# DOE Fractional Factorial Analysis

This guide provides instructions on analyzing fractional factorial experiments (experiments where not every possible treatment combination in a full factorial design is run) using the Fit Model platform.

## Specify the Model and Analyze

Reactor 8 Runs.jmp (Help > Sample Data Folder > Design Experiment).
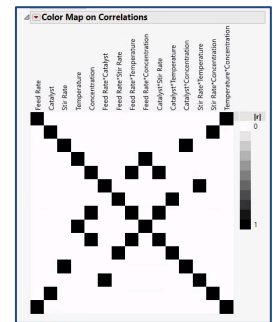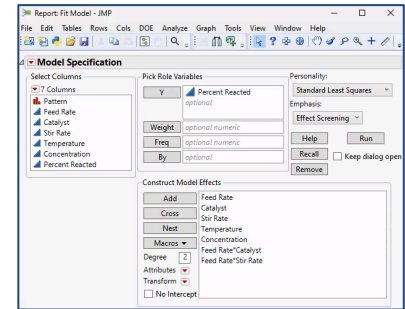
This is a unreplciated 8 run $2^{5-2}$ Resolution III

1. Experiments designed in JMP® will have a **Model** script saved to the data table. The model specification window will be populated with this model. To generate the model manually:

   - Select **Analyze > Fit Model**.
   - Click on the response under **Select Columns**, and click **Y**.
   - Select the factors of interest, and click **Add** (under **Construct Model Effects**).
   - To add specific interaction terms, select the variables under **Select Columns** and click **Cross**. Click Run to fit the specified model.
     In this experiment, all but two of the 2-way interactions are confounded with main effects.
     - Feed Rate*Catalyst = Stir Rate*Temperature
     - Feed Rate*Stir Rate = Catalyst*Temperature, and

     One way to view the level of confounding of the factors is to examing the Color Map of Correlations in the Evaluate Design report. Here you'll see the counding between the 2-way interations and main effects as well as the confounding between the two 2-way interactions listed above.





2. Click **Run** to fit your specified model

   Note: If your design is **saturated** (there are no error degrees of freedom) as the case here, the Effects Summary, Parameter Estimates, and Effect Tests tables with not show test statitics and p=values. Select **Estimates > Sorted Estimates** from the top red triangle to see p-values based on **Lenth Pseudo Standard Error** (PSE, an estimate of residual standard error).



3. **Reduce the model** (removing terms) as desired. Here we removed the 2-way interaction with the highest pseudo p-value (Feed Rate*Catalyst = Stir Rate*Temperature). Upon doing that, there is now a single degree of freedom to estimate experimental error. Test statistics and p-values will now appear in the Effect Summary table. Recall that all the main effects are counfounded with 2-way interactions and that the Feed Rate * Stir Rate interaction is confounded with Catalyst*Temperature. Thus it is unknown if it's the main effects or the 2-way interactions they are each confounded with that have a significant effect on the response. Similarly, it is also unknown which of the two 2-way interactions are impacting the response.



Visit **Design of Experiments Guide** in **JMP Help** to learn more.