Book of Proofs

# Fundamentals

## Sets

A set is often expressed by listing its element between commas enclosed by braces. For example, is a set with four elements which are 2, 4, 6, and 8.

A set can be an infinite set like a collection of all integers

#### Uppercase Alphabet set denotation

A set can be denoted using a uppercase alphabets like

#### Special Symbols for sets

- Natural number set symbol, - set of all integers symbol, - set of all real numbers, - empty set, - rational number.

#### Infinite set

A set with infinite number of elements in it. Special sets like , , and other specific infinite sets like

#### Finite Set

A set with a finite number of elements in it.

– set with 4 elements – 2, 4, 6, 8.

#### Element of a set symbol -

In the above example, 2 is an element of the set A. This can be denoted as . Similarly, 7 is not an element of the set A. It can be denoted as .

#### Equality of sets

Two sets can be equal if all the elements of the two sets are equal irrespective of its order.

#### Various elements in a set

A set can have numbers, coordinates, other sets, alphabets and other mathematical things in it.

Alphabetical lowercase letters can used to denote a set’s element. For example,

. Here a is representing a two-by-two matrix.

#### Cardinality or size of a finite set

It is denoted for example by . In this example cardinality of set A is 4;

#### Empty set denoted by .

It represents an empty set . A set with no elements within it.

#### Set builder notation

A set builder notation is used to denote complex sets in a simpler form.

For example, a set of all even integers can denote as , which holds the results .

Here the braces can be read as “a set of all things of the form” and colon as “such that”. Together, the above set builder notation can be read as E is equal to a set of all elements of the form *2n* such that *n is an element of integer set*.

Some authors interchange colon () with a bar (|).

#### Distinction of

If A is a number like -1, 1, etc., then means absolute value of A. If A is a set then represents the cardinality or size of the set A.

#### Intervals on a number line

In a number line, an infinite set interval can be by a dark segmented line. A solid circle denote an element is included in the interval. A hallow circle denote an elements is not included in the interval.

##### Closed Interval

##### Open Interval

##### Half-open Interval

##### Infinite Interval

The notation can denote both an open interval on a line and a point on a plane. But the difference is usually clear from the context.

### Exercises

1. Write each of the following sets by listing elements between braces.

. A set of Integers.

A set of Integers.

Other questions yet to complete.

## The Cartesian Product

The cartesian product of two sets is denoted as .

#### Cardinality of a cartesian product

#### Ordered Pairs

A list of two things x and y enclosed with in parenthesis and separated by comma.

#### Cartesian Power