Chapter 7

1. A randomly chosen subject arrives for a study of exercise and fitness. Consider these statements.
   I. After 10 minutes on an exercise bicycle, you ask the subject to rate his or her effort on the Rate of Perceived Exertion (RPE) scale. RPE ranges in whole-number steps from 6 (no exertion at all) to 20 (maximum exertion).
   II. You measure VO2, the maximum volume of oxygen consumed per minute during exercise. VO2 is generally between 2.5 liters per minute and 6 liters per minute.
   III. You measure the maximum heart rate (beats per minute).

   The statements that describe a discrete random variable are
   (a) None of the statements describes a discrete random variable.
   (b) I.
   (c) II.
   (d) I, III.
   (e) I, II, III.

2. A local town has scheduled an outdoor festival. If it is warm that day, they expect to make a $6,000 profit. If it is cool that day, they expect to make a $1000 profit. If it is very cold that day, they expect to suffer a $4,000 loss. Based upon historical records, the weather office has estimated the chances of a warm day to be 0.63; the chances of a cool day to be 0.22. What is the producer's expected profit?
   (a) $4600
   (b) $3000
   (c) $1000
   (d) $3400
   (e) cannot be determined

3. The probability that 0, 1, 2, 3, or 4 people will seek treatment for the flu during any given hour at an emergency room is shown in the following distribution.

X	0	1	2	3	4
P(X)	0.12	0.25	0.33	0.24	0.06

   (a) What does the random variable count or measure?

   (b) Calculate the mean of X, and interpret this value in context.

   (c) What are the variance and standard deviation of X?

4. If a player rolls two dice and gets a sum of 2 or 12, he wins $20. If the person gets a sum of 7, he wins $5. The cost to play the game is $3. Find the expected winnings of the game after the $3 is paid to play.
5. Picard Partners is planning a major investment. The amount of profit X is uncertain but a probabilistic

estimate gives the following distribution (in millions of dollars):

Profit	1	1.5	2	4	10
Probability	0.1	0.2	0.4	0.2	0.1

(a) Find the mean profit μ_X and the standard deviation of the profit.

(b) Picard Partners owes its source of capital a fee of $200,000 plus 10% of the profits X. So the firm actually retains Y = 0.9X – 0.2 from the investment. Find the mean and standard deviation of Y.

6. A random variable Y has the following distribution:

Y	−1	0	1	2
P(Y)	3C	2C	0.4	0.1

The value of the constant C is:
(a) 0.10.
(b) 0.15.
(c) 0.20.
(d) 0.25.
(e) 0.75.

7. Cans of soft drinks cost $ 0.30 in a certain vending machine. What is the expected value and variance of daily revenue (Y) from the machine, if X, the number of cans sold per day has E(X) = 125, and Var(X) = 50 ?

(a) E(Y) = 37.5, Var(Y) = 50
(b) E(Y) = 37.5, Var(Y) = 4.5
(c) E(Y) = 37.5, Var(Y) = 15
(d) E(Y) = 37.5, Var(Y) = 30
(e) E(Y) = 125, Var(Y) = 4.5

Questions 8 and 9 use the following: Suppose X is a random variable with mean μ_X and standard deviation σ_X. Suppose Y is a random variable with mean μ_Y and standard deviation σ_Y.

8. The mean of X + Y is
(a) $\mu_X + \mu_Y$.
(b) $(\mu_X / \sigma_X) + (\mu_Y/\sigma_Y)$.
(c) $\mu_X + \mu_Y$, but only if X and Y are independent.
(d) $(\mu_X/\sigma_X) + (\mu_Y/\sigma_Y)$, but only if X and Y are independent.
(e) None of these.
9. The variance of X + Y is

(a) $\sigma_X + \sigma_Y$.
(b) $(\sigma_X)^2 + (\sigma_Y)^2$.
(c) $\sigma_X + \sigma_Y$, but only if X and Y are independent.
(d) $(\sigma_X)^2 + (\sigma_Y)^2$, but only if X and Y are independent.
(e) None of these.

10. The Census Bureau reports that 27% of California residents are foreign-born. Suppose that you choose three Californians independent of each other and at random. There are eight possible arrangements of foreign (F) and domestic (D) birth. For example, FFD means that the first two are foreign-born, and the third is not.

    (a) Let the random variable X be the number of foreign-born people in each group of three Californians. What are the possible values of X? Use the probabilities you found in (a) to construct a probability distribution table for X. (*there are 8 possible combination in all*)

    (b) What is the expected number of foreign-born residents in a randomly selected group of three?

    (c) What is the standard deviation of X?

Chapter 8

1. A dealer in the Sands Casino in Las Vegas selects 40 cards from a standard deck of 52 cards. Let Y be the number of red cards (hearts or diamonds) in the 40 cards selected. Which of the following best describes this setting?
   (a) Y has a binomial distribution with $n = 40$ observations and probability of success $p = 0.5$.
   (b) Y has a binomial distribution with $n = 40$ observations and probability of success $p = 0.5$, provided the deck is shuffled well.
   (c) Y has a binomial distribution with $n = 40$ observations and probability of success $p = 0.5$, provided after selecting a card it is replaced in the deck and the deck is shuffled well before the next card is selected.
   (d) Y has a normal distribution with mean $p = 0.5$.
   (e) Y has a geometric distribution with $n = 40$ observations and probability of success $p = 0.5$.

2. The probability that a three-year-old battery still works is 0.8. A cassette recorder requires four

working batteries to operate. The state of batteries can be regarded as independent, and four three-year-old batteries are selected for the cassette recorder. What is the probability that the cassette recorder operates?

(a) 0.9984
(b) 0.8000
(c) 0.5904
(d) 0.4096
(e) The answer cannot be computed from the information given.

3. Twenty percent of all trucks undergoing a certain inspection will fail the inspection. Assume that trucks are independently undergoing this inspection, one at a time. The expected number of trucks inspected before a truck fails inspection is

(a) 2.
(b) 4.
(c) 5.
(d) 20.
(e) The answer cannot be computed from the information given.

4. A random sample of 15 people is taken from a population in which 40% favor a particular political stand. What is the probability that exactly 6 individuals in the sample favor this political stand?

(a) 0.6098
(b) 0.5000
(c) 0.4000
(d) 0.2066
(e) 0.0041

5. A headache remedy is said to be 80% effective in curing headaches caused by simple nervous tension. An investigator tests this remedy on 100 randomly selected patients suffering from nervous tension.

(a) Define the random variable being measured. X =

(b) What kind of distribution does X have? (*normal, binomial, uniform, unknown*)

(c) Calculate the mean and standard deviation of X.

(d) Determine the probability that exactly 80 subjects experience headache relief with this remedy.

(e) What is the probability that between 75 and 90 (inclusive) of the patients will obtain relief? Justify your method of solution.