Section 6.1: Experiments, Events, and Sample Spaces

An **experiment** is an activity with observable results (outcomes).

A **sample point** is an outcome of an experiment.

A **sample space** is a set consisting of all possible sample points of an experiment.

A **Finite Sample Space** is a sample space with finitely many outcomes.

An **event** is a subset of a sample space of an experiment.

Given two events, E and F:
The **union** of E and F is denoted by $E \cup F$.

The **intersection** of E and F is denoted by $E \cap F$.

If $E \cap F = \emptyset$ then E and F are called **mutually exclusive**. (An event is mutually exclusive also means that two events that cannot happen at the same time, such as getting a head and a tail on the same toss of a coin).

The **complement** of an event is E^c and is the set of all outcomes in a sample space that is not in E.

Example 1: Consider the experiment of tossing a die.
a. Describe the sample space, S, of this experiment.

b. Let E be the event that an even number is tossed and F be the event that a prime number is tossed. Describe E and F in set notation then find the following:

$E \cup F =$

$E \cap F =$

$E^c =$

$(E \cup F^c)^c =$

Example 2: A sample of 3 apples taken from a fruit stand is examined to determine whether they are good or rotten. The sample space S = {GGG, GGR, GRG, GRR, RGG, RGR, RRG, RRR}. Let E be the event that at least 1 apple is good and let F be the event that exactly 2 apples are rotten. Find the events.

Example 3: An experiment consists of selecting a letter at random from the letters in the word COMMUNICATION and observing the outcomes.

a. What is an appropriate sample space for this experiment?

b. Describe the event "the letter selected is a vowel."

Example 4: Describe a sample space associated with the experiment of tossing 2 fair coins.

Describe the event of having the same outcome on each coin.