23/1/25

Day-5

Page No.
Date

* Agenda :-

1. Type-1 and Type-2 Error
2. one Tailed and 2 Tailed test
3. Confidence Interval
4. zetest, t-test, Chi-Square test

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1. Type I & Type II Error :-

Null Hypothesis (Ho) :- Coin is fa
Alternate Hypothesis (H1) :- Coin is No

Reality Check

Either Null hypothesis is True
or
Null hypothesis False

With Respect to check :-

Decision

Null hypothesis is True or Null Hypothesis is False

Outcome 1 :-

We reject the Null hypothesis, When it is in reality it is false
→ "yes" it is good decision

Outcome - 2 :

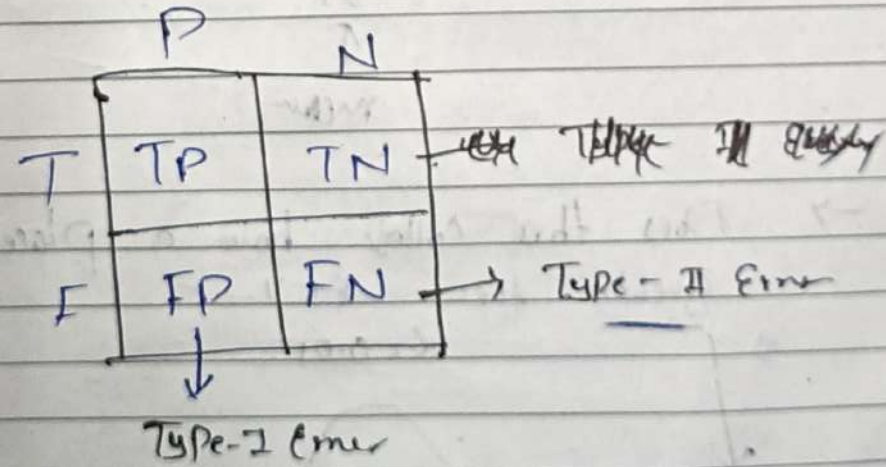
We reject the Null hypothesis, when in reality it is True → Type-I Error.

Eg :- In movies a person role a bad character but in reality a person was very good guy This is known as ⟹ Type-I Error

Outcome - 3 :- We ~~Return~~ Accept the Null hypothesis when in reality it is false → No → This Error is known as Type II Error

Outcome - 4 :-

We Accept the Null hypothesis when in reality it is true → Good decision

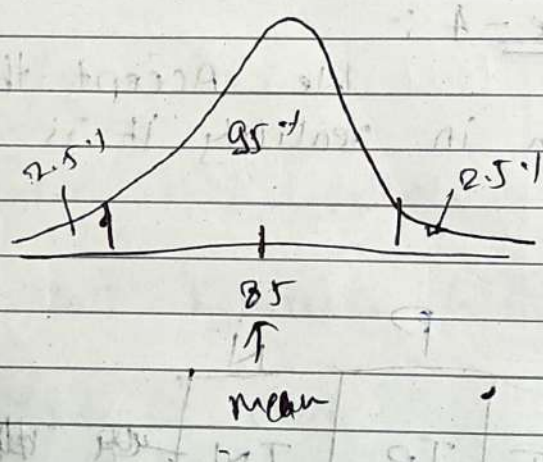


* One tailed and Two tailed Test :-

Eg:- A Colleges in Karnataka have an 85% placement rate. In the placement time. A new College was recently opened and it was found that a Sample of 150 students had a placement rate of 88% with Standard Deviation 4%. Does this College hay a different placement rate then the other Colleges ?

Given $\alpha = 0.05$

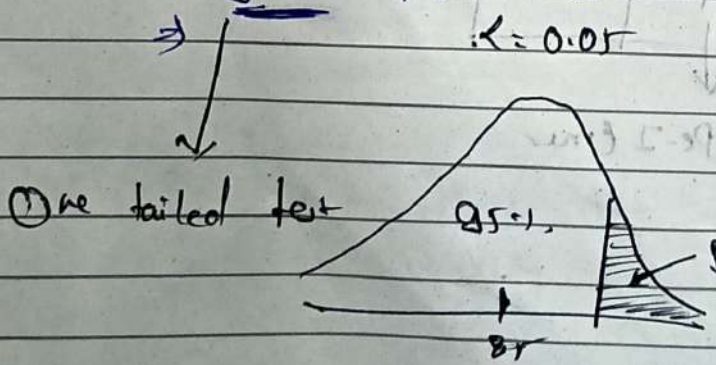
↳ 2 tailed test



→ Does this college have a placement rate greater then 85%.

$\alpha = 0.05$

⇒

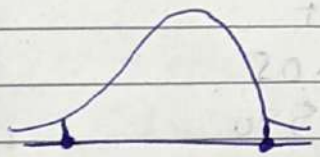


d/b { $\bar{x}$ = (sample mean) ;- $\bar{x} = \Sigma x_i / n$
M = (Population mean) ;- $\bar{x} = \frac{\Sigma x_i}{N}$

→ When my Experiment Either greater than Or lesser than that time we can say two tailed test.

→ Why my Experiment Only greater than ? It is one tailed test.

Imp * Confidence Intervals :-

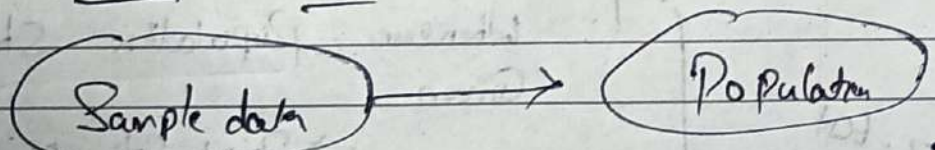


We check Now

→

i ⇒ Point Estimate :- Point Estimate defined as, The value of any Statistic that Estimates the value of a parameter is called Point Estimate ;

Inferential Stats



Mean Mean

$\bar{x}$ ⟶ μ

Es :- $\bar{x} = 2.9$ $\mu = 3$

⇓

This value approach to M or Same with M ∴

Page No.
Date

Confidence Intervals:

Point Estimate ± margin of Error

Q) On the quant test of CAT Exam, the Standard deviation is known to be 100. A Sample 25 test takers has a mean of 520 scores. Construct 95% Confidence interval about the mean?

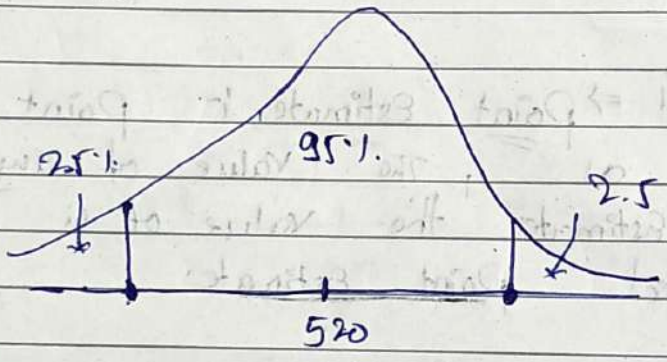
Ans :-

$\sigma = 100$

$n = 25$

$\alpha = 0.05$

$\bar{x} = 520$



1. Whenever Population Standard deviation is Given

→ Point Estimate ± margin of Error

Formula :- $\bar{x} \pm Z_{\alpha/2} \left[\frac{\sigma}{\sqrt{n}}\right]$ ← Standard Error

Z-test Happens

2. when we use this Formula

→ $n \geq 30$

[$n \geq$ Cue take any number Given dekh]

$Z_{\frac{0.05}{2}} = Z_{0.025}$

$\bar{x} + Z_{\frac{0.05}{2}} \frac{100}{\sqrt{25}}$ → Upper bound

$\bar{x} - Z_{\frac{0.05}{2}} \frac{100}{\sqrt{25}}$ → Lower bound

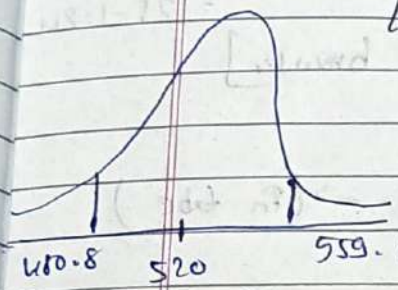
[1.96 → To check Z Score table → 0.06 + 1.9]

Upper bound = 520 + 1.96 (20)

lower bound = 520 − 1.96 (20)

UB = 559.2

LB = 480.8



Interview Q :- Find the average size of the Shares throughout the world?

You known the σ, $\bar{x}$, μ, $\alpha = 0.05$.

find? CI :-

For Sample deviation

Q) on the quant test of CAT Exam, the Sample of 25 test takers as a mean of 520 Scores with a Standard devia, SD = 80'/. Construct 95'/. Confidence Interval about the mean?

⇒ Condition :-

$n = 25$

$\bar{x} = 52$

$S = 80$

$\alpha = 0.05$

Here, Population SD is not give then we use T-test

Page No.
Date

Point Estimate ± Margin of Error

Formula $\bar{x} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$ → Standard Error

Upper bond :- $\bar{x} + t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$

to calculat t → Degree of freedom = $n-1$
$= 25-1 = 24$

[You check T-table on browser]

$t_{\frac{0.01}{2}} = 2.064$ → (from tabe)

$= 520 + 2.064(80/5)$

$= 520 + 33.024$

$= 553.024$ //

Lower bond :- $\bar{x} - t_{\alpha/2}(s/\sqrt{n})$

$= 520 - 2.064(80/5)$

$= 486.976$ //

LB ⟷ UB

[486.97 ⟷ 553.024]

Page No.
Date

→ Hypothesis Testing

1. One Sample z-test
   i. Population standard deviation is given
   ii. Sample size $n \geq 25$ → (we can put any value)

Q) * In the population the Average IQ is 100 with a SD of 15. Researcher wants to test a new meditation to see if there is positive Negative Effect on intelligence, or No Effect at all. A Sample of 30 participants who have taken the meditation has a mean IQ of 140. did the medication affect the intelligence ?

$\alpha = 0.05$
CI = 95%.

Ans :

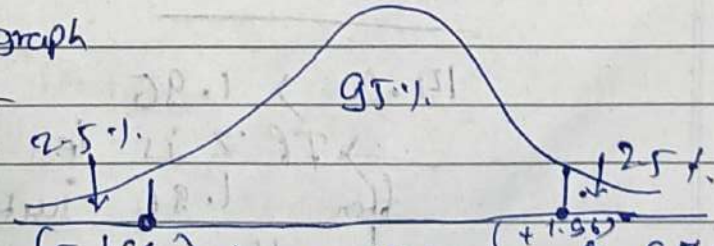
i) Define the Null hypothesis
→ $H_0 = \mu = 100$

ii) Alternate Hypothesis
$H_1 \rightarrow \mu \neq 100$

iii) State Alpha value
$\alpha = 0.05$

iv) State Decision Rule.
→ always Specify graph

2 Tail Test



Check z-table.

Page No.
Date

V) Calculat test Statistics
(Z- test)

Z-test formula: $Z = \frac{\bar{x} - \mu}{\sigma}$

Real formula of Z test (when we are huge amount of data)

$$Z = \frac{\bar{x} - \mu}{\{\sigma/\sqrt{n}\}}$$ Standard Error formula

$$\Rightarrow Z = \frac{140 - 100}{15/\sqrt{30}} = \frac{40}{15/\sqrt{30}}$$

$$= \frac{40}{15} \times \sqrt{30}$$

$$= 2.66 \times 5.477$$

$$= 14.60 //$$

* State our decision :-

$14.60 > 1.96$

→ If Z is less than -1.96 or greater than 1.96, just reject the null hypothesis

→ Did the medication impro the intelligence our decrease. ?
→ It is improved

Q1. Question $\bar{x} = 110$, $M = 100$, & $SD = 15$

$$Z = \frac{110 - 100}{15/\sqrt{30}} = 10/15 \times \sqrt{30}$$

$$= 10/15 \times 5.477$$

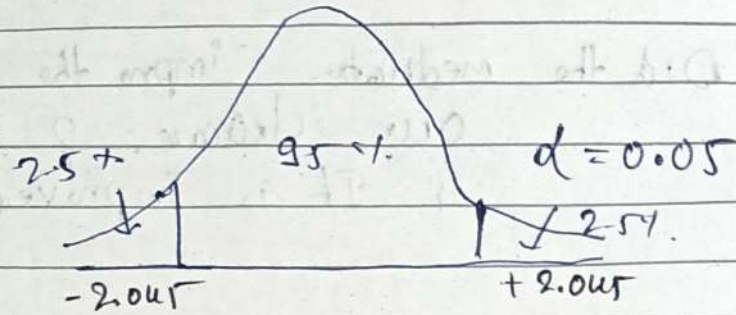
$$= 3.65$$

* One Sample T-test :-

Z-test ⇒ Population std
T-test ⇒ Unknown Population Std.

Q) Same Question :- the avg IQ = 100
$n = 30$ $\bar{x} = 110$ $S = 20$
did the medication effect intelligence ?
$\alpha = 0.05$

Ans :- 1. $H_0 : M = 100$
2. $H_1 : M \neq 100$
3. Calculate the degree of freedom.
$n - 1 = 30 - 1 = 29$
4. State Decision Rule



= 2.045 (To check browser t test table)

5. T-test

$$t = \frac{\bar{X} - \mu}{S/\sqrt{n}}$$

$$= \frac{140 - 100}{20/\sqrt{30}} = \frac{40}{20} \times \sqrt{30}$$

$$= \frac{40}{20} \times 5.477$$

$$= 10.954$$

$t = 10.96 > 2.045$

Reject the Null hypothesis $p \leq$ Significant value.

∴

Increase the Intelligence.

Page No.
Date

{Interview Question in banks}

Real world problem

Banks → A Tm machine Area