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MATH 301.04

Relationship Between Gender and Animal Preference?

For this report, we were given several factors to choose from to run this hypothesis test. However, we chose gender and their animal preference. The animal preference consists of being a dog person, cat person, both, or neither. We chose these two factors because the majority of people today are dog people. Therefore, we are interested to test whether there is a relationship between gender and animal preference. We were then given a data set of a simple random sample of 121 people and their animal preference in no particular order. From there, we sorted and counted the males and females and their animal preference.

Table 1 shows a two-way table of data we gathered during the 2019-2020 academic year for a Statistics survey.

Table 1:

Gender	Dog	Cat	Both	Neither
Male	30	2	16	0
Female	35	3	34	1

To begin the hypothesis test, we first determine the null (Ho) and alternative hypothesis (Ha). The null hypothesis states that there is no relationship between gender and animal preference. In this instance, that would mean that gender would not play a role in determining the animal preference. The alternative hypothesis states the opposite; that there is a relationship between gender and animal preference. Therefore, gender determines the animal preference.

The next step is to state the parameters in context. The first parameter is the row factor, stating the gender of people (Male or Female). The second parameter is the column factor, stating the animal preference of people (Dog, Cat, Both, or Neither).

For the next step, we must identify our test and conditions. We are running a Chi-Squared Test (x^2) to analyze the data, which must satisfy certain conditions.

First, the data must be a simple random sample. However, we do not need to assume because we are strictly told that the data given is a simple random sample (SRS) from a Statistics survey from the 2019-2020 academic year. Next, we have to determine the expected count. Once the data is entered into the calculator under matrix, find [B], and the expected counts will be

shown. In order to be a valid condition, all expected counts must be greater than 5. However, only half of our expected counts are greater than five. This causes a great deal of caution for our test, but we are going to run the test anyway. The expected counts are shown in Table 2 below, rounded to four decimal places.

Table 2:

Gender	Dog	Cat	Both	Neither
Male	25.7851	1.9835	19.8347	.3967
Female	39.2149	3.0165	30.1653	.6033

Next, we need to figure out our significance level, represented by alpha (α). We do not have a huge amount of data, so we will set our significance level as 0.05. We then proceed to conduct the actual test. Within our calculator, we navigated to the Chi-Squared test (x^2). The test gave us our x^2, which measures how the expectations compare to the actual observed data. Our P-Value, which represents the probability that the Chi-Squared statistic has its degrees of freedom. Also, the goal of the P-Value is to be less than our significance level for the alternative hypothesis to be true. Lastly, it gave us the degrees of freedom, which is calculated from the formula: **df** = (r-1)(c-1). The 'r' represents the rows, and the 'c' represents the columns from our two-way data table. The calculator gave us the following information below in Figure 1, which we rounded to four decimal places.

Figure 1:

x^2 = 3.0286 **P-Value** = .3872 **Df** = 3

The last step of our hypothesis test is determining and stating our conclusion. The conclusion is determined by whether our P-Value is greater or less than our significance level. Since our P-Value = .3872, it is greater than our significance level. Which leads us to believe that our alternative hypothesis (Ha) is not true. Therefore, we believe the null hypothesis (Ho). For our conclusion we stated that, there is not significant evidence that there is a relationship between gender and animal preference. Which is stating a difference between someone's gender and their animal preference. Also, the group that contributed the most data in our hypothesis test is being a dog person. We collected that 65 people from our simple random sample of 121 people

preferred dogs, which is over half of our population. That leaves a lot of room for the data to be altered rather than having close numbers for each category.