Math 345
Quiz 4

Show all work in a neat and organized fashion. Clearly indicate your answers. 20 points possible.

1. (3 pts.) A completely randomized design will be performed on fourteen subjects. Six subjects will be assigned at random to treatment 1, and the other eight will get treatment 2.

Assume nine subjects give successes while five subjects give failures. Find all possible 2 by 2 contingency tables of the observed counts (using “treatment number” for the rows).

You do **not** have to find the row proportions. You do **not** have to find the probability of each table.

(Here is one blank sample table. To save time, you may omit the headings on your tables.)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>S</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. (4 pts.) Because cardiac deaths appear to increase after heavy snowfalls, a study was designed to compare cardiac demands of snow shoveling to those of using an electric snow thrower. Ten subjects cleared tracts of snow using both methods, and their maximum heart rates were recorded during both activities. A mean rate of 124 beats/min and a standard deviation of 18 beats/min were obtained from these subjects during the portion of the experiment involving the use of an electric snow thrower (based on data from “Cardiac Demands of Heavy Snow Shoveling,” by Franklin et al., *Journal of the American Medical Association*, Vol. 273, No. 11). Assume that the population has a normal distribution. Find the 90% confidence interval estimate of the population mean for those who use the electric snow thrower.

3. (4 pts.) A container of car antifreeze is supposed to hold 3785 mL of the liquid. Realizing that fluctuations are inevitable, the quality-control manager wants to be quite sure that the standard deviation is less than 30 mL. Otherwise, some containers would overflow while others would not have enough of the coolant. She selects a simple random sample of 18 containers, and these containers have a mean of 3787.0 mL of coolant, with a standard deviation of 55.4 mL. Use these sample results to construct the 95% confidence interval for the true value of the population standard deviation. Does this confidence interval suggest that the fluctuations are at an acceptable level?
4. (5 pts.) Fred has had difficulty getting dates with women, so he is abandoning his strategy of careful selection and replacing it with a desperate strategy of random selection. In pursuing dates with randomly selected women, Fred finds that some of them are unavailable because they are married. Fred, who has an abundance of time for such activities, records and analyzes his observations. The results are given below (where M denotes married and S denotes single). Use the runs test to determine whether the given sequence is randomly arranged. Use a significance level of $\alpha = 0.05$.


1. Hypotheses

   $H_0 :$

   $H_1 :$

2. Test Statistic

3. Decision Rule ($\alpha =$

   Picture:

   Reject $H_0$ if

   Otherwise, fail to reject $H_0$.

4. Observed Value

5. Conclusion

   Reject $H_0$/Fail to reject $H_0$ (Circle one)

   In English:

5. (4 pts.) You have been hired by the Ford Motor Company to do market research, and you must estimate the percentage of households in which a vehicle is owned. How many households must you survey if you want to be 98% confident that your sample percentage has a margin of error of four percentage points. Assume that a previous study suggested that vehicles are owned in 86% of households.