Exercise on Chapter 10 Math 181B, UCSD, Spring 2018

Exercise 1

After getting trounced by your little brother in a children's game, you suspect the die he gave you to roll may be unfair. To check, you roll it 60 times, recording the number of times each face appears. Do these results cast doubt on the die's fairness?

Face	Count
1	11
2	7
3	9
4	15
5	12
6	6

1. If the die is fair, how many times would you expect each face to show?

2. To see if these results are unusual, will you test goodness-of-fit or homogeneity/independence?

- 3. State your hypotheses.
- 4. Check the conditions.
- 5. How many degrees of freedom are there?
- 6. Find χ^2 and the *p*-value.
- 7. State your conclusion.

Exercise 2

Two different professors teach an introductory Statistics course. The table shows the distribution of final grades they reported. We wonder whether one of these professors is an "easier" grader.

	Prof. Alpha	Prof. Beta
A	3	9
В	11	12
C	14	8
D	9	2
F	3	1

1. Will you test goodness-of-fit independence?

2. Write appropriate hypotheses.

3. Find the expected counts for each cell, and explain why the chi-square procedures are not appropriate.

Exercise 3

In some situations where the expected cell counts are too small, as in the case of the grades given by Professors Alpha and Beta in Exercise 5, we can complete an analysis anyway. We can often proceed after combining cells in some way that makes sense and also produces a table in which the conditions are satisfied. Here, we create a new table displaying the same data, but calling D's and F's "Below C":

	Prof. Alpha	Prof. Beta
A	3	9
В	11	12
C	14	8
Below C	12	3

1. Find the expected counts for each cell in this new table, and explain why a chi-square procedure is now appropriate.

- 2. With this change in the table, what has happened to the number of degrees of freedom?
- 3. Test your hypothesis about the two professors, and state an appropriate conclusion.

Exercise 4

A subtle form of racial discrimination in housing is "racial steering." Racial steering occurs when real estate agents show prospective buyers only homes in neighborhoods already dominated by that family's race. This violates the Fair Housing Act of 1968. According to an article in Chance magazine (Vol. 14, no. 2 [2001]), tenants at a large apartment complex recently filed a lawsuit alleging racial steering. The complex is divided into two parts: Section A and Section B. The plaintiffs claimed that white potential renters were steered to Section A, while African-Americans were steered to Section B. The table displays the data that were presented in court to show the locations of recently rented apartments. Do you think there is evidence of racial steering?

	New Renters		
	White	Black	Total
Section A	87	8	95
Section B	83	34	117
Total	170	42	212

Exercise 5

Hershey claims that 50% of Reese's Pieces candies are orange, 25% are brown, and 25% are yellow. Suppose you open a random bag containing 200 of these candies and count 112 orange ones, 49 brown ones, and 39 yellow ones.

Do these results seem consistent with what Hershey claims?