Answer on Question #64886 – Math – Statistics and Probability

Question

The following data represents the sale (Rs. 1,000) per month of 3 brands of a toilet soap allocated among 3 cities:

	Cities		
Brands	A	B	C
I	42	48	30
II	42	54	57
III	29	42	29

At 5% level of significance, test whether the mean sales of 3 brands are equal.

Solution

H_0: The mean sales of 3 brands are equal.

H_a: Not all mean sales of 3 brands are equal.

Using the one-way analysis of variance (ANOVA)

$$df_T = 3 - 1 = 2,$$

$$df_{total} = 9 - 1 = 8,$$

$$df_E = 8 - 2 = 6,$$

$$SS_{total} = 42^2 + 48^2 + 30^2 + 42^2 + 54^2 + 57^2 + 29^2 + 42^2 + 29^2$$
$$- \frac{(42 + 48 + 30 + 42 + 54 + 57 + 29 + 42 + 29)^2}{9} =$$

$$= 884.222,$$

$$SS_T = \frac{(42+48+30)^2}{3} + \frac{(42+54+57)^2}{3} + \frac{(29+42+29)^2}{3} - \frac{(42+48+30+42+54+57+29+42+29)^2}{9} = 477.556,$$

$$SS_E = SS_{total} - SS_T = 884.222 - 477.556 = 406.666,$$

$$MS_T = \frac{SS_T}{3-1} = \frac{477.556}{2} = 238.778,$$

$$MS_E = \frac{SS_E}{9-3} = \frac{406.666}{6} = 67.778.$$

The test statistic is

$$F = \frac{MS_T}{MS_E} = \frac{238.778}{67.778} = 3.522.$$

Using the tables of the F distribution the critical value at 5% significance level is

$$F_\alpha(3-1,9-3) = F_{cr}(2,6) = 5.143.$$

The test statistic is less than critical value. Thus, we don't reject the null hypothesis at 5% level of significance.

There is not sufficient evidence to conclude that mean sales of 3 brands are not equal.

Answer: There is not sufficient evidence to conclude that mean sales of 3 brands are not equal.