The ***complement*** of set A (symbolized by *A'*), which can be read *A* prime or not *A*, is the set of all elements in the universal set are not in *A*.

- This idea can be expressed in set-builder notation as: $A' = \{x \mid x \in U \text{ and } x \notin A\}$

Example 3: Let U = {a, b, c, d, e} and A = {a, d}. Find *A'*.

The ***intersection*** of sets A and B (written $A \cap B$) is the set of elements common to both set A **and** set B.

- This definition can be expressed in set-builder notation as: $A \cap B = \{x \mid x \in A \text{ and } x \in B\}$

Example 4: Find each of the following intersections:

a. {1, 3, 5, 7, 10} ∩ {6, 7, 10, 11}

b. {1, 2, 3} ∩ {4, 5, 6, 7}

c. {1, 2, 3} ∩ ∅

The ***union*** of sets A and B (written $A \cup B$), is the set of elements that are members of set A **or** of set B or of both sets.

- This definition can be expressed in set-builder notation as: $A \cup B = \{x \mid x \in A \text{ or } x \in B\}$

The empty set in intersection and union

For any set A,

1. $A \cap \varnothing = \varnothing$
2. $A \cup \varnothing = A$

Example 5: Find each of the following unions:

a. {1, 3, 5, 7, 10} ∪ {6, 7, 10, 11}

b. {1, 2, 3} ∪ {4, 5, 6, 7}

c. (1, 2, 3) ∪ ∅