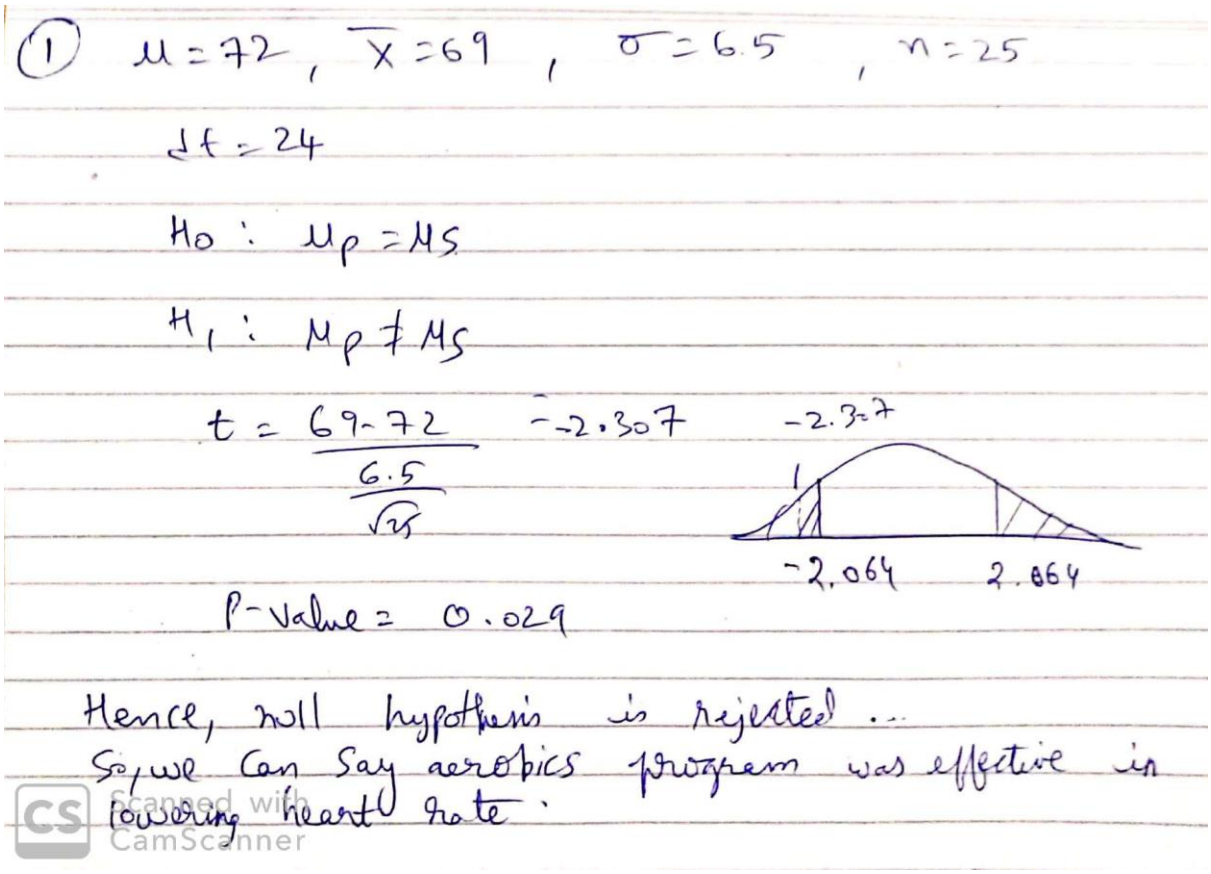
T-Test Assignment

1. Average heart rate for Americans is 72 beats/minute. A group of 25 individuals participated in an aerobics fitness program to lower their heart rate. After six months the group was evaluated to identify is the program had significantly slowed their heart. The mean heart rate for the group was 69 beats/minute with a standard deviation of 6.5. Was the aerobics program effective in lowering heart rate?

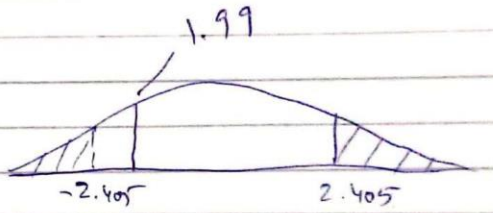


2. A manufacturer of running shoes knows that the average lifetime for a particular model of shoes is 15 months. Someone in the research and development division of the shoe company claims to have developed a longer lasting product. This new product was worn by 30 individuals and lasted on average for 17 months. The variability of the original shoes is estimated based on the standard deviation of the new group which is 5.5 months. Is the designer's claim of a better shoe supported by the trial results? Please base your decision on a two tailed testing using a level of significance of $p < 0.05$.

(2) $\mu = 15, n = 30, \bar{x} = 17, \sigma = 5.5, df = 29, \alpha = 0.05$

$H_0 : \mu_S = \mu_P$ $\quad H_1 : \mu_S \neq \mu_P$

$$t = \frac{17 - 15}{\frac{5.5}{\sqrt{30}}} = 1.99$$



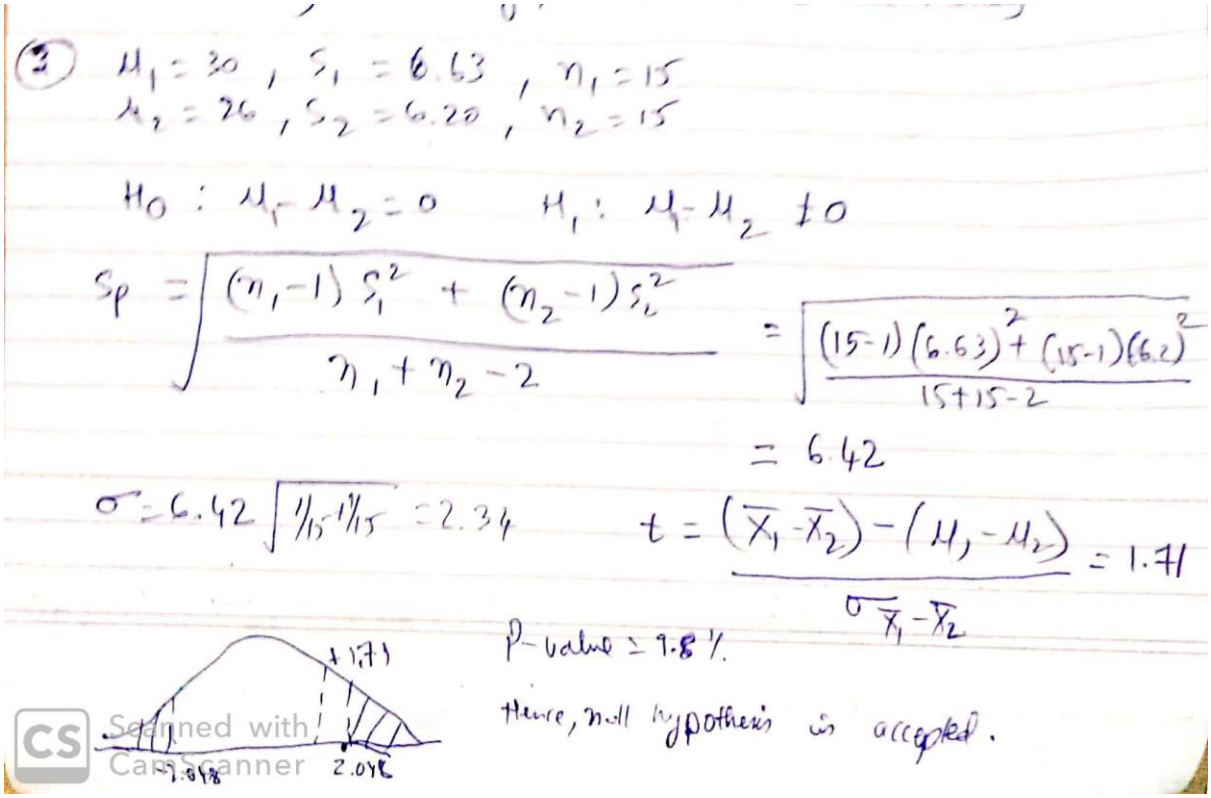
P-Value = 0.055

Hence, we accept null hypothesis and reject claim by designer that better shoe has longer life.

3. A research term wants to investigate the usefulness of relaxation training for reducing levels of anxiety in individuals experiencing stress. They identify 30 people at random from a group of 100 who have "high stress" jobs. The 30 people are divided into two groups. One group acts as the control group - they receive no training. The second group of 15 receive the relaxation training. The subjects in each group are then given an anxiety inventory. The summarized results appear below higher scores indicate greater anxiety.

Control: $\bar{X} = 30, S = 6.63, n = 15$

Relaxation: $\bar{X} = 26, S = 6.20, n = 16$



4. The above experiment is repeated again but this time with the matched samples on the dimensions of sex and job type. The raw data is mentioned below. Evaluate the experiment using the criteria of $p < .05$. Assume it is a two tailed test.

Pairs: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Contr: 38 40 35 36 35 32 31 30 28 26 24 21 18 34 22

Relax: 35 32 30 34 30 32 28 27 22 22 18 17 17 25 21

④ Control $\mu_1 = 30$, $S_1 = 6.63$, $n_1 = 15$

Relax $\mu_2 = 26$, $S_2 = 6.2$, $n_2 = 15$

$H_0 : \mu_1 - \mu_2 = 0$

$H_1 : \mu_1 - \mu_2 \neq 0$

$df = 14$

(Paired T-test)

$$t = \frac{(\Sigma D)/N}{\sqrt{\frac{\Sigma D^2 - ((\Sigma D)^2/N)}{(N-1)N}}}$$

$\Sigma D = 60$, $\Sigma D^2 = 332$

$$= \frac{60/15}{\sqrt{\frac{332 - 4}{14 \times 15}}} = 3.20$$

P-value = 0.006

Hence, null hypothesis is rejected and alternate hypothesis is accepted.

5. A Big Boss in the City and County agency has heard that one of his departments is receiving, on mean 16 complaints a month. The Big Boss is going to collect some data to see if he needs to replace the manager of the department. If the complaints are too high he will fire the manager. Thus, the Big Boss will test the theory that the mean number of complaints per month is equal to 16. Conversely, he will try to prove that the mean number of complaints per month is not equal to 16.

Here is the data:-

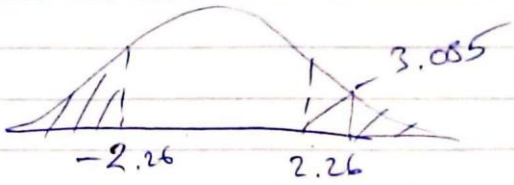
Random sample of n = 10 months, s = 2.05 complaints, $\bar{x}$ = 18 complaints.

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

$H_0 : \mu = 16$ $\quad df = 9$

$H_1 : \mu \neq 16$

$$t = \frac{18 - 16}{\frac{2.05}{\sqrt{10}}} = 3.085$$



P-value = 0.013

Hence, based on t-test, null hypothesis is rejected

So, statistically confirming, he should fire the manager.