MCTC Intro Stats **8.1 Sampling Distributions Classwork**

1. The Census Bureau has established that income of heads of household in a particular city is normal with a mean of $41,500 and a standard deviation of $18,700.

a) Suppose we take an SRS of 100 heads of household. What are the mean and standard deviation of the average income of our sample of 100 ($\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$)?

b) What is the probability that a randomly chosen sample of 100 heads of household will have a mean of $45,510 or more? Make and shade a sketch of the appropriate normal distribution.

2. A bottling company uses a filling machine to fill plastic bottles with cola. The bottles are supposed to contain 300 milliliters (ml). In fact, the contents vary according to a normal distribution with mean $\mu = 298$ ml and standard deviation $\sigma = 3$ ml. What is the probability that the mean contents of the bottles in a six-pack is less than 295 ml?

3. In which year did Columbus discover America?

a) A Gallup Poll found that 210 out of 501 American teens 13-17 yrs old knew this year. Is this a parameter or a statistic? Represent this value using the correct notation.

b) If 45% of all American teens 13-17 yrs old know this year, what is the probability of getting a result as small or less than the result in part a?

4. Take a sample of 30 runners in the Lincoln Marathon, where 44.56% of the runners were from Nebraska. What is the probability that more than 60% of the runners in your sample are from Nebraska?

5. A polling organization asks a SRS of 1500 freshman college students whether they applied to a college other than the one they are attending. In fact, 65% of all freshmen applied to another college. What is the probability that the random sample of 1500 students will give a result within 2 percentage points of the true proportion of freshmen who applied to another college? In other words, what is the probability of obtaining a sample proportion between 63% and 67%?

6. One way to check for sources of bias in a sample survey is to compare the sample with known facts about the population. About 11% of American adults are black. The proportion p of black adults in an SRS of 1500 adults should therefore be close to 0.11. If a national sample contains only 9.2% of black adults, should we suspect that the sample is underrepresenting black adults? Find the probability that a sample contains no more than 9.2%.

7. A *USA Today* poll asked a random sample of 1012 U.S. adults what they do with the milk in the bowl after they have eaten the cereal. Of the respondents, 67% said that they drink it. Suppose that 70% of U.S. adults actually drink the cereal milk. Find the probability of obtaining a sample of 1012 adults in which 67% or fewer say they drink the cereal milk.