Comma commonly denotes or and and Defintion of a Set presupposes 1,2,...,n-1,n which is the definition of a set Must define the relationship between elements and sets first

Ch. 2 Set Theory

1 Element

Define element l

$$l$$

2 Identity

Define identity of element l

$$|l| := 1$$

3 Set

3.1 Definition

Define set S as an ordered union of elements s_i

$$S := s_1 \cup s_2 \cup \ ... \cup s_{n-1} \cup \ s_n = \{s_1, s_2, ..s_n\}$$

3.2 Alternate Notation

$$S := s_i \in S : i = 1, 2, ..., n-1, n$$
$$S = \{s_1, s_2, ..., s_{n-1}, s_n\}$$

3.3 Magnitude of a Set

$$|S| = |\{x_1, ..., x_N\}| = N$$

3.4 Definition Unordered Set

Set S is unordered if

$$
\begin{gathered}
S = \{x_1, x_2, ..x_n\} \\
S = S_1 = S_2 = S_N = \{x_{i_1}, x_{i_2}, ..., x_{i_n}\} \\
\forall i_1, i_2, ..., i_n, \\
\iff x_i, x_j \in S, x_i = x_j, \quad \forall i, j \quad i \neq j \qquad (Theorem)
\end{gathered}
$$

3.5 Definition of Unique Set

$$
\begin{gathered}
a_i, a_j \in S \\
a_i \neq a_j \quad \forall i, j \neq i
\end{gathered}
$$

3.6 Definition of Countable/Uncountable set

Potentially just a line?

4 Topology; Elements to Sets

Every element is a set, but not all sets are elements

5 Comma ,

The comma symbol ”,” is an overloaded symbol

5.1 Comma in Set Theory

5.2 Comma in Counting

Definition of "," = or and & = and Comma might be a union (spoken as "and" but logicall represents or)

6 Universal Set

6.1 Definition

Define Universe, the "Universal Set" containing all elements

$$\Omega := s_i \in \Omega, \forall i$$

7 Empty Set

7.1 Definition

Define Empty Set, the set containing no elements

$$\varnothing \equiv \{\}$$

8 Definition Counting

1,2,3,4,5,...,N

9 Define a line $\mathbb{L}$

Define line $\mathbb{L}$

$$\mathbb{L} = \{l_0, l_1, l_2, ..., l_{N-1}, l_N, l_{N+1}, ...$$

10 Definition of Span

A function mapping to every element of L?

11 Containment

11.1 Contains

11.2 Equals $=$

Define set equivalence $=$

$$S_1 \subseteq S_2; \quad S_2 \subseteq S_1 \iff S_1 = S_2$$

11.3 Subset

11.4 Proper Subset Citation

11.5 Definition of Complement

$$S = \{s_1, s_2, ..., s_N\}$$
$$S^C :=$$
$$s_j : \{s_j \in \Omega\} \cap \{s_j \notin S\}; \;\; \forall j$$

11.6 Alternate Notation

Wikipedia definition of complement

$$S^C = U - S = \{x \in \Omega : x \notin S\}$$

https://en.wikipedia.org/wiki/Complement_(set_theory)

Set Operators

12 ← "Assignment"

12.1 Definition

13 Insertion

14 Append

15 "Deletion"

15.1 Definition

16 Iteration ↻

16.1 Definition

Define iteration ↻

17 Definition of No-op

Define ";" , the no-op (The C representation of a null statement or no-op)

17.1 Properties of No-op

1. Can be added to any solution S_i and remain a solution for all i anywhere in the order for all j

18 Appendix

18.1 Proofs and Properties

1. $\Omega \subset \varnothing$

2. $\Omega \cap \Omega = \Omega$

3. $\Omega \cup \Omega = \Omega$

4. $\Omega \cup \varnothing = \Omega$

5. $\Omega \cap \varnothing = \varnothing$

6. $\Omega \cap S = S$

7. $\Omega \cup S = \Omega$

8. $\varnothing \nsubseteq \Omega$

9. $\varnothing \cup \varnothing = \varnothing$

10. $\varnothing \cap \varnothing = \varnothing$

11. $\varnothing \cap S = \varnothing$

12. $\varnothing \cup S = S$

13. $\varnothing = \varnothing$

14. $\varnothing = \Omega^C$

15. $\Omega \subseteq S$