

5.2

2

a

$$\begin{aligned}
 X &= 73, n = 100 \\
 \alpha &= .05 \Rightarrow Z_{\alpha/2} = 1.96 \\
 \tilde{n} &= 100 + 4 = 104 \\
 \tilde{p} &= \frac{X + 2}{\tilde{n}} = \frac{75}{104} \\
 \tilde{p} \pm Z_{\alpha/2} \sqrt{\frac{\tilde{p}(1 - \tilde{p})}{\tilde{n}}} &= .7212 \pm .08619
 \end{aligned}$$

b

$$\begin{aligned}
 X &= 73, n = 100 \\
 \alpha &= .01 \Rightarrow Z_{\alpha/2} = 2.58 \\
 \tilde{n} &= 100 + 4 = 104 \\
 \tilde{p} &= \frac{X + 2}{\tilde{n}} = \frac{75}{104} \\
 \tilde{p} \pm Z_{\alpha/2} \sqrt{\frac{\tilde{p}(1 - \tilde{p})}{\tilde{n}}} &= .7212 \pm .113
 \end{aligned}$$

c

$$\begin{aligned}
 .05 &= Z_{\alpha/2} \sqrt{\frac{\tilde{p}(1 - \tilde{p})}{\tilde{n}}} \\
 \Rightarrow \\
 n &= \frac{\tilde{p}(1 - \tilde{p})}{\frac{.05^2}{Z_{\alpha/2}^2}} - 4 \\
 &= \frac{.7212(1 - .7212)}{\frac{.05^2}{1.96^2}} - 4 \\
 &= 304.97 \\
 &= 305
 \end{aligned}$$

d

$$\begin{aligned}
 .05 &= Z_{\alpha/2} \sqrt{\frac{\tilde{p}(1-\tilde{p})}{\tilde{n}}} \\
 &\Rightarrow \\
 n &= \frac{\tilde{p}(1-\tilde{p})}{\frac{.05^2}{Z_{\alpha/2}^2}} - 4 \\
 &= \frac{.7212(1-.7212)}{\frac{.05^2}{2.58^2}} - 4 \\
 &= 535.36 \\
 &= 536
 \end{aligned}$$

5.3

7

For the data given it is appropriate to use the Student's t statistic to construct a 95% confidence interval for the mean shade of Mezza Perl tile. This is because as Seen in figure 1 There are no outliers. The construct the confidence interval can be seen below.

$$\begin{aligned}
 \bar{X} &= 205.127, s = 1.72, n = 9 \\
 \bar{X} \pm t_{n-1, \alpha/2} \frac{s}{\sqrt{n}} &= 205.127 \pm 2.306 * \frac{1.72}{\sqrt{9}} \\
 &= 205.127 \pm 1.322
 \end{aligned}$$

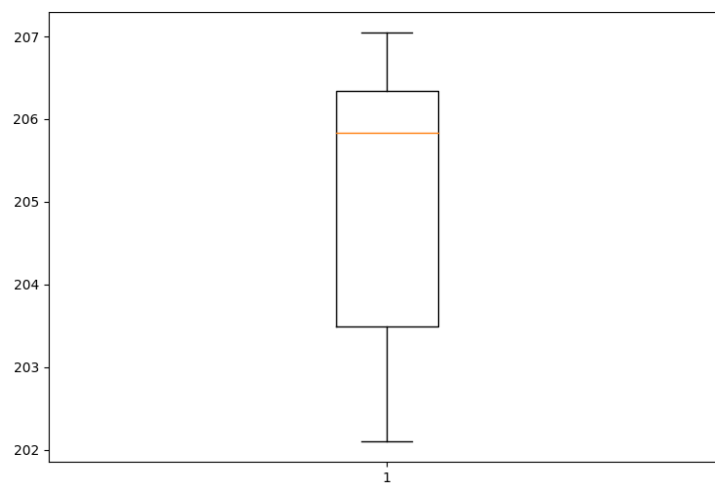


Figure 1: Box plot of the given data, Showing no outliers

8

a $\bar{X} \pm t_{n-1, \alpha/2} \frac{s}{\sqrt{n}} = 196.64 \pm 2.571 * \frac{.68}{\sqrt{6}} = 196.64 \pm 0.713 \text{ K}$

b $\bar{X} \pm t_{n-1, \alpha/2} \frac{s}{\sqrt{n}} = 196.64 \pm 3.365 * \frac{.68}{\sqrt{6}} = 196.64 \pm 0.934 \text{ K}$

c The confidence intervals above would not be valid as what can be seen in figure 2 there is an outlier.

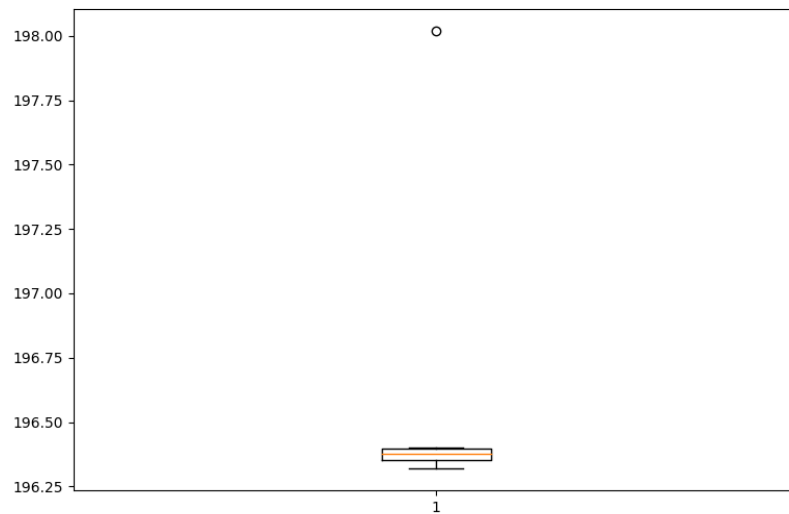


Figure 2: Box plot of the given data, Showing one outlier

problem from the lecture

For the data given in the lecture there is a CI available the box plot can be seen in figure 3. The calculation for the 95

$$\begin{aligned}\bar{X} &= 196.768, s = 0.3651 \\ \bar{X} \pm t_{n-1, \alpha/2} \frac{s}{\sqrt{n}} &= 196.76 \pm 2.571 * \frac{.3651}{\sqrt{6}} \\ &= 196.76 \pm 0.3832\end{aligned}$$

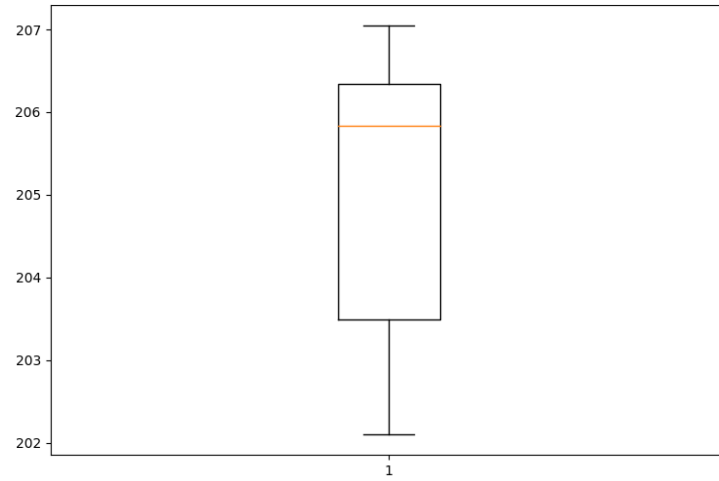


Figure 3: Box plot of the given data, Showing no outliers