§7.1 Estimating a population Proportion

Goal: Create a Confidence Interval for a population proportion.

Requirements

1. Good Sample SRS
   Simple Random Sample
   Statistically Reliable Sample - No Bias
2. Binomial
   i) n = # trials
   ii) p = prob. Success
   iii) Independent
   iv) Two Outcomes
3. $np > 5$, $nq > 5$ so Normal is a good approximation to Binomial.

$\mu = np$ = Ex. # of Successes = # yes

nq = # of failures = # No

Spring Break $X = 11$ = # of people going out of Town

$n = 24$

Point estimate $= \hat{p} = \frac{11}{24} = .46 = .458 =$ Sample Statistic

Population = All SRJC Students

What proportion of SRJC students are going out of town?

Best estimate is .46

How good is that estimate?

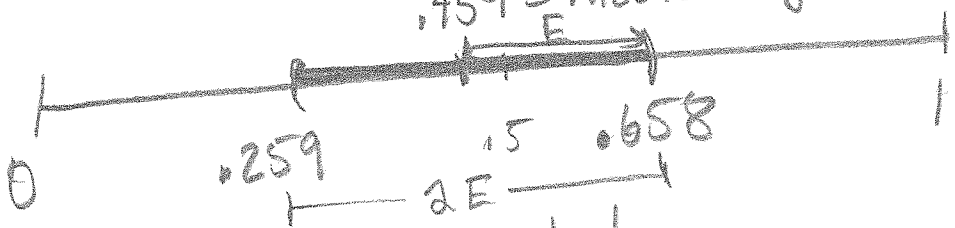
A 1-PropZInterval or a one proportion Confidence Interval is an interval of values for which we are CL = 95% (is the confidence level) confident contains the True proportion of SRJC students who will leave town.

$CI = (.259, .658) = (a, b)$

the True proportion is between 26% and 66% will leave Town

There are 3 ways to write a Confidence Interval

① (.259, .658) Interval Notation



② $.259 < \hat{p} < .658$ Inequality

↑ Population proportion

③ $\hat{p} \pm E = .458 \pm E$

E = the Margin of Error

$\hat{p} = \frac{LB + UB}{2} = \frac{.259 + .658}{2} = .459$

$E = UB - \hat{p} = .658 - .459 = .199$

$E = \frac{UB - LB}{2} = .199$

As n increases, E decreases.

How do we find E? if given $n = 24$ $x = 11$

CLT for Proportions Gives $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$

The Standard Error for Sample = $\sqrt{\frac{\hat{p}\hat{q}}{n}}$

95% CI $\Rightarrow$ $Z_{.05/2} = \text{invnorm}(1 - .05/2, 0, 1)$

$= 1.96 = Z_{.025}$

"Z sub Alpha over 2"

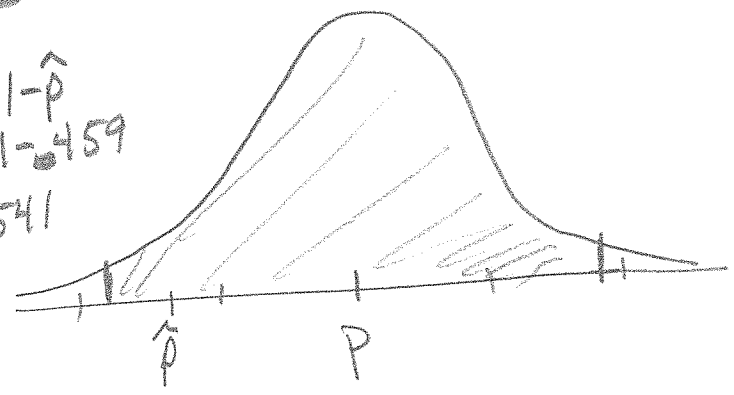
$\alpha = 1 - CL = 1 - .95 = .05$

$\alpha/2 = \frac{.05}{2} = .025$

$\hat{q} = 1 - \hat{p}$

$= 1 - .459$

$\hat{q} = .541$



$$E = Z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$E = 1.96\sqrt{\frac{.459 \cdot .541}{24}}$$

$$\hat{p} = \frac{x}{n} = \frac{11}{24}$$

$$E = .199$$