Test of Hypothesis

21-Jul-23

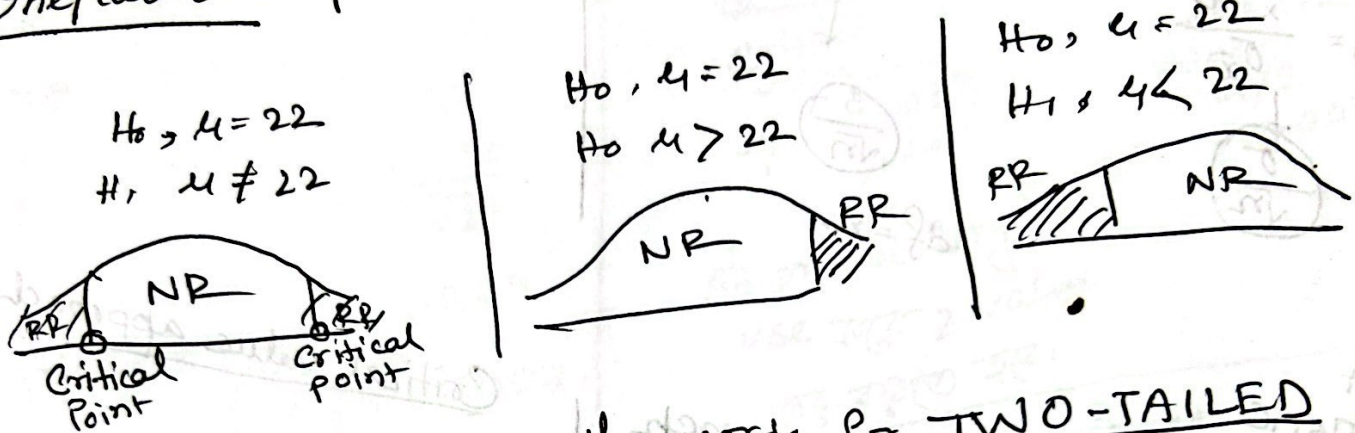
Null hypothesis H_0, $\mu = 22$

Alternative H_1, $\mu \neq 22$

NR: Non-rejection region

RR: Rejection region

One/two tail depends on ALTERNATE HYPOTHESIS

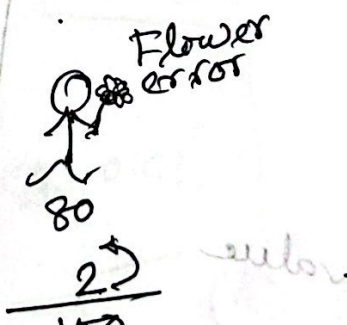


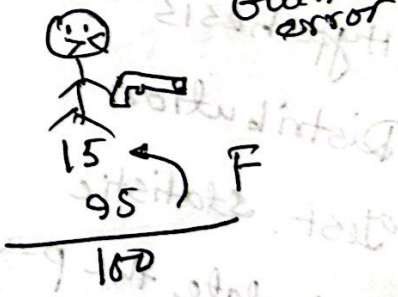
Changed, different → keywords for TWO-TAILED.

* Null to always reject করতে চাই।

Rejection Error

Acceptance Error





This is more risky.

Rejected sth that is true.

	Ho True	Ho False
Accept Ho	✓	X (Type II error)
Reject Ho	X (Type I error)	✓

$\alpha = P(H_0 \text{ is rejected} \mid H_0 \text{ is true})$ ← $1-\beta$ Power of test

$P(H_0 \text{ is rejected} \mid H_0 \text{ is false}) +$

$P(H_0 \text{ is not rejected} \mid H_0 \text{ is false}) = 1$

β

Mid-18 August
Quiz-11 August

Hypothesis Testing

4-Aug-23

μ

- σ known → Normal distribution
  - $z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
  - Test STATISTIC
- σ unknown → t distribution
  - $t = \frac{\bar{x} - \mu}{s_{\bar{x}}}$, $s_{\bar{x}} = \frac{s}{\sqrt{n}}$
  - $df = n - 1$

P

$$z = \frac{\hat{p} - p}{\sigma_{\hat{p}}}, \quad \sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$$

p-value approach

1. Hypothesis
2. Distribution
3. Test statistic
4. Calculate the p-value
5. Decision
6. Conclusion

Critical value approach

5. Critical value(s) + region
4. Test statistic

Different → TWO TAILED

Rule: Reject H_0 if p-value $\leq \alpha$

p-value is the smallest level of significance where we can reject H_0

given,

$n = 20$, $\bar{x} = 85$, $\sigma = 7$, $\alpha = 0.01$ [90 mins machine maths]

p-value approach

① Hypothesis: TWO-TAILED

$H_0 : \mu = 90$ [Description]

$H_1 : \mu \neq 90$ [Description]

② Distribution: Normal

③ Test statistic: $z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$= \frac{85 - 90}{7/\sqrt{20}}$

$= -3.19$

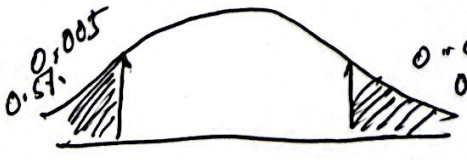
④ p-value: (2) × 0.0007

= 0.0014

Since this is a two-tailed test

⑤ Since p-value is $0.0014 < \alpha = 0.01$, so we reject H_0.

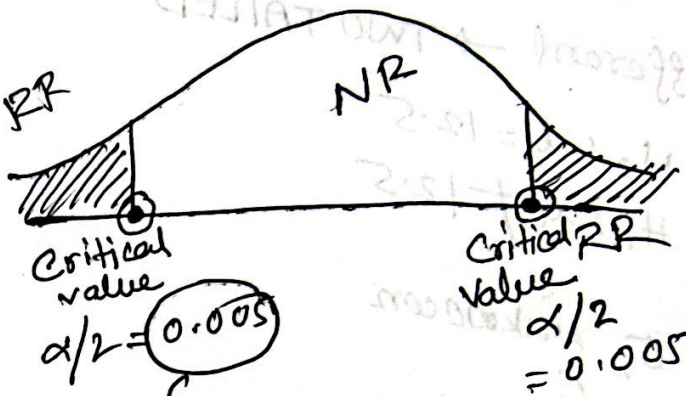
⑥ We may conclude that, mean time ..... is different from 90 mins.



Critical value approach

$\alpha = 0.01$

③



এই probability for use করে z value বের করতে হবে।

65% -ই fix to reduce gun-error [Type-I error]

0.0049 fix

-2.58
$+2.58$] Critical values

④ $z = -3.19$

⑤ Since $z = -3.19$ falls in the rejection region, so we reject H_0. [FIGURE MUST]

[the psychologist – children math]

$n = 18$

$\bar{x} = 12.9$

$s = 0.80$

Different → TWO TAILED

① $H_0 : \mu = 12.5$

$H_1 : \mu \neq 12.5$

② $\sigma_{\bar{x}}$ unknown

↳ t distribution

③ $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}$

$= \dfrac{12.9 - 12.5}{0.8/\sqrt{18}}$

④ $0.2 < p\text{-value} < 0.5$

⑤ Since $p\text{-value} > \alpha = 0.01$,
so we can not reject H_0.

⑥ Conclusion, ...

Till 64th slide
Quiz syllabus.