

## 1. Problem

A survey with 49 persons was conducted to analyze the design of an advertising campaign. Each respondent was asked to evaluate the overall impression of the advertisement on an eleven-point scale from 0 (bad) to 10 (good). The evaluations are summarized separately with respect to type of occupation of the respondents in the following figure.



To analyze the influence of occupation on the evaluation of the advertisement an analysis of variance was performed:

	Res. Df	RSS	Df	Sum of Sq	F	Pr(>F)
1	48	24.789				
2	45	24.642	3	0.147	0.089	0.96565

Which of the following statements are correct?

- A one-sided alternative was tested for the mean values.
- It can be shown that the evaluation of the respondents depends on their occupation. (Significance level 5%)
- The fraction of explained variance is larger than 59%.
- The fraction of explained variance is smaller than 56%.
- The test statistic is smaller than 1.2.

## Solution

In order to be able to answer the questions the fraction of explained variance has to be determined. The residual sum of squares when using only a single overall mean value ( $RSS_0$ ) as well as the residual sum of squares when allowing different mean values given occupation ( $RSS_1$ ) are required. Both are given in the RSS column of the ANOVA table. The fraction of explained variance is given by  $1 - RSS_1/RSS_0 = 1 - 24.642/24.789 = 0.006$ .

The statements above can now be evaluated as right or wrong.

- False. An ANOVA always tests the null hypothesis, that all mean values are equal against the alternative hypothesis that they are different.
- False. The  $p$  value is 0.966 and hence *not* significant. It can *not* be shown that the evaluations differ with respect to the occupation of the respondents.
- False. The fraction of explained variance is 0.006 and hence *not* larger than 0.59.
- True. The fraction of explained variance is 0.006 and hence smaller than 0.56.
- True. The test statistic is  $F = 0.089$  and hence smaller than 1.2.