Assignment on T-Test

① Given, $\mu = 72$

$\bar{x} = 69$, $s = 6.5$, $n = 25$

n is small, (<30), sample standard deviation given,
let us calculate t-statistic

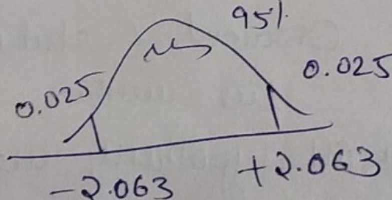
$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{69 - 72}{\frac{6.5}{\sqrt{25}}} = \frac{-3}{\frac{6.5}{5}}$$

$$= \frac{-3}{1.3} = -2.307$$

Not mentioned (m assuming)

Suppose we take at level of significance 5%

t at $df = n-1$ $(25-1)$
$= 24$, 0.025

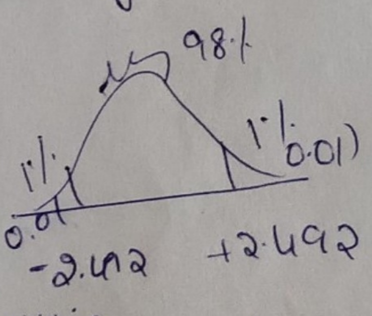


t-critical values are
$-2.063, +2.063$

Obtained t-statistic is -2.3; outside significant region; so, we don't say aerobic program helped in lowering heart rate.

Suppose we assume at $\alpha = \cancel{0.02}$ (0.02) 2% level of significance

t-values at $df = 24$, $\alpha = 1\%$ (0.01)



critical values for region
are ± 2.492

Obtained t-score $= -2.307$ lies within critical values (Not outside but within acceptance region)
So, we can say, Aerobic program has effective reason for lowering heart rate to 69 beats per minute at 2% level of significance.

(2) Given, $\mu = 15$

$n = 30$, $\bar{X} = 17$

$S = 5.5$

Null Hypothesis: $\mu = 15$

Alternate Hypothesis: $\mu > 15$

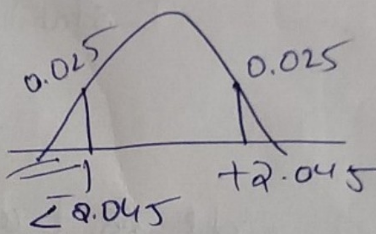
Two-tailed test at $P < 0.05$

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

$$= \frac{17-15}{\frac{5.5}{\sqrt{30}}} = \frac{2}{\frac{5.5}{5.4}} = \frac{2}{1.01} = 1.98$$

$\approx t = \approx 1.98 \; (\approx 2)$

at $df = (30-1) = 29$, $P < 0.05$



Obtained 't' statistic 2 (1.98) lies within 't' values critical values at $P < 0.05$, we accept Null Hypothesis that avg lifetime for particular model of shoes is 15 months; & for that sample by due chance it is 17 months.

(3) Given, Control $\to$ $\bar{X}_1 = 30$, $S_1 = 6.63$, $n_1 = 15$

Relaxation: $\bar{X}_2 = 26$, $S_2 = 6.20$, $n_2 = 15$

Two samples, seperate groups

Applying t-test

Null Hypothesis: Control & Relaxation groups are same

Alternate Hypothesis: There is difference between Control and Relaxation groups

We have $df = n_1 + n_2 - 2$

$= 15 + 15 - 2 = 28$

Standard error (SE) = $\sqrt{\frac{(S_1)^2}{n_1} + \frac{(S_2)^2}{n_2}}$

$= \sqrt{\frac{(6.63)^2}{15} + \frac{(6.20)^2}{15}}$

$= \sqrt{\frac{43.95}{15} + \frac{38.44}{15}}$

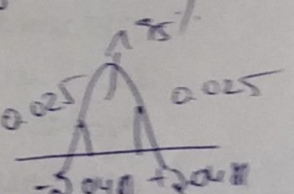
$= \sqrt{2.93 + 2.56} = \sqrt{5.49} = 2.34$

T-statistic = $\frac{\bar{x}_1 - \bar{x}_2}{SE} = \frac{30 - 26}{2.34}$

$= \frac{4}{2.34} = 1.709$

df = 28, t-critical value at 0.05 level of significance

1.709, lies in 't' values
within Acceptance region



No, change in Control and Relaxation groups, we accept Null hypothesis

(4) Here, it is Paired Sample t-test

Pairs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Control group	38	40	35	36	35	32	31	30	28	26	24	21	18	34	22
Relaxation group	35	32	30	34	30	32	28	27	22	22	18	17	17	25	21
D →	3	8	5	2	5	0	3	3	6	4	6	4	1	9	1

Mean of differences = 3+8+5+2+5+0+3+3+6+4+6+4+1+9+1 = 60/15 = $\boxed{4}$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D^2	9	64	25	4	25	0	9	9	36	16	36	16	1	81	[illegible]

we have, <u>Null hypothesis:</u> Mean of differences of Control and Relaxation group = 0 ($D=0$)

<u>Alternate hypothesis:</u> $\mu(D) \neq 0$

D D^2 Stand devi

Mean of $D = 4$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	3	8	5	2	5	0	3	3	6	4	6	4	1	9	1
D^2	9	64	25	4	25	0	9	9	36	16	36	16	1	81	1
stdevi $(D-\text{mean})^2$	1	16	1	4	1	16	1	1	4	0	4	0	9	25	9

$(4-3)^2 + (4-8)^2 + (4-5)^2 + (4-2)^2 + (4-5)^2 + (4-0)^2 + (4-3)^2 + (4-3)^2 + (4-6)^2 + (4-4)^2 + (4-6)^2 + (4-4)^2 + (4-1)^2 + (4-9)^2 + (4-1)^2$

$1 + 16 + 1 + 4 + 1 + 16 + 1 + 1 + 4 + 0 + 4 + 0 + 9 + 25 + 9$

$$\text{mean of std i.e } (D-\text{Mean})^2 = \frac{1+16+1+4+1+16+1+1+4+0+4+0+9+25+9}{15-1}$$

$$= 92/15 = \cancel{6.13} \quad 92/14 = 6.571 = \sqrt{6.571} = 2.56$$

$$\text{Standard error} = \frac{\text{mean of std}}{\sqrt{n}}$$

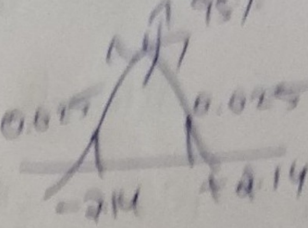
$$= \frac{2.56}{\sqrt{15}} = \frac{2.56}{3.87} = \cancel{1.58}\ 0.66$$

$$\text{Calculating t-static} = \frac{\text{Mean of D}}{\text{Standard error}} = \frac{4}{\cancel{1.58}\ 0.66} = \cancel{2.531}\ 6.06$$

t-critical value at 0.05, assume two tailed test t at df = n-1; 15-1 = 14

± 2.14

Obtained t static is 6.06 > 2.14 lies outside critical i.e in Rejection Region, we reject null hypothesis



There is difference in Pop means of Control and Relaxation groups based on Training.

(5) Given, $n = 10$, $s = 2.05$, $\bar{x} = 18$, $\mu = 16$

<u>Null hypothesis</u>: $\mu = 16$ (complaints per month)

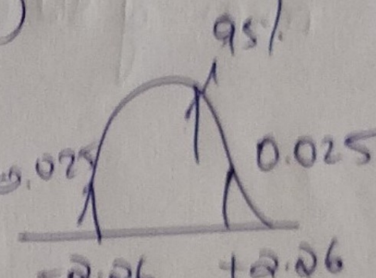
<u>Alternate hypothesis</u>: $\mu \neq 16$

$$t\text{-statistic} = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$= \frac{18 - 16}{\frac{2.05}{\sqrt{10}}} = \frac{2}{\frac{2.05}{3.16}} = \frac{2}{0.648} = 3.086$$

At $\alpha = 0.05$ (assuming), df = 9 (10-1)

t- critical values are ± 2.26



Obtained 't'- statistic at $\alpha = 0.05$ is 3.086 lies within critical values in Acceptance Region & hence we accept Null Hypothesis i.e avg complaints received per month is 16 & 18 complaints received is by chance on someday/month.