

## Answer on Question #48232 – Math – Statistics and Probability

The average hourly wage of a sample of 150 workers in plant A was Rs. 2.56 with a standard deviation of Rs. 1.00. The average hourly wage of a sample of 200 workers in plant B was Rs. 2.87 with a standard deviation of Rs. 1.20. Write a suitable hypothesis to test whether the wages are comparable and test it.

### Solution

To compare means:

Null hypothesis: means are the same; alternative hypothesis: means differ.

$$H_0: \mu_1 = \mu_2; H_a: \mu_1 \neq \mu_2$$

Let the significance level  $\alpha = 0.1$

Rejection region:  $z \leq -1.645; z \geq 1.645$

Compute z-score:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{2.56 - 2.87}{\sqrt{\frac{1^2}{150} + \frac{1.2^2}{200}}} = -2.633$$

As z-score lies in the rejection region, we reject null hypothesis. Thus, at 0.1 significance level, there is sufficient evidence to reject the claim that the means are equal (null hypothesis).

To compare standard deviations:

Null hypothesis: standard deviations are equal; alternative hypothesis: standard deviations differ.

$$H_0: \sigma_1^2 = \sigma_2^2; H_a: \sigma_1^2 \neq \sigma_2^2$$

Let the significance level  $\alpha = 0.1$

Test score:  $F = \left(\frac{s_1}{s_2}\right)^2 = 0.6944$

Since the first sample had the smaller standard deviation, this is a left-tailed test.

F-distribution has two degrees of freedom,  $150-1=149$  and  $200-1=199$ .

The p-value is  $p = \text{Fcdf}(0, 0.6944, 149, 199) = 0.0096$ , which is less than our significance level.

Thus, we should reject the null hypothesis that standard deviations are equal.