BUSINESS MATHEMATICS

Theory of Set

Set:

A set is a collection of objects or groups of objects. These objects are often called elements or members of a set. For example, a group of players in a cricket team is a set.

Types of Sets

1. Empty Sets

The set, which has no elements, is also called a null set or void set. It is denoted by {}.

Example Set of all Person whose heights is > 25 feet

2. Singleton Sets

The set which has just one element is named a singleton set.

Example, Set A = { 8 } is a singleton set.

3. Finite and Infinite Sets

A set that has a finite number of elements is known as a finite set, whereas the set whose elements can't be estimated, but has some figure or number, which is large to precise in a set, is known as infinite set.

Example, set A = {3,4,5,6,7} is a finite set, as it has a finite number of elements.

Set C = {number of cows in India} is an infinite set,

4. Equal Sets

If every element of set A is also the elements of set B and if every element of set B is also the elements of set A, then sets A and B are called equal sets.

Example, A = {3,4,5,6} and B = {6,5,4,3}, then A = B

5. Subsets:

The set A is called a Subset of the Set S if every element of A is also an element of S.

Example: A={x,y}, S ={w,x,y,z}

6. Finite Set:

A Set is said to be finite, if it has a finite number of elements. The elements can be counted by a definite number.

Example: A = {1,2,3,4}

7. Infinite Set:

A Set which is not finite is called an infinite set. The number of elements cannot be definitely known.

Example: A = {x: x is the set of all whole numbers}

8.Universal Set:

A set which consists of all the sets under consideration as subsets is called an universal set. It is denoted by U or X.

Example: A={1,2}, B={2,3}, The universal set here will be, U = {1, 2,3}

Cardinality of a Set:

1. n(AUB) = n(A) + n(B) - n(AnB)
2. n(AUBUC) : = n(A) + n(B) + n(C) - n(AnB) - n(BnC) - n(AnC) + (AnBnC)
3. n (A-B) = n(A)-n(AnB)
4. n [(AUB)']=n(U)-n(AUB)

Simple Interest

Simple Interest is the method to calculate the interest where we only take the principal amount each time without changing it with respect to the interest earned in the previous cycle. In simple terms, we can say that simple interest is the interest earned only because of the principal amount whereas compound interest is the interest earned on both principal and the previous interest earned.

Ratio:

Ratio is an expression of relationship between two quantities of the same kind with regard to their magnitude. The first quantity is called antecedent and the second quantity is called Consequent.

Features of Ratio:

1. Ratio as an absolute measure:

The ratio is just an abstract number and is independent of the units in which the quantities are quoted.

2. **Ratio as relative increase or decrease:**

The ratio indicates how much one quantity is contained in another.

3. **Ratio as parts in whole:**

The ratio also indicates how many times a quantity is contained in another.

4. **Ratio as fraction:**

A ratio by dividing one quantity (antecedent-numerator) by another(consequent – denominator)

5. Ratio as relative change in quantities:

If two quantities are related by a formula, a change in one quantity might cause the other quantity to change.

Types of Matrices

1) Row Matrix

A row matrix has only one row but any number of columns. A matrix is said to be a row matrix if it has only one row.,

2) Column Matrix

A column matrix has only one column but any number of rows. A matrix is said to be a column matrix if it has only one column.

3) Square Matrix

A square matrix has the number of columns equal to the number of rows. A matrix in which the number of rows is equal to the number of columns is said to be a square matrix.

4) Rectangular Matrix

A matrix is said to be a rectangular matrix if the number of rows is not equal to the number of columns.

5) Diagonal matrix

A square matrix B = [bij] m × m is said to be a diagonal matrix if all its non-diagonal elements are zero, that is a matrix $B = [b_{ij}]_{m\times m}$ is said to be a diagonal matrix if $b_{ij} = 0$, when $i \neq j$.

6) Scalar Matrix

A diagonal matrix is said to be a scalar matrix if all the elements in its principal diagonal are equal to some non-zero constant. A diagonal matrix is said to be a scalar matrix if its diagonal elements are equal, that is, a square matrix $B = [b_{ij}]_{n \times n}$ is said to be a scalar matrix if

7) Zero or Null Matrix

A matrix is said to be zero matrix or null matrix if all its elements are zero.

8) Unit or Identity Matrix

If a square matrix has all elements 0 and each diagonal elements are non-zero, it is called identity matrix and denoted by I.

9) Upper Triangular Matrix

A square matrix in which all the elements below the diagonal are zero is known as the upper triangular matrix. For example,

10) Lower Triangular Matrix

A square matrix in which all the elements above the diagonal are zero is known as the upper triangular matrix.

Terms Related To Probability

There are various terms for probability, here we will discuss few of them :

1. Event

An event refers to an outcome or set of random experiment outcomes. It can be a single outcome or a combination of outcomes.

2. Sample Space

The sample space is the set of all possible outcomes of a random experiment. It represents the complete set of events that could potentially occur.

3. Experiment

An experiment is a process or an activity that results in an outcome. In the context of probability, it refers to a situation where the outcome is uncertain or random.

4. Independent Events

If one event happens or does not happen, it does change the chance that the other will happen. Independent events are events where the occurrence or non-occurrence of one event does not affect the probability of the other event. The outcomes of independent events are statistically unrelated.

5. Dependent Events

Dependent events are ones whose chances of happening depend on how often another event happens. The outcomes of dependent events are statistically related.

6. Expected Value

The expected value is the average of a random variable's values, weighted by how likely each value is. It represents the long-term average outcome of an experiment.

Different Types of Probability

There are three major types of probabilities, and those are:

- Theoretical probability
- Experimental probability

- Conditional Probability

Theoretical probability

Theoretical probability is based on the chances of something happening. We can also say that it is based on the possible chances of things happening in a particular problem, or previous events or a real-life situation. The probability is basically based on the basic reasoning open probability.

Experimental Probability

The name suggests that it is experimental. It means it will consist of some experiments in this type of probability. Basically, we can say that the experimental probability is based on the observation coming from an experiment.

In order to get an answer from such a type of probability, there must be an experiment going on, and from that, we will account or observe the outcomes, and then we will get to know about the probability of any event from that particular experiment.

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Conditional Probability

Conditional probability is one of the important concepts in probability and statistics. The "probability of A given B" (or) the "probability of A with respect to the condition B" is denoted by the conditional probability P(A | B) (or) P (A / B) (or) PB�(A). Thus, P(A | B) represents the probability of A which happens after event B has happened already. the probability of an event may alter if there is a condition given.

Definition of Conditional Probability

If A and B are two events associated with the same sample space of a random experiment, **the conditional probability of event A given that B has occurred is given by $P(A/B) = P(A \cap B)/P(B)$**, provided $P(B) \neq 0$.

Types of Event

1. Complementary events:

If one of two events can happen only if the other doesn't happen, then the two events are said to be complementary.

2. Independent events:

If the probability of occurrence of event A is not dependent on the occurrence of another event B, then A and B are said to be independent events.

3. Mutually exclusive events:

If two events don't have any common point for each other, then the event is said to be mutually exclusive. This can be defined as " If the occurrence of one event excludes the occurrence of another event, then the event is termed a mutually exclusive event. For example, when a coin is tossed, you get either a head or a tail; there is no other way to get both outcomes. In this case, the two events are mutually exclusive.

4. Equally Likely Events in Probability

Events with an equal chance of occurring are equally likely events.

5. Complementary Events in Real-life

Any event has two possibilities i.e, whether it will occur or not. As someone who will come or not come to your house, get a job or not get a job, etc., they are examples of complementary. Some real-life examples are:

- It will rain or not today
- Whether the student will pass the test or not.
- You win the lottery or you don't win.

Uses of Probability

1. **Weather Forecasting-**

   We often check weather forecasting before planning for an outing. The weather forecast tells us if the day will be cloudy, sunny, stormy, or rainy. On the basis of the prediction made, we plan our day. Suppose the weather forecast says there is a 75% chance of rain. Now, the question arises how is the calculation of probability or precise prediction done? Access to the historical database and the use of certain tools and techniques helps in calculating the probability. For example, according to the database, if out of 100 days, 60 days were cloudy, then we can say that there is a 60% chance that the day will be cloudy depending on other parameters like temperature, humidity, pressure, etc.

2. **Agriculture-**

   Temperature, season, and weather play an important role in agriculture and farming. Earlier, we did not have a better understanding of weather forecasting, but now various technologies are developed for weather forecasting, which helps the farmers to do their job well on the basis of predictions. Undoubtedly, the occurrence of erratic weather is beyond human control, but it is possible to prepare for adverse weather if it is forecasted beforehand. The process of sowing is usually done in clear weather. Thus, the accurate prediction of weather enables the farmer to take major steps in order to prevent big losses by saving their crops. The planning of other suitable farming operations like irrigations, application of fertilizers and pesticides, etc., depends on the weather. Thus a proper weather forecast is needed.

3. **Politics-**

Many politicians want to predict the outcome of an election even before the polling is done. Sometimes they predict which political party will rise to power by closely studying the results of exit polls. There are some politicians who spend a lot only to predict the results so that they can save themselves from being dethroned. There are other good uses of probability, like predicting the number of students who would be needing jobs in the upcoming year so that the vacancy can be created accordingly. Politicians can also analyze the rate of car and bike accidents increased in past years so that they can take measures and reduce road accidents.

4. **Insurance-**

Insurance companies use probability to find out the chances of a person's death by studying the database of the person's family history and personal habits like drinking and smoking. Probability also helps to examine and evaluate the best insurance plan for the benefit of a person and his family. Suppose a person who is an active smoker has more chances of getting lung cancer as compared to the people who don't. Thus, it is beneficial for a smoker to go for health insurance rather than vehicle or house insurance for the betterment of his family.

Ratio and Proportion

Ratio is used for comparing two quantities of the same kind. The ratio formula for two numbers, a and b is expressed as a : b or a/b. When two or more ratios are equal, they are said to be in proportion. The concept of ratio and proportion is based on fractions. Ratio and proportion are the key foundations for various other concepts in Mathematics. Ratio and proportion have their applications in solving many day-to-day problems, like when we compare heights, weights, distance or time or while adding ingredients in cooking, and so on.

Ratio and Proportion-Meaning

A comparison of two quantities by division is called a ratio and the equality of two ratios is called proportion. A ratio can be written in different forms like x : y or x/y and is commonly read as, x is to y. On the other hand, proportion is an equation that says that two ratios are equivalent. A proportion is written as x : y : : z : w, and is read as x is to y as z is to w. Here, x/y = z/w where w & y are not equal to 0.

Definition of Ratio

Ratio is the comparison of two quantities which is obtained by dividing the first quantity by the other. If a and b are two quantities of the same kind and with the same units, such that b is not equal to 0, then the quotient a/b is called the ratio between a and b. Ratios are expressed using the symbol of the colon (:). This means that ratio a/b has no unit and it can be written as a : b

Definition of Proportion

Proportion refers to the equality of two ratios. Two equivalent ratios are always in proportion. Proportions are denoted by the symbol (: :) and they help us to solve for unknown quantities. In other words, proportion is an equation or statement that is used to depict that the two ratios or fractions are equivalent. Four non-zero quantities, a, b, c, d are said to be in proportion if a : b = c : d. Now, let us consider the two ratios - 3 : 5 and 15 : 25. Here, 3 : 5 can be expressed as 3:5 = 3/5 = 0.6 and 15:25 can be expressed as 15:25 = 15/25 = 3/5 = 0.6. Since both the ratios are equal, we can say that these two are proportional.

There are two types of proportions.

- Direct Proportion
- Inverse Proportion

Direct Proportion

Direct proportion describes the direct relationship between two quantities. If one quantity increases, the other quantity also increases and vice-versa. Thus, a direct proportion is written as $y \propto x$. For example, if the speed of a car is increased, then it covers more distance in a fixed period of time.

Inverse Proportion

Inverse proportion describes the relationship between two quantities in which if one quantity increases, the other quantity decreases and vice-versa. Thus, an inverse proportion is written as $y \propto 1/x$. For example, as the speed of a vehicle is increased, it will cover a fixed distance in less time.

Ratio and Proportion Formula

The formula for ratio is expressed as a : b ⇒ a/b, where,

- a = the first term or antecedent.
- b = the second term or consequent.

For example, ratio 2 : 7 is also represented as 2/7, where 2 is the antecedent and 7 is the consequent.

Now, in order to express a proportion for the two ratios, a : b and c : d, we write it as a:b::c:d⟶ab=cd

- The two terms b and c are called mean terms.
- The two terms a and d are known as extreme terms.
- In a: b = c : d, the quantities a and b should be of the same kind with the same units, whereas, c and d may be separately of the same kind and of the same units. For example, 5 kg : 15 kg = Rs. 75 : Rs. 225
- The proportion formula can be expressed as, a/b = c/d or a : b : : c : d.
- In a proportion, the product of the means = the product of the extremes. Therefore, in the proportion formula a: b:: c : d, we get b × c = a × d. For example, in 5 : 15 :: 75 : 225, we will get 15 × 75 = 5 × 225

Difference between Ratio and Proportion

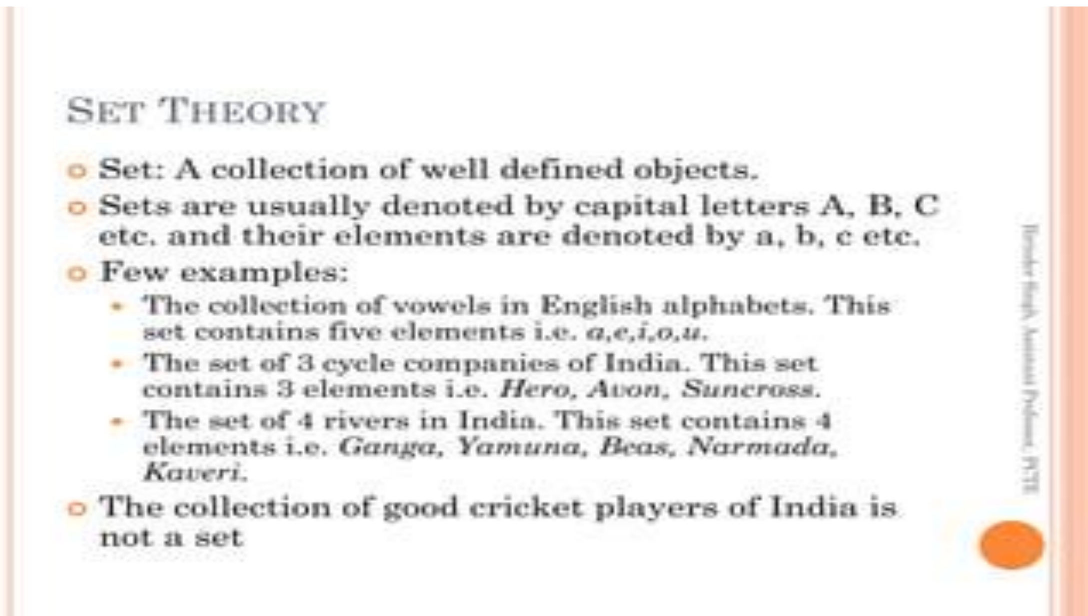
The difference between ratio and proportion can be seen in the following table.

Ratio	Proportion
It is used to compare the size of two quantities with the same unit.	It is used to express the relation of two ratios.
The symbols used to express a ratio - a colon (:), slash (/)	The symbol used to express a proportion - double colon (::)
It is referred to as an expression.	It is referred to as an equation.

Important Notes on Ratio and Proportion

- Any two quantities with the same units can be compared.
- Two ratios are said to be in proportion only if they are equal.
- To check whether two ratios are equal and are in proportion, we can also use the cross-product method.
- If we multiply and divide each term of a ratio by the same number, the ratio remains the same.
- For any three quantities, if the ratio between the first and the second is equal to the ratio between the second and the third, then these are said to be in a continued proportion.

- Similarly, in the case of any four quantities in a continued proportion, the ratio between the first and the second is equal to the ratio between the third and the fourth.



Representation of a Set

Set Builder Form

- This form is also called Property Form.
- In this, a set is represented by stating all the properties P(x) which are satisfied by the elements x of the set and not by other element outside the set.
  - If A is the set of even natural numbers, then
    $A = \{x: x \in N, x = 2n, n \in N\}$
    $A = \{x$: x is a natural number and $x = 2n$ for $n \in N\}$
  - If $A = \{0, 1, 4, 9, \ldots\ldots\}$
    $A = \{x^2 : x \in N\}$
  - If B = The set of all real numbers greater than -3 and less than 3
    $B = \{-3<x<3 : x \in R\}$

Roster Form

- This method is also called Tabular Method.
- In this, a set is described by listing elements, separated by commas, within braces { }
  - The collection of vowels in English alphabets. This set contains five elements i.e. {*a*,*e*,*i*,*o*,*u* }
  - If A is the set of even natural numbers, then A = {2, 4, 6, ... }
  - If A is the set of all prime numbers less than 11, then A = {2, 3, 5, 7}
- Note:
  - The order of writing the elements of a set is immaterial.
  - An element of a set is not written more than once.

Types of Sets

- **Empty Set:** A set is said to be empty or null or void set if it has no element and it is denoted by ϕ.
- In Roster Method, it is denoted by { }
- Examples:
  - $A = \{x : x \in N,\ 7 < x < 8\} = \phi$
  - $B = \{x \in R : x^2 = -2\} = \phi$
  - C = Any Indian company which is into Automobiles, Clothing, Plastics, Paper, Processed Food
- Note:
  - {ϕ} is not a null set, since it contains ϕ as an element.
  - {0} is not a null set, since it contains 0 as an element.

Types of Sets

- **Singleton Set:** A set is said to be a singleton set as it contains only one element.
- Examples: {5}, {0}, {-15}, {Mukesh Ambani}

- **Finite Set:** A set whose elements can be listed or counted.
- Examples: {1,2,3}, {5, 10, 15, 20}, {a, e, i, o, u}

- **Infinite Set:** A set whose elements can't be listed or counted.
- Examples: {1, 2, 3, ...}, All real numbers

Types of Sets

- **Equivalent Sets:** Two finite sets A and B are equivalent if their cardinal numbers are same. i.e. n(A) = n(B).
- Example: {5, 10, 15, 20, 25}, & {a, e, i, o, u} are equivalent.

- **Equal Sets:** Two sets A and B are said to be equal if every element of A is a member of B and every element of B is a member of A.
- Example: If A is the set of even natural numbers
  B = {2, 4, 6, ... }

SUBSETS

- In two sets A & B, if every element of A is an element of B, then A is called subset of B.
- If A is a subset of B, we write $A \subseteq B$.
- Thus, $A \subseteq B$ if $a \in A$ implies $a \in B$.
- If A is a subset of B, then B is called Super Set of A.

PROPERTIES OF SUBSETS

- The null set is subset of every set i.e. $\phi \subseteq A$
- Every set is subset of every set i.e. $A \subseteq A$
- If $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$.
- The total number of subsets of a finite set containing n elements is 2^n.

Operation on Sets – Set Union

- $A \cup B$

- "*A* union *B*" is the set of all elements that are in *A*, or *B*, or both.

- This is similar to the logical "or" operator.

Combining Sets – Set Intersection

- $A \cap B$

- "*A* intersect *B*" is the set of all elements that are in *both* *A* and *B*.
- This is similar to the logical "and"

Set Complement

- $\overline{A}$
- "*A* complement," or "not *A*" is the set of all elements not in *A*.
- The complement operator is similar to the logical not, and is reflexive, that is,

$$\overline{\overline{A}} = A$$

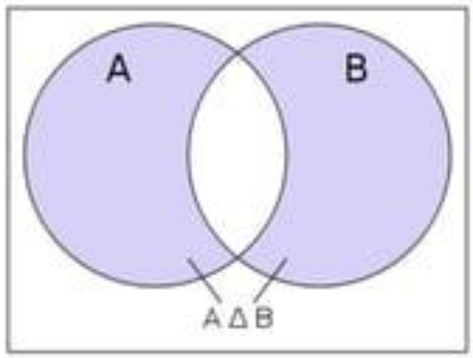
Set Difference

- $A - B$
- The set difference "A minus B" is the set of elements that are in A, with those that are in B subtracted out. Another way of putting it is, it is the set of elements that are in A, *and* not in B, so

$$A - B = A \cap \overline{B}$$

Symmetric Difference of Two Sets

- It is defined as the union of sets A – B and B – A.
- It is denoted by AΔB.
- $A \Delta B = (A - B) \cup (B - A)$



Fundamental Laws of Algebra of Sets

- Idempotent Laws: $A \cup A = A$ & $A \cap A = A$
- Identity Laws: $A \cup \phi = A$ & $A \cap U = A$
- Commutative Laws: $A \cup B = B \cup A$ & $A \cap B = B \cap A$
- Associative Laws: $(A \cup B) \cup C = A \cup (B \cup C)$

  $(A \cap B) \cap C = A \cap (B \cap C)$
- Distributive Laws: $(A \cup B) \cap C = (A \cup B) \cap (A \cup C)$

  $(A \cap B) \cup C = (A \cap B) \cup (A \cap C)$
- De Morgan's Laws: $(A \cup B)' = A' \cap B'$

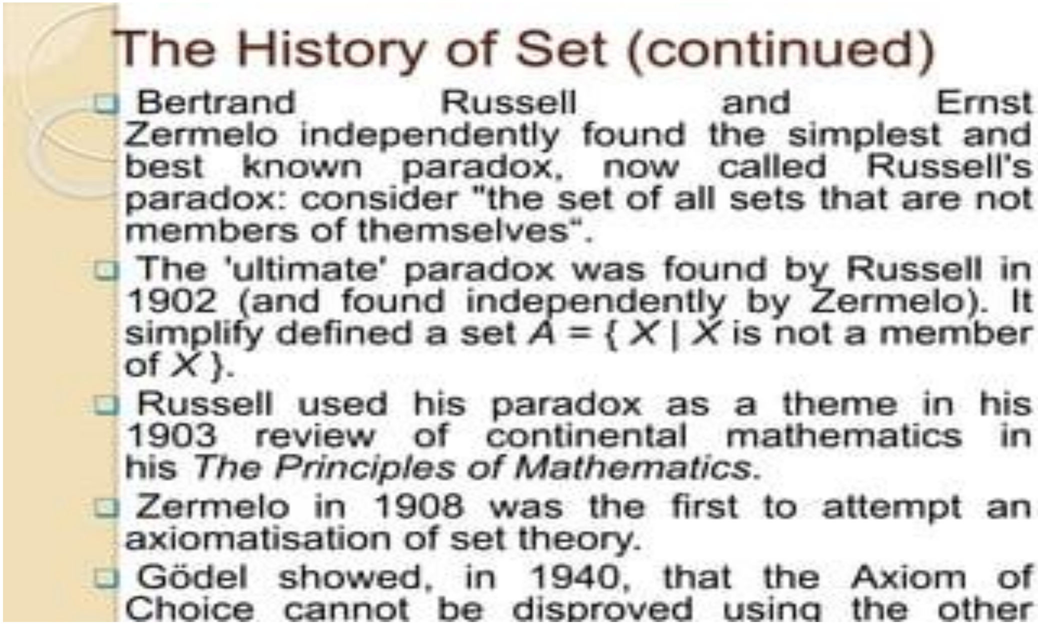
  $(A \cap B)' = A' \cup B'$

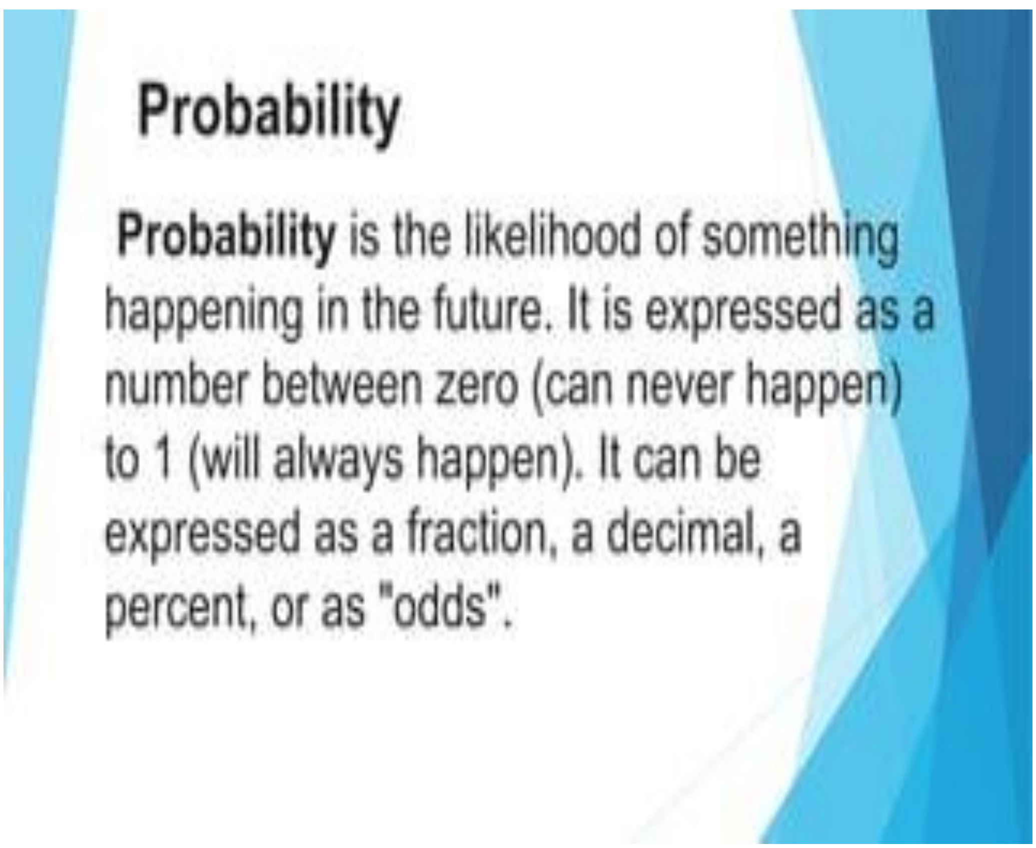
Application of Sets

- $n(A \cup B) = \text{n(A)} + \text{n(B)}$ if $A \cap B = \phi$
- $n(A \cup B) = \text{n(A)} + \text{n(B)} - \text{n}(A \cap B)$ if $A \cap B \neq \phi$
- $n(A \cup B) = \text{n(A} - \text{B)} + \text{n(B} - \text{A)} + \text{n}(A \cap B)$
- $n(A \cup B \cup C) = \text{n(A)} + \text{n(B)} + \text{n(C)} - \text{n}(B \cap C) - \text{n}(C \cap A) + \text{n}(A \cap B \cap C)$
- $n(A) = \text{n(A} - \text{B)} + \text{n}(A \cap B)$
- $n(B) = (\text{B} - \text{A}) + \text{n}(A \cap B)$

History of Set

- The theory of sets was developed by German mathematician Georg Cantor (1845-1918). A single paper, however, founded set theory, in 1874 by Georg Cantor: "On a Characteristic Property of All Real Algebraic Numbers".
- He first encountered sets while working on "problems on trigonometric series".
- Cantor published a six-part treatise on set theory from the years 1879 to 1884. This work appears in *Mathematische Annalen* and it was a brave move by the editor to publish the work despite a growing opposition to Cantor's ideas.
- The next wave of excitement in set theory came around 1900, when it was discovered that Cantorian set theory gave rise to several contradictions,


The History of Set (continued)
Bertrand Russell and Ernst Zermelo independently found the simplest and best known paradox, now called Russell's paradox: consider "the set of all sets that are not members of themselves".
The 'ultimate' paradox was found by Russell in 1902 (and found independently by Zermelo). It simplify defined a set A = { X | X is not a member of X }.
Russell used his paradox as a theme in his 1903 review of continental mathematics in his The Principles of Mathematics.
Zermelo in 1908 was the first to attempt an axiomatisation of set theory.
Gödel showed, in 1940, that the Axiom of Choice cannot be disproved using the other


Probability
Probability is the likelihood of something happening in the future. It is expressed as a number between zero (can never happen) to 1 (will always happen). It can be expressed as a fraction, a decimal, a percent, or as "odds".

Types of Probability :

Three types of probability are there

- Classical definition of probability
- Statistical or Empirical definition of probability
- Subjective probability

Classical Probability:

$$P(E) = \frac{\text{No of favourable outcomes}}{\text{Total no of outcomes}}$$

Ex: If we wanted to determine the probability of getting an even number when rolling a die, 3 would be the number of favorable outcomes because there are 3 even numbers on a die (and obviously 3 odd numbers). The number of possible outcomes would be 6 because there are 6 numbers on a die. Therefore, the probability of getting an even number when rolling a die is 3/6, or 1/2 when you simplify it.

Conditional Probability:

- Two events A and B are said to be dependent when B can occur only when A is known to have occurred (or vice versa).The probability attached to such that event is called conditional probability and denoted by P(A/B).
- If two events A and B are dependent then the conditional probability of B given A is

$$P(B/A) = \frac{P(AB)}{P(A)}$$

- **Exhaustive Events:**

The total number of all possible elementary outcomes in a random experiment is known as '*exhaustive events*'. In other words, a set is said to be exhaustive, when no other possibilities exists.

- **Favourable Events:**

The elementary outcomes which entail or favour the happening of an event is known as '*favourable events*' i.e., the outcomes which help in the occurrence of that event.

- **Mutually Exclusive Events:**

Events are said to be '*mutually exclusive*' if the occurrence of an event totally prevents occurrence of all other events in a trial. In other words, two events A and B cannot occur simultaneously.

- **Equally likely or Equi-probable Events:**

Outcomes are said to be *'equally likely'* if there is no reason to expect one outcome to occur in preference to another. i.e., among all exhaustive outcomes, each of them has equal chance of occurrence.

- **Complementary Events:**

Let E denote occurrence of event. The complement of E denotes the non occurrence of event E. Complement of E is denoted by '**Ê**'.

- **Independent Events:**

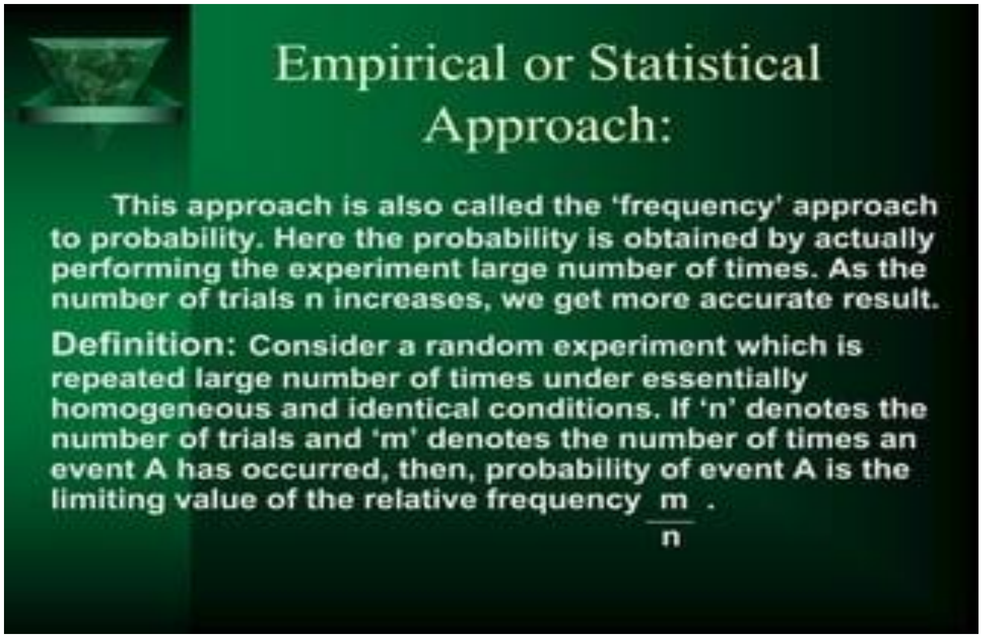
Two or more events are said to be 'independent', in a series of a trials if the outcome of one event is does not affect the outcome of the other event or vise versa.

Classical or Mathematical Approach:

In this approach we assume that an experiment or trial results in any one of many possible outcomes, each outcome being Equi-probable or equally-likely.

Definition: If a trial results in 'n' exhaustive, mutually exclusive, equally likely and independent outcomes, and if 'm' of them are favourable for the happening of the event E, then the probability 'P' of occurrence of the event 'E' is given by-

$$P(E) = \frac{\text{Number of outcomes favourable to event E}}{\text{Exhaustive number of outcomes}} = \frac{m}{n}$$



QUESTION BANK

UNIT I

1. A **set** is a well defined collection of objects.
2. A set having no element is called **Null set or Empty set or Void set**.
3. A set having only one element is called **Singleton** set.
4. The **empty** set is a subset of every set.
5. The set of all distinct subsets of a set is called a **power** set.
6. A **finite** set has finite number of elements.
7. $U - A$ = $\boldsymbol{A'}$
8. The symmetric difference of two sets A and B is denoted by $\boldsymbol{A \Delta B}$
9. $(A \cup B)'$ = $\boldsymbol{A' \cap B'}$
10. $A' \cup B'$ = $\boldsymbol{(A \cap B)'}$
11. $(A - B) \cap (A - C)$ = $\boldsymbol{A - (B \cup C)}$
12. $(A - B) \cup (A - C)$ = $\boldsymbol{A - (B \cap C)}$

13. The number of elements of a finite set is called **cardinality** of the set.

14. $(A')' =$ $\underline{\boldsymbol{A}}$

15. $A \cap A' =$ $\underline{\phi}$

16. $A \cup \phi =$ $\underline{\boldsymbol{A}}$

17. $\underline{\boldsymbol{A} \cap (\boldsymbol{B} \cup \boldsymbol{C})} = (A \cap B) \cup (A \cap C)$

18. $(A - B) \cap (B - A) =$ $\underline{\phi}$

19. Set of all elements which belong to both A and B is denoted by $\underline{\boldsymbol{A} \cap \boldsymbol{B}}$

20. **Venn Diagram** is a pictorial representation of different types of sets

21. Universal set is usually represented by a **rectangle**

22. Roaster method is also called as **tabulation or enumeration** method

23. Set builder method is also called as **Rule defining** method

24. The set, which contains all the sets under consideration as subsets, is called an **Universal** set

UNIT II

1. **Ratio** is an expression of relationship between two quantities of the same kind.
2. A ratio can be reduced by dividing all the terms by their **Greatest Common Divisor (GCD)**.
3. Ratio is an **absolute** measure.
4. Ratio indicates **how many** times a quantity is contained in another.
5. If the ratio of wages of male and female worker is 90:60, it means male workers wages is **1.5** times the wages of the female workers.
6. Ratio can also express as a **fraction**.
7. Find the ratio of 500 kg to 1 tonne**500 : 1000 = 1:2**
8. Express the following ratio in decimal 5 : 20 **0.25 : 1**
9. One ratio is **inverse** of another if their product is equal to one.

10. A ratio of greater inequality is diminished by **adding** the same positive number to both of its antecedent and consequent.
11. If x > 0 $\frac{a+x}{b+x} \geq a/b$
12. A ratio of greater inequality is increased and a ratio of less inequality is diminished if from both terms of the ratio, the same **positive number** is taken away.
13. If $a > b$ and $x > 0$ $then$ $\frac{a-x}{b-x} > \frac{a}{b}$
14. If $a < b$ and $x > 0$ $then$ $\frac{a-x}{b-x} < \frac{a}{b}$
15. If $a > b$ and $x > y$ $then$ $\frac{ax}{by} > \frac{a}{b}$
16. If $a < b$ and $x < y$ $then$ $\frac{ax}{by} < \frac{a}{b}$
17. If $\frac{a}{b} = \frac{c}{d} = \frac{c}{b}$ $then\ each\ ratio\ is$ $\left(\frac{pa^n + qc^n + re^n}{pb^n + qd^n + rf^n}\right)^{1/n}$
18. The duplicate ratio of 3 : 4 = **3^2 : 4^2 = 9 : 16**
19. The triplicate ratio of 2 : 3 = **8 : 27**
20. The sub duplicate ratio of 36 : 49 = **6 : 7**
21. The sub triplicate ratio of 27 : 64 = **3 : 4**
22. In the ratio a: b, a is known as **antecedent**.
23. In the ratio a: b, b is known as **consequent**.

UNIT III

1. **Interest** is the extra money paid by the organization for having used the money lent by others.
2. The money received for use is called **Principal**
3. The sum total of the principal and interest is called **Amount**
4. Interest calculated on principal at a uniform rate per year is called **Simple interest**.

5. Formula for calculation of simple interest $= \frac{PNR}{100}$ or PNI
6. **Compound interest** is calculated recursively on the amount accumulated at the end of each year
7. Formula for calculation of compound interest = **$P(1 + i)^n - P$**
8. **Depreciation** means decrease or decline in value of assets due to wear and tear in use or the passage of time
9. The residual value of the assets at the end of its life time is called **Scrap**
10. Formula for calculation of scrap value = **$A = P(1 - i)^n$**
11. **Percentage** is a way of comparing a part with a whole having 100 parts
12. **Cent** is the abbreviation of century or hundred
13. To change decimals into percentage, multiply the decimal by **100**
14. To change percentage into a decimal, remove the % sign and divide the number by **100**
15. The interest is usually paid at the end of specified **equal intervals** of time
16. The calculation of interest is divided into two **Simple interest** and **Compound interest**

UNIT IV

1. The number of rows and columns present in a matrix is called **Order** of matrix
2. The numbers in a matrix are called **elements** of the matrix
3. A matrix with only a single row is called a **Row** matrix
4. A **Square** matrix has equal number of rows and columns
5. A diagonal matrix in which all the diagonal elements are 1 is called a **Unit** matrix

6. A square matrix in which all the non-diagonal elements are zero, and all diagonal elements are equal is called **Scalar** matrix
7. Two matrices can be added or subtracted only if they are of the **Same** order.
8. The value of the determinant obtained by deleting i^{th} row and j^{th} column of the given determinant is called **Minor**.
9. The cofactor is a **Signed Minor**.
10. The matrix obtained by interchanging rows and columns of a matrix is called **Transpose** matrix.
11. The number of elements in the square matrix of order n is equal to $\mathbf{n^2}$
12. The elements a_{11}, a_{22}, a_{33} …….. a_{mn} are called **Diagonal elements**
13. The diagonal of square matrix is called **Principal diagonal**
14. Two matrices of same order are said to be equal if their **Corresponding** elements are the same.
15. A square matrix is called a **Singular** matrix if its determinant is equal to zero
16. The value of determinant is **unaltered** if the corresponding rows and columns are interchanged.
17. The transpose of the cofactor matrix is called **Adjoint** matrix.
18. The concept of **Inverse** matrix is used in solving simultaneous linear equation.
19. A matrix equal to it's transpose is called **Symmetric matrix**.
20. $|\boldsymbol{AB}| = |A| \, . \, |B|$

UNIT V

1. An expression of likelihood of occurrence of an event is known as **Probability**

2. The probability of occurrence of an event A can be defined as **P(A)** $= \frac{\text{Number of favourable cases}}{\text{Total number of equally likely cases}}$
3. The **classical** approach to probability is the oldest and simplest.
4. The probability obtained by following relative frequency definition is called **empirical** probability
5. An act repeated under some given conditions is called as an **experiment**
6. Experiments whose results depend on chance are called **Random** experiments.
7. The outcome of an experiment is called **Event**
8. When two events cannot happen simultaneously, then it is called as **mutually exclusive** events
9. When the outcome of one event does not affect the outcome of other event, then it is known as **independent** event
10. P(A or B) = **P(A) + P(B)**
11. P(A and B) = **P(A) x P(B)**
12. Multiplication theorem is not applicable for **dependent** events
13. The probability attached to dependent events is called **conditional** probability
14. The probability of event A, given event B is $P(A_1 / B)$ = $\mathbf{P(A_1 \text{ and } B) / P(B)}$
15. The mathematical expectation of the weighted arithmetic mean of a random variable is called **expected value**.
16. When two events are not mutually exclusive then P(A or B) = **P(A) + P(B) – P(A and B)**
17. In case of **compound events** we consider the joint occurrence of two or more events.