

# MAT2440, Classwork18, Spring2025

ID: \_\_\_\_\_ Name: \_\_\_\_\_

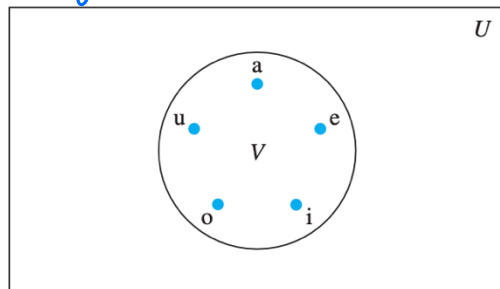
## 1. The Venn Diagram and the Universal Set $U$ :

Sets can be represented graphically using Venn Diagram:

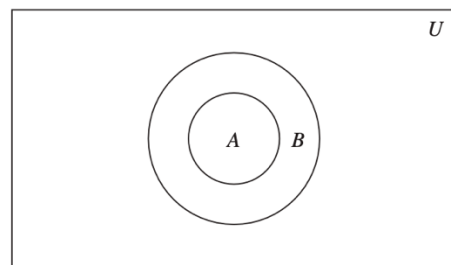
The universal set  $U$ , which contains all the elements objects under consideration, is represented by a rectangle.

Inside this rectangle, circles or other geometrical figures are used to represent sets.

*Example:* the Venn diagram for  $V$ : the set of vowels in English alphabet.



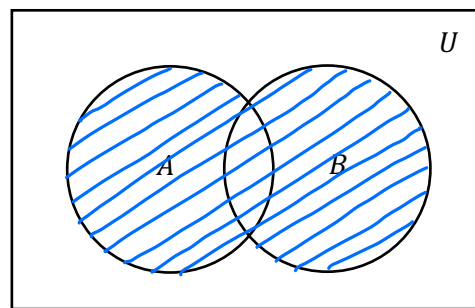
2. If  $A \subseteq B$ , then the corresponding Venn diagram can be the circle for  $A$  within the circle for  $B$ .



## 3. The definition of the **Union** of two sets:

Let  $A$  and  $B$  be sets. The union of  $A$  and  $B$ , denoted by  $A \cup B$ , is the set that contains those elements that are either in  $A$  or in  $B$ , or in both. Hence,

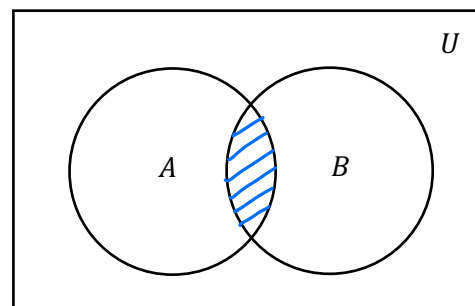
$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}. = B \cup A$$



## 4. The definition of the **Intersection** of two sets:

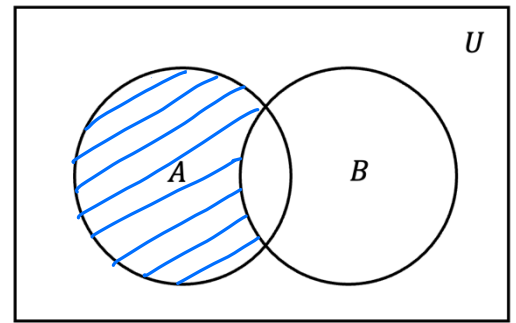
Let  $A$  and  $B$  be sets. The intersection of  $A$  and  $B$ , denoted by  $A \cap B$ , is the set that contains those elements in both  $A$  and  $B$ . Hence,

$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}. = B \cap A$$



5. The definition of the **Difference** of two sets:

Let  $A$  and  $B$  be sets. The difference of  $A$  and  $B$ , denoted by  $A-B$  or  $A \setminus B$ , is the set containing those elements that are in  $A$  but not in  $B$ . It is also called the ~~difference~~ complement of  $B$  with respect to  $A$ . Hence,

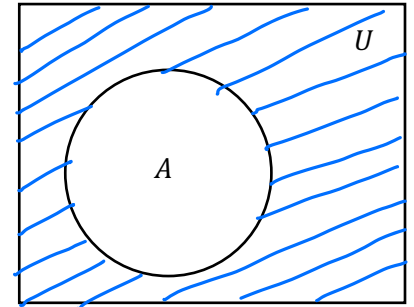


$$A - B = \{x \mid x \in A \wedge x \notin B\}.$$

$$B - A = \{x \mid x \in B \wedge x \notin A\}$$

6. The definition of the **Complement** of a set:

Let  $A$  be a set and  $U$  be the universal set. The complement of  $A$ , denoted by  $\bar{A}$ , is the complement of  $A$  with respect to  $U$ .

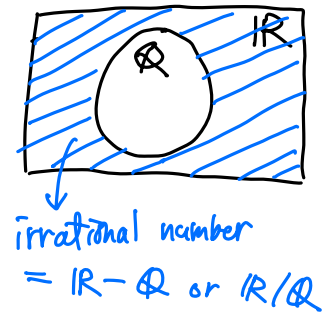
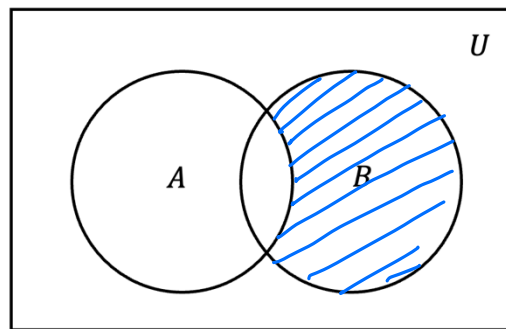


Therefore, the complement of  $A$  is  $U - A$ . Hence,

$$\bar{A} = U - A = \{x \mid x \in U \wedge x \notin A\}.$$

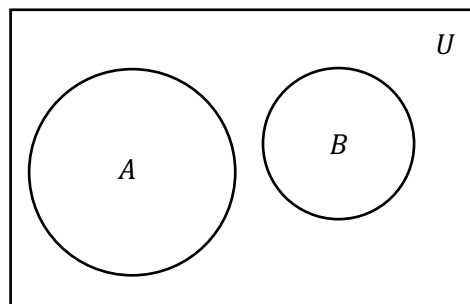
$$A - B = A \cap \bar{B}$$

7. Let  $A$  and  $B$  be sets. Shade the Venn diagram for  $B - A$ .



8. The definition of Disjoint:

Two sets are called disjoint if their intersection is the empty set.



$$A \cap B = \emptyset$$