

Excel Assignment 6 Solutions: Inference about CO₂ and Pine Cones

1. Sorted data is on the *Inference* page of *PineCones_Sols.xlsx*. Statistics are calculated there; the results are:

	Treatment	Control
Mean	16.57	15.43
Standard deviation	5.23	5.17
Number in sample	297	347

2. The standard error of the difference in means is

$$SE = \sqrt{\frac{5.23^2}{297} + \frac{5.17^2}{342}} = 0.4115.$$

3. The variable is quantitative and we have two samples.

Step 1:

Null hypothesis is that the treatment and control populations have the same mean:

$$H_0: \mu_1 = \mu_2.$$

Alternate hypothesis is that the treatment population has a higher mean than the control population: $H_a: \mu_1 > \mu_2$.

Step 2:

The t -value has $df = 296$ and

$$t = \frac{16.57 - 15.43}{0.4115} = 2.77.$$

Step 3:

The p -value is $p = 2(0.0029) = 0.596 = 0.596\%$.

Step 4:

Since the p -value is small, we reject the null hypothesis and conclude that the experiment provided evidence that CO₂ increases tree growth.

4. From the table $t = 1.984$. The 95% confidence interval is

$$\begin{aligned} & (\bar{x}_1 - \bar{x}_2 - t \cdot SE_{\bar{x}_1 - \bar{x}_2}, \bar{x}_1 - \bar{x}_2 + t \cdot SE_{\bar{x}_1 - \bar{x}_2}) \\ & = (16.57 - 15.43 - 1.984 \cdot 0.4115, 16.57 - 15.43 + 1.984 \cdot 0.4115) \\ & = (1.06, 1.22). \end{aligned}$$

5. Since 0 is not in the confidence interval, the interval provides evidence that the two population means do not have a difference of 0. In other words there is a statistically significant difference between them.