```
data new;
  input Detergent $ Temperature $ CleanRating;
  if Detergent='Best' then best=1; else best=0;

  if Temperature='Cold' then do; Cold=1; Warm=0; end;
  else if Temperature='Warm' then do; Cold=0; Warm=1; end;
  else do; Cold=0; Warm=0; end;

  BestCold=Best*Cold;
  BestWarm=Best*Warm;
cards;
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
run;
proc means data=new;
  class Detergent Temperature;
  types Detergent Temperature Detergent*Temperature;
  var CleanRating;
run;

proc glm data=new;
  class Detergent Temperature;
  model CleanRating=Detergent Temperature Detergent*Temperature/ss1 ss2 ss3 solution;
  lsmeans Temperature/tdiff pdiff cl adjust=bon;
run;
proc glm data=new;
  class Detergent Temperature;
  model CleanRating=Detergent Temperature/ss1 ss2 ss3 solution;
  lsmeans Temperature/tdiff pdiff cl adjust=bon;
run;

proc reg data=new;
      model CleanRating=best cold warm bestcold bestwarm;
      INT: test bestcold=bestwarm=0;
      TEMP: test cold=warm=0;
run;
proc reg data=new;
      model CleanRating=best cold warm;
      TEMP: test cold=warm=0;
run;
```

The MEANS Procedure

Analysis Variable : CleanRating

Temperature	N Obs	N	Mean	Std Dev	Minimum	Maximum
Cold	7	7	5.1428571	0.8997354	4.0000000	6.0000000
Hot	8	8	11.2500000	1.4880476	9.0000000	13.0000000
Warm	8	8	11.0000000	2.7255406	7.0000000	15.0000000

Analysis Variable : CleanRating

Detergent	N Obs	N	Mean	Std Dev	Minimum	Maximum
Best	12	12	10.0000000	3.9080337	4.0000000	15.0000000
Super	11	11	8.5454545	2.5831623	5.0000000	12.0000000

Analysis Variable : CleanRating

Detergent	Temperature	N Obs	N	Mean	Std Dev	Minimum	Maximum
Best	Cold	4	4	5.0000000	1.1547005	4.0000000	6.0000000
	Hot	4	4	12.0000000	1.4142136	10.0000000	13.0000000
	Warm	4	4	13.0000000	1.4142136	12.0000000	15.0000000
Super	Cold	3	3	5.3333333	0.5773503	5.0000000	6.0000000
	Hot	4	4	10.5000000	1.2909944	9.0000000	12.0000000
	Warm	4	4	9.0000000	2.1602469	7.0000000	12.0000000

The GLM Procedure

Class Level Information

Class	Levels	Values
Detergent	2	Best Super
Temperature	3	Cold Hot Warm

Number of Observations Read 23
Number of Observations Used 23

The SAS System

Demographics/Baseline Characteristics

The GLM Procedure

Dependent Variable: CleanRating

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	211.2028986	42.2405797	20.13	<.0001
Error	17	35.6666667	2.0980392		
Corrected Total	22	246.8695652			

R-Square	Coeff Var	Root MSE	CleanRating Mean
0.855524	15.56757	1.448461	9.304348

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Detergent	1	12.1422925	12.1422925	5.79	0.0278
Temperature	2	181.4022727	90.7011364	43.23	<.0001
Detergent*Temperatur	2	17.6583333	8.8291667	4.21	0.0328

Source	DF	Type II SS	Mean Square	F Value	Pr > F
Detergent	1	19.0321429	19.0321429	9.07	0.0079
Temperature	2	181.4022727	90.7011364	43.23	<.0001
Detergent*Temperatur	2	17.6583333	8.8291667	4.21	0.0328

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Detergent	1	16.8596491	16.8596491	8.04	0.0114
Temperature	2	170.6583333	85.3291667	40.67	<.0001
Detergent*Temperatur	2	17.6583333	8.8291667	4.21	0.0328

Parameter			Estimate		Standard Error	t Value	Pr > |t|
Intercept			9.000000000	B	0.72423049	12.43	<.0001
Detergent	Best		4.000000000	B	1.02421658	3.91	0.0011
Detergent	Super		0.000000000	B			
Temperature	Cold		-3.666666667	B	1.10628035	-3.31	0.0041
Temperature	Hot		1.500000000	B	1.02421658	1.46	0.1613
Temperature	Warm		0.000000000	B			
Detergent*Temperatur	Best	Cold	-4.333333333	B	1.50760599	-2.87	0.0105
Detergent*Temperatur	Best	Hot	-2.500000000	B	1.44846098	-1.73	0.1025
Detergent*Temperatur	Best	Warm	0.000000000	B			
Detergent*Temperatur	Super	Cold	0.000000000	B			
Detergent*Temperatur	Super	Hot	0.000000000	B			
Detergent*Temperatur	Super	Warm	0.000000000	B			

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Demographics/Baseline Characteristics

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Bonferroni

Temperature	CleanRating LSMEAN	LSMEAN Number
Cold	5.1666667	1
Hot	11.2500000	2
Warm	11.0000000	3

Least Squares Means for Effect Temperature
t for H0: LSMean(i)=LSMean(j) / Pr > |t|

Dependent Variable: CleanRating

i/j	1	2	3
1		-8.07019 <.0001	-7.73854 <.0001
2	8.07019 <.0001		0.345194 1.0000
3	7.738538 <.0001	-0.34519 1.0000	

Temperature	CleanRating LSMEAN	95% Confidence Limits	
Cold	5.166667	3.999643	6.333690
Hot	11.250000	10.169546	12.330454
Warm	11.000000	9.919546	12.080454

Least Squares Means for Effect Temperature

i	j	Difference Between Means	Simultaneous 95% Confidence Limits for LSMean(i)-LSMean(j)	
1	2	-6.083333	-8.084677	-4.081990
1	3	-5.833333	-7.834677	-3.831990
2	3	0.250000	-1.672829	2.172829

The GLM Procedure

Class Level Information

Class	Levels	Values
Detergent	2	Best Super
Temperature	3	Cold Hot Warm

Number of Observations Read 23
Number of Observations Used 23

The GLM Procedure

Dependent Variable: CleanRating

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	193.5445652	64.5148551	22.99	<.0001
Error	19	53.3250000	2.8065789		
Corrected Total	22	246.8695652			

R-Square	Coeff Var	Root MSE	CleanRating Mean
0.783995	18.00540	1.675285	9.304348

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Detergent	1	12.1422925	12.1422925	4.33	0.0513
Temperature	2	181.4022727	90.7011364	32.32	<.0001

Source	DF	Type II SS	Mean Square	F Value	Pr > F
Detergent	1	19.0321429	19.0321429	6.78	0.0174
Temperature	2	181.4022727	90.7011364	32.32	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Detergent	1	19.0321429	19.0321429	6.78	0.0174
Temperature	2	181.4022727	90.7011364	32.32	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		10.08750000	B	0.68819343	14.66	<.0001
Detergent	Best	1.82500000	B	0.70082189	2.60	0.0174
Detergent	Super	0.00000000	B			
Temperature	Cold	-5.98750000	B	0.86848609	-6.89	<.0001
Temperature	Hot	0.25000000	B	0.83764237	0.30	0.7686
Temperature	Warm	0.00000000	B			

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are
followed by the letter 'B' are not uniquely estimable.

The SAS System

Demographics/Baseline Characteristics

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Bonferroni

Temperature	CleanRating LSMEAN	LSMEAN Number
Cold	5.0125000	1
Hot	11.2500000	2
Warm	11.0000000	3

Least Squares Means for Effect Temperature
t for H0: LSMean(i)=LSMean(j) / Pr > |t|

Dependent Variable: CleanRating

i/j	1	2	3
1		-7.18204 <.0001	-6.89418 <.0001
2	7.182038 <.0001		0.298457 1.0000
3	6.894181 <.0001	-0.29846 1.0000	

Temperature	CleanRating LSMEAN	95% Confidence Limits	
Cold	5.012500	3.683066	6.341934
Hot	11.250000	10.010296	12.489704
Warm	11.000000	9.760296	12.239704

Least Squares Means for Effect Temperature

i	j	Difference Between Means	Simultaneous 95% Confidence Limits for LSMean(i)-LSMean(j)	
1	2	-6.237500	-8.517368	-3.957632
1	3	-5.987500	-8.267368	-3.707632
2	3	0.250000	-1.948900	2.448900

The SAS System

Demographics/Baseline Characteristics

The REG Procedure
Model: MODEL1
Dependent Variable: CleanRating

Number of Observations Read 23
Number of Observations Used 23

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	211.20290	42.24058	20.13	<.0001
Error	17	35.66667	2.09804		
Corrected Total	22	246.86957			

Root MSE	1.44846	R-Square	0.8555
Dependent Mean	9.30435	Adj R-Sq	0.8130
Coeff Var	15.56757		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.50000	0.72423	14.50	<.0001
best	1	1.50000	1.02422	1.46	0.1613
Cold	1	-5.16667	1.10628	-4.67	0.0002
Warm	1	-1.50000	1.02422	-1.46	0.1613
BestCold	1	-1.83333	1.50761	-1.22	0.2406
BestWarm	1	2.50000	1.44846	1.73	0.1025

The REG Procedure
Model: MODEL1

Test INT Results for Dependent Variable CleanRating

Source	DF	Mean Square	F Value	Pr > F
Numerator	2	8.82917	4.21	0.0328
Denominator	17	2.09804		

The REG Procedure
Model: MODEL1

Test TEMP Results for Dependent Variable CleanRating

Source	DF	Mean Square	F Value	Pr > F
Numerator	2	23.53030	11.22	0.0008
Denominator	17	2.09804		

The SAS System

Demographics/Baseline Characteristics

The REG Procedure
Model: MODEL1
Dependent Variable: CleanRating

Number of Observations Read 23
Number of Observations Used 23

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	193.54457	64.51486	22.99	<.0001
Error	19	53.32500	2.80658		
Corrected Total	22	246.86957			

Root MSE	1.67528	R-Square	0.7840
Dependent Mean	9.30435	Adj R-Sq	0.7499
Coeff Var	18.00540		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.33750	0.68819	15.02	<.0001
best	1	1.82500	0.70082	2.60	0.0174
Cold	1	-6.23750	0.86849	-7.18	<.0001
Warm	1	-0.25000	0.83764	-0.30	0.7686

The REG Procedure
Model: MODEL1

Test TEMP Results for Dependent Variable CleanRating

Source	DF	Mean Square	F Value	Pr > F
Numerator	2	90.70114	32.32	<.0001
Denominator	19	2.80658		