Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ STAT 110 Homework #6

Directions: For each scenario shown below, you need to state the population of interest, the model being used, and then calculate the Chi-Squared Value for each one. (SHOW ALL WORK)

1. Acme Toy Company prints baseball cards. The company claims that 30% of the cards are rookies, 60% veterans, and 10% are All-Stars. The cards are sold in packages of 100. Suppose a randomly selected package of cards has 50 rookies, 45 veterans, and 5 All-Stars. Is this consistent with Acme's claim? Use a 0.05 level of significance.

2. A study was performed to determine whether the name of a course had an effect on student registrations. A statistics course in a large school district was given 4 different names in a course catalog. Each name corresponded to the exact same statistics course. A random sample of student registrations was recorded and the results are given below:

Course Name Number of Registrations

Statistical Applications 25 Statistical Reasoning 22 Statistical Analysis 30 The Practice of Statistics 40

**TOTAL**  **117**

Do these data suggest the name of the course influences student registrations? Conduct an appropriate statistical test to support your conclusion.

3. Researchers studied the behavior of birds that were searching for seeds and insects in an Oregon forest. In this forest, 54% of the trees were Douglas firs, 40% were ponderosa pines, and 6% were other types of trees. At a randomly selected time during the day, the researchers observed 156 red-breasted nuthatches: 70 were in Douglas firs, 79 in ponderosa pines, and 7 in other types of trees. Do these data provide convincing evidence that nuthatches prefer particular types of trees when they’re searching for seeds and insects?

4. Faked numbers in tax returns, invoices, or expense account claims often display patterns that aren’t present in legitimate records. Some patterns are obvious and easily avoided by a cleaver crook. Others are subtler. It is a striking fact that the first digits of numbers in legitimate records often follow a model knows and Benford’s law. Call the first digit of a randomly chosen record X or short. Benford’s law gives this probability model for X (note that the first digit cannot be 0).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1st Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Probability | 0.301 | 0.176 | 0.125 | 0.097 | 0.079 | 0.067 | 0.058 | 0.051 | 0.046 |

A forensic accountant who is familiar with Benford’s law inspects a random sample of 250 invoices from a company that is accused of committing fraud. The table below displays the sample data.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1st Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Occurrences | 61 | 50 | 43 | 34 | 25 | 16 | 7 | 8 | 6 |