

```

data AB1;
input formltn $    speed $    y    trt $;
cards;
1    60    189.7 1
1    60    188.6 1
1    60    190.1 1
1    70    185.1 2
1    70    179.4 2
1    70    177.3 2
1    80    189.0 3
1    80    193.0 3
1    80    191.1 3
2    60    165.1 4
2    60    165.9 4
2    60    167.6 4
2    70    161.7 5
2    70    159.8 5
2    70    161.6 5
2    80    163.3 6
2    80    166.6 6
2    80    170.3 6
;

```

```

proc glm;
class formltn speed;
model y = formltn speed formltn*speed;
lsmeans formltn / pdiff adjust=tukey cl;
lsmeans speed / pdiff adjust=tukey cl;
run; quit;

```

Dependent Variable: y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2502.837778	500.567556	83.58	<.0001
Error	12	71.866667	5.988889		
Corrected Total	17	2574.704444			

R-Square Coeff Var Root MSE y Mean

0.972087 1.391696 2.447221 175.8444

Source	DF	Type I SS	Mean Square	F Value	Pr > F
formltn	1	2253.442222	2253.442222	376.27	<.0001
speed	2	230.814444	115.407222	19.27	0.0002
formltn*speed	2	18.581111	9.290556	1.55	0.2516

Source	DF	Type III SS	Mean Square	F Value	Pr > F
formltn	1	2253.442222	2253.442222	376.27	<.0001
speed	2	230.814444	115.407222	19.27	0.0002
formltn*speed	2	18.581111	9.290556	1.55	0.2516

Adjustment for Multiple Comparisons: Tukey

		H0:LSMean1=LSMean2	
formltn	y LSMEAN	Pr > t	
1	187.033333	<.0001	
2	164.655556		

formltn	y LSMEAN	95% Confidence Limits	
1	187.033333	185.255988	188.810679
2	164.655556	162.878210	166.432901

Least Squares Means for Effect formltn

		Difference Between Means	Simultaneous 95% Confidence Limits for LSMean(i)-LSMean(j)	
i	j			
1	2	22.377778	19.864223	24.891332

Adjustment for Multiple Comparisons: Tukey

		LSMEAN	
speed	y LSMEAN	Number	
60	177.833333	1	
70	170.816667	2	
80	178.883333	3	

Least Squares Means for effect speed

Pr > |t| for H0: LSMean(i)=LSMean(j)

		Dependent Variable: y		
i/j		1	2	3
1			0.0009	0.7433
2		0.0009		0.0003
3		0.7433	0.0003	

speed	y LSMEAN	95% Confidence Limits	
60	177.833333	175.656539	180.010128
70	170.816667	168.639872	172.993461
80	178.883333	176.706539	181.060128

Least Squares Means for Effect speed

		Difference Between Means	Simultaneous 95% Confidence Limits for LSMean(i)-LSMean(j)	
i	j			
1	2	7.016667	3.247384	10.785950
1	3	-1.050000	-4.819283	2.719283
2	3	-8.066667	-11.835950	-4.297384

```

data AB2;
input brand $      temp $      y;
cards;
super cold  4
super cold  5
super cold  6
super cold  5
super warm  7
super warm  9
super warm  8
super warm 12
super hot   10
super hot   12
super hot   11
super hot   9
best  cold  6
best  cold  6
best  cold  4
best  cold  4
best  warm 13
best  warm 15
best  warm 12
best  warm 12
best  hot  12
best  hot  13
best  hot  10
best  hot  13
;

proc glm;
class brand temp;
model y = brand temp brand*temp;
lsmeans brand*temp / pdiff adjust=tukey cl;
run; quit;

```

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	236.8333333	47.3666667	23.04	<.0001
Error	18	37.0000000	2.0555556		
Corrected Total	23	273.8333333			

R-Square Coeff Var Root MSE y Mean
0.864881 15.78408 1.433721 9.083333

Source	DF	Type I SS	Mean Square	F Value	Pr > F
brand	1	20.1666667	20.1666667	9.81	0.0058
temp	2	200.3333333	100.1666667	48.73	<.0001
brand*temp	2	16.3333333	8.1666667	3.97	0.0372

Source	DF	Type III SS	Mean Square	F Value	Pr > F
brand	1	20.1666667	20.1666667	9.81	0.0058
temp	2	200.3333333	100.1666667	48.73	<.0001
brand*temp	2	16.3333333	8.1666667	3.97	0.0372

Least Squares Means
Adjustment for Multiple Comparisons: Tukey

brand	temp	y LSMEAN	LSMEAN Number
best	cold	5.0000000	1
best	hot	12.0000000	2
best	warm	13.0000000	3
super	cold	5.0000000	4
super	hot	10.5000000	5
super	warm	9.0000000	6

Least Squares Means for effect brand*temp
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: y

i/j	1	2	3	4	5	6
1		<.0001	<.0001	1.0000	0.0005	0.0103
2	<.0001		0.9164	<.0001	0.6806	0.0765
3	<.0001	0.9164		<.0001	0.1862	0.0103
4	1.0000	<.0001	<.0001		0.0005	0.0103
5	0.0005	0.6806	0.1862	0.0005		0.6806
6	0.0103	0.0765	0.0103	0.0103	0.6806	

Least Squares Means for Effect brand*temp

i	j	Difference Between Means	Simultaneous 95% Confidence Limits for LSMean(i)-LSMean(j)	
1	2	-7.000000	-10.221873	-3.778127
1	3	-8.000000	-11.221873	-4.778127
1	4	0	-3.221873	3.221873
1	5	-5.500000	-8.721873	-2.278127
1	6	-4.000000	-7.221873	-0.778127
2	3	-1.000000	-4.221873	2.221873
2	4	7.000000	3.778127	10.221873
2	5	1.500000	-1.721873	4.721873
2	6	3.000000	-0.221873	6.221873
3	4	8.000000	4.778127	11.221873
3	5	2.500000	-0.721873	5.721873
3	6	4.000000	0.778127	7.221873
4	5	-5.500000	-8.721873	-2.278127
4	6	-4.000000	-7.221873	-0.778127
5	6	1.500000	-1.721873	4.721873