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Section 1

MANE 6313

Subsection 1

Week 8, Module D

Student Learning Outcome

- Select an appropriate experimental design with one or more factors,
- Select an appropriate model with one or more factors,
- Evaluate statistical analyses of experimental designs,
- Assess the model adequacy of any experimental design, and
- Interpret model results.

Module Learning Outcome

Analyze a design using replicates as blocks in Minitab.

Problem 7.5

7.5 Consider the data from the first replicate of Problem 6.11. Construct a design with two blocks of eight observations each with *ABCD* confounded. Analyze the data.

Figure 1: Problem 7.5

6.11 An experiment was performed to improve the yield of a chemical process. Four factors were selected, and two replicates of a completely randomized experiment were run. The results are shown in the following table:

Treatment Combination	Replicate I	Replicate II	Treatment Combination	Replicate I	Replicate II
(1)	90	93	*d*	98	95
a	74	78	*ad*	72	76
b	81	85	*bd*	87	83
ab	83	80	*abd*	85	86
c	77	78	*cd*	99	90
ac	81	80	*acd*	79	75
bc	88	82	*bcd*	87	84
abc	73	70	*abcd*	80	80

Figure 2: Problem 6.11

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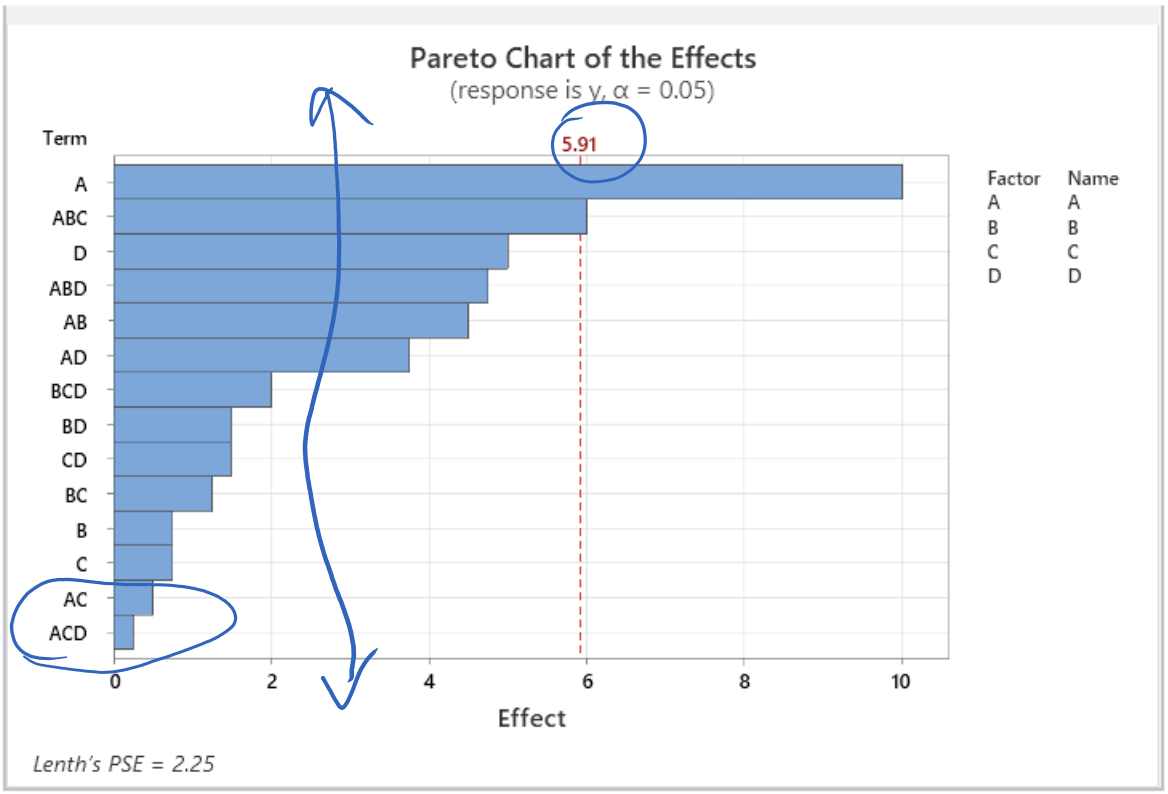

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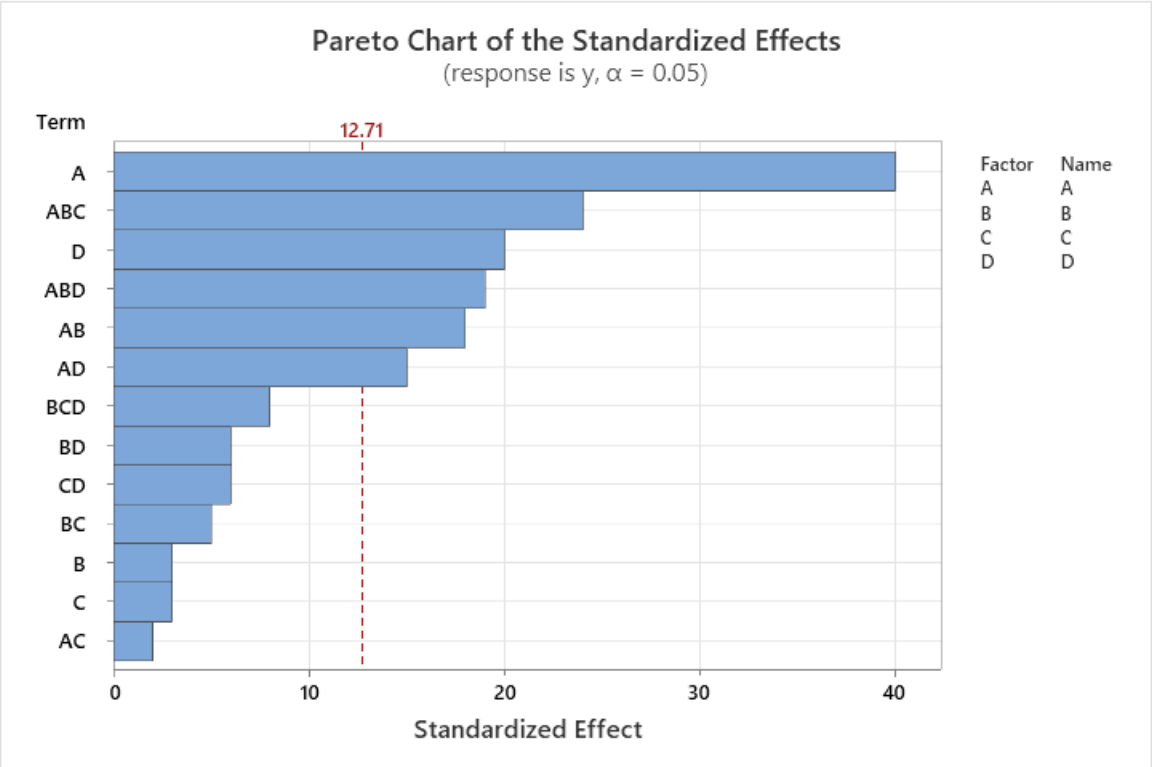

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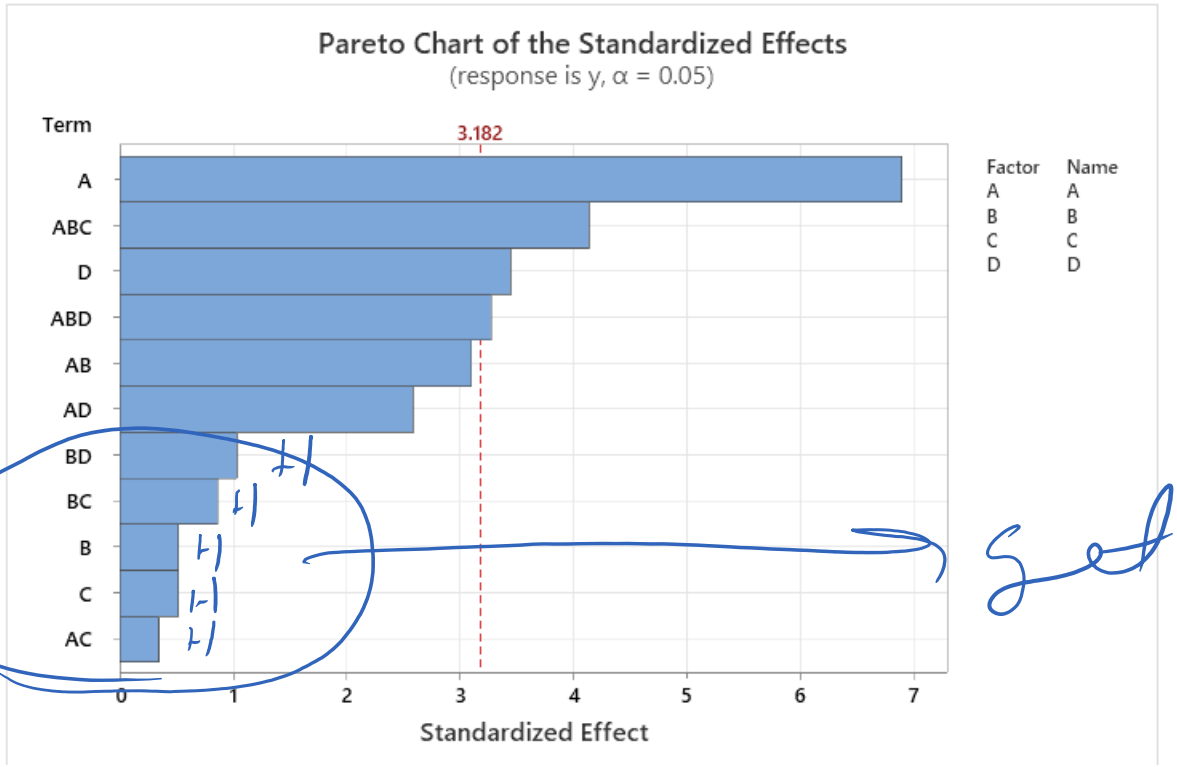

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Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	12	934.500	77.875	9.25	0.046
Blocks	1	42.250	42.250	5.02	0.111
Linear	4	504.500	126.125	14.99	0.025
A	1	400.000	400.000	47.52	0.006
B	1	2.250	2.250	0.27	0.641
C	1	2.250	2.250	0.27	0.641
D	1	100.000	100.000	11.88	0.041
2-Way Interactions	5	153.500	30.700	3.65	0.158
A*B	1	81.000	81.000	9.62	0.053
A*C	1	1.000	1.000	0.12	0.753
A*D	1	56.250	56.250	6.68	0.081
B*C	1	6.250	6.250	0.74	0.452
B*D	1	9.000	9.000	1.07	0.377
3-Way Interactions	2	234.250	117.125	13.92	0.030
A*B*C	1	144.000	144.000	17.11	0.026
A*B*D	1	90.250	90.250	10.72	0.047
Error	3	25.250	8.417		
Total	15	959.750			

Not statistically significant at $\alpha = .05$

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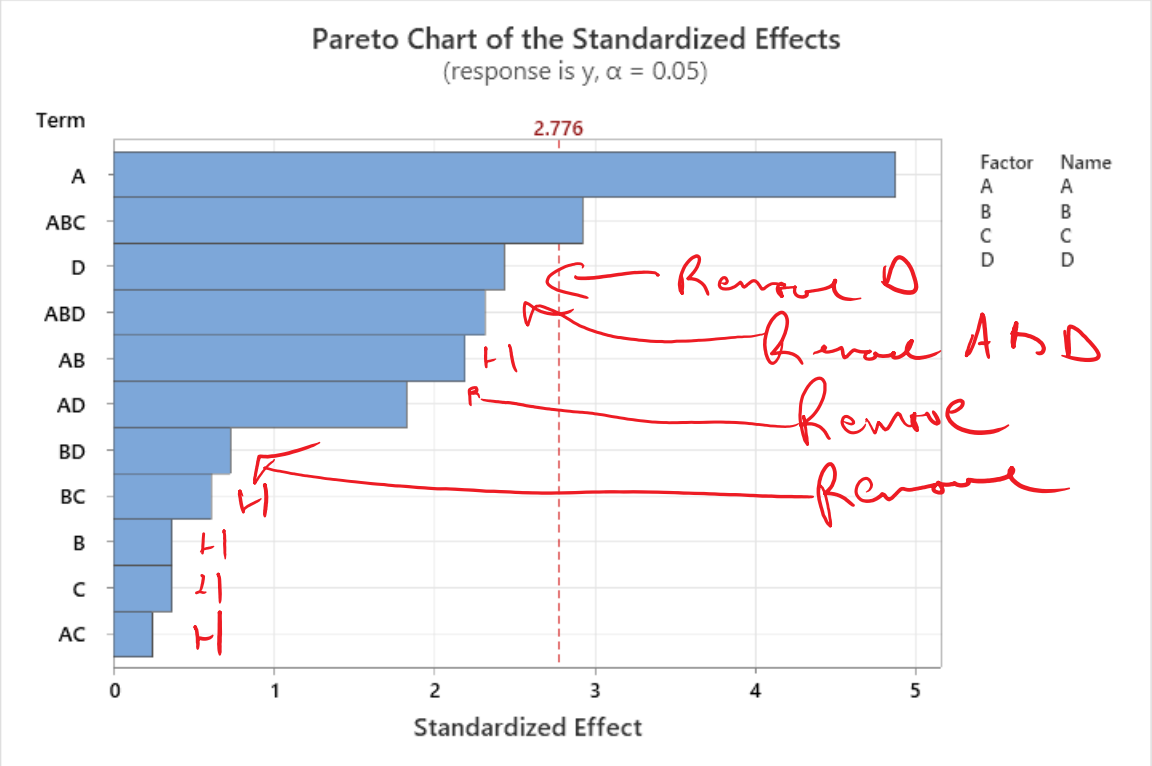

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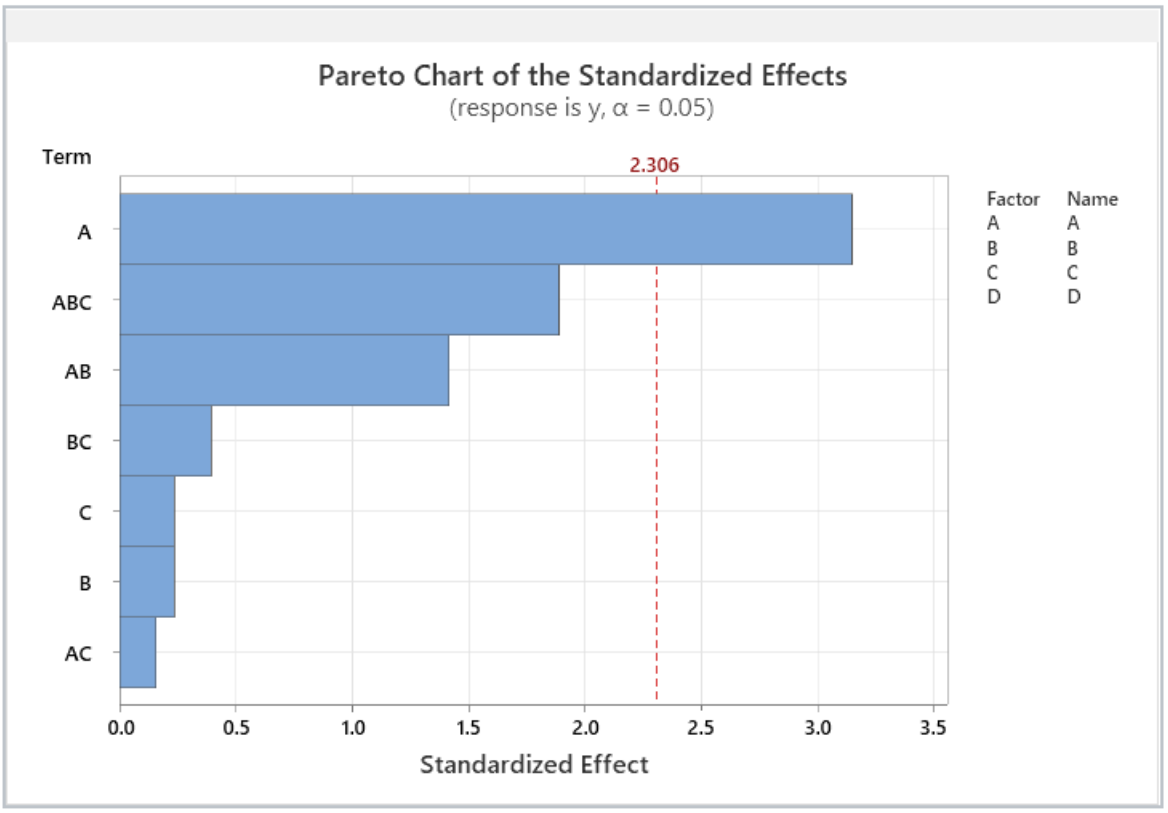

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Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
6.35413	66.35%	36.90%	0.00%

Means extra terms in Model

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Final Model Candidate One: A, ABC, AB, BC,C,B,AC

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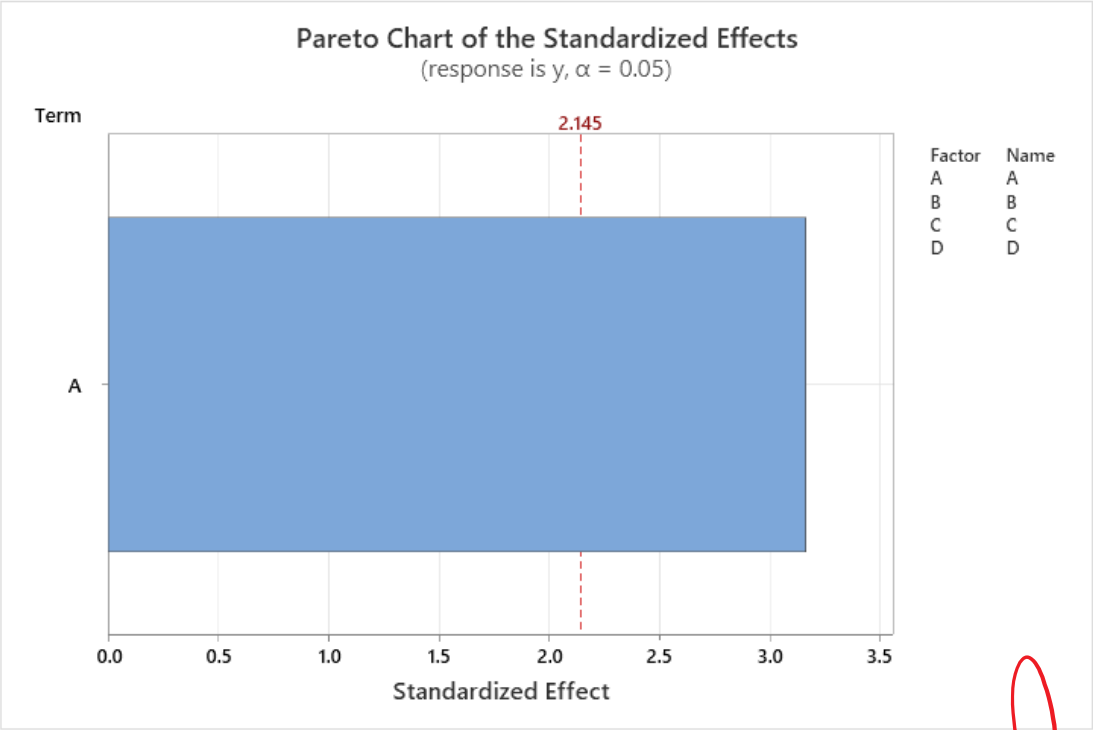

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Final Model!

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
6.32314	41.68%	37.51%	23.82%

agreement

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