SYLLABUS

Class – BBA I Year

Subject : Business Mathematics

UNIT – I	Ratio- Gaining and sacrificing ratio, Proportion, Percentage, Average-Simple and Weighted Averages.
UNIT – II	Simultaneous Equations: Meaning, Characteristics, Types and Calculations, Preparation of Invoice.
UNIT – III	Determinants and Matrices, Matrix – Definition, Types, Basic Operations on Matrices, Transpose of Matrix, Determinants-Minor and Co-Factors, Adjoint and Inverse of Matrix.
UNIT – IV	Practical approach and application of Vedic Maths, Logarithms and Antilogarithms – Principles and Calculations. Simple and Compound interest.
UNIT – V	Commission, Discount, Brokerage and Profit and Loss.

UNIT –I

RATIO, PROPORTION, PERCENTAGE AND AVERAGE

Ratios are the comparison of two quantities or more quantities (having the same units) that we express as a fraction. Ratio between x & y can be represented in following way:
x:y or it can be written as $\frac{x}{y}$.

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) We use the symbol ':' to denote ratios.
iii) It must be expressed in the same units.
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.

Types of Ratio

Less in equality ratio: When ratio is written in fraction if denominator is more than its numerator. For example: 1/4

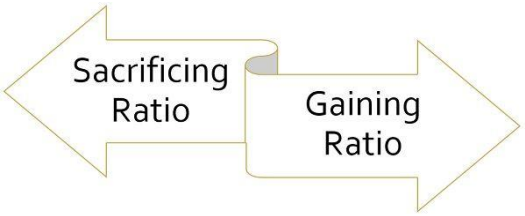
Equality ratio: When the ratio is equal to unit . For Exampple: 5/5

Greater in equality ratio: When the ratio is greater than 1. For example: 3/2

Duplicate ratio: The ratio of square of first and second term . For example: $3^2:4^2$

Triplicate ratio: The ratio of root of first amd second term.For example: √2:√3

Compound ratio: The ratio of products of first term and second term of two or more ratio. For example: 2:3,4:7,7:15 is 2x4x7:3x7x15=56:315



What is the Gaining Ratio?

The gaining ratio is the proportion in which the partners who continue to be part of a company divide the profits and losses after one partner retires, resigns, or exits the partnership. This ratio decides how the departed partner's share is reallocated among the partners who remain in the business.

Gaining ratio formula

Gaining ratio= New profit sharing ratio- Old profit sharing ratio

What is the Sacrificing Ratio?

The sacrificing ratio refers to the proportion in which existing partners forego their share of profits and losses in the firm to accommodate a new partner who is being admitted.

Sacrificing ratio formula

Sacrificing ratio= Old profit sharing ratio-New profit sharing ratio

Basis	Sacrificing ratio	Gaining ratio
1. Meaning	It is the proportion of the profit which is sacrificed by the old partners in favour of a new partner.	It is the proportion of the profit which is gained by the continuing partners from the retiring partner.
2. Purpose	It is calculated to determine the amount to be adjusted towards goodwill for the sacrificing partners.	It is calculated to determine the amount to be adjusted towards goodwill for the gaining partners.
3. Time of calculation	It is calculated at the time of admission of a new partner.	It is calculated at the time of retirement of a partner.
4. Method of calculation	It is the difference between the old ratio and the new ratio Sacrificing ratio = Old profit sharing ratio – New profit sharing ratio	It is the difference between the new ratio and the old ratio. Gaining ratio = New profit sharing ratio - Old profit sharing ratio

PROPORTION

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 have 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-

Direct Proportion

- The direct proportion describes the relationship between two quantities, in which the increases in one quantity, there is an increase in the other quantity also and vice-versa.
- The direction proportion is written as $a \propto b$.

Inverse Proportion

- The inverse proportion describes the relationship between two quantities in which an increase in one quantity leads to a decrease in the other quantity and vice-versa.
- The inverse proportion of two quantities, say "a" and "b" is represented by $a \propto (1/b)$.

Continued Proportion

- Any three quantities are said to be in continued proportion if the ratio between the first and the second is equal to the ratio between the second and the third.
- It is written as a:b::c:d.

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 twomay be of another type.
4	There is not a product rule	The product of extremes is equal to productof the means.

PERCENTAGE

Percent and Percentage

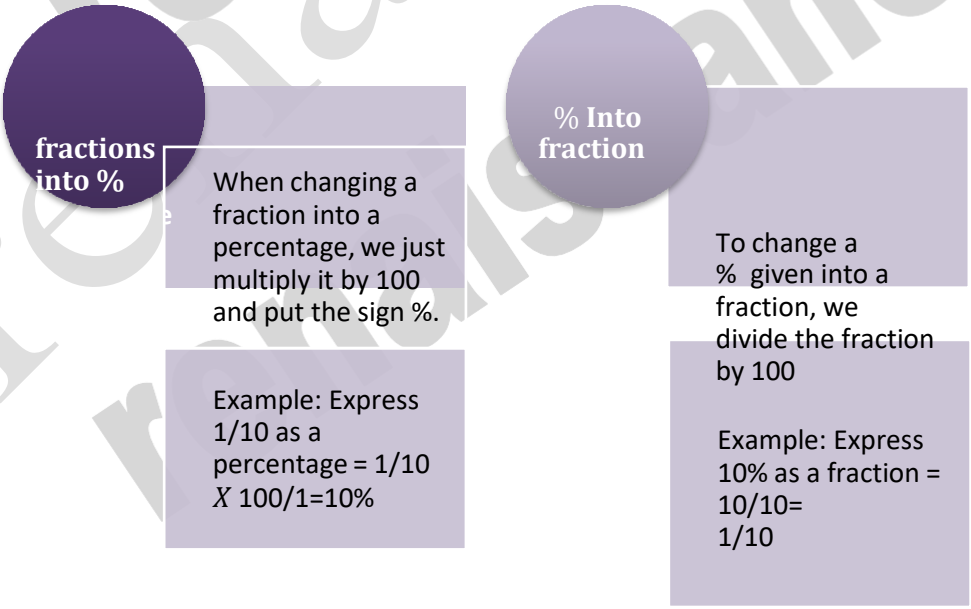
When we talk of percentage, we usually refer to "for every one hundred."
Actually percentage can be defined as a fractional expression with 100 as its denominator.

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 –

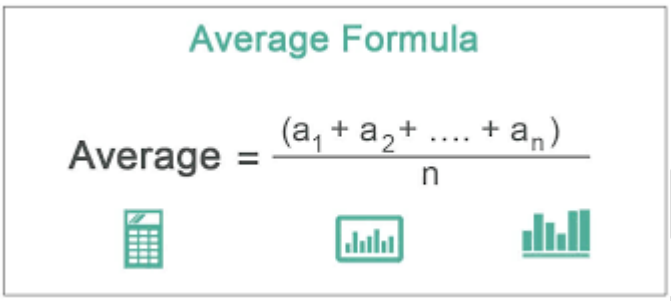
$$\frac{\cancel{10}}{100} = \frac{\cancel{1}}{10}$$

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%.



AVERAGE

The average of the number of quantities of observations of the same kind is their sum divided by their number. The average is also called average value or mean value or arithmetic mean.



Functions of Average

a) To present the salient features of data in simple and summarized form
b) To compare and draw conclusion
c) To get a simple value that describes the characteristics of the entire group
d) To help in statistical analysis

Types of mean:

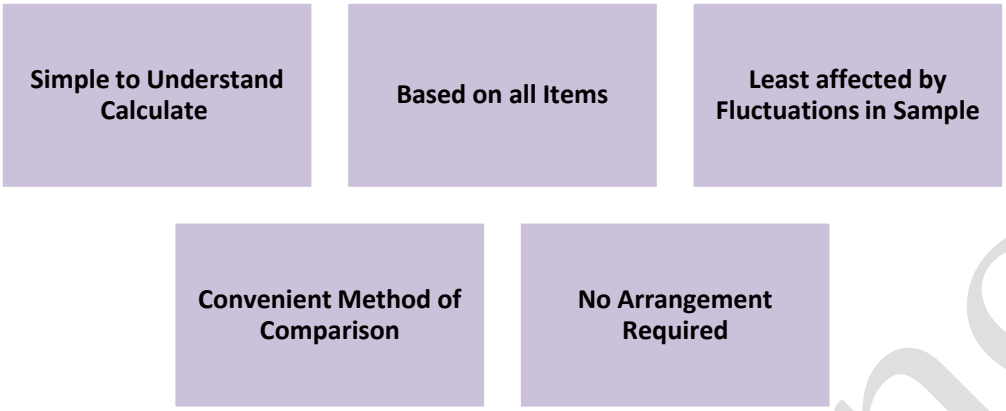
Simple Arithmetic Mean

The sum of a set of numbers divided by the total number of values in the set leads to a simple arithmetic mean. It is also referred to as the **average**.

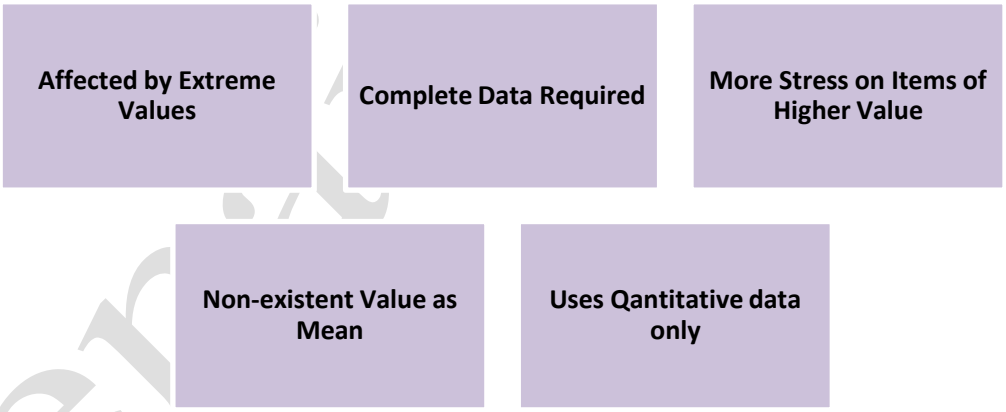
Weighted Arithmetic Mean

The term weighted mean refers to the average when different items in the series are assigned different weights based on their corresponding importance.

Merits of Mean



Demerits of Mean



Assignment

1. Explain the term Ratio along with it's types by citing examples.
2. What will be the ratio of milk and water in the final mixture formed by mixing milk and water that are present in 3 vessels of capacity 1 litre, 2 litre and 3 litre respectively and in the ratios 5:1, 3:2 and 4:3 respectively.
3. Harman and Ajay are partners sharing profits in the ratio 3:2. They admit Vijay into partnership who acquires (1/5)th of the share from Harman and (4/25)th share from Ajay. Calculate new Profit sharing ratio and sacrificing ratio.

4. The price of a diamond varies directly with the square of its weight. If the price of a diamond weighing 3.5 carats is Rs. 400, find the price of another diamond weighing 5.25 carats.
5. 15% of the inhabitants of a town are victim of a Epidemic and 20% of the remaining population migrate. It even after this the population of town is 16,10. What was it at the beginning?
6. A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?
7. The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is?
8. Two numbers are in the ratio of 6:7. If 5 is subtracted from each number, the new ratio will be 5:6. Find the numbers?
9. If A's income is 25% more than that of B, how much percent B's income less than that of A?
10. A,B and C are partners who share their profit in the ratio of their capital. A's capital is Rs. 5000 and B's capital is 25,000. In 2009 profit was Rs. 3,500 in which C's share was Rs. 1.500. find C's capital?

UNIT-II

Simultaneous Equations

Equation – Equations signify relation of equality between two algebraic expressions symbolized by the sign of equality '='. In other words, an equation is statement which says that the two algebraic expressions are equal and is satisfied only for certain values of the variables.

Identify – When equality of two algebraic expressions hold true for all values of variables then it is called an identity.

Root of an Equation – The value of unknown or variable for which the equation is true is known as the root of the equation. To find the roots of an equation means to solve the equations.

Degree of an Equation – The degree of an equation is the highest exponent of the variable x or variables (x, y, …) present in the equation is called the degree of an equation.

Linear Equation – An equation which involves power of an unknown quantity not higher than unity (one) is called a linear equation.

One variable Linear Equation – A linear equation in one variable (x, say) in which the highest degree of the variable x is 1. A linear equation in one variable is, in general, written as ax+by = c or ax = c. This equation is also called, "First degree equation in x" or simple equation.

Two variable equation – A linear equation in two variables (x, y, say) in which the highest degree of the variables x and y each is 1. A linear equation in two variables, is general, is written as ax+by+c = 0 or ax+by=d.

Three variable equation – A linear equation in three variables (x, y, z, say) in which the highest degree of the variables x, y and z each is 1. A linear equation in three variables, in general, is written as $a_1x+b_1y+c_1z=d$.

Types of Simultaneous Equations –

i) Linear Simultaneous Equations in two Variables – Two linear equations in two variables together are linear simultaneous equations in two variables, e.g.:

$$4x+y = 2$$
$$3x-5y = 18$$

ii) Linear Simultaneous Equations in three Variables – Three linear equations in three variables together are linear simultaneous equations in three variables, e.g.:

$$3x+5y-7z = 13$$
$$4x+y-12z = 6$$
$$2x+9y-3z = 20$$

iii) Specific type of Simultaneous Equations – The equations in other than linear form are called specific type equations, e.g.:

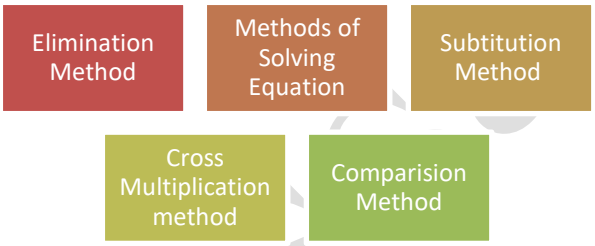
i) quadratic equation : $ax^2 + bx + c = 0$

Characteristics of Simultaneous Equations –

1) A system of linear equations in one variable is not taken under simultaneous equations.
2) The set of values of two variables x and y which satisfy each equation in the system of equations is called the solution of simultaneous equations.
   The solutions of two variable linear simultaneous equations may be –
   i) Infinitely many,
   ii) An unique solution, or
   iii) No solution.

3) For simultaneous equations –
   $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$

   a. If a1/a2 = b1/b2 = c1/c2 then there are infinitely many solutions.
   b. If a1/a2 = b1/b2 ≠ c1/c2, then there is no solution.
   c. If a1/a2 ≠ b1/b2, then there is an unique solution of the given system of equations..

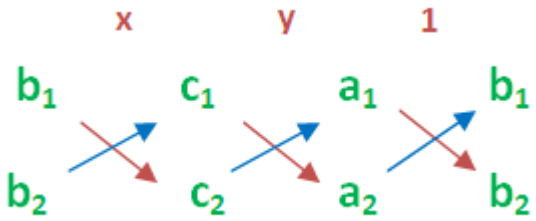


Methods ofSolving

Solving by Elimination:
1) Write the equations in the same order. (line up the x's and y's)
2) Make the numbers in front of the $x's$ OR the $y's$ the same. (whichever seems easier)
3) Same signs: subtract one equation from the other. Different signs: add the equations together.
4) Solve the new equation to find x or y.
5) Substitute back into one of the original equations to find the other letter.

Solving by Substitution:
1) Rearrange one of the equations (if necessary) to make either $\boldsymbol{x}$ or $\boldsymbol{y}$ the subject.
2) Substitute either x or y into the other equation.
3) Solve the new equation to find x or y.
4) Substitute back into your rearranged equation to find the value of the other letter.

Solving by Cross Multiplication :



Preparation of Invoice

After the dispatch of goods, the seller prepares an invoice of the goods sold in which the quantity and quality of goods and their price is mentioned. Discount, if any, is deducted from the total amount, to this are added the seller's other expenses. Railway receipt number is also mentioned in the invoice if the goods have been sent by train.

Types of Invoice –

1) ***Local invoices*** – In these invoices only the cost of the goods less any trade discount is borne by the seller. All expenses of packing, cartage, loading and freight for carrying goods to the place of buyer are shown extra and charged to the buyer. It means that the cost includes cost of the goods only and all other expenses are extra and are recovered from the buyer.

2) ***At station invoice*** – This implies that all costs upto the stage of putting the goods at railway station will be borne by the seller and are included in the cost of goods but expenses beyond that, i.e., the railway fare, insurance, etc., will be borne by the buyer.

3) ***Free on Rails (FOR) invoices*** – Under this all the costs, i.e., cost of goods, cost of packing, carrying the goods to railway station, loading them in wagons, are borne by the seller and further expenses are borne by the buyer, i.e., they are charged over and above the cost of goods.

4) ***Cost and Freight (C and F) invoice*** – In such type of invoices it is presumed that cost which the seller is charging includes cost of goods, cost of packing, freight for carrying goods to the buyer and all other incidental expenses. All expenses other than above, i.e., insurance will be charged extra.

5) ***Cost, Insurance and freight, (CI & F) invoice*** – In such invoices cost charged by the seller includes cost of goods, cost of packing, freight and insurance. Other expenses are charged extra.

6) ***Franco invoice*** – In such invoices all costs upto putting the goods at the door of the buyer are borne by the seller, i.e., the price which he has quoted includes all expenses incurred in carrying the goods to the buyer's place. For example, Franco cost invoice will mean that cost charged by the sellerincludes cost of the goods, cost of packing, freight, insurance and local transportation charges.

Preparation of Invoice –

Invoice is prepared in duplicate. The original copy is sent to the buyer and the duplicate is kept for future reference. The usual contents of the invoice are –

i. Name and address of the seller
ii. No. and date of the invoice
iii. No. of the purchase order

iv. Name and address of the buyer
v. Place where it has been made
vi. Terms of trade
vii. Details about quantity of goods like weight or length etc.
viii. Date
ix. Separate price of each item and total price.
x. Trade discount, if any.
xi. Expenses incurred on sending the goods.
xii. Advance payment received (if paid by the buyer)
xiii. Net amount payable.
xiv. Details about mode of sending the goods
xv. Errors and omissions excepted
xvi. Special information, if any
xvii. Signature of the seller.

Uses of Invoice –

Following are the uses of invoice –

a. It informs the buyer about the price of the goods and other expenses he has to pay.
b. If the invoice reaches buyer before the goods, he can make arrangement for their resale.
c. The buyer can compare the invoice with his order.
d. After taking delivery of the goods he can compare the contents of the packages with the invoice and point discrepancy, if any to the seller.
e. Pay Octroi etc. on the basis of the invoice.

Necessary entries can be made in the books of accounts on the basis of invoice.

ASSIGNMENT

1. 8x-6y=-20
   8x-2y=20
   Solve the above equation by Elimination, Substitution, Cross-multiplication and Comparison method.
2. What is meant by Simultaneous equation? Explain its methods by giving suitable examples.
3. If 1 is added to numerator of a fraction it becomes 1 and if 6 is added to denominator it becomes ½. Find the fraction.
4. Find two numbers whose total is 36 and twice of one number is equal to four times of another number.
5. A number is formed of two digits whose sum is 6. If 18 is subtracted from the number , the resulting number is equal to original number with the digits interchanged. What is the number?
6. The sum of two numbers is 40. The larger exceeds thrice the smaller by 8. Find the numbers?
7. A father ages 3 times that of his son. 6 years ago, father age was five times that of his son. Find their present age.
8. What do you understand by Invoice? Give its objectives.
9. Explain conditions for solutions in simultaneous equation.
10. If twice of a number exceeds by 6 and the second number exceeds the first by 6. Find numbers.

UNIT - III
Determinants and Matrices

Definition of Matrix –
A matrix (plural of matrices) is an array of real numbers (or other suitable elements) arranged in row and columns is called as a matrix. Consider a set of real numbers *m* and *n* when multiplied together we get *m*x*n* or *mn*. These can be used to define a matrix.

Types of Matrix

1. **Row Matrix or Row Vector –**
   A matrix having only one row is known as a row matrix or a row vector. It is in the form (1x*n*).
   Example –

$$[\,1 \quad 2 \quad 3\,]$$

2. **Column Matrix or Column Vector –**
   This is a type of Matrix which has only one column. It is in the form (*m* x 1).
   Example-

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

3. **Zero or Null Matrix-**
   This is a type of Matrix whose every element is zero. It is denoted by bold zero face.
   Example-

$$\begin{bmatrix} \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} \end{bmatrix}$$

4. **Diagonal Matrix –**
   Some matrix are such that all their elements are zero apart from the diagonal extending from the upper left hand corner to the lower right hand corner. These are known as diagonal matrix.
   Example $\begin{bmatrix} -2 & 0 \\ 0 & 3 \end{bmatrix}$ -

5. **Square Matrix-**
   In this matrix, the number of rows and columns are the same.
   Example $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$

6. **Unit or identity Matrix-**
   This is a type of matrix where diagonal elements have values of 1. A unit matrix is usuallydenoted by bold face (1).
   Example

$$\begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$$

7. Scalar Matrix-

This is a diagonal matrix whose diagonal elements are all equal.

Example $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$

8. **Transposed Matrix**

A matrix obtained by interchanging the row and columns of a matrix is called transpose of A and is denoted by A^T or A'.

Elementary properties of a Matrix

1. Addition of Matrix
2. Subtraction of Matrix
3. Multiplication of a Matrix by a constant
4. Multiplication of two Matrices

Determinants: Every square matrix A of the order n, can associate a number called determinants of the square matrix A.

Properties of Determinants:

Property 1- The value of the determinant remains unchanged if the rows and columns of a determinant are interchanged.

Property 2- If any two rows (or columns) of determinants are interchanged, then sign of determinants changes.

Property 3- If any two rows or columns of a determinant are equal or identical, then the value of the determinant is 0.

Property 4- If each element of a row or a column is multiplied by a constant value k, then the value of the determinant originally obtained is multiplied with k.

Minor: Minor of an element a_{ij} of a determinant is the determinant obtained by deleting its 'ith' row and 'jth' column in which element a_{ij} lies. Minor of an element a_{ij} is denoted by M_{ij}.

Cofactor: Cofactor of an element a_{ij} of a determinant, denoted by A_{ij} or C_{ij} is defined as $A_{ij} = (-1)^{i+j} M_{ij}$, where M_{ij} is a minor of an element a_{ij}.

Singular and non-singular Matrix: If the value of determinant corresponding to a square matrix is zero, then the matrix is said to be a singular matrix, otherwise it is non-singular matrix,

Adjoint of a Matrix: The adjoint of a square matrix 'A' is the transpose of the matrix which obtained by cofactors of each element of a determinant corresponding to that given matrix. It is denoted by adj(A)

=

Assignment

1. A unit of a firm manufactures 30 color T.V. sets and 100 black-white T.V. sets per month. Another unit manufactures 50 color T.V. sets and 60 black and white T.V. sets per month. Using matrix algebra, find total production of the firm for a year.

2. Solve for x and y if

   3x+2y=I

   2x-y=O

3. If A= $\begin{bmatrix} -1 & -3 \\ -2 & -4 \end{bmatrix}$, B=$\begin{bmatrix} -8 & -7 \\ -5 & -3 \end{bmatrix}$, C=$\begin{bmatrix} 4 & 2 \\ 9 & 6 \end{bmatrix}$ find AB+AC

4. A co-operative society has 10 dozen books of Physics, 8 dozen books of chemistry and 5 dozen books of mathematics. Selling price of each book is Rs.8.30, Rs.3.45 and Rs.4.50 respectively. How much amount will be received from selling all the books? Solve using method of Matrix

5. Solve the following by Cramer rule:

   8x+4y=2
   9x+6y=3

6. What do you understand by Matrix? Explain different types of Matrix.

7. Evaluate the determinant:

$$A = \begin{vmatrix} 2 & -4 & 2 \\ 1 & 3 & 5 \\ 3 & 7 & 4 \end{vmatrix}$$

8. Find minors and co-factors of the following determinants:

$$A = \begin{vmatrix} 1 & 7 & -2 \\ 2 & 5 & 3 \\ 3 & -4 & 0 \end{vmatrix}$$

9. Find inverse

$$A = \begin{vmatrix} -1 & 3 & 4 \\ 2 & -2 & 5 \\ -3 & 4 & 2 \end{vmatrix}$$

10. Solve the following simultaneous equation by matrix inverse method:

    4x+2y+3z=4900
    3x+3y+2z=4500
    4x+3y+4z=5800

UNIT - IV

VEDIC MATHEMATICS

MULTIPLICATION RULE

1. Criss – Cross Method

The criss-cross method in Vedic Mathematics for multiplying two 2-digit numbers is a simple and efficient way to perform multiplication. Here's a step-by-step guide:

Step-by-Step Guide

Let's multiply AB×CD, where AB represent 23 and CD represent 54

For example, multiply 23 by 54:

i. Set up the multiplication:

2 3

X 5 4

ii. Multiply the rightmost digits (B and D):

B×D=3×4=12

Write down 2 and carry over 1.

iii. Cross-multiply and add:

(A×D)+(B×C)=(2×4)+(3×5)=8+15=23

Add the carry from the previous step (1): 23+1=24

Write down 4 and carry over 2.

iv. Multiply the leftmost digits (A and C):

A×C=2×5=10

Add the carry from the previous step (2): 10+2=12

Write down 12.

v. Combine all the results:

Combine the results from each step to get the final answer:

a. Step 2: Rightmost digit is 2.
b. Step 3: Middle digit is 4.
c. Step 4: Leftmost digits are 12.

So, 23×54=1242

2. SQUARE METHOD

Ekadhikam Purvam: The Ekadhika Purva method is a Vedic Mathematics technique used for squaring numbers ending in 5. The phrase "Ekadhika Purva" translates to "one more than the previous" in Sanskrit. This method simplifies squaring numbers of the form N=10a+5 Identify the base number (a):
, where a is any digit. Here's a step-by-step guide to using this method:

Step-by-Step Guide

Let's take an example to square the number N=25

i. Identify the base number (a):

N=25

a=2 (since 25=10×2+5)

ii. **Add one to a:**

a+1=2+1=3

iii. **Multiply a by a+1:**

a×(a+1)=2×3=6

iv. **Append 25 to the result of the multiplication:**

Combine the product obtained in step 3 with 25.

So, 25^2=6×100+25=625

3. Duplex Method: (D' Method)

The Duplex Method for squaring two-digit numbers in Vedic Mathematics simplifies the process by breaking it down into smaller, manageable parts. Here's a step-by-step guide to using the Duplex Method for squaring a two-digit number:

Step-by-Step Guide

Let's take an example to square the number AB, where A and B are digits of the two-digit number.

For example, square 34:

i. **Identify the number and its digits:**

- AB=34
- Digits: A=3A, B=4

ii. **Calculate the duplexes:**

Duplex of the rightmost digit: $D'(B)=B^2$

Duplex of both digits: $D'(A,B)=2\times A\times B$

Duplex of the leftmost digit: $D'(A)=A^2$

iii. **Perform the calculations:**

a. Duplex of the rightmost digit: $D'(4)=4^2=16$
b. Write down 6, carry over 1.
c. Duplex of both digits: $D'(3,4)=2\times 3\times 4=24$
d. Add the carry from the previous step (1): $24+1=25$
e. Write down 5, carry over 2.
f. Duplex of the leftmost digit**:** $D'(3)=3^2=9$
g. Add the carry from the previous step (2): $9+2=11$

iv. **Combine the results:**

Combine the results from each step to get the final answer:

- Step 3: Rightmost digit is 6.
- Step 3: Middle digit is 5.
- Step 3: Leftmost digits are 11.

So, $34^2=1156$

Logarithms

Logarithms is a method of solving difficult Mathematical operations conveniently and easily. This method was invented by John Napier and then Henry Briggs modified the theory of natural logarithms.

logarithms are the other way of writing the exponents. A logarithm of a number with a base is equal to another number. A logarithm is just the opposite function of exponentiation. For example, if $10^2 = 100$ then $\log_{10} 100 = 2$.

Hence, we can conclude that,

$\text{Log}_b\, x = n$ or $b^n = x$

`Where b is the base of the logarithmic function.

This can be read as "Logarithm of x to the base b is equal to n".

Logarithm Rules and Properties

There are certain rules based on which logarithmic operations can be performed. The names of these rules are:

- Product rule
- Division rule
- Power rule/Exponential Rule
- Change of base rule
- Base switch rule
- Derivative of log
- Integral of log

Let us have a look at each of these properties one by one

i. Product Rule

In this rule, the multiplication of two logarithmic values is equal to the addition of their individual logarithms.

$\text{Log}_b\,(mn) = \log_b m + \log_b n$

For example: $\log_3(2y) = \log_3(2) + \log_3(y)$

ii. Division Rule

The division of two logarithmic values is equal to the difference of each logarithm.

$\text{Log}_b\,(m/n) = \log_b m - \log_b n$

For example, $\log_3(2/y) = \log_3(2) - \log_3(y)$

iii. Exponential Rule

In the exponential rule, the logarithm of m with a rational exponent is equal to the exponent times its logarithm.

$\log_b (m^n) = n \log_b m$

Example: $\log_b(2^3) = 3 \log_b 2$

iv. Change of Base Rule

$\log_b m = \log_a m / \log_a b$

Example: $\log_b 2 = \log_a 2/\log_a b$

v. Base Switch Rule

$\log_b (a) = 1 / \log_a (b)$

Example: $\log_b 8 = 1/\log_8 b$

vi. Other Properties

Some other properties of logarithmic functions are:

- $\text{Log}_b\ b = 1$
- $\text{Log}_b\ 1 = 0$
- $\text{Log}_b\ 0$ = undefined

SIMPLE INTEREST

Interest –Whenever we borrow a certain sum of money (known as the principal), we pay back the originalamount accompanied with a certain amount of interest on that amount. In a way, those are the charges of borrowing that sum of money.

Simple interest is one method of determining the amount due at the end of loan duration.

Definitions of Usual Words –

Principal (P): The original sum of money loaned/deposited.

Interest (I): The amount of money that you pay to borrow money or the amount of money that you earnon a deposit.

Time (T): The duration for which the money is borrowed/deposited.

Rate of Interest (R): The percent of interest that you pay for money borrowed, or earn for moneydeposited

Where:
P: Principal (original amount)R: Rate of Interest (in %)
T: Time period (yearly, half-yearly etc.)

Amount Due at the end of the time period, **A = P (original amount) + SI**

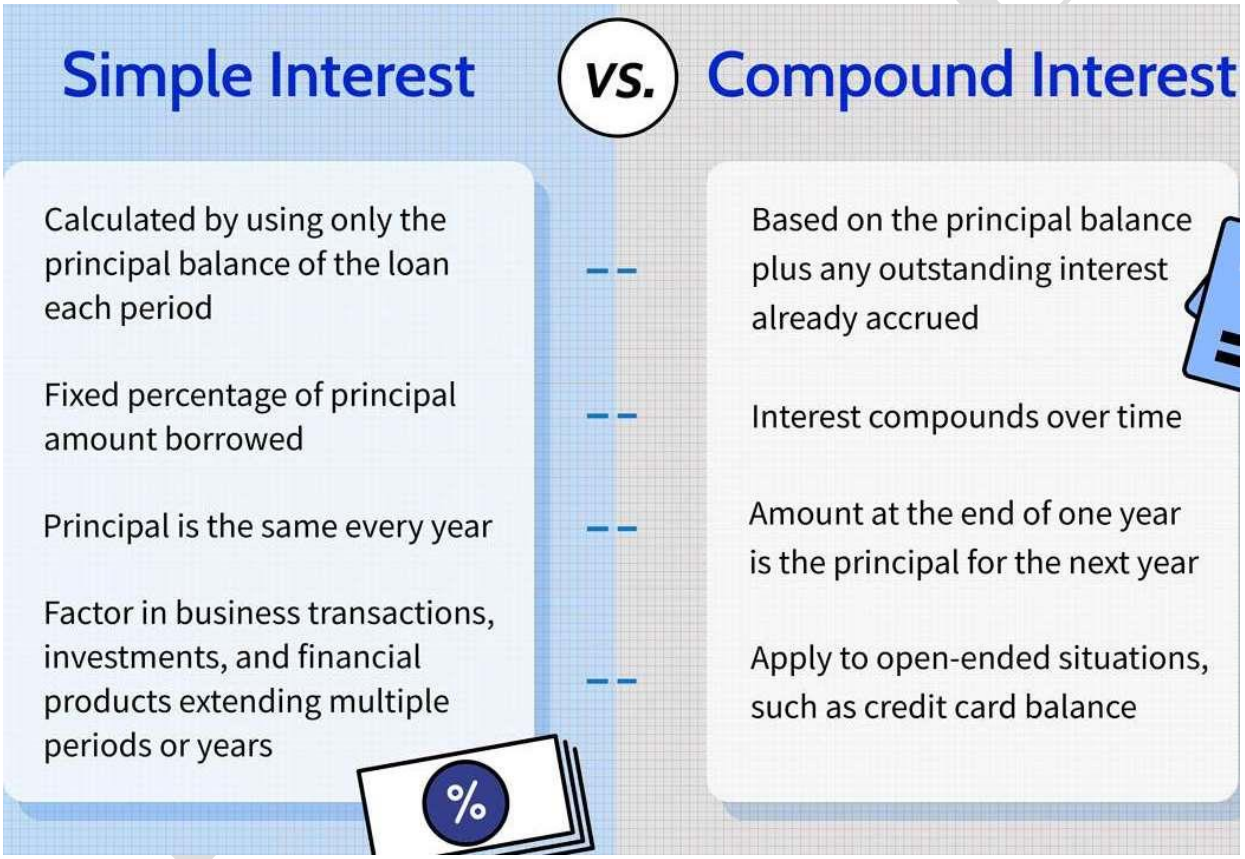
If you have a close look, Simple Interest is nothing else but an application of the concept of percentages.

Meaning of Compound Interest –

By compound interest we mean when interest becomes due after a certain period, it is added to theprincipal amount and interest on succeeding years is based on the principal and the interest added. The difference between the amount and the original principal is called the compound interest.

It means that in compound interest, the principal doesn't remain fixed at the original sum but increase at the end of each interest period. Interest period is the period at which the interest becomes due. It may be a year, half year or quarter year.

Difference between Simple and Compound Interest –



The following are some of the methods used to calculate compound interest –

1) Simple interest method.
2) Interest table method.
3) Decimal point method.
4) Compound interest formula method.
5) By Logarithm method.

1) Simple Interest Method –

When the time of the interest is not so long, i.e.; when interest is calculated for only a few years then we use this method. It is just similar to that used to find out simple interest. Follow the steps below –

i) Calculate interest on principal at the end of every year.

ii) Add the interest got in step (i) above to the original principal. This amount is principal for the next year.

iii) Calculate compound interest by adding each year's interest for the entire period.

iv) Finally subtract the original from the compounded amount and this gives the compound interest.

2) Compound Interest Formula Method –

When the number of years involved to calculate the compound interest are many, we use the above method. The formula used is –

$$A = P\,(1 + R/100)^{n}$$

Where P denotes = Principal (original)
n = number of years (interest period)
r = rate of interest (in percentage)
A = Amount after n years.

Assignment

1. Solve the following using Vedic Maths:
   i. 35x35
   ii. 26x45
   iii. 75x95
2. Find the value of x, if log(x+5)+log(x-5)=4log2+2log3
3. Simplify using logarithms:
   (36.71x0.8246)/546
4. A bank advances Rs. 7850 for 7 months at the rate of 8.5% p.a. simple interest. What sum will have to be paid at the end of this period?
5. In what time will the simple interest on Rs.500 at 6% be equal to the interest on Rs. 540 for 8 years at 5%.
6. Find the compound interest of Rs.10,000 for 2 years @ 8% per annum compounding monthly.
7. Highlight the points of difference between Simple and Compound interest.
8. What do you understand by Vedic Maths? Explain the utility of Vedic Maths.
9. What is the difference between the compound interest on Rs.5,000 for 1.5 years at 4% compounded yearly and half-yearly ?
10. Rs. 2,000 becomes Rs.2,200 in one year at the compound interest. In how many years the amount shall be Rs,.2,662 on the same rate?

UNIT – V
Commission, Discount, Brokerage and Profit and Loss

PROFIT AND LOSS

SOME IMPORTANT DEFINITIONSRELATED WITH PROFIT AND LOSS

Cost Price (CP)

The price, which is paid to acquire a product, is called cost price. All the overhead expenses (transportation, taxes etc.) are also included in the cost price.

Selling Price (SP)

The sum of money, which is finally received for the product i.e. the price at which the product is finally disposed off is called the Selling price.

Marked Price (MP)

The price, which is listed or marked on the product, is also known as quotation price/printed price/catalogue price/invoice price.

Profit

If selling price is greater than Cost price, then excess of SP to CP is called Gain or Profit.
PROFIT = SELLING PRICE – COST PRICE

Loss

If selling price is less than Cost price, then excess of CP to SP is called Loss.
LOSS = COST PRICE – SELLING PRICE

Profit percentage formula

$$\text{Profit \%} = 100 \times \text{Profit/Cost Price.}$$

Percentage Loss

$$\text{Loss \%} = 100 \times \text{Loss/Cost Price.}$$

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 employe 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 = Rate of commission X Amount of sales100

ii. Rate of commission = Rate of commission X 100Amount of Sales

iii. Amount of Sales = Rate of commission X 100Rate of commission

iv. Amount of Del-cradere commission = Credit Sales X Rate of del-credare commission100

Assignment

1. By selling 33 mt. of carpet, a person losses an equal amount to the selling price of 3 mt. of carpet. Find his gain or loss percent?
2. If income of Mr. Ajay increases by 20%, 30% and 40% in three years, then what will be his income after 3 years?
3. A T.V. was bought for Rs. 21,000, where it's value was depreciated by 5%n p.a. Find its value after 5 years?
4. If Kapil sells mobile to Sachin at gain of 5% and Sachin again sells it to Rohit at profit of 12%. If Rohit pays Rs.332, then what is cost price for Kapil?
5. In a company the manager has a right to receives a commission at 5% which is to be calculated on net profit arrived after charging such commission if the net profit before deducting commission is Rs. 22,470. Find the commission of manager?
6. A publisher offers 22 copies for 20 copies of the same book ordered and a cash discount of 12%. What is the net value of the discount of the buyer?
7. A person purchased a horse and a cart for Rs. 1,800 he sold the horse at 20% profit and the cart at 305. His total profit was 25.84. find the cost price of horse?
8. A manufactures price his good at 20% on cost. He allows some discount to his customers on this marked price and still makes a profit of 8%. Find out the rate of discount?
9. A scooter is sold for Rs.6,500 at profit if it is sold for Rs.5,900 there would be a loss equal to three times of the profit earned. Find the cost price of the scooter?
10. A C.D. player dealer sold a C.D player for Rs. 10,763 the selling price of which was Rs.11,450. Find rate of trade discount?