Section 7.1

Experiments, Outcomes, and Sample Spaces
An **experiment** is an occurrence with a result, or **outcome**, that is uncertain before the experiment takes place. The set of all possible outcomes is called the **sample space** for the experiment.

Events
Given a sample space S, an **event** E is a subset of S. The outcomes in E are called the **favorable** outcomes. We say that E **occurs** in a particular experiment if the outcome of that experiment is one of the elements of E - that is, if the outcome of the experiment is favorable.

Complement of an Event
The **complement** of an event E is the set of all outcomes not in E. Thus, the complement of E represents the event that E *does not occur*.

Union of Events
The **union** of the events E and F is the set of all outcomes in E or F (or both). Thus $E \cup F$ represents the event that E occurs *or F* occurs (or both).

Intersection of Events
The **intersection** of the events E and F is the set of all outcomes common to E and F. Thus, $E \cap F$ represents the event that both E *and F* occur.

Mutually Exclusive Events
If E and F are events, then E and F are said to be **disjoint** or **mutually exclusive** if $E \cap F$ is empty. (Hence, they have no outcomes in common.)

Problem 1. Describe the sample space S of the experiment and list the elements of the given event.

   a) Three coins are tossed; the result is at most one head.

   b) Two distinguishable dice are rolled; the numbers add to 7.

   c) Two indistinguishable dice are rolled; both numbers are prime.

d) A letter is chosen at random from the word *Mozart*; the letter is a vowel.

e) A sequence of two different letters is randomly chosen from the digits $0 - 4$; the first digit is larger than the second.

Problem 2. A packet of gummy candy contains four strawberry gums, four lime gums, two black current gums, and two orange gums. April May sticks her hand in and selects four at random. Complete the following sentences:

a) The sample space is the set of …

b) April is particularly fond of combinations of two strawberry and two black currant gums. The event that April will get the combination she desires is the set of …

Problem 3. Let S be the sample space of the set of outcomes that result from tossing three coins. Suppose the three coins tossed are a dime, a nickel, and a quarter, in that order. So, for example, if the dime comes up heads, the nickel tails, and the quarter heads, the outcome would be (H, T, H). Let E be the set of outcomes where there the quarter comes up heads, and let F be the set of outcomes where exactly two coins come up tails.

a) Express in words, and then list the elements of the set: $E \cap F$.

b) Express in words: $E' \cup F$

c) Express in symbols: Either the quarter comes up heads, or two coins don't come up tails.

Homework: Read section 7.1, do #6, 13, 16, 20, 28, 32, 46