Lecture Notes: Introduction to Sets and Set Notation

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1 Overview

Key Points

- Set Rules
- Set Notation
- Set Cardinality

2 Detailed Notes

2.1 Set Rules

- Set Definition: A collection of objects called elements or members of that set.
- Notation for a set is usually captial letters
  - Example: A, B, C
- Lowercase letters represent elements in the set
  - Example: a, b, c
- If a is a element of A
  - Example: $a \in A$
- If a is not an element of A we write
  - Example: $a \notin A$
- $A = x : p(x)$
- $A = x : |x|2 = \{-2, 2\} = \{2, -2\}$

2.2 Equality of Sets and Cordinality of Sets

- $A = B$ if A and B have the same elements
- A set with no elements is called an empty set or a void set and is denoted used the symbol ϕ
- Natural Number Set
  - $\mathbb{N} = \{1, 2, 3, 4 \ldots\}$
- Integer Set
  - $\mathbb{Z} = \{\ldots -3, -2, -1, 0, 1, 2, 3 \ldots\}$
- Rational Number Set
  - $\mathbb{Q} = \{\frac{m}{n} : n \in \mathbb{N}, z \in \mathbb{Z}\}$
- Complex Number Set
  - $\mathbb{C} = \{a \pm i * b : b \in \mathbb{R}\}$
- Cardinality of a Set
  - If S is a set $|S|$ is it cardinality
  - $|S|$ = Number of elements in s if s is infinite if s has infinitivly many elements
  - $|\phi| = 0$

  Subsets and Proper Subsets
  - A is a subset of B if every element of A is a element of B
  - There are also proper subsets and normal subsets, but people often don't mind the difference unless there is a explicit reason for needing one over the other $\subset$

2.3 Power Set

If A is a set then the set of all subsets of A is called a powerset of A and denoted by $\mathbb{P}$

3 Important Formulas/Theorems/Definitions

Key Formula/Theorem

In general

$$|\mathbb{P}(A)| = 2^{|A|} \tag{1}$$

4 Examples

D is a set of digits

- $D = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
- $D = \{0, 1, 2, 3 \ldots 8, 9\}$
- $D = \{x : x \text{ is a digit}\}$
- $D = \{x | x \text{ is a digit}\}$

Cardinality of a Set

- $|D| = 10$
- $s = \{x : |x| = 2\}$
  - $|S| = 2$

Power Set

- $A = \{1, 2, 3\}$
- $\mathbb{P}A = \{\phi, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$
- $|\mathbb{P}(A)| = 8$

5 Questions/Topics for Further Study

- Question or topic for further study