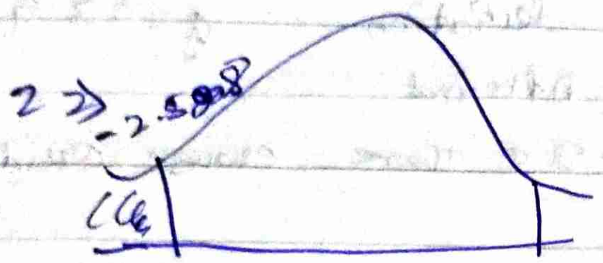
STAT → Day-6

18/9/2022

P-value ≠ {significance value}

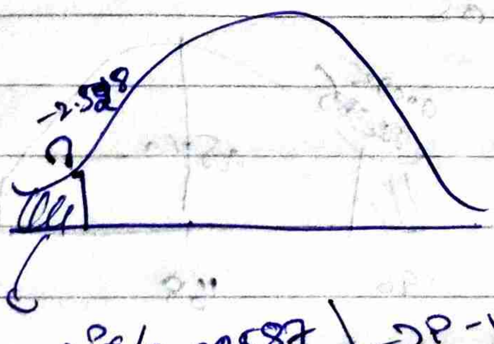
P-value ⇒ probability value



* what's Area under curve for Z -2.52 in Z Ta

=The value is 0.00587

* so,



area under curve is (0.00587) → P-value

* How to check with α value in previous live class example prob

α value is 0.02

* So if p-value < α

Then reject the Ho

Hypothesis testing problems (Z Test)

3.) The average weight of all residents in a town xyz is 168 pounds. A Nutritionist believes the true mean to be different. She measured the weight of 36 individuals and found the mean to be 169.5 points with standard deviation of 3.9

a) Null & Alternat

b) a=5% Is there enough evidence to discard

Solution

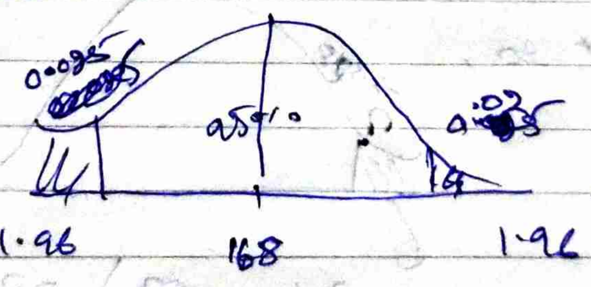
$H_0 \; \mu = 168P$

$H_1 \; \mu \neq 168P$

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

S.V = 0.05

→



$\Rightarrow Z = 1 - 0.025$

$\boxed{Z = 0.975}$

↓

This Area value have to see in Z Table and then find the Z values in x & y axis & it was 1.96

two tailed test

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

$$Z = \frac{169.5 - 168}{3.9} \times 6$$

$$= \frac{1.5}{3.9} \times 6$$

$Z = 2.30$

Conclusion

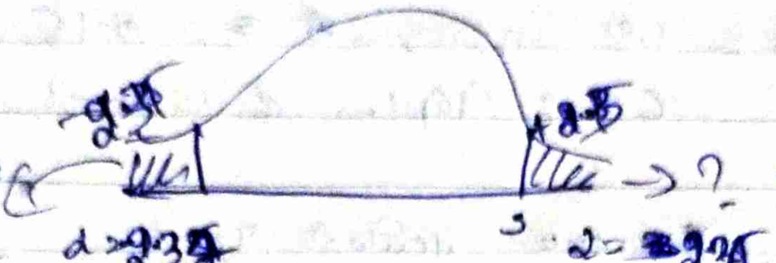
$|z| = 1.96$

C.v 2.30

So $z > C.3$ so H_0 is rejected.

P value

0.01044 ~~0.1251~~



? what is area value? ↓ get from z table

$P = 0.1251$

$\therefore P < \alpha$

~~0.1251~~ 0.1044 < ~~1.15~~ 2.31.

* H_0 is rejected by P value also.

T Test ⇒ Examples Hypothesis Testing

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 samples, he measures the average life span to be 1.8 years with a standard deviation of 0.15.

a) State the Null an Alternate

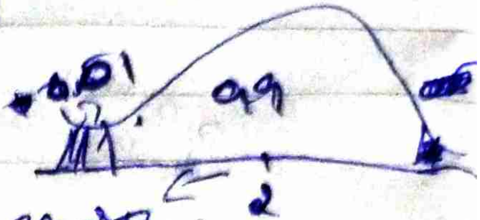
b) At a 99% C.I, is there enough evidence to discard the null

$H_0 \Rightarrow \mu \geq 2$

$H_1 \Rightarrow \mu < 2$

$\bar{x} = 1.8$, $n = 10$, $s = 0.15$ $\mu \geq 2$
C.I = 99%. S.L = 0.01

one tailed Test

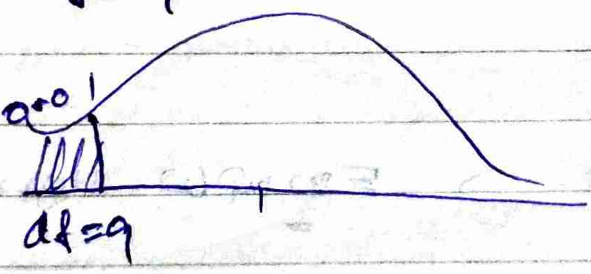


$\Rightarrow$ T-Test to be used because

sample is < 30 & sample s.d was given so T test should be done

$\therefore$ d.f $\Rightarrow$ n-1, so, = 10-1 = 9

d.f = 9



In T table

df = 9

x axis α = 0.01

so t = -2.821

Calculation

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

$$= \frac{-0.2}{0.15} \times \sqrt{10} = \frac{-0.2}{0.15} \times 3.16$$

$\boxed{t = -4.216}$

Conclusions

t is < t_{score}

-4.216 < -2.821

$\therefore$ H_0 is rejected

H_1 is accepted

Z Test proportion

Problem

A Tech Company believes that the percentage of residents in town XYZ that owns a cell phone is 70%. A Marketing manager believes that this value to be different. He conducts a survey of 200 individuals & found that 130 respondend 'yes' owning a cellphone?

a) State H_0 & H_1 Hypothesis

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

Soln step ①

$H_0 : P_0 = 0.70$

$H_1 : P_0 \neq 0.70$

$q_0 = 1 - P_0 = 0.30 \Rightarrow$ The whole percentage

$n = 200 \quad x = 130$

$\hat{p} = \frac{130}{200} = \frac{13}{20} = 0.65$ } Proportion

$\boxed{\hat{p} = 0.65}$

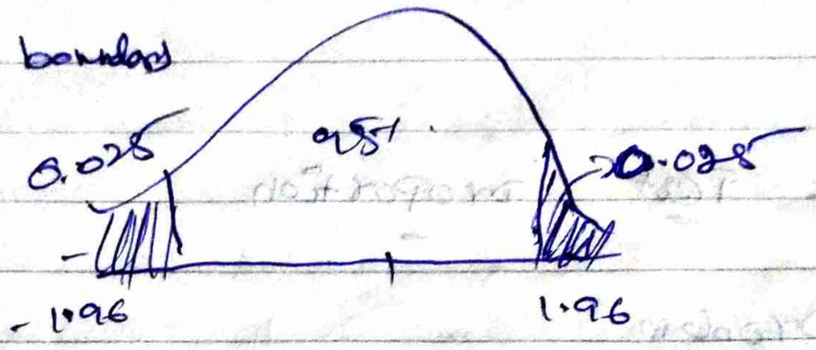
step 2

C.I = 0.95 (95%)

S.V(α) = 0.05

step-3

Decision boundary



Step 4

z test with proportion.

$$Z_{test} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

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

$$Z = \frac{-0.05}{\sqrt{0.00105}}$$

$$Z = \frac{-0.05}{0.0324}$$

$$\boxed{Z_{test} = -1.54}$$

Conclusion

$Z = -1.54$ is > -1.96, so Ho was ~~rejected~~ accepted.

$Z > -1.96 < 1.96 \Rightarrow$ Ho accepted

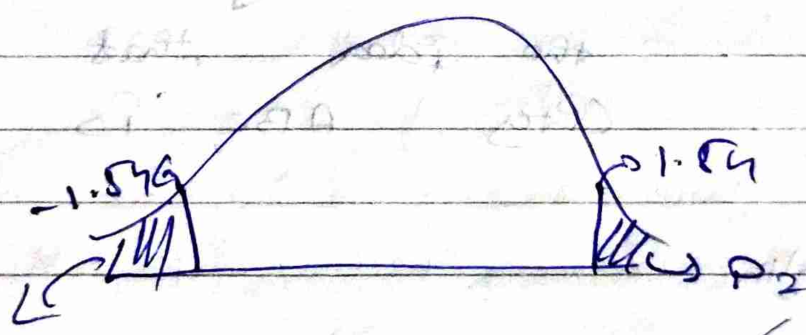
$-1.54 > -1.96 < 1.96 \Rightarrow$ Ho "

∴ So 70% is the correct value.

Calculate P value

Draw Normal curve with New z value

$z = -1.54$



$P = 0.06178$

$P = +0.06178$

$P \text{ value} = 0.06178 + 0.6178$

$P = 0.12356$

∴ Conclusion

Pvalue > significance value

∴ $0.12356 > -1.546$

∴ So Ho is accepted by the p value as well.

Chi square Test

* Chi square Test claims about population proportions.

* It is a non parametric test that is performed on categorical data.

  & even for
  1.) ordinal &
  2.) Nominal.

Problems.

In the 2000 US census the age of individuals in a small town found to be following:

<18 yr's	18-35 yr's	>35 yr's
20%	30%	50%

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

<18 yrs	18-35 yrs	>35 yrs
121	288	91

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

Why we use Chi square Test
Because we have 3 category 18, 18-35, >35. So we have to use Chi square

Soln

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

n = 500

	<18	18-35	>35
observed	121	288	91
Expected	100	150	250

This value should be calculated line below

20% 500 = 100
30% 500 = 150
50% 500 = 250

State Hyp (1)

Ho → : The data Need's expected Distribut
H1 → : The " doesn't " " "

Step (2)

$\alpha = 0.05$ $C.I = 0.95$

Step (3)

~~$d.f = n-1$~~ This only for quantity → but here we have Categorical so

~~$\boxed{d.f = 499}$~~

$(<18, 18\text{-}35, >35)$

$d.f = 3\,cat - 1$
$= 2$

step : 4

Decision boundary

$d.f = 2$
$\alpha = 0.05$ } → go & see Chi square value in Chi-square Table
↓
The value is 5.991

$$\boxed{\chi^2 = 5.991}$$

~~Conclusion~~

so 5.991 is χ^2 value

step : 5

Chi-square Test Statistics

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

f_o = observed
f_e = expected

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

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

Inference

In chisquare calculated value is > chisquare table value the Ho is rejected.

$232.494 > 5.991$

Ho is rejected.