Union, Intersection and Difference

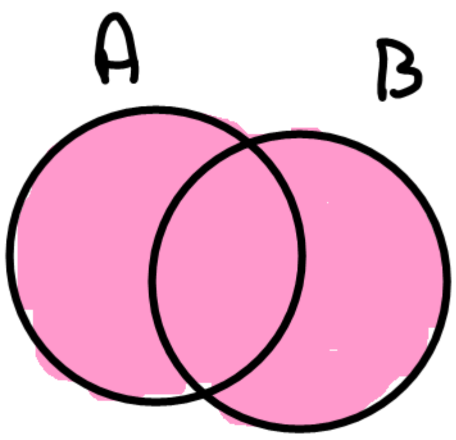
(more ways to create sets!)

Given sets A and B

$A \cup B$ = "A union B" = $\{x : x \in A \text{ or } x \in B\}$

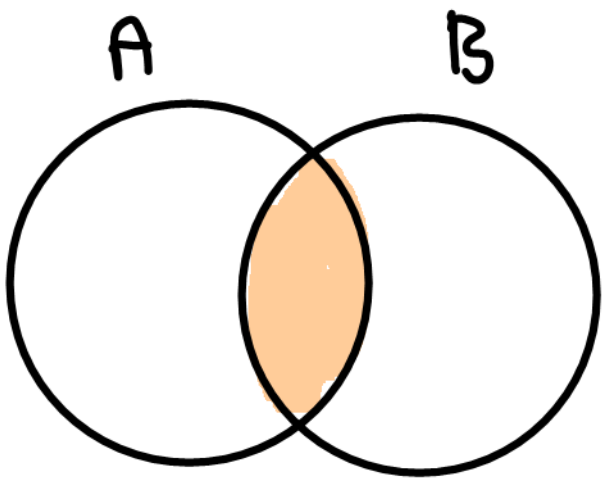
ex 1) $A = \{1, 2, ⌂\}$ $B = \{0, 1\}$

$A \cup B = \{1, 2, ⌂, 0\}$



$A \cap B$ = "A intersect B"

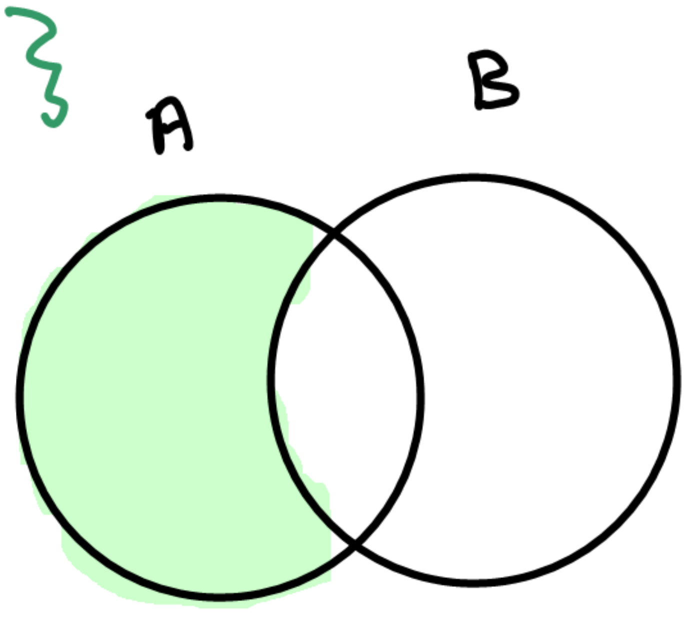
$= \{x : x \in A \text{ and } x \in B\}$



$A = \{1, 2, ⌂\}$, $B = \{0, 1\}$

$A \cap B = \{ 1 \}$

$A - B = \{x : x \in A \text{ and } x \notin B\}$



$A = \{1, 2, ⌂\}$, $B = \{0, 1\}$

$A - B = \{2, ⌂\}$

notes

1) we can extend these set operations to more than two sets

$$A \cup B \cup C = \{x : x \in A \text{ or } x \in B \text{ or } x \in C\}$$

$$= \{x : x \text{ is an element of at least one of the sets } A, B, \text{ or } C\}$$

section 1.8 discusses in more detail unioning & intersecting lots (even infinitely many) sets together

ex 1) $A_1, A_2, A_3, \ldots, A_n, \ldots$

$$\bigcup_{i=1}^{\infty} A_i = A_1 \cup A_2 \cup A_3 \cup \ldots$$

$$= \{x : x \in A_i \text{ for some } i\}$$

$$\bigcap_{i=1}^{\infty} A_i = A_1 \cap A_2 \cap A_3 \ldots$$

$$= \{x : x \in A_i \text{ for every } i\}$$

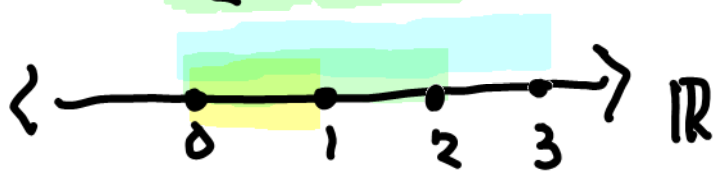
ex 2

$$\mathbb{N} \cap \mathbb{Z} \cap \mathbb{Q} = \mathbb{N}$$

$$\mathbb{N} \cup \mathbb{Z} \cup \mathbb{Q} = \mathbb{Q}$$

ex 3 $\quad S_i = [0, i] \qquad i \in \mathbb{N}$

$S_1 = [0,1] \quad S_2 = [0,2] \quad \ldots$



$$\bigcap_{i=1}^{\infty} S_i = [0,1]$$

$$\bigcup_{i=1}^{\infty} S_i = \{ x : 0 \leq x \}$$

$$= [0, \infty)$$

Def. we say that two sets are disjoint if their intersection is empty

"A and B are disjoint if $A \cap B = \emptyset$"