2.2 Set operations

<u>Outline</u>

Operations on sets:

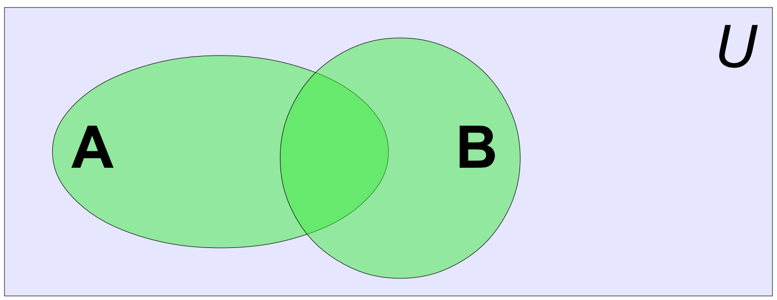
- Union
- Intersection
- Difference
- Complement

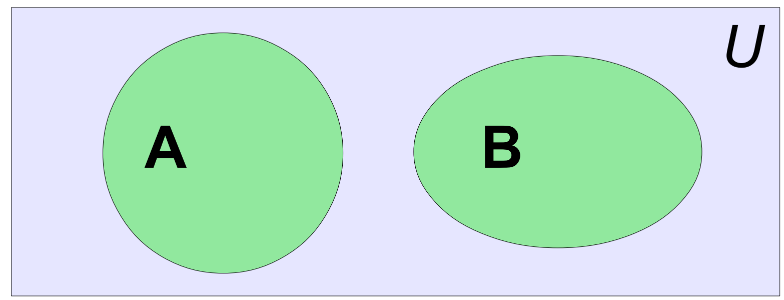
2.2 Set operations

Let **A**, **B** be any two sets.

The union of two sets **A** and **B** is the set that contains those elements that are either in **A** or in **B**, or in both.

denotation: **A** U **B** **A** U **B** = { x | x ∈ **A** ∨ x ∈ **B** }





Shaded (hatched) areas represent the union of sets **A** and **B**.

Example 1:

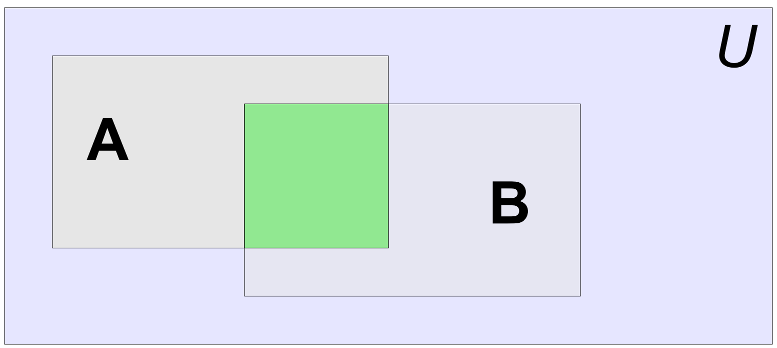
Let **A**={1,2,3} and **B**={2,3,4,5}, then **A** U **B** = {1,2,3,4,5}

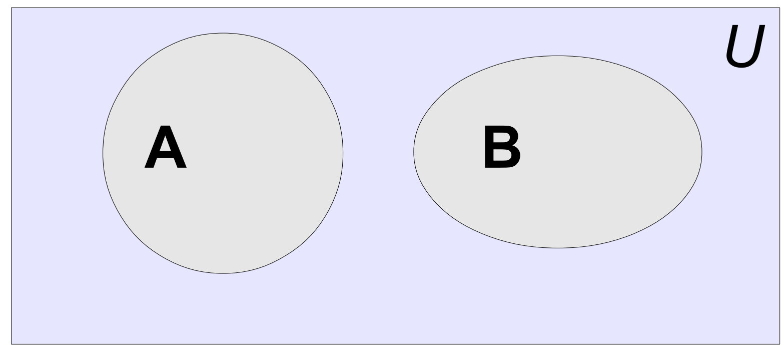
2.2 Set operations

Let **A**, **B** be any two sets.

The intersection of two sets **A** and **B** is the set that contains those elements that are in both **A** and **B**.

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





Shaded (hatched) areas represent the intersection of sets **A** and **B**.

Example 2:

Let **A**={1,2,3} and **B**={2,3,4,5}, then $\mathbf{A} \cap \mathbf{B} = \{2,3\}$

2.2 Set operations

Let **A**, **B** be any two sets.

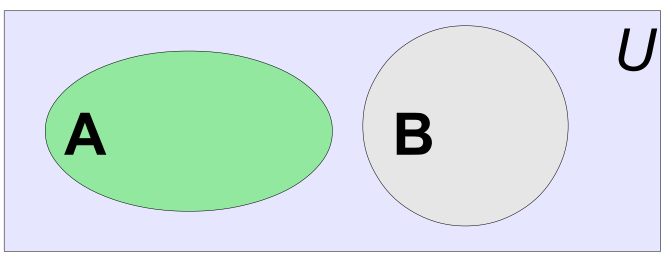
Two sets are disjoint if their intersection is an empty set, i.e. $\mathbf{A} \cap \mathbf{B} = \varnothing$.

Example:

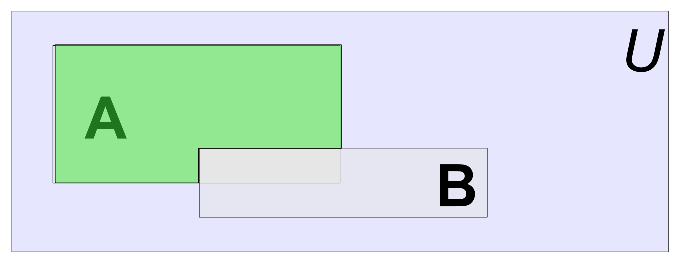
Let **A**={1,2,3,4,a,n,f} and **B**={5,6,7,b}, then $\mathbf{A} \cap \mathbf{B} = \varnothing$, therefore A and B are disjoint.

The difference of **A** and **B** is the set containing those elements that are in **A**, but not in **B**.

denotation: **A - B** $\quad\quad \mathbf{A} - \mathbf{B} = \{ x \mid x \in \mathbf{A} \wedge x \notin \mathbf{B} \}$



A – B is shaded



A – B is shaded

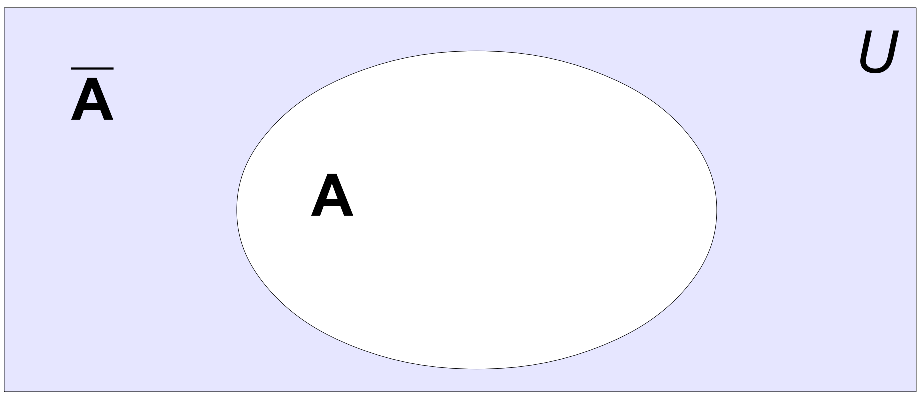
Example:

Let **A**={1,2,3,4,a,n,f} and **B**={1,2,3,a,b}, then **A – B** = {4,n,f}

2.2 Set operations

Let's assume that the universe set *U* has been specified. And let **A** be any set. Then, the compliment of the set **A** is the set of all elements of the universe set *U* that are not the elements of set A.

denotation: $\overline{\mathbf{A}}$ $\qquad$ $\overline{\mathbf{A}} = \{\, x \mid x \notin A \,\}$



Example 5:

Let *U* be the set of all integers, and let **A**={0,1,2,3,4,...}, then
$\overline{\mathbf{A}} = \{\ldots,-4,-3,-2,-1\}$