***Choose the one best answer for each question below by writing the corresponding letter in the blank to the left of the question. Each question is worth 1 point.***

**1.** What symbol is used to represent the sample standard deviation?

\_\_\_\_\_ **A.**  **B.**  **C.**  **D.** x **E.** s

**2.** What symbol is used to represent the population mean?

\_\_\_\_\_ **A.**  **B.**  **C.** n **D.** x **E.** s

**3.** What symbol is used to represent the sample size?

\_\_\_\_\_ **A.**  **B.**  **C.** n **D.** x **E.** s

**4.** What symbol is used to represent the probability of making a type II error?

\_\_\_\_\_ **A.**  **B.**  **C.**  **D.** x **E.** s

**5.** What type of error is rejecting a false H0?

\_\_\_\_\_ **A.** Egregious **B.** Power **C.** Type I **D.** Type II **E.** Not an error

***Answer questions 6-9 in the provided space.***

1. **[5 pts]** What is the definition of a p-value and how is it used to make a decision about H0?
2. **[5 pts]** Describe choices that you, as a researcher, can make to decrease the probability of making a Type II error. Which is the best choice to make (statistically) **and why**?
3. **[5 pts]** Describe choices that you, as a researcher, can make to reduce the margin-of-error. Which is the best choice to make (statistically) **and why**?
4. **[5 pts]** Completely describe three major differences between a population distribution and a sampling distribution.
5. **[6 pts]** Suppose the following sets of sample means were taken from a population with a mean of 80.

Set #1. – 71.5, 73.4, 85.7, 89.4

Set #2. – 68.8, 69.3, 70.9, 71.0

Set #3. – 78, 79, 81, 82

Set #4. – 51, 64, 80, 95

Identify which set from above **best** represents each situation below.

* 1. Accurate and most precise. \_\_\_\_\_\_\_\_\_
  2. Inaccurate and most precise. \_\_\_\_\_\_\_\_\_
  3. Inaccurate and least precise. \_\_\_\_\_\_\_\_\_

***Answer questions 11-15 (next page) on separate sheets of paper. Make sure to write legibly, clearly label each of your answers, show your work (including R code) where appropriate, put your name on each extra sheet, and staple your answers sheets to the back of this quiz.***

***Note that you may find the following R hints useful.***

**library(NCStats)**

**distrib(val,mean=meanval,sd=sdval,lower.tail=FALSE,type=”q”)**

where

* **val** is a value of the quantitative variable (x) or an area (i.e., percentage, but entered as a proportion)
* **meanval** is the population mean ()
* **sdval** is the standard deviation () or error (SE; i.e., use **sdval/sqrt(nval)**, where **nval** is sample size.]
* **lower.tail=FALSE** is included for “right-of” calculations
* **type=”q”** is included for reverse calculations

1. **[20 pts]** Alanson (1992; J. Ag. Econ.) examined the size of farms in England in 1989. He found that the distribution of farms sizes was strongly right-skewed with a mean of 65.1 hectares (ha) and a standard deviation of 107.7 ha. Use this information to answer the questions below to three decimal places. *If you choose not to answer the question, carefully and specifically explain why.*
2. What is the probability that the mean size of 35 farms is greater than 90 ha?
3. What is the probability that a farm is less than 100 ha?
4. What is the probability that the mean size of 60 farms is between 50 and 90 ha?
5. What is the probability that the mean size of 20 farms is less than 30 ha?
6. What is the IQR for the mean size of 50 farms?
7. For the following questions, use HA: ≠500, =50, n=25, =0.01, and the population is symmetric.
   1. **[5 pts]** Compute the p-value ifx=515 and **[2 pts]** make a decision about HO from your p-value.
   2. **[5 pts]** Compute an appropriate confidence region ifx=515 and **[2 pts]** *with a complete sentence* interpret your confidence region.
8. **[4 pts]** Compute  assuming HA: <500, =50, n=25, =0.01, and the actual  is 465.
9. Managers of a wastewater treatment plant would need to take corrective actions to reduce the biological oxygen demand (BOD; lbs/day) in the wastewater if the mean BOD is significantly greater than 2200 lbs/day at a 10% rejection level. Previous studies showed that the standard deviation of BOD was 1200 lbs/day. The manager’s monitored the BOD in the plant’s wastewater each of the 118 months between January 1991 and October 2000 and found a mean BOD of 2504 lbs/day. Do these results suggest that the managers need to take corrective actions? Use this information to answer the questions below. *Show your work and R code where appropriate.*
   1. **[6 pts]** What are the null and alternative hypotheses? [*Make sure to define the parameter.*]
   2. **[5 pts]** Compute the p-value and **[3 pts]** *with a complete sentence* make a decision (what can be concluded about mean monthly BOD and why).
   3. **[5 pts]** Construct an appropriate confidence region and **[3 pts]** *with a complete sentence* interpret your confidence region.
   4. **[4 pts]** *With complete sentences*, define a Type I and a Type II error for this study.
10. **[5 pts]** Students in the Mammology class want to capture enough field mice from the Maxwell Property such that they can estimate the mean weight of adult field mice to within 3 grams with 90% confidence. In a preliminary study they found that the standard deviation of the weights of adult field mice was 20 grams. Use this information to determine how many adult field mice should be sampled to meet the student’s constraints.