Consider the sample proportions

\[ \hat{p}_1 = \frac{x_1}{n_1} \quad \text{and} \quad \hat{p}_2 = \frac{x_2}{n_2} \]

where \( n_1 \) and \( n_2 \) are the sample sizes and \( x_1 \) and \( x_2 \) are the number of "successes" in the two samples from populations 1 and 2, respectively.

When all of the following conditions are satisfied,

\[ n_1 \cdot \hat{p}_1 \geq 10 \quad \text{and} \quad n_1 \cdot (1 - \hat{p}_1) \geq 10 \]
\[ n_2 \cdot \hat{p}_2 \geq 10 \quad \text{and} \quad n_2 \cdot (1 - \hat{p}_2) \geq 10 \]

Then, a \((1 - \alpha)100\%\) confidence interval for \( p_1 - p_2 \) can be approximated as

\[ (\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}_1 \cdot (1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2 \cdot (1 - \hat{p}_2)}{n_2}} \]

**Example 1:**

In a comparative study of two new drugs, A and B, 120 patients were treated with drug A and 150 patients with drug B, and the following results were obtained.

<table>
<thead>
<tr>
<th></th>
<th>Drug A</th>
<th>Drug B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cured</td>
<td>78</td>
<td>111</td>
</tr>
<tr>
<td>Not cured</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>150</td>
</tr>
</tbody>
</table>

Construct a 95\% confidence interval for the difference in the cure rates of the two drugs.

**Step 0:** Check the assumptions

**Step 1:** Compute the \((1 - \alpha)100\%\) confidence interval