1. In the two-way ANOVA model with interactions, the interaction term describes how the relationship between a factor and the response differs as a function of the level of the other factor.

True

False

2. Consider a two-way ANOVA model with two factors, τ and α, each of two levels, with the following regression form:

$$Y_i = \beta_0 + \beta_1\tau_{i,2} + \beta_2\alpha_{i,2} + \beta_3\tau_{i,2}\alpha_{i,2} + \varepsilon_i,$$

where the typical definitions of the indicator variables hold (e.g., $\tau_{i,2} = 1$ when the i^{th} unit is in the second level of τ and $\tau_{i,2} = 0$ otherwise).

Whether there is an interaction in the data can be successfully tested with a t-test.

True

False

4. Consider a two-way ANOVA model with two factors, τ, of three levels, and α of two levels, with the following regression form:

$$Y_i = \beta_0 + \beta_1\tau_{i,2} + \beta_2\tau_{i,3} + \beta_3\alpha_{i,2} + \beta_4\tau_{i,2}\alpha_{i,2} + \beta_5\tau_{i,3}\alpha_{i,2} + \varepsilon_i,$$

where the typical definitions of the indicator variables hold (e.g., $\tau_{i,2} = 1$ when the i^{th} unit is in the second leve of τ and $\tau_{i,2} = 0$ otherwise).

Suppose that there is, in fact, no interaction between factors at any level. Then the mean of the response for unit in the second level of the τ factor and the second level of the α factor is:

$\mu_{2,2} = \beta_0 + \beta_1 + \beta_3 + \beta_4$

$\mu_{2,2} = \beta_0 + \beta_1 + \beta_3$

$\mu_{2,2} = \beta_0 + \beta_1 + \beta_3 + \beta_4 + \beta_5$

$\mu_{2,2} = \beta_1 + \beta_3$

5. Consider a two-way ANOVA model with two factors, τ, of three levels, and α of two levels, with the following regression form:

$$Y_i = \beta_0 + \beta_1\tau_{i,2} + \beta_2\tau_{i,3} + \beta_3\alpha_{i,2} + \beta_4\tau_{i,2}\alpha_{i,2} + \beta_5\tau_{i,3}\alpha_{i,2} + \varepsilon_i,$$

where the typical definitions of the indicator variables hold (e.g., $\tau_{i,2} = 1$ when the i^{th} unit is in the second leve of τ and $\tau_{i,2} = 0$ otherwise).

Suppose that there is, in fact, an interaction between factors. Then the mean of the response for units in the first level of the τ factor and the first level of the α factor is:

$\mu_{1,1} = \beta_0$

$\mu_{1,1} = \beta_0 + \beta_4$

$\mu_{1,1} = \beta_0 + \beta_4 + \beta_5$

There is not enough information about the nature of the interaction to answer this question.

6. Researchers designed an experiment to study factors affecting the particle size in the production of polyvinyl chloride (PVC) plastic. In the experiment, three operators (Factor A, levels X, Y, and Z) used eight different devices called resin railcars (Factor B, levels 1-8) to produce PVC. Suppose that there were several replications in the study.

If the interaction terms in this study are statistically significant, then we cannot easily interpret the marginal effec of resin railcar in particle size.

True

False

7. In the two-way ANOVA context, when using the F-test to test whether an interaction exists for a particular dataset, the model with the interaction term is the reduced model.

True

False