Grad Stats Second Exam **Fall, 2002**

All questions worth 3 points.

Question A

The measurement of intelligence (IQ) has long been a topic of interest in psychology. More recently, researchers have been studying lay theories and prejudices about intelligence. In some of these studies, respondents are asked to estimate the IQ of a school-aged child they know. Suppose the following variables were available:

EIQ	Estimated IQ, the dependent variable to be predicted
WAIS_IQ	Actual IQ as measured by the WAIS
AGE	Age in years of the person being judged
SEX	whether the person being judged is male or female
JUDGE	whether the judge is the teacher, the father, or the mother of the person being judged

For each of the following questions, specify the MODEL A/C comparison one would use to answer the question. For many of the questions you will need to create new variables defined in terms of the above variables. Be sure to specify all such definitions. Feel free to used abbreviations for variables (first letters?) once you have defined them.

1. The average IQ is supposed to be 100. Do average estimated IQs differ significantly from 100?

2. Are estimated IQs related to actual IQs as measured by the WAIS?

3. For each point that actual WAIS IQ increases does estimated IQ also increase by one point?

4. Assuming that actual IQs are indeed useful predictors of estimated IQs, use a more powerful test to answer the first question about whether estimated IQs differ from 100 on average.

5. Do the estimated IQs of boys differ from those of girls on average?

6. IQ scores are normed by age so age should not be a predictor of IQs. However, lay observers may confuse normal developmental differences with intelligence. If so, age would be a predictor of estimated IQs even when controlling for actual IQ as measured by the WAIS. Is that the case?

7. Are the demographic variables of the students (age and sex) useful predictors of estimated IQ over and above predictions based on the actual WAIS IQ?

8. Do the average judgments of teachers differ from those parents? (Answer this question using a full set of codes; see the next question).

9. Do fathers estimate higher or lower IQs than mothers?

10. What potential assumption violation would the previous two questions alert you to check for? [This is not a MODEL A/C comparison]

Question B

To help understand factors influencing the election of George W. Bush in 2000, data are collected on the 50 states. For each state we have the following variables:

BUSH	Proportion (*100) of those voting who voted for Bush for President
PERCOLL	Proportion (*100) of the State's adult residents with 4 years or more college
INC00	Mean income (in hundreds of dollars) per state resident, 2000 census
DENS99	Population density (no. of people per square mile)

On the following pages, the latter three variables are used in regression models to predict BUSH. The first three models are simple regression models, using each of the three predictor variables, one at a time, as predictors. Then a multiple regression is reported in which all three predictors are included.

In addition to these three variables, we also have data on whether each state's legislature is controlled by the Democrats, the Republicans, or whether the two state legislative houses are split between the two parties. Two contrast-coded predictors are used to define this categorical variables: PARTY1 and PARTY2. Their values (and the number of states in each category) are given below:

	Democrat	Split	Republican
n	16	17	17
PARTY1	+1	0	-1
PARTY2	1	-2	1

The final two models on the following pages include regressions using PARTY1 and PARTY2 to predict BUSH and then, finally, adding DENS99 as a predictor in addition to these two contrast-coded predictors.

Based on these analyses, answer the following questions.

1. Is there evidence that Bush received less support in states where the general population is more highly educated? (Provide PRE, F*, n-pa, pa-pc, and a one sentence conclusion.)

2. PERCOLL and INC00 might be considered to be ways of measuring socio-economic status of a state's population (how well it is doing in terms of education and income). Are these variables as a set predictive of support for Bush over and above the population density of states? (Provide PRE, F*, n-pa, pa-pc, and a one sentence conclusion.)

3. Is there evidence that population density is predictive of support for Bush over and above PERCOLL and INC00? (Provide PRE, F*, n-pa, pa-pc, and a one sentence conclusion.)

4. Based on the first model (where PERCOLL is only predictor) and the fourth model, where it is a predictor along with INC00 and DENS99, discuss the relationship between PERCOLL and Bush support. Can we conclude that support for Bush in a state depends on the education level of residents of the state?

5. Are there differences among states in support for Bush as a function of the party (ies) in control of the state's legislature? (Provide PRE, F*, n-pa, pa-pc, and a one sentence conclusion.)

6. What is the mean proportion of voters who supported Bush in states where Democrats control both houses of the state legislature?

7. In the fourth model, where PARTY1 AND PARTY2 are used to predict Bush support, interpret the slope for PARTY1 (i.e., -3.41).

8. (A bit beyond what we have done in class, but the answer is an easy generalization of what we have considered). The slope for PARTY1 in the final model equals –2.08. What does this value tell you that is different from the slope you considered in the previous question (i.e., -.3.41)?

9. Is there any evidence that there are population density differences among the states that can be predicted by knowing whether the state legislature is controlled by Democrats, Republicans, or split between the two? (Provide PRE, F*, n-pa, pa-pc, and a one sentence conclusion.)

Variable	N	Mean	Std Dev	Minimum	Maximum
BUSH	50	49.9400000	8.7444676	31.0000000	67.0000000
PERCOLL	50	24.9320000	4.3123193	15.3000000	34.6000000
INC00	50	281.8000000	43.0234867	209.0000000	406.0000000
DENS99	50	175.9020000	240.6854875	1.1000000	1097.60

Model: MODEL1
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	925.65602	925.65602	15.749	0.0002
Error	48	2821.16398	58.77425		
C Total	49	3746.82000			

Root MSE	7.66644	R-square	0.2471
Dep Mean	49.94000	Adj R-sq	0.2314
C.V.	15.35129		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	75.068871	6.42416203	11.685	0.0001
PERCOLL	1	-1.00790	0.2539713	-3.969	0.0002

Model: MODEL2
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	1470.70849	1470.70849	31.015	0.0001
Error	48	2276.11151	47.41899		
C Total	49	3746.82000			

Root MSE	6.88614	R-square	0.3925
Dep Mean	49.94000	Adj R-sq	0.3799
C.V.	13.78884		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	85.823983	6.51655413	13.170	0.0001
INC00	1	-0.127338	0.02286507	-5.569	0.0001

Model: MODEL3
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	1641.21448	1641.21448	37.414	0.0001
Error	48	2105.60552	43.86678		
C Total	49	3746.82000			

Root MSE	6.62320	R-square	0.4380
Dep Mean	49.94000	Adj R-sq	0.4263
C.V.	13.26232		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	54.169660	1.16426142	46.527	0.0001
DENS99	1	-0.024046	0.00393115	-6.117	0.0001

Model: MODEL4
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	1926.15823	642.05274	16.222	0.0001
Error	46	1820.66177	39.57960		
C Total	49	3746.82000			

Root MSE	6.29123	R-square	0.5141
Dep Mean	49.94000	Adj R-sq	0.4824
C.V.	12.59758		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	72.473339	7.30175473	9.925	0.0001
PERCOLL	1	-0.321641	0.32478911	-0.990	0.3272
INC00	1	-0.040913	0.03944518	-1.037	0.3051
DENS99	1	-0.016969	0.00502833	-3.375	0.0015

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	3899.181914	.	.
PERCOLL	1	38.815022	0.02087416	0.41176613
INC00	1	42.580510	0.02285291	0.28046350
DENS99	1	450.770564	0.19845212	0.55147764

Model: MODEL5
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	430.01118	215.00559	3.047	0.0570
Error	47	3316.80882	70.57040		
C Total	49	3746.82000			

Root MSE	8.40062	R-square	0.1148
Dep Mean	49.94000	Adj R-sq	0.0771
C.V.	16.82142		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	49.884804	1.18851215	41.972	0.0001
PARTY1	1	-3.408088	1.46303196	-2.329	0.0242
PARTY2	1	0.648284	0.83610622	0.775	0.4420

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	124323	.	.
PARTY1	1	382.945187	0.10350558	0.99968760
PARTY2	1	42.425864	0.01262962	0.99968760

Model: MODEL6
Dependent Variable: BUSH

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	1978.74978	659.58326	17.160	0.0001
Error	46	1768.07022	38.43631		
C Total	49	3746.82000			

Root MSE	6.19970	R-square	0.5281
Dep Mean	49.94000	Adj R-sq	0.4973
C.V.	12.41430		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	54.175914	1.10740246	48.922	0.0001
PARTY1	1	-2.080941	1.09978147	-1.892	0.0648
PARTY2	1	1.367916	0.62737885	2.180	0.0344
DENS99	1	-0.024162	0.00380643	-6.348	0.0001

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	91991	.	.
PARTY1	1	137.609486	0.07221019	0.96355881
PARTY2	1	182.726143	0.09366746	0.96704472
DENS99	1	1548.738605	0.46693635	0.93456659