Psychology 407
Assignment A

Consider the following set of numbers representing matched observations on two variables:

Variable 1	Variable 2
95	31
100	31
100	31
102	32
103	32
105	32
106	33
106	33
106	33
109	34
110	34
110	34
111	35
112	35
112	35
114	36
114	36
115	36
117	37
118	37
130	37

Variable 1	Variable 2
Sum: 2,295	Sum: 714
Sum Squares: 251,991	Sum Squares: 24,360

Sum of Cross Products: 78,323

i) Construct a scatterplot for these two variables (placing variable 2 along the abscissa — i.e., along the "x axis").

ii) Find the least-squares line for predicting variable 1 from variable 2 and plot it on the scatterplot constructed in (i).

iii) Calculate the correlation between the two variables and give the percentage of sample variance for variable 1 that is "accounted for" by variable 2 in terms of a linear relationship.

iv) Obtain the usual sample variance of estimate and its unbiased counterpart.

The questions below refer to the data given above. Treat variable 1 as the dependent variable Y and variable 2 as the independent variable X.

Correlational Model:

Suppose the pairs of values given by X and Y represent independent observations from a bivariate normal distribution.

a) Test $H_0 : \rho_{xy} = 0$ versus $H_1 : \rho_{xy} \neq 0$ using the t-statistic.

b) Test $H_0 : \rho_{xy} = .8$ versus $H_1 : \rho_{xy} \neq .8$ using Fisher's Z-transformation.

c) Using Fisher's Z-transformation, find a 95% confidence interval for ρ_{xy}.

Regression Model:

Suppose the data on X and Y are assumed to follow the usual linear regression model with the X variable fixed.

d) Construct a 95% confidence interval on β_1 and test the hypothesis that $H_0 : \beta_1 = 0$ versus $H_1 : \beta_1 \neq 0$ at $\alpha = .05$. What is the relation of this latter test to that done in (a).

e) Construct a 95% confidence interval on β_0.

f) Construct a 95% confidence interval on the "true mean" for Y given that $X = 33$.

g) Construct a 95% prediction interval for a new observation with an X value of 33.

h) Partition the Total Sum of Squares for Y into the Regression and Error Sum of Squares. Construct the analysis-of-variance table and carry out the

appropriate F-test for testing $H_0 : \beta_1 = 0$ versus $H_1 : \beta_1 \neq 0$. What is the relation of the latter to what was done in (a) and (d)?

i) Partition the Error Sum of Squares into the Sum of Squares for Pure Error and for lack of fit. Construct the analysis-of-variance table for assessing lack of fit and carry out the appropriate F-test.