**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 question #1 below and ***only ONE*** of the other two questions below using the 11 Step of any Hypothesis Test. ***Show ALL*** of your work, including any R code that you use. Maintain ***at least three digits*** on intermediate calculations.

1. Rudin *et al.* (2017; Behavioral Ecology) were interested in behaviors related to the physical dominance of crickets. Specifically, they hypothesized that “subordinate” crickets would “explore their surroundings” significantly less than “dominant” crickets. To explain this, they staged a number of “fights” among crickets to identify “dominant” and “subordinate” crickets. Following this, dominant and subordinate crickets were randomly placed in separate “arenas” where their activities were monitored, including recording the “relative amount of exploring” (no units, but larger numbers mean more exploration). Use the results in Table 1 to test, at the 1% level, the researcher’s hypothesis about exploration. Note that the Levene’s Test p-value is 0.566.

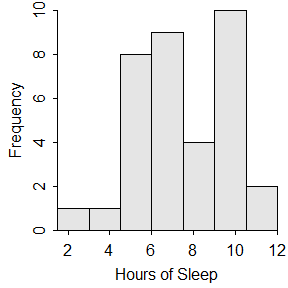
Table 1. Summary statistics for the “amount of exploration” by dominant and subordinate crickets.

Group n mean sd min Q1 median Q3 max

Dominant 41 2.394 1.060 0.223 1.766 2.328 3.195 4.576

Subordinate 39 1.304 0.928 -0.294 0.675 1.171 1.976 3.644

1. Zhao *et al.* (2016; Journal of Biosciences and Medicines) examined safety issues of Chinese and European employees working on ocean-going vessels. In one aspect of their study, they hypothesized that the mean hours of daily sleep by European workers would be less than 8 hours. Figure 1 and Table 2 show their results for the number of daily hours of sleep for a random sample of *just* European seafarers. Use these results to test their hypothesis at the 5% level.

Table 2. Summary statistics for hours of sleep by European seafarers.

n 35 min 2.927

mean 7.443 Q1 5.967

sd 2.173 median 7.162

Q3 9.376

Max 11.992

🡸 Figure 1. Histogram for hours of sleep by European seafarers.

1. Researchers observed random groups of dolphins off the coast of Iceland near Keflavik in 1998. The researchers recorded the time of the day and the main activity of the group (travelling quickly, feeding, or socializing). The number of dolphin groups observed by each time of day and activity is in Table 3. Use this information to determine, at the 5% level if the proportion of groups exhibiting each activity differs by time of day.

Table 3. Frequency of dolphin groups by time of day and main activity.

|  |  | **Traveling** | **Feeding** | **Socializing** |
| --- | --- | --- | --- | --- |
| **Time of Day** | Before noon | 12 | 32 | 43 |
| After noon | 27 | 56 | 17 |