MATH 338
FINAL EXAM
SOFTWARE PORTION
MON/WED/THURS, DEC 11/13/14, 2017

Your name: _____

Your scores (to be filled in by Dr. Wynne):

Problem 1: _____/5

Problem 2: _____/7

Problem 3 (optional): _____/4

Problem 4 (optional): _____/5

Total: _____/21

You may refer to your textbook, any notes/code you wrote, anything on Titanium, and software help menus. You may ask Dr. Wynne to clarify what a question is asking for, or to help you troubleshoot RGuroo errors and/or debug your R code. You may not ask other people for help or use online resources other than those on Titanium or the software itself.

For full credit, include all R code (if using RStudio), graphs, and output. Save your answers as a .docx or .pdf file and upload the file to Titanium.

Problem 1. Abhishek and colleagues (2017) investigated a group of 550 patients with acute gout attacks. In the gout.csv data set, the variable urate_lowering_treatment indicates whether the patient was on a drug to lower uric acid levels (in µmol/L). The patient's measured uric acid level is recorded as the variable serum_uric_acid. Note that some patients may have missing values for one or both of these variables.

A. [2 pts] Graphically display the distribution of serum uric acid levels in patients with and without treatment.

PASTE (ANY CODE AND) YOUR GRAPH(S) HERE:

B. [3 pts] Estimate with 95% confidence the population mean difference in serum uric acid level between gout patients on a urate-lowering treatment and gout patients not on a urate-lowering treatment. Interpret your estimate. Assume that your answer in part (A) suggests that your choice of inference is appropriate.

WRITE YOUR ESTIMATE HERE:

WRITE YOUR INTERPRETATION HERE:

PASTE YOUR (CODE AND) SOFTWARE OUTPUT HERE:

Problem 2. The milk.csv file contains the concentration of trace elements in human milk fed to a sample of infants from three different countries (Argentina, Poland, and United States). All element concentrations are in µg/L.

A. [2 pts] Report the least-squares regression equation predicting arsenic (As) concentration in milk from the copper (Cu) concentration in milk.

WRITE YOUR EQUATION HERE:

PASTE YOUR (CODE AND) PARAMETER ESTIMATES FROM SOFTWARE HERE:

B. [1 pt] In this model, is copper concentration a significant predictor of arsenic concentration, at the 5% significance level? Why or why not? Assume that it is valid to do this inference.

WRITE WHETHER COPPER CONCENTRATION IS SIGNIFICANT HERE:

EXPLAIN YOUR REASONING HERE:

C. [4 pts] Determine whether the population mean arsenic concentration in milk differs between the three countries. Assume that exploratory analysis has already been done and the assumptions for inference have been checked; just do the inference. For this problem you will need to set your own confidence/significance level.

WRITE THE NAME OF INFERENTIAL TECHNIQUE YOU WILL USE HERE:

EXPLAIN WHY YOU ARE USING THAT TECHNIQUE HERE:

PERFORM YOUR CHOSEN INFERENCE AND WRITE YOUR INTERPRETATION AND/OR CONCLUSIONS HERE:

PASTE YOUR (CODE AND) SOFTWARE OUTPUT HERE:

Problem 3. [4 pts] A 2017 study investigated the prevalence of drunkenness at Swedish football (soccer) matches. The researchers defined a blood alcohol content of at least 0.1% to be "highly intoxicated." In a random sample of 4420 spectators, 395 had a blood alcohol content (BAC) of at least 0.1%. Construct and interpret a 95% confidence interval for the proportion of all Swedish football (soccer) match spectators who are highly intoxicated.

WRITE THE NAME OF INFERENTIAL TECHNIQUE YOU WILL USE HERE:

EXPLAIN WHY YOU ARE USING THAT TECHNIQUE HERE:

PERFORM YOUR CHOSEN INFERENCE AND WRITE YOUR INTERPRETATION AND/OR CONCLUSIONS HERE:

PASTE YOUR (CODE AND) SOFTWARE OUTPUT HERE:

Problem 4. [5 pts] This problem expands on the gout problem (Problem 1). The table below may be useful. The row variable is the sex of the gout patient and the column variable shows whether the patient was on a urate-lowering treatment.

	Treatment	No Treatment	Total
Female	32	17	49
Male	384	93	477
Total	416	110	526

Test whether the patient's sex affects whether the patient is on a urate-lowering treatment. Use a significance level of $\alpha = 0.05$.

WRITE THE NAME OF INFERENTIAL TECHNIQUE YOU WILL USE HERE:

EXPLAIN WHY YOU ARE USING THAT TECHNIQUE HERE:

PERFORM YOUR CHOSEN INFERENCE AND WRITE YOUR INTERPRETATION AND/OR CONCLUSIONS HERE:

PASTE YOUR (CODE AND) SOFTWARE OUTPUT HERE: