

## Fall 2006

### Week-in-Review #7

*courtesy: Kendra Kilmer*

(covering Sections 7.1, 7.2, 7.3, and 7.4)

#### Section 7.1

- An **experiment** is an activity with an observable result.
  - The **outcome** or **sample point** is the observed result.
  - The **sample space**,  $S$ , is the set of all possible outcomes.
  - An **event** is a subset of the sample space.
  - All set operations (union, intersection, complement) are valid with events.
  - Two events are **mutually exclusive** if  $E \cap F = \emptyset$
  - The **impossible event** is the empty set. The **certain event** is the sample space.
1. Let  $S = \{5, 6, 7, 8, 9, 10\}$ ,  $E = \{5, 8, 10\}$ ,  $F = \{7, 8, 9, 10\}$ ,  $G = \{6, 7\}$ .
    - (a) Find the event  $(E \cup F \cup G)^c$
    - (b) Find the event  $E \cup (F \cap G)^c$
    - (c) Are the events  $E$  and  $G$  mutually exclusive?
    - (d) Are the events  $E$  and  $G$  complementary?
  2. An experiment consists of rolling a six-sided die and drawing one marble out of a bowl containing 3 red and 7 blue marbles.
    - (a) Find the sample space associated with the experiment.
    - (b) Find the event,  $E$ , that an even number is rolled.
    - (c) Find the event,  $F$ , that a green marble is selected.
  3. Chris purchased shares of IBM and Dell. Let  $E$  be the event that the IBM shares increase in value over the next year and let  $F$  be the event that the Dell shares increase in value over the next year. Use  $\cap$ ,  $\cup$ ,  $^c$  to describe the following events:
    - (a) The IBM shares do not increase in value.
    - (b) The IBM shares and the Dell shares do not increase in value.
    - (c) The shares of at least one of the two companies increase in value.
    - (d) The shares of only one of the two companies increase in value.

#### Sections 7.2 and 7.3

- Suppose we repeat an experiment  $n$  times and an event  $E$  occurs  $m$  of those times. Then  $\frac{m}{n}$  is called the **relative frequency** of the event  $E$ .
- The **probability of an event** is a number between 0 and 1 that represents the likelihood of the event occurring. The larger the probability, the more likely the event is to occur.
- An event which consists of exactly one outcome is called a **simple event** of the experiment.

- The table that lists the probability of each outcome in an experiment is known as the **probability distribution**.
- For a **uniform sample space** with  $n$  outcomes the probability of each outcome is  $\frac{1}{n}$ .
- To find the probability of an event  $E$ , add the probabilities of the simple events of  $E$ . Recall  $P(\emptyset) = 0$  and  $P(S) = 1$ .
- Rules of Probability
  - $P(E \cup F) = P(E) + P(F) - P(E \cap F)$
  - If  $E$  and  $F$  are mutually exclusive, then  $P(E \cap F) = 0$
  - $P(E) = 1 - P(E^c)$

4. An experiment consists of randomly selecting 2 chips from a bowl containing 3 chips numbered 1 through 3.
  - (a) Find the sample space
  - (b) Find the simple events associated with the experiment.
5. A marble is selected at random from a bowl containing 3 blue, 6 yellow, and 8 orange marbles and the color is observed. Find the probability distribution for this experiment.
6. Two fair six-sided dice are rolled. What is the probability that the sum is at least 10 or exactly 1 five is rolled?
7. A survey was conducted of 80 freshmen. It was found that 50 students play intramural soccer, 60 students play intramural basketball, and 10 students play neither of the two sports. If a student is selected at random, what is the probability that they play exactly one of the two sports?

#### Section 7.4

- If  $S$  is a uniform sample space then  $P(E) = \frac{n(E)}{n(S)}$ .
8. A bowl contains 30 red marbles, 15 green marbles, and 28 yellow marbles. An experiment consists of randomly selecting 5 marbles without replacement.
    - (a) What is the probability of selecting exactly 2 red marbles?
    - (b) What is the probability of selecting at least 1 green marble?
    - (c) What is the probability of selecting exactly 3 marbles of the same color?
  9. Three cards are randomly selected from a deck of 52. What is the probability of selecting a pair?
  10. An exam consists of 10 multiple choice questions each have 5 choices. If a student randomly guesses on each question, what is the probability of the student passing the exam (i.e. answering at least 6 questions correctly)?
  11. A shipping carton contains 20 radios. Before shipping, an inspector randomly selects 3 radios for testing. If any of the radios are defective, the carton is not shipped. If it is known that the carton contains 5 defective radios, what is the probability of shipping this carton?