 0.88 (where 0.88 = 1 – 0.12, 0.12 being the decimal equivalent of 12%).

If the production in 1994 is given as 400 MT and it is a decrease of 13% from 1993, then the production in 1993 will be equal to 400/0.87 (where 0.87 = 1 – 0.13, 0.13 being the decimal equivalent of 13%).

On the basis of percentage increase, we can write down how many times the old value gives the new value. For example, if the percentage increase is 100%, then we can conclude that the new value is 2 times the old value. If the percentage increase is 300%, the new value is 4 times the old value. If the percentage increase is 450%, then the new value is 5.5 times the old value. In general, if the percentage increase is p%, then the new value is $\left(\frac{p}{100}+1\right)$ times the old value.

Conversely, if we know how many times the old value gives the new value, we can find out the percentage increase in the old value to get the new value. For example, if the new value is 3 times the old value, the percentage increase in the old value to get the new value is 200%. If the new value is 4.25 times the old value, then the percentage increase is 325%. In general, if the new value is k times the old value, then the percentage increase is (k – 1) × 100.

Examples

3.01. The number of tourists visiting a country increased by 80% from 1990 to 1991. From 1991 to 1992, there was a 50% increase. Find the percentage increase in the number of tourists visiting the country from 1990 to 1992.

Sol: Let the number of tourists visiting the country in 1990 be 100. As the number of visitors increased by 80% from 1990 to 1991, the number of visitors increased by 80% of 100 i.e. 80. Hence the number of visitors will be 180 in 1991. Then, there was 50% increase from 1991 to 1992. This means, in 1992 the number of tourists to the country will be 180 + 90 (50% of 180) = 270. So the number of tourists to the country went up from 100 in 1990 to 270 in 1992, an increase of 170 from the initial number of tourists of 100. Hence the percentage increase

$$= \frac{\text{Increase}}{\text{Initial}} \times 100 = \frac{170}{100} \times 100 = 170\%$$

3.02. The percentage increase in the value of exports of apples of a country is as follows:
2001 – 2002 → 25%
2002 – 2003 → 20%
2003 – 2004 → 10%
What is the percentage increase in the value of exports of apples of the country from 2001 to 2004?

Sol: Let the value of exports in 2001 be 100 units. In 2002, it will become 125 units. Then there is a 20% increase in 2003, hence in 2003, value of exports = 150 units. As there is a 10% increase in 2004, value of exports in 2004 = 165 units.
Hence overall increase in exports = 65 units starting from 100 units. Therefore there is 65% increase.

In general,

> if there are successive increases of p%, q% and r% in three stages, the effective percentage increase is
> $$\left\{\left(\frac{100+p}{100}\right)\left(\frac{100+q}{100}\right)\left(\frac{100+r}{100}\right)-1\right\}\times 100$$
> If one or more of p, q and r are decrease percentage figures and not increase percentage, then it will be taken as a negative figure and not as a positive figure.
>
> Similarly, if the resultant figure is negative, it means it is a net decrease.
>
> The same can be extended to any number of successive increase or decrease percentages.

3.03. The price of a clock imported from Switzerland was ₹1200. Due to devaluation of rupee, its value increased to ₹2100. What is the percentage increase in the price of the clock due to devaluation of rupee?

Sol: Percentage increase is given by
$$\frac{\text{Final price}-\text{Initial price}}{\text{Initial price}}\times 100$$
$\therefore$ The required percentage increase
$= \frac{2100-1200}{1200}\times 100 = \frac{3}{4}\times 100 = 75\%$

3.04. In 1991, Anjana's salary was ₹30000 and Bhavana's salary was ₹40000. In 1990, Anjana's salary was 40% of the sum of the salaries of Anjana and Bhavana in 1991. What was the percentage increase in Anjana's salary from 1990 to 1991?

Sol: Anjana's salary in 1990
$= (30000 + 40000) \times 0.4 = ₹28000$
Percentage increase in Anjana's salary
$= \frac{30000-28000}{28000}\times 100$
$= (1/14) \times 100 = 7.14\%$

3.05. 56% of a number is 448. What is 98% of the same number?

Sol: Let the number be n.
Given $(56/100) \times n = 448 \Rightarrow n = 800$
$\therefore$ 98% of n = 98% of 800 = (98/100) (800) = 784

Alternate method:

Given 56% of a number is 448.
$\therefore$ 98% of the number = $\frac{98\times 448}{56} = 784$

3.06. The ratio of the salaries of Mehta and Dixit is 20 : 21. By what percentage is Dixit's salary greater than that of Mehta?

Sol: The given ratio = 20 : 21
The salary of Dixit is 21 parts when the salary of Mehta is 20 parts. Percentage by which Dixit's salary is greater than Mehta's
$= \frac{21-20}{20}(100) = 5\%$

3.07. The length of a rectangle is increased by 10% and the breadth is increased by 20%. What is the consequent percentage increase in its area?

Sol: Let the initial length be l and initial breadth be b. Area of the rectangle = lb
Increase in length = 10l/100
Increase in breadth = 20b/100
New area of the rectangle
$= \left(l+\frac{10}{100}l\right)\left(b+\frac{20}{100}b\right)$
$= (1.1l)\ (1.2b) = 1.32lb$
Percentage increase in area
$= \frac{1.32lb - lb}{lb}\times 100 = 32\%$

3.08. If the price of an item goes up by 10%, by what percentage should the new price be reduced to bring it down to the original price?

Sol: Let the original price be ₹100.
New price = ₹110, due to 10% increase. Now, to bring this down to the original price, we have to effect a reduction of ₹10 from ₹110. Hence
percentage reduction = $\frac{10}{110}\times 100\% = 9.09\%$
Note:
$\left[\text{In this problem, the percentage reduction can be written as } \frac{10}{(100+10)}\times 100\right]$ and can be generalised as {(100x) /(100 + x)}%

3.09. If Dinesh's salary is 20% less than Eswar's salary, then by what percentage is Eswar's salary more than Dinesh's salary?

Sol: [Note: In general, the object or quantity which follows the phrase MORE THAN or LESS THAN is assumed as 100, to facilitate the working.]
Let Eswar's salary be ₹100
Dinesh' salary being 20% less, it will be ₹80
Eswar's salary is more than Dinesh's salary by
$\frac{100-80}{80}\times 100 = 25\%$

3.10. If the price of tea goes up by 10%, then what should be the percentage decrease in the quantity consumed so that the total expenditure on tea remains the same?

Sol. Let p be the price of tea initially and q be the quantity consumed initially.

Since the price is increased by 10%, the new price is 1.1p. Let the new quantity consumed be z.
As the total expenditure remains the same, we have p x q = 1.1p x z.

$\Rightarrow z = \frac{q}{1.1}$

$\therefore$ Percentage reduction in consumption

$= \frac{q - \frac{q}{1.1}}{q} \times 100 = 9\frac{1}{11}\%$

(Note: In this problem, the percentage reduction in the quantity can be written as $\frac{10}{100+10} \times 100 = 9\frac{1}{11}\%$)

In the above three examples, if the percentage given initially is x, what is asked to be found is $\frac{100x}{(100 + x)}$.

We can generalize each of the three cases as below:

If the value of an item goes up/down by x%, the percentage reduction/increment to be now made to bring it back to the original level is $\frac{100x}{(100 \pm x)}\%$

If A is x% more/less than B, then B is $\frac{100x}{(100 \pm x)}\%$ less/more than A.

If the price of an item goes up/down by x%, then the quantity consumed should be reduced/increased by $\frac{100x}{(100 \pm x)}\%$ so that the total expenditure remains the same.

PERCENTAGE POINTS

The concept of "percentage points" is important in the usage of percentages. Percentage points is the difference of two percentage figures.
Let us understand this with an example.
Suppose that rice forms 20% of total food grain production in Year I and 30% of total food grain production in Year II.

If we are asked to find out the percentage increase in the production of rice, calculating percentage increase from 20 to 30 as $\frac{30 - 20}{20} \times 100$ and saying it is 50% increase is NOT correct. With the available data, we cannot find out the percentage increase in the production of rice from Year I to Year II. We can only say that the production of rice as a percentage of total food grain production went up by 10 PERCENTAGE POINTS (the 10 being the increase from 20 to 30 – both percentage figures)

We can see by taking the following figures that the percentage increase in rice production need not be 50%.

	Year I	Year II
Rice	1000	960
Total foodgrains	5000	3200
Rice as percent of total foodgrains	20%	30%

Here, while rice is 20% of total food grains in Year I and 30% of total food grains in Year II, we find that the actual production of rice has not even increased – it decreased from 1000 in Year I to 960 in Year II.

PROFIT AND LOSS

In any business/commercial environment the most important concern is about the profit/loss of the transaction conducted.
The SELLING PRICE (S.P) and the COST PRICE (C.P) of an article determine the profit or loss made on the particular transaction.

The computation is done as follows:

Profit = Sale Price – Cost Price = S.P. – C.P.

Percentage Profit = $\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$

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

Loss = C.P. - S.P.

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

It is customary to express Profit/Loss as percentage of Cost Price. However, in some problems it may specifically be given that profit/loss percentage has been calculated on the selling price or the student may be asked to calculate the profit/loss percentage on the selling price. Unless such specific directions are given, the profit/loss percentage is always to be calculated on the cost price.

Given Profit/Loss percentage along with S.P., C.P. can be found out and similarly, given Profit/Loss percentage along with C.P., S.P. can be found out by using the concepts discussed at the beginning of this chapter (where, if percentage increase or decrease is given, we can find out the new value from the old value or the old value from the new value).

The following simple rules can be remembered for this purpose.

Given the cost price (C.P.) and profit percentage p%, the selling price will be given by S.P. = C.P. $\times \frac{(100 + p)}{100}$

Given the cost price (C.P.) and loss percentage p%, the selling price will be given by S.P. = C.P. $\times \frac{(100 - p)}{100}$

Given the selling price (S.P.) and profit percentage p%, the cost price will be given by C.P. = S.P. $\times \frac{100}{(100+p)}$

Given the selling price (S.P.) and loss percentage p%, the cost price will be given by C.P. = S.P. $\times \frac{100}{(100-p)}$

When two articles are SOLD at the same price (i.e., their S.P. is the same) such that there is a PROFIT of p% on one article and a LOSS of p% on the other (i.e., common profit or loss percentage), then, irrespective of what the S.P. actually is, the net result of the transaction is LOSS. This percentage loss is given by

$$\text{Loss percentage} = \frac{(\text{Common profit or loss})^2}{100} = \frac{p^2}{100}$$

MARKED PRICE or LIST PRICE is the price that is indicated or marked on the product or it is the price which is given in the price list. This is the price at which the product is intended to be sold. However, there can be some DISCOUNT given on this price and consequently, the actual SELLING PRICE of the product may be less than the MARKED PRICE.

SELLING PRICE = MARKED PRICE – DISCOUNT

The amount of discount given can also be expressed as a percentage. DISCOUNT is always expressed as a percentage of the MARKED PRICE or the LIST PRICE.

DISCOUNT percent

$$= \frac{\text{Marked Price} - \text{Selling Price}}{\text{Marked Price}} \times 100$$

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

Certain discount is given on an article whose marked price is M.P. If further discounts are given on this discounted price, such discounts are referred to as successive discounts. If the successive discounts are p%, q% and r%, on a product whose selling price is S.P., then the effective price after all the discounts is given by

$$\text{S.P.} = \text{M. P. x} \frac{(100 - p)(100 - q)(100 - r)}{100 \times 100 \times 100}$$

3.11. A shopkeeper bought a table for ₹500 and sold it for ₹600. What is his profit percentage?

Sol: Given selling price of the table = ₹600
Given cost price of the table = ₹500
Profit = S.P – C.P = 600 – 500 = ₹100
Percentage of profit
$= \frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{100}{500} \text{ x } 100 = 20\%$

3.12. A merchant gains 20% by selling a book for ₹12. Find the merchant's percentage of gain or loss if he sold the book at
(A) ₹9 (B) ₹15
(C) ₹8 (D) ₹18

Sol: Given selling price = ₹12 and profit = 20%
$\Rightarrow$ Cost price $\times$ 1.2 = 12
$\Rightarrow$ Cost price = ₹10
(A) Selling price = ₹9,
Cost price = ₹10
Loss % = $\frac{10 - 9}{10} \text{ x } 100 = 10\%$

(B) Selling price = ₹15,
Cost price = ₹10
Profit % = $\frac{15 - 10}{10} \times 100 = 50\%$

(C) Selling Price = ₹8,
Cost price = ₹10
Loss % = $\frac{10 - 8}{10} \times 100 = 20\%$

(D) Selling price = ₹18,
Cost price = ₹10
Profit % = $\frac{18 - 10}{10} \times 100 = 80\%$

3.13. By selling a chair at ₹300, Soman makes a profit of 20%. Find the cost price of the chair.

Sol: Cost price of the chair
$= 300 \text{ x } \left(\frac{100}{100 + 20}\right) = ₹250$

3.14. The selling price of 12 pens is equal to the cost price of 20 pens. Find the profit percentage.

Sol: [Note: In such problems where there is no amount specified for the Cost Price (C.P.) or the Sales Price (S.P.), the best approach is to assume cost of each unit to be Re.1 and proceed.]
Let the cost price of each pen be ₹x
Cost price of 12 pens = ₹12x
Selling price of 12 pens = Cost price of 20 pens = ₹20x
Percentage of profit = $\frac{20x - 12x}{12x} \times 100\%$
$= 66\frac{2}{3}\%$

3.15. The cost price of 6 oranges is equal to the selling price of 8 oranges. Find the profit or loss percentage.

Sol: Let the cost price of each orange be ₹x
Cost price of 8 oranges = ₹8x
Selling price of 8 oranges = cost price of 6 oranges = ₹6x
The selling price of 8 oranges is less than the cost price of 8 oranges. A los is made
Percentage of loss = $\frac{8x - 6x}{8x} \times 100\% = 25\%$

3.16. A trader cheats his customers to make profit by announcing that he sells the goods at cost price but gives 200 gms less for every 1 kg. Find the profit percentage of the trader.

Sol: From the given data, selling price of 800 gms = cost price of 1000 gms
Let the cost price of each gram be ₹x, then cost price of 800 gms = ₹800x
Selling price of 800 gms = cost price of 1000 gms = ₹1000x
Profit percentage

$= \frac{1000x - 800x}{800x}(100) = 25\%$

3.17. A sells a suitcase to B at 10% profit. B sells it to C at 30% profit. If C pays ₹2860 for it, then what is the price at which A bought the suitcase?

Sol: Let the price at which A bought the suitcase be x.
B's C.P = x(110/100) = 1.1x
C's C.P = (1.1x) (130/100) = (1.1x) (1.3)
C bought the suitcase at ₹2860
(1.1x) (1.3) = 2860
x = 2860/(1.1) (1.3)
x = ₹2000

3.18. Ajay sold his bag at a loss of 6%. Had he sold it for ₹42 more he would have made a profit of 8%. Find the price at which he bought the bag.

Sol: Let the price at which he bought be ₹100.
Since he sold the bag at a loss of 6%, selling price would be ₹94.
Had he sold the bag at 8% profit, selling price would have been ₹108.
Difference in the selling prices is ₹14, when the C.P. is ₹100
But, it is given that difference in the selling prices is ₹42. Hence, the cost price

$= \frac{42 \times 100}{14} =$ ₹300

Alternate method:
Let the price at which he bought the bag be c.p.
Loss on the sale of the bag = 6%
If sold at ₹42 more, gain = 8%
$\therefore [8\% - (-6\%)] \times C.P = 42$
$\Rightarrow 14\% \times C.P = 42 \Rightarrow C.P =$ ₹300

3.19. Praveen bought 18 kg of rice for ₹360. He was forced to sell it at a loss which is as much as the selling price of 4.5 kg. At what price did he sell the rice?

Sol: Let S.P per kg be S. Given loss = 4.5S
As Loss = CP – S.P
$\Rightarrow 4.5S = 360 - 18S \Rightarrow S =$ ₹16

3.20. Ajit buys a certain number of bananas at 8 for ₹10 and an equal number at 10 for ₹15. If he sells them at 15 for ₹20, does he gain or lose and by what percentage?

Sol: Let the number of bananas that Ajit bought be 2x i.e., x at each of the two prices.
The cost price of x bananas at 8 for ₹10 = x (10/8) = ₹5x/4
Similarly, cost price of x bananas at 10 for ₹15 = x(15/10) = ₹3/2x
Cost price of the bananas = 5x/4 + 3x/2
= ₹11x/4
Selling Price of the bananas = (2x) (20/15)
= ₹8x/3
As $\frac{8x}{3} < \frac{11x}{4}$, there is loss.

$$\text{Percentage of loss} = \frac{\frac{11}{4}x - \frac{8x}{3}}{\frac{11}{4}x} \times 100$$

$= \frac{100}{33}\%$

Hence Ajit incurred a loss of $\frac{100}{33}\% = 3.03\%$

3.21. If goods are purchased for ₹120, and one-third of them sold at a loss of 5%, then at what profit percentage should the rest be sold to obtain an overall profit percentage of 5%?

Sol: Cost price of one-third of goods
= 1/3 (120) = ₹40
Selling price of these goods at 5% loss
= (40) (0.95) = ₹38
Let selling price of the rest of the goods be x.
5% profit on ₹120 gives S.P as ₹126
$\Rightarrow 126 = x + 38 \Rightarrow x =$ ₹88
As cost price of the remaining goods is ₹80,
required profit % = $\frac{88-80}{80} \times 100 = 10\%$

3.22. Prakash calculates his profit on selling price and finds it to be 20%. What is his actual profit percentage?

Sol: Let's assume selling price as ₹100
Since profit = 20% of selling price, actual profit = 20/100 (100) = ₹20
Cost price = 100 – 20 = ₹80
$\therefore$ Actual profit percentage, i.e., with reference to the cost price = $20/80 \times 100 = 25\%$

3.23. Ashok sells two radio sets at the same price, one at a loss of 12% and the other at a profit of 12%. Find the overall loss or profit made by Ashok percentage.

Sol: When 2 items are sold at the SAME selling price, one at p% profit and the other at p% loss, irrespective of what the selling price is, the net result is always a loss and the loss percentage = $(p^2/100)$.
Here the common profit or loss = 12%
$\therefore$ Net loss = $12^2/100 = 1.44\%$
So, Ashok incurs 1.44% loss on the whole.

3.24. If a man sells an item at three-fourth of its selling price, he incurs a loss of 4%. What will be the profit percentage if he sells it at the actual selling price?

Sol: Let the cost price be ₹100When sold at $3/4^{th}$ of the selling price, the loss is 4%. This means selling price in this case = ₹96
= 3/4 times the actual selling price
Hence 96 = (3/4) [Actual selling price]
$\Rightarrow$ Actual selling price
= (96) (4/3) = ₹128
If Ajay sells at the actual S.P, then he makes a profit of ₹28 on a cost price of ₹100 i.e., 28% profit.

3.25. A trader marks his product 15% above the cost price and offers a discount of 20%. Find the loss percentage incurred by the trader.

Sol: Let the cost price be ₹100, then marked price = ₹115
Since a discount of 20% is allowed on ₹115, selling price = $(80/100) \times 115 =$ ₹92

Loss % = $\frac{100-92}{100} \times 100 = 8\%$

3.26. A trader marks his goods at a certain percentage over his cost price and then gives a 30% discount, thereby making 5% profit. What is the mark up percentage?

Sol: Let cost price be ₹100, then
selling price = ₹105
Since 30% discount was given,
70% of MP = sale price = 105, where MP is the marked price.
Marked price = ₹150.
Hence the marked price is ₹50 above the cost price i.e. 50% above the cost price of ₹100.

PARTNERSHIPS

Two or more people can get together to do business by pooling their resources. The money put in by each of the partners is called his "INVESTMENT" or "CAPITAL."

All the people who have invested money in the partnership are called PARTNERS.

While two or more partners would have invested money, it is not necessary that all of them should be involved in the day-to-day running of the business. The partners involved in the day-to day activities of the business are called "working partners" and the others are called "sleeping partners" or "dormant partners."

The profits left after paying the working partners' remuneration/commission are shared amongst all the partners.

Sometimes, the partners also take interest on their investments and only the remaining profits are shared by the partners.

Sharing of profits among the partners also depends on the understanding between the partners. However, if no special scheme of sharing the profits is specified (in a problem), then the profits are shared based on the investments of the partners. There are three different possibilities that exist here.

- If the partners invest DIFFERENT amounts each for the SAME period of time, then the profits at the end of the year are shared in the ratio of their investments.
- If the partners invest the SAME amounts for DIFFERENT periods of time, then the profits at the end of the year are shared in the ratio of the time periods for which their respective investments have been in business.
- If the partners invest DIFFERENT amounts and the time periods for which their investments are in the business are also DIFFERENT, then the profits at the end of the year are shared in the ratio of the products of (investment x time period) calculated for each partner.

There CAN be problems that are modelled along the sharing of profits in partnerships. An example of this type is where a particular facility (like renting a tractor for ploughing their fields by three different people) is used by more than one party and the rent has to be shared by all the concerned parties – similar to sharing of profits in a partnership.

Examples

3.27. A and B invest ₹27000 and ₹22500 respectively in a business and at the end of the year, they make a profit of ₹35200. Find their individual shares in the profit.

Sol: Since their investments are there in the business for the same duration (1 year) profits will be shared in the ratio of their investments i.e., 27000 : 22500 = 6 : 5
$\therefore$ A's share = 6/11 (35200) = ₹19200 and
B's share = 5/11 (35200) = ₹16000

3.28. Ali starts a business with ₹36000. Three months later Akbar joins him with ₹21000. At the end of the year in what ratio should they share the profits?

Sol: As the investments of Ali and Akbar are for different time periods, sharing of profits will be in the ratio of investments multiplied by the respective time periods.
Hence ratio is $(36000 \times 12) : (21000 \times 9)$
= 48 : 21 = 16 : 7

3.29. Dinesh started a business with ₹20000 and after 5 months, Dhiraj joined him with ₹45000. Dinesh received ₹45250 including 10% of the profits as commission for managing the business. What amount did Dhiraj receive?

Sol: Ratio of the shares of profits is
$(20000 \times 12) : (45000 \times 7) = 240 : 315 = 16 : 21$.
Let the total profit be P. As Dinesh receives 10% of this as commission, the remaining 90% of P, is shared in the ratio of 16 : 21. Hence, Dinesh's receipts will be $16/37^{th}$ of 90% of the total profit plus his commission.
0.1p + 16/37 (0.9p) = 45250
$\Rightarrow$ p = ₹92500
Dhiraj's share = Total profit – payment to Dinesh
= 92500 – 45250 = ₹47250

3.30. A started a business with ₹30000. After 4 months B joined him with ₹40000. C joined them after some more time with ₹50000. If C gets ₹15000 as his share at the end of the year out of a total profit of ₹49000, how many months after B joined the business did C join?

Sol: The ratio of the shares of profits is
$(30000 \times 12) : (40000 \times 8) : (50000 \times x)$.
(Here x is the number of months that C was with the business) = 36 : 32 : 5x

C's share = $\frac{5x}{36+32+5x} = \frac{5x}{68+5x}$

Given, $\frac{5x}{68+5x} = \frac{15000}{49000} \Rightarrow x = 6$

$\therefore$ C joined the business 2 (i.e. 6 – 4) months after B joined the business.

3.31. Girish started a business with ₹25000. After three months, Harish joins with an investment of ₹30000 and Girish withdraws ₹5000 out of his capital. Three months later, Harish brought in ₹10000

more. At the end of the year what should be the ratio in which they share the profits?

Sol: Girish has invested ₹25000 for 3 months and then since he withdrew ₹5000, his investment was only ₹20000 for the rest of the nine months. The term of the ratio that will represent Girish's share will be $(25000 \times 3) + (20000 \times 9) = 255000$
Harish joined with ₹30000 which remained unchanged for 3 months and then since he brought in ₹10000 more, his investment was ₹40000 for the rest of the 6 months. The term of the ratio that will represent Harish's share will be $(30000 \times 3) + (40000 \times 6) = 330000$
Ratio in which they share their profits
= 255000 : 330000 = 51 : 66 = 17 : 22

3.32. The commission paid to the working partner of a business is equal to 30% of the total profit left after his commission is paid. If his commission is known to be ₹24000, then find the total profit.

Sol: Let the total profit be p. The profit left after the working partner's commission of ₹24000 is paid is (p – 24,000). 30% of this is the working partner's commission. So, we have 0.3 (p – 24,000) 24,000 = 0.3p = ₹31200
p = ₹104000

STOCKS AND SHARES

A limited company raises capital by floating shares. It is also referred to as stock. The capital required is divided into small units called shares. In India, the generally accepted value for such a unit is ₹10 or ₹100. This is called the Face Value or Par Value.

The shares of a public limited company are traded in the market place and depending on the demand for the share, the price fluctuates. The rate at which a share is bought or sold in the market is the Market Value of the share. This fluctuates. If the market value is more than the face value of the share, then we say that such a share is quoting at a "premium." If the market value is less than the face value of the share, then we say that such a share is quoting at a "discount."
The people who are holding the shares are called shareholders. The company distributes a part of its profits from its operations as dividend to the shareholders. The dividend is expressed as a percentage of the Par Value. Whenever any company quotes a dividend percentage figure, it goes without saying that it is a percentage of the face value.

$$\% \text{ of dividend} = \frac{\text{Dividend Amount}}{\text{Par Value}} \times 100$$

Dividend is always calculated only on the 'FACE VALUE' or the 'PAR VALUE' irrespective of the price at which the share was purchased.

The government also deals with stock where it issues bonds or other form of stock with a certain face value and a certain assured rate of interest. This stock is then traded in the market as per the regulations of the government. Since the government stock comes with fixed rate of return, the stock is normally referred to by the percentage of the return. For example, if 5% is the rate of return (of stock whose face value is ₹100), then such stock is referred to as 5% stock. The face value of the government bond is normally ₹100.

Supposing this stock yielding 5% return (on face value) is purchased by somebody at ₹95, then we say that person has purchased "5% stock at 95". Instead, if he purchases it at ₹108, then we say that he has purchased "5% stock at 108".

In the case where he purchased 5% stock at 95, to buy one unit of that stock, he pays ₹95. But since the face value is ₹100, the return or income he gets at the end of the year will be 5% of 100, i.e., ₹5.

In this case, since he receives an income of ₹5 per year by investing ₹95, his rate of return is $\frac{5}{95} \times 100$ which is $5\frac{5}{19}\%$.

To compare two investments (i.e., investments in two different stocks), we compare the rate of return for both investments and whichever gives a higher rate of return is a better investment.

If somebody is holding ₹1000 "worth of stock", it means that the face value of stock he is holding is ₹1000. If the face value of the stock is ₹100, that person will be holding 10 units of such stock.

Typical problems in Shares and Stocks may include finding as to which out of given investment is a better one or finding the annual income or change in income from a certain investment or change in portfolio, etc.

These problems are very similar to problems in Profit and Loss Percentages except for involving the terminology as given above.

For all the examples we are going to look at, the face value of the stock is to be taken as ₹100 unless otherwise specified.

Examples

3.33. What is the annual income from ₹41000 invested in 4% stock at 2.5% premium?

Sol: 2.5% premium means the market value is ₹102.50 when the face value of the share is ₹100. Since ₹41000 is invested in this stock, the number of units purchased = 41,000/102.5 = 400. Since this is 4% stock, each unit of this stock will yield 4% interest on ₹100 at the end of the year. Therefore 400 units will have an annual income of 400×4 = ₹1600.

3.34. Which of the following is a better investment:6% stock at 125 or 5% stock at 114?

Sol: [Note: We can calculate the rate of return for each of these investments and decide which is better.

Another approach is to take a certain amount as invested in each of these two stocks and calculate the income from each stock.

For this purpose, instead of taking any arbitrary amount, if we take the amount invested as the product of the market values of both the stocks, then calculations become simple.]

Let the amount invested be equal to the product of the market values of both the stocks i.e., 125 x 114 = ₹14250.

In 6% stock we get $\frac{125 \times 114}{125} \times 6$ = ₹684

The same amount in 5% stock we get $\frac{125 \times 114}{114}$ $\times$ 5 = ₹625

Since the annual income from 6% stock is higher, it is a better investment.

3.35. A man owned ₹12500 worth of 3% stock. When it was quoting at ₹216, he sells it and uses the proceeds to buy 5% stock quoting at ₹160, so that his annual income doubles. How much money was he left with or how much more money was he required to bring in?

Sol: ₹12500 worth of stock means it refers to face value, which is ₹100 for 1 unit. Hence he owned 125 units. When he sells at ₹216, his sales proceeds will be 216 $\times$ 125 = ₹27000. Since each unit sold gave him ₹3 as income per annum his annual income was 125 $\times$ 3 = 375

With the investment in the second stock, his income doubled, new income
= 2 $\times$ 375 = ₹750.
To get the annual income of ₹750, he must have bought 750/5 = 150 units. ($\because$ he is buying 5% stock)
Market price of 5% stock was ₹160.
To buy 150 units, he will need to pay 160 $\times$ 150 = ₹24000
The sale proceeds from 3% stock was ₹27000.
Hence the difference between ₹24000 and ₹27000 i.e., ₹3000 is the amount he is left with after the transaction.

3.36. A person invests ₹28200 in 10% stock at 94. He then sells it when it is quoting at 106. He then reinvests the money in 6% stock at 100 which he sells when the stock is quoting at 107. Find the overall profit of the transaction.

Sol: At ₹94 per unit, ₹28200 will get him 28200/94 = 300 units. These when sold at 106 gives him ₹31800. This is invested in 6% stock at 100. This gets him 31800/100 = 318 units. This stock is then sold when it is quoting at 107 giving him 318 $\times$ 107 = ₹34026
His overall profit = 34026 – 28200 = ₹5826

Concept Review Questions

Directions for questions 1 to 50: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. Find the following:

(i) 37.5% of 976 = ☐

(ii) 57.14% of 784 = ☐

(iii) $11\frac{1}{9}$% of 918 = ☐

2. What percent of 125 is 16?
(A) $10^2/_5$% (B) $12^4/_5$%
(C) $11^1/_5$% (D) $11^2/_3$%

3. 80 is what percent of 64?
☐

4. If 30% of a number exceeds 20% of it by 18, find the number.
(A) 120 (B) 200 (C) 180 (D) 150

5. If 35% of a fraction $\frac{3n}{5}$ is 10 more than 10% of 110, then 10% of n is ☐

6. The payment per hour of a part-time employee is increased by 30% and his working time is reduced by 30%. Find the percentage change in his income.
(A) No change (B) 9% increase
(C) 9% decrease (D) 45% decrease

7. In a test, Karan got 40% of the maximum marks and Kiran got 50% of the maximum marks. Karan's score was less than Kiran's by _____ percentage points.
☐

8. The price of sugar became ₹7.25 per kg after an increase of 45%. Find the original price of sugar. (in ₹/kg)
(A) 5 (B) 10 (C) 6 (D) 8

9. In the year 2005, it was found that 480 million tonnes of rice was produced. Due to draught, the production of rice decreased by 20% in the year 2006 (over the previous year). Find the production of rice in 2006. (in million tonnes).
(A) 384 (B) 396 (C) 398 (D) 402

10. The selling price of a tube of toothpaste is decreased by 20%. It now sells for ₹20. What was the original selling price (in ₹) of the tube of tooth paste?
☐

11. The population of a village this year is twice its population last year. Find the percentage increase in the population of the village from last year to this year.
☐

12. The price of a walkman is increased by 20%. By what percent should the new price be decreased to bring it back to the original price?
(A) 20% (B) 25% (C) $33^1/_3$% (D) $16^2/_3$%

13. Ashok's salary increased by 25% this year. By what percentage was his last year's salary less. then to this year's?
☐

14. The monthly salaries of two persons are equal. If the monthly salary of one of them is increased by 20% and that of the other is decreased by 20%, find the percentage change in this total salary.
☐

15. The price of item P is twice the price of item Q. If the price of P is decreased by 25% and the price of Q is increased by 50%, find the percentage increase in the sum of the prices of the two items.
☐

16. There are 40 employees in a company. The salaries of 10 employees are increased by 10%. The salaries of the remaining employees are increased by 30%. Find the percentage increase in the total salary of all the employees.
(A) 20% (B) 25%
(C) 15% (D) Cannot be determined

17. A family's monthly savings are 20% of its total monthly income. The monthly expenditure on food is increased from 20% to 30% of the total monthly income and its total monthly income as well as its savings remain unchanged. The expenditure on food forms what percent of its savings?
(A) 160% (B) 150%
(C) $166^2/_3$% (D) 175%

18. Kiran's income before he got an increment was 40% of his family's total income. His increment is 1/4th of his income. If there is no change in the incomes of the other members of the family, what percentage of his family's total income is his salary?
(A) 25% (B) $11^1/_9$%
(C) $41^5/_{11}$% (D) $45^5/_{11}$%

19. In an exam, Raja got 25% more marks than Satish. By what percentage are the marks of Satish less than those of Raja?
(A) $16^2/_3$% (B) $33^1/_3$%
(C) 20% (D) 25%

20. If the price of an article went up by 20%, by what percent should it be brought down to bring it back to the original price?
(A) $16^2/_3$% (B) 20% (C) $22^1/_3$% (D) 15%

21. Girish bought a cycle for ₹600 and sold it for ₹900. Find the percentage of profit he made.

22. The cost price of a TV set is 60% of its selling price. Find the profit percentage.
(A) $16^2/_3$% (B) $33^1/_3$% (C) 50% (D) $66^2/_3$%

23. The cost prices of two shirts are equal. One shirt is sold for 20% profit and the other is sold for 10% loss. Find the overall profit percentage.

24. A shopkeeper sells a calculator at ₹120 for $33^1/_3$% profit. At what price should he sell it to gain 40%?
(A) ₹160 (B) ₹140 (C) ₹120 (D) ₹126

25. Rohit bought a cassette for ₹40. He sold it for 20% profit to Rakesh. Rakesh sold it at $33^1/_3$% profit to Suresh. Find Suresh's cost price (in ₹).

26. The profit made in selling 20 m of a cloth equals the cost price of 5 m of that cloth. Find the profit percentage made in selling each metre.
(A) 20% (B) 40% (C) 25% (D) 50%

27. By selling 80 oranges, a man gains the cost price of 20 oranges. Find the gain percentage.

28. By selling 60 oranges, a man gains the selling price of 20 oranges. Find the gain percentage.

29. The cost price of 80 hats is ₹12 each. 30 of them were sold for ₹14 each. At what price should the remaining be sold in order to get an overall profit of ₹4·50 per hat?
(A) ₹16 (B) ₹24 (C) ₹20 (D) ₹18

30. The cost price of a table is ₹330. It is sold at a profit of ₹30 after giving a 10% discount. Find its marked price (in ₹).

31. A trader marked up the price of a product by 75%. When the discount was decreased from 50% to 25%, his profit increased by ₹210. What is the cost of the product?
(A) ₹210 (B) ₹280 (C) ₹320 (D) ₹480

32. A product costs a company ₹64 to manufacture, and it sold the product to a dealer for ₹80, who sold it to a shopkeeper for ₹98, who sold it to a customer for ₹120. Find the company's profit percentage.
(A) 25% (B) 87·5%
(C) 50% (D) None of these

33. In the previous question, who got the highest profit by selling the product?
(A) Dealer
(B) Shopkeeper
(C) Company
(D) All the three got the same profit

34. Bhuvan purchased a plot of land for ₹120000 and a house for ₹320000. Then, he sold the plot of land at 12% profit and the house at 4.5% loss. Find his gain or loss percent in the overall transaction.
(A) 4.5% (B) 7.5%
(C) 8% (D) None of these

35. An article is sold at 10% profit. If its cost price increased by ₹20 and the selling price is increased by ₹10, the profit would be $1^1/_9$%. Find the original cost price.
(A) ₹120 (B) ₹150
(C) ₹115 (D) ₹102

36. A trader wants to sell a watch at 25% profit. If its cost price was ₹x more, an extra profit of ₹50 would be made on it. Find x (in ₹)
(A) 100 (B) 125 (C) 150 (D) 200

37. Sreenivas sells a table to Shiva at 10% profit and Shiva sells it to Mahesh at 10% loss. At what price (in ₹) did Sreenivas purchase the table if Mahesh paid ₹2178?

38. A trader marks his articles 20% above the cost price. If he allows 20% discount, then find his gain or loss percent.
(A) 4% loss (B) 4% profit
(C) 2% loss (D) 2% loss

39. The ratio of the investments of A, B and C is 5 : 6 : 7. If they share the profit in the ratio 5 : 9 : 14, find the ratio of their periods of investment.
(A) 2 : 3 : 4 (B) 3 : 5 : 6
(C) 3 : 2 : 4 (D) 2 : 4 : 3

40. Ramesh and Suresh started a business with investments of ₹30000 and ₹20000 respectively. At the end of one year, they earned a profit of ₹6000. Find Ramesh's share in this profit.
(A) ₹2400 (B) ₹4800 (C) ₹3600 (D) ₹4000

41. Anil and Sunil started a business with investments of ₹20000 each. Anil left after eight months while Sunil stayed for a year. If the profit for that year is ₹2000, Anil's share (in ₹) is

42. Sameer started a business with an investment of ₹9000. After three months, Tarun joined with an investment of ₹12000. If the profit for that year is ₹6000, Sameer's share (in ₹) is .

43. P and Q started a business with respective investments of ₹4 lakhs and ₹10 lakhs. As P runs the business, his salary is ₹5000 per month. Which is paid from the annual profit. If they earned ₹2 lakhs as profit at the end of the year, find the ratio of their earnings.
(A) 2 : 5 (B) 5 : 2 (C) 3 : 5 (D) 1 : 1

44. Ganesh, Harish and Raghu started a business with respective investments of ₹15000, ₹18000 and ₹21000. At the end of one year, they earned a profit of ₹5400. Find the respective shares of Ganesh, Harish and Raghu in this profit (in ₹).
(A) 1500, 1800, 2100 (B) 1360, 1800, 2240
(C) 1750, 2100, 2450 (D) 1890, 2100, 2310

45. Find the annual income (in ₹) of a person who invested ₹10000 in a 10% stock at par.

46. Find the annual income of a person who invested ₹10550 in a 7% stock at 5·5% premium.
(A) ₹350 (B) ₹700 (C) ₹1400 (D) ₹2100

47. Find the annual income (in ₹) of a person who invested ₹19300 in a 6% stock at 3.5% discount.

48. A man invested ₹18600 in 5% stock at ₹93. If he sells it when it is quoting ₹105, find his profit (in ₹).

49. Ajay invested ₹2650 in 15% stock at ₹106. Vijay invested ₹3060 in 12% stock at ₹102. Who will get a greater annual income?
(A) Ajay
(B) Vijay
(C) Both Ajay and Vijay got equal annual incomes
(D) Cannot be determined

50. A man invested ₹25800 in a 5% stock at 14% discount. Find his yield percent at the end of one year.
(A) 5.41%
(B) 6.21%
(C) 5.81%
(D) 7.2%

Exercise – 3(a)

Directions for questions 1 to 35: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. In an office, 30% of the employees are men and the remaining are women. 60% of the men are married and 66% of the employees are married. What percentage of women are not married?
(A) $17^1/_7$% (B) 30% (C) $31^3/_7$% (D) 20%

2. Rakesh got 273 marks in an examination and secured 5% more than the pass marks in the examination. If Rakesh got 312 marks, then by what percentage was the score of Rakesh above the pass marks in the examination?
(A) 20% (B) 25% (C) 40% (D) 50%

3. A, B and C have certain number of mangoes with them. B has 10% less mangoes than A and C has 20% less than A. By what percentage is the number of mangoes with B more than those with C?

4. Shyam spends 60% of his annual salary and saves the remaining amount. His salary increased by 25% this year and he increased his spending by 20%. By what percentage did his savings increase?

5. Three raw-materials P, Q and R are used to manufacture a product S. P contributes 20% of the total cost while Q and R contribute 10% each to the total cost S. If the costs of P, Q and R are 20% higher and S's total cost was 10% higher, the percentage contribution of raw materials to the total cost of S becomes _____.
(A) $16\frac{1}{11}$ % (B) $43\frac{7}{11}$ %
(C) $22\frac{1}{11}$ % (D) None of these

6. The price of sugar decreased by 20% and then increased by 50%. By what percentage should a housewife now increase/decrease her consumption so that the expenditure on sugar remains the same?
(A) 30% decrease (B) $16^2/_3$% decrease
(C) $6^1/_4$% decrease (D) $6^1/_4$% increase

7. The price of an item went up by 25% and a family decided to reduce its consumption so that the total expenditure would increase by only 8% as compared to the previous expenditure. If 25 kg of the item was consumed previously, then how many kg of the item should be consumed now?

8. The price of P is 19% less than that of Q. The price of P increases by x% every month while the price of Q decreases by y% every month. If x = 5, what is the least value of y such that after two months the price of P will not be less than the price of Q?
(A) 5.5 (B) 6
(C) 5 (D) 4.5

9. Bablu ordered two types of chocolates – Bar-Milk and Bar-Choco. Each piece of Bar-Milk costs 40% more than each piece of Bar-Choco. The shop owner swapped the number of the two type of chocolates, by mistake. As a result the total cost was 10% less than what it would have been. Find the ratio of number of Bar-Milk and Bar-Choco chocolates ordered by Bablu.
(A) $\frac{25}{13}$ (B) $\frac{15}{13}$ (C) $\frac{13}{25}$ (D) $\frac{13}{15}$

10. The price of a radio at the beginning of a year was ₹3000. It increased by x% and then decreased by y% over the year. It increased by x% and then decreased by y% over the next year too. At the end of the second year, the price of the radio was ₹3000. Which of the following can be concluded?
(A) x > y (B) x = y
(C) x < y (D) None of these

11. A jewellery shop owner conducts his business in the following manner. Every once in a while he raises his prices by a certain percentage and a while later he reduces his prices by the same percentage. After one such updown cycle of increasing and then decreasing his price by x%, the price of a jewel decreases by ₹100. In the next cycle, he increases and then decreases his price by (x/2)% and then sells the jewel for ₹2376. What is the initial price of the jewel (in ₹)?
(A) 2450 (B) 2475
(C) 2500 (D) 2575

12. The population of a village is 7500. 42% of the population are females and the rest males. The total number of literate persons in the village is 2370 while there are 90 more male illiterates compared to female illiterates. What is the percentage of literate males out of the total number of males in the village?

13. In the U.S. opinion polls, 30% favoured George Bush and the rest favoured Bill Clinton. Following a debate between the two groups, 20% of the supporters of each shifted their loyalty to the other. Find the percentage of the total electorate which must shift from Clinton to Bush so that both have equal number of supporters.

14. A school had raised 60% of the amount it needed for a new building by receiving an average donation of ₹300 from the people it had already solicited. The people already solicited represent 80% of the people the school intends to ask for donations. The school wants to raise the exact amount it needs for the new building. Find the average donation it should receive from the remaining people to be solicited (in ₹).
(A) 600 (B) 700 (C) 800 (D) 500

15. The Indian cricket team played 25 one-day matches in a particular season of an year and won 40% of their matches. A new coach was then brought in, who wanted a success rate of 75% of the matches played by the end of the year. What is the minimum number of additional matches that should be played to achieve that target?

16. A salesman used to get 8% on the total sales as commission. Under a new policy he now gets a fixed amount ₹2000 and 5% commission on any amount of sales in excess of ₹10000. The salesman thus got ₹540 more this month. What were his total sales for this month?
(A) ₹20000 (B) ₹26000
(C) ₹32000 (D) ₹35000

17. I had enough money to purchase either 40 apples or 50 oranges. I decided to spend only 80% of the money and purchased 20 oranges and some apples. How many apples did I purchase?

18. In any given month, a salesman earns a commission of a% on the first ₹1000 worth of his sales. He earns b% on all further sales during that month. He made a commission of ₹900 from the sales of ₹3000 in January and ₹1300 from the sales of ₹4000 in February. Find the value of a.

19. A man sold a book at a loss of 10%. Had he sold it for ₹104 more, he would have earned a profit of 10%. Find the cost price of the book.
(A) ₹400 (B) ₹520 (C) ₹640 (D) ₹840

20. A man purchased 120 kg of sugar and was forced to sell it at a loss equal to the selling price of 30 kg of sugar. If he purchased each kilogram of sugar for ₹15, then at what price (in ₹) did he sell each kilogram of sugar?

21. A person sold two refrigerators each for ₹5060. On one he gained 10% and on the other he lost 8%. Find his overall profit/loss.
(A) ₹20 loss (B) ₹20 profit
(C) ₹10 loss (D) ₹10 profit

22. Mr. Singh purchased 40,000 apples at ₹7 each. He found that 30% of those were spoilt and hence were found unfit to be sold. At what price should he sell each of the remaining apples so as to get an overall profit of 25%?
(A) ₹8.75 (B) ₹10
(C) ₹11.25 (D) ₹12.50

23. A shopkeeper defrauds both the dealer and the customer by measuring weights incorrectly. When he is purchasing items from the dealer, he takes 20% more than the indicated weight and when he is selling them to the customer, he gives 20% less than the indicated weight. If the price that the shopkeeper charges his customer is the same as what the dealer charges the shopkeeper, then what profit percentage does the shopkeeper make?

24. A shopkeeper defrauds both the dealer and the customer by measuring the weights incorrectly. When he is purchasing items from the dealer, he takes 20% more than the indicated weight and while selling he gives to the customer a quantity, such that if 20% is added to it, the indicated weight is obtained. If the price that the shopkeeper charges his customer is the same as what the dealer charges the shopkeeper, what is the shopkeeper's profit percentage?

Directions for questions 25 and 26: These questions are based on the information given below.

In manufacturing a certain item, 40% of the expenditure is on account of raw materials, 20% on account of labour charges, 20% on account to fixed charges and the rest on miscellaneous. The item is sold at a profit of 25%. The price of the raw materials went up by 15% and the labour charges went up by 20% and the cost on the miscellaneous heads went up by 50% while the fixed costs remained unchanged.

25. If the selling price remained unchanged, then what is the profit percentage?
(A) 2% (B) 4%
(C) $4^{1}/_{6}$% (D) 10%

26. If the manufacturer wants a $13^{7}/_{11}$% profit, then by what percentage should he reduce his expenditure on raw materials (at the increased price) as to achieve that target, the selling price remaining the same?
(A) $17^{17}/_{23}$% (B) $20^{14}/_{23}$%
(C) $21^{17}/_{23}$% (D) $24^{14}/_{23}$%

27. A discount of 40% on the marked price of a trouser enables a man to purchase a shirt also, which costs him ₹320. How much did the man pay (in ₹) for the trouser?

28. An item was sold at a price after giving two successive discounts of 30% and 50%. If the selling price of the item was ₹448, then what was the marked price of the item (in ₹)?

29. Merchant A sold an article after giving a 30% discount. Merchant B sold the same article after giving three successive discounts of 10% each. Merchant C sold the same article after giving successive discounts of 15%, 10% and 5%. If the marked prices of the three merchants were the same, find the ascending order of their selling prices.
(A) ACB (B) ABC
(C) BCA (D) BAC

30. In a joint venture, A and B invested ₹32000 and ₹56000 respectively. A received ₹1000 per month as salary for managing the business and the remaining profit was divided in the ratio of their investments. At the end of the year A received a total of ₹20000, how much did B receive (in ₹)?

31. A and B started a venture with different investments. It was decided that A would get 20% of the profit as salary and the remaining profit would then be equally divided between the two of them. Had the entire profit been divided in the ratio of their investments, B would have received ₹5200 more as his share of the profit. The respective earnings of A and B are ₹16800 and ₹11200. Find the investment of A, if B invested ₹82000.
(A) ₹44000 (B) ₹58000 (C) ₹68000 (D) ₹77000

32. A, B and C start a venture with investments of ₹12000, ₹16000 and ₹10000 respectively. A left after 2 months. B left after another 2 months at that time A rejoined with only 2/3rd of his original investment. A month later B rejoined with one quarter less than his original investment. C remained invested throughout the year. The profit at the end of the year was ₹267000. How much more did B earn than A?
(A) ₹37500 (B) ₹42000
(C) ₹45000 (D) ₹55000

33. A man invested ₹37800 in a 4% stock at 108. What is the yield percent?
(A) $5^1/_{11}$% (B) 4% (C) $3^2/_{23}$% (D) $3^{19}/_{27}$%

34. Which of the following is the best investment?
(A) 12% stock at 112. (B) 15% stock at 120
(C) 4% stock at 108 (D) 8% stock at 104

35. A man invests a certain sum in a 5% stock at 120 and twice the sum in a 4% stock at 110. Had he invested the entire sum in a 8% stock at 99, his income would have been ₹845 more. How much did he invest in the 4% stock?
(A) ₹6600 (B) ₹13200
(C) ₹15700 (D) ₹20440

Exercise – 3(b)

Directions for questions 1 to 45: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. In a school, it has been observed that there is an increase of 30% in the number of students when compared to the previous year. Presently, the number of students in the school is 1976. Then the strength of the school in the previous year was .

2. The increase in the population of a town for every decade is 25%. If the population of the town in 2005 is 37800, then what was its population in 1995?
(A) 30240 (B) 30242
(C) 30250 (D) 30280

3. X, Y and Z invest in a partnership in the ratio 4 : 7 : 11. If in the end the profit was distributed in the ratio 24 : 35 : 77, then find the ratio of the time for which they were invested.
(A) 7 : 11 : 5 (B) 5 : 6 : 7
(C) 5 : 11 : 7 (D) 6 : 5 : 7

4. A man invested ₹38000 in a 6% stock at 120. Find his yield percent.

5. Which of the following is the best investment?
(A) 10% stock at 120. (B) 12% stock at 140.
(C) 13% stock at 150. (D) 14% stock at 160.

6. The ratio of three positive quantities P, Q and R is $\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. By what percent is Q less than (P + R)?

7. Two candidates contested in an election. The candidate favoured by 38% of the votes is rejected by a majority of 18924 votes. Find the total number of valid votes.

8. A student, in his supplementary exam, scored 40% more marks than that in annual exam and passed the examination with the minimum marks. If the pass mark is 35, then how many marks did he score in his annual exam?
(A) 27 (B) 25 (C) 30 (D) 28

9. Ram bought a flat for ₹2 lakh. Shyam bought a plot of land for ₹2.5 lakhs. The rates of increase in the prices of the flat and the plot are 25% p.a. and 20% p.a. respectively. Ram and Shyam agreed to exchange their possessions after 2 years under the condition that one would pay the other the difference in the price. Which of the following holds true?
(A) Ram has to pay ₹47500 to Shyam.
(B) Shyam has to pay ₹47500 to Ram.
(C) Neither of the two would have to pay any amount to the other.
(D) None of the above

10. The price of an item increased by the same percentage over the last four weeks. If at the beginning it was ₹512 per gm and in the end it became ₹1250 per gram, then find the percentage increase every week.
(A) 10% (B) 15% (C) 20% (D) 25%

11. If the curved surface area of a sphere increased by 44%, then by what percentage would its volume increase?
(A) 20%
(B) 44%
(C) 72.8%
(D) Cannot be determined

12. The salary of Rahul increases by 10% every year. If for the year 1998 his salary was ₹22000, then for which year would his salary be ₹29282?
(A) 2000 (B) 2001 (C) 2002 (D) 2003

13. If the payment per hour of a part-time employee increased by 25% but his working time reduced by 20%, then find the net percentage change in his income.

14. In a certain season, the Indian Cricket Team had won 40% of the first 30 matches they played. If the team wanted an overall success rate of 80%, find the minimum number of matches that should be played to achieve the target.

15. A salesman used to get a commission of 12% on his total sales. A new policy is introduced and he now gets a fixed sum of ₹4680 and 8% commission on the total sales made in excess of ₹16000. The salesman's total sales for the previous month exceeded ₹16000. His total sales for this month was the same as that for last month and his total income for this month is ₹1000 more than that for last month. Find his total sales (in ₹) this month.
(A) 40000 (B) 50000 (C) 60000 (D) 70000

16. Ram spends 80% of his annual salary. If his annual salary increased by 14% and his expenditure increased by 10%, his savings would increase by

17. Raju's salary before he got an increment was equal to the total savings of his family. The total expenditure of his family was 64% of its total income. Raju got a 50% increment. If his family's expenditure remained unchanged, find the percentage that the new total savings of the family will form of its new total income.
(A) 20% (B) $16\frac{2}{29}\%$
(C) $45\frac{45}{59}\%$ (D) $41\frac{1}{59}\%$

18. A village has 10000 people, 68% of the people are males. The total literate population of the village is 6000. There are 1200 more male illiterates than female illiterates. What percent of the female population are illiterates?

19. The price of a pencil is twice that of an eraser. The price of an eraser is thrice that of a sharpener. If the price of a pencil increases by 10%, price of an eraser increases by 30% and the price of a sharpener increases by 20%, find the percentage increase in the price of 30 pencils, 30 erasers and 30 sharpeners.
(A) 13% (B) 17%
(C) 21% (D) Cannot be determined

20. An article was marked at ₹350. After successive discounts of 20% and d%, it was sold for ₹210. Find d.

21. David sold a calculator for ₹400 after offering a discount of ₹100 and he observed that the profit made by him on selling the calculator for ₹400 would be the same as the loss he would have made in selling it at a 25% loss. By how much percentage his marked price was above his cost price?

22. Mr. Sharma purchased a truck load of apples at ₹14 each. He found that 30% of those were spoilt and hence were unfit to be sold. By selling the remaining apples for ₹4,90,000, Mr. Sharma made a profit of 25% on them. How many apples did Mr. Sharma purchase?

23. A shopkeeper claims to sell his items at a loss of 10%, but instead he secretly weighs $16\frac{2}{3}\%$ less by using a false weight. What is the effective profit percentage he gets on every 100 gm he sells?
(A) 8% (B) 10%
(C) 12.5% (D) None of these

24. By selling an article for ₹816, a shopkeeper incurs a loss of 20%. At what price (in ₹) should he sell so as to gain 10%?

25. A dealer bought 60 radios at ₹3000 each and sold them under a special scheme. For every two radios purchased from him at ₹x each, he gave one radio free. He sold all the radios and all his customers took advantage of the scheme. If he incurred a loss of 10x, find x.

26. If 15 items are purchased for ₹12 and 12 items sold for ₹15, then what would be the profit/loss percentage?
(A) 32.25%
(B) 42.50%
(C) 50%
(D) 56.25%

27. If after giving a discount of 12%, a profit of 10% was made on an article, then by what percentage was the price marked up?

28. Two items were sold, both for the same price. The first item was sold at a profit of 40% and the other at a profit of 60%. If the customer paid a total sum of ₹12000 for the two items, then at what price (in ₹) did the shopkeeper purchase the cheaper item?

29. A shopkeeper sells his goods at the same price as what he pays his supplier. But when he buys from his supplier, he takes 10% more than the indicated weight and when he sells to his customers he gives 10% less than the indicated weight. Find his profit percentage.
(A) $18^2/_{11}\%$ (B) $22^2/_9\%$
(C) 20% (D) None of these

30. A shopkeeper sells his goods at the same price as what he pays his supplier. But when he buys from his supplier he takes 10% more than the indicated weight and when he sells, he gives a quantity, such that if 10% of that is added to it, the indicated weight is obtained. Find his profit percentage.
(A) $18^2/_{11}\%$ (B) $22^2/_9\%$
(C) 20% (D) 21%

31. A shopkeeper professes to sell the goods at cost price. He uses a false weight with the intention of selling an item at 25% profit. After selling the item, he realizes that the customer has paid 15% less than what he should have paid. Find the actual profit percentage made by the shopkeeper.
(A) 10% (B) 12.5% (C) 6.25% (D) 15%

32. Alok purchased 9000 apples at ₹6 each. He then realized 40% of them were spoilt. He sold only the remaining apples but still made a profit of 25% on the whole. Find the selling price (in ₹) of each apple.
(A) 10.50 (B) 12.50 (C) 13.50 (D) 15

33. Two items were sold at ₹9000 each. The first was sold at 50% loss and the second was sold at 40% loss. Find the difference in the cost prices of the first and the second items (in ₹)

34. A shopkeeper gave a 30% discount on the marked price of a trouser. As a result, a person was able to purchase a shirt in addition to the trouser. Find the marked price of the trouser if he paid ₹120 for the shirt (in ₹).

35. An item was marked up by 40% and after that a discount of 20% is given on it. If each item costs ₹225, then what profit (in ₹) is earned by selling it?

36. Ashok produces pencils at ₹9 and sells them at ₹12. The government used to impose a tax of 10% on the production cost. It now decided to impose 10% tax on the selling price. Find the percentage decrease in Ashok's profit.
(A) $28^{3}/_{7}\%$ (B) $42^{6}/_{7}\%$ (C) $14^{2}/_{7}\%$ (D) $7^{1}/_{7}\%$

37. Amar sold a camera at 20% profit to Bhavan. Bhavan sold it to Chetan at 30% loss. Chetan bought the camera for ₹840. Find the cost price of Chetan, had Amar sold the camera to Bhavan at 30% loss and Bhavan sold it to Chetan at 20% profit (in ₹.)

38. Ashwin purchased a second hand machine for ₹1 lakh. Over the first year after its purchase, he incurred an expense of ₹20000 in maintaining it. At the end of the first year he sold it for ₹80000. If depreciation is 25% of the total cost price (i.e. purchase price + maintenance expenses) find his profit/loss percentage.
(A) 12.5% profit (B) 12.5% loss
(C) $11^{1}/_{9}\%$ profit (D) $11^{1}/_{9}\%$ loss

39. Akbar and Birbal started a business with investments of ₹30000 and ₹40000 respectively. At the end of one year, they gave 10% of the total profit of ₹7000 to charity. Find the difference in the profit shares of both out of the remaining profit (in ₹).

40. Prasad and Satish started a business with investments of ₹2000 and ₹5300 respectively. At the end of every month, Prasad invests ₹300 while Satish withdraws ₹300. What is the ratio in which they should share the profits at the end of one year?
(A) 13 : 14 (B) 1 : 1
(C) 14 : 13 (D) Cannot be determined

41. A and B enter into a partnership with investments of ₹54000 and ₹81000 respectively. A stayed for the entire year. If at the end of the year the profit was distributed equally, then for how many months less was B's investment there in the business?
(A) 2 (B) 4
(C) 5 (D) 8

42. Anwar sold an article marked at ₹4000 after four successive discounts of 10%, 15%, 20% and 25%. Instead if he sold it after a 30% discount, he would have realized
(A) ₹964 less. (B) ₹964 more.
(C) ₹482 less. (D) ₹482 more.

43. A company imported two components X and Y. It imported X from U.K. and Y from France. It then assembled those components with other components to form a machine used in a chemical process. X made up to 20% of the production cost. Y made up to 40% of the production cost. Their regular practice was to sell the machine at 25% above the production cost. The U.K. pound became 40% costlier and the French franc became 30% costlier. Owing to these reasons, the company increased its selling price by 8%. Find the profit percentage, now.
(A) 10% (B) 12.5% (C) 15% (D) 8%

44. A and B started a business with some investments. A as a working partner received 40% of the annual profits as salary and the remaining was equally divided among A and B. If the entire profit was divided among A and B in the ratio of their investments, A would have received ₹900 less than what he actually got. B got a profit share of ₹2100. If B's investment is ₹45000, A's investment is (in ₹)
(A) 75000 (B) 60000
(C) 90000 (D) 45000

45. A man invests a certain sum in a 4% stock at 96 and an equal amount in a 5% stock at 102. Another man invests a certain sum in a 8% stock at 120 and an equal amount in a 3% stock at 125. If the investment of the first person is ₹960 more than that of the second person and the difference of their earnings is ₹44, then find the investment made by the first man.
(A) ₹24480 (B) ₹48960
(C) ₹97920 (D) None of these

Directions for questions 46 to 55: Each question is followed by two statements, I and II. Indicate your responses based on the following directions:

Mark (A) if the question can be answered using one of the statements alone, but cannot be answered using the other statement alone.
Mark (B) if the question can be answered using either statement alone.
Mark (C) if the question can be answered using statements I and II together but not using I or II alone.
Mark (D) if the question cannot be answered even using statements I and II together.

46. A certain sum was divided among P, Q and R. Who got the least share?
- I. P got 10% of the total amount
- II. Q's share is 80% of R's share

47. Is there any improvement in Sudhir's score in Maths from test 1 to test 2?
- I. In Maths he scored 60% marks in test 1.
- II. In Maths he scored 70 marks in test 2.

48. What is the profit percent made by selling a television set?
- I. 50% of the cost price of the television set is equal to 40% of its selling price.
- II. The cost price of the television set is 20% less than its selling price.

49. What is the profit percent made by selling each banana?
- I. Bananas are bought at ₹x per gross but sold at ₹ $x/8$ per dozen (1 gross = 12 dozens).
- II. By selling x dozens of bananas at ₹x per dozen, there is a profit of ₹300.

50. What is the profit percent made by selling two houses?
- I. One house is sold at 20% profit and the other house is sold at 20% loss.
- II. The cost price of each of the houses is the same.

51. What is the discount percentage offered on the calculator?
- I. The marked price of the calculator is ₹800
- II. The ratio of the selling price and the marked price of the calculator is 5 : 8.

52. A coat was marked at ₹600 above the cost price. What is the profit made by selling the coat?
- I. 50% discount on the marked price leads to a loss of ₹200.
- II. Discount offered on the coat is ₹200.

53. Is $x > y$?
- I. 20% of x is equal to 35% of y
- II. 12% of x is less than 8% of y.

54. What is the number of employees in the material department in TEAM organization which has a total of 240 employees?
- I. The number of persons in the material department is 25% of the number of marketing employees. The number of marketing employees is 40% of the number of employees of TEAM.
- II. If 60 employees leave the marketing department, then the number of employees in departments other than material department decreases by 20 percentage points.

55. What is the percentage increase in the area of a square?
- I. The side of the square is increased by 10%.
- II. The length of the diagonal of the square increased by 10%.

Key

Concept Review Questions

1. (i) 366	8. A	17. B	26. C	35. C	44. A
(ii) 448	9. A	18. D	27. 25	36. D	45. 1000
(iii) 102	10. 25	19. C	28. 50	37. 2200	46. B
2. B	11. 100	20. A	29. D	38. A	47. 1200
3. 125	12. D	21. 50	30. 400	39. A	48. 2400
4. C	13. 20	22. D	31. D	40. C	49. A
5. 10	14. 0	23. 5	32. A	41. 800	50. C
6. C	15. 0	24. D	33. B	42. 3000	
7. 10	16. D	25. 64	34. D	43. D	

Exercise – 3(a)

1. C	7. 21.6	13. 12	19. B	25. C	31. B
2. A	8. A	14. C	20. 12	26. C	32. C
3. 12.5	9. A	15. 35	21. B	27. 480	33. D
4. 32.5	10. A	16. C	22. D	28. 1280	34. B
5. B	11. C	17. 16	23. 50	29. A	35. B
6. B	12. 40	18. 10	24. 44	30. 14000	

Exercise – 3(b)

1. 1520	9. A	17. C	25. 3600	33. 3000	41. B	49. A
2. A	10. D	18. 43.75	26. D	34. 400	42. B	50. C
3. D	11. C	19. B	27. 25	35. 27	43. B	51. A
4. 5	12. B	20. 25	28. 3750	36. C	44. B	52. A
5. D	13. 0	21. 56.25	29. B	37. 840	45. B	53. B
6. 52	14. 60	22. 40000	30. D	38. D	46. C	54. B
7. 78850	15. C	23. A	31. C	39. 900	47. D	55. B
8. B	16. 30	24. 1122	32. B	40. B	48. B	