Mathematics Foundations (CBCA104)

Lecture-3

30/09/2022

Outline

- Representation of a Set
  - (i) Roster Form or Tabular Form
  - (ii) Set-builder Form
- Subset

Representation of Sets

There are two ways to represent a set:

i. Roster or Tabular Form

i. Set-builder Form

Roster or Tabular Form

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

- The set of all even positive integers is described in the roster form as {2, 4, 6}.

- The set of all natural numbers which divide 42 is {1, 2, 3, 6, 7, 14, 21, 42}.

- The set of all vowels in English alphabet is {a, e, i, o, u}.

- The set of all odd natural numbers is {1, 3, 5, 7, 9, 11, ...}.

Set-builder Form

- In the set builder form, all the elements of a set possess a single common property which is not possessed by any element outside the set.
- For example in the set V={a, e, i, o, u}, all the elements possess a single common property i.e., each of them is a vowel in English alphabet and no other letter possess this property.
- We can write set V as

  V={x: x is a vowel in English alphabet}.

- The set , A={x: x is a natural number and 3 < x < 10}.

Examples

- Write the solution set of the equation $x^2 + x - 2 = 0$ in roster form and set – builder form.

The given equation can be written as
$x^2 + x - 2 = 0 \Rightarrow (x+2)(x-1) = 0 \Rightarrow x = 1, -2$
Thus the solution set of given equation in roster form is {1,-2}.
Tabular form: $\{x \in R : x^2 + x - 2 = 0\}$.

- Write the set {x: x is a positive integer and $x^2 < 40$}.

Given set in roster form is {1, 2, 3, 4, 5, 6}.

Examples

- ➢ Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set builder form.

Here each number given has the numerator one less than the denominator.

Also, numerator begins from 1 and do not exceed 6.

Hence in set-builder form, the given set is

{x: x=n/(n+1), where n is a natural number and 1$\leq n \leq$6}.

Subset

- If all the elements of a set A are also elements of a set B, then A is a subset of B.

- For example, if A = {2, 4, 6} and B = {1, 2, 3, 4, 5, 6, 7}, then A is a subset of B.

- This is specified by $A \subset B$.

  Or by $\{2, 4, 6\} \subset \{1, 2, 3, 4, 5, 6, 7\}$

- If A is not a subset of B, it is written as such: $A \not\subset B$

  For example, $\{1, 2, 8\} \not\subset \{1, 2, 3, 4, 5, 6, 7\}$.

Example

- Consider, X= set of all students in Bennett
  Y= set of all students in your class

- Then Y is a subset of X i.e.,
- $Y \subset X$, *because every student is your class is a student in Bennett*.

Points to Remember:

- If $A \subset B$ *and* $B \subset A$ *then* $A = B$.
- Every set is a subset of itself.
- Since empty set has no element , thus empty set is a subset of every set.

Proper Set

- If A is a subset of B, and A is not equal to B, then A is a proper subset of B.
- Let A = {0, 1, 2, 3, 4, 5}. If B = {1, 2, 3}, B is not equal to A, and A is a subset of B.

  A proper subset is written as $A \subset B$

- Let X = {0, 1, 2, 3, 4, 5}. X is equal to A, and thus is a subset (but not a proper subset) of A.
- Can be written as: $X \subset A$ and $A \subset X$ (or just X = A)
- Let Q = {4, 5, 6}.

  Q is neither a subset or A nor a proper subset of A.

Proper Set

- The difference between “subset” and “proper subset” is like the difference between “less than or equal to” and “less than” for numbers.

- The empty set is a proper subset of all sets other than the empty set (as it is equal to the empty set).

Singleton Set

- If a set A has only one element, we call it a singleton set.
- A={a} is a singleton set.
- B={5} is a singleton set.
- X={Blue} is a singleton set.