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

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

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

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

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

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

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 in 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 x 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 x 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) x 100.

Examples

3.01. Rice production in a country increased by 25% from 2000 to 2004. It increased by 20% from 2004 to 2008. Find the percentage increase in the rice production from 2000 to 2008.

Sol: Let the rice production in 2000 be 100 tonnes.

Rice production in 2004

$= 100+\frac{25}{100}(100)=125$ tonnes

Rice production in 2008

$= 125+\frac{20}{100}(125)=150$ tonnes

$\therefore$ Percentage increase in the rice production from 2000 to 2008 is $\frac{150-100}{100}\times100$ i.e. 50%.

3.02. The population of a country increased by 10% from 2001 to 2002. It increased by 20% from 2002 to 2003. It increased by 30% from 2003 to 2004. Find the simple average yearly percentage increase in the population from 2001 to 2004.

Sol: Let the population of the country in 2001 be 100 million. Population in 2002 = 110 million.
Population in 2003 = $110 \times 1.2 = 132$ million.
Population in 2004 = 132×1.3
= 171·6 million
Simple average percentage increase
$= \frac{171.6-100}{\frac{100}{3}}(100) = 23\frac{13}{15}\%$

3.03. The price of a Swiss watch was ₹10000 in 2001. Due to devaluation of the rupee it becomes ₹12000 in 2002. Find the percentage increase in its price from 2001 to 2002.

Sol: Percentage increase
$= \frac{\text{Final price} - \text{Initial price}}{\text{Initial price}}(100)$
$= \frac{12000-10000}{10000}(100) = 20\%$

3.04. In 2002, Rakesh's salary was ₹24000. In 2001, his salary was equal to that of Ramesh. Rakesh's salary in 2001 was 20% less than his salary in 2002. Ramesh's salary in 2002 was 20% more than his salary in 2001. By what percentage is the sum of the salaries of Ramesh in both the years more / less than that of the Rakesh in both the years?

Sol: Salary of Ramesh in 2001 = Salary of Rakesh in 2001
$= 24000\left(1-\frac{20}{100}\right) = 19200$
Salary of Ramesh in 2002
$= 19200\left(1+\frac{20}{100}\right) =$ ₹23040.
Total salary of Rakesh in both the years = 19,200 + 24,000 = ₹43200. Total salary of Ramesh in both the years = 19200 + 23040 = ₹42240, which is ₹960 less than that of Rakesh.
∴ Required percentage
$= \frac{960}{43200}(100) = 2\frac{2}{9}\%$

3.05. 64% of a number is 416. Find 85% of that number.

Sol: Let the number be x
$\frac{64}{100}x = 416$
x = 650
$\frac{85}{100}x = 552\cdot5$

Alternative method:

64% = 416
85% = $\frac{85}{64}(416) = 552\cdot5$

3.06. The ratio of the salaries of A and B is $2 : 2\frac{1}{7}$.

By what percentage is B's salary greater than A's salary?

Sol: Let the salary of A be 2x ⇒ Salary of B = ₹$2\frac{1}{7}x$
∴ The salary of B is more than the salary of A by $\frac{\frac{1}{7}x}{2x}(100) = 7\frac{1}{7}\%$

3.07. The height of a triangle as well as its base are increased by 30%. Find the percentage increase in its area.

Sol: Let the original height as well as the base be 100 cm. Original area = $\frac{(100)(100)}{2} = \frac{100^2}{2}$
New Height = New Base = 130 cm
New area = $\frac{(130)(130)}{2}$
$= \frac{1}{2}\left((1\cdot3)(100)^2\right) = \frac{1\cdot69\left(100^2\right)}{2}$
= 1·69 (original area)
∴ the area increased by 69%.

3.08. The price of an article is increased by 25%. By what percentage must this price be reduced to bring it down to the original price?

Sol: Let the original price be ₹100
New price = 100×1.25 = ₹125
To bring back the price to ₹100 it has to be reduced by ₹25
Percentage reduction = $\frac{25}{125}(100) = 20\%$

3.09. If Ram's salary is 20% less than Shyam's salary, by what percentage is Shyam's salary more than Ram's salary?

Sol: Let Shyam's salary be ₹100
Ram's salary = ₹80
Shyam's salary is more than Ram's salary by $\frac{20}{80}(100) = 25\%$

3.10. If the price of tea goes up by $33\frac{1}{3}\%$, what should be the percentage by which its consumption must be reduced so that the expenditure on it remains unchanged?

Sol: Let the original price be ₹300 per kg and the original consumption be 100 kg. Original expenditure = New expenditure = ₹30000.
New price = $300\left(1+\frac{1}{3}\right)$ = ₹400
New consumption = $\frac{30000}{400}$ i.e. 75 kg.
Percentage reduction in consumption
$= \frac{25}{100}(100) = 25\%$

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 $\frac{30 - 20}{20}$ x 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 = $\frac{S.P. - C.P.}{C.P.}$ x 100 = $\frac{Profit}{C.P.}$ x 100

Loss = C.P. - S.P.

Percentage Loss = $\frac{Loss}{C.P.}$ x 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. x $\frac{(100+p)}{100}$

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

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

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

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

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 selling price is S.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

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

3.11. Alok bought a watch for ₹250 and sold it for ₹300. Find his profit percentage.

Sol: Given that
S.P = ₹300 C.P = ₹250
$\Rightarrow$ Profit = S.P – C.P = ₹300 – ₹250 = ₹50

Profit % = $\frac{50}{250}(100) = 20\%$

3.12. Anand gained 20% by selling a book at ₹30. Find his gain percentage if he sells it for ₹36.

Sol: Let his cost price be ₹ x

Given, $\left(1+\frac{20}{100}\right)x = 30 \Rightarrow x = 25$

Gain percent when sold at ₹36

$= \frac{36-25}{25}(100) = 44\%$

3.13. Ajay calculated his profit / loss percentage on his selling prices. Find his actual profit/loss percentage if he calculated
(i) his profit percentage to be 25%
(ii) his loss percentage to be 25%

Sol: Let his selling price be ₹100
(i) Profit = ₹25 $\Rightarrow$ CP = SP – Profit = ₹75
Actual profit percentage
$= \frac{25}{75}(100) = 33\frac{1}{3}\%$
(ii) Loss = ₹25 $\Rightarrow$ CP = SP + Loss = ₹125
Actual loss percentage
$= \frac{25}{125}(100) = 20\%$

3.14. The cost of 4 apples equals the selling price of 3 apples. Find the profit/loss percentage.

Sol: Let the cost of each apple be ₹x
Cost of 3 apples = ₹3x
Selling price of 3 apples = Cost price of 4 apples = ₹4x
$\therefore$ Profit on selling 3 apples = ₹x

Profit % = $\frac{x}{3x}(100) = 33\frac{1}{3}\%$

3.15. The profit made by selling 5 m of a cloth equals the selling price of 2 m of that cloth. Find the profit percentage made.

Sol: SP (5m) = CP (5m) + Profit (5m)
As Profit (5m) = SP (2m),
SP (5m) = CP (5m) + SP (2m)
$\Rightarrow$ SP (3m) = CP (5m)
$\Rightarrow \frac{SP}{CP} = \frac{5}{3}$

$\therefore$ Profit % = $\frac{5-3}{3} \times 100 = 66\frac{2}{3}\%$

3.16. A trader promised his customers to sell at cost price. But he cheats his customers by giving 100 gms less for every kg that he sells. Find his profit percentage.

Sol: Let the cost of each gm to the trader be ₹1. Cost price of 1000 gms = Selling price of 900 gms.
ost of 900 gms = ₹900
elling price of 900 gms = ₹1000

rofit percentage = $\frac{1000-900}{900}(100) = 11\frac{1}{9}\%$.

3.17. A sold a chair to B at 10% profit. B sold it to C at 20% profit. If C bought it for ₹660, find the price at which A bought the chair.

Sol: et the cost price of A be ₹x
Selling price of A = Cost price of B = ₹1·1x
Selling price of B = Cost price of C = ₹1·32x
Given that 1·32x = 660 $\Rightarrow$ x = 500
$\therefore$ A bought it at ₹500

3.18. Kiran sold a table at 20% loss. If he sold it at 10% profit, he would have earned ₹300 more. Find the cost price of Kiran.

Sol: Let the cost price of Kiran be ₹x
Selling price of Kiran = ₹0·8x
If he sold it at 10% profit, his selling price = ₹1·1x
Given that
1·1x = 0·8x + 300
$\therefore$ x = 1000

3.19. Ashok bought 15 kg of cashew nuts for ₹540. He was forced to sell them at a loss equal to the amount he would have realized by selling 3 kg. Find his selling price per kg.

Sol: CP = SP + Loss
$\Rightarrow$ CP (15kg) = SP (15kg) + SP (3kg)
$\Rightarrow$ CP (15kg) = SP (18 kg) = ₹540 (given)
$\therefore$ selling price per kg = $\frac{₹540}{18}$ = ₹30

3.20. Shyam purchased some goods for ₹1800. He sold one-third of the goods purchased at 20% loss. Find the profit percentage at which the rest of the goods must be sold to realize an overall profit of 20%.

Sol: Suppose that Shyam purchased 3 kg for ₹1800
Cost price of 1 kg = ₹600
He sold one kg at a loss of 20%. Hence his selling price of this kg = ₹480
His total selling price must be (1.2) $\times$ 1800 = ₹2160
Hence selling price of the remaining 2 kg must be ₹1680. Cost price of 2kg = 2 $\times$ 600 = ₹1200
$\therefore$ Profit percentage = $\frac{1680-1200}{1200}(100) = 40\%$

3.21. Usha bought a certain number of chocolates at the rate of 16 chocolates for ₹12 and the same number of chocolates at the rate of 24 chocolates for ₹20. She sold all of them at the rate of 30 chocolates for ₹30. Find her gain / loss percentage.

Sol: Let 2x be the total number of chocolates that she bought.
otal cost price of Usha
$\frac{12}{16}(x)+\frac{20}{24}(x) = ₹\frac{19}{12}x$
Total selling price of Usha = $\frac{30}{30}(2x) = ₹2x$
Hence the gain% of Usha
$= \frac{2x-\frac{19}{12}x}{\frac{19}{12}x}(100) = \frac{500}{19}\% = 26\frac{6}{19}\%$

3.22. Anwar bought two radios at the same price. He sold one at x% profit and the other at y% loss. Find his overall profit/loss percentage, if
(i) x = y = 10
(ii) x = 20, y = 10
(iii) x = 10, y = 20

Sol: Let the cost price of each radio be ₹1000.
Total cost price = ₹2000
(i) Selling price of the radio sold at profit = 1.1 $\times$ 1000 = ₹1100
Selling price of the radio sold at loss = 0.9 $\times$ 1000 = ₹900
Total selling price = Total cost price = ₹2000
$\therefore$ Neither profit nor loss is made in the entire transaction.

(ii) Selling price of the radio sold at profit = 1.2 $\times$ 1000 = ₹1200
Selling price of the radio sold at loss = 0.9 $\times$ 1000 = ₹900
Total selling price = ₹2100
Overall profit = ₹100
Overall profit % = $\frac{100}{2000}(100) = 5\%$

(iii) Similar to a method as in (ii), it can be shown that overall loss = 5%

Note: Overall profit/loss percentage is always half of the difference of x and y.

3.23. Balu sold two TV sets, one at 10% profit and the other at 10% loss. Find his overall profit/loss percentage if he sold both the sets at the same price.

Sol: When two items are sold at the same selling price with one being sold at x% profit and the other being sold at x% loss, on the overall a loss is always made and the overall loss percentage is given by $\frac{x^2}{100}\%$. As Balu sold both TV sets at the same price and x = 10, he must have made an overall loss of $\frac{10^2}{100}$ i.e. 1%

3.24. If Ram sold an article at four-fifth of its actual selling price, he would have incurred a loss of 40%. Find his actual profit / loss percentage.

Sol: Let the cost price of Ram be ₹100
Given that four-fifth of its actual selling price 0.6 $\times$ 100 = ₹60. Hence its actual selling price is $\frac{5}{4} \times 60$ = ₹75
$\therefore$ Ram made a loss of 25%.

3.25. A trader marked his goods 40% above his cost price. He then gave a discount of 20%. Find his profit percentage.

Sol: Let the cost price be ₹100.
Marked price = 1.4 $\times$ 100 = ₹140.
Selling price = 0.8 $\times$ 140 = ₹112.
$\therefore$ Profit % = $\frac{112-100}{100} \times 100 = 12\%$.

3.26. Sachin gave a discount of 20% on the marked price of his watch and then sold it. He made a profit of 25%. By what percentage did he mark the watch above its cost price?

Sol: Let the cost price of the watch be ₹100
Let the marked price be ₹x.
Selling price = ₹0·8x
Also given that the selling price = ₹125
$\Rightarrow$ 0·8x = 125
$x = \frac{625}{4} = 156 \cdot 25$
$\therefore$ Percentage of mark up = 56·25

3.27. Alex sold his goods after announcing two successive discounts of 30% each. Find his effective discount percentage.

Sol: Let the marked price be ₹100. Price after the first discount = ₹70. Price after the second discount
$0.7 \times 70 = ₹49$
$\therefore$ Effective discount percentage is 100 – 49 = 51%.

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.

3.28. Ram and Shyam invested ₹18000 and ₹21600 respectively in a business and at the end of the year shared a profit of ₹22000. Find the profit share of Ram.

Sol: Ratio of profits when ivested for the same periods = ratio of investments = 18000 : 21600 = 5 : 6

Profit share of Ram = $\frac{5}{11}(22000) = ₹10000$

3.29. David started a business with ₹40000. Three months later, Edward joined him with ₹50000. Find the ratio in which they must share the annual profit.

Sol: Ratio of the profits of David and Edward = The ratio of the product of their investments and the period of investment.
= (40000) (12) : (50000) (9) = 16 : 15

3.30. Sachin started a business with ₹20000 and after 4 months Sunil joined him with ₹40000. Sachin received ₹39000 as his annual profit share which included a salary of 16% of the annual profit. Find the annual profit share of Sunil.

Sol: Let the total annual profit be ₹x
Ratio of the part of the total annual profit which is shared in the ratio of the (investments $\times$ time)
= (20000) (12) : (40000) (8) = 3 : 4.
Hence the share of Sachin

$$= \frac{3}{7}\left(\frac{84}{100}x\right) + \frac{16x}{100} = 39000$$

x = 75000
$\therefore$ Annual profit share of Sunil
= ₹75000 – ₹39000 = ₹36000

3.31. A started a business with ₹20000. After 3 months, B joined him with ₹40000. After some more months, C joined them with ₹100000. B received ₹18000 out of the total annual profit of ₹55000. How many months after A started the business did C join?

Sol: Let us say C joined after x months.
Profit is shared in the ratio
(20000) (12) : (40000) (9) : 100000 (12 – x)
= 24 : 36 : 10 (12 – x)

Given $\frac{36}{180-10x} = \frac{18}{55} = \frac{36}{110}$

180 – 10x = 110
$\therefore$ x = 7

3.32. Mohan started a business with ₹20000. After 4 months, Sachin joined him with ₹30000. At the beginning of the fifth month, Mohan added ₹10000. Find the ratio in which the annual profit will be shared.

Sol: Ratio of the profit shares
= [(20000) (12) + (10000) (8)] : [30000 (8)] = 4 : 3

3.33. The salary of a working partner equals 20% of the annual profit remaining after his salary is paid. If his salary is ₹10000, find the annual profit.

Sol: Let the annual profit be ₹x

Given, $10000 = \frac{20}{100}(x - 10000)$

$\Rightarrow x = 60000$

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 $5^5/_{19}\%$

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.

3.34. What is the annual income from ₹32400 invested in 12% stock at 8% premium?

Sol: Market value = ₹108

Number of units purchased = $\frac{32400}{108} = 300$

Each unit purchased gives ₹12 as income.

$\therefore$ Annual income = (12) (300) = ₹3600

3.35. Which of the following is a better investment – 6% stock at 84 or 8% stock at 96?

Sol: In the first investment, ₹84 must be invested to obtain ₹6 as income.

$\therefore$ ₹14 must be invested to obtain ₹1 as income.

In the second investment, ₹96 must be invested to obtain ₹8 as income.

$\therefore$ ₹12 must be invested to obtain ₹1 as income.

$\therefore$ The second investment is a better investment.

3.36. Sastry invests half his salary in 4% stock at 95 and the other half in 8% stock at 105. Sharma invests the same amounts in 4% stock at 90 and 8% stock at 110. Who receives a better percentage yield?

Sol: Let the total Amount be $(2 \times 95 \times 105 \times 90 \times 110)$; (Common multiple of prices)

Sastry makes $(4 \times 105 \times 90 \times 110) + (8 \times 95 \times 90 \times 110) = 90 \times 110 \times 4\ (105 + 190)$ ……. (1)

Rate of return = $\frac{295 \times 90 \times 110 \times 4}{2 \times (95 \times 105 \times 90 \times 110)} \times 100$

= 5·09%

Sharma makes

$(4 \times 105 \times 95 \times 110) + (8 \times 105 \times 95 \times 90)$

$= (110 + 180) \times 4 \times 105 \times 95$ …….. (2)

Rate of return = $\frac{290 \times 4 \times 105 \times 95}{2 \times (110 \times 90 \times 95 \times 105} \times 100$

= 5·08%.

Note: Even without calculating the rates of return, the numbers under (1) and (2) can be compared and the result obtained.

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. If 40% of 50 = x% of 80, what is the value of x?
(A) 20 (B) 25 (C) 30 (D) 40

2. What percentage of 80 is 200?

3. 32% of what number is 256?
(A) 1024 (B) 800 (C) 640 (D) 400

4. If 60% of x is 60 more than 60% of 60, then 60% of x = _____.
(A) 90 (B) 94 (C) 96 (D) 92

5. Which of the following fractions equals $101^{3}/_{5}$%?
(A) 508/5 (B) 254/5
(C) 51/25 (D) 127/125

6. If 60% of 70% of a number is 1680, find the number.

7. If 40% of a number y is 75 more than 20% of 1500, y = _____.
(A) 962.5 (B) 952.5
(C) 937.5 (D) 912.5

8. If A% of $\frac{A}{B}+\frac{A}{B}$% of A = C% of $\frac{A}{B}$, C = A.

9. If a% of b + b% of a is equal to $33^{1}/_{3}$% of (a + b), $\left(\frac{1}{a}+\frac{1}{b}\right)$ = _____.
(A) 6% (B) 9% (C) 12% (D) 18%

10. Ganesh owns $83^{1}/_{3}$% of a property. Three-fourths of his share is worth ₹5 lakhs. Find the value of the property (in ₹ lakhs).

11. A student secured 80% of the total marks and got 720 marks. How many marks did a student who scored 90% get?
(A) 750 (B) 1000
(C) 810 (D) 900

12. In a test, the pass percentage was 35%. A student who wrote it got 230 marks and failed by 15 marks. Find the maximum mark in it.
(A) 700 (B) 630 (C) 770 (D) 840

13. The income tax rate is reduced from 25% to $17^{1}/_{2}$%. The tax to be paid by Bala whose taxable income is ₹9200 would reduce by (in ₹) .

14. Ashok secured 70% of the votes polled in an election and was elected by a majority of 168 votes. All the votes polled were valid. Find the number of votes polled if there were only two contestants.
(A) 490 (B) 420 (C) 350 (D) 560

15. The price of an article becomes ₹260 after it increases by 30%. Find the original price (in ₹).

16. The cost price of an article and its selling price are ₹600 and ₹900 respectively. Find the profit percentage.
(A) 50% (B) $33\frac{1}{3}$% (C) 100% (D) $16\frac{2}{3}$%

17. P and Q started a business in which P invested ₹10000 and Q invested ₹20000. They received a profit of ₹9600 at the end of a year. Find Q's share in the profit (in ₹).

18. The price of an article becomes ₹63 after a decrease of 30%. Find the original price (in ₹).
(A) 100 (B) 96 (C) 90 (D) 80

19. In a test, Mohan's mark was 25% more than Sohan's mark. Mohan got the minimum mark required to pass the test. The pass mark was 35. Find Sohan's mark.

20. Ravi's salary before he got an increment was 20% of the total income of his family. His increment was one-fourth of his salary after the increment. What percentage of the total income of his family is his new salary?
(A) $16\frac{2}{3}$% (B) 20%
(C) $33\frac{1}{3}$% (D) 25%

21. The salaries of two persons are equal. If the salary of one of them is increased by 20% and the salary of the other is decreased by 20%, find the percentage change in the total salary of the two persons.
(A) 4% increase (B) 4% decrease
(C) 0% (D) None of these

22. The population of a country quadrupled from 2001 to 2002. Find the percentage increase in the population.
(A) 400% (B) 500% (C) 300% (D) 4%

23. In an exam, Arun got 20% more marks than Bala. By what percentage are the marks of Bala less than that of Arun?
(A) 20% (B) $16\frac{2}{3}$% (C) 25% (D) $33\frac{1}{3}$%

24. The price of a TV is decreased by 20%. By what percent must it be increased to bring it back to the original price?

(A) 25% (B) 20% (C) $16\frac{2}{3}\%$ (D) 15%

25. The price of a TV is increased by 20%. By what percent must it be decreased to bring it back to the original price?

(A) 25% (B) 20% (C) $16\frac{2}{3}\%$ (D) 15%

26. The ratio of two numbers is 5/6 : 2/3. By what percentage is the second number more/less than the first number?

(A) 20% less (B) 25% more
(C) 25% less (D) 20% more

27. The price of fan A is twice that of another fan B. The price of A is increased by 10% and that of B is decreased by 20%. Find the percentage decrease in the sum of the prices of the fans.

[ ]

28. There are 30 employees in a company. The salaries of 20 of them were each increased by 10%. The salaries of the rest were each increased by 20%. Find the percentage increase in the total salary of the employees.

(A) $13\frac{1}{3}\%$ (B) 15%

(C) $16\frac{2}{3}\%$ (D) Cannot be determined

29. The price of an article is decreased by 20% and then increased by 20%. Find the net percentage change in the price.

(A) 0% (B) 4% increase
(C) 4% decrease (D) None of these

30. The price of on article is increased by 10% and then decreased by 10%. Find the net percentage change in the price.

(A) 0% (B) 1% increase
(C) 1% decrease (D) None of these

31. A positive number was decreased by 20% and then increased by 20%. Find the percentage change in it.

(A) 2% decrease (B) 0%
(C) 4% decrease (D) 4% increase

32. There are three natural numbers. The first and second are less than the third by 40% and 50% respectively. What percentage of the second number is the first number?

(A) 125% (B) $133^{1}/_{3}\%$
(C) $116^{2}/_{3}\%$ (D) 120%

33. Raja receives an increment in his salary. His salary presently forms 30% of the total income of his family. Before the increment his salary used to form 20% of the total income of his family. By how many percentage points did the salary of Raja as a percentage of his family's total income increase?

(A) $14\frac{2}{7}$ (B) $16\frac{2}{3}$ (C) 10 (D) 8

34. An amount of ₹36 is gained when an article was sold at a profit of 6%. What is the cost price of the article? (In ₹)

[ ]

35. Two articles are bought at the same price. One is sold at 20% profit and the other is sold at 10% loss. Find the overall profit/loss percentage.

(A) 10% profit (B) 10% loss
(C) 5% loss (D) 5% profit

36. The cost price of a camera is 90% of its selling price. Find the profit percentage.

(A) $9\frac{1}{11}\%$ (B) 10% (C) $11\frac{1}{9}\%$ (D) 12%

37. The cost price of a product is ₹50. It is increased by 20% and then by $33\frac{1}{3}\%$. Find its latest price (in ₹)

[ ]

38. A shopkeeper sells an item for ₹60 at a profit of 20%. At what price (in ₹) should he sell it to gain 30%?

(A) 63 (B) 65 (C) 68 (D) 70

39. The profit made on selling 5 m of a cloth equals the cost price of 2 m of that cloth. Find the profit percentage in selling each metre of the cloth.

(A) $66\frac{2}{3}\%$ (B) 50% (C) 40% (D) $28\frac{4}{7}\%$

40. A company manufactures a product for ₹50. It sold it to a dealer for ₹60. The dealer sold it to a shopkeeper for ₹75. The shopkeeper sold it to a customer for ₹100. Find the profit percentage of the company.

(A) $16\frac{2}{3}\%$ (B) 25%

(C) 20% (D) $33\frac{1}{3}\%$

41. In question above who got the highest profit on selling the product?

(A) Company
(B) Dealer
(C) Shopkeeper
(D) All of them got the same profit

42. The cost price of 80 articles is ₹12·50 per article. Twenty of them were sold for ₹18 each. At what price should each of the remaining articles be sold so as to get an overall profit of ₹4.50 per article?

(A) ₹15 (B) $₹16\frac{2}{3}$ (C) $₹17\frac{1}{3}$ (D) ₹18

43. Two successive discounts of 30% and 10% are equivalent to a single discount of

[ ] %.

44. Govind marked an article 25% above its cost price and allowed a discount of 30%. Find his loss percentage.

(A) 10% (B) 15% (C) 7.5% (D) 12.5%

45. Rohit marked his goods 40% above his cost price. He sold it after a discount at 12% profit. Find his discount percentage.

[ ] %

46. A shopkeeper bought an article for ₹360. The profit made by the shopkeeper after selling it after a $11\frac{1}{9}\%$ discount is ₹40. Find the marked price (in ₹) of the article.

[ ]

47. Ajay and Vijay invested ₹8000 each to start a business. Ajay invested his money for nine months and Vijay invested his money for a year. At the end of a year, if the profit was ₹3500, find Ajay's share.

(A) ₹1500 (B) ₹2000
(C) ₹2100 (D) ₹2800

48. Ramesh and Suresh started a business. Ramesh invested ₹9000 for ten months and Suresh invested ₹6000 for a year. If the profit at the end of a year was ₹4500, find Suresh's share.

(A) ₹3600 (B) ₹2700
(C) ₹2500 (D) ₹2000

49. Ashok invested ₹12000 in a 6% stock at par. Find his annual income (in ₹).

[ ]

50. Ajay invested ₹12600 in a 5% stock at 5% premium. Find his annual income (in ₹).

(A) 600 (B) 630 (C) 660 (D) 720

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 2004, the price of a shampoo bottle increases by 10% with respect to that in 2003. By what percentage is its price in 2003 less than that in 2004?

(A) 10% (B) $9\frac{1}{11}\%$

(C) 11% (D) $10\frac{1}{11}\%$

2. A student secures 38% of the total marks in an exam and gets 18 marks more than the pass mark. A second student secures 27% of the total marks in the same exam and fails by 37 marks. What is the pass mark as a percentage of the total marks?

[ ]

3. Due to inflation the total cost of monthly household items has gone up by 20%, but the salary of the family increased by only 10%. Initially, the family used to spend 20% of the salary on household items. What percentage of the present salary should the family spend to buy the same quantities of household items?

(A) 10% (B) $20\frac{2}{11}\%$

(C) $22\frac{2}{11}\%$ (D) $21\frac{9}{11}\%$

4. In 2001, the transportation cost of an item was 30% of its manufacturing cost. From 2001 to 2002, its manufacturing cost went up by 20%. Its transportation cost in 2002 was $33\frac{1}{3}\%$ of its manufacturing cost in that year. By what percent should the total cost in 2002 be reduced to bring it back to that in 2001?

[ ] %

(Total cost = Manufacturing cost + Transportation cost).

5. In a town, the population of males decreased by 25% from 2001 to 2002. The population of females increased by 20% in this period. If females formed $44\frac{4}{9}\%$ of the population in 2002, what percentage of the population in 2001 were males?

(A) 50% (B) $66\frac{2}{3}\%$

(C) 80% (D) 75%

6. The length of a rectangle is increased by 20% and its breadth is increased by 10%. Which of the following is a possible value of the percentage increase in its perimeter?

(A) 13% (B) 14%

(C) 12% (D) 16%

7. The production of rice in the year 2001 was 1000 tonnes which was 25% of the total food grain production in that year. In the next year if the production of rice decreased by 4% and production of rice as a percentage of total food grain production increased by 5 percentage points, what is the total food grain production in 2002? (in tonnes)

[ ]

8. In a public sector unit (PSU), there are 45600 employees. When the PSU offered a voluntary retirement scheme (VRS), 40% of the employees applied for the VRS. After scrutinizing, the PSU has rejected 15% of the applications. But only 9120 employees took the retirement through the scheme. What percentage of the total number of employees did not take retirement even though their applications are not rejected?

(A) 25% (B) 14% (C) 24% (D) 12.75%

9. A school has 2000 students, out of which 40% of the students are in higher secondary. Out of the students in the higher secondary, 28% are girls and 50% of them passed. The overall pass percentage in the higher secondary is 40%. How many boys passed?

(A) 208 (B) 320

(C) 200 (D) 96

10. In an election among three contestants P, Q and R, P gets 120% more votes than Q. P beats R by 3,50,000 votes. Q beats R by 5% of the total votes. Find the total number of votes polled (in lakhs).

(A) 12 (B) 10 (C) 9 (D) 11

11. In a certain month, the total income of A, B, C is ₹644000. In that month, A spends 75% of his income, B spends 80% of his income, C spends 62.5% of his income. The ratio of the amounts spent by A, B, C in that month is 42 : 64 : 55. Find the income of A in the month. (in ₹)

[ ]

12. The success rate at one stage, of the Indian cricket team in Australia was 25% from 60 matches. If India lost the next 12 matches, what was the minimum number of total matches that were played if the overall success rate of India was 50%?

(A) 42 (B) 104

(C) 118 (D) 114

13. In 2003, Brijesh paid a tax of 20% of his salary. In 2004, his salary increased by $93^3/_4\%$ and the tax scheme changed. Under the new tax scheme he had to pay a fixed sum of ₹1000 and an additional 20% on the amount above ₹10000. His salary in 2004 was more than ₹10,000 and he paid a tax of ₹500 more than what he paid in 2003. What is his salary in 2004?

(A) ₹15500 (B) ₹17000

(C) ₹18200 (D) ₹20000

14. At a certain stationery shop, the cost of each ruler is 2.5 times the cost of each sharpener. Anil bought 25 rulers and a certain number of sharpeners. Had he bought as many rulers as the number of sharpeners that he bought and vice versa, his total expenditure on the two items would have been $9\frac{1}{11}$ % less. How many sharpeners did he buy?

15. In 2000, the market shares of the toilet soaps Margo, Palmolive and Dove were 40%, 30% and 30% respectively. Starting from the next year, a new soap enters the market each year and gets 10% of total market share in that year. The existing soaps in that year share the remaining market in the same ratio as they did in the previous year. What percent of the total market share will Margo have in 2002?
(A) 32% (B) 32.4%
(C) 28.8% (D) 34%

16. At the beginning of a year, the owner of a jewel shop raised the prices of all the jewels in his shop by x% and the lowered then by x%. The price of one jewel after this up and down cycle reduced by ₹100. The owner carried out the same procedure after a month. After this second up-down cycle, the price of that jewel was ₹2304. Find the original price of that jewel (in ₹).
(A) 2600 (B) 2550 (C) 2650 (D) 2500

17. At the beginning of 2002, Sunil had four dozen goats with him. He increased this stock by x%. At the end of 2002, he sold off y% of his stock. At the beginning of 2003, he again increased his stock by x% and at the end of 2003, he again sold off y% of his stock. There were no other changes in the number of goats. At the end of 2003, he had five dozen goats with him after his sales. Which of the following always holds true?
(A) $x > \frac{100y}{100-y}$ (B) $\frac{100y}{100-y} > x > y$
(C) $x < y$ (D) $\frac{100y}{100-y} < x < y$

18. A bicycle was sold at a loss of 18%. Had it been sold for ₹990 more, there would have been a profit of 15%. At what price (in ₹) should the bicycle be sold to make a profit of 10%?

19. A person sold two shirts each for ₹880. On one he gained 10% and on the other he lost 20%. What is the overall profit or loss percentage?
(A) 55% profit (B) 5.5% loss
(C) 7.36% profit (D) 7.36% loss

20. The cost of production of a motorbike which is sold at 20% profit went up by 40%. What should be the percentage increase in the selling price to maintain the profit percentage the same even at the new cost of production?
%

21. Initially a television was being offered at a discount of 40%. The dealer reduced this discounted price further by 20% because the customer bargained. If the selling price of the television is ₹9600, then what is its marked price?
(A) ₹19200 (B) ₹16000
(C) ₹20000 (D) ₹25000

22. A shopkeeper sold $\frac{2}{9}^{th}$ of his stock at 18% profit, three – fifth of his stock at 27.5% profit and the rest at 30% profit. The overall profit percentage made by the shopkeeper is
(A) $21\frac{1}{6}\%$ (B) $25\frac{5}{6}\%$
(C) $19\frac{7}{2}\%$ (D) $28\frac{1}{3}\%$

23. A man bought 100 mangoes at a certain price, with the intention of selling each at a profit of 25%. But 20 mangoes got spoilt. If he sold the rest at the intended price, what was his profit or loss percentage?
(A) 0% (B) 6.66% profit
(C) 6.25% loss (D) 12.5% profit

24. A trader sells an article at a profit of ₹25. If the cost price is reduced by ₹25 and consequently the selling price is reduced by 25% he would make a profit of 25%. What is his initial cost price? (in ₹)

25. A shopkeeper always weighs 20% less than the correct weight. One day, he weighed 20% more than the quantity usually weighed by him. If the profit on the correct weight is 20%, what is the effective percentage of profit in this transaction?
(A) 10% (B) 25% (C) 20% (D) 15%

26. A dealer bought 50 television sets at ₹10000 each. For every set purchased from him, he gave one set free. The loss made by him is equal to the selling price of 15 sets. What is the selling price of each set, that is bought?
(A) ₹10000 (B) ₹15000 (C) ₹12500 (D) ₹20000

27. Anwar bought an article listed at ₹18000 at 30% discount. He sold it to Balu at $33\frac{1}{3}\%$ profit. Balu marked up the price of the article by 25% and then gave $16\frac{2}{3}\%$ discount. Find the profit percentage made by Balu. $\frac{\square}{6}$ %

28. A printer undertook the task of printing 2000 pages for a client. The client provided the paper. The dimension of each page was 24 cm x 14 cm. A 2 cm gap was left on each page on all the 4 sides of the margin. The cost of printing was ₹8 per sq. cm. If the printer wants to make 8% profit, how much should he charge per page?
(A) ₹1728 (B) ₹2281 (C) ₹1628 (D) ₹1901

29. Serena and Venus start a business with ₹50000 each. At the end of 3 months Venus withdraws ₹10000 from his investment. What percent of the total profit should Venus receive at the end of the year?

(A) 33.3% (B) $45\frac{5}{6}\%$

(C) 50% (D) $45\frac{35}{37}\%$

30. Mehta, Mehra and Mihir start a business with investments in the ratios of 1 : 2 : 3. They make a profit of ₹600000. If Mihir and Mehra leave after 4 and 8 months respectively, then what is Mehta's share of the total profit? (in ₹)

31. Goyal and Gokul invest ₹20000 and ₹30000 respectively and start a business. Since Goyal manages the business, he gets a salary which is equal to 20% of the balance profit after deducting this salary. If Goyal's total earnings are ₹4800 at the end of one year, what is the total profit made by the business?

(A) ₹4000
(B) ₹5200
(C) ₹9600
(D) ₹6400

32. Ganga and Gayathri start an enterprise by investing ₹24000 and ₹36000 respectively. Their agreement is to share half of the total profit equally and then share the remaining half in the ratio of their capitals. If they share the entire profit in the ratio of their capitals, Gayathri would have got ₹2500 more than what she would have got otherwise. What is the total profit?

(A) ₹75000 (B) ₹72000
(C) ₹108000 (D) ₹50000

33. A man invests ₹1395 in a 3% stock at ₹93. After holding the stock for a month, he sells ₹1000 worth of stock at ₹95 and the remaining at ₹80. What is the overall profit or loss in the above purchase and sale transaction?(in ₹)

(A) 75 loss (B) 15 loss (C) 22 profit (D) 45 loss

34. Ismail invests in a 6% stock at 5% premium. He gets a dividend of ₹3600 at the end of the year. What is his investment? (in ₹)

35. A man invests half of the amount he has in 4% stock at 90 and the other half in 8% stock at 110. If he had invested the total amount in the 8% stock at 110 he would have made ₹3500 more. How much did he invest?

(A) ₹250000 (B) ₹247500
(C) ₹300000 (D) ₹225000

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. A's salary is 20% less than B's salary. If C's salary is ₹10000 and it is 25% more than B's salary, then what is A's salary?

(A) ₹6000 (B) ₹9600
(C) ₹8000 (D) ₹6400

2. School A has 30% more students than school B. If 120 more students join school B, the two schools will have the same number of students. What is the sum of the number of students in school A and school B initially?

3. The price of petrol increased by 2% in a certain week and increased by 4% in the next week. Find the net percentage increase in the price of petrol over these two weeks.

(A) 6.12% (B) 6.08%
(C) 6.16% (D) 6.20%

4. Rahul got 150 marks in a test. He scored 25% more marks than the pass mark in it. Rajesh got 165 marks in it. By what percent did his mark exceed the pass mark?

%

5. In a college of total strength 1000, 30% of the students are girls. There are 600 PGs and 120 more male UGs than female UGs. What percent of the males are the female UGs?

(A) 20% (B) 15% (C) 25% (D) 10%

6. A machine costs ₹4,00,000. It depreciates by 18% in value in the first year, 16.5% in the second year, 15% in the third year and so on. Find the amount by which it depreciates in the seventh year (in ₹) (Assume all percentages apply to the original cost of the equipment).

7. One month Mrs. and Mr. Rai take home ₹20000 each. These amount respectively represent an increase of 25% over Mrs. Rai's take home in the previous month and a decrease of 33.33% over Mr. Rai's take home in the previous month. What was their total income in the previous month?

(A) ₹40000 (B) ₹50000
(C) ₹46000 (D) ₹41666

8. The monthly income of Ram increased by 26%. His expenditure which is 70% of his monthly income increased by 20%. His savings must have increased by

(A) 40% (B) 30%
(C) 50% (D) 25%

9. Anand cut a rectangular piece of paper twice. With the first cut, he decreased its area by 40%. With the second cut, he decreased its area by 50%. Its final area was 30 sq cm less than its area after the first cut. Find its original area (in sq cm).

10. The breadth of a rectangle decreases by 20% and then increases by 30%. By what percent should the length decrease, so that the area remains unchanged?

(A) $3\frac{9}{13}\%$ (B) $3\frac{8}{13}\%$

(C) $3\frac{10}{13}\%$ (D) $3\frac{11}{13}\%$

11. A laptop was sold at a profit of 15%. If it was sold at a price that was 10% lower, the profit would have been ₹1050. What is the cost price of the laptop?

(A) ₹21000 (B) ₹35000

(C) ₹30000 (D) ₹42000

12. A new coach was appointed in the middle of a season for a football team. After he took over, the team won 80% of the 60 matches it played. But the overall success rate of the team was only 60%. Find the minimum number of matches the team must have played that season before the new coach took over.

13. Mr. Singh is paid as per the number of hours he puts in per month. The rate of pay was increased by 20% per hour, but the number of hours put in by him went down by 20%. What is the percentage increase/decrease in his income?

(A) 2% decrease (B) 2% increase

(C) 4% decrease (D) 4% increase

14. In December 2014, Bala spent 75% of his income on food, shopping and utility bills. The amounts that he spent on food, shopping and utility bills is 7 : 6 : 2. In February 2015, Bala spent 72% of his income on food, shopping and utility bills. The amount that he spent on food, shopping and utility bills is 22 : 19 : 7. The amount he spent on utility bills in February 2015 was $16\frac{2}{3}\%$ more than that in December 2014. The percentage by which his income in December 2014 was less than that in February 2015 is

%.

15. A motorist used 10% of his fuel to cover 20% of his total journey. He covered another 40% of his total journey under similar conditions. For the rest of journey the conditions were different. Find the maximum percentage by which his fuel efficiency (distance covered per unit quantity of fuel) can drop, so that he can still cover the remaining journey without a refill.

(A) $71\frac{3}{7}\%$ (B) $72\frac{6}{7}\%$

(C) $27\frac{1}{7}\%$ (D) $74\frac{2}{7}\%$

Directions for questions 16 and 17: These questions are based on the data given below.

A family has 4 earning members A, B, C, D. In 2001 their respective shares in the total family income are 25%, 35%, 10% and 30%.

They spend 30% of the total income and save the remaining. In 2002, A's salary went up by 20%, B's salary increased by 20%, C's salary decreased by 10% and D's salary decreased by 20%.

16. In 2002, what percent of the total income should they spend to save the same amount as in 2001?

(A) 35% (B) 30%

(C) 33.33% (D) 22.22%

17. The total income increases further by 20% in 2003 solely due to an increase in A's salary. What should be the percentage increase in A's salary from 2002 to 2003?

(A) 20% (B) 30% (C) 70% (D) 60%

Directions for questions 18 and 19: Answer the questions based on the following data:

In an exam, every question correctly answered fetches 2 marks. Every question wrongly answered loses 1 mark. Unanswered questions have no marks associated with them. Ram and Shyam wrote this exam. Ram attempted a certain number of questions and 30% of them went wrong. Shyam attempted a certain number of questions and 40% of them went wrong. Ram got 40 marks more than the pass mark. Shyam got 25 marks more than the pass mark. The two of them together attempted a total of 100 questions.

18. Find the pass mark in the exam.

(A) 15 (B) 20 (C) 25 (D) 30

19. If there are 80 questions in the exam, find the percentage of marks secured by Ram.

(A) 40.625% (B) 45.75%

(C) 50.75% (D) 34.375%

20. The price of a PC has been decreasing every year by a constant percentage over the last 4 years. If cost of a PC was ₹50000 4 years ago and it costs ₹32805 now, find the yearly rate of decrease.

(A) 8% (B) 5% (C) 10% (D) 15%

21. In a certain year, the wholesale price index fluctuated as given below:

Period	Percentage of increase or decrease over the preceding period.
(a) 1st April to 30th April	Increased by x%
(b) 1st May to 31st May	Decreased by x%
(c) 1st June to 30th June	Increased by x%
(d) 1st July to 31st July	Decreased by x%

If the decrease for the period 1st April to 31st May was 160 points and that for the period from 1st June to 31st July was 134.4 points, what was the price index on 1st April? (in points)

(A) 800 (B) 900 (C) 1000 (D) 1200

22. To manufacture a product X, a company needs raw materials P, Q and R and others. The cost price of P is 10% of the total cost price of X. The cost price of each of Q and R is 20% of the total cost of X. The cost of P is increased by 20%. The costs of each of Q and R is increased by 10%. The total cost is increased by 15%. Find the percentage increase in the cost of the others.

[ ] %.

23. The length of a rectangle is increased by 10%. The breadth of the rectangle is increased by 20%. The perimeter of the rectangle increased by x%. The range of x is_____.

(A) [15, 20) (B) (10, 15]
(C) (10, 20) (D) None of these

24. P sold an article to Q at 20% profit. Q sold it to R at 25% profit. If the difference in the cost prices of Q and R is ₹90, find the cost price of the article for P.

(A) ₹270 (B) ₹360 (C) ₹300 (D) ₹250

25. A man gets back the amount he had invested in buying 100 radios by selling 65 of them. What is his profit percentage?

(A) $53\frac{11}{13}\%$ (B) $49\frac{9}{13}\%$
(C) 35% (D) 65%

26. Ravi manufactures watches. Each day he manufactures as many watches as the cost price per watch (in ₹). Each day he sells all his watches at a profit of ₹60 per watch and at the end of the day his profit percentage is 10%. Find his daily profit (in ₹).

[ ]

27. Rakesh bought some chocolates at 10 for ₹1.50 and an equal number at 20 paise each. He sold them at a rate of 20 for ₹4 and made a profit of ₹10. How many chocolates did he purchase?

(A) 100 (B) 200 (C) 300 (D) 400

28. Kanchan has bought 50 articles. He sells 20% of the articles and makes a profit of ₹1200, which is also equal to the cost of 5 articles. If the selling price for all 50 articles is the same, what is the value of the remaining articles at the selling price?

[ ]

29. Ajay sold an article at 20% profit to Balu. Balu sold it at 30% profit to Chetan. Dinesh sold a similar article at 20% loss to David. David sold it at 30% loss to Edward. The sum of the price that Chetan and Edward paid for their respective articles is ₹28000 more than what Ajay paid. If Ajay and Dinesh bought the article for the same price, Find the sum of the prices paid by Ajay and Dinesh (in rupees) for their respective articles.

(A) 50000 (B) 40000 (C) 45000 (D) 52000

30. An article is marked up by 35%. What should be the discount percentage so that the profit is 20%?

(A) $11\frac{1}{9}\%$ (B) 10% (C) 15% (D) 20%

31. If the discount and profit percentage are both 20% by what percent is the marked price above the cost price?

[ ] %

32. A car dealer sold a car at a discount of ₹100000. Even after the discount, he made a profit of 15%. What is the marked price of the car, if the marked price is 25% more than the cost price?

(A) ₹1000000 (B) ₹1115000
(C) ₹2500000 (D) ₹1250000

33. Simon gets a discount of 25% on purchasing 100 VCD's from Samuel. He sells them and makes a profit equal to the undiscounted price of 25 VCD's. What is the gain percentage?

(A) 25% (B) 30%
(C) 66.66% (D) 33.33%

34. Mr. Londa imported 10000 hard disks from Korea at a discount of 10% on the marked price. Out of these, 20% of the hard disks were damaged in transit. If the selling price of an undamaged disk is 20% more than its cost price, what is the profit/loss percentage on total sales?

(A) 6.66% profit (B) 10% profit
(C) 6.66% loss (D) 4% loss

35. Ashwin bought an article at ₹200 and marked it at ₹300. He offered a discount and then sold it his profit/loss percentage and discount percentage are in the ratio 3 : 2. Find his profit/loss percentage.

(A) 29% profit (B) 25% profit
(C) 20% loss (D) 25% loss

36. Feroze marks up an article by 30% and sells it at a discount of 20% to Sohail. Sohail marks up the price of the article to a certain amount which happens to be 20% more than Feroze's cost price. What is the maximum discount Sohail can offer without going into loss?

(A) 30% (B) 20%
(C) $16\frac{2}{3}\%$ (D) $13\frac{1}{3}\%$

37. Girish marked an article at 60% above his cost price. What is the maximum number of successive discounts, each being 10%, he can give such that he does not make a loss?

[ ]

38. Govind bought an article at ₹300 and marked it at ₹400. He offered a certain discount but sold it at a profit. Which of the following holds true?

(A) If his discount percentage is at least equal to his profit percentage, his profit will be at least equal to is discount.
(B) If his discount percentage is at most equal to his profit percentage, his profit will be at most equal to his discount.
(C) If the profit percentage is at least equal to the discount percentage, the discount is at most equal to the profit.
(D) If the profit percentage is at most equal to the discount percentage, the discount is at least equal to the profit.

39. In a provision store, a packet of dal contains 20% less than the labelled weight. But it is sold to a customer at a discount of 10%. How much more, as a percentage by weight, should the customer get, so that he gets the dal at the rate he would have got, if the packet contained the correct quantity and there was no discount?

40. Gopal, Hari and Karthik started a business with investments of ₹8000, ₹12000 and ₹16000 respectively. Hari and Karthik left the business after x months. Out of the annual profit share, Gopal got more than Hari but less than Karthik. If x is an integer, find the ratio of Gopal's, Hari's and Karthik's shares.
(A) 27 : 21 : 28 (B) 24 : 21 : 28
(C) 30 : 27 : 36 (D) 32 : 30 : 40

41. P and Q started a business. They made an annual profit of ₹50000. Q being a working partner received 20% of the annual profit as his salary. If the entire profits were divided in the ratio of their investments, P would have received ₹8000 more as his profit share than what he actually got. Find P's actual profit share (in ₹).

42. A, B, C and D started a business with investments in the ratio 3 : 4 : 5 : 6. As B and C were working partners they were paid equal salaries. The ratio of B's and C's total annual income is 9 : 10. If the total annual profit is ₹84000, find B's salary (in ₹).

43. In an election between two candidates P and Q, only 90% of the registered voters cast their vote. Only 90% of the polled votes were valid. P got 65% of the valid votes and won by a margin of 9720 votes. How many registered voters were there?

44. Satish, Sanjay and Sunil started a business with an investment of ₹20000 each. At the start of each month starting from the second, Satish adds ₹1000. At the start of each even month starting from the second, Sanjay adds ₹2000. At the start of the 3rd, 6th, 9th and 12th months, Sunil adds ₹3000. Who gets the greatest share out of the annual profit?
(A) Satish
(B) Sanjay
(C) Both Satish and Sunil
(D) Sunil

45. A man invests ₹19950 in a 4% stock at 5% premium and the same amount in a 6% stock at 5% discount. What is the approximate effective yield percentage on his total investment?
(A) 6% (B) 7% (C) 5% (D) 4%

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

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 I and II together but not using I or II alone
Mark (D) if the question cannot be answered even using I and II together.

46. Was the discount percentage offered on item x less than 16%?
I. Its marked price was at most ₹30 and the profit made was 25%.
II. Its cost price was ₹20.

47. What is the cost price of the cycle?
I. The cost price is ten times the profit, and the selling price is ₹165
II. The profit is 10% of ₹160, the selling price.

48. Did the transaction result in loss or gain?
I. Selling price of the article is ₹320.
II. Selling price of 18 articles is equal to the cost price of 21 articles.

49. What percentage of income does the man save?
I. He spends 35% of income on house rent.
II. He spends 75% of his income remaining after paying house rent on other items.

50. A and B are in a business, in which B joined A after x months. What is the value of x?
I. They shared the profits equally at the end of the year.
II. The capitals of A and B are in the ratio 7 : 12.

51. In a partnership business, did A and B invest equal capitals, given that they are in the business for the same period where A did not receive any remuneration?
I. B looked after the business and got a remuneration of 25% of the profit for it.
II. A and B got equal amounts at the end of the year.

52. What is the percentage of literacy in females?
I. Out of the total population, 60% are males. 25% of the males are literates and 25% of the total population are literates.
II. For every four females one is literate.

53. What were the sales of a salesman in a month?
I. The salesman earns ₹1500 in that month.
II. Every month the salesman gets a flat commission of 7.5% on all the sales and a bonus of 2.5% on all the sales exceeding ₹9000.

54. In a certain store, item X sells for 10% less than item Y. What is the ratio of the store's revenue from the sales of item X to that from the sales of item Y?
I. The store sells 20% more units of item Y than item X.
II. The store's revenue from the sales of item X is ₹6000 and from the sales of item Y is ₹8000.

55. If the original price of an article was ₹120, and the original price was reduced by ₹d, then d is what percent of the reduced price?
I. d is 25% of the original price.
II. d is $^1/_3$rd of the reduced price.

Key

Concept Review Questions

1. B	6. 4000	11. C	16. A	21. C	26. A	31. C	36. C	41. C	46. 450
2. 250	7. C	12. A	17. 6400	22. C	27. 0	32. D	37. 80	42. B	47. A
3. B	8. 2	13. 690	18. C	23. B	28. D	33. C	38. B	43. 37	48. D
4. C	9. A	14. B	19. 28	24. A	29. C	34. 600	39. C	44. D	49. 720
5. D	10. 8	15. 200	20. D	25. C	30. C	35. D	40. C	45. 20	50. A

Exercise – 3(a)

1. B	6. D	11. 16100	16. D	21. C	26. C	31. C
2. 34.4	7. 3200	12. D	17. A	22. B	27. 25	32. D
3. D	8. B	13. A	18. 3300	23. A	28. A	33. D
4. 18.75	9. A	14. 20	19. D	24. 100	29. D	34. 63000
5. B	10. B	15. B	20. 40	25. B	30. 180000	35. B

Exercise – 3(b)

1. D	8. A	15. A	22. 18	29. A	36. D	43. 40000	50. C
2. 920	9. 100	16. C	23. B	30. A	37. 4	44. B	51. C
3. B	10. D	17. C	24. C	31. 50	38. D	45. C	52. B
4. 37.5	11. C	18. A	25. A	32. D	39. 12.5	46. D	53. C
5. A	12. 20	19. D	26. 36000	33. D	40. B	47. B	54. B
6. 36000	13. C	20. C	27. D	34. D	41. 32000	48. A	55. B
7. C	14. 10	21. C	28. 14400	35. B	42. 15000	49. C	