SOLUTIONS TO STATISTICS 7 PRACTICE PROBLEMS FOR CHAPTER 8

Chapter 8: #3, 10, 14, 20, 31, 34, 35, 40, 48a, 55, 56, 66

8.3 **a.** Discrete
b. Continuous
c. Continuous
d. Discrete

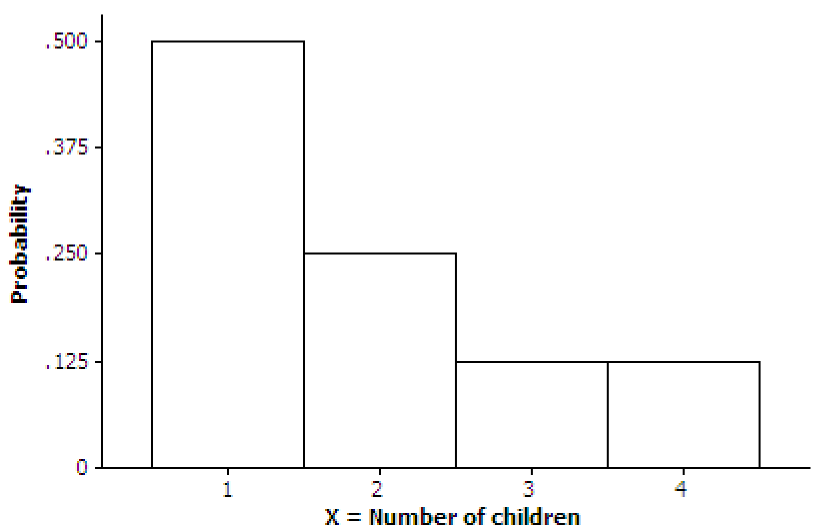
8.10 **a.** .80. Find this by adding the probabilities for $X = 0$, 1, and 2.
$P(X \leq 2) = P(X=0) + P(X=1) + P(X=2) = .14 + .27 + .39 = .80.$
b. $P(X = 1 \text{ or } X = 2) = .37 + .29 = .66.$
c. $P(X > 0) = 1 - P(X = 0) = 1 - .14 = .86$. This can also be found be adding probabilities for X = 1, 2, and 3.
d.

k	0	1	2	3	4
$P(X \leq k)$	.14	.51	.80	.95	1

8.14 The probability that X=1 is the probability that the first child is a girl, so $P(X=1)=.5$. For X=2, the sequence must be Boy, Girl so $P(X=2)= (.5)(.5)=.25$. For X=3, the sequence is Boy, Boy, Girl and this probability is (.5)(.5)(.5)=.125. The probability that X=4 can be found be subtracting the sum of the other probabilities from 1, and this gives $P(X=4)=.125$. A summary of the distribution is:
a. Simple events are {G, BG, BBG, BBBG, BBBB}
b. Probability of G **=** .5, probability of BG = .5×.5 = .25, probability of BBG = .5×.5×.5 = .125, probability of BBBG = 5×.5×.5 ×.5= .0625, and probability of BBBB = .0625
c. For X = number of children, the probability distribution is:

k	1	2	3	4
$P(X=k)$	.5	.25	.125	.12 5

The probability for X = 4 is the sum of the probabilities for BBBG and BBBB.
d.



8.20 E(X) = (\$100)(.01) + (−\$5) (.99) = −\$3.95.

8.31 **a.** μ = E(X) = $\sum xp(x)$ = (15×.8) + (20×.2) = 16 minutes.
b. No, the expected value will never be your actual commute time (which is always either 15 min. or 20 min.)

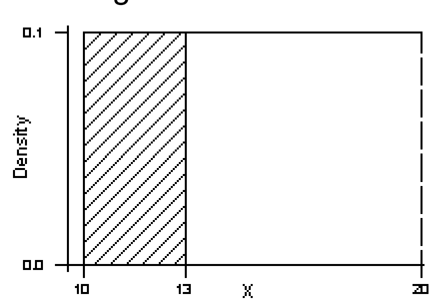
8.34 **a.** n = 30 and p = 1/6.
b. n = 10 and p = 1/100.
c. n = 20 and p = 3/10.

8.35 **a.** μ = E(X) = np = (30)(1/6) = 5.
b. μ = E(X) = np = (10)(1/100) = 0.10.
c. μ = E(X) = np = (20)(3/10) = 6.

8.40 **a.** The number of trials is specified in advance. There are two possible outcomes—either the subject guesses correctly or not. If the subject merely guesses, the probability of success remains the same from trial to trial. Whether a subject guesses correctly or not on a trial is independent from the results of previous trials.
b. Yes, X is a binomial random variable with n = 10 and p = .25.
c. The number correct is either 6 or more or 5 or less, so $P(X \geq 6) = 1 - P(X \leq 5) = 1 - .9803 = .0197$.
d. With p = .5, $P(X \geq 6) = 1 - P(X \leq 5) = 1 - .6230 = .3770$.
e. This answer will vary. A factor to consider is that among all people who merely guess, .0197(about 2%) will be able to get 6 or more correct. If many people are tested, a few who just guess will be able to get 6 or more right. Another factor to consider is the possible proportion in the population that actually has psychic ability. If few people have psychic ability, a result of 6 or more correct might reasonably be considered to have been the result of lucky guessing. If many people actually have psychic ability, it might be reasonable to think the result was obtained from one of those with psychic ability.

8.48 **a.** The rectangle has height =1/10=0.1 because the range of X is 20−10 = 10.

Figure for Exercise 8.48a



8.55 **a.** $z = \frac{71-75}{8} = -0.5$. So, $P(X \leq 71) = P(Z \leq -0.5) = .3085$.

b. $z = \frac{85-75}{8} = 1.25$. So, $P(X \geq 85) = P(Z \geq 1.25) = 1 - P(Z < 1.25) = 1 - .8984 = .1016$.

Equivalently, $P(Z > 1.25) = P(Z < -1.25) = .1016$.

c. For pulse =59, $z = \frac{59-75}{8} = -2$ while for pulse = 95, $z = \frac{95-75}{8} = 2.5$. Find the area under the standard normal curve between these two z-scores.

$P(-2 \leq Z \leq 2.5) = P(Z \leq 2.5) - P(Z \leq -2) = .9938 - .0228 = .9710$.

8.56 First, find the standardized score z^* for which $P(Z \leq z^*) = .10$. It's $z^* = -1.28$ so the answer is 1.28 standard deviations below the mean. The answer is $(-1.28 \times 8) + 75 = 64.76$, or about 65.

8.66 **a.** Answer = .0571. For a binomial random variable with $n = 50$ and $p = .512$,

$\mu = np = 50(.512) = 25.6$, and $\sigma = \sqrt{50(.512)(1-.512)} = 3.535$.

Thus, for $X = 20$, $z = \frac{20 - 25.6}{3.535} = -1.58$.

$P(X \leq 20) \approx P(Z \leq -1.58) = .0571$.

b. Answer = .0749. With the continuity correction, we find $P(X \leq 20.5)$.

For $X = 20.5$, $z = \frac{20.5 - 25.6}{3.535} = -1.44$. So, $P(X \leq 20.5) = P(Z \leq -1.44) = .0749$.