Unions and intersections

- Let I be an index set — typically $\mathbb{N}$ or $\mathbb{Z}$ or subsets thereof;
- Assume that $A_n \subseteq U$ for all $n \in I$, then define:

$$\bigcup_{n \in I} A_n = \{x \in U : x \in A_n \text{ for some } n \in I\},$$
$$\bigcap_{n \in I} A_n = \{x \in U : x \in A_n \text{ for all } n \in I\},$$

- We can write this collection as

$$\{A_n : n \in I\}, \quad \text{or} \quad (A_n)_{n \in I}.$$

- We say that the collection is **pairwise disjoint** if

$$i \neq j \implies A_i \cap A_j = \emptyset \tag{1}$$