**STATISTICS FOR ENGINEERS**
**ASSIGNMENT VIII**
**OCTOBER 22, 2010**

This homework assignment deals with problems from all previous chapters. Please make sure you read the questions thoroughly and think about them before you begin your answer. There are five problems, each worth two points. Make sure you show all your work and that you state your assumptions clearly. As always, unless stated otherwise, assume $\alpha = 0.05$.

PROBLEM 8.1

The main production line at Bakugan Industries was recently altered, with a new machine (the SR-90) introduced that is supposed to produce the watches much more cheaply than before. However, one of your line workers comes to you saying that the number of defective watches has increased since the SR-90 was introduced. For the next two weeks, you count the number of defective watches produced. At the end of those two weeks, you compare the number of defective watches to the two weeks prior to the alteration. The table below gives the number of defective watches per shift. Does the data support the observation of the line worker?

| Before Change | | After Change | |
|---|---|---|---|
| Shift | Defectives | Shift | Defectives |
| 1 | 123 | 1 | 130 |
| 2 | 152 | 2 | 145 |
| 3 | 133 | 3 | 133 |
| 4 | 122 | 4 | 196 |
| 5 | 117 | 5 | 187 |
| 6 | 144 | 6 | 132 |
| 7 | 175 | 7 | 122 |
| 8 | 155 | 8 | 156 |
| 9 | 102 | 9 | 183 |
| 10 | 119 | 10 | 201 |

PROBLEM 8.2

You are an analyst for an acne drug trial. Ten patients enter the clinic and have the number of facial blemishes counted. Five receive the drug regimen for two weeks. Five receive a placebo. At the end of those two weeks, the number of blemishes is counted for each of the ten. The data is given in the table below.

| Took Drug | | | Did not take Drug | | |
|---|---|---|---|---|---|
| Patient ID | Before | After | Patient ID | Before | After |
| 142 | 9 | 2 | 645 | 8 | 6 |
| 843 | 7 | 5 | 941 | 7 | 4 |
| 112 | 8 | 1 | 483 | 4 | 5 |
| 537 | 7 | 4 | 622 | 1 | 0 |
| 938 | 5 | 0 | 965 | 0 | 2 |

First, do those who received the drug have statistically fewer facial blemishes after taking the drug for two weeks? Next, do those who did not receive the drug have statistically fewer facial blemishes after two weeks? Finally, did those who took the drug statistically improve more than those who did not take the drug?

PROBLEM 8.3

In a recent issue of the Journal of Emergency Management (Volume 8, Number 4, Pages 17–24), there was an article examining the efficacy of a disaster preparedness school program. One of the goals of the program was to get the children to create an evacuation plan for their house. Before the workshop, of the 305 children participants, 28.2% did not have an evacuation plan in place, while 36.6% did (the remainder were uncertain). After the program, 22.4% of the children still did not have an evacuation plan in place, while 49.0% did (the remainder were still uncertain). Was the difference in the proportion of children having an evacuation plan in place significantly different from those who did not have an evacuation plan, before the workshop? If 53.4% of the participants were female, and if we assume that having an evacuation plan is independent of gender, how many of the participants were female and had no evacuation plan before the workshop?

## PROBLEM 8.4

Boxes of nails contain 100 nails each. A sample of 10 boxes is drawn, and each box of nails is weighed. The average weight is 1.500kg, with a standard deviation of 5.000g. Assume that the weight of the box is zero. If we let $\mu_{box}$ denote the mean weight of a box of nails, what is the 95% confidence interval for $\mu_{box}$? What is the 95% confidence interval for the average weight of a nail, $\mu_{nail}$?

## PROBLEM 8.5

A random sample of a dozen grades from a recent examination (not yours) are provided in the table below. Find the arithmetic, geometric, and harmonic mean of the sample. Find the variance, standard deviation, and interquartile range of the sample. Find the 95% confidence interval for the population mean. The professor states that the class average for the test was 75%. Does this sample support his assertion?

| Student ID | Score | Student ID | Score | Student ID | Score |
| --- | --- | --- | --- | --- | --- |
| 143 | 72 | 984 | 94 | 382 | 44 |
| 833 | 35 | 483 | 89 | 398 | 76 |
| 311 | 99 | 798 | 84 | 143 | 94 |
| 008 | 88 | 570 | 63 | 603 | 88 |