SYLLABUS

B.Com I Year

Subject – Business Mathematics

UNIT – I	Ratio – Gaining and Sacrificing Ratio, Proportion, Percentage, Commission, Discount and Brokerage.
UNIT – II	Simultaneous Equations – Meaning, Characteristic, Types and Calculations, Preparation of invoice.
UNIT – III	Elementary Matrices – definition and Calculations, Types of Matrices.
UNIT – IV	Logarithms and Antilogarithms – Principles and Calculations, Simple and Compound Interest.
UNIT – V	Average – Simple, Weighted and business Averages Arithmetic mean, Harmonic mean, Geometric mean, Profit and Loss.

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UNIT-I
Chapter -1 – RATIO

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A ratio can exist only between two quantities of the same type. If x and y are any two numbers and y $\neq$ 0 then the fraction $\frac{x}{y}$ is called the ratio of x and y is written as x:y.

Characteristics of Ratio –

The following characteristics are attributed to ratio relationship:

i)   Ratio is a cross relation found between two or more quantities of same type.

ii)   It must be expressed in the same units.

iii)   By the fraction laws a ratio can be expressed as below:

$$\frac{y}{x} = x:y$$

$$\frac{10}{5} = 10:5 \text{ or } 2:1$$

iv)   A ratio expresses the number of times that one quantity contains another.

v)   Two or more ratios may be compared by reducing their equivalent fractions to a common denominator.

Different types of Ratio –

Ratio can be divided into following ways –

1)   Unit Ratio – When homogeneous items are same on the basis of unit, it is called unit ratio.
     For example – Ram and Shyam are getting Rs. 5 each.

$$\frac{x}{y} = \frac{5}{5} \text{ or } 5:5 \text{ or } 1:1$$

2)   Duplicate Ratio – When the homogeneous items are shown in unit with square, it is called duplicate ratio.
     For Example, 2:3 square means $2^2:3^2$ or 4:9

3)   Triplicate ratio – When homogenous item is multiplied by 3, it is known as triplicate ratio.
     For example, $2^3:3^3$ = x2x2x2:3x3x3   8:27

4)   Sub triplicate ratio – When ratio is expressed in cube root it is known as sub triplicate ratio.
     For example, $\sqrt[3]{8}: \sqrt[2]{27}$ = 2:3

5)   Ratio of greater in equality – In this type of ratio the first item of given ratio is greater than other items.
     For example,   8:3, 13:8.

6)   Ratio of less in equality – When first item of given ratio is less than the other items of ratio, it is called ratio of less of equality.
     For example,   2:7, 5:12, 1:3

7)   Equality ratio – In this type of ratio first item is equal to other item of ratio.
     For example,   5:5, 8:8, 12:12

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Proportion

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Relationship between the two ratio's is called proportion. Here, quantity ratio of first two items is equality to rest two terms.
     For example,   2:5::6:15
     Proportion is expressed by four parallel points (::).

In the simple proportion here its not necessary that two items of first ratio and the items of second ratio should be homogeneous. But the items of second set of ratio has the same relationship which is found between the items of first ratio. For example 2:5::6:15. Here 5 is 2.5 times of 2 in case of first ratio. In the same 15 is 2.5 times of 6 in the second set of ratio.

Characteristics of Proportion –
  i)   Proportion is given in four parts. So first number is known as first item, second number is second item, third number is third item and fourth number is known as fourth item.
  ii) First and fourth items are known as extremes items and second and third items are known as mean items.
  iii) It is not necessary in proportion that all four items should be homogenous. But the ratios of first and second and third and fourth should be the same.

Types of Proportion –

1) **Continued proportion** –
   If ratio of items is going on continuously, e.g., ratio of first and two is equal to two and three and ratio of two and three is equal to three and fourth item and so on, thus, ratio is known as continued ratio.
   For example, $\frac{A}{B} = \frac{B}{C} = \frac{C}{D} = \frac{D}{E} = \frac{E}{F}$....
   Here A, B, C, D, E and F are in continued ratio.
2) **Direct Proportion** –
   In this type of ratio, two different items has the such relation that if the one is increased or decreased,   another will change accordingly in the same ratio.

Difference Between Ratio and Proportion –

S.No.	Ratio	Proportion
1	There are two terms in a ratio.	There are four terms in a proportion.
2	Comparison of two quantities of same type.	Comparison of two ratios.
3	Two quantities must be of same type.	All four quantities are not of same type but the first two are of one type and the last two may be of another type.
4	There is not a product rule	The product of extremes is equal to product of the means.

Chapter -2 - PERCENTAGE
Percent and Percentage
When we take of percentage, we usually refer to "for every one hundred."
Actually percentage can be defined as a fractional expression with 100 as its denominator.

When we talk of 10 percentage of a number, we mean 10 parts put of one hundred parts of the number in consider action the word "percentage" can be denoted by the sign (%).

In the above example 10 percentages can be written as 10% or even$\frac{10}{100}$. When written in the form $\frac{10}{100}$, it is in a fraction form whereby the upper number is the numerator and the bottom the denominator. It can further be simplified as –

$$\frac{10}{100} = \frac{1}{10}$$

From the above discussion we can conclude that when dealing with percentage, a number can be expressed as a fraction of percentage, i.e.,
$\frac{10}{100} = \frac{1}{10}$; or it can be written just in percentage form, i.e., 10 percent = 10%.

Change fractions into percentage –
When changing a fraction into a percentage, we just multiply it by 100 and put the sign %.
Example: Express $\frac{1}{10}$ as a percentage = $\frac{1}{10} X \frac{100}{1} = 10\%$

Change percentage into fraction –
To change a percentage given into a fraction, we divide the fraction by 100.
Example: Express 10% as a fraction = $\frac{10}{10} = \frac{1}{10}$

To find percentage of quantity with another quantity –
Let x and y be two quantities of same type and rate percentage r, such that
$\qquad$ r % of x = y
$\qquad\qquad\qquad\qquad\qquad$ or

$x. \frac{r}{100} = y$
$r = \frac{y\ X\ 100}{x}$
i.e., Rate percent = $\frac{The\ quantity\ \ which\ represent\ \ in\ percent}{Second\ \ quantity} X\ 100$
Example: What percent Rs. 20 of Rs. 350?
Solution: r% $\frac{20 X 100}{350} = 5\frac{5}{7}$

To find the quantity when rate percent and percentage value are known –
If rate percent value are given then
Quantity = $\frac{Percent\ \ value\ X\ 100}{Rate\ \ percent}$

Chapter -3 – COMMISSION

The terms commission and discount are commonly applicable in the business world. We should clearly understand the terminologies before solving questions related with them.

Who is an Agent?
Usually businessman may not be directly doing the business transactions themselves because of expanded area of business. They may employ persons to be doing the selling or buying on their behalf. Such person are known as agents. Agents get commission against their works performance.

Commission –
Having transacted the business transactions, the agents will require remuneration from their principal such as remuneration is known as commission. Usually the commission is calculated on the basis of the percentage of total sales done by the agent.

Who is a Broker?
The buyer and seller may not come into contact face to face. Their transaction may be made possible by a middleman. He negotiates the sales and purchase proceeds between the buyer and seller such a negotiator is known as broker.

Brokerage –
This is the remuneration paid to the broker. It is actually a commission paid to the broker. It is calculated on the basis of percentage of the total value of the business transacted by the broker.

Del Credere Agent –
A del-credere agent is a person who guarantees collection of dues for the principal from the customers. They got a special type of commission known as del-credere commission. Usually they deduct the commission on the dues collected and remit the remaining amount to the principal.

Travelling Agent –
This is a person who moves round the trading zone of the principal doing the selling proceeds.

Important formulae –

i)   Amount of commission $= \dfrac{Rate\ of\ commission\ X\ Amount\ of\ sales}{100}$

ii)   Rate of commission $= \dfrac{Rate\ of\ commission\ X\ 100}{Amount\ of\ Sales}$

iii)   Amount of Sales $= \dfrac{Rate\ of\ commission\ X\ 100}{Rate\ of\ commission}$

iv)   Amount of Del-cradere commission $= \dfrac{Credit\ Sales\ X\ Rate\ of\ del-credare\ commission}{100}$

DISCOUNT

The allowance or deduction from the market price of goods sold given by the vendor (Seller) to the purchaser (Buyer) is called discount. Discount is also known as allowance. The objective of allowing discount are –
- To increase the sales
- To retain the customership
- To encourage the customers to make the payment early

Kinds of Discount –
General there are two types of discounts are allowed to the customers –
Trade Discount and Cash Discount

1) **Trade Discount –** The Discount which is allowed by the seller according to the customs and traditions of the Business and which is allowed to all the customers irrespective of the payments conditions is called Trade Discount. The objective allowing Trade Discount is to increase the sales.

2) **Cash Discount –** The deduction on the marked price or invoice price or the selling price to the customer to encourage them to pay in cash or to make earlier cash payments is called cash discount.

In general Trade discount is given on marked price and cash discount is given on the remaining amount after deducting trade discount. In this way the purchaser in cash is entitled to get both type of discount.

Apart from these two discounts, there are some more types of discount.

Bulk discount or Quantity discount – It is allowed to the customers on purchasing on good in big quantity or bulk quantity.

Successive discount – When another discount is given after a discount, then the combination of these two discounts are known as successive discounts.

Equivalent Rate of Discount – The discount for which the amount due is equal o the amount due for successive discount is called their equivalent discount. Equivalent discount rate is also called single rate of equivalent discount.

It is to be noted that the total amount of successive discount is equal to the among of equivalent discount.

For example:
If a trader allows successive discount of 20% and 5% then the single rate/equivalent rate of discount will be –
D = 20+5 – 20x5 / 100 = 24%

NINE-VALUE TABLE
It is a method of calculating discount on a certain sum of list price/marked price. In this method on the basis of rate given first of all we have to calculate the discount for Rupee 1 and accordingly for Rupees 2, 3, 4, 5, 6, 7, 8 and 9.

With the help of this table we can calculate the commission or discount on any quantity.

Questions to be prepared on Unit-I :
1)   Give the definition and characteristics of Ratio and also explain its types.
2)   Describe the various type of Proportion.
3)   Distinguish between Ratio and Proportion.
4)   Explain the importance/significance of Percentage.
5)   Explain the terms Commission, Discount & Brokerage.
6)   What is successive discount?
7)   Explain equivalent rate of discount with example.
8)   Explain Nine-Values Table with example.