**Problem​ ​Statement​**

In one state, 52% of the voters are Republicans, and 48% are Democrats. In a second state, 47% of the voters are Republicans, and 53% are Democrats. Suppose a simple random sample of 100 voters are surveyed from each state. What is the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state?

**Solution**

P1 = the proportion of Republican voters in the first state,

P2 = the proportion of Republican voters in the second state,

p1 = the proportion of Republican voters in the sample from the first state,

p2 = the proportion of Republican voters in the sample from the second state.

The number of voters sampled from the first state (n1) = 100

the number of voters sampled from the second state (n2) = 100.

n1P1 = 100 \* 0.52 = 52, n1(1 - P1) = 100 \* 0.48 = 48,

n2P2 = 100 \* 0.47 = 47, and n2(1 - P2) = 100 \* 0.53 = 53

the mean of the difference in sample proportions: E(p1 - p2) = P1 - P2 = 0.52 - 0.47 = 0.05.

σd = sqrt{ [ P1(1 - P1) / n1 ] + [ P2(1 - P2) / n2 ] }

σd = sqrt{ [ (0.52)(0.48) / 100 ] + [ (0.47)(0.53) / 100 ] }

σd = sqrt (0.002496 + 0.002491) = sqrt(0.004987) = 0.0706

Zp1 - p2 = (x - μp1 - p2) / σd = (0 - 0.05)/0.0706 = -0.7082

P(z <=0.7082) = 0.24

the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state is 0.24.