1. Example of McNemar’s Test -- Textbook problem 10.58 on page 507

10.58 Obesity now and in 20 years
Many medical studies have used a large sample of subjects from Framingham, Massachusetts, who have been followed since 1948. A recent study (Annals of Internal Medicine, vol. 138, pp. 24-32, 2003) gave the contingency table shown for weight at a baseline time and then 20 years later.

<table>
<thead>
<tr>
<th>Baseline</th>
<th>20 Years after Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>Normal</td>
<td>695</td>
</tr>
<tr>
<td>Overweight</td>
<td>87</td>
</tr>
</tbody>
</table>

a. Find the sample proportion with normal weight at (i) baseline and (ii) 20 years later.
b. Identify the two samples and whether they are independent or dependent. Explain.

c. compute McNemar’s test.
2. Practice Writing Interpretations for CI and ST for the cases in Chapter 10.

Example – Suppose that you were comparing the cholesterol levels of men and women. You want to know if there was a difference in the cholesterol levels of men and women.

Write interpretations for the following scenarios

- **p-value = 0.45**
  - With a p-value of 0.45, we have no statistically significance evidence that the population mean cholesterol levels for men and women were different.
  - (Other option)
  - With a p-value of 0.45 which is greater than alpha = 0.05, we fail to reject Ho and have no statistically significance evidence that the population mean cholesterol levels for men and women were different.

- **p-value = 0.08**
  - With a p-value of ____, we have ____ statistically significance evidence that the population mean cholesterol levels for men and women were different.

- **p-value = 0.03**
  - With a p-value of ____, we have ____ statistically significance evidence that the population mean cholesterol levels for men and women were different.

- **p-value = 0.0001**
  - With a p-value of ____, we have ____ statistically significance evidence that the population mean cholesterol levels for men and women were different.
  - (Other option)
  - With a p-value of 0.001 which is less than alpha = 0.05, reject Ho and have statistically significance evidence that the population mean cholesterol levels for men and women were different.
Example – Suppose that you were comparing the cholesterol levels of men(1) and women(2). You computed a 95% confidence interval to estimate the difference.

- 95% CI: (-25, 65)
  We are 95% confident that the population mean cholesterol level for men is between ________ to ________ than women.

- 95% CI: (25, 65)
  We are 95% confident that the population mean cholesterol level for men is between ________ to ________ than women.

- 95% CI: (-25, -75)
  We are 95% confident that the population mean cholesterol level for men is between ________ to ________ than women.

How does this change for means of dependent samples?
Suppose that you were testing to see if a weight loss program worked.

ST: You want to know if participants lost weight on average.

p-value = 0.02

CI: (2.5, 6.5)

How does this change for comparing two independent proportions?
Suppose that you were interested in determining if there was a difference in the population proportion of men and women who planned on voting in the next election.

p-value = 0.15

CI: (-0.23, 0.56)
10.8 Significance test for aspirin and cancer deaths study  In the study for cancer death rates, consider the null hypothesis that the population proportion of cancer deaths $p_1$ (for placebo) is the same as the population proportion $p_2$ for aspirin. The sample proportions were $\hat{p}_1 = 347/1,535 \approx 0.030$ and $\hat{p}_2 = 327/14,035 \approx 0.023$.

a. For testing $H_0: p_1 = p_2$ against $H_a: p_1 \neq p_2$, show that the pooled estimate of the common value $p$ under $H_0$ is $\hat{p} = 0.027$ and the standard error is 0.002.

b. Show that the test statistic is $z = 3.5$.

c. Find and interpret the P-value in context.
4. Randomization Tests

Ex.1

We are interested in seeing if there is a difference in text messages sent between in state and out of state students.

In state: 50 100 60 30 30 50 15 200 5
Out of State: 0 500 30 100 45

1. What would be the null and alternative hypothesis?

2. How do we simulate a randomization distribution?

3. Compute values of the sample statistic to create a randomization distribution.

4. Determine how likely it was to see a sample statistic like you did under the null.
We are interested in seeing if there is a difference in number of students that prefer studying in groups between men and women.

Out of 40 men, 5 prefer studying in groups.

Out of 43 women, 8 prefer studying in groups.

1. What would be the null and alternative hypothesis?

2. How do we simulate a randomization distribution?

3. Compute values of the sample statistic to create a randomization distribution.

4. Determine how likely it was to see a sample statistic like you did under the null.