UNIT I: VERBAL ABILITY AND BASIC QUANTITATIVE APTITUDE (Only Long Theoritical concepts)

*Numerical will be discussed in class

Q1. Explain the difference between primary and secondary data. Discuss the various methods of collecting primary data.

Answer:

Primary Data is the information collected directly from first-hand sources for the first time. It is original and specific to the purpose of the study.

Secondary Data is the information that has already been collected by someone else and is readily available from other sources such as books, government publications, websites, etc.

Differences between Primary and Secondary Data:

Basis	Primary Data	Secondary Data
Source	Collected by the researcher	Collected by someone else
Cost	Expensive to collect	Less costly
Time	Time-consuming	Time-saving
Specificity	Specific to the objective	May not exactly suit the objective
Reliability	Highly reliable	Less reliable if source is not authentic

Methods of Collecting Primary Data:

1. **Direct Personal Interview**: The investigator personally meets the respondents and collects information.
2. **Indirect Oral Investigation**: Information is obtained through a third party who is familiar with the issue.
3. **Information from Correspondents**: Local agents or correspondents are used to collect data regularly.
4. **Questionnaire Method**: A list of questions is given to respondents to fill in.
5. **Schedules**: Enumerators fill in the data during interaction with respondents.
6. **Telephonic Interview**: Data is collected over the phone, useful in time-bound research.

Q2. Explain the concept of permutations and combinations with examples.

Answer:

Permutation refers to the arrangement of objects in a specific order. **Order matters** in permutation.

The formula for permutation of rrr objects from nnn total objects is:

$nPr = n!/(n-r)!$

Combination refers to the selection of objects where **order does not matter**.

The formula for combination is:

$nCr = n!/r!(n-r)!$

Examples:

1. **Permutation Example**: In how many ways can 3 students be selected and seated from a group of 5?

2. **Combination Example**: In how many ways can 3 students be selected from 5 for a project team?

Q3. Explain the concept of Time, Speed, and Distance. Derive formulas and solve an example.

Answer:

Concepts:

- **Speed** is the rate at which distance is covered.
- **Distance** is the length covered.
- **Time** is the duration taken to cover that distance.

Formulas:

- Speed = Distance / Time
- Distance = Speed × Time
- Time = Distance / Speed

Unit Consistency:

- Speed is usually in km/hr or m/s.
- 1 km/hr = 5/18 m/s; 1 m/s = 18/5 km/hr

Example:
A car travels 90 km in 2 hours. What is the speed?

Solution:
Speed = Distance / Time = 90 / 2 = **45 km/hr**

Reverse Example:
If a bike travels at 60 km/hr for 1.5 hours, distance covered =
Distance = Speed × Time = 60 × 1.5 = **90 km**

Time-Speed-Distance questions help test logical calculation ability in job aptitude tests.

Q4. What is Linear Equation? Explain with methods of solving and examples.

Answer:

Linear Equation is an equation of the form:

- In one variable: $ax + b = 0$
- In two variables: $ax + by = c$

It represents a straight line when graphed.

Solving Techniques:

1. **Substitution Method**
2. **Elimination Method**
3. **Cross Multiplication (for two equations)**

Example 1 (One Variable):
Solve: $2x + 3 = 11$
$\Rightarrow 2x = 11 - 3 = 8$
$\Rightarrow x = 8 / 2 =$ **4**

Example 2 (Two Variables):
Solve:
$x + y = 10$
$x - y = 4$

Add both:
$(2x) = 14 \rightarrow x = 7$
Put $x = 7$ in first: $7 + y = 10 \Rightarrow y = 3$

Linear equations are used in business, economics, and daily life budgeting problems.

Q5. What is the difference between Primary and Secondary data? Explain the sources of Secondary Data.

Answer:

Primary Data: Original data collected for a specific purpose directly by the researcher.

Secondary Data: Data already collected and available from other sources.

Comparison Table:

Feature	Primary Data	Secondary Data
Collection	First-hand	Already available
Time	More time-consuming	Time-saving
Cost	Expensive	Cheaper
Accuracy	More accurate	May be outdated

Sources of Secondary Data:

1. **Government Publications**: Census reports, economic surveys
2. **Websites and Portals**: NSSO, RBI, World Bank
3. **Books and Journals**
4. **Reports of NGOs or private agencies**
5. **Internal company records**

□ UNIT II: LOGICAL REASONING – I

Q6. What is syllogism? Explain its rules with examples.

Answer:

Syllogism is a form of logical reasoning that uses two or more propositions (premises) to arrive at a conclusion.

Structure of a syllogism:

- **Major Premise**: All men are mortal.
- **Minor Premise**: Socrates is a man.
- **Conclusion**: Therefore, Socrates is mortal.

Basic Rules of Syllogism:

1. **Universal to Particular**: If the premises are universal, the conclusion must be universal or particular.
2. **Two negative premises produce no conclusion.**
3. **If one premise is negative, the conclusion must be negative.**
4. **The middle term must be distributed at least once.**
5. **The conclusion cannot be broader than the premises.**

Example 1:

- Premise 1: All doctors are intelligent.
- Premise 2: All surgeons are doctors.
- Conclusion: All surgeons are intelligent.

This is a valid syllogism, and follows the rule of transitivity.

Example 2:

- Premise 1: Some teachers are musicians.
- Premise 2: All musicians are artists.
- Conclusion: Some teachers are artists. *(Invalid – cannot be concluded)*

Q7. What are Venn diagrams? How are they used in reasoning problems? Give examples.

Answer:

Venn Diagrams are pictorial representations of sets, using circles to show the relationships between different groups. They are widely used in logical reasoning and set theory to illustrate commonality or exclusiveness between sets.

Uses in Reasoning:

1. **To identify union, intersection, and difference of sets**
2. **To solve syllogisms**
3. **To detect logical consistency**

Example:
Let's consider 3 categories: Students who play Cricket (C), Football (F), and Tennis (T). A Venn diagram with three overlapping circles can represent:

- Students who play both Cricket and Football.
- Students who play all three games.

- Students who play only Tennis, etc.

Sample Problem:
In a group of 100 students:

- 60 play Cricket
- 50 play Football
- 30 play both

Find how many play only Cricket.

Solution using Venn Diagram logic:

- Cricket only = 60 - 30 = 30

Q8. Define Set Theory. Explain the types of sets and operations on sets with Venn diagram illustrations.

Answer:

Set Theory is a fundamental branch of mathematics that deals with collections of objects, called sets. Each object in a set is called an **element** or **member**.

Types of Sets:

1. **Null Set (Ø)**: Contains no element. Example: Set of squares with 3 sides.
2. **Singleton Set**: Contains exactly one element. Example: {0}
3. **Finite Set**: Contains countable elements. Example: {1, 2, 3}
4. **Infinite Set**: Uncountable elements. Example: Set of all natural numbers.
5. **Equal Sets**: If A = {1, 2} and B = {2, 1}, A = B
6. **Subset**: A is a subset of B if every element of A is in B.

Set Operations:

- **Union (A ∪ B)**: Elements in A or B or both.
- **Intersection (A ∩ B)**: Elements common to both.
- **Difference (A − B)**: Elements in A but not in B.
- **Complement (A′)**: Elements not in set A.

Venn Diagram Example:
Let A = {1, 2, 3}, B = {2, 3, 4}

- $A \cup B = \{1, 2, 3, 4\}$
- $A \cap B = \{2, 3\}$
- $A - B = \{1\}$

Set theory is useful in logical reasoning, computer science, and data analysis.

✅Q9. What is Probability? Explain basic terms and solve a simple problem.

Answer:

Probability measures the **likelihood** of the occurrence of an event.

Key Terms:

- **Experiment**: An action with uncertain results (e.g., tossing a coin).
- **Sample Space (S)**: All possible outcomes. Tossing a coin: S = {H, T}
- **Event**: Subset of outcomes.

Classical Probability Formula:

P(E)=Number of favorable outcomes/Total outcomes

Example:
A die is rolled. What is the probability of getting an even number?

- Sample Space S = {1, 2, 3, 4, 5, 6}
- Favorable outcomes = {2, 4, 6} = 3 outcomes

P(E)=3/6=1/2

Probability ranges from 0 (impossible) to 1 (certain).

It's applied in weather forecasting, data science, finance, etc.

✅Q10. Explain the difference between LCM and HCF with examples. How are they calculated using prime factorization?

Answer:

LCM (Least Common Multiple) is the smallest multiple that is common to two or more numbers.
HCF (Highest Common Factor) is the largest factor that divides two or more numbers.

Prime Factorization Method:

1. Break numbers into prime factors.
2. **HCF**: Multiply common prime factors (take smallest powers).
3. **LCM**: Multiply all prime factors (take highest powers).

Example: Find LCM and HCF of 12 and 18.

- $12 = 2^2 \times 3^1$
- $18 = 2^1 \times 3^2$
- **HCF** $= 2^1 \times 3^1 = 6$
- **LCM** $= 2^2 \times 3^2 = 36$

Relationship:

HCF×LCM=Product of Numbers

Used in real-world scenarios like scheduling, packaging, and data grouping.

Note- Various topics have already discussed in Class