

Answer on Question #40842 – Math – Statistics and Probability

A town-planning sub-committee in Tshwane wanted to know if there is any difference in the mean travelling time to work of car and Train commuters. They there carried out a survey amongst car and bus commuters and with the following sample statistics:

Car Commuters

Train Commuters

$$X_1 = 29.6 \text{ min}$$

$$X_2 = 25.2 \text{ min}$$

$$S_1 = 5.2 \text{ min}$$

$$S_2 = 2.8 \text{ min}$$

$$N_1 = 22 \text{ drivers}$$

$$N_2 = 36 \text{ passengers}$$

4.1 Test the hypothesis at the 5% significance level that it takes car commuters to get to work earlier than Train commuters.

Solution

The population variances are not assumed to be equal. The population variances are unknown, N_1 and N_2 are small, so we need to use t-test.

$$H_0: \mu_1 = \mu_2; H_a: \mu_1 < \mu_2.$$

The test statistic is

$$t = \frac{X_1 - X_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}} = \frac{29.6 - 25.2}{\sqrt{\frac{5.2^2}{22} + \frac{2.8^2}{36}}} = 3.66.$$

Number of degrees of freedom is smaller of $N_1 - 1$ and $N_2 - 1$: $df = 22 - 1 = 21$.

For $df = 21$, the tabled value is $t_\alpha = t_{0.05} = 1.72$. The rejection region: $t < -1.72$. The observed value of the test statistic is $t = 3.66 > -1.72$. Therefore, at the $\alpha = 0.05$ level of significance the null hypothesis H_0 is accepted and we conclude that the claim (it takes car commuters to get to work earlier than Train commuters) is not substantiated by the data.