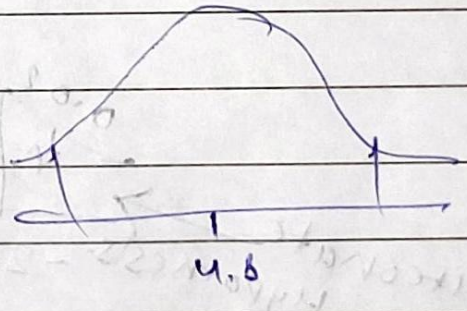
* A factory manufactures cars with warranty of 5 years on the engine and transmission. An engineer believes that the engine or transmission will malfunction in less than 5 years. He tests a sample of 40 cars and finds the average time to be 4.8 years with a standard Deviation of 0.50 (1) State the null & Alternate Hypothesis.

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



step 1 $H_0 : \mu \geq 5$

$H_1 : \mu < 5$

step : $\alpha = 0.02$ C.I = 0.98 SV = 0.02

$$z\text{-score} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{4.8 - 5}{0.50/\sqrt{40}} = \frac{-0.02}{0.50/}$$

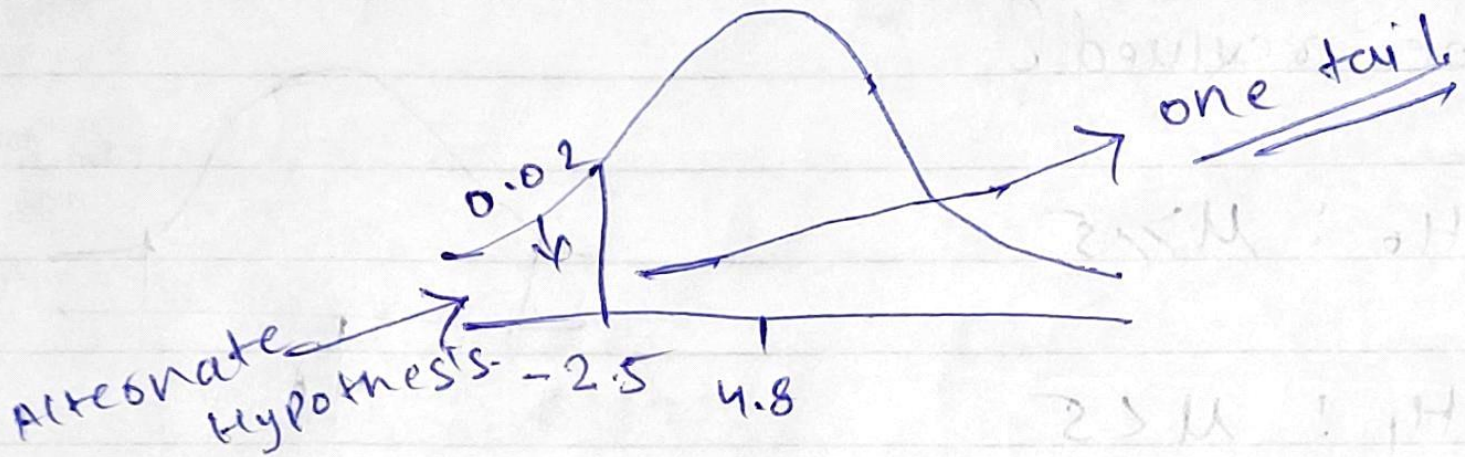
Teacher's Signature.....

Ans → $\mu = 5$, $n = 40$, $\bar{x} = 4.8$, $\sigma = 0.50$, C.I = 98%

S.L = 0.02

Step 1 : H_0 $\mu > 5$ Null Hypothesis

H_1 $\mu < 5$ Alternate Hypothesis.



$$\text{Z-score} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{4.8 - 5}{0.50/\sqrt{40}} = -2.52$$

conclusion : $-2.52 < -2.05$ Reject the Null Hypothesis

warranty needs to revised.

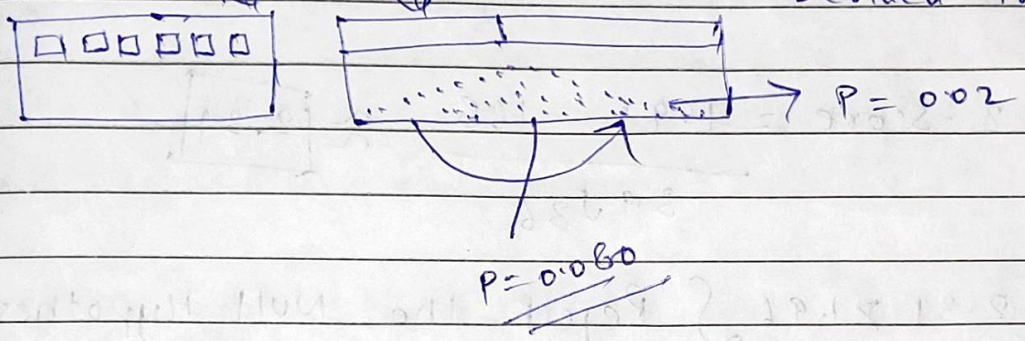
Statistics class 6

P- value

Key board

Significance value

Derived from C.I



Assignment :-

* The average weight of all Jehi residents in town xyz is 168 pounds A nutritionist believes the true mean to be different. she measured the weight of 36 individual and found the mean to be 169.5 pounds with standard deviation of 3.9.

(a) Null & Alternate Hypothesis

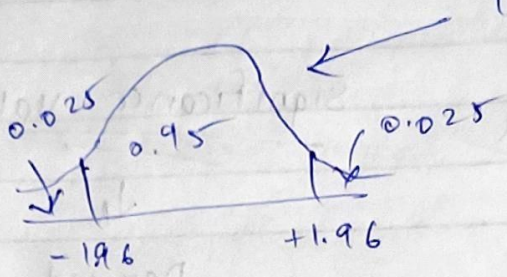
(b) 95% Is there evidence to discard the null Hypothesis?

→ $\bar{x} = 169.5$ $s = 3.9$ $n = 36$ $\mu = 168$ C.I = 0.95

Step 1 H_0 $\mu = 168$ S.V = 0.025

H_1 $\mu \neq 168$.

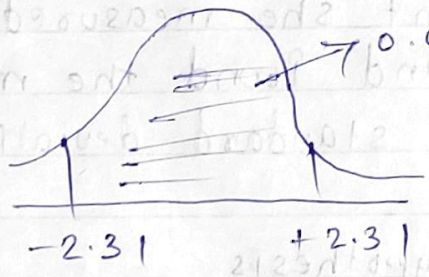
step 2 : C.I = 0.95 S.V = 0.05



step 2 -score $= \frac{169.5 - 168}{3.9\sqrt{36}} \simeq \boxed{2.31}$

$2.31 > 1.96$ { Reject the Null Hypothesis }

P-value Area under -2.31 and $+2.31$ using z-table



$= 1 - 0.98956 = 0.01044$

P-value $= 0.01044 + 0.01044 = 0.02081$

$0.02081 < 0.05 \rightarrow \alpha$

α ↓ significance value

two-tail

{ Reject the Null Hypothesis }

A company manufactures bikes Batteries with an average life span of 2 year or more year. An Engineer Believes this value to be less. using 10 sample, he measures the average life span to be 1.8 years with standard Deviation of 0.15.

1) State the Null & Alternate Hypothesis?

2) At a 99% C.I, is there enough evidence to discard the H_0?

t-test

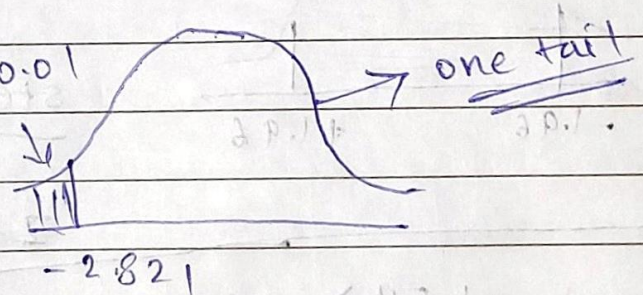
Degree of freedom
$= n - 1$
$= 10 - 1 = 9$

→ Ans: step1: $H_0 : \mu \geq 2$
$H_1 : \mu < 2$

step 2: C.I = 0.99 $\alpha = 0.01$

$n < 30$ → t-test → Sample Deviation given

step 3:



step 4:

T-Test

$$t = \frac{\bar{n} - \mu}{s/\sqrt{n}} = \frac{1.8 - 2}{0.15/\sqrt{10}} = -4.216$$

step 5: $-4.216 < -2.82$ { Reject the Null Hypothesis

Conclusion: The average life of battery is less than 2 years

Teacher's Signature.....

Z-test with proportion :

* A tech company believes that the percentage of residents in town XYZ that owns cell phone is 70%. A marketing manager believes that the value to be different. He conducts a survey of 200 individuals and found that 130 residents responded yes. owning a cell phone?

(a) state Null and Alternate Hypothesis?

(b) At a 95% is there enough evidence to reject the Null Hypothesis?

→ Answ : **Step 1** :

Null Hypothesis $(P_0) = 0.70$

Alternate Hypothesis $P_0 \neq 0.70$

$q_0 = 1 - P_0 = 0.3$

Step 2 :

$n = 200$, C.I = 0.95% , $X = 130$, $\alpha = 0.05$

Step 3 :

$$P = \frac{130}{200} = 0.65$$

Step 4 : Z test with proportion

$$Z\text{-test} = \frac{P - P_0}{\sqrt{\frac{P_0 q_0}{n}}}$$

$$= \frac{0.65 - 0.70}{\sqrt{\frac{0.7 \times 0.3}{200}}} \approx -1.54$$

Conclusion : $-1.54 > -1.96$

Fail to Reject the Null Hypothesis

Expt. No.....

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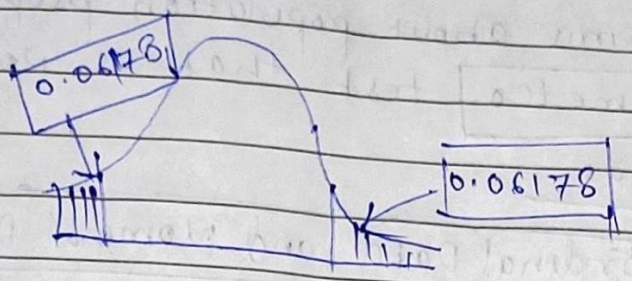


P-value = 0.6178 + 0.06178

= 0.12356

* P-value > significance value fail to reject the Null Hypothesis.

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

(a) State Null and Alternate Hypothesis.

(b) At 10% significance level, is there enough evidence to support the idea that vehicle ownership in city ABC is 60% or less?

→ Ans:- $H_0 : P_0 \leq 0.60$

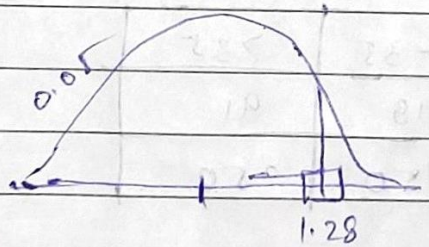
$H_1 : P_0 > 0.60$

$p = \frac{170}{250} = 0.68$

Z-score $= 0.68 - 0.60$

$\sqrt{\frac{0.6 \times 0.4}{250}}$

$= \frac{0.08}{0.03098} = 2.588$



Reject the Null Hypothesis

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* Chi-Square test

* Chi-Square test claims about population proportion It is a non-parameter test that is performed on categorical Datas.

→ Ordinal Data and Nominal Data

* In the 2000 U.S census the age of individual in a small town found to be the following.

<18	18-35	>35
20%	30%	50%

In 2010, ages of n=500 individuals were sampled Below are the result

<18	18-35	>35
121	288	91

using $\alpha = 0.05$ would you conclude the population distribution of ages has changed in the last 10 years?

→

	<18	18-35	>35
Expected	20%	30%	50%

n=500

	<18	18-35	>35
observed	121	218	91
Expected	100	150	250

Date.....

Expt. No.....

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Step 1 : Null Hypothesis H_0 : The data meets the expected distribution

H_1 : The data does not meet expected distribution

Step 2 : $\alpha = 0.05$ C.I = 95%

Step 3 : Degree of freedom { categories }

$df = c - 1 = 3 - 1 = \boxed{2}$

↳ no. of categories.

$\alpha = 0.05$

Step 4 : Decision Boundary = $\boxed{5.991}$ { chi square test }

Step 5 : Chi-Square Test statistics.

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e} = \frac{(121-100)^2}{100} + \frac{(288-150)^2}{150} + \frac{(91-250)^2}{250}$$

$$\boxed{\chi^2 = 232.494}$$

Conclusion : $\chi^2 > 5.99$ Reject H_0.

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