

Section 6.1

1. In government data, a *household* consists of all occupants of a dwelling unit, while a *family* consists of two or more persons who live together and are related by blood or marriage. So all families form households, but some households are not families. Here are the distributions of household size and family size in the United States:

Number of persons	1	2	3	4	5	6	7
Household Probability	0.25	0.32	0.17	0.15	0.07	0.03	0.01
Family Probability:	0	0.42	0.23	0.21	0.09	0.03	0.02

(a) Make a probability histogram for these two discrete distributions; using the same scales (make sure you show which is *household* and which is *family*).

(b) What is the probability that there are at least two people live in a household?

(c) What is the probability that there are less than 5 people in a family?

(d) Write in symbols “there are at most 4 people in a household. **Now** find its probability.

2. The mean height of players in the National Basketball Association is about 79 inches and the standard deviation is 3.5 inches. Assume the distribution of heights is approximately Normal. Let H = the height of a randomly-selected NBA player.

(a) Find and interpret $P(H > 74)$.

3. Joe the barber charges \$30 for a shave and haircut and \$18 for just a haircut. Based on experience, he determines that the probability that a randomly selected customer comes in for a shave and haircut is 0.85, the rest of his customers come in for just a haircut. Let J = what Joe charges a randomly-selected customer.

(a) Give the probability distribution for J .

(b) Find and interpret the mean of J , μ_J .

(c) Find and interpret the standard deviation of J , σ_J .

4. Tyler is running the balloon darts game at the school fair. He has blown up hundreds of balloons with notes about prize tickets inside them. Twelve percent of the notes say “You win 5 tickets,” twenty percent say “You win 3 tickets,” and the rest say “Sorry, try again!” After each play, he replaces the popped balloon with another one bearing the same note. Let T = the number of tickets won by a randomly selected player of this game.

Find and interpret the mean of T , μ_T .

Find and interpret the standard deviation of T , σ_T .

Section 6.2

5. For an upcoming concert, each customer may purchase up to 3 child tickets and 3 adult tickets. Let C be the number of child tickets purchased by a single customer. The probability distribution of the number of child tickets purchased by a single customer is given in the table below.

C	0	1	2	3
$P(C)$	0.3	0.4	0.2	0.1

a) Compute the mean and the standard deviation of C .

b) Suppose the mean and standard deviation for the number of adult tickets purchased by a single customer are 2 and 1.2, respectively. Assume that the number of child tickets and adult tickets purchased are independent random variables. Compute the mean and standard deviation of the total number of adult and child tickets purchased by a single customer.

c) Suppose each child ticket costs \$12 and each adult ticket costs \$30. What is the mean total amount spent per purchase?

Section 6.3

6. Determine whether the random variable described satisfies the conditions for a binomial setting, a geometric setting, or neither. Support your conclusion.

Suppose that one of every 100 people in a large community is infected with HIV. You want to identify an HIV-positive person to include in a study of an experimental new drug. How many individuals would you expect to have to interview in order to find the first person who is HIV-positive?

7. Determine whether the random variable described satisfies the conditions for a binomial setting, a geometric setting, or neither. Support your conclusion.

Deal seven cards from a standard deck of 52 cards. Let H = the number of hearts dealt.

8. Research suggests that about 24% of 12-year-olds in the United States can pick out the state of Colorado on a map.

(a) What is the probability that you must sample exactly 5 twelve-year-olds to find the first one who can pick out Colorado on a map? (Show your work)

(b) What is the probability that you must sample 5 or more twelve-year-olds to find the first one who can pick out Colorado on a map? (Show your work)

9. An online poll reported that 20% of respondents subscribe to the “five-second rule.” That is, they would eat a piece of food that fell onto the kitchen floor if it was picked up within five seconds. Let’s assume this figure is accurate for the entire U.S. population, and we select 15 people at random from this population. (Show your work for all questions)

(a) Determine the probability that exactly 3 of the 15 people subscribe to the “five-second rule.”

(b) Find the probability that less than 4 people out of 15 subscribe to the “five-second rule.”

(c) Let F = the number of people in our sample of 15 who subscribe to the “five-second rule.” Find the mean and standard deviation for F .

10. A manufacturer produces a large number of toasters. From past experience, the manufacturer knows that approximately 2% are defective. In a quality control procedure, we randomly select 20 toasters for testing.

(a) Determine the probability that exactly one of the toasters is defective.

(b) Find the probability that at most two of the toasters are defective.

(c) Let X = the number of defective toasters in the sample of 20. Find the mean and standard deviation of X .

11. A professional soccer player succeeds in scoring a goal on 84% of his penalty kicks. Assume that the success of each kick is independent.

(a) In a series of games, what is the probability that the first time he fails to score a goal is on his fifth penalty kick?

(b) What is the probability that he scores on 5 or fewer of his next 10 penalty kicks?

(c) Suppose that our soccer player is out of action with an injury for several weeks. When he returns, he only scores on 5 of his next 10 penalty kicks. Is this evidence that his success rate is now less than 84%? Explain.

12. The weights of adult men are approximately Normally distributed with a mean of 190 pounds and a standard deviation of 30 pounds.

(a) If you randomly select three men, what are the mean and standard deviation of the sum of their weights?

(b) An elevator in a small apartment building has a maximum weight capacity of 700 pounds. If three (randomly-selected) adult men get on the elevator, what is the probability that they exceed the maximum capacity?