

Math 166 - Spring 2008  
 Week-in-Review #5  
*courtesy: Kendra Kilmer*  
 (covering Sections 7.1-7.4)

### Section 7.1

- An **experiment** is an activity with an observable result.
  - The **outcome** is the observed result.
  - The **sample space**,  $S$ , is the set of all possible outcomes.
  - An **event** is a subset of the sample space. (Note: An event  $E$  is said to occur whenever  $E$  contains the observed outcome.)
  - 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.
- Let  $S = \{5, 6, 7, 8, 9, 10\}$ ,  $E = \{5, 8, 10\}$ ,  $F = \{7, 8, 9, 10\}$ ,  $G = \{6, 7\}$ .
    - Find the event  $(E \cup F \cup G)^c$
    - Find the event  $E \cup (F \cap G)^c$
    - Are the events  $E$  and  $G$  mutually exclusive?
    - Are the events  $E$  and  $G$  complementary?
  - An experiment consists of rolling a six-sided die and drawing one marble out of a bowl containing 3 red and 7 blue marbles.
    - Find the sample space associated with the experiment.
    - Find the event,  $E$ , that an even number is rolled.
    - Find the event,  $F$ , that a green marble is selected.
  - 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:
    - The IBM shares do not increase in value.
    - The IBM shares and the Dell shares do not increase in value.
    - The shares of at least one of the two companies increase in value.
    - 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  $P(E \cap F) = 0$

- $P(E) = 1 - P(E^c)$

- An experiment consists of randomly selecting 2 chips from a bowl containing 3 chips numbered 1 through 3 and observing the numbers in your hand.
  - Find the sample space
  - Find the simple events associated with the experiment.
- 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.
- Let  $S = \{a, b, c, d, e, f\}$  be the sample space associated with an experiment having the following probability distribution:

Outcome	$a$	$b$	$c$	$d$	$e$	$f$
Probability	0.1445	_____	0.2355	_____	0.0765	0.0265

- If  $P(B) = 0.3275$  where  $B = \{d, f\}$ , complete the above probability distribution.
  - What is the probability of  $(A \cap B^c)$  if  $A = \{a, b, f\}$ ?
- Two fair six-sided dice are rolled. What is the probability that the sum is at least 10 or exactly 1 five is rolled?
  - 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  $P(E) = \frac{n(E)}{n(S)}$ .
- A bowl contains 30 red marbles, 15 green marbles, and 28 yellow marbles. An experiment consists of randomly selecting 5 marbles without replacement.
    - What is the probability of selecting exactly 2 red marbles?
    - What is the probability of selecting at least 1 green marble?
    - What is the probability of selecting exactly 3 marbles of the same color?
    - What is the probability of selecting exactly 2 red marbles or exactly 2 green marbles?
  - Three cards are randomly selected from a deck of 52. What is the probability of selecting a pair?
  - An exam consists of 10 multiple choice questions. Each question has five choices and only one of the choices is correct. 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)?
  - 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?
  - Four people are selected at random. What is the probability that at least two of the people in this group were born on the same day of the week? (Assume that being born on each day of the week is equally likely.)