Name:_____   Math 130 Day 22 Lecture Worksheet

Date: Sections 12.1 and 12.2 part 1: The Goodness-Of-Fit Test and The Test For Independence

Ex 1: (Sec. 12.1 Goodness-of-Fit) In order to test to see if a die is "fair", it is rolled 600 times. The results are in the table below. Perform a goodness-of-fit test at the $\alpha = 0.025$ significance level to test the claim that the die is "fair".

Categories	Observed Frequencies (O)
1	71
2	116
3	105
4	113
5	101
6	94

a) Use the P-value method
b) Use the rejection region method

Ex 2 (Sec. 12.1, Hw #12, pg. 595): **Peanut M&Ms** According to the manufacturer of M&Ms, 12% of the peanut M&Ms in a bag should be brown, 15% yellow, 12% red, 23% blue, 23% orange, and 15% green. A student randomly selected a bag of peanut M&Ms. He counted the number of M&M's that were each color and obtained the results shown in the table below. Test whether peanut M&Ms follow the distribution stated by M&M/Mars at the $\alpha = 0.05$ level of significance.

Color	Frequency
Brown	53
Yellow	66
Red	38
Blue	96
Orange	88
Green	59

a) Use the P-value method
b) Use the rejection region method

Ex 3 (Sec. 12.1, Hw #13, pg. 595): **Benford's Law, Part I** Our number system consists of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The first significant digit in any number must be 1, 2, 3, 4, 5, 6, 7, 8, or 9 because we do not write numbers such as 12 as 012. Although we may think that each digit appears with equal frequency so that each digit has a 1/9 probability of being the first significant digit, this is not true. In 1881, Simon Newcomb discovered that first digits do not occur with equal frequency. This same result was discovered again in 1938 by physicist Frank Benford. After studying much data, he was able to assign probabilities of occurrence to the first digit in a number as shown in the table first table below. The probability distribution is now known as Benford's Law and plays a major role in identifying fraudulent data on tax returns and accounting books. For example, the second table below represents the first digits in 200 allegedly fraudulent checks written to a bogus company by an employee attempting to embezzle funds from his employer. Using an $\alpha = 0.01$ significance level, test whether the first digits in the allegedly fraudulent checks obey Benford's Law.

Benford's Law

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

Data

First Digit	1	2	3	4	5	6	7	8	9
Frequency	36	32	28	26	23	17	15	16	7

a) Use the P-value method
b) Use the rejection region method

Ex 1 (Sec. 12.2, Ex 2, pg. 604): Is there a relationship between marital status and happiness? The data in the table below show the marital status and happiness of individuals who participated in the General Social Survey. Does the sample evidence suggest that one's happiness depends on one's marital status? Use the $\alpha = 0.05$ level of significance.

Marital Status

		Married	Widowed	Divorced/Separated	Never Married
Happiness Level	Very Happy	600	63	112	144
	Pretty Happy	720	142	355	459

a) Use the P-value method
b) Use the rejection region method