Assignment-3

① Blood glucose levels for obese patients have mean of 100 with a std deviation of 15. A researcher thinks that a diet high in raw constarch will have a positive effect on blood glucose levels. A sample of 36 patients who have tried the raw constarch diet have a mean glucose levels of 108. Test the hypothesis that the raw constarch had an effect or not.

Ans: $\mu = 100 \quad \sigma = 15 \quad n = 36 \quad \bar{x} = 108$

H_0: $\mu = 100$ (Raw constarch had no effect) (two tail test).

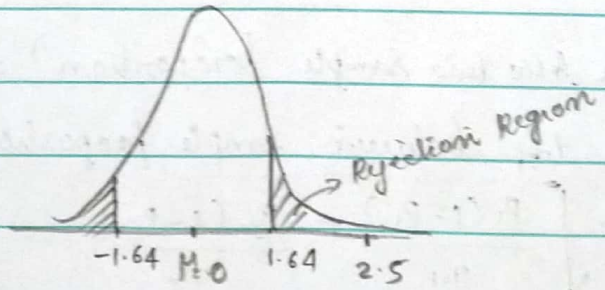
H_1: $\mu \neq 100$.

$$Z = \frac{\bar{x} - \mu}{SE} \qquad SE = \frac{\sigma}{\sqrt{n}} = \frac{15}{\sqrt{36}} = \underline{\underline{2.5}}$$

$$Z_{(stat)} = \frac{108 - 100}{2.5} = \underline{\underline{3.2}}$$

Let significance level 5%, then $\alpha = 0.05$

$$Z_{Table}\left(\frac{\alpha}{2} = 0.025\right) = -1.64$$



Reject Null hypothesis (H_0)

Conclusion: Raw constarch had an effect blood glucose levels.

(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 second state than in first state?

State - 1	State 2	
Republicans - 52% ✓	47% ✓	$\Rightarrow M(p_1) = 0.52 \quad (P_1)$
Democrats - 48%	53%	$M(p_2) = 0.47 \quad (P_2)$

$n_1 = 100$

$n_2 = 100$

To find probability that $p_1 < p_2$ (i.e., $p_1 - p_2 < 0$), transform random variable $p_1 - p_2$ into z-score.

$$Z_{p_1-p_2} = \frac{X - M_{p_1-p_2}}{\sigma_d}$$

$M_{p_1-p_2}$ (Mean difference btw two sample proportions) $= 0.52 - 0.47 = 0.05$

σ_d (Std deviation of diff: between sample proportions)

$$= \sqrt{\frac{P_1(1-P_1)}{n_1} + \frac{P_2(1-P_2)}{n_2}}$$

$$= \sqrt{\left(\frac{0.52 \times 0.48}{100} + \frac{0.47 \times 0.53}{100}\right)} = 0.07$$

Ztable

$$Z_{p_1-p_2} = \frac{0 - 0.05}{0.007} = -0.708 \text{ (Ztable)} \quad \left\{ \begin{matrix} -0.7 + \\ .01 \end{matrix} \right.$$

$$= 0.238$$

$$= \underline{\underline{0.24}}$$

Probability = 24%

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

$\bar{x} = 1100$

$M = 1026$

$\sigma = 209$

$$Z = \frac{\bar{x} - M}{\sigma} = \frac{1100 - 1026}{209} = \underline{\underline{0.354}}$$

$P(Z \leq 0.354) = 0.63683 = 63.86\%$

$P(Z > 0.354) = 1 - 0.6368 = 0.3632 = 36.32\%$

Conclusion: My SAT Score is 0.354 above standard mean (Average) and 63.86% students scored less than me.