Two Population Proportions

Confidence Interval:

- **Final Answer:** **Lower Value** $< P_1 - P_2 <$ **Upper Value**
- **Margin of Error:** $E = \dfrac{\textbf{C.I. Upper Value} - \textbf{C.I. Lower Value}}{2}$
- **Confidence Interval formula:** $(\hat{P}_1 - \hat{P}_2) - E < P_1 - P_2 < (\hat{P}_1 - \hat{P}_2) + E$
- **Margin of error formula:** $E = Z_{\alpha/2}\sqrt{\dfrac{\hat{P}_1(1-\hat{P}_1)}{n_1} + \dfrac{\hat{P}_2(1-\hat{P}_2)}{n_2}}$
- **Pooled Sample Proportion:** $\bar{P} = \dfrac{x_1 + x_2}{n_1 + n_2}$
- **Using TI:** **STAT** > **TESTS** > **2-PropZInt** > **ENTER**

Critical Value(s):

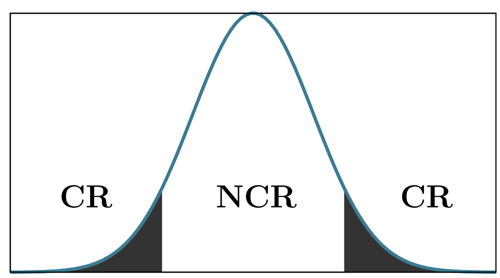
- **Using TI Calculator** **PRGM** > **ZVAL** > **ENTER** **(Twice)**

Hypothesis Testing:

Two–Tail Test:

$H_0 : P_1 = P_2$

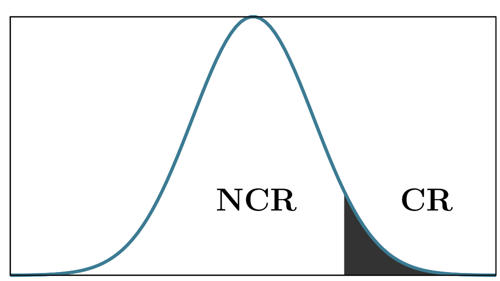
$H_1 : P_1 \neq P_2$



Right–Tail Test:

$H_0 : P_1 \leq P_2$

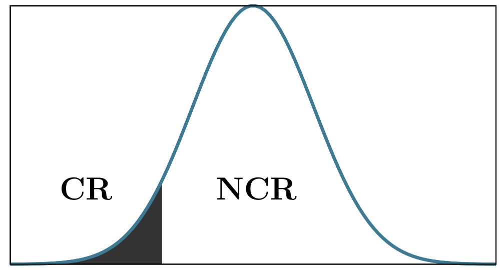
$H_1 : P_1 > P_2$



Left–Tail Test:

$H_0 : P_1 \geq P_2$

$H_1 : P_1 < P_2$



Computed Test Statistic & P–Value:

- **Using TI Calculator** **STAT > TESTS > 2-PropZTest**
- **Using formula for C.T.S.:** $$z = \frac{(\hat{p}_1 - \hat{p}_2) - (P_1 - P_2)}{\sqrt{\frac{\bar{p}_1(1-\bar{p}_1)}{n_1} + \frac{\bar{p}_1(1-\bar{p}_1)}{n_2}}}$$
- **Using normalcdf(for P–Value:** **2ND > VARS > normalcdf(> ENTER**

Example: Consider the chart below:

Sample 1	Sample 2
$x_1 = 50$	$x_2 = 40$
$n_1 = 84$	$n_2 = 76$

- Find 99% confidence interval for the difference of two population proportions.

  Solution:
  Using 2-PropZInt, we get $-0.133 < P_1 - P_2 < 0.271$

- Test the claim that $P_1 > P_2$.

  Solution:
  Here we have $H_0 : P_1 \leq P_2, \quad H_1 : P_1 > P_2$ RTT, Claim

  With no α, using ZVAL, we get C.V. $Z = 1.645$

  Using 2-PropZTest, we get C.T.S. $Z = 0.878$, P-Value $p = 0.190$

  Final Conclusion: Reject the Claim