Hypothesis Tests for ANOVA

The p-values in the ANOVA table are addressing the three questions from Why do ANOVA.

1. In the table for the full model, the p-value for the interaction is testing:
   \[ H_0: \alpha_{ij} = 0 \]
   \[ H_a: \alpha_{ij} \neq 0 \]
   If the p-value for the interaction is not significant, drop this term and fit the additive model.

2. In the table for the additive model, the p-value for Factor A is testing:
   \[ H_0: \alpha_1 = \alpha_2 = \ldots = \alpha_I \]
   \[ H_a: \text{At least one } \alpha_i \text{ is different} \]

3. Also in the table for the additive model, the p-value for Factor B is testing:
   \[ H_0: \beta_1 = \beta_2 = \ldots = \beta_J \]
   \[ H_a: \text{At least one } \beta_j \text{ is different} \]

After addressing these questions, we know the form of the final model for the data.

**Final Model for the Wood-Joint Example:**
\[ Y_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + e_{ijk}, \text{ where } e_{ijk} \sim N(0, \sigma^2) \]

**Final Model for the Pencil Brand-Soak Time Example:**
\[ Y_{ijk} = \mu + \beta_j + e_{ijk}, \text{ where } e_{ijk} \sim N(0, \sigma^2) \]