

Intersections and Unions

Math 1001

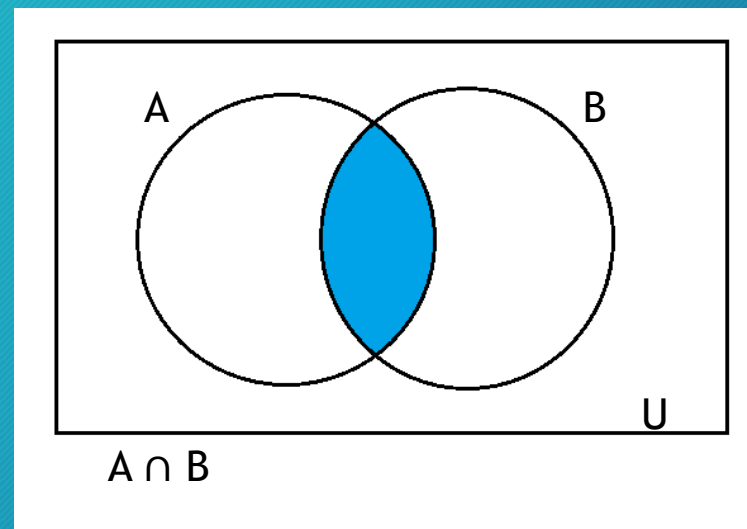
Quantitative Skills and Reasoning



COLUMBUS STATE
UNIVERSITY

The Intersection of Sets

- The intersection of sets A and B , denoted by $A \cap B$, is the set of elements common to both A and B .
- $A \cap B = \{x \mid x \in A \text{ and } x \in B\}$
- Venn Diagram of the intersection of A and B :



The Intersection of Sets

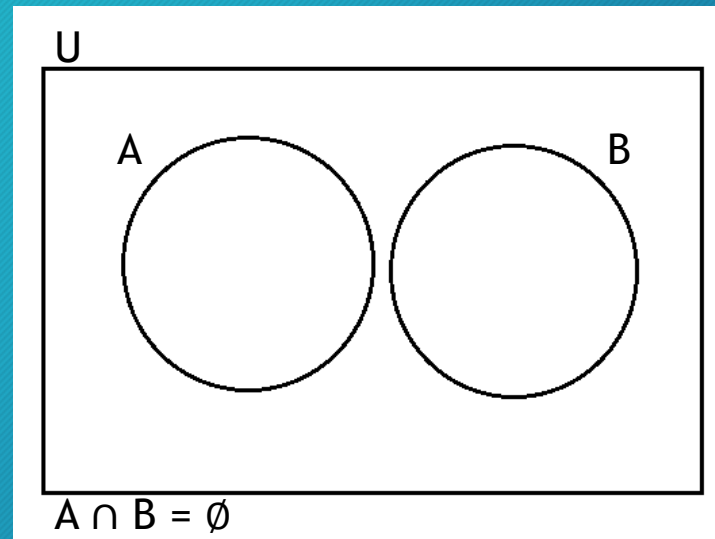
- Let $A = \{2, 5, 6, 8\}$, $B = \{3, 4, 5, 6, 7\}$, and $C = \{3, 7, 9\}$.

Find:

- $A \cap B$ The elements common to A and B are 5 and 6, so
 $A \cap B = \{5, 6\}$
 - $A \cap C$ A and C have no common elements, therefore
 $A \cap C = \{\} = \emptyset$
 - $B \cap C$ The elements common to B and C are 3 and 7, so
 $B \cap C = \{3, 7\}$
- Note that $A \cap B$ does not equal 5, 6, but $\{5, 6\}$. **The intersection of two sets is also a set.**

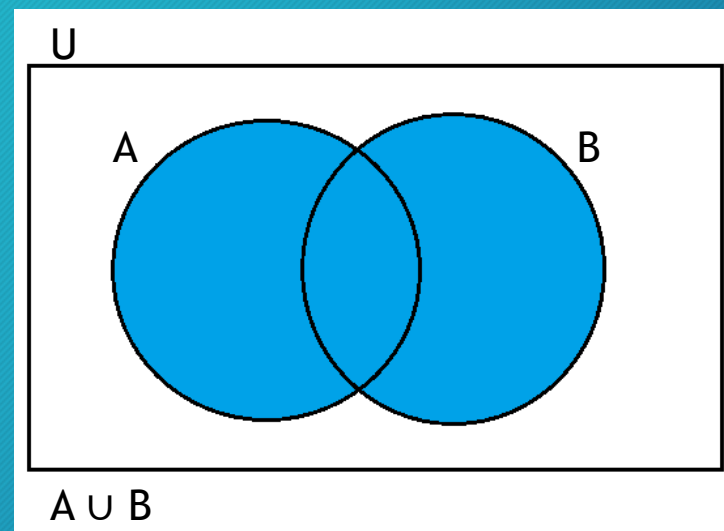
Disjoint Sets

- Two sets are **disjoint** if their intersection is the empty set. The sets A and C from the previous example are disjoint.
- The Venn diagram below illustrates two disjoint sets.



The Union of Sets

- The union of sets A and B , denoted by $A \cup B$, is the set that contains all the elements that belong to A or B , or to both.
- $A \cup B = \{x \mid x \in A \text{ or } x \in B\}$
- Venn Diagram of the union of A and B , shaded in blue:



The Union of Sets

- Let $A = \{2, 5, 6, 8\}$, $B = \{3, 4, 5, 6, 7\}$, and $C = \{3, 7, 9\}$.

Find:

- $A \cup B$ $A \cup B = \{2, 3, 4, 5, 6, 7, 8\}$

- $A \cup C$ $A \cup C = \{2, 3, 5, 6, 7, 8, 9\}$

- $B \cup C$ $B \cup C = \{3, 4, 5, 6, 7, 9\}$

Intersections and Unions

- In mathematical problems that involve sets, the word “and” is interpreted to mean *intersection*.
 - For instance, the phrase “College students *and* parents” indicates the population that are both college students and parents.
- Similarly, the word “or” is interpreted to mean *union*.
 - The phrase “College students *or* parents” indicates the population that are college students, those that are parents, and those that are both college students and parents.

Intersections and Unions

- Write a sentence that describes the set.

- $D \cup (B \cap C)$

The set of all elements that are in D , or are in B and C .

- $Q \cap R'$

The set of all elements that are in Q and are not in the set R .