SAS Output for Problem 1

Model Information	
Data Set	WORK.SMOKE_DEPRESS
Response Variable	depress
Number of Response Levels	2
Frequency Variable	count
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	8
Number of Observations Used	8
Sum of Frequencies Read	3213
Sum of Frequencies Used	3213

Response Profile		
Ordered Value	depress	Total Frequency
1	yes	194
2	no	3019

Probability modeled is depress='yes'.

Class Level Information		
Class	Value	Design Variables
gender	female	1
	male	0
smoke	yes	1
	no	0

Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	0.7713	1	0.7713	0.3798
Pearson	0.8097	1	0.8097	0.3682

Number of unique profiles: 4

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	1467.199	1414.830
SC	1473.274	1433.055
-2 Log L	1465.199	1408.830

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	56.3692	2	<.0001
Score	53.9576	2	<.0001
Wald	51.7322	2	<.0001

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
gender	1	30.1741	<.0001
smoke	1	29.0001	<.0001

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-3.9670	0.2032	381.3072	<.0001
gender	female	1	0.9368	0.1705	30.1741	<.0001
smoke	yes	1	0.9186	0.1706	29.0001	<.0001

The LOGISTIC Procedure

Model Information	
Data Set	WORK.SMOKE_DEPRESS
Response Variable	depress
Number of Response Levels	2
Frequency Variable	count
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	8
Number of Observations Used	8
Sum of Frequencies Read	3213
Sum of Frequencies Used	3213

Response Profile		
Ordered Value	depress	Total Frequency
1	yes	194
2	no	3019

Probability modeled is depress='yes'.

Class Level Information		
Class	Value	Design Variables
gender	female	1
	male	0
smoke	yes	1
	no	0

Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	0.0000	0	.	.
Pearson	0.0000	0	.	.

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	1467.199	1416.058
SC	1473.274	1440.358
-2 Log L	1465.199	1408.058

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	57.1405	3	<.0001
Score	60.8613	3	<.0001
Wald	55.1745	3	<.0001

Joint Tests			
Effect	DF	Wald Chi-Square	Pr > ChiSq
gender	1	3.2610	0.0709
smoke	1	3.0811	0.0792
gender*smoke	1	0.8041	0.3699

Analysis of Maximum Likelihood Estimates							
Parameter			DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept			1	-3.7305	0.3200	135.9073	<.0001
gender	female		1	0.6474	0.3585	3.2610	0.0709
smoke	yes		1	0.6293	0.3585	3.0811	0.0792
gender*smoke	female	yes	1	0.3648	0.4068	0.8041	0.3699

SAS Output for Problem 2

Model Information	
Data Set	SASUSER.ASBESTOS
Response Variable	Exposure
Number of Response Levels	3
Model	cumulative logit
Optimization Technique	Fisher's scoring

Number of Observations Read	83
Number of Observations Used	83

Response Profile		
Ordered Value	Exposure	Total Frequency
1	(1) Low exposure	45
2	(2) Action level	6
3	(3) Above legal limit	32

Probabilities modeled are cumulated over the lower Ordered Values.

Class Level Information		
Class	Value	Design Variables
Task	Insulation	1
	Tile	0
Ventilation	General	1
	Negative pressure	0

Model Convergence Status
Convergence criterion (GCONV=1E-8) satisfied.

Score Test for the Proportional Odds Assumption		
Chi-Square	DF	Pr > ChiSq
1.6130	2	0.4464

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	151.620	107.914
SC	156.457	117.590
-2 Log L	147.620	99.914

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	47.7055	2	<.0001
Score	41.0749	2	<.0001
Wald	29.3468	2	<.0001

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Task	1	13.6857	0.0002
Ventilation	1	14.5921	0.0001

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	(1) Low exposure	1	2.4751	0.5633	19.3075	<.0001
Intercept	(2) Action level	1	3.0208	0.6034	25.0599	<.0001
Task	Insulation	1	-2.2870	0.6182	13.6857	0.0002
Ventilation	General	1	-2.1594	0.5653	14.5921	0.0001

The LOGISTIC Procedure

Model Information	
Data Set	SASUSER.ASBESTOS
Response Variable	Exposure
Number of Response Levels	3
Model	generalized logit
Optimization Technique	Newton-Raphson

Number of Observations Read	83
Number of Observations Used	83

Response Profile		
Ordered Value	Exposure	Total Frequency
1	(3) Above legal limit	32
2	(2) Action level	6
3	(1) Low exposure	45

Logits modeled use Exposure='(1) Low exposure' as the reference category.

Class Level Information		
Class	Value	Design Variables
Task	Insulation	1
	Tile	0
Ventilation	General	1
	Negative pressure	0

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	151.620	110.083
SC	156.457	124.596
-2 Log L	147.620	98.083

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	49.5371	4	<.0001
Score	41.9096	4	<.0001
Wald	26.1218	4	<.0001

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Task	2	12.8225	0.0016
Ventilation	2	14.8842	0.0006

Analysis of Maximum Likelihood Estimates							
Parameter		Exposure	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		(3) Above legal limit	1	-3.1172	0.7206	18.7117	<.0001
Intercept		(2) Action level	1	-3.4236	0.8886	14.8428	0.0001
Task	Insulation	(3) Above legal limit	1	2.6995	0.7554	12.7698	0.0004
Task	Insulation	(2) Action level	1	1.1598	0.9917	1.3677	0.2422
Ventilation	General	(3) Above legal limit	1	2.4959	0.6757	13.6442	0.0002
Ventilation	General	(2) Action level	1	2.3164	0.9970	5.3982	0.0202

SAS Output for Problem 3

Model A

The LOGISTIC Procedure

Model Information	
Data Set	WORK.LRI
Response Variable	lri
Number of Response Levels	2
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	284
Number of Observations Used	284

Response Profile		
Ordered Value	lri	Total Frequency
1	1	114
2	0	170

Probability modeled is lri=1.

Class Level Information			
Class	Value	Design Variables	
ses	0	1	0
	1	0	1
	2	0	0
agegroup	1	1	0
	2	0	1
	3	0	0

Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	353.6339	275	1.2859	0.0009
Pearson	279.8768	275	1.0177	0.4071

Number of unique profiles: 284

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	384.593	371.634
SC	388.242	404.475
-2 Log L	382.593	353.634

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	28.9587	8	0.0003
Score	28.1000	8	0.0005
Wald	25.8389	8	0.0011

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
passive	1	0.7859	0.3753
crowding	1	6.5921	0.0102
ses	2	0.6917	0.7076
race	1	0.0079	0.9290
agegroup	2	8.9473	0.0114
risk	1	8.8034	0.0030

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-1.0329	0.7385	1.9563	0.1619
passive		1	0.2493	0.2812	0.7859	0.3753
crowding		1	0.7131	0.2778	6.5921	0.0102
ses	0	1	-0.1617	0.4066	0.1582	0.6908
ses	1	1	0.1091	0.3911	0.0778	0.7802
race		1	0.0278	0.3116	0.0079	0.9290
agegroup	1	1	0.7267	0.9233	0.6195	0.4312
agegroup	2	1	2.5445	0.9048	7.9085	0.0049
risk		1	-0.0633	0.0213	8.8034	0.0030

Partition for the Hosmer and Lemeshow Test					
		Iri = 1		Iri = 0	
Group	Total	Observed	Expected	Observed	Expected
1	30	1	5.65	29	24.35
2	28	8	6.50	20	21.50
3	28	7	7.53	21	20.47
4	28	8	8.82	20	19.18
5	28	14	9.89	14	18.11
6	28	15	11.46	13	16.54
7	29	14	13.64	15	15.36
8	28	13	14.73	15	13.27
9	28	17	15.91	11	12.09
10	29	17	19.87	12	9.13

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	DF	Pr > ChiSq
11.7599	8	0.1622

Model B

The LOGISTIC Procedure

Model Information	
Data Set	WORK.LRI
Response Variable	lri
Number of Response Levels	2
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	284
Number of Observations Used	284

Response Profile		
Ordered Value	lri	Total Frequency
1	1	114
2	0	170

Probability modeled is lri=1.

Class Level Information			
Class	Value	Design Variables	
agegroup	1	1	0
	2	0	1
	3	0	0

Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	354.3619	278	1.2747	0.0013
Pearson	280.1102	278	1.0076	0.4532

Number of unique profiles: 284

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	384.593	366.362
SC	388.242	388.256
-2 Log L	382.593	354.362

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	28.2307	5	<.0001
Score	27.3810	5	<.0001
Wald	25.1269	5	0.0001

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
passive	1	1.5508	0.2130
crowding	1	9.2219	0.0024
agegroup	2	9.2893	0.0096
risk	1	9.9432	0.0016

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-1.0919	0.6608	2.7301	0.0985
passive		1	0.3282	0.2635	1.5508	0.2130
crowding		1	0.7848	0.2584	9.2219	0.0024
agegroup	1	1	0.7424	0.9169	0.6557	0.4181
agegroup	2	1	2.5852	0.9009	8.2337	0.0041
risk		1	-0.0662	0.0210	9.9432	0.0016