T- test

Q. Suppose a child psychologist say that the average time working mother spend talking their children is upto 11 minutes per day. To test the hypothesis you took a random sample of 20 working mother and found average time they spent is 11.5 minutes. The sample standard deviation is 2.3 mins. Conduct test with 5% level of significance ($\alpha = 0.05$)

S.S ≤ 30

$\mu = 11$, $\bar{x} = 11.5$, $n = 20$, $S = 2.3$, $\alpha = 0.05$

Step-1 $H_0 : \mu \leq 11$, $H_A > 11$

Step-2 $\alpha = 0.05 \longrightarrow 5\% \longrightarrow$ One tail test

$dof = 20 - 1 = 19$.

Step-3 – t-test

$$t_{statistic} = \frac{\bar{x} - \mu}{S/\sqrt{n}} = \frac{11.5 - 11}{2.3/\sqrt{20}} = \frac{0.5}{0.514} = 0.97$$

Step-4

$t_{critical}$ Corresponding 0.05

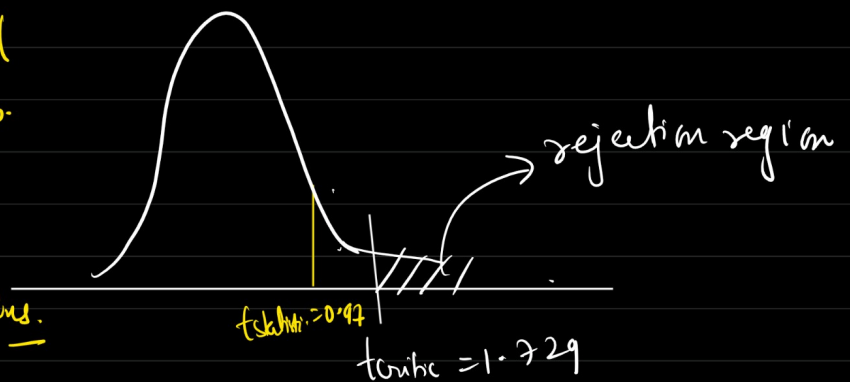
$dof = 19$, one tail test

$t_{critical} = 1.729$

Step5

Conclusion $\Rightarrow$ we fail to reject H_0.

The avg time working mother spend is ≤ 11 mins.



Q In the population, the average IQ is 100. A team of researchers want to test a medicine to check the +ve or -ve effect on intelligence. A sample of 30 participants who took medicine has a mean IQ of 140 with standard dev^n of 20. Did the medication affect the intelligence. Test hypothesis with 5% alpha.

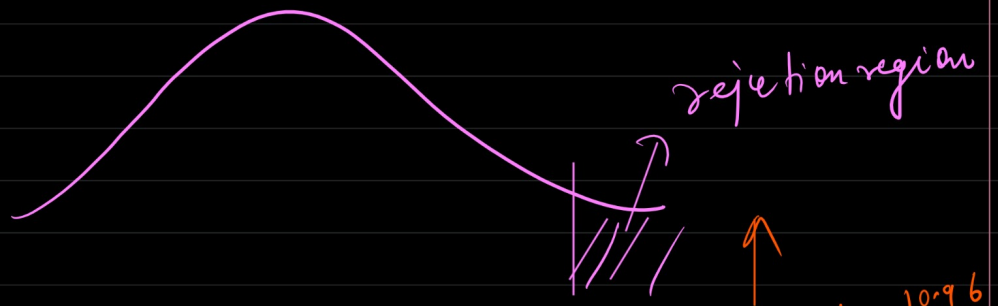
Step-1 $H_0: \mu = 100$, $H_A: \mu \neq 100$

Step-2 two tail test, dof $n-1 = 30-1 = 29$

Step-3 t-test

$$t\text{statistics} = \frac{\bar{x}-\mu}{s/\sqrt{n}} = \frac{140-100}{20/\sqrt{30}} = \frac{40}{3.65} = 10.96$$

Step-4 - $t_{critical}$ $\alpha = 0.05$, two tail $= 2.045$.



Step-5

$t_{stat} > t_{critical}$, $10.96 > 2.045$

$\downarrow$

we reject H_0.

Conclusion - Reject the H_0, the medicine has effect on IQ.