Sect. 9 – 6, #12:

a) State Hypotheses and Claim

\( H_0: \ p_1 = p_2 \quad H_1: \ p_1 \neq p_2 \)  

Claim: \( H_1 \)

b) Summarize data

Test Two Proportions:

<table>
<thead>
<tr>
<th></th>
<th>DL</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 )</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>( X_1 )</td>
<td>30</td>
<td>24</td>
</tr>
<tr>
<td>( \hat{p}_1 )</td>
<td>0.3</td>
<td>0.24</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>P-value test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ z = \left( \hat{p}_1 - \hat{p}_2 \right) - (p_1 - p_2) \]

\[ \sqrt{pq \left( \frac{1}{n_1} + \frac{1}{n_2} \right)} \]

where: \( \bar{p} = \frac{X_1 + X_2}{n_1 + n_2}, \hat{p}_1 = \frac{X_1}{n_1}, \quad \bar{q} = 1 - \bar{p}, \quad \hat{p}_2 = \frac{X_2}{n_2} \)

\[ \bar{p} = \frac{30 + 24}{100 + 100} = \frac{54}{200} = 0.27 \quad \rightarrow \quad \bar{p} = 0.73 \]

\[ z = \sqrt{\frac{0.27 \cdot 0.73 \cdot \frac{1}{100} + \frac{1}{100}}{0.0638}} = \frac{0.06}{0.0638} = 0.96 \]

d) Calculate P-value: Two tail test: \( P(z=0.96) = 1 - 0.3316 = 0.1185 \quad \rightarrow \quad P-value = 2 \times 0.1185 = 0.337 \)

e) Decision (with Justification): \( P-value = 0.337 > 0.02 = \alpha \quad \rightarrow \quad Do \ Not \ Reject \ H_0 \)

f) Summary: There is not enough evidence to support the claim that the proportions are different.
Sect. 9 – 6, #14:

a) State Hypotheses and Claim

\[ H_0 : p_1 = p_2 \quad H_1 : p_1 < p_2 \]

Claim: \( H_1 \)

b) Summarize data

Test Two Proportions:

<table>
<thead>
<tr>
<th>High School</th>
<th>College</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 = 50 )</td>
<td>( n_2 = 75 )</td>
</tr>
<tr>
<td>( X_1 = 8 )</td>
<td>( X_2 = 20 )</td>
</tr>
<tr>
<td>( \hat{p}_1 = 0.16 )</td>
<td>( \hat{p}_2 = 0.267 )</td>
</tr>
</tbody>
</table>

\[ \alpha = 0.05 \]

P-value test

c) Calculate Test Value:

\[
z = \left( \frac{\hat{p}_1 - \hat{p}_2}{{\sqrt{pq}} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)} \right), \quad \text{where: } \ p = \frac{X_1 + X_2}{n_1 + n_2}, \ \hat{p}_1 = \frac{X_1}{n_1}, \ \hat{q} = 1 - \hat{p}, \ \hat{p}_2 = \frac{X_2}{n_2}
\]

\[
\bar{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{8 + 20}{50 + 75} = \frac{28}{125} = 0.224 \rightarrow \bar{p} = 0.776
\]

\[
z = \frac{0.16 - 0.267}{\sqrt{(0.224) (0.776) \left( \frac{1}{50} + \frac{1}{75} \right)}} = -1.41
\]

d) Calculate P-value: Left tail test: \( P(z < -1.41) = 0.0793 \)

e) Decision (with Justification): \( P-value = 0.0793 > 0.05 = \alpha \rightarrow \) Do Not Reject \( H_0 \)

f) Summary: There is not enough evidence to support the claim that the proportions of college freshmen who have their own cars is higher than the proportion of high school seniors who have cars.
Sect. 9 Review, #10:

a) State Hypotheses and Claim

\[ H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2 \]

Claim: \( H_1 \)

b) Summarize data

Test Two means:

<table>
<thead>
<tr>
<th></th>
<th>RI</th>
<th>NY</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 )</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>( \bar{X}_1 )</td>
<td>35270</td>
<td>29512</td>
</tr>
<tr>
<td>( s_1 )</td>
<td>3256</td>
<td>1432</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

Test of two means with \( \sigma \)'s not known and one n (n1 <30) and \( \sigma \)'s assumed not equal (given)

c) Calculate Test Value:

\[
t = \frac{\bar{X}_1 - \bar{X}_2 - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{35270 - 29512 - 0}{\sqrt{\frac{3256^2}{15} + \frac{1432^2}{30}}} = 6.54
\]

d) Calculate CV and CR: CV = \( \pm 2.624 \), CR: \( t < -2.624 \) or \( t > 2.624 \)

e) Decision (with Justification): Test Value in CR \( \Rightarrow \) Reject \( H_0 \)

f) Summary: There is enough evidence to support the claim that there is a difference in the teachers' salaries.

g) Calculate CI:

\[
E = t_{\alpha/2} \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \quad \text{with} \quad d.f. = \min(n_1 - 1, n_2 - 1) = \min(14, 29) = 14
\]

\[
t_{\alpha/2} = 2.624
\]

\[
E = 2.624 \cdot \sqrt{\frac{3256^2}{15} + \frac{1432^2}{30}} = 2310
\]

CI: \( (\bar{X}_1 - \bar{X}_2) - E < \mu_1 - \mu_2 < (\bar{X}_1 - \bar{X}_2) + E \) \( \Rightarrow \)

CI: 35270 - 29512 - 2310 < \( \mu_1 - \mu_2 \) < 35270 - 29512 + 2310 \( \Rightarrow \)

CI: 2448 < \( \mu_1 - \mu_2 \) < 8068
a) State Hypotheses and Claim

\[ H_0: \, p_1 = p_2 \quad H_1: \, p_1 \neq p_2 \]

Claim: \( H_1 \)

b) Summarize data

Test Two Proportions:

<table>
<thead>
<tr>
<th>SP</th>
<th>Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 = 365 )</td>
<td>( n_2 = 365 )</td>
</tr>
<tr>
<td>( X_1 = 207 )</td>
<td>( X_2 = 166 )</td>
</tr>
<tr>
<td>( \hat{p}_1 = 0.567 )</td>
<td>( \hat{p}_2 = 0.455 )</td>
</tr>
</tbody>
</table>

\[ \alpha = 0.02 \]

Traditional Method

c) Calculate Test Value:

\[
z = \frac{\left( \hat{p}_1 - \hat{p}_2 \right) - (p_1 - p_2)}{\sqrt{\frac{pq}{n_1} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}
\]

\[ \bar{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{207 + 166}{365 + 365} = \frac{373}{730} = 0.511 \rightarrow \bar{p} = 0.489 \]

\[
z = \frac{0.567 - 0.455 - 0}{\sqrt{(0.511)(0.489)\left(\frac{1}{365} + \frac{1}{365}\right)}} = 3.03
\]

d) Calculate CV: \( \pm 2.33 \)

e) Decision (with Justification): Test value in CR \( \rightarrow \) Reject \( H_0 \)

f) Summary: There is enough evidence to support the claim that the proportions of foggy days are different.

g) \[ E = z_{\alpha/2} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} \rightarrow 2.33 \sqrt{\frac{(0.567)(0.433)}{365} + \frac{(0.455)(0.545)}{365}} = 0.086 \]

h) CI: \( \left( \hat{p}_1 - \hat{p}_2 \right) - E < p_1 - p_2 < \left( \hat{p}_1 - \hat{p}_2 \right) + E \rightarrow (0.567 - 0.455) - E < p_1 - p_2 < (0.567 - 0.455) + E \rightarrow 0.112 - 0.086 < p_1 - p_2 < 0.112 + 0.086 \rightarrow 0.026 < p_1 - p_2 < 0.198 \]