Answer on Question #82907 – Math – Statistics and Probability

Question

A sample of 100 motorcar tyres has a mean of 20,000 km and a standard deviation of 800 km. A second sample of 150 tyres has a mean life of 22,000 km and a standard deviation of 900 km. Is it true to say that the two samples were drawn from the same population?

Solution

$$F = \frac{s_1^2}{s_2^2} = \frac{800^2}{900^2} = 0.79$$

Since p-value for $F(99,149) = 0.79$ equals 0.90, we can assume equal variances.

Two sample t-test assuming equal variances.

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Degrees of freedom:

$$df = n_1 + n_2 - 2 = 100 + 150 - 2 = 248$$

Test statistic:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{20000 - 22000}{\sqrt{\frac{99 \cdot 800^2 + 149 \cdot 900^2}{248}\left(\frac{1}{100} + \frac{1}{150}\right)}} = -17.98$$

p-value (from the table): $p < 0.0001$

Since $p - value < 0.0.5,$ the null hypothesis should be rejected.

Answer: two samples were drawn from different populations.