

HW 13 is due on **MONDAY, Dec. 2**. Exam 3 is Wednesday, Nov 20. The Final is Tuesday, Dec. 10 10:15-12:15 in AG 102 (right ACEG center G odd seats). Quiz 11 is on ch. 23, ch. 24, ch 9. Four sheets of notes. **Two pages: problems A)- I)**

Coefficient Estimates

Label	Coef	St. Dev	T	P
Constant	-2.3948	0.3963	-6.04	0.000
Time	0.158483	0.003661	43.29	0.000

A) (23.10 MODIFIED) The above output is for predicting the *length* of an icicle grown in a cold chamber at -11° C with a water flow of 11.9 mg per second. The explanatory variable is the *time* in minutes in the chamber. Assume $n = 18$.

a) Give the 95% CI for β .

b) Do a 4 step test for $H_0: \beta = 0$ vs $H_a: \beta \neq 0$.

comment for A) and B): See p. 609 and p. 605 and the final review.

B) Data from dinosaur skeletons was used for predicting the *humerus length* from *femur length*. Software says that the least squares slope is $b = 1.1969$ with standard error $SE_b = 0.0751$. Do a 4 step test for $H_0: \beta = 0$. Assume $n = 5$.

Regression line is $\text{Length} = -2.39 + 0.158 \text{ Time}$

Predicted Values for New Observations

New Obs	Fit	SE Fit	95.0% CI	95.0% PI
1	29.302	0.429	(28.392, 30.211)	(27.367, 31.237)

C) (23.13 MODIFIED) The above output is for icicle growth in a cold chamber. We want to predict the $Y = \text{length}$ of an icicle for $x^* = \text{Time} = 200$ (minutes in the chamber).

i) Use the regression line from the output to predict Y . Your answer should be close to the Fit given in the output.

ii) Give a 95% interval for the length of an icicle if $x^* = 200$. Explain your choice briefly.

iii) Give a 95% interval for the mean length of an icicle if $x^* = 200$. Explain your choice briefly.

Comment: Use a confidence interval for a parameter (mean) and use a prediction interval for a random variable. See p. 610-614.

D) 9.1 A study looked at a group of 469 people who have brain cancer. The investigators matched each cancer patient with a person of the same sex, age and race who did not have brain cancer, and then asked about cell phone use. Result: "Our data suggest that use of handheld cellular telephones is not associated with risk of brain cancer." i) Is this an observational study or an experiment? ii) What is the explanatory variable? iii) What is the response variable?

comment for D) and E): See p. 223-226.

E) 9.2 A company wants to compare the effectiveness of its computer animation for teaching about supply and demand with that of a textbook presentation. The company

tests the economic knowledge of a group of freshmen, then divides them into two groups. One group uses the computer animation while the other uses the textbook. The company retests all of the students and compares the increase in economic understanding of the two groups. The variables are *teaching method* and *change in test score*. i) Is this an experiment or observational study? Why? ii) What is the explanatory variable? iii) What is the response variable?

F) Does regular exercise reduce the risk of a heart attack? Here are two ways to study this question. Explain clearly why the 2nd design will produce more trustworthy data.

1. A researcher finds 2000 men over 40 who exercise regularly and have not had heart attacks. She matches each with a similar man who does not exercise regularly, and she follows both groups for 5 years.

2. Another researcher finds 4000 men over 40 who have not had heart attacks and who are willing to participate in a study. She randomly assigns 2000 of the men to a regular program of supervised exercise. The other 2000 continue their usual habits. She follows both groups for 5 years.

comment: See ex. 9.4 and ex. 9.5 on p. 228-229 and see p. 232-3.

G) 9.48abc A study has two variables *vitamin treatments* and *does colon cancer develop*. 864 people at risk were randomly divided into 4 groups: daily beta-carotene, daily vitamins C and E, all 3 vitamins and a placebo. After 4 years no significant difference in colon cancer was found. a) What are the explanatory and response variables in this experiment? b) Outline the design of the experiment. c) Assign labels to the 864 subjects, and use Table B line 118 to choose the *first five* subjects for the beta-carotene group.

comment: Person 1 gets label 001, person 2 gets label 002, ..., person 864 gets label 864. In table B, read across line 118, then go to line 119 if necessary. See ex 8.4 on p. 207 and ex. 9.5 on p. 229.

H) Suppose a randomized, double blind, placebo controlled experiment is used to study the benefits of aspirin. Explain to a doctor who knows no statistics what i) “randomized,” ii) “double blind,” and iii) “placebo controlled” mean.

comment: See p. 229-231, and 234-235.

I) Regression Analysis

The regression equation is

Instrucr = 0.650 + 0.821 Manner

Predictor	Coef	StDev	T	P
Constant	0.65020	0.08837	7.36	0.000
Manner	0.82100	0.03085	26.62	0.000

From the computer output, do a 4 step hypothesis for $H_0: B = 0$ vs $H_a: B \neq 0$.

Instrucr is teacher evaluation. Manner is the teacher's manner.