Example 12.
Let $A$ be the set of whole numbers and $B$ be the set of negative integers. Then $A \cup B$ is the union of $A$ and $B$ consists of all integers.

Remark: Both $A$ and $B$ are always in $A \cup B$, that is $A \subseteq (A \cup B)$ and $B \subseteq (A \cup B)$.

Intersection
The intersection of sets $A$ and $B$ is a set of elements which are common to $A$ and $B$, that is, those elements which belong to $A$ and which also belongs to $B$. We denote the intersection of $A$ and $B$ by $A \cap B$, which is read “$A$ intersection $B$”.
The intersection of $A$ and $B$ may also be defined concisely by $A \cap B = \{x \mid x \in A, x \in B\}$.

Here, the comma has the same meaning as “and”.

Remark:
Each of the sets $A$ and $B$ contains $A \cap B$ as a subset, i.e.
$(A \cap B) \subseteq A$ and $(A \cap B) \subseteq B$.

Example 13.
1. Let $P$ be the set of prime numbers and $Q$ be the set of even numbers. Then the intersection of $P$ and $Q$ is the set of 2, i.e. $P \cap Q = \{2\}$.
2. Let $A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}, C = \{1, 2, 3, 6\}$. Then $A \cap B \cap C = \{2\}$.

Difference
The difference of sets $A$ and $B$ is the set of elements which belong to $A$ but which do not belong to $B$. We denote the difference of $A$ and $B$ by $A - B$, which is read “$A$ difference $B$”, or simply “$A$ minus $B$”.
The intersection of $A$ and $B$ may also be defined concisely by $A - B = \{x \mid x \in A, x \notin B\}$.

Remark:
Set $A$ contains $A - B$ as a subset, i.e.
$(A - B) \subseteq A$.

Example 14.
1. Let $P$ be the set of integers and $Q$ be the set of negative integers. Then $P - Q$ consists of positive integers and zero.
2. Let $A = \{1, 2, 3, 4\}, B = \{1, 4\}$. Then $A - B = \{2, 3\}$ and $B - A = \{\}$.

Complement
The complement of a set $A$ is the set of elements which do not belong to $A$, that is, the difference of the universal set $U$ and $A$. We denote the complement of $A$ by $A'$. The complement of set $A$ may also be defined concisely by $A' = \{x \mid x \in U, x \notin A\}$
or, simply $A' = \{x \mid x \notin A\}$

Example 15.
Let $U$ be the universal set consisting of the name of days in a week, and let $P = \{\text{Monday, Tuesday, Thursday, Saturday}\}$. Then $P' = \{\text{Sunday, Wednesday, Friday}\}$. 