FY BBA- CA Semester II (CBCS) Pattern 2019
Business Mathematics
Course code 203
Credit 3

Syllabus

Cha.1 Ratio, Proportion and Percentage:

Ratio – Definition, Continued Ratio, Inverse Ration, Proportion, Continued Proportion, Direct Proportion, Inverse Proportion, Variation, Inverse Variation, Joint Variation, Percentage, computation of Percentage.

Cha.2 Profit and Loss: -

Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, selling price, Trade discount and cash discount. Introduction to Commission and brokerage, Problems on commission and brokerage

Cha.3.Interest and Annuity: -

Simple interest, Compound interest, Equated monthly Installments (EMI) by interest of reducing balance and flat interest methods and problems.

Ordinary annuity, sinker fund, annuity due, present value and future value of annuity.

Shares and Mutual Funds:- Concepts of

Shares, face value, market value, dividend, brokerage, equity shares, preferential shares, bonus shares, examples and problems, Concept of Mutual Funds, Change in Net Asset Value (NAV), Systematic Investment Plan (SIP), Examples and Problems.

Cha.4.Matrices and Determinant: - Definition of Matrices, Types of Matrices, Algebra of Matrices, Determinant, Adjoint of Matrix,

Inverse of Matrix, System of Linear equations, Solution of System of Linear Equation by adjoint method (upto 3 variables only).

Cha. 5. Linear Programming Problem (LPP)-: Concept of LPP, Formulation of LPP and solution of LPP by graphical method.

Transportation Problem (T.P.):- Concept of Transportation Problem, Initial Basic Feasible Solution, North-West

Corner Method (NWCM), Least Cost Method (LCM), Vogal's Approximation Method (VAM).

Reference Books:

1) Business Mathematics by Dr. AmarnathDikshit and Dr. Jinendrakumar Jain.
2) Business Mathematics by V. K. Kapoor – Sultan, Chand and sons. Delhi.
3) Business Mathematics by Bari – New Literature publishing company, Mumbai.
4) Operation Research by S. D. Sharma - Sultan, Chand and sons.
5) Operation Research by J. K. Sharma - Sultan, Chand and sons

Cha.1 Ratio, Proportion and Proportion

Ratio – If 'a' and 'b' are magnitude of same kind expressed in same units then the quotient $\frac{a}{b}$ is called the ratio of 'a' to 'b' and is denoted by a:b.

Ex- $\frac{2}{3}$ can be written as 2:3.

Continued Ratio – It is the relation between the magnitudes of three or more quantities of the same kind .

The continue ratio of thre similar quantities a,b,c is denoted by a:b:c.

Note-

1) Ratio is a pure number
2) In the ratio a:b , a is called antecedent and b is called consequent.
3) If we multiply the numerator and denominator in any ratio by the same (non-zero) number,the ratio remains the same.

$$\frac{a}{b} = \frac{ma}{mb}$$

Ex. 1) Two numbers are in the ratio 7:8 and their sum is 195. Find the numbers.

Solution : Let the numbers be 7x and 8x.

i.e. 7x+8x = 195

i.e. 15x = 195

i.e. x = 13

so, Required numbers are 91 and 104.

Ex. 2) If a:b = 4:7 and b:c = 9:5, find a:c.

Solution : $\frac{a}{b} = \frac{4}{7}$

i.e. 7a = 4b

i.e. $a=\frac{4b}{7}$

Again, $\frac{b}{c} = \frac{9}{5}$

i.e. 5b = 9c

i.e. $c= \frac{5b}{9}$

i.e. a:c = 36:35.

Homework questions:

1) The sum of present ages of 3 persons is 66 years. Five years ago,their ages were in the ratio 4:6:7. Find their present ages.
2) The monthly salaries of two prsons are in thr ratio 3:5. If each receives an increase of Rs.200 in monthly salary, the new ratio is 13:21. FINd their original salaries.

Proportion- If two ratios are euual,then the four quantities given by them are said to be in proportion, i.e. if the ratios a:b and c:d are equal ,then a,b,c,d are said to be in proportion and we write a:b :: c:d.

Here, b and c are called **means** while a and d are called **extremes**, also d is called **4^{th} proportion** to a,b, and c.

Note- If a,b,c are in proportion, then ,

$\frac{a}{b} = \frac{c}{d}$

i.e. ad=bc

i.e. product of extremes = product of means

Types of proportion

1) **Continued proportion** – If a,b,c are three quantities of the same kind and if a/b = b/c,then a,b,c are said to be in continued proportion.
   Here, b is called mean proportional to a and c.

$b^2 = ac.$

2) **Direct proportion –** When two variables are so related that an increase (or reduction) in one causes an increase (or reduction) in the other in same ratio then the proportion is called Direct proportion.
3) **Inverse proportion –** When two variables are so related that an increase (or reduction) in one causes a reduction(or increse) in the other in same ratio then the proportion is called Inverse proportion.

Variation –

1) **Direct variation**

Emily sets out to drive from her home in Appleton to visit her friend Kim who lives 600 km away in Brownsville. She drives at a constant speed and notes how far she has travelled every hour. The distance and times are represented in the table below.

Time (*t* hours)	1	2	3	4	5	6
Distance (*d* km)	100	200	300	400	500	600

It can be seen that as *t* increases, *d* also increases. The rule relating time to distance is $d = 100t$. This is an example of **direct variation** and 100 is the **constant of variation**. In this case *d* **varies directly** as *t* or the distance travelled is **proportional** to the time spent travelling.

The graph of *d* against *t* is a straight line passing through the origin.

A metal ball is dropped from the top of a tall building and the distance it has fallen is recorded each second.

Time (*t* s)	0	1	2	3	4	5
Distance (*d* km)	4.91	19.64	44.19	78.56	12	2.75

It can be seen that as *t* increases, *d* also increases. This time the rule relating time and distance is $d = 4.91\, t2$. This is another example of **direct variation**. In this case, *d* **varies directly** as t.

the square of t or the distance travelled is **proportional** to $t2$. The graph of d against $t2$ is a
straight line passing through the origin.

The symbol used for 'varies as' or 'is proportional to' is $\propto$. For example, d varies as t can be written as $d \propto t$, and d varies as $t2$ can be written as $d \propto t2$.

In the following, a proportional to a positive power of b is considered,

i.e. a varies directly as bn, $n \in R+$

If $a \propto bn$ then $a = kbn$ where k is a **constant of variation**.

For all examples of direct variation (where k is positive), as one variable increases the other will also increase. The graph of a against b will show an upwards trend. It should be noted that not all increasing trends will be examples of direct variation.

If $a \propto bn$ then the graph of a against bn is a straight line passing through the origin.

2) Inverse variation- If x and y are two variables such that x varies directly as 1/y ,then we say that x varies inversely as y and write,

$$X \propto \frac{1}{y}$$

Then $x = \frac{k}{y}$,where k is constant of proportionality.

3) Joint variation - i)A variable x is said to vary jointly with respect to the variables y and z,if it varies as their product i.e. if

$$X \propto yz$$

Then, x= kyz

ii) A variable x is said to vary directly as y and inversely as z,if it varies as $\frac{y}{z}$

i.e. $x \propto \frac{y}{z}$

then, $x = \frac{ky}{z}$

EX.1) The time it takes to travel a fixed distance varies inversely with the speed traveled. If it takes Pam 40 minutes to bike to the secret fishing spot at 9 miles per hour, what is the equation that represents this situation? How long will it take if she rides 12 miles per hour?

Solution- Since the units are not the same first change 40 minutes into hours:

40/ 60 = 2 /3 hour.

Letting y = time and x = speed, use the equation: y = k/ x (time varies inversely with speed)

Substitute the values and solve for k. 2/ 3 = k/ 9 , so k = 6 .

The equation of this inverse variation is: y = 6 /x If she rides 12 miles per hour the time is: y = 6 /12 = 1 /2 hour or 30 minutes.

Example 2) Variable I varies jointly as the values of P and T. If I = 1200 when P = 5000 and T = 3, find I when P = 7500 and T = 4.

Use the same method as above. Write the general equation. I = kPT Solve for k (the constant of variation) . 1200 = k(5000)(3) k = 0.08 Use the formula, k, and the new values. I = 0.08(7500)(4) = 2400

Example 3) Find x if 6 : 15 :: 2 : x

Solution- 6 : 15 :: 2 : x

i.e. $\frac{6}{15} = \frac{2}{x}$

i.e. 6x = 30

i.e. x = 5.

Example 4) Find fourth proportional to 6,8,10.

Solution- Let x be the fourth proportional.

i.e. 6:8 :: 10:x

i.e. $\frac{6}{8} = \frac{10}{x}$

i.e. 6x = 80

x = 13.333.

Percentage- In mathematics, a **percentage** (from Latin *per centum* "by a hundred") is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, "%",[1][2] although the abbreviations "pct.", "pct" and sometimes "pc" are also used.[3] A percentage is a dimensionless number (pure number); it has no unit of measurement

For example, 45% (read as "forty-five percent") is equal to 45/100, 45:100, or 0.45. Percentages are often used to express a proportionate part of a total.

(Similarly, one can also express a number as a fraction of 1000, using the term "per mille" or the symbol "‰".)

Example 1

If 50% of the total number of students in the class are male, that means that 50 out of every 100 students are male. If there are 500 students, then 250 of them are male.

Example 2

An increase of $0.15 on a price of $2.50 is an increase by a fraction of 0.15/2.50 = 0.06. Expressed as a percentage, this is a 6% increase.

While many percentage values are between 0 and 100, there is no mathematical restriction and percentages may take on other values.[4] For example, it is common to refer to 111% or −35%, especially for percent changes and comparisons.

Percentage increase and decrease

Due to inconsistent usage, it is not always clear from the context what a percentage is relative to. When speaking of a "10% rise" or a "10% fall" in a quantity, the usual interpretation is that this is relative to the *initial value* of that quantity. For example, if an item is initially priced at $200 and the price rises 10% (an increase of $20), the new price will be $220. Note that this final price is 110% of the initial price (100% + 10% = 110%).

Some other examples of percent changes:

- An increase of 100% in a quantity means that the final amount is 200% of the initial amount (100% of initial + 100% of increase = 200% of initial). In other words, the quantity has doubled.
- An increase of 800% means the final amount is 9 times the original (100% + 800% = 900% = 9 times as large).
- A decrease of 60% means the final amount is 40% of the original (100% – 60% = 40%).
- A decrease of 100% means the final amount is *zero* (100% – 100% = 0%

In general, a change of x percent in a quantity results in a final amount that is $100 + x$ percent of the original amount (equivalently, $(1 + 0.01x)$ times the original amount).