STATISTICS ASSIGNMENT-3

Q.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.

here, population standard deviation (15) is known & the sample size (36) is large ≥ 30, Thus, normal Distribution is used.

H_0 : $\mu = 100$

H_1 : $\mu \neq 100$

Assuming 95% confidence Interval $\therefore$ CV, $z_{0.025} = 1.96$

$$\text{Test Statistics} = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \Rightarrow \frac{108-100}{15/\sqrt{36}} \Rightarrow \frac{8 \times 6^2}{15}$$

$$\Rightarrow 3.5$$

$\therefore$ the calculated statistics 3.5 is greater than the critical value, 1.96, we reject the null hypothesis & conclude that the raw cornstarch had an effect on blood glucose level.

STATISTICS ASSIGNMEN-3

Q.2. In one state, 52% of the voters are Republicans, and 48% are Democrats. In a second state, 47% of the voters are Republican & 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?

Sample Proportion of Republicans from the state One $(\hat{p}_1) = 0.52$

Sample proportion of Republicans from the state Two $(\hat{p}_2) = 0.47$.

Let n_1 & n_2 be sample sizes from state One & state Two, respectively,

Thus $n_1 = n_2 = 100$.

Let p denote the difference in proportion for the 2 states. The sample difference & std. deviation in the proportion of Republicans in both states is compiled as follows:—

$$\hat{p} = \hat{p}_1 - \hat{p}_2 \Rightarrow 0.52 - 0.47 \Rightarrow 0.05$$

$$S_p = \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \Rightarrow \sqrt{\frac{0.52(1-0.52)}{100} + \frac{0.47(1-0.47)}{100}}$$

$$= 0.070619$$

To have a greater percentage of Republican voters in the second state than in the 1st state, the difference should be less than zero.

Hence, the value of the difference in the proportion corresponds to zero, that is $p = 0$.

Thus,

$$Z = \frac{p - \hat{p}}{s_p}$$

$$= \frac{0 - 0.05}{0.070619}$$

$$= -0.708028$$

From, the Standard Normal table, the value & -0.708028 corresponds to 0.239464.

Thus, the required probability is 0.239464.

STATISTICS ASSIGNMENT-3

Q.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?

Step 1: X-Value in Z-score equation, here is 1100

$$Z = \frac{X\text{-value} - \mu}{\sigma} \Rightarrow \frac{1100 - 1026}{\sigma}$$

here $\mu = 1026$ & $\sigma = 209$

Step 2 Substituting these values in Z-score Eq^n

$$Z = \frac{1100 - 1026}{209}$$

$$= 0.354$$

Step 3: Look up your z-value in z-table to see what percentage of test takers scored below you.

A z-score of 0.354 is $0.1368 + 0.5000$

$\Rightarrow 0.6368$ or **63.68%**

*The z-table scores for the RIGHT of the mean, Therefore, we have to add 0.500 for all the area LEFT of the mean.