**Problem​ ​Statement​ ​1:**

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:

State1, P(r1) = 52% = 0.52

P(d1) = 48% = 0.48

State2, P(r2) = 47% = 0.47

P(d2) = 53% = 0.53

Sample Size n = 100

Difference in sample proportions = P(r1) – P(r2) = 0.52 – 0.47 = 0.05

Standard Deviation of the difference = √(P(r1)P(d1) / n + P(r2)P(d2) / n)

= √((0.52\*0.48)/100 + (0.47\*0.53)/100)

= √ (0.002496 + 0.002491)

= 0.0706

To find the Probability of p(r1) < P(r2), or Probability of P(r1) > P(r2), if we transform the random variable,

X would be 0, as the transformation of P(r1) – P(r2) = 0

Z(p(r1)-P(r2)) = (X – difference in sample proportions) / (Standard Deviation of proportions)

Z = 0 – 0.05 / 0.0706 = -0.7082

Going by the Z table, the p(z) = 0.2420

Hence, probability of P(r1) > P(r2) = 0.2420