**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 glucoselevels. 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:**

Since the population standard deviation is known, Z-test is used.

H0: μ=100

H1: μ≠100

Let α=0.05

Z = (x̄ – μ) / (σ / √n)

Z0.05=1.96 (two tailed)

Z= (140-100)/ (15/√30) ​=14.61

Since Z=14.61> 1.96 , we reject the null hypothesis and conclude that the raw constant had an effect at 5% level of significance.

**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:**

Let 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, and p2 = the proportion of Republican voters in the sample from the second state. The number of voters sampled from the first state (n1) = 100, and the number of voters sampled from the second state (n2) = 100.

The solution involves four steps.

* Make sure the sample size is big enough to model differences with a normal population. Because 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 are each greater than 10, the sample size is large enough.
* Find the mean of the difference in sample proportions: E(p1 - p2) = P1 - P2 = 0.52 - 0.47 = 0.05.
* Find the standard deviation of the difference.
  + 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
* Find the probability. This problem requires us to find the probability that p1 is less than p2. This is equivalent to finding the probability that p1 - p2 is less than zero. To find this probability, we need to transform the random variable (p1 - p2) into a [z-score](https://stattrek.com/statistics/dictionary.aspx?definition=z-score). That transformation appears below.
  + z p1 - p2 = (x - μ p1 - p2 ) / σd = = (0 - 0.05)/0.0706 = -0.7082

Using Stat Trek's [Normal Distribution Calculator](https://stattrek.com/Tables/Normal.aspx), we find that the probability of a z-score being -0.7082 or less is 0.24.

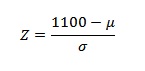
Therefore, the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state is 0.24.

**Problem Statement 3:**

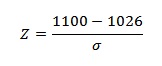
You take the SAT and score 1100. The mean score for the SAT is 1026 and the standard deviation is 209. How well did you score on the test compared to the average test taker?

**Solution:**

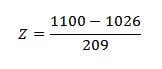
* Write your X-value into the z-score equation. For this sample question the X-value is your SAT score, 1100.



* Write the mean, μ, into the z-score equation.



* Write the standard deviation, σ into the z-score equation.



* Calculate the answer using a calculator

(1100 – 1026) / 209 = .354.

This means that your score was .354 std devs above the mean.