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.

```
In [2]: import scipy.stats as sts
        from scipy.stats import norm
        import math
        import numpy as np

        pop_mean = 100
        pop_std = 15
        n = 36
        sample_mean = 108
        alpha = 0.05

        SE = pop_std/math.sqrt(n)
        Z = (sample_mean-pop_mean)/SE

        print("Z score is ",Z)

        print("\nCumulative probability for Z score 3.20 is 0.9993");

        print("\nThe probability of having value less than 108 is 0.9993 and more than or equals to
         108 is (1 - 0.9993) = 0.0007.");

        print("\nWe reject null hypothesis because the probability of having mean glucose level more
        than or equals to 108  is 0.0007 which is  less than 0.05.")
```

```
Z score is  3.2

Cumulative probability for Z score 3.20 is 0.9993

The probability of having value less than 108 is 0.9993 and more than or equals to 108 is (1
- 0.9993) = 0.0007.

We reject null hypothesis because the probability of having mean glucose level more than or e
quals to 108  is 0.0007 which is  less than 0.05.
```

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?

```
In [3]: #Total sample voter from state 1
        n1 = 100
        #Total sample voter from state 2
        n2 = 100
        #Republicans from state 1
        R1 = 0.52
        #Republicans from state 2
        R2 = 0.47
        #Democrats from state 1
        D1 = 0.48
        #Democrats from state 2
        D2 = 0.53

        mu = R1 - R2

        std = math.sqrt(((R1 * D1 ) / n1) + ((R2 * D2) /n2))

        #This problem requires us to find the probability that p1 is less than p2.
        #This is equivalent to finding the probability that R1 - R2 < 0.
        x = 0
        #To find this probability, we need to transform the random variable (R1 - R2) into a z-scor
        e.
        #That transformation appears below.

        Z_R1_R2 = ( x - mu)/std

        print("mu: ",mu)
        print("std: ",std)
        print("Z_p1_p2 : ",Z_R1_R2)

        print("\nFrom Z table we find that the probability of a z-score being -0.7082 or less is 0.2
        4.")

        print("\nTherefore, the probability that the survey will show a greater percentage of Republ
        ican voters in the second state than in the first state is 0.24")
```

```
mu:  0.050000000000000044
std:  0.07061869440877536
Z_p1_p2 :  -0.7080278164104213

From Z table 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 voter
s 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?

```
In [4]: #The z score tells you how many standard deviations from the mean your score is
        x = 1100 #
        mu = 1026 # Population Mean
        sd = 209 #population standard deviation
        z = ( x - mu)/sd
        print("Z Score : ",z)
        #the above calculation shows that my score is 0.35 standard deviations above the mean
        print("My Score is in the range {} - {}  with a  zscore {:.2f}".format(mu - sd,mu + sd,z))
```

```
Z Score :  0.35406698564593303
My Score is in the range 817 - 1235  with a  zscore 0.35
```