Homework 5

STAT 201-502

Lecture 7 & 8 Material

1 Recall the problem on Exam I about the recall vote for then California governor Gray Davis. An exit poll was taken on 3160 voters. Suppose that 55% of *all* voters voted for the recall (which was actually the case).

a. Identify n and p for the binomial distribution that is the sampling distribution of the number in the sample who voted for the recall our of the sample of size 3160.

b. Find the mean and standard deviation of the binomial random variable in (a).

c. Find the mean and standard deviation of the sampling distribution of the proportion of the 3160 people in the sample who voted for the recall.

d. In (c), if the mean was 0.55 and the standard deviation was 0.0089, based on the approximate normality of the sampling distribution, give an interval of values within which the sample proportion will almost certainly fall.

2 According to a recent *Current Population Reports*, the population distribution of number of years of education for self-employed individuals in the United States has a mean of 13.6 and a standard deviation of 3.0.

a. Identify the random variable X whose distribution is described here.

b. Find the mean and standard deviation of the sampling distribution of $\bar{X}$ for a random sample of size 100. Interpret them.

c. Repeat (b) for $n = 400$. Describe the effect of increasing n.

3 A roulette wheel in Las Vegas has 38 slots. If you bet a dollar on a particular number, you'll win $35 if the ball ends up in that slot and $0 otherwise. Roulette wheels are calibrated so that each outcome is equally likely.

a. You decide to play once a minute for 12 hours a day for the next week, a total of 5040 times. Show that the sampling distribution of your sample mean winning has mean = 0.921 and standard deviation = 0.079.

b. Using the central limit theorem, find the probability that with this amount of roulette playing, your mean winnings is at least $1, so that you have not lost money after this week of playing. (*Hint:* Find the probability that a normal random variable with mean 0.921 and standard deviation 0.079 exceeds 1.0)

4 For the population of farm workers in New Zealand, suppose that weekly income has a distribution that is skewed to the right with a mean of μ=\$500 (N.Z.) and a standard deviation of σ=\$160. A researcher, unaware of these values, plans to randomly sample 100 farm workers and use the sample mean annual income $\bar{X}$ to estimate μ.

a. Show that the standard deviation of $\bar{X}$ equals 16.0.

b. Explain why it is almost certain that the sample mean will fall within \$48 of \$500.

c. The sampling distribution of $\bar{X}$ provides the probability that $\bar{X}$ falls within a certain distance of μ. Show how to calculate the probability that $\bar{X}$ falls within \$20 of $\mu$for all such workers. (*Hint*: Using the standard deviation, convert the distance 20 to a Z-score for the sampling distribution.)

5 Do textbook problems 5.28 (pg 369) and 5.34 (pg 370)