

18.2 Let p_1 = proportion of Republican voters in first state
 p_2 = proportion of democratic Republican voters in second
 p_1 = prop of Republicans in sample from first state
 p_2 = prop of Republicans in sample from second state
 n_1 = voters from first state (sample) = 100
 n_2 = voters from second state (sample) = 100

1. Is sample size enough to model differences
 $n_1 p_1 = 100 \times 0.52 = 52$; $n_1(1-p_1) = 100 \times 0.48 = 48$; $n_2 p_2 = 100 \times 0.47 = 47$
 $= 53$; $n_2(1-p_2) = 100 \times 0.53 = 53$ are greater than 10, so sample size is enough.

2. Mean of the difference in sample proportions
 $E(p_1 - p_2) = 0.52 - 0.47 = 0.05$

3. Standard deviation of the difference

$$\sigma_d = \sqrt{\frac{p_1(1-p_1)}{n_1}} + \sqrt{\frac{p_2(1-p_2)}{n_2}} = \sqrt{\frac{0.52 \times 0.48}{100}} + \sqrt{\frac{0.47 \times 0.53}{100}}$$

$$= 0.0706$$

4. We need to find probability of $p_1 < p_2$. This is equal to $p_1 - p_2 < 0$. We need to transform $p_1 - p_2$ into Z-Score.

$$Z_{p_1 - p_2} = \frac{X - \mu_{p_1 - p_2}}{\sigma_d} = \frac{0 - 0.05}{0.0706} = -0.7082$$

probability of Zscore less than or beign -0.7082 is

0.24