## Practice Questions - Sec. 8.7-8.8, 9.10:

1. In a test for extrasensory perception (ESP), the participant repeatedly guesses the suit of a card randomly sampled with replacement from an ordinary deck of cards. There are four suits (hearts, clubs, spades, diamonds), all equally likely. The participant guesses 100 times, and $X$ represents the number of correct guesses.

   (a) Explain why $X$ is a binomial random variable, and specify $n$ and $p$, assuming that the participant is randomly guessing.

   (b) Find the mean and standard deviation for $X$ if the participant is randomly guessing.

   (c) Suppose that the participant guesses correctly 33 times. Using the normal approximation to the binomial distribution, find the approximate probability of guessing this well or better by chance alone.

   (d) Suppose that the participant guesses correctly 50 times. Find the approximate probability of guessing this well or better by chance. Do you think the participant was guessing at random in this case?

2. Suppose the heights of adult males in a population have a normal distribution with $\mu = 70$ inches and standard deviation $\sigma = 2.8$ inches. Two unrelated men will be randomly sampled. Let $X$ represent the height of the first man, and $Y$ represent the height of the second.

   (a) Consider $D = X - Y$, the difference between the heights of the two men. What type of distribution will the variable $D$ have? What are the mean and standard deviation of the variable $D$?

(b) Determine the probability that the first man is more than 3 inches taller than the second man. That is, find $P(D > 3)$.

(c) Find the probability that one of the men is at least 3 inches taller than the other.

3. The tip percentage at a restaurant has a mean value of 18% and a standard deviation of 6%. What is the appoximate probability that the sample mean tip percentage for a random sample of 40 bills is between 16% and 19%?

4. Suppose the number of times that a randomly selected customer of a large bank uses the bank's ATM during a particular period is a random variable with mean 3.2 and standard deviation 2.4. Among 100 randomly selected customers, how likely is it that the sample mean number of times the bank's ATM is used exceeds 4?