***Answer each question below on separate sheets of paper. Make sure to clearly label each of your answers (e.g., #1), put your name on each extra sheet used, and staple these questions to the top of your answer sheets when completed to hand in. Also make sure to read the directions carefully.***

**library(NCStats)**

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

**distrib(val,distrib=”X”,df=dfval,lower.tail=FALSE,type=”q”)**

where

* **val** is a value of the quant. variable or area (i.e., percentage as a proportion)
* **meanval** is population mean () for a normal distribution
* **sdval** is standard deviation () or error (SE) for a normal distribution
* **distrib=”X”** has “X” replaced with “t” for a t- and “chisq” for a 2-distribution
* **dfval** is the degrees-of-freedom for t- and 2-distributions
* **lower.tail=FALSE** is included for “right-of” calculations
* **type=”q”** is included for reverse calculations

# **11 Steps for any Significance Test**

1. **[2]** state the rejection criterion (),

2. **[4]** state the null and alternative hypotheses to be tested – define the parameter,

3. **[2]** determine which hypothesis test to use – thoroughly explain why,

4. **[2]** collect the data (address type of study and randomization),

5. **[4]** check all necessary assumptions – explain how you tested the validity,

6. **[2]** calculate the appropriate statistic(s),

7. **[4]** calculate the appropriate test statistic,

8. **[4]** calculate the p‑value,

9. **[2]** state rejection decision,

10. **[4]\*** summarize your findings in terms of the problem, and

11. **[4]\* If reject H0,** compute a **100(1-)%** *confidence region* for the parameter.

where

**Please answer 2 of the 3 questions below using the 11 Step of any Hypothesis Test. Show ALL of your work, including any R code that you use.**

1. The numbers of different types of animals in several zoos are in the table below. The researchers that collected these data wanted to determine if the distribution of animal types differed among the zoos examined. Test the researcher’s question at the 5% level.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Type of Animal | | |
|  |  | Amphs/Reps | Birds | Mammals |
| Zoo | Chicago | 27 | 66 | 70 |
| San Antonio | 168 | 218 | 69 |
| San Diego | 27 | 40 | 109 |

1. The Northwestern University Placement center conducted a random survey on the starting salaries of college graduates. The Dean of the College of Liberal Arts told prospective students that graduates from the College would earn a starting salary of more than $32000 on average. The results in the table below are from the Placement Center’s results for graduates of the College of Liberal Arts for the year just prior to the Dean’s statements. Use these results to determine, at the 10% level, the correctness of the Dean’s statement.

n mean sd min Q1 median Q3 max

42 32511 1713 29300 31300 32500 33800 36800

1. A study examined the effectiveness of foil-lined milk cartons to reduce “leakage” of dioxins from the carton to the milk (dioxins were found in milk cartons due to the bleaching process). The dioxin content (parts per thousand, ppt) in milk from 50 unlined and 50 lined cartons of milk were recorded and the summary results are shown in the table below. Also note that the Levene’s Test p-value was 0.0368. Determine, at the 1% level, if lining the cartons with foil significantly reduced the mean amount of dioxin in the milk.

Type n mean sd min Q1 median Q3 max

lined 50 0.005860 0.002339 0.0001 0.004175 0.00605 0.0071 0.0112

unlined 50 0.029024 0.009040 0.0117 0.022575 0.02810 0.0342 0.0577