Chapter 7

22. (a) \( \frac{6101}{9821} \) butter-side down = 0.621. Confidence interval: \( 0.612 < p < 0.631 \).

(b) The 95% confidence interval for \( p \) exclude 0.5, so 0.5 is not one of the most plausible values for \( p \).

26. If there is no preference, when we expect 1 in 5 people to choose the dog food \( (0.20) \), on average, whereas we observed \( \frac{2}{18} = 0.11 \). \( H_0: \) Dog food is chosen one time in 5, \( p = 0.2 \); \( H_A: \) Dog food is chosen at a frequency other than one time in 5, \( p \neq 0.20 \). Use number of people choosing dog food as our test statistic. \( P = 2 \Pr[2 \text{ or fewer}] = 2 (\Pr[0] + \Pr[1] + \Pr[2]) = 2 (0.271) = 0.542 \). Since \( P > 0.05 \), do not reject \( H_0 \). We cannot conclude that people prefer meats intended for humans.

Chapter 8

14. (a) \( H_0: \) Windows kill the same number of birds per time period at any angle.
\( H_A: \) Windows angled towards the ground kill a different number of birds per time period than windows at the vertical.

(b) \( \frac{30}{53} \) were killed by windows at the vertical, or 0.566.

(c) We can use a goodness of fit test for the null hypothesis.

(d) The null hypothesis implies windows at each angle should kill 33% of the birds.

\[
\begin{array}{ccc}
\text{window angle} & \text{observed deaths} & \text{expected deaths} \\
\hline
\text{(vertical)} & 30 & 17.67 \\
20 & 15 & 17.67 \\
40 & 8 & 17.67 \\
\hline
\text{Sum} & 53 & 53.01 \\
\end{array}
\]

\[
\chi^2 = 14.3
\]
We had three categories, no estimated parameters, so \( df = 2 \). \( \chi^2 = 14.3 > 13.92 \), the critical value for \( \alpha = 0.001 \), so \( P < 0.001 \) and we reject \( H_0 \). Window angle does influence bird mortality \( (P = 0.0008) \).

15. \( H_0 \): Number of deaths per regiment-year has a Poisson distribution. \( H_A \): Number of deaths per regiment-year does not have a Poisson distribution. The mean is 0.61 deaths per regiment-year. We must combine categories to avoid expected numbers of deaths per regiment year less than 1.

<table>
<thead>
<tr>
<th>Number of deaths</th>
<th>Observed</th>
<th>Expected</th>
<th>( \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>109</td>
<td>108.67</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>65</td>
<td>66.29</td>
<td>0.03</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>20.22</td>
<td>0.16</td>
</tr>
<tr>
<td>3+</td>
<td>4</td>
<td>4.82</td>
<td>0.11</td>
</tr>
<tr>
<td>Sum</td>
<td>200</td>
<td>200.00</td>
<td>( \chi^2 = 0.322 )</td>
</tr>
</tbody>
</table>

We have 4 categories, one estimated parameter (the mean), so 2 degrees of freedom. Our test statistic is less than 5.99, the critical value for \( \alpha = 0.05 \), so we do not reject \( H_0 \) \( (P = 0.96) \). Data on death by horse is consistent with the Poisson distribution.