**AP Statistics Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Midterm Review 2016-2017**

1. What is central limits theorem? What is Large Counts? What do they do?

2. Sampling distributions of means protect against what? Why do we check CLT or need the population to be a certain way?

3. Virginia is particularly beautiful in early November, during “fall season.” At that time of year, a large proportion of trucks on Interstate 77 near Wytheville have out-of-state license plates. Suppose a Virginia State Trooper randomly selects 100 trucks driving past Exit 81 on I-77 and calculates the proportion of trucks with out-of-state plates. What does this sample describe in relation to a sampling distribution? (Be specific)

4. Consider a population of New York rats with a mean weight of 500 grams and a standard deviation of 40 grams. You collect a simple random sample of 23 rats. What is true of the following?

Does this one mean weight sample represent: the entire population? The Sampling Distribution of all means of weights of samples of size 23? Or just this mean from the sample of 23 rats?

5. According to the Canada Census bureau, 40% of people in Canada are under the age of 21. In a random sample of 400 residents in a small town in Vancouver, 45% of the sample was under 21. Identify the population, sample, statistic and parameter. Be sure to use correct notation.

6. Suppose we want to compare the proportion of New Mexico residents (population 2 million) and the proportion of Vermont residents (population 626 thousand) who have purchased items through Ebay. We would like to select samples from each state in such a way that the sampling distributions have roughly equal variances. If the population proportions are nearly the same in each state, then what was done for sample size?

7. There are 2327 students at Middle Creek high school. The school newspaper conducts a poll that asks 250 randomly selected students how many hours of sleep they got last night. They find that the mean hours of sleep is 5.2 hours and the standard deviation is 3.1 hours. Can we estimate the standard deviation of the sampling distribution of means by using196hours? Why?

8. A honey maker who wants to evaluate the health of his bee hives in a large shed randomly selects 15 locations in the shed and creates 1-meter rectangles with each location as a center (making sure none overlap). He then evaluates all the bee hives in the rectangle. What type of survey was taken and why? Could you make it into a different type of survey?

9. Describe a Randomized block design. Describe a matched pairs design. Describe a completely randomized design.

10. A doctor wants to test two different types of surgery (1 and 2) on the effect of a new incision to remove tumorous cells. The effect of the new incision will be measured in recovery time. Ten patients were randomly assigned to each of the two surgeries. The treatment and levels, experimental unit, and response variable are,

11. The five-number summary for the lengths of the first 300 words in J.K. Rowling’s *Harry Potter and the Philosopher’s Stone* is 3 5 9 13 15 . What percentile is each number represent? The 80th percentile would be between which value and why?

12. You want to take an SRS of 15 of the 200 students who live in a dormitory at Wake Tech. How would you label the students and carry out the SRS? Please carry out the first 5 selected using line 145 of the random digit table.

13. A company that sells mopeds maintains an email help line to assist customers who are having issues after they have been delivered. To determine how many “customer service representatives” are needed, they keep detailed records of the percentage of bicycle purchasers who email in for assistance. They have determined that 39% of all buyers email the help line.

1. Suppose we select a random sample of 20 buyers. What are the mean and standard deviation of the number of buyers among the 20 who email in for help?

(b) What is the probability that exactly 12 of these 20 buyers email in for assistance?

1. Now, we select a random sample of 150 buyers and calculate the proportion (NOT number) of buyers in the sample who email in for help. SOCS of the sampling distribution.

 (d) What is the probability that at least 45% of the buyers in this sample of 150 call in for assistance?

14. City folk in Raleigh have spent many years studying traffic patterns at the intersection of interstate 440 and interstate 40. They have determined that the number of semis merging onto 440 from 40 in any randomly-selected one-hour period has a mean of 104 semi-trucks and a standard deviation of 17 cars. The distribution is skewed to the left.

 (a) Suppose the city folk take a SRS of 70 one-hour periods. What does it mean to be an unbiased estimator and describe in the context of the information above what unbiased means?

(b) Describe the sampling distribution of means for samples of 70 one-hour intervals.

(c) What is the probability that 4 consecutive simple random samples of size 70 ALL have sample means below 91 semi-trucks?

(d) The city folk install new merge ramps for semis only. After the new ramps have been in place for two weeks, a single SRS of 70 one-hour periods produces a mean of 91 semi-trucks. Do you think this means that the merge ramps have reduced traffic through this area? Support your answer with appropriate probabilities.