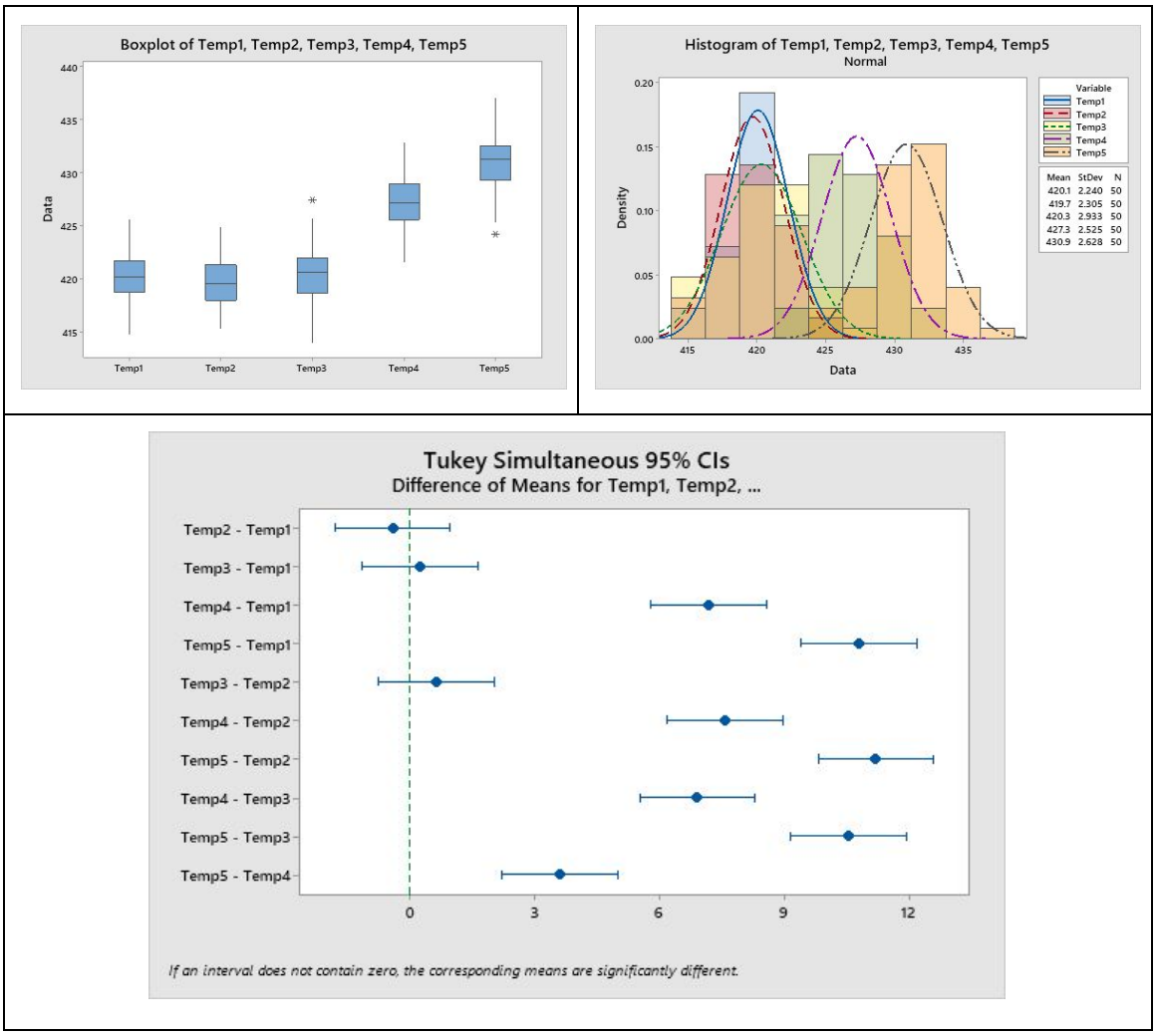
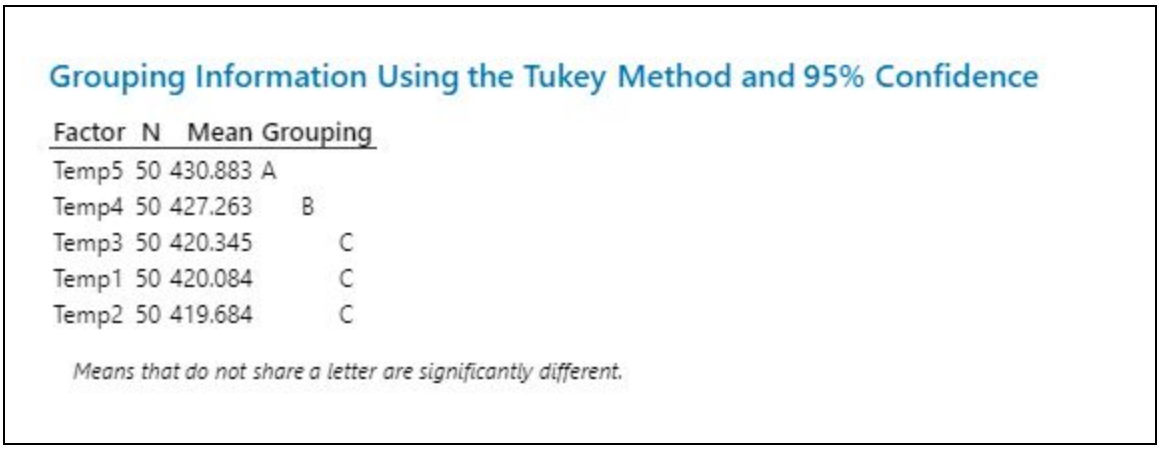
Gus Lipkin

Commercial Bakery Oven Performance

1. Did the five ovens perform consistently in terms of baking temperature?
   - By looking at a boxplot and histogram of the oven temperatures for all five ovens, three of the ovens performed similarly while ovens 4 and 5 were different.



2. If not, which oven(s) performed differently?
   - By examining the Tukey test, we can see that the ranges for Ovens 1, 2, and 3 contain 0, meaning they are not significantly different. Any comparison containing Ovens 4 or 5 do not contain 0 and are therefore significantly different. This is also shown in the Tukey groupings below where Ovens 1, 2, and 3 are in the same group while Ovens 4 and 5 are each in their own groups.



Grouping Information Using the Tukey Method and 95% Confidence

Factor	N	Mean	Grouping
Temp5	50	430.883	A
Temp4	50	427.263	B
Temp3	50	420.345	C
Temp1	50	420.084	C
Temp2	50	419.684	C

Means that do not share a letter are significantly different.

3. What do you recommend to the operations manager as some possible next steps?
    - If possible, I would recommend the operations manager recalibrate their ovens to the correct temperature. If it's not possible, the actual differences are not that much and they could change the process times to reflect the differences in temperature. However, depending on the items being cooked, the temperature difference may not mean much and then it wouldn't be worth doing anything about.

More charts and graphs are included below

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Factor	5	Temp1, Temp2, Temp3, Temp4, Temp5

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	4	5237	1309.14	203.17	0.000
Error	245	1579	6.44		
Total	249	6815			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2.53841	76.84%	76.46%	75.88%

Means

Factor	N	Mean	StDev	95% CI
Temp1	50	420.084	2.240	(419.377, 420.791)
Temp2	50	419.684	2.305	(418.977, 420.391)
Temp3	50	420.345	2.933	(419.638, 421.052)
Temp4	50	427.263	2.525	(426.556, 427.970)
Temp5	50	430.883	2.628	(430.175, 431.590)

Pooled StDev = 2.53841

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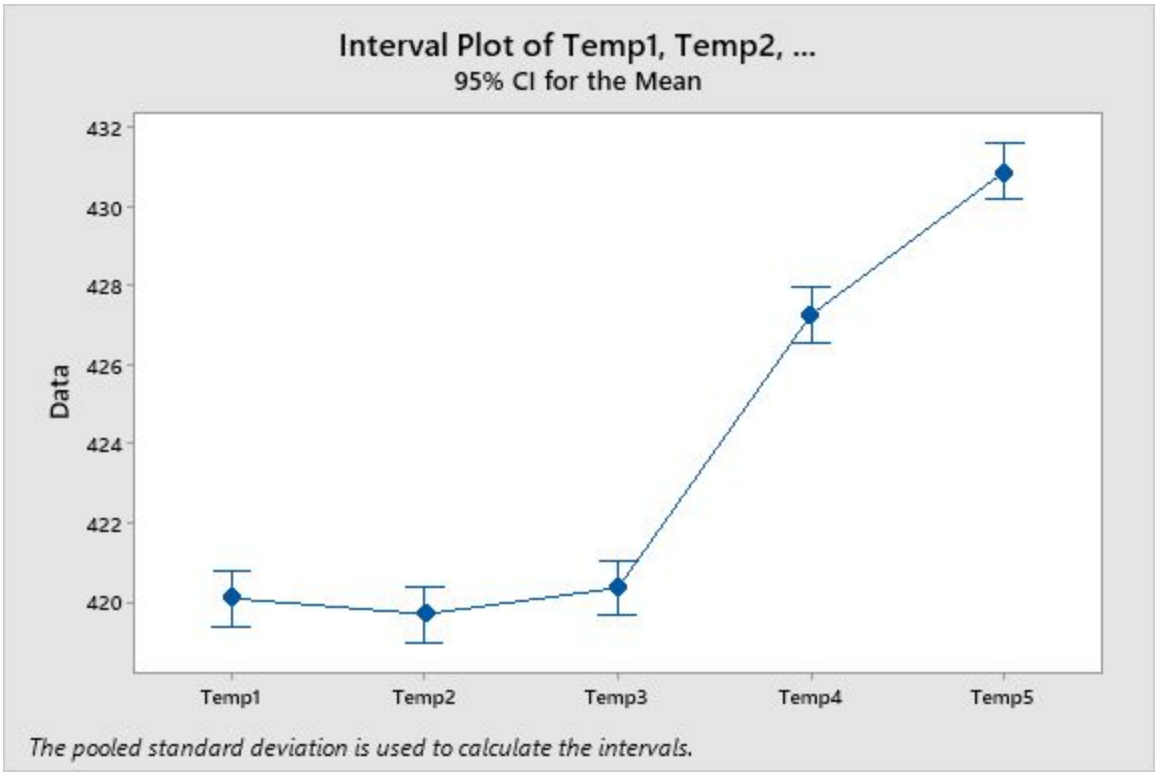

The pooled standard deviation is used to calculate the intervals.