Chi-square Test

1. A police department wishes to compare the average number of monthly robberies at four locations in their town. Use equal categories in order to identify one or more concentrations of robberies. The data are presented in Table 1.

TABLE 1

	Average monthly robberies
Location 1	15
Location 2	10
Location 3	19
Location 4	16

Use a χ^2 goodness-of-it test with $\alpha = 0.05$ to determine if the robberies are concentrated in one or more of the locations. Report your findings.

2. The χ^2 goodness-of-it test serves as a useful tool to ensure that statistical samples approximately match the desired stratification proportions of the population from which they are drawn.

A researcher wishes to determine if her randomly drawn sample matches the racial stratification of school age children. She used the most recent U.S. Census data, which was from 2001. The racial composition of her sample and the 2001 U.S. Census proportions are displayed in Table 2.

Use a χ^2 goodness-of-it test with $\alpha = 0.05$ to determine if the researcher's sample matches the proportions reported by the U.S. Census. Report your findings.

TABLE 2

Race	Frequency of race from the researcher's randomly drawn sample	Racial percentage of U.S. school children based on the 2001 U.S. Census (%)
White	57	72
Black	21	20
Asian, Hispanic, or Pacific Islander	14	8

3. A researcher wishes to determine if there is an association between the level of a teacher's education and his/her job satisfaction. He surveyed 158 teachers. The frequencies of the corresponding results are displayed in Table 3.

TABLE 3

	Teacher education level (observed)			
	Bachelor's degree	Master's degree	Post-Master's degree	Row totals
Satisfied	60	41	19	120
Unsatisfied	10	13	15	38
Column totals	70	54	34	158

First, use a χ^2-test for independence with $\alpha = 0.05$ to determine if there is an association between level of education and job satisfaction. Then, determine the effect size for the association. Report your findings.