

Math 343 - Lab 4

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Question 1

a)

To compute $\hat{\tau}_2$, note that:

$$\begin{aligned}\hat{\tau}_2 &= \bar{y}_{2\cdot} - \bar{y}_{\cdot\cdot} \\ &= 68.5 - 71.75 \\ &= -3.25\end{aligned}$$

To compute \hat{y}_{23} , note that:

$$\begin{aligned}\hat{y}_{23} &= \bar{y}_{2\cdot} + \bar{y}_{\cdot 3} - \bar{y}_{\cdot\cdot} \\ &= 68.5 + 72.4 - 71.75 \\ &= 69.15\end{aligned}$$

b)

H_0 : $\tau_1 = \tau_2 = \tau_3 = \tau_4 = 0$.

H_a : Not all $\tau_i = 0$.

An F test on the equality in mean effect (tensile strength of cloth after treatment) of the four chemical agents gives an F-value = 2.38, and a p-value of 0.121, from which we can conclude the following. There is not enough statistical evidence to support the hypothesis that not all $\tau_i = 0$.

c)

H_0 : The data are drawn from a normal distribution.

H_a : The data are not drawn from a normal distribution.

The residual plot does not appear to be linear. It seems to have an "S" shaped curve. The p-value = 0.049 > $\alpha = 0.01$, therefore, the evidence from the data is consistent with the hypothesis that the data are drawn from a normal distribution.

d)

The graphical results of the Tukey pairwise comparison for every pair of the chemical treatments is:

Chemical	(1)	(2)	(3)	(4)
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Tukeys test threshold is:

$$\begin{aligned}q_{\alpha, a, (a-1)(b-1)} \frac{s}{\sqrt{b}} &= q_{0.05, 4, 12} \frac{\sqrt{1.817}}{\sqrt{5}} \\ &= 4.20(0.602) \\ &= 2.531\end{aligned}$$

e)

Note that there is no line, this indicates that no means are significantly different. This is consistent with the above F-test which concluded that each treatment effect was equal to 0.

Question 2

a)

b)

c)

d)