Supplemental Examples (Module 10)

Online S520

1 Trosset exercise 9.6.9

A confidence level of $1 - \alpha = 0.99$ corresponds to a critical value of $q =$ `qnorm(.995)`. Setting the width of the interval equal to L gives $n = (2q\sigma/L)^2$. Plugging in $q, \sigma = 6, L = 2$ gives $n = 238.8563$. Round up to 239.

2 Trosset chapter 10 Problem Set C, questions 1, 3.

1. (a) The experimental unit is a pair of seedlings of the same age. The measurements taken on each unit are the final height of the cross-fertilized plant and the final height of the self-fertilized plant, both in inches.

   (b) Let X_i be the difference in heights (cross minus self) for each pair $1, \ldots, n$.

   (c)

$$\begin{aligned} H_0 &: \theta \leq 0 \\ H_1 &: \theta > 0 \end{aligned}$$

   (It'll be the other way around if we did the subtraction in part (b) the other way around.)

3.
```
seedlings = read.table("http://mypage.iu.edu/~mtrosset/StatInfeR/Data/seedlings.dat")
diffs = seedlings[,1] - seedlings[,2]
n = length(diffs)
t.stat = mean(diffs) / (sd(diffs) / sqrt(n))
P.value = 1 - pt(t.stat, df = n-1)
lower = mean(diffs) - qt(0.95, df=n-1) * sd(diffs) / sqrt(n)
upper = mean(diffs) + qt(0.95, df=n-1) * sd(diffs) / sqrt(n)
```

   The P-value (significance probability) is 0.025, less than the specified level of α, so we would reject the null hypothesis. A 90% confidence interval for the mean difference in heights is 0.5 to 4.7 inches.