

Test 2

10/28/04

Instructions: Use your own paper. You must show all your work in order to receive full credit.

- (1) A bin contains 100 balls, of which 25 are red, 40 are white, and 35 are black. Two balls are selected from the bin without replacement.
 - (a) What is the probability that the first ball drawn is black and the second ball drawn is white?
 - (b) What is the probability that one will be red and one will be white?
 - (c) What is the probability that the second ball drawn is red given that the first ball drawn is white?

- (2) If the events A , B , and C are independent, show that
 - (a) the events A and $B \cap C$ are independent.
 - (b) the events A and $B \cup C$ are independent.

- (3) It is determined that a one-car accident in a Ford Explorer may be the result of faulty brakes, a flat tire, or a malfunction in the steering mechanism. The probability of faulty brakes is 0.4, the probability of a flat tire is 0.9, and the probability of a malfunction in the steering mechanism is 0.3. The probability that the accident would occur due to faulty brakes is 0.35, the probability that it would occur due to a flat tire is 0.45, and the probability that it would occur due to a fault in the steering mechanism is 0.65.
 - (a) Given that an accident has happened, what is the most likely cause of the accident?
 - (b) What is the least likely cause of the accident?

- (4) A box contains four balls numbered 1,2,3, and 4. If two balls are drawn at random and X is the sum of the two numbers drawn, find
 - (a) the probability distribution of X and draw its histogram.
 - (b) the distribution function of X and draw its graph.

- (5) The number of minutes that a flight from Phoenix to Tucson is early or late is a random variable whose density function is

$$f(x) = \begin{cases} \frac{36-x^2}{288} & \text{for } -6 < x < 6 \\ 0 & \text{otherwise} \end{cases}$$

(where negative values of the random variable represent the flight being early and positive values represent it being late). Find the probability that one of these flights will be

- (a) at least 2 minutes early.
 - (b) at least 1 minute late.
 - (c) anywhere from 1 to 3 minutes early.
 - (d) exactly 5 minutes late.
- (6) Find the expected value of the random variable in problem #4 and interpret its meaning in terms of a long-term average.
- (7) Find the expected value of the random variable in problem #5 and interpret its meaning in terms of a long-term average.