Stat 122 (Mathematical Statistics 2)

Problem Set No. 6

INSTRUCTIONS: Answer the following as indicated. Show detailed solutions.

1. Suppose that Y is a single observation from an exponential distribution with mean θ. Show that $2Y/\theta$ is a pivital quantity and use this to construct a 90% confidence interval for θ.

2. A random sample of 130 healthy human body temperatures yielded a mean 98.25 degrees and standard deviation 0.73 degrees.

    a. Construct and interpret a 99% confidence interval for the average body temperature of healthy people.

    b. Does the confidence interval obtained in part (a) contain the value 98.6 degrees, the accepted average temperature cited by physicians and others? What conclusions can you draw?

3. For a comparison of the rates of defectives produced by two assembly lines, independent random samples of 100 items were selected from each line. Line A yielded 18 defectives in the sample, and line B yielded 12 defectives.

    a. Find a 98% confidence interval for the true difference in proportions of defectives for the two lines.

    b. Is there evidence here to suggest that one line produces a higher proportion of defectives than the other?

4. Organic chemists often purify organic compounds by a method known as fractional crystallization. An experimenter wanted to prepare and purify 4.85 g of aniline. Ten 4.85-gram specimens of aniline were prepared and purified to produce acetanilide. The following dry yields were obtained: 3.85, 3.88, 3.90, 3.62, 3.72, 3.80, 3.85, 3.36, 4.01, 3.82. Construct and interpret a 95% confidence interval for the mean number of grams of acetanilide that can be recovered from 4.85 grams of aniline.

5. The ages of a random sample of five university professors are 39, 54, 61, 72, and 59. Using this information, find a 99% confidence interval for the population standard deviation of the ages of all professors at the university, assuming that the ages of university professors are normally distributed.