STATISTICS FOR MANAGEMENT (IDS 570)

HOMEWORK 9
DUE DATE:THURSDAY, NOVEMBER 20 AT 11:59 PM

Please solve the following exercises using R. One simple way to present your solutions is to copy all of your code and results into a Word document or a LATEX file.

Problem 1. To determine whether glaucoma affects the corneal thickness, measurements were made in 8 people affected by glaucoma in one eye but not in the other. The corneal thicknesses (in microns) were as follows:

Person	1	2	3	4	5	6	7	8
Eye affected by glaucoma	488	478	480	426	440	410	458	460
Eye not affected by glaucoma	484	478	492	444	436	398	464	476

Assume the corneal thicknesses are normally distributed with mean μ_1 and variance σ_1^2 for eyes affected by glaucoma, and mean μ_2 and variance σ_2^2 for eyes not affected by glaucoma. Test $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 < \mu_2$ using $\alpha = 0.1$. interval.

(a) [3 pts] What kind of test will you perform?
(b) [4 pts] Write the formula to compute your test.
(c) [4 pts] What is the p-value?
(d) [4 pts] What is your decision?
(e) [5 pts] Base your conclusion on a 90% confidence.

Problem 2. In this problem, we will examine the sugar content of several national brands of cereals, here measured as a percentage of weight.

children	40.3	55.0	45.7	43.3	50.3	45.9	53.5	43.0	44.2	44.0					
	33.6	55.1	48.8	50.4	37.8	60.3	46.6	47.4	44.0						
adult	20.0	30.2	2.2	7.5	4.4	22.2	16.6	14.5	21.4	3.3	10.0	1.0	4.4	1.3	8.1
	6.6	7.8	10.6	10.6	16.2	14.5	4.1	15.8	4.1	2.4	3.5	8.5	4.7	18.4	

(a) [5 pts] Give a summary of these two data sets.
(b) [5 pts] Create side-by-side boxplots and interpret what you see.
(c) [10 pts] Use R to create a 95% confidence interval for the difference in mean sugar content and explain your result.

Problem 3. Drivers of cars calling for regular gas sometimes premium in the hopes that it will improve gas mileage. Here a rental car company takes 10 randomly chosen cars in its fleet and runs a tank of gas according to a coin toss, runs a tank of gas of each type.

Car #	1	2	3	4	5	6	7	8	9	10
Regular	16	20	21	22	23	22	27	25	27	28
Premium	19	22	24	24	25	25	26	26	28	32

(a) [6 pts] Write an appropriate hypothesis test for this situation and state the testing procedure appropriate to this circumstance.

(b) [7 pts] Compute the necessary summary statistics for the test in part (a).

(c) [7 pts] Perform the t-test and report the p-value.

Problem 4. . The body temperature in degrees Fahrenheit of 52 randomly chosen healthy adults is measured with the following summary of the data:

$$n = 52, \quad \bar{x} = 98.2846, \quad s = 0.6824.$$

(a) [6 pts] Find a 98% confidence interval for the mean body temperature and explain its meaning.

(b) [7 pts] Give a two-side hypothesis test for a mean body temperature of 98.6° Fahrenheit and use the information above to evaluate a test with significance level $\alpha = 0.02$.

(c) [7 pts] Find the power of the test at the parameter value $\mu = 98.2$ and indicate this value using the cutoff value for the test and drawing the sample distribution for the null and alternative hypothesis.

Problem 5. [20 pts] Your company produces a sun block lotion designed to protect the skin from both UVA and UVB exposure to the sun. You hire a company to compare your product with the product sold by your major competitor. The testing company exposes skin on the backs of a sample of 20 people to UVA and UVB rays and measures the protection provided by each product. For 13 of the subjects, your product provided better protection, while for the other 7 objects, your competitor's product provided better protection. Do you have evidence to support a commercial claiming that your product provides superior UVA and UVB protection?