Chapter 5 HW Solutions

5.47  a) Each toss is independent of every other, so the next toss has the same probability as any other of coming up Tails.

b) Again, each toss is independent of every other, and the probability of getting a Head is constant.

c) \( \hat{p} \) is the sample proportion, not the population parameter

d) Among other problems, the number of trials is not fixed in advanced. Moreover, it is not the case that each such “near-crash” event is a success or a failure.

5.48  a) No, \( X \) is a count

b) No, the variance for a binomial count is \( \sqrt{np(1-p)} \).

c) We need \( np \geq 10 \) and \( n(1-p) \geq 10 \). If \( p \) is very close to 0 or very close to 1, these conditions might not hold, even if \( n \) is very large.

d) The rule of thumb the book uses is that you need the population to be at least 20 times larger than the sample in order to use the binomial distribution to approximate the sampling distribution of \( \hat{p} \). Here, the population is only 10 times the sample size.

5.49  a) Yes, reasonable: the number of trial is fixed (200), each is a failure (not cranky) or success (cranky), each trial is independent of every other (my crank has nothing to do with yours), and the probability of success is the same for every trial (namely, the proportion of people in the general college student population who are cranky.)

b) Not reasonable: number of trials not fixed in advance.

c) Yes, reasonable: as with part a), all four conditions for a binomial are met.

d) Not reasonable: thinking of each card as a “trial”, with black as “success” and red as “failure”, almost makes this binomial. However, the probability of success changes from card to card. Thus the conditions for binomial are not met.

5.50  a) No: each outcome is not a “success” or “failure”

b) Reasonable–all four conditions for a binomial are met.

c) Reasonable–all four conditions are met.

d) A bit of a stretch. To model this as binomial, we need to suppose that the probability of skipping class on any given day is the same as any other. In reality, this is probably not the case.

5.52  a) The distribution of \( X \) is \( B(15, .75) \).

b) 

\[
P(X \geq 12) = P(X = 12) + P(X = 13) + P(X = 14) + P(X = 15) \]

\[
= .0134 + .0668 + .1559 + .2252 \\
= .4613
\]

5.54  a) \( \mu_X = np = 15 \cdot .60 = 9 \), while \( \mu_{\hat{p}} = p = .60 \).

b) \( \mu_X = 150 \cdot .60 = 90 \), while again \( \mu_{\hat{p}} = p = .60 \).

\( \mu_X = 1500 \cdot .60 = 900 \), while again \( \mu_{\hat{p}} = p = .60 \).