A car company believes that the percentage of citizens in city ABC that owns a vehicle is 60% or less. A sales manager disagrees with this. He conducted a hypothesis testing surveying 250 residents & found that 170 residents responded yes to owning a vehicle.

a. State the null & alternate hypothesis.
b. At a 10% significance level, is there enough evidence to support the idea that vehicle owner in ABC city is 60% or less.

Solution:-

Null Hypothesis (H_0) : p_0 <= 60%

Alternate Hypothesis (H_1) : p_0 > 60%

p_0 = 60% = 0.6

q_0 = 1 - p_0 = 0.4

x = 170, n = 250

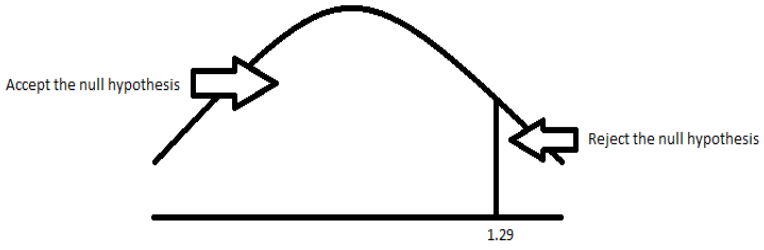
$\hat{p} = \frac{x}{n} = \frac{170}{250}$ = 0.68

α = 10% = 0.1

It will be a Z - Test as sample size is greater than 30 (i.e. 250 > 30). And it will be one - tail as sales manager believes that more than 60% of citizens in city ABC owns a vehicle whereas a car company believes it is 60% or less.

Area for the rest of the part = 1 – 0.1 = 0.9

After checking in Z - score table, value of $Z_{0.9}$ = 1.29



Formula for Z - test with proportion:-

$$\frac{\hat{p} - p_0}{\sqrt{\frac{p_0 * q_0}{n}}}$$

Putting the respective values in the equation and after calculation, we get:-

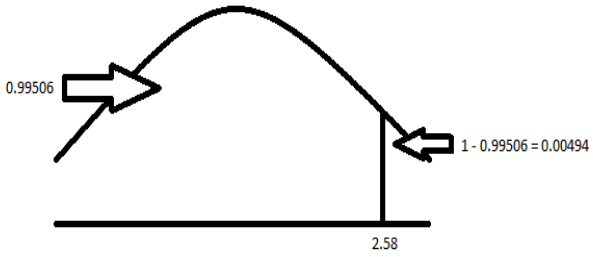
Z_{test} = 2.58

Here, 2.58 > 1.29. Hence, we can conclude that we can reject the null hypothesis. That means, the percentage of citizens in city ABC owning a vehicle is more than 60%.

Using p-value,

From the Z - score table, area of the body is 0.99506

p - value = 1 – 0.99506 = 0.00494



Here p - value is less than α (i.e. 0.00494 < 0.1). Hence, we can conclude that we can reject the null hypothesis. That means, the percentage of citizens in city ABC owning a vehicle is more than 60%.