Welcome to APMA 1650

Announcements

- Read Syllabus.
- Join Campus
- this week: - Reading Quiz (Canvas)
  - Calculus prep assignment.
    - doesn't count toward final grade

Set theory

- Def: set is an unordered collection of distinct things.

- $A = \{H, T\}$, $C = \{1, 2, 3\}$,
- $B = \{\clubsuit, \diamondsuit\}$, $D = \{x^2 : x = 1, 2, 3\}$

  clubs diamonds $= \{1, 4, 9\}$,

Infinite sets

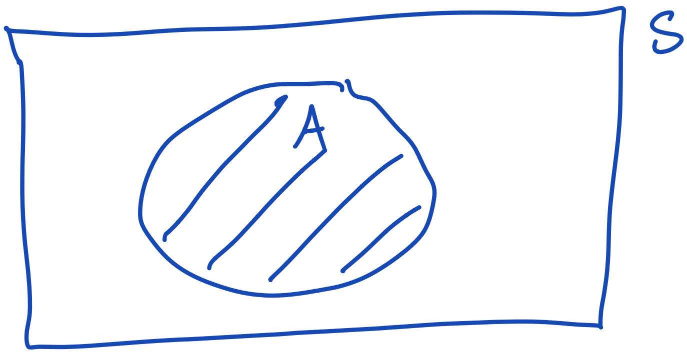
- Natural numbers, $\mathbb{N} = \{1, 2, 3, \ldots\}$,
- Integers $\mathbb{Z} = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$,

- Real numbers $\mathbb{R} = (-\infty, \infty)$

<u>Special sets</u> Universal set $= S = \Omega$
Empty set $= \phi = \{\}$

<u>Venn Diagrams</u>

- Help visualize sets

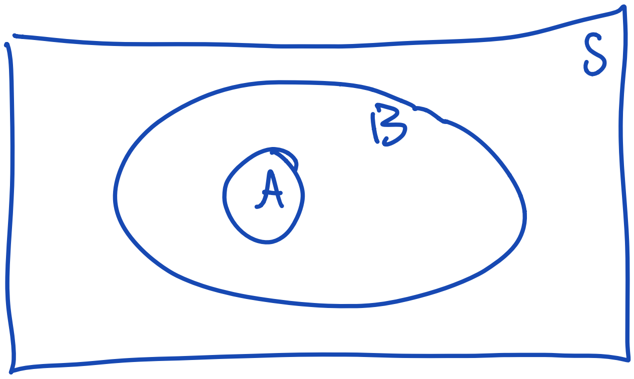


<u>Subset</u> : Given A, B. we say.
$A \subset B$ - "A is a subset of B"
if every element of A belongs to B.

<u>Or in first order logic</u> (if)

$$A \subset B \equiv (x \in A) \Rightarrow (x \in B)$$

defined by. is an element of

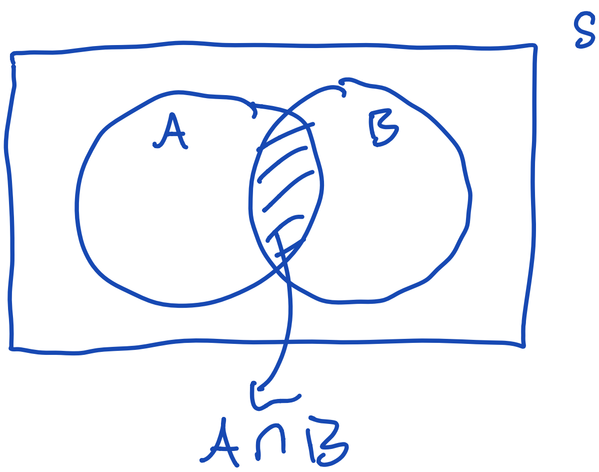


Examples

$\mathbb{N} \subset \mathbb{Z}$, $A = \{1, 2, 3\}$, $B = \{1, 2, 3, 4\}$, $A \subset B$.

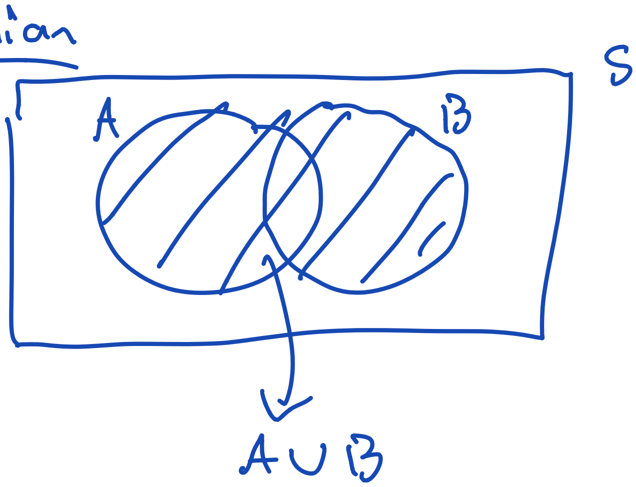
$\phi \subset A$, for any A

Intersection.



The intersection of A and B, denoted by $A \cap B$, is the set of all elements both in A and B.

Union



The union of A and B denoted by $A \cup B$, is the set of all elements that are either in A or B.

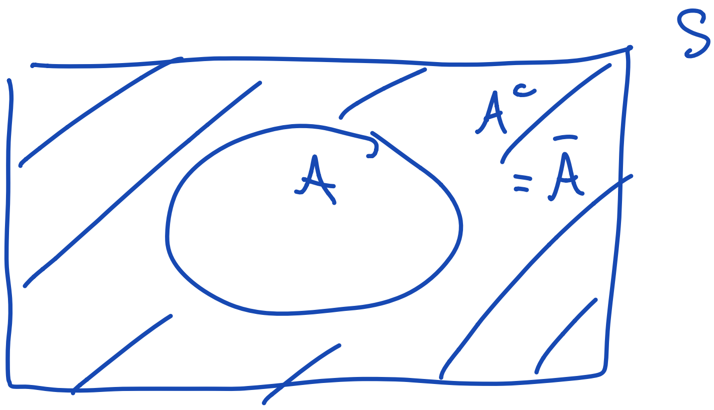
Ex $A = \{1, 2, 3, 4\}$, $B = \{4, 5\}$.

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

distinct elements.

Complement.

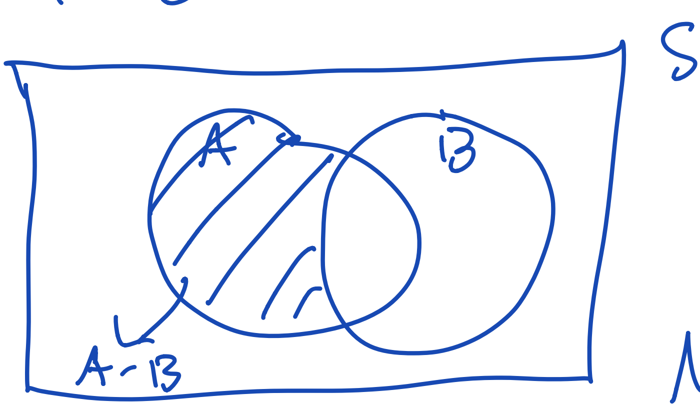
The complement of A, denoted by A^c or $\bar{A}$ the elements of S that don't belong to A.



Relative complement / Set subtraction.

$A - B$

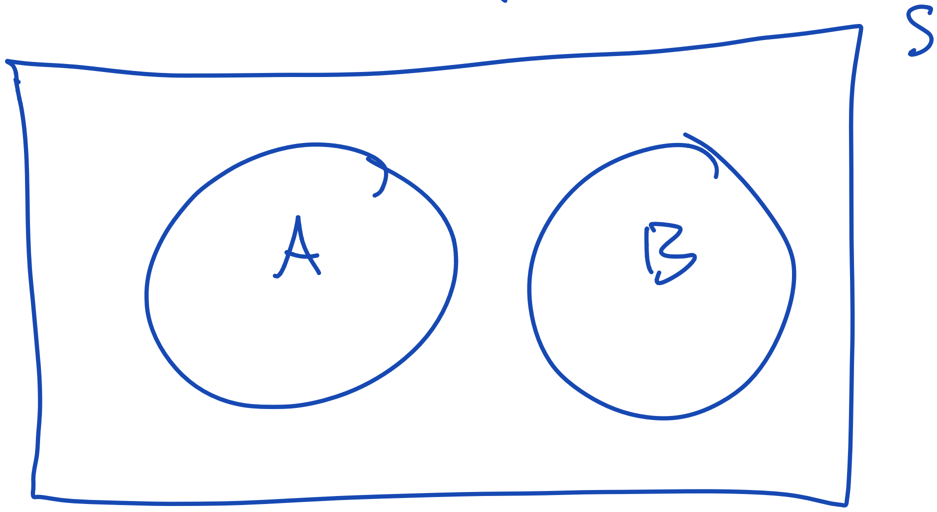
the set of all elements in A that are not in B



Note: $A - B = A \cap B^c$

Disjoint sets (mutually exclusive sets).

A, B are disjoint (mutually exclusive)
if $A \cap B = \phi$.

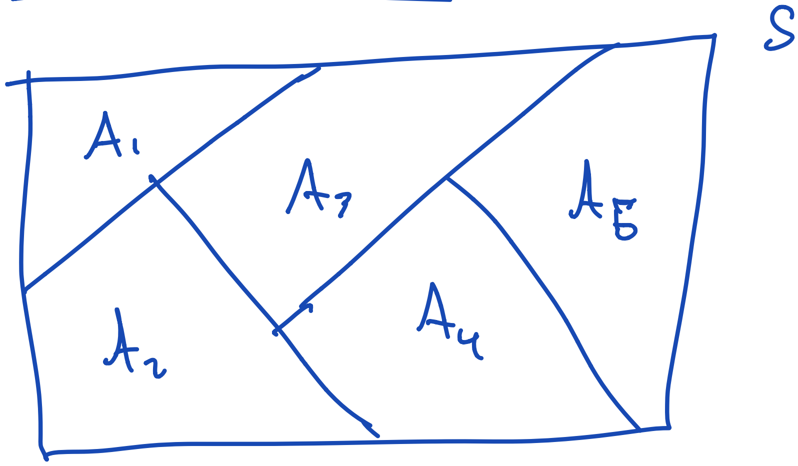


No overlap.

$A_1, A_2, \ldots, A_n$ are mutually exclusive
(or pairwise disjoint) if

$$A_i \cap A_j = \phi \quad \text{for } i \neq j.$$

Partition of S.



- Diving up S.

- A collection $A_1, A_2, \ldots, A_n$ is a partition of S if they are mutually exclusive.

and

$$S = A_1 \cup A_2 \cup \ldots \cup A_n = \bigcup_{i=1}^{n} A_i$$
