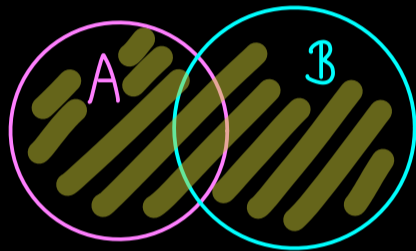


## Start Learning Sets - Part 3

$$A \subseteq B \leftarrow \begin{array}{l} \text{is a superset of } A \\ \text{is a subset of } B \end{array} \rightsquigarrow \begin{array}{l} B \subseteq B \checkmark \\ \emptyset \subseteq B \checkmark \end{array}$$
$$\forall x : x \in \emptyset \rightarrow x \in B$$

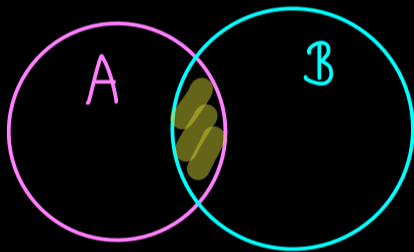
Union:



$$A \cup B := \{x \mid x \in A \vee x \in B\}$$

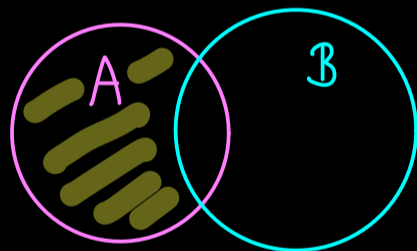
$$\left( \forall x : x \in A \cup B \leftrightarrow x \in A \vee x \in B \right) \text{ is true}$$

Intersection:



$$A \cap B := \{x \mid x \in A \wedge x \in B\}$$

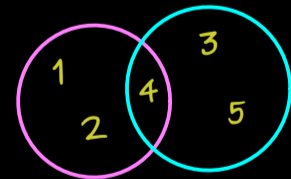
Set difference:



$$A \setminus B := \{x \mid x \in A \wedge x \notin B\}$$

Example:

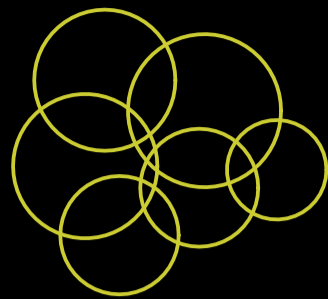
$$A := \{1, 2, 4\}, \quad B := \{3, 4, 5\}$$



$$A \cup B = \{1, 2, 3, 4, 5\}, \quad A \cap B = \{4\}, \quad A \setminus B = \{1, 2\}$$

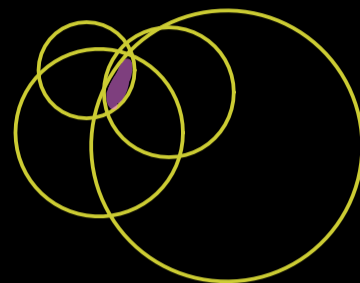
Big union: Need:  $I$  set,  $A_i$  set for each  $i \in I$ .

$$\bigcup_{i \in I} A_i := \{x \mid \exists i \in I : x \in A_i\}$$



Big intersection:

$$\bigcap_{i \in I} A_i := \{x \mid \forall i \in I : x \in A_i\}$$



Example:

$$A_1 = \{1\}, A_2 = \{2\}, A_3 = \{3\}, \dots$$

$$I = \mathbb{N}, A_i = \{i\}. \text{ Then: } \bigcup_{i \in I} A_i = \{1, 2, 3, \dots\} = \mathbb{N}$$

$$\bigcap_{i \in I} A_i = \emptyset$$

Power set: For a set  $A$  define  $\mathcal{P}(A) := \{X \mid X \subseteq A\}$

The set of all subsets of  $A$

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

Number of elements:  $|A| = 3, |\mathcal{P}(A)| = 8 = 2^3$