

Applied Statistics Comprehensive Examination

Statistical Methods I & II

1. (20 pts) Assume that Graduate Record Examination (GRE) scores follow a normal distribution with a mean of 1000 and a standard deviation of 200.
 - (a) Find the probability that a randomly chosen student will have a score between 915 and 1215.
 - (b) Find the score that separates the lower 40% from the upper 60%.
 - (c) Find the probability that the mean of a random sample of 25 graduates will be between 950 and 1050.
 - (d) Find the probability that at least two of three randomly chosen students will have a score between 915 and 1215.

2. (20 pts) Suppose that a random sample of 12 observations yielded an average value of 36.4 and a standard deviation of 28.5.
 - (a) Determine if these data provide evidence that the population mean is less than 50. Use $\alpha = 0.05$.
 - (b) Suppose that the median of the 12 observations was 26. Decide whether or not this new information casts any doubt on the validity of the hypothesis test above and justify your answer.

3. (20 pts) A quality control department is concerned that a new method for filling cans with soup might increase the standard deviation of “fill” above the target of $\sigma = 2$ grams. A simple random sample of $n = 10$ cans gave the following results in grams: 404, 407, 397, 403, 402, 410, 405, 396, 406, 400. Test the hypothesis $H_0 : \sigma = 2$ against the appropriate alternative and explain your results. Use $\alpha = 0.05$. State the necessary assumptions for your hypothesis test and how you might assess them.

4. (40 pts) A psychologist has conducted an investigation of the critical flicker frequency (cff) and its possible relationship to eye color. The critical flicker frequency is the highest frequency, in cycles per second, at which the flicker in a light source can be detected by an observer. The investigation produced the following data.

Eye color	Critical Flicker Frequency	Total
Blue	25.7, 27.2, 29.9, 28.5, 29.4, 28.3	169.0
Brown	26.8, 27.9, 23.7, 25.0, 26.3, 24.8, 25.7, 24.5	204.7
Green	26.4, 24.2, 28.0, 26.9, 29.1	134.6

The sum of the squares of all the values is 13659.67.

- Display the data in an appropriate manner and comment on your result with respect to location and spread of each sample distribution.
- State the necessary assumptions for an analysis of variance of these data and how you would assess them.
- Complete the ANOVA table and summarize your conclusions in non-technical language and within the context of the problem.
- Discuss what you would do next (but do not do it) if you were to find a significant “treatment effect.”