Sets

Introduction

The concept of set serves as a fundamental part of the present day mathematics.
Today this concept is being used in almost every branch of mathematics. The sets are used to define the concept of relations and functions. The study of geometry, sequence, probability etc requires the knowledge of sets.
Theory of sets was developed by German mathematician George Cantor.

Sets and their representations:-

In every day life we often speak of collection of objects of a particular kind such as a pack of cards, a crowd of people, a cricket team etc.
In mathematics also, we come across collections of example of natural numbers, points, prime numbers etc.

All natural numbers less than 20
1, 2, 3, 4,5,6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19

The vowels of English alphabet
a,e,i,o,u

Prime factors of 210 i.e; 2,3,5,7

All of the above example is well-defined collection of objects in the sense that we can definitely decide whether a given particular object belongs to a given collection or not.

e.g. The set of rivers of India.

River Nile does not belong to the collection of rivers of India. But river Ganga does belong to this collection.

The collection of five most renowned mathematician of world is not well defined, because the criterion for

determining a mathematician as most renowned may vary from person to person. This is not a well-defined collection.

Definition of set:-A set is a well-defined collection of objects.

* Objects ,elements and members of a set or synonymous terms.
* Sets are usually denoted by capital letters A, B, C, X, Y, Z.....etc.
* The elements of a set are represented by small letters a.b,c,.....,x,y,z,...1,2,3 etc.

Representation of sets :-

* Roster or tabular form
* Set-Builder form

Roster form, all the elements of a set or listed, the elements are being separated by commas, and are enclosed within braces { }.

For example the set of all even positive integers less than seven is described in roster form as {2,4,6}
Set of English{a,b,c,.....x,y,z}

Set-Builder form
The set of all natural numbers less than 10
X = {x : x<10, x is a natural number }

Types of sets

1. Empty set :
A set which does not contain any element is called the empty set or the void set .It is denoted by symbol ϕ (phi) or { }.

2. Finite and in finite sets:

Let A = {1,2,3,4,5}
A contain five elements.
N = {set of all natural numbers}
There are in finite number of elements in the set N.

3. Equal sets :

Given two sets A and B, if every element of A is also an element of B and if every element of B is also an element of A, then the sets A and B are said to be equal.

X = {1,2,3,4} Y = {3,4,1,2}
X and Y are equal sets.

4. Subset :

Consider X = {all the students of a school}
Y = {all the students of class I of that school}
Y is a subset of X.
∵ every student of class I is also a student of school.

Quiz I : Problem-solving and Sets

Q1. Mathematics teaching and learning should be based on memorise rules for computation.

1. Yes
2. No

Q2. The primary focus in a mathematics class should be on

1. Students thinking processes
2. On problem-solving strategies
3. On directing a lesson
4. To devise a plan

Q3. Polya's famous book' how to solve it' has been translated in

1. 10 Languages
2. 17 Languages
3. 15 Languages
4. 16 Languages

Q4. According to Polya's "Basic principles of problem-solving include"

1. Understand the problem

2. Find a strategy
3. Apply the strategy
4. Reflect on the solution
5. All of the above

Q5. Let X = {1,3,5,7,9} Is the following statement true or false
$3 \notin X$
1. True
2. False

Q6. An empty set can be described as
1. A ={ }
2. $A = \phi$
3. $A \neq \phi$
4. $A \neq \{ \}$

Q7. Let A ={1,2,3}
B ={3,4,5} which of the following sets is equal to the union of A and B
A U B ?
1. {1,2,3,4,5}
2. {1,2,3,3,4,5}
3. {3}
4. {1,2,3}

Q8. The set of positive integers greater than 100 is an example of
1. Finite set
2. In finite set
3. Empty set
4. Null set

Q9. Let A = (-1,2,3,-4,6}
Compute the cardinality of set F.
1. 4
2. 5
3. 3
4. 0

Q10. Let A ={1,2,3,4,5}
B ={1,2,3} which of the following sets is equal to the intersection of A and B
$A \cap B$?

1. {1,2,3}
2. {1,2,3,4,5}
3. {1}
4. {1,2}