

Question #72491, Math / Statistics and Probability

A random sample of size $n_1 = 40$ households in the first community has a mean monthly income of 1900\$ with a standard deviation 540\$. For the second community a sample of $n_2 = 30$ households has a mean of 1600\$ with a standard deviation 420\$. Using a 5% level of significance, test the null hypothesis that there is no difference between the average monthly household income in the two communities.

Answer.

Two-tailed t-test for two samples assuming unequal variances.

Null hypothesis $H_0: \mu_1 = \mu_2$.

Alternative hypothesis $H_a: \mu_1 \neq \mu_2$.

$$\text{Test statistic: } t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{1900 - 1600}{\sqrt{\frac{540^2}{40} + \frac{420^2}{30}}} = 2.61.$$

Degrees of freedom: $df = n_2 - 1 = 30 - 1 = 29$.

P-value: $p = 0.0142$.

Since P-value is less than 0.05 we should reject the null hypothesis and conclude that there is a significant difference between average monthly household income in the two communities.

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