Review CSCI-338

Sets: A set is an unordered collection of distinct objects.

$$V = \{A, E, I, O, U\}$$

$$bits = \{0, 1\}$$

$$\mathbb{Z} = \{\ldots\ldots, -2, -1, 0, 1, 2, \ldots\ldots\}$$

Size of the set S using $|S|$, this denotes how many elements we have in the set.

$$|V| = 5$$

$A \in V$ ← A exists in V

$B \notin V$ ← B does not exist in V

Subsets

A set A is a subset of set B, if every element in Set A appears in set B.

We denote this $A \subseteq B$

If we want to say A is not a subset of B $A \not\subseteq B$

$A = \{2, 5\}$ $B = \{1, 2, 3, 4, 5\}$

$A \subseteq B$

$B \not\subseteq A$

$D = \{1, 6\}$

$D \not\subseteq B$

Question: If $|A| = n$, how many subsets does A have?

$$2^n$$

$A = \{1, 2, 3\}$

$P(A) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$

$|P(A)| = 8 = 2^3$

Def: A is a proper subset of B, If $A \subseteq B$ and $|A| \neq |B|$, denoted as $A \subset B$ or $A \subsetneq B$

$A = \{1, 2\}$ $\qquad B = \{1, 2, 3, 4\}$

$D = \{1, 2, 3, 4\}$

$A \subset B$

$D \subseteq B$

$D \not\subset B$

Question

$$(X \subseteq Y) \wedge (Y \subseteq X) \implies X = Y$$

$a, b \in \mathbb{R}$

$$(a \leq b) \wedge (b \leq a) \implies a = b$$

Multisets: A set that allows duplicate elements.

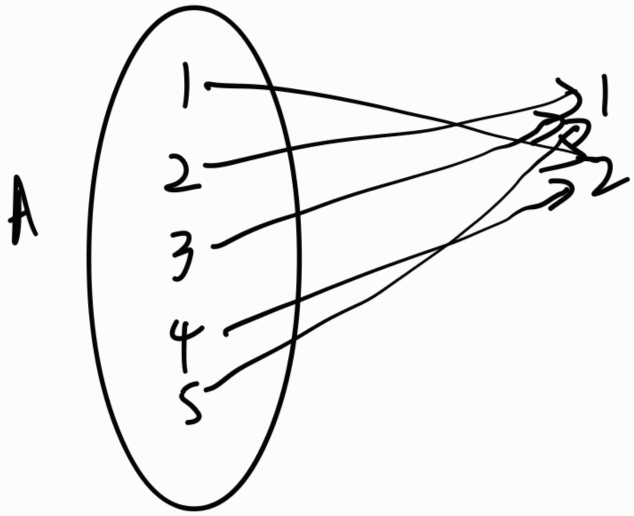
$M = \{1, 1, 2, 3, 4, 4, 5\}$

This is not a set.

A multiset M is an ordered pair (A, m), where A is the underlying set, and m is a function such that $m: A \to \mathbb{Z}^+$ that denotes multiplicity.

$M = \{1, 1, 2, 3, 4, 4, 5\}$

$A = \{1, 2, 3, 4, 5\}$



$m(1) = 2$

$m(2) = 1$

$m(3) = 1$

$m(4) = 2$

$m(5) = 1$

Some important sets

$\mathbb{Z}$ - The set of all integers

$\mathbb{Z} = \{ \ldots\ldots, -2, 1, 0, 1, 2, \ldots\ldots \}$

$\mathbb{N}$ - The set of natural numbers

$\mathbb{N} = \{ 1, 2, 3, 4, \ldots\ldots \}$

$\mathbb{Z}^+ = \{ 1, 2, 3, \ldots\ldots \}$

$\mathbb{Z}^- = \{ \ldots\ldots, -2, -1 \}$

$\mathbb{Z} = \mathbb{Z}^+ \cup \mathbb{Z}^- \cup \{0\}$

$\mathbb{R}$ = set of all real numbers

$\mathbb{Z}^{\geq 0} = \mathbb{Z}^+ \cup \{0\}$