

AREC/ECON 339  
Homework Assignment #1  
Total Points: 35

1. (1 point) How many permutations of three items can be selected from a group of six? Use the letters A, B, C, D, E, and F to identify the items, and list each of the permutations of items B, D, and F.
  
2. (4 points) The National Sporting Goods Association conducted a survey of persons 7 years of age or older about participation in sport activities (Statistical Abstract of the United States: 2002). The total population in this age group was reported at 248.5 million, with 120.9 million males and 127.6 million females. The number of participants for the top five sports activities are:

Activity	Participants (millions)	
	Male	Female
Bicycle riding	22.2	21.0
Camping	25.6	24.3
Exercise walking	28.7	57.7
Exercising with equipment	20.4	24.4
Swimming	26.4	34.4

- a. For a randomly selected female, estimate the probability of participation in each of the sports activities.
- b. For a randomly selected male, estimate the probability of participation in each of the sports activities.
- c. For a randomly selected person, what is the probability the person participates in exercise walking?
- d. Suppose you just happen to see an exercise walker going by. What is the probability it is a woman? What is the probability it is a man?
  
3. (3 points) A 2001 preseason NCAA football poll asked respondents to answer the question, "Will the Big Ten or the Pac-10 have a team in this year's national championship game, the Rose Bowl"? Of the 13,429 respondents, 2961 said the Big Ten would, 4494 said the Pac-10 would, and 6823 said neither the Big Ten nor the Pac-10 would have a team in the Rose Bowl ([www.yahoo.com](http://www.yahoo.com), August 30, 2001).
  - a. What is the probability that a respondent said neither the Big Ten nor the Pac-10 will have a team in the Rose Bowl?
  - b. What is the probability that a respondent said either the Big Ten or the Pac-10 will have a team in the Rose Bowl?
  - c. Find the probability that a respondent said both the Big Ten and the Pac-10 would have a team in the Rose Bowl.

4. (4 points) Assume that we have two events, A and B, that are mutually exclusive. Assume further that we know  $P(A) = .30$  and  $P(B) = .40$
- What is  $P(A \cap B)$ ?
  - What is  $P(A | B)$ ?
  - A student in statistics argues that the concepts of mutually exclusive events and independent events are really the same, and that if events are mutually exclusive they must be independent. Do you agree with this statement? Use the probability information in this problem to justify your answer.
  - What general conclusion would you make about mutually exclusive and independent events given the results of this problem?
5. (3 points) A consulting firm submitted a bid for a large research project. The firm's management initially felt they had a 50-50 chance of getting the project. However, the agency to which the bid was submitted subsequently requested additional information on the bid. Past experience indicates that for 75% of the successful bids and 40% of the unsuccessful bids the agency requested additional information.
- What is the prior probability of the bid being successful (that is, prior to the request for additional information)?
  - What is the conditional probability of a request for additional information given that the bid will ultimately be successful?
  - Compute the posterior probability that the bid will be successful given a request for additional information.
6. (2 points) To perform a certain type of blood analysis, lab technicians must perform two procedures. The first procedure requires either 1 or 2 separate steps, and the second procedure requires either 1, 2, or 3 steps.
- List the experimental outcomes associated with performing the blood analysis.
  - If the random variable of interest is the total number of steps required to do the complete analysis (both procedures), show what value the random variable will assume for each of the experimental outcomes.

7. (5 points) A technician services mailing machines at companies in the Phoenix area. Depending on the type of malfunction, the service call can take 1, 2, 3, or 4 hours. The different types of malfunctions occur at about the same frequency.
- Develop a probability distribution for the duration of a service call.
  - Draw a graph of the probability distribution.
  - Show that your probability distribution satisfies the conditions required for a discrete probability function.
  - What is the probability a service call will take 3 hours?
  - A service call has just come in, but the type of malfunction is unknown. It is 3:00 p.m. and service technicians usually get off at 5:00 p.m. What is the probability the service technician will have to work overtime to fix the machine today?

8. (3 points) The following table provides a probability distribution for the random variable  $x$ .

<u><math>x</math></u>	<u><math>f(x)</math></u>
3	.25
6	.50
9	.25

- Compute  $E(x)$ , the expected value of  $x$ .
  - Compute  $\sigma^2$ , the variance of  $x$ .
  - Compute  $\sigma$ , the standard deviation of  $x$ .
9. (6 points) Consider a binomial experiment with  $n = 20$  and  $p = .70$
- Compute  $f(12)$ .
  - Compute  $f(16)$ .
  - Compute  $P(x \geq 16)$ .
  - Compute  $P(x \leq 15)$ .
  - Compute  $E(x)$ .
  - Compute  $\text{Var}(x)$  and  $\sigma$ .
10. (4 points) Airline passengers arrive randomly and independently at the passenger-screening facility at a major international airport. The mean arrival rate is 10 passengers per minute.
- Compute the probability of no arrivals in a 1-minute period.
  - Compute the probability that three or fewer passengers arrive in a 1-minute period.
  - Compute the probability of no arrivals in a 15-second period.
  - Compute the probability of at least one arrival in a 15-second period.