

- **Random Experiment** – a process leading to an uncertain outcome
- **Basic Outcome** – a possible outcome of a random experiment
- **Sample Space** – the collection of all possible outcomes of a random experiment
- **Event** – any subset of basic outcomes from the sample space
- **Intersection of Events** – If A and B are two events in a sample space S, then the intersection, $A \cap B$, is the set of all outcomes in S that belong to both A and B
- A and B are **Mutually Exclusive** Events if they have no basic outcomes in common
i.e., the set $A \cap B$ is empty
- **Union of Events** – If A and B are two events in a sample space S, then the union, $A \cup B$, is the set of all outcomes in S that belong to either
A or B
- Events E_1, E_2, \dots, E_k are **Collectively Exhaustive** events if $E_1 \cup E_2 \cup \dots \cup E_k = S$
i.e., the events completely cover the sample space
- The **Complement** of an event A is the set of all basic outcomes in the sample space that do not belong to A. The complement is denoted

e.g. Let the Sample Space be the collection of all possible outcomes of rolling one die:

$$S = [1, 2, 3, 4, 5, 6]$$

Let A be the event “Number rolled is even”

Let B be the event “Number rolled is at least 4”

Then

$$A = [2, 4, 6] \quad \text{and} \quad B = [4, 5, 6]$$

$$\text{so } S = [1, 2, 3, 4, 5, 6] \quad A = [2, 4, 6] \quad B = [4, 5, 6]$$

compliments of A and B will be written as

$$\bar{A} = [1, 3, 5] \quad \bar{B} = [1, 2, 3]$$

Similarly the intersections would be written as,

$$A \cap B = [4, 6] \quad \text{and} \quad \bar{A} \cap B = [5]$$

The unions would be written as,

$$A \cup B = [2, 4, 5, 6]$$

$$A \cup \bar{A} = [1, 2, 3, 4, 5, 6] = S$$

Mutually exclusive:

A and B are not mutually exclusive. The outcomes 4 and 6 are common to both.

Collectively exhaustive:

A and B are not collectively exhaustive. $A \cup B$ does not contain 1 or 3.