SOLUTIONS TO THE PROBLEMS FROM CHAPTER 8 (BINOMIAL AND NORMAL)

8.30 **a.** Yes. $n = 10$ and $p = .5$.
b. No. p is not the same from trial to trial.
c. No. The "trials" (cities) are not independent of each other as they will tend to have the same weather.
d. No. The "trials" (children) are not independent of each other because they are in the same class and flu is contagious.

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

8.33 The answers can be found using any of the methods discussed in Section 8.4, including the use of Minitab or Excel.
a. $P(X = 5) = .0264$.
b. $P(X = 2) = .3020$.
c. $P(X = 1) = .2684$.
d. $P(X = 9) = .000004$.

8.35 **a.** The probability of success does not remain the same from one trial (game) to the next. The probability of winning a game against a good team is not the same as the probability of winning a game against a poor team.
b. The number of trials is not specified in advance.
c. The probability of success does not remain the same from one trial to the next because whether or not the first card is an ace affects the probability that the next card is an ace, and so on. This also means that trials are not independent.

8.36 Use a binomial distribution with $n = 10$, $p = .5$. Let X = number of games won by human. The answers can be found using any of the methods discussed in Section 8.4, including the use of Minitab or Excel.
a. $P(X = 5) = .2461$.
b. $P(X = 3) = .1172$. If computer wins 7 games, then human wins 3 games.
c. $P(X \geq 7) = .1719$, calculated as $P(X = 7) + P(X = 8) + P(X = 9) + P(X = 10) =$
$.1172 + .0439 + .0098 + .0010 = .1719$. Equivalently, $P(X \geq 7) = 1 - P(X \leq 6) = 1 - .8281$.

8.37 **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 differ for each student. 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 tested 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. The discussion of the confusion of the inverse in Section 7.7 is relevant to this discussion.

8.38 The answers for this exercise can be found using any of the methods discussed in Section 8.4, including the use of Minitab or Excel.
a. $P(X = 4) = .2051$
b. $P(X \geq 4) = 1 - P(X \leq 3) = 1 - .6496 = .3504$
c. $P(X \leq 3) = .6496$
d. $P(X = 0) = .5905$

e. $P(X \geq 1) = 1 - P(X = 0) = 1 - .5905 = .4095$

8.39 **a.** Note that 1/4 of 1,000 is 250 so the desired probability is $P(X\geq250)$. $n = 1000$ and p = the proportion of adults in the United States living with a partner, but not married at the time of the sampling. The value of p is not known.

b. The desired probability is $P(X\geq110)$, $n = 500$, and $p = .20$.

c. Note that 70% of 20 is 14 so the desired probability is $P(X\geq14)$. $n = 20$, and $p = .50$.

8.43 **a.** $\frac{1.5-0}{1} = 1.5.$

b. $\frac{4-10}{6} = -1.$

c. $\frac{0-10}{5} = -2.$

d. $\frac{-25-(-10)}{15} = -1.$

8.44 Table A.1 can be used to find the answers.

a. .5000.
b. .3632.
c. .6368.
d. .9750.
e. .0099.
f. .9951.
g. .9505.

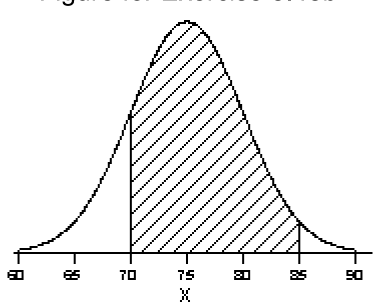
8.45 **a.** Answer = .8413. For 200 lbs, $z = \frac{200-180}{20} = 1$. $P(Z \leq 1) = .8413$.

b. Answer = .2266. For 165 lbs, $z = \frac{165-180}{20} = -0.75$. $P(Z \leq -0.75) = .2266$.

c. Answer = .7734. This is the "opposite" event to part (b), so calculation is $1-.2266 = .7734$.

8.48 **b.**

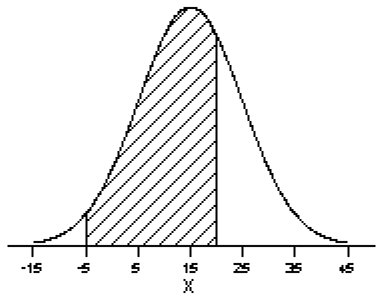
Figure for Exercise 8.48b



Note: The range of this normal curve was determined using the fact that about 99.7% of the area will be in the range mean ± 3 standard deviation.

c.

Figure for Exercise 8.48c



Note: The range of this normal curve was determined using the fact that about 99.7% of the area will be in the range mean ± 3 standard deviation.

8.49 **a.** $P(Z \leq -1.4) = .0808$
b. $P(Z \leq 1.4) = .9192$
c. $P(-1.4 \leq Z \leq 1.4) = P(Z \leq 1.4) - P(Z \leq -1.4) = .9192 - .0808 = .8384$
d. $P(Z \geq 1.4) = 1 - P(Z \leq 1.4) = 1 - .9192 = .0808$. Equivalently, $P(Z \geq 1.4) = P(Z \leq -1.4) = .0808$.

8.50 **a.** 0001.
b. $P(-3.72 \leq Z \leq 3.72) = P(Z \leq 3.72) - P(Z \leq -3.72) = .9999 - .0001 = .9998$.
c. About 0. This is far beyond the usual range of a standard normal curve.