MATH 338

MIDTERM 1 - LAB PORTION

THURSDAY, OCTOBER 4, 2018

Your name: _____

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

Problem 1: ____/5

Problem 2: ____/8.5

Problem 3: ____/3.5

Total: ____/17

You have 50 minutes to complete this exam and an extra 10 minutes to save (as a .docx or .pdf file) and upload it to Titanium.

You may refer to your notes, your textbook, and any pre-existing online reference (eBook, R/Rguroo help, anything on Titanium). You may search for help online, but you must cite any source found through the search. You may ask Dr. Wynne to clarify what a question is asking for. You may not ask other people for help or use any other resources.

For full credit, show all work except for final numerical calculations (which can be done using a scientific/graphing calculator or R).

1. The cats.csv file on Titanium contains values of the following variables measured on 144 cats:

- Sex (M – Male, F – Female)
- Body_Weight: weight of the cat, in kilograms
- Heart_Weight: weight of the cat's heart, in grams

Important Note: If you are having trouble importing the data for any reason, this dataset is also found in the `MASS` package as the `cats` data set. You can access it in Rguroo by importing it from the Rguroo Data Repository (MASS repository), or in R/R Studio by running the command to load the package, `library(MASS)`.

A) [1.5 pts] Find the mean and median of the variable Body_Weight, rounded to two decimal places. Interpret each value.

B) [0.5 pts] Compute the interquartile range of the variable Body_Weight, rounded to two decimal places.

C) [2 pts] Create a set of graphs that shows how the distribution of body weights differs in Male vs. Female cats. Make sure your axis labels are well-defined!

D) [1 pt] Briefly explain what your figure in part (C) indicates about how Body_Weight is affected by Sex.

2. Suppose that the heart weight of all female cats in a population is approximately N(9, 1.5) and the heart weight of all male cats in a population is approximately N(12, 2.5). Round all probabilities below to three decimal places (tenth of a percent).

For this problem only: If you are using Rguroo, please include either a screenshot of the dialog you used to obtain the answer, or the resulting graph. If you are using R, please remember to include your code as well as the answer.

A) [1.5 pts] What is the probability that a randomly selected female cat has a heart weight above 11 g?

B) [2 pts] What is the probability that a randomly selected male cat has a heart weight between 11.5 and 12.5 g?

C) [2 pts] What is the probability that a simple random sample of 47 female cats has a sample mean heart weight below 8.8 g?

D) [3 pts] Suppose we obtain a simple random sample of 5 female cats and, independently, a simple random sample of 5 male cats. What is the probability that the sample of female cats has a higher mean heart weight?

3. In Problem 4 of the Lecture Exam, you (hopefully) modified the HQ Trivia rules to allow people to answer all 12 questions, even if they get a question wrong. Your young nephew has gotten a hold of the phone and is randomly touching the screen, so that he has a 1/3 chance of getting any individual question correct. Round all probabilities below to three decimal places (tenth of a percent). If you are using Rguroo, use the approximation 1/3 = 0.3333 as fractions may not be recognized.

For this problem only: If you are using Rguroo, please include either a screenshot of the dialog you used to obtain the answer, or the resulting graph. If you are using R, please remember to include your code as well as the answer.

A) [1.5 pts] Under these new rules (12 questions, 1/3 chance of getting each question correct), what is the probability that your nephew gets no questions correct?

B) [2 pts] Under the new rules, what is the probability that your nephew gets 25% or fewer of the questions correct?