HW-8

MS -Business Intelligence & Analytics

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BIA – 654 A

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Ethics Statement

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination. I further pledge that I have not copied any material from a book, article, the Internet or any other source except where I have expressly cited the source.

Signature _Mohit Ravi Ghatikar_____ Date: 04/12/2016___

HW-8

a)

Estimated factor and 2-way interaction effects are:

This is obtained by multiplying the co-efficients in the JMP results by 2.

Term	Effects
Intercept	
A[L1]	-24
B[L1]	-21.5
C[L1]	-4.25
D[L1]	7.75
E[L1]	9.25
F[L1]	-1
A[L1]*B[L1]	45.5
A[L1]*C[L1]	-5.25
A[L1]*D[L1]	6.75
A[L1]*E[L1]	1.75
A[L1]*F[L1]	0
B[L1]*D[L1]	-0.25
B[L1]*F[L1]	-2

Confounding patterns are: (Ignoring interactions of order 3 and higher)

C
1
2
1 2 = 3 5
3
1 3 = 2 5
2 3 = 1 5 = 4 6
4
1 4 = 5 6
2 4 = 3 6
3 4 = 2 6
5
1 5 = 2 3 = 4 6
2 5 = 1 3
3 5 = 1 2
4 5 = 1 6
6
1 6 = 4 5
2 6 = 3 4
3 6 = 2 4
4 6 = 2 3 = 1 5
5 6 = 1 4

b)

The confounding patterns for C, CD and AB are:

I = 1 2 3 5 = 2 3 4 6 = 1 4 5 6
C = 3 = 1 2 5 = 2 4 6 = 1 3 4 5 6
CD = 3 4 = 1 2 4 5 = 2 6 = 1 3 5 6
AB = 1 2 = 3 5 = 1 3 4 6 = 2 4 5 6

The effects are given by:
C = -4.25
CD = -2
AB = 45.5

c)

Var effect = $\text{Sigma}^2 / 4$

Main factors:
95 % Confidence interval : effect +/- $t_{0.025}(16) * (13^2 / 4)^{0.5}$

Confidence interval for A: (-37.715, -10.285)
Since it does not contain 0, it is significant.
Confidence interval for B: (-35.215, -7.785)
Since it does not contain 0, it is significant.
Confidence interval for C: (-17.965, 9.465)
Since it does contains 0, it is not significant.
Confidence interval for D: (-5.965, 21.465)
Since it does contains 0, it is not significant.
Confidence interval for E: (-4.465, 22.965)
Since it does contains 0, it is not significant.
Confidence interval for F: (-14.715, 12.715)
Since it does contains 0, it is not significant.

Interaction effects:
95 % Confidence interval : effect +/- $t_{0.025}(16) * (13^2 / 4)^{0.5}$

Confidence interval for AB: (31.785, 59.215)
Since it does not contain 0, it is significant.
Confidence interval for AC: (-18.965, 8.465)
Since it does contains 0, it is not significant.
Confidence interval for AD: (-6.965, 20.465)
Since it does contains 0, it is not significant.
Confidence interval for AE: (-11.965, 15.465)
Since it does contains 0, it is not significant.
Confidence interval for AF: (-13.715, 13.715)

Since it does contains 0, it is not significant.
Confidence interval for BD: (-13.965, 13.465)
Since it does contains 0, it is not significant.
Confidence interval for BF: (-15.715, 11.715)
Since it does contains 0, it is not significant.

Thus we found out that only factor A, B and interaction factor AB are significant.

d)

Only main factor effects A, B and the interaction of A*B are significant.

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	3	12434.000	4144.67	42.7653
Error	12	1163.000	96.92	Prob > F
C. Total	15	13597.000		<.0001*

Parameter Estimates

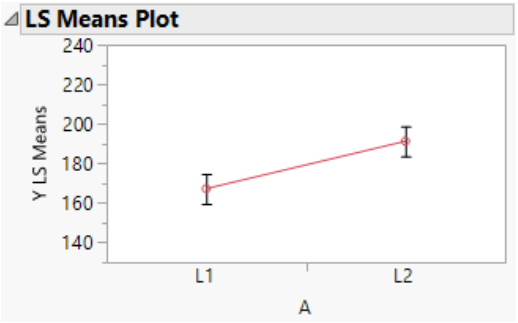
Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	179.25	2.461157	72.83	<.0001*
A[L1]	-12	2.461157	-4.88	0.0004*
B[L1]	-10.75	2.461157	-4.37	0.0009*
A[L1]*B[L1]	22.75	2.461157	9.24	<.0001*

The Regression Prediction equation is:
Distance = 179.25 -12 * A – 10.75 * B + 22.75 * A *B

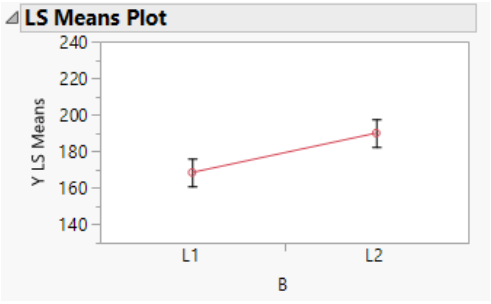
When A and B are positive, Distance = 179.25
When A and B are negative, Distance = 224.75

Therefore, Distance is maximized when A and B are negative. Since other factors are negligible, Karen should consider the levels that have cheaper cost. Hence, Karen should take negative levels for all factors (- - - - - -).

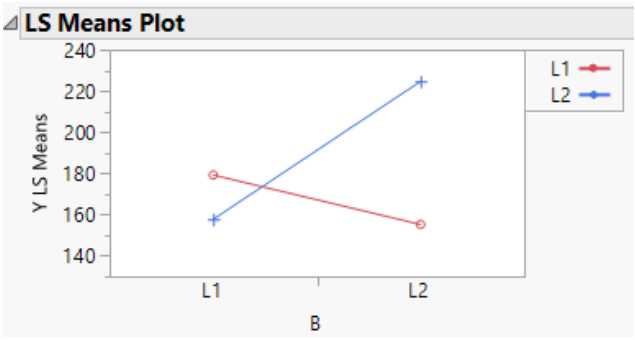
Main factor Plot for A:



Main factor plot for B:



Interaction plot for AB:



e)

The average yardage for Karen is 179.25
With my advice, Karen's yardage is 224.75.
Therefore, she can expect an additional yardage of 45.5

f)

If we take Karen's husbands suggestion, then we are confounding the day effect with the main factor effect of A. I.e even number of days have positive level and odd number of days have negative level. We don't want this effect to get confounded with main factor A, because we are interested in factor A.
On the other hand, if we apply the professor's suggestion, then we are confounding the day effect with the interaction effect of ACD.

	A	C	D	ACD
1	-	-	-	-
2	+	-	-	+
3	-	-	-	-
4	+	-	-	+
5	-	+	-	+
6	+	+	-	-
7	-	+	-	+
8	+	+	-	-
9	-	-	+	+
10	+	-	+	-
11	-	-	+	+
12	+	-	+	-
13	-	+	+	-
14	+	+	+	+
15	-	+	+	-
16	+	+	+	+

Days 1,3,6,8,10,12,13 and 15 have negative levels and the rest of the days have a positive level. Since we are not interested in the 3-order interaction of ACD, we can confound it with the day effect.
Thus the professor's suggestion is better.