Representation of sets:

1) **Roster/Tabular/listing Method-**

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

   Example: Set of all natural numbers less than 10

   N = {1, 2, 3, 4, 5, 6, 7, 8, 9} or N = {2, 1, 5, 7, 3, 8, 9, 4, 6}

   Note:

   a) Order of element is not important
   b) Elements are not repeated
      Example: SCHOOL = {S, C, H, O, L}, LETTER = {L, E, T, R}

2) **Set-Builder form/Rule Method:**

   In this form all the elements of a set possess a single common property **p(x)**, which is not possessed by any other element outside the set. In such case, the set is described by **{x : p(x) holds}**

   Example: V= {a, e, i, o, u}

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

Representation of a statement in both form:

Statement	Roster	Set-Builder
The set of all natural numbers between 10 to 14	A = {11, 12, 13}	A = {x : x ∈ N; 10 < x< 14 }
Set of all words using in FRIEND	W = {F, R, I, E, N, D}	W = {x : x distinct letter are used in FRIEND}

Cardinality of sets:

- Sometimes we are required to know the size of sets.
- Cardinality of a set is defined as the total number of unique elements in a set or the number of elements in a set.
  Example: A = {1, 2, 3, 4, 5, 6} where cardinality = 6, because number elements in set A=6.
- It is denoted by the **modulus sign** on both sides of the set name i.e. **|A|,** or **card(A)**, or **n(A)**. Where **|A|** and **n(A)** are mostly used. So, the cardinality of above set A is **n(A)**=6.
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Cardinality of a Finite set:

- A finite set is a set with a finite number of elements and is countable.
  Example: B = {a, b, c, d} where n(B) = 4

- When set B is finite, |B| or n(B) will be the exact number of elements in the set B.
- Finite sets are also called numerable sets.

A set is said to be finite if –

a) It is an empty set.
b) if there is one to one correspondence between the elements in the set (Counting each element in a set once).

Examples:

i) Suppose there is a set X that contains all English alphabets. Then the cardinality of set X is 26 because there are 26 letters in the English Alphabet. So, n(X) = 26.
ii) If there is a set of months in a year, it will have cardinality of 12, as there are 12 months in a year. So, n(M) = 12.

Note:

A one to one (1-1) correspondence between two sets X and Y is another name for a function f: X→Y.

Example: X = {1, 2, 3} and Y = {a, b, c} where n(X) = 3, n(Y) = 3 therefore, n(X) = n(Y) so X and Y are equivalent sets. One to one correspondence between X and Y are-

1 → a, 2→b, 3→ *c*

Cardinality of Countable set:

A set is called countable if –

a) The set is finite.
b) If there can be one to one correspondence between the elements in the set.

Example: let a set X and X→N i.e. n(X) = n(N). where N is natural numbers.

- If a set is countable and infinite then it is called a countable infinite set. Ex: N (natural numbers), Z(Integers), Q (Rational numbers).
- For an infinite countable set, the cardinality is equal to the cardinality of the set of natural numbers.
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Cardinality of a Infinite set:

- A set that is not finite is called infinite set.
- A set is infinite if it is not empty and also cannot be put into 1-1 correspondence.
- Infinite sets are countable infinite and uncountable infinite.
- The examples of infinite sets include set of whole numbers, set of all integers, set of natural numbers.

- The cardinality of infinite sets is n(B) = ∞, where B is any infinite set.

Note:

Sets like natural numbers (N) and integers (Z) are countable though they are infinite because it is possible to list them.