Hypothesis Testing And Statistical Analysis

① Z Test
② t Test
} ⇒ Average ⇒ Z table / t table → Z score And p value

③ CHI SQUARE ⇒ Categorical Data

④ ANNOVA ⇒ Variance

Z test : i) Population std ii) $n \geq 30$

1) The average heights of all residents in a city is 168cm. A doctor believes the mean to be diffuent. He measured the height of 36 individuals and found the average height to be 169.5 cm. with a $\sigma = 3.9$

(a) State null and Alternate Hypothesis

(b) At a 95% confidence level, is there enough evidence to reject the null hypothesis.

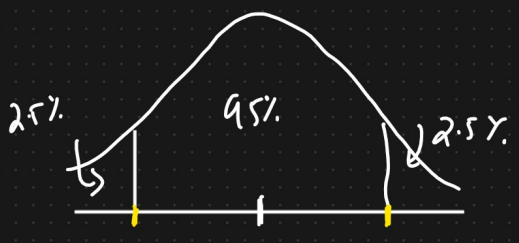
Ans) $\mu = 168cm$, $\sigma = 3.9$, $n = 36$ $\bar{x} = 169.5cm$

a) Null Hypothesis H_0 $\mu = 168cm$

b) Alternate Hypothesis H_1 $\mu \neq 168cm$ { 2 Tail Test }

c) C.I = 0.95 $\alpha = 1 - 0.95 = 0.05$

Decision Boundary



① Z test
② p value

$1 - 0.25 = 0.9750$

−1.96 168 +1.96

$$Z\text{-score} = \frac{x_i - \mu}{\sigma}$$

d) Statistical Analysis

$$Z.test = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$\sigma/\sqrt{n}$

$$= \frac{169.5 - 168}{3.9/\sqrt{36}} = 2.31$$

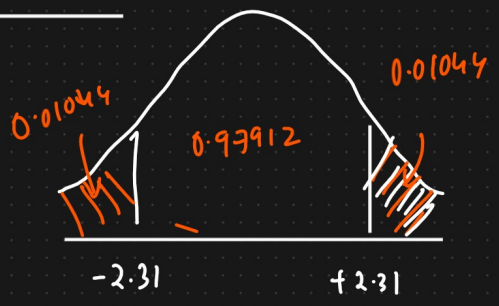
If Z-test value is less than −1.96 or greater +1.96 We Reject the Null Hypothesis

Else

We Accept Null Hypothesis

$2.31 > +1.96$ {We Reject the Null Hypothesis}.

② P-value



1 − Area under the curve of 2.31

1 − 0.98956

=

p value = 0.01044 + 0.01044 = 0.02088//.

if P-value < Significance

0.02088 < 0.05 {Reject the Null Hypothesis}

② A factory manufactures bulbs with a average warranty of 5 years with standard deviation of 0.50. A worker believes that the bulb will malfunction in less than 5 years. He tests a sample of 40 bulbs and find the average time to be 4.8 years.

(a) State null and alternate hypothesis

(b) At a 2% significance level, is there enough evidence to support the idea that the warranty should be revised?

Ans) $\mu = 5 \quad \sigma = 0.50 \quad n = 40 \quad \bar{x} = 4.8$.

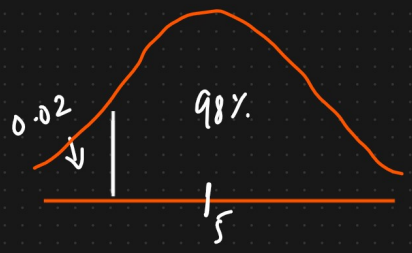
① Null Hypothesis $H_0 : \mu = 5$

② Alternate Hypothesis $H_1 : \mu < 5$ {1 Tail Test}

③ Decision Boundary

C.I = 0.98

$\alpha = 1 - 0.98 = 0.02$.

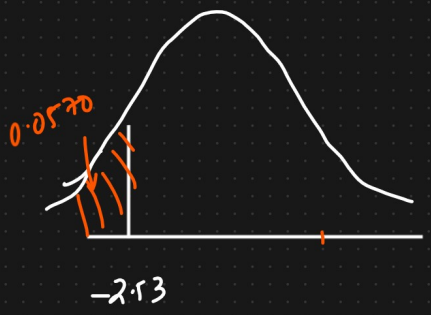


④ P value

$$Z\text{-test} = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{4.8 - 5}{0.50/\sqrt{40}}$$

$$Z\text{-test} = -2.53$$



Area Under the Curve of -2.53

Z value is : 0.00570

P-value : 0.00570.

if p-value < Significance

0.05 70 < 0.02 => False

{We accept the Null Hypothesis}

Conclusion : The Warranty needs to be revised.