Sets

CSE015 Lab 5, 2024 Fall

Jieke (Jacky) Wang
jwang450@ucmerced.edu
EECS, School of Engineering
UC Merced

TOC

Slides is posted on Canvas:Files. If you find any typos or have any concerns, please contact me ASAP!

Concepts

- **Sets**, subset, power set, Cartesian product, Venn diagram, Cardinality
- intersection, union, difference, complement, disjoint, multiset

Exercises by Problem Type in 2.1

- **Notation (set builder, interval)**: 1, 2, 3, 4
- **Set relation (subset, equivalence, belongs to)**: 5, 6, 7, 8, 9, 10, 11, 12, 13, 19, 20
- **Power set**: 23, 24, 25, 26, 27,
- **Cartesian product**: 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44,
- **Venn diagram**: 14, 15, 16, 17, 18
- **Cardinality**: 21, 22
- **Predicates and quantifiers**: 45, 46, 47,
- Advanced problems (for reading): 49, 50, 51

Some Story (for reading)

- In Exercise 50, **Russell's paradox** is also known as **Barber's paradox**:
  "Supposes a barber who shaves all men who do not shave themselves and only men who do not shave themselves. Then does the barber should shave himself or not?"
  This caused the 3rd crisis in Mathematics. 1st is about rational numbers; 2nd is about calculus.
- In Exercise 51, to list all subsets, the following procedure is an example for 3-element set $\{a, b, c\}$. First, list all binary numbers up to 2^3: $[000, 001, 010, 100, 011, 101, 110, 111]$. Now convert binary number to set by binding "digit" to an element and treating 1/0 as inclusion/exclusion of corresponding element. This idea is also discussed in Textbook 2.2.4 **Computer Representation of Sets**.

Exercises by Problem Type in 2.2

- **Apply set operations (union, intersection, difference, complement)**: 1, 2, 3, 4, 14, 27, 31, 32
- **Venn Diagram**: 18, 28, 29, 30
- **Prove set equivalence**: 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 34, 35, 36, 37
- Advanced reading: 38 $\sim$ 75

Tips: Proving set equivalence $A \equiv B$

- Membership table (2.2 Example 13).
- Prove $A \subseteq B$ and $B \subseteq A$ (2.2 Example 12).
- Chain of logical equivalence on builder notation (2.2 Example 11) or Chain of set equivalence (2.2 Example 14).