**Quantitative Methods Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Midterm Exam Fall 2012, Aaron Hill**

*Instructions: Answer the following questions thoroughly, and remember to describe and interpret your results. Include relevant information about your assumptions, methods or tests used, calculations, and interpretations. Remember to show all of your work; attach extra pages as needed. All problems use fictitious data examples and do not represent actual research.*

**SECTION ONE***Computation and interpretation (three questions, 10 points each)*

1. The average height of men in the U.S. is 5’ 10” and the standard deviation is 3”. Height is normally distributed. What percentage of men in the U.S. is shorter than 5’ 10”? What is the probability that a man in the U.S. is taller than 6’ 1”?
2. A random sample survey of 1,349 citizens in the United States found that 1,214 of them like cheese. A survey sample meeting EPSEM standards of 1,198 citizens in the Ukraine found that 240 of them like cheese. At a 95% level of confidence, estimate the proportion of citizens in each country that likes cheese. Compare each of the estimates and comment on your findings.
3. Consider that following data:

|  |  |
| --- | --- |
| **Number of Injuries** | **Type of Shoe** |
| 4 | Running |
| 2 | Cross-Training |
| 0 | Cross-Training |
| 5 | Running |
| 0 | Cross-Training |

1. How many variables are in this dataset, and what is the level of measurement for each? (1 point)
2. What is the mean number of injuries for each shoe type? (2 points)
3. What is the standard deviation of “Number of Injuries?” (4 points)
4. What conclusions might you draw from this data? (3 points)

**SECTION TWO***Essay (two essays, 15 points each)*

1. Researchers rarely have data on the full population that they are studying. In order to learn about their population, they draw a sample from it in order to infer meaning about the entire population. However, this inference is only permissible and/or credible under certain circumstances. What are these circumstances? What are the mechanisms by which these inferences are possible? What statistical principles and theories underlie these mechanisms? *In detail*, list, describe, define, and explain the process by which statistical inference is made.
2. In chapter three of *Numbers Rule Your World,* Kaiser Fung recounts how South Florida experienced a “100-year storm” in 2004 and another “100-year storm” storm in 2005. How is it possible to have two “100-year storms” in consecutive years? Describe how this unusual occurrence led to the collapse of the natural-disaster insurance industry in Florida. Explain how a fundamental misunderstanding of *probability* can impair our understanding of risk.

**SECTION THREE***Short answer (40 points)*

Circle the *best* answer. (3 points each)

1. If you wanted to test the difference between a sample mean and a known population, you would use a \_\_\_\_\_\_\_ sample hypothesis test; if you wanted to test for difference in either direction, you would use a \_\_\_\_\_\_\_ tailed test.
   1. one, two
   2. two, one
   3. one, one
   4. two, two
2. If the median is less than the mean, you have \_\_\_\_\_\_\_ skew.
   1. positive
   2. negative
   3. insufficient
   4. too much
3. Which of the following is a measure of variance?
   1. standard deviation
   2. variance
   3. sum of squares
   4. all of the above
4. In inferential statistics, the theoretical link between the sample and the population is the:
   1. hypothesis
   2. standard error
   3. sampling distribution
   4. normal curve
5. Alpha is the:
   1. margin of error
   2. probability of error
   3. confidence level
   4. confidence interval
6. A range of values between a lower and upper bound, within which there is a specified probability that the true population value lies within it.
   1. range
   2. confidence level
   3. confidence interval
   4. standard deviation
7. A descriptive statistic that expresses the magnitude of change in a variable from one point in time to a later point in time.
   1. proportion
   2. percentage
   3. ratio
   4. percentage change
8. If I were going to survey the population of zookeepers in the United States by travelling to each sample member and conducting face-to-face interviews, the most feasible sampling technique for me to use is:
   1. simple random sample
   2. systematic sample
   3. cluster sample
   4. stratified sample
9. The primary goal for any sample that will be used to infer meaning to a larger population is:
   1. That N be equal to 100.
   2. That it be representative of the population.
   3. That it be administered in SPSS.
   4. That it be shaped like the normal curve.
10. Of the following choices, which is the best graph for visualizing an interval-ratio level variable?
    1. pie chart
    2. bar chart
    3. histogram
    4. frequency table

Rank the 5-steps of the Hypothesis Test process in the correct order from the first step to the fifth step.*(1 pt each)*

\_\_\_\_\_ Compute the test statistic.

\_\_\_\_\_ Select alpha and establish the critical region.

\_\_\_\_\_ State the dependent and independent variables and their levels of measurement; state your assumptions; decide which hypothesis test to use and confirm that your data meet the test requirements.

\_\_\_\_\_ Interpret the results.

\_\_\_\_\_ State the null and research hypotheses.

List the level of measurement of each of the following variables. *(1 pt each)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Width of hair follicle

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Flavor of smoothie

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Miles per hour

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Type of athlete (amateur, semi-professional, or professional)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Number of hours spent watching Here Comes Honey Boo Boo