# Problem Statement 1:

Blood glucose levels for obese patients have a mean of 100 with a standard deviation of

15. A researcher thinks that a diet high in raw cornstarch will have a positive effect on

blood glucose levels. A sample of 36 patients who have tried the raw cornstarch diet

have a mean glucose level of 108. Test the hypothesis that the raw cornstarch had an

effect or not.

## Solution:

The population mean (µ) = 100

The population standard deviation (sigma) = 15

Let us perform a two-tailed z-test (as the expectation is to do a hypothesis test that the raw corn starch had an effect or not)

H0: Corn starch has no effect in blood glucose level (µ = µ0)

H1: Corn starch has an effect in blood glucose level (µ ≠ µ0)

Sample count n = 36

Sample mean xbar = 108

Standardization parameter Z = (xbar - µ)/(sigma/√n)

=(108-100)/(15/√36)

=3.2

Let us consider the significance level as 5%. Hence the critical z value at 5% significance level for a two tailed test is ±1.96

Hence, we need to reject the null hypothesis. This means that the raw corn starch has an effect on blood glucose level at 5% significance level.

# Problem Statement 2:

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:

The goal is to find the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state. This means we need to get the proportion of calculated z value for republicans.

The problem contains % values in each state. Let us find the proportions of each of them considering n1 = 100 and n2 = 100.

Standardization parameter Z = (Xbar - µ)/standard\_error

**Xbar**: Here it is the difference in proportion between 2 states and it is 0.

**µ:** Here it is the difference in proportion between republicans = 0.52 – 0.47 = 0.05

**standard\_error:** The problem is to deal with two groups, we can use the below formula for standard error:

sqrt(p1(1-p1)/n1+p2(1-p2)/n2)

where p1 = proportion of republicans in state1 = 0.52

p2 = proportion of republicans in state2 = 0.47

Z = (0-0.05)/sqrt((0.52\*0.48/100)+(0.47\*0.53/100)) = -0.70803

The proportion found in Z table for the calculated Z value is 0.23885. Hence, the probability of survey to show a greater percentage of Republican voters in the second state than in the first state is 0.24.

# Problem Statement 3:

You take the SAT and score 1100. The mean score for the SAT is 1026 and the standard deviation is 209. How well did you score on the test compared to the average test taker?

## Solution:

The goal is to find the probability of calculated z score.

Xbar = 1100

µ = 1026

standard\_deviation = 209

Standardization parameter Z = (Xbar - µ)/standard\_deviation = (1100-1026)/209 = 0.354067

The proportion found in Z table for the calculated Z value is 0.63683. This means that 64% students scored below the person.