Chapter 7 - Probability
7.1 - Experiments, Sample Spaces, and Events

Experiment: an activity with observable results
Outcomes: the results of an experiment

Examples of Experiments:

Sample Point: an outcome of an experiment (an element of a set)
Sample Space (S): the set consisting of all possible outcomes of an experiment (a universal set)
Event: a subset of a sample space of an experiment

NOTE:
1. An event, say $A$, occurs whenever $A$ contains the observed outcome.
2. $\emptyset$ is the impossible event.
3. $S$ is the certain event.

Ex:
(a) Describe the sample space associated with tossing a coin and observing which side lands up.

What are the sample points?

What are the events of the experiment?

If two events cannot occur at the same time then they are said to be mutually exclusive.
(b) Describe the sample space associated with observing the composition of a three-child family in which the children were born at different times.

Describe the event, \( E \), that there are 2 girls and 1 boy in the family.

Describe the event, \( F \), that the middle child is a boy.

Are \( E \) and \( F \) mutually exclusive? Why or why not?

**A common sample space is that describing the outcomes of rolling two dice and observing the number falling uppermost on each die.**
All of the sample spaces described thus far have been examples of finite sample spaces. What happens when the sample space is not finite?

Ex:

(a) What is the sample space describing how many seconds you stand at an A&M football game?

(b) Describe the event, $E$, that you stand between 5000 and 7000 seconds, inclusively.

(c) Describe the event, $F$, that you stand for more than 60 seconds.