1 Set Theory

1.1 Introduction

Quick recap on Naive set theory, meaning:

1. Introducing the basic concept of sets;
2. Introduce notation;
3. Illustrate Union, Intersection, and Set Difference operations;
4. Venn diagrams as proof;
5. Power sets;
6. How to proof with more rigor.

Question: Why are sets relevant to computing?
We have to represent data to compute it.
To group data, we put it into sets.
Some sets that I have seen before:

$$\text{The set of natural numbers: } \mathbb{N} = \{1, 2, 3, ...\}$$
$$\text{The set of integers: } \mathbb{Z} = \{..., -3, -2, -1, 0, 1, 2, 3, ...\}$$

Question: What are sets?
Sets are a collection of unique elements.
Sets are denoted with capital letters, e.g. A, B, C. The elements of a set are listed inside curly brackets:

$$A = \{1, 2, 3\}$$
$$B = \{a, b, c, d, e, f, g, h\}$$

The union of two sets A and B is denoted $A \cup B$ and contains all elements of both sets. The intersection $A \cap B$ contains elements common to both.

$$A \cup B = \{1, 2, 3, a, b, c\}$$
$$A \triangle B = \emptyset \bigcup \{\}$$

Sets can also be described using set builder notation:

$$C = \{x | x \in \mathbb{N}, 0 \leq x \leq 5\}$$
$$= \{x | x \text{ is in the appropriate set}, 0 \leq x \leq 5\}$$

This covers the basics of set notation and operations in Latex math mode. Additional set theory topics like power sets, Cartesian products, etc. could be added.

$$= \{\text{Who knows, it's all pipes!}\}$$