Exercise

Binomial Probability Distribution

1. Compute the following binomial probabilities using R directly from the formula for b(x; n, p):
   a. b(3; 8, .35)
   b. b(5; 8, .6)
   c. $P(3 \leq X \leq 5)$ when $n = 7$ and $p = 0.6$
   d. $P(1 \leq X)$ when $n = 9$ and $p = 0.1$

2. When circuit boards used in the manufacture of compact disc players are tested, the long-run percentage of defectives is 5%. Let $X =$ number of defective boards in a random sample of size $n = 25$, so $X \sim Bin(25,0.5)$.
   a. Determine $P(X \leq 2)$.
   b. Determine $P(X \geq 5)$.
   c. Determine $P(1 \leq X \leq 4)$.
   d. What is the probability that none of the 25 boards is defective?
   e. Calculate the expected value and standard deviation of X.

3. A company that produces fine crystal knows from experience that 10% of its goblets have cosmetic flaws and must be classified as "seconds."
   a. Among six randomly selected goblets, how likely is it that only one is a second?
   b. Among six randomly selected goblets, what is the probability that at least two are seconds?
   c. If goblets are examined one by one, what is the probability that at most five must be selected to find four that are not seconds?

4. A particular telephone number is used to receive both voice calls and fax messages. Suppose that 25% of the incoming calls involve fax messages, and consider a sample of 25 incoming calls. What is the probability that
   a. At most 6 of the calls involve a fax message?
   b. At least 6 of the calls involve a fax message?
   c. What is the expected number of calls among the 25 that involve a fax message?
   d. What is the probability that the number of calls among the 25 that involve a fax transmission exceeds the expected number by more than 2 standard deviations?

5. A very large batch of components has arrived at a distributor. The batch can be characterized as acceptable only if the proportion of defective components is at most 0.1. The distributor decides to randomly select 10 components and to accept the batch only if the number of defective components in the sample is at most 2. What is the probability that the batch will be accepted when the actual proportion of defectives is .01? .05? .10? .20? .25?