# Mathematical Statistics Final

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### Problem 1

|  |  |  |
| --- | --- | --- |
| Number of Ants | Obs Num of Min | Expected Num of Min |
| 0 | 10 | 13.66 |
| 1 | 29 | 27.20 |
| 2 | 25 | 27.06 |
| 3 | 27 | 17.95 |
| 4 | 6 | 8.93 |
| 5 | 3 | 3.554 |
| 6+ | 0 | 1.62 |

We combined the last entry to have 5+, meaning expected[5] = 3.554 + 1.62

Now, we calculate d by following case study 10.4.2, giving us . Our degrees of freedom is , so our chi-squared value is . The criteria to accept the distribution of data as Poisson is

Thus we cannot claim that this data follows the Poisson Distribution with .

### Problem 2

Using the formula

We can sum for p(A), p(B) and p(C) to get

### Problem 3

The wording of this problem confuses me but I feel like the answer to this, since the events are independent, is

### Problem 4

Using the formulas in section 9.2, we get

In order to reject the null hypothesis in this case, . Since this is not the case, we cannot reject the null hypothesis.

### Problem 5

I cannot figure out a better way of testing if these defects are independent from plant other than doing paired t-tests on each column to see if the mean defect counts are equal. If all of them come back equal, then that means there must be some sort of company-wide issue rather than a plant specific one.

Our Hypothesis setup is this:

, j = plant

|  |  |  |
| --- | --- | --- |
| Test | p-value | Reject Null? |
| A-B | 0.859 | No |
| A-C | 0.03932 | Yes |
| B-C | 0.08691 | No |

Since the paired t-test for A-C has a p-value < 0.05, we can reject the null hypothesis. There is some sort of issue that needs to be investigated between plants A and C, and judging by the tabulated data provided on the final, it seems plant C has found a better way to produce their furniture.

Thus, failure mode is independent of plant.

### Problem 6

The hypothesis setup for this problem was the following:

Following the procedure in case study 9.3.1, we calculate the following values:

Since the calculated F value is in-between both F values from the table, we cannot reject the null hypothesis. Thus, we do not have statistically compelling evidence to conclude that the viscosity variances between plants B and C are different.

### Problem 7

Using Theorem 9.4.1, we have the following setup

Now we have the following values

Thus, with , we cannot reject the null hypothesis. We do not have enough data to conclude that the traffic circle reduces accidents.

### Problem 8

Using theorem 7.5.1, we get the following data from scores: