μ σ

Population of DSE students with true mean of 23.8 years with SD of 2.75 years

[23.17, 26.57, 21.04, 23.50 , 21.69, 27.48, 20.64, 24.22, 20.45 , 24.09,25.04, 21.82, 24.90, 21.45, 29.93, 21.96, 25.84, 26.08, 23.18, 25.41,22.12, 28.85, 18.14, 28.86, 24.64,
24.99, 21.49, 25.87, 22.00, 26.61,23.58, 24.21, 24.40, 24.06, 19.43 ,30.19, 21.46 , 21.94, 25.63, 22.96, 22.37, 23.23 , 29.59, 19.39, 26.87,23.49, 25.46, 27.45, 20.48, 27.13]

50 trials
$n = 30$

Dist of 50 $\bar{x}$'s

[23.85,23.67,23.73,23.72,25.19,25.00,25.06,23.82,24.22,23.69,23.25,23.68,24.03,24.06, 23.62, 23.80, 23.66, 23.76, 23.79, 24.42, 23.94, 24.68, 24.46,23.98,23.85,
23.57, 23.91, 24.43, 24.46, 23.47, 24.43, 23.63, 24.82, 24.35, 24.741, 23.67, 23.10, 24.40,24.12, 24.39, 24.48, 23.60, 23.91, 24.47, 24.23, 24.16, 23.96, 24.18,24.49, 24.32]

Mean of the mean distributions = 24.12 (Estimated Mean)
Standard Deviation (Standard Error in predicting the mean=Average difference of all 50 attempts) =0.49

95% CI Range

$$[24.12 \pm 1.96 * 0.49]$$

$$\Rightarrow [23.16 \text{ to } 25.08]$$

One round of sampling done with n=30
25.63,24.09,28.85,24.20,25.87, 25.41,29.59,23.18,21.45,24.63,20.47,24.41,25.41,23.57,21.46,20.64,
24.22, 22.96,26.57,18.14,25.63,25.87, 24.20,25.46,20.47, 25.411, 20.45, 26.61, 23.57, 27.12

Mean=24.18
SD=2.60

95% CI Range

$$24.18 \pm 1.96 * \frac{2.60}{\sqrt{30}} = 0.47 \simeq 0.49$$

$$\Rightarrow [23.25 \text{ to } 25.11]$$

$$\Rightarrow [23.25 \text{ to } 25.11]$$

$$23.25 = 24.18 - 1.96 * \frac{s}{\sqrt{n}}$$

$$24.18 + 1.96 * \frac{s}{\sqrt{n}} = 25.11$$

$$\frac{23.25 - 24.18}{s/\sqrt{n}} = -1.96$$

$$1.96 * \frac{s}{\sqrt{n}} = 25.11 - 24.18$$

$$1.96 = \frac{25.11 - 24.18}{s/\sqrt{n}}$$

$$Z_{stat} \simeq t_{stat} = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

Expected Mean of pop

$$\frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

When $n = 500$

$$Z_{stat} \simeq t_{stat}$$

H_0 : $\mu_{exp} = 23.5$ yrs

H_a : $\mu_{exp} \neq 23.5$ yrs

$$t_{stat} = \frac{\bar{x} - 23}{s/\sqrt{n}}$$

Sample statistic

$\bar{x} = 24.18$, $s = 0.47$

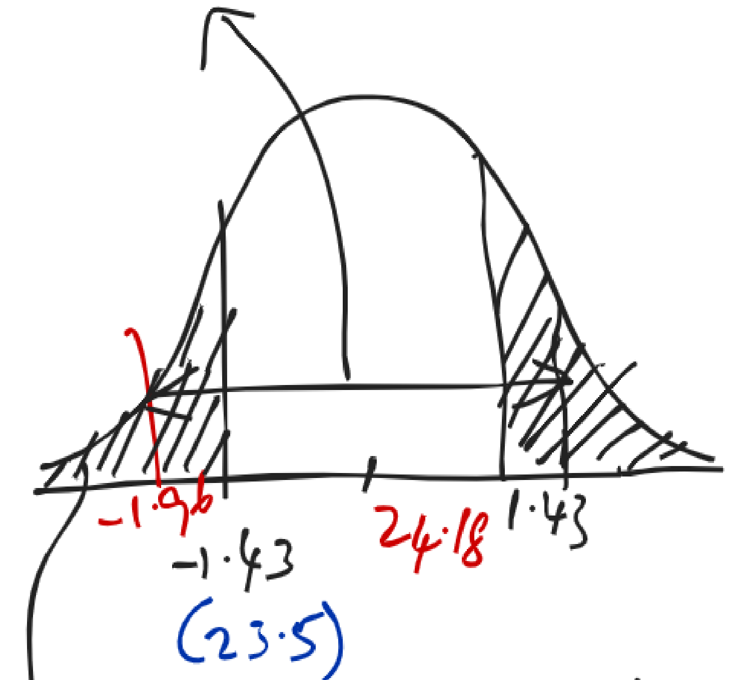
$n = 30$

Plug in the values $\Leftarrow$

$$t_{stat} = \frac{24.18 - 23.5}{0.47} = -1.43$$

p_value > 5%

Acceptance zone for Ho

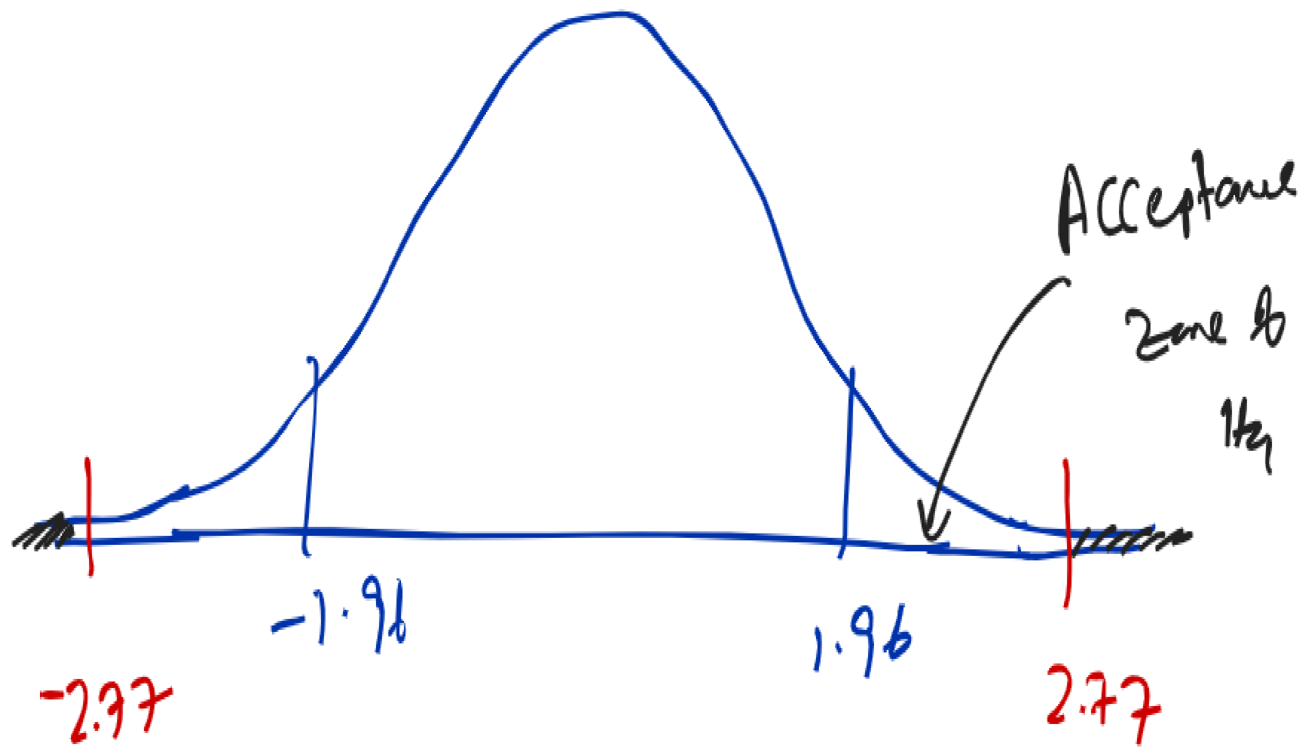


Acceptance zone for Ha

$H_0: \quad \mu_{exp} = 25.5$ yrs

$H_a: \quad \mu_{exp} \neq 25.5$ yrs

$$t_{stat} = \frac{24.18 - 25.5}{0.47}$$

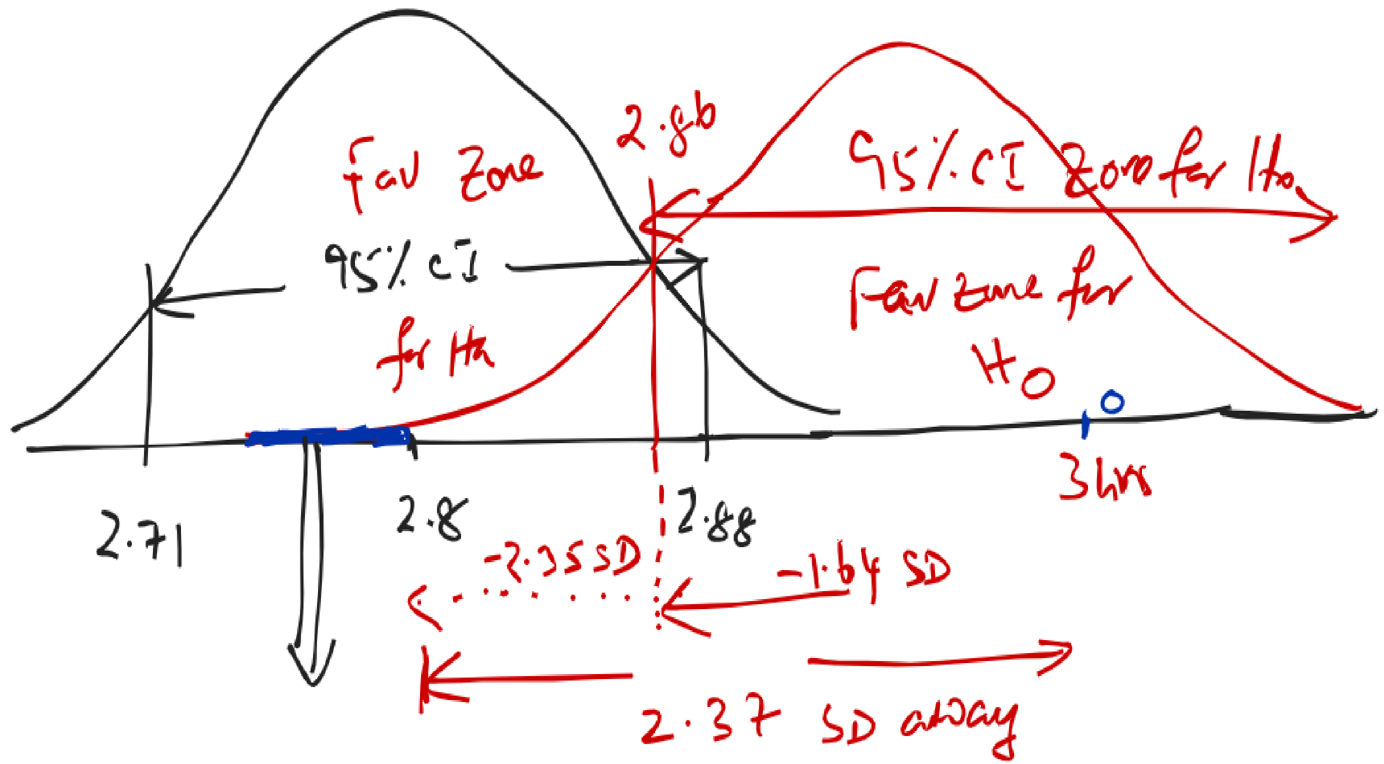


$p < 5\%$

Courier Company example

Sample
$n = 50$
$\bar{x} = 2.8$
$s = 0.6$

$H_a < 3$ hrs
$H_0 \geq 3$ hrs



$$t_{std} = \frac{2.8 - 3}{0.6/\sqrt{50}} =$$

$$-1.96 = \frac{? - 3}{0.6/\sqrt{50}} \Rightarrow 2.82$$

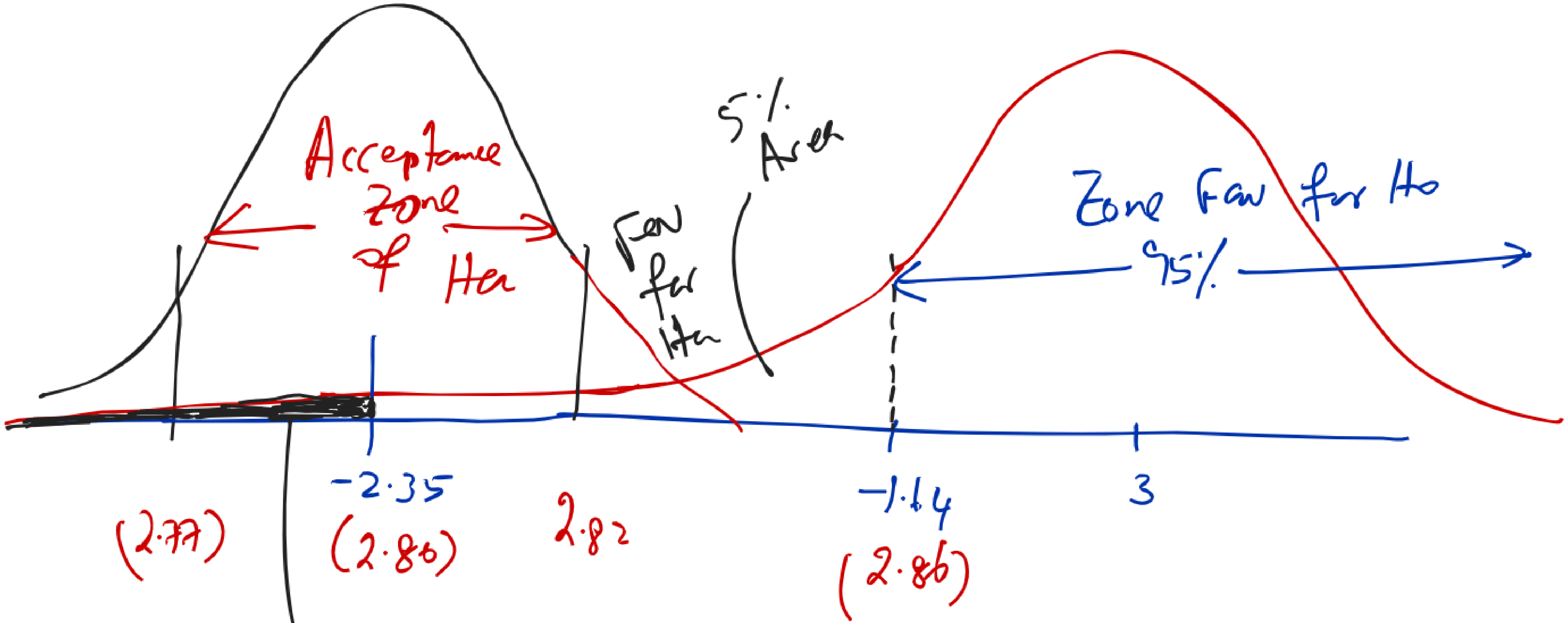
$$-1.64 = \frac{? - 3}{0.6/\sqrt{50}} \Rightarrow 2.86$$

p-val ⇒ Area

⇒ $0.009 < 5\%$ (0.05)

Hence we reject Ho

Sample Statistic is fav for Courier Company Claim



P-val < 5% Area Rej Ho

Soyabean yield example

$H_0 \leq 520$

$H_a > 520$

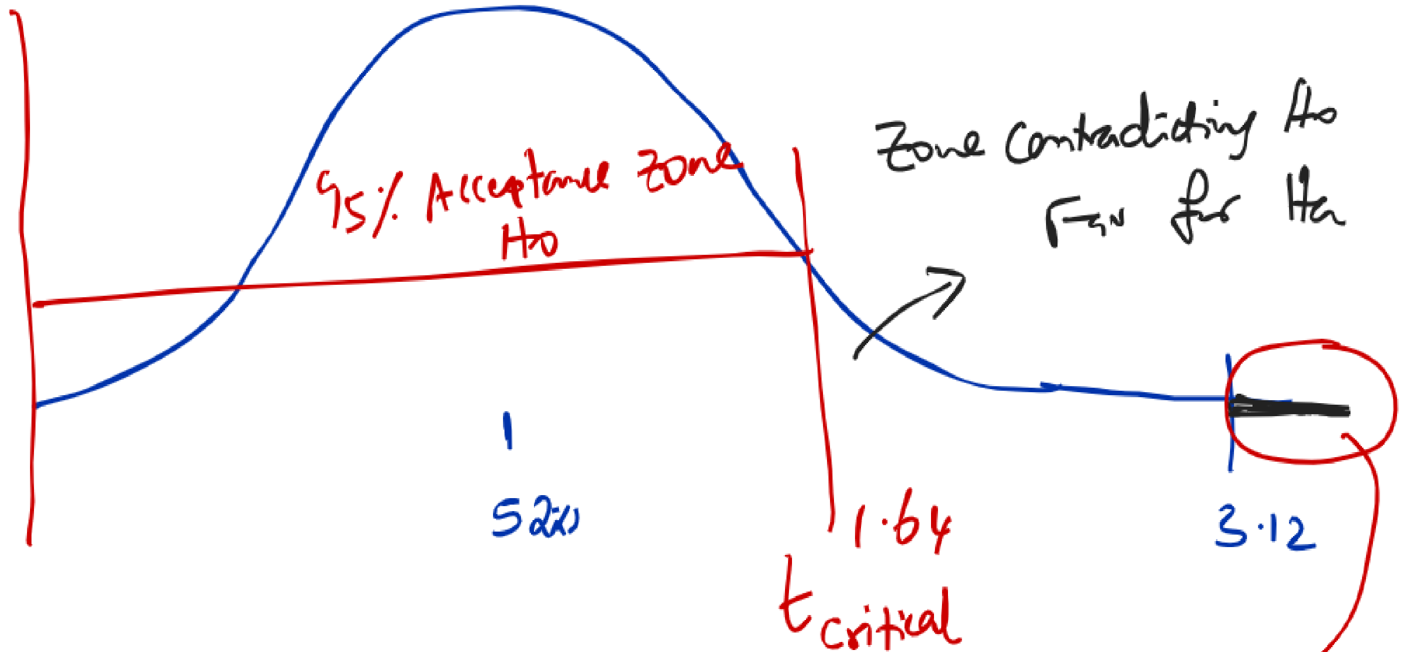
Sample

$n = 36$

$\bar{x} = 586.16$

$SD = 127.28$

$$t_{data} = \frac{586.16 - 520}{127.28 / \sqrt{36}} = 3.12$$



Since t data > 1.96

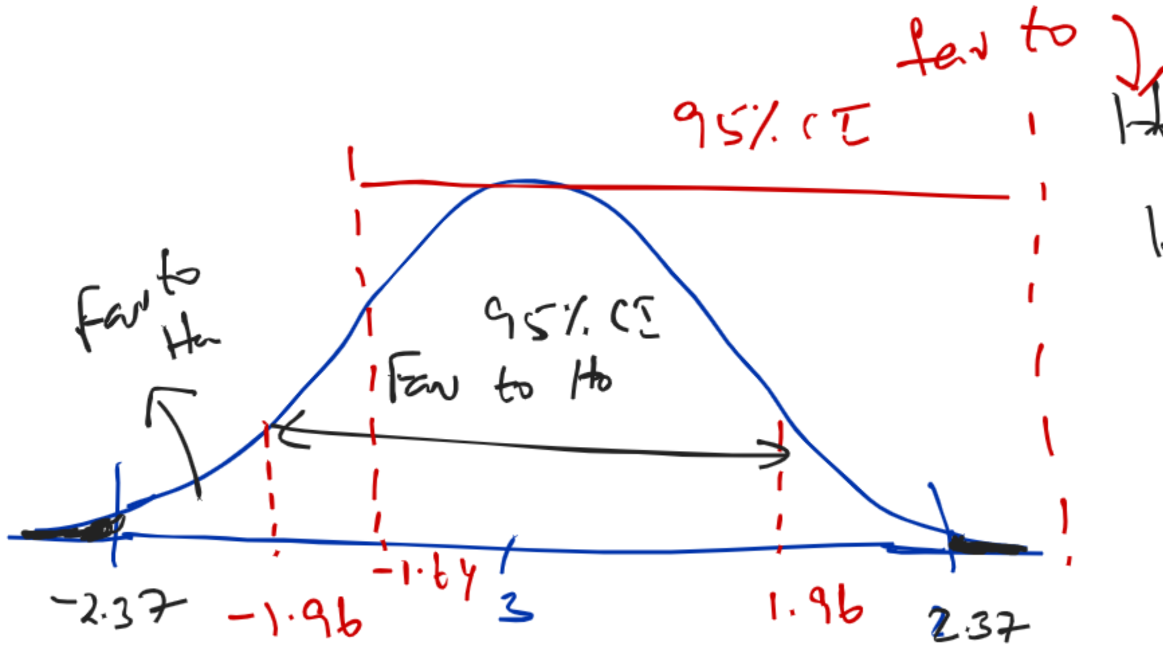
& p-val < 0.05 (5%)

We reject Ho, Hence Ha holds good

Texas A&M claim is True

H_0 : $\mu_{pop} = 3$

H_a : $\neq 3$



H_0 : $\mu_{pop} \geq 3$

H_a : $\mu_{pop} < 3$

Sample

$\bar{x} = 2.8$

$s = 0.6$

$n = 50$

$$t_{data} = \frac{2.8 - 3}{\frac{0.6}{\sqrt{50}}} = -2.37$$

$p(-2.37)$

$= 0.018 < 0.05$

Ho is rejected

$t_{data} = -2.37$

$p(-2.37)$

$= 0.009$

< 0.05

Ho is rejected

$\bar{x}_1 = 3.847$
$s_1 = 0.522$
$n_1 = 20$

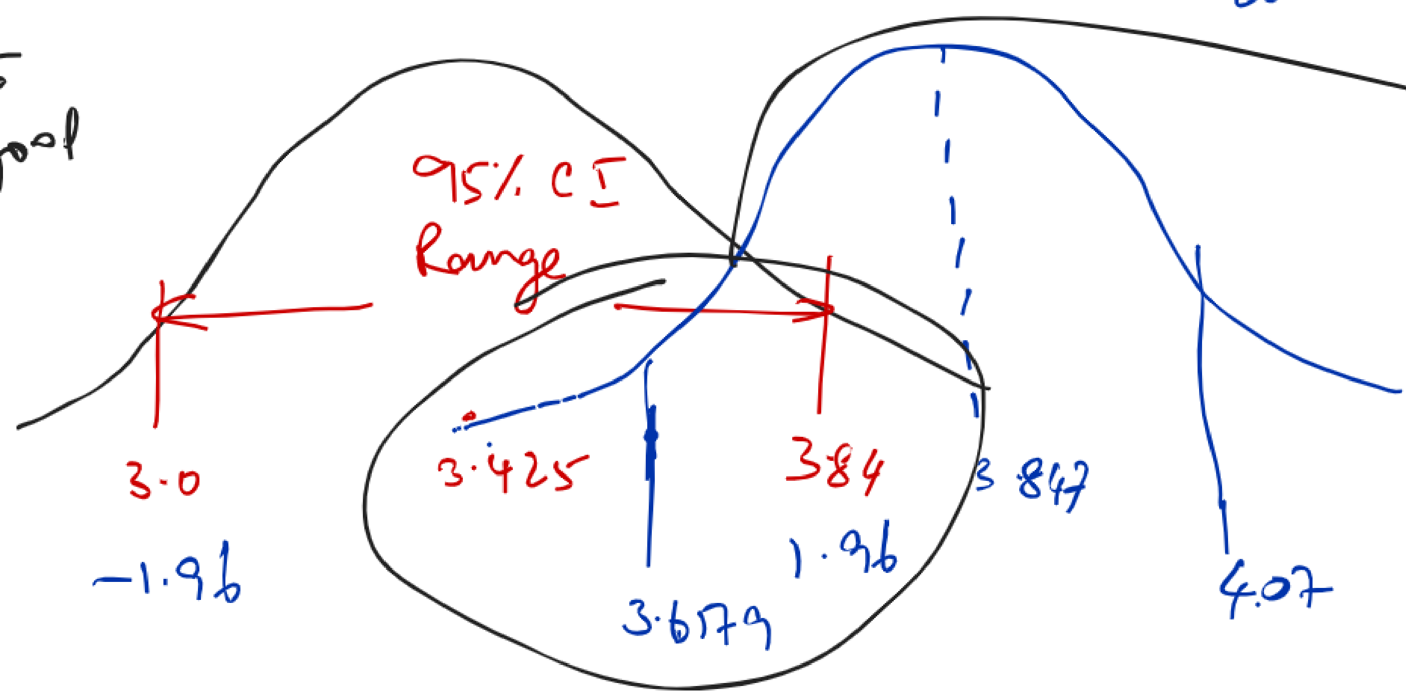
$\bar{x}_2 = 3.425$
$s_2 = 0.851$
$n_2 = 16$

$H_0: \bar{x}_1 = \bar{x}_2$

$H_a: \bar{x}_1 \neq \bar{x}_2$

$$t_{stat} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \Rightarrow \frac{3.847 - 3.425}{\sqrt{\frac{0.522^2}{20} + \frac{0.851^2}{16}}} = 1.7346$$

Since $p > 0.05$
Ho holds good



This overlapping
is > 5%

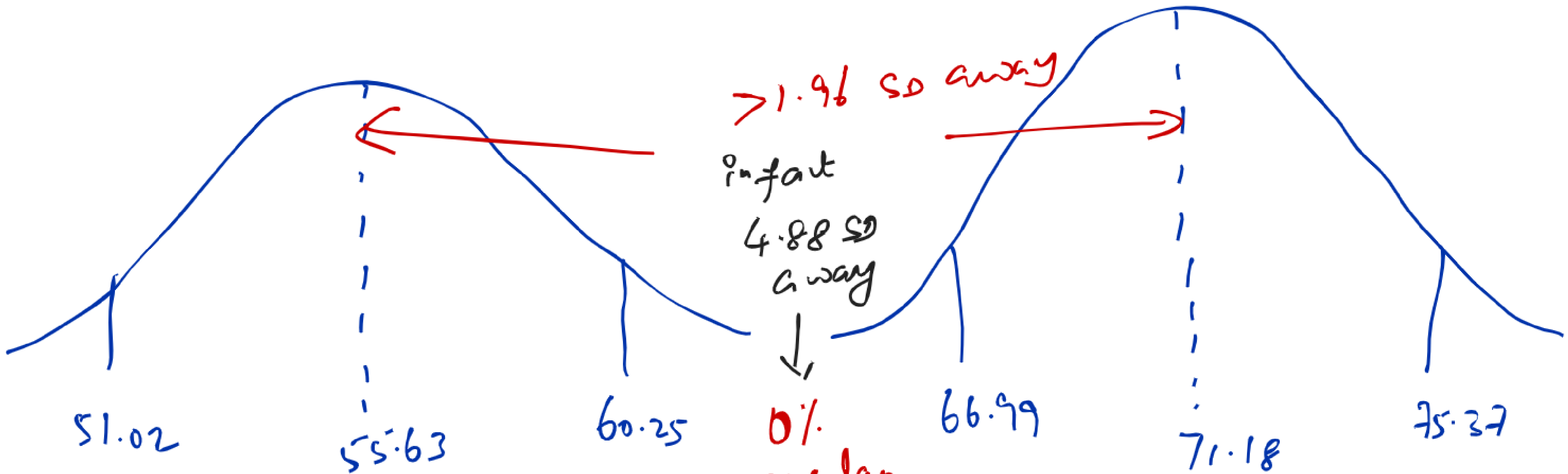
p-val > 0.05

$p(1.7346) = 0.076$

$\bar{x}_1 = 55.63$
$s_1 = 6.66$
$n_1 = 8$

$\bar{x}_2 = 71.18$
$s_2 = 6.04$
$n_2 = 8$

$H_0: \bar{x}_1 = \bar{x}_2$
$H_a: \bar{x}_1 \neq \bar{x}_2$



$p = 0 < 0.05$, we reject H_0 strongly