JMP One-Page Guides

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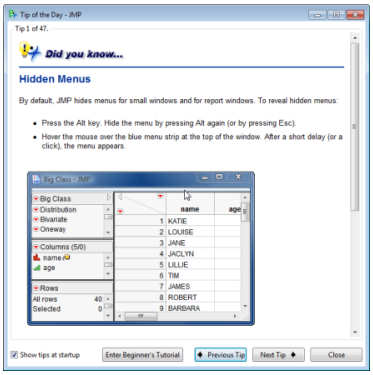
Table of Contents

Opening JMP® and Getting Started

This page gives information on creating a new data table, opening data tables, and finding help within JMP.

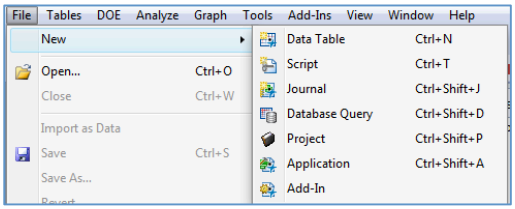
Opening JMP®

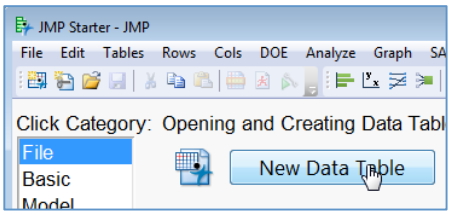


1. When you first open JMP, you'll see the **Tip of the Day** and the **JMP Home** windows. On Mac you'll also see the **JMP Starter** window.
   - Tip of the Day gives helpful hints on using JMP.
   - The JMP Home Window displays recently used files and open data tables and windows. See the page "**Navigating JMP in Windows**" for Windows-specific information.
   - The **JMP Starter** window (click on **View > JMP Starter** on Windows to open) provides shortcuts for using JMP, including opening files and accessing JMP analyses.
2. The JMP menus, across the top, can be used to perform JMP functions.
3. The JMP toolbar, located beneath the menu bar, provides many shortcuts and helpful tools.

Creating a New JMP® Data Table

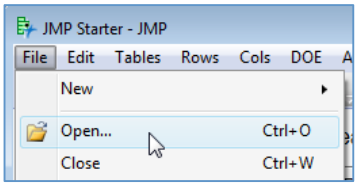
Click on **File > New > Data Table** or select **New Data Table** from the **JMP Starter**.

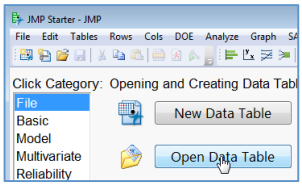




Opening a JMP® Data Table

1. Click on **File > Open**, or click on **Open Data Table** from the **JMP Starter** window. Navigate to the directory where your JMP, Excel or other files are stored.
2. Click on the file name and click **Open**.

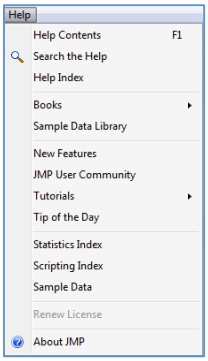




Getting Help

The **Help** menu provides many resources to help you get started:

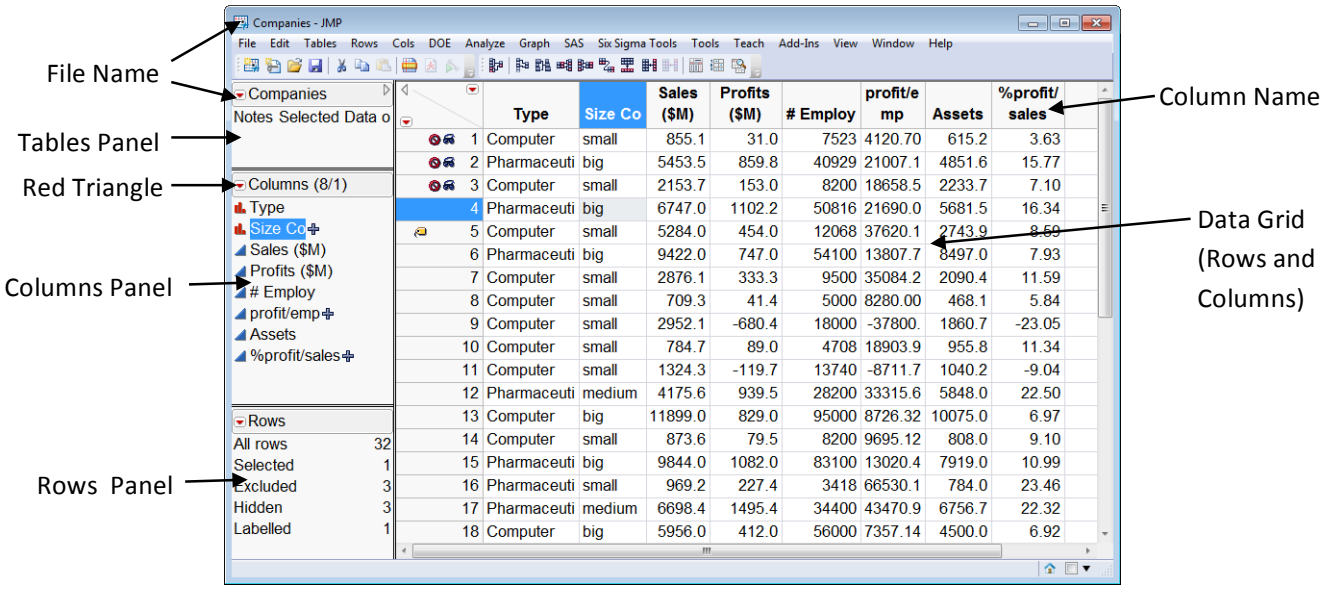
- Searchable documentation (Help Contents, Search the Help, Help Index and Books),
- A summary of new features,
- Tutorials,
- Sample Data,
- Indexes of statistical terms and JMP scripting functions, and more.



JMP® Data Tables

This page gives information on the structure, components and information contained in JMP data tables.

Click on **File > Open** to open a JMP data table. To open a file from the JMP Sample Data directory, go to **Help > Sample Data**. A portion of the Sample Data file **Companies.jmp** is shown.



	Type	Size Co	Sales ($M)	Profits ($M)	# Employ	profit/emp	Assets	%profit/sales
1	Computer	small	855.1	31.0	7523	4120.70	615.2	3.63
2	Pharmaceuti	big	5453.5	859.8	40929	21007.1	4851.6	15.77
3	Computer	small	2153.7	153.0	8200	18658.5	2233.7	7.10
4	Pharmaceuti	big	6747.0	1102.2	50816	21690.0	5681.5	16.34
5	Computer	small	5284.0	454.0	12068	37620.1	2743.9	8.59
6	Pharmaceuti	big	9422.0	747.0	54100	13807.7	8497.0	7.93
7	Computer	small	2876.1	333.3	9500	35084.2	2090.4	11.59
8	Computer	small	709.3	41.4	5000	8280.00	468.1	5.84
9	Computer	small	2952.1	-680.4	18000	-37800.	1860.7	-23.05
10	Computer	small	784.7	89.0	4708	18903.9	955.8	11.34
11	Computer	small	1324.3	-119.7	13740	-8711.7	1040.2	-9.04
12	Pharmaceuti	medium	4175.6	939.5	28200	33315.6	5848.0	22.50
13	Computer	big	11899.0	829.0	95000	8726.32	10075.0	6.97
14	Computer	small	873.6	79.5	8200	9695.12	808.0	9.10
15	Pharmaceuti	big	9844.0	1082.0	83100	13020.4	7919.0	10.99
16	Pharmaceuti	small	969.2	227.4	3418	66530.1	784.0	23.46
17	Pharmaceuti	medium	6698.4	1495.4	34400	43470.9	6756.7	22.32
18	Computer	big	5956.0	412.0	56000	7357.14	4500.0	6.92

Tables Panel

- The data table name
- A list of table properties and scripts

– Double-click on properties to display or open.

Columns Panel

- The number of columns
- The number of selected columns
- Column names
- The modeling type for each column
- Column properties

– This data table has eight columns, and one column has been selected.
– Two columns are nominal (red bars).
– Six columns are continuous (blue triangles).
– There are no ordinal columns (green bars).
– Three columns have stored formulas (the plus sign after the column name – click on the plus sign to display the formula).

Rows Panel

- Rows
- Selected rows
- Hidden rows (with a mask)
- Excluded rows (with a “don’t” sign)
- Labeled rows (with a tag)

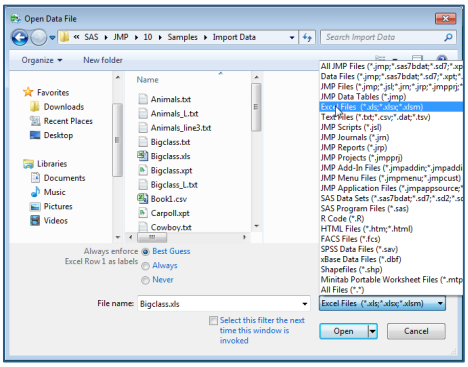
– This data table has 32 rows, or observations.
– One row has been selected (row 4).
– Three rows have been both excluded and hidden (rows 1-3).
– Hidden rows will not display on graphs.
– Excluded rows will not be included in most future analyses.
– One row has been labeled (row 5).

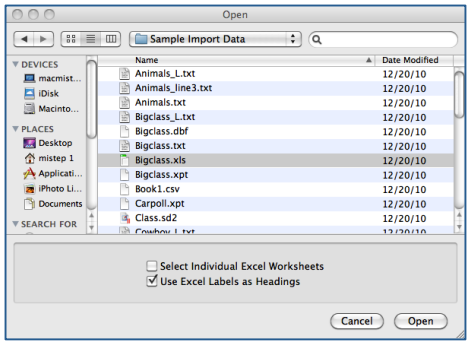
Notes: **Red triangles** are used throughout JMP to access other commands, and **gray triangles** are used to minimize display areas**. Right-click** in different regions of the data table (or graphs) for additional options. For additional information, see the book ***Discovering JMP*** (under **Help > Books**).

Importing Data from Excel

This page gives information on how to import data into JMP® from Excel. Mac OS differences are noted.

Opening Excel Files Directly in JMP®

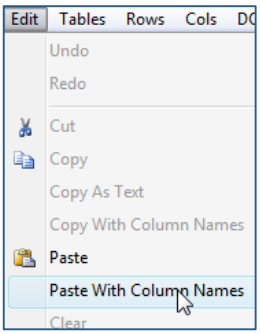




1. Select **File > Open**.
2. Navigate to the directory where your files are stored.
3. JMP will display all files recognized – unrecognized files will be grayed out. In Windows only, to see a complete list of file types JMP can read, click on the arrow next to **All JMP Files** (shown to the right).
4. Select the Excel file you'd like to import. In Windows, a preview of the file will display.
5. At the **bottom** of the window, indicate whether **the first row of your spreadsheet should be used as labels.** Default settings for Windows (top) and Mac (bottom) are shown.
6. Click **Open**. The file will be imported into JMP.

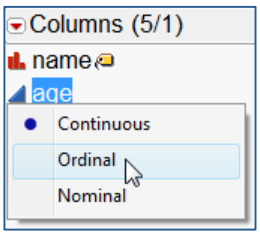
   Note: If you have more than one worksheet in your Excel file, JMP will import each sheet as a separate data table. To select which worksheets to import in Windows, check the arrow next to **Open** and select box next to **Open Selected Worksheet**. In Mac, check **Select Individual Excel Worksheets**.

Copying and Pasting from Excel into JMP®



1. In Excel, copy the cells you'd like to import, including column names (one row).
2. In JMP, click on **File > New > Data Table** or select **New Data Table** from the **JMP Starter**.
3. Select **Edit > Paste** or **Edit > Paste with Column Names** to paste the data into the new data table. Selecting the latter will allow you to paste column names from your Excel file.

Tips:



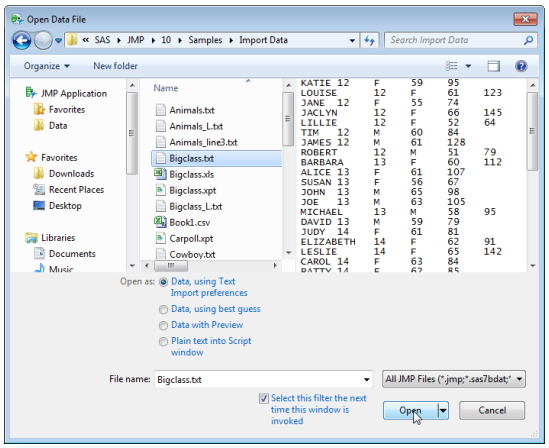
- Always check to make sure that the Excel file was imported correctly.
- In particular, check that JMP has assigned the **correct modeling types**. By default, numeric columns will be **Continuous** (blue triangles) and alphanumeric (text) columns will be **Nominal** (red bars).
- To change the modeling type, click on the icon in front of the column name in the **Columns** panel, or change the modeling type in the **Column Info** window.

Note: In **Windows** you can open .xls and .xlsx files directly. In **Mac** you can open .xls files can directly, but .xlsx files cannot be imported unless a Mac Excel ODBC driver is installed. To import .xlsx files, save and import as a text file. See the page **Importing Text Files** for details.

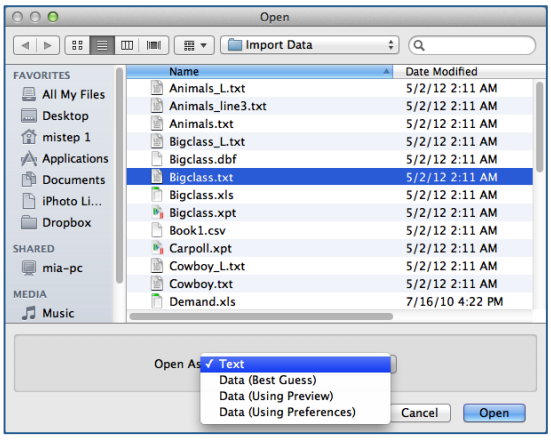
Importing Text Files

This page gives information on how to import text files (.txt, .csv, .dat, or .tsv) into JMP®. Windows (top) and Mac (bottom) file open windows are displayed, and Mac OS differences are noted.

Importing Data from Text Files



1. Select **File > Open**.
2. Navigate to the directory where your files are stored.
3. JMP will display all files recognized – unrecognized files will be grayed out.
4. Select the text file you'd like to import. In Windows, a preview of the file will display.
5. At the bottom of the window choose one of the four import methods next to **Open as**, and click **Open**.

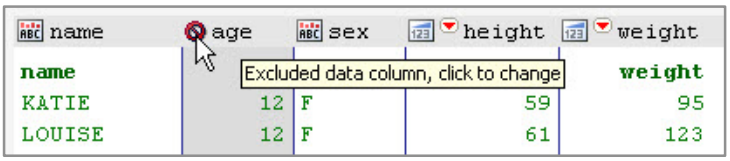


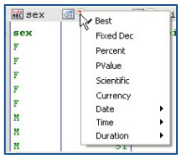
Import Methods:

- **Data, using Text Import preferences**, or in Mac, **Data (Using Preferences)**: JMP uses the import rules set in Preferences to open the file. To see or change your preference settings, go to **File > Preferences > Text Data Files**, or in Mac, **JMP > Preferences > Text Data Files**.
- **Data, using best guess**, or in Mac, **Data (Best Guess)**: JMP uses its best guess to import the text file.
- **Data with Preview**, or in Mac, **Data (Using Preview)**: JMP displays a window with the data and options for reading in the data. Additional details are provided below.
- **Plain text into Script window**, or in Mac, **Text**: JMP opens the file in a text-editing window.

Importing data using **Preview**:

- JMP will detect the file's structure and display the appropriate Text Import window. Click the **Delimited Fields** or **Fixed Width Fields** radio button to change the import type.
- Select **Next** to see how your data will look in JMP. From here, you can:
  - Click on a column name to change it.
  - Click on the icon next to each column name to toggle between Numeric, Character and Exclude.
  - Select a format for numeric columns by clicking on the red triangle next to the column name.





- Select **Import** at the bottom of the window when you're ready to import the data into JMP.

Note: For more details, see the book ***Using JMP*** (under **Help > Books**).

JMP Tools

The Tools menu provides tools to help you interact with JMP output and data. These tools are also available from a toolbar located under the main menu. In Windows, the menus and the toolbar are hidden by default in JMP output. Click the Alt key to view.

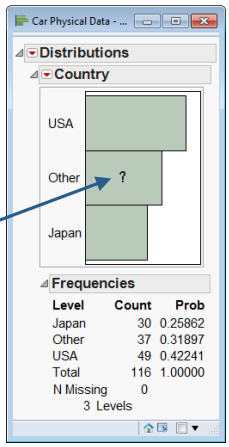
Windows 

Mac 

Using the Tools

The default tool is the Arrow, or Cursor. To change tools, click on the icon from the toolbar or select from the Tools Menu. Your curser will change from the arrow to the shape of the tool selected, and the active tool will be highlighted in the toolbar.

Description of Tools



Arrow – Allows you to select points in plots, choose analysis options, and more. Remember to select the arrow after you've finished using other tools.

Help – The help tool or question mark accesses the JMP help system. Select the help tool, then click on an area of a data table or report on which you need assistance. Context-sensitive help tells about the items located near the location of your click.

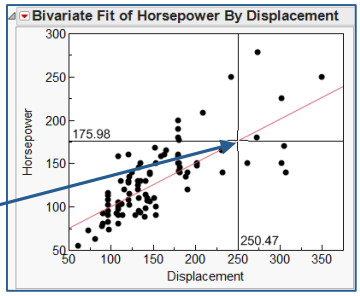
Selection – The selection tool, or fat plus sign. Click on the selection tool, then select rows or regions of rows by clicking and dragging, or select portions of graphical output or analysis results to copy and paste.

Scroller – The scroller tool is for scrolling reports up or down to show only the results you want to see.

Grabber – The grabber or hand tool is for manipulating plots, axes and formula components. Click and drag to rescale or change the range of an axis, or click and drag in a histogram to change the bin size.

Brush – The brush tool is for highlighting a rectangular area of points in a plot. Alt-click (Option-click on Mac) to change the size of the rectangle or to extend the selection.

Lasso – The lasso tool lets you highlight an irregular area of points in a plot. Drag the lasso around any set of points to select them.



Magnifier – The magnifier tool is for zooming in on an area in a plot. The area you click on becomes the center of a new view. Alt-click (Option-click on Mac) to restore the original plot.

Crosshairs – The crosshair tool, or skinny plus sign. Select the crosshair tool, then click on an area of a plot for a movable set of axes to locate points and estimate values.

Annotate – The Annotate tool is for adding text to a plot, output or journal.

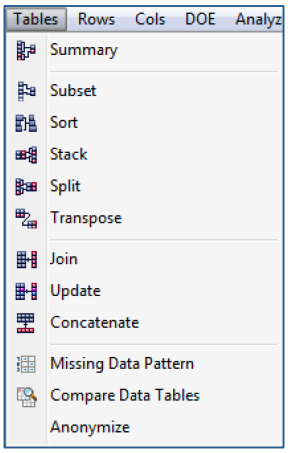
Line, Polygon, and Simple Shape – The drawing tools draw lines, polygons, and shapes on JMP reports, journals, and layouts. Right click a line or shape for a menu of options to customize it.

Notes: Right click on the toolbar to customize it. For more details see the book **Using JMP** (under Help > Books).

JMP® Tables Menu

This page gives information on the JMP Tables Menu functions, which allow you to summarize, subset, reshape and explore existing data tables, and more. The first option, Summary, is also described.

The Tables Menu Functions

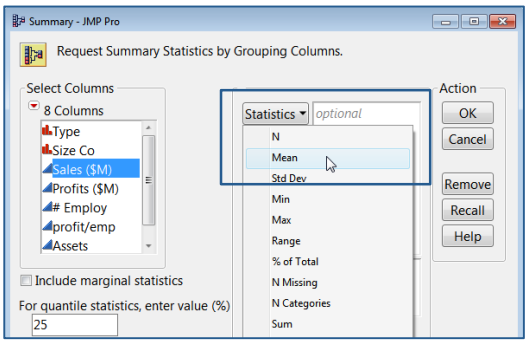


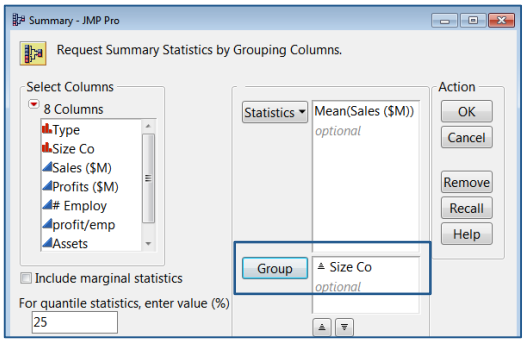
- Summary – Calculates summary statistics for columns in the active data table.
- Subset – Creates a new table that is a subset of the active table.
- Sort – Sorts a table by one or more columns.
- Stack – Stacks separate columns into one new column.
- Split – Splits a column into multiple columns.
- Transpose – Creates a table whose columns were the rows in the original table.
- Concatenate – Combines tables end to end (bottom to top).
- Join – Combines tables side by side.
- Update – Updates a table with values from a second table.
- Missing Data Pattern – Allows you to explore patterns in missing data.
- Compare Data Tables – Identify differences between two open data tables.

Summarizing Data with the Summary Function

1. From an open JMP data table, select **Tables > Summary**.
2. Select one or more variables from **Select Columns**. Then, click on **Statistics** and select a statistic. Repeat for each statistic desired.
3. To create a row for combination of grouping variables, select the variable(s) from **Select Columns**, and click **Group**.

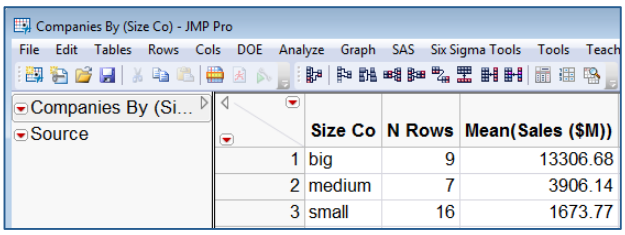
Example:
Companies.jmp
(Help > Sample Data)





4. Click **OK** to create the summary table. This table is linked to the original table.

- The summary table has three rows, one for each category of the Group variable (Size Co, in this example).
- N Rows shows the number of rows of each category that were in the original table.
- Mean (Variable), the statistic we selected, is shown in the third column - Mean(Sales ($M)).



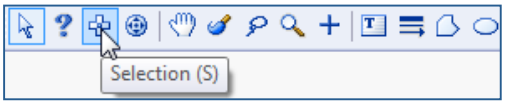
	Size Co	N Rows	Mean(Sales ($M))
1	big	9	13306.68
2	medium	7	3906.14
3	small	16	1673.77

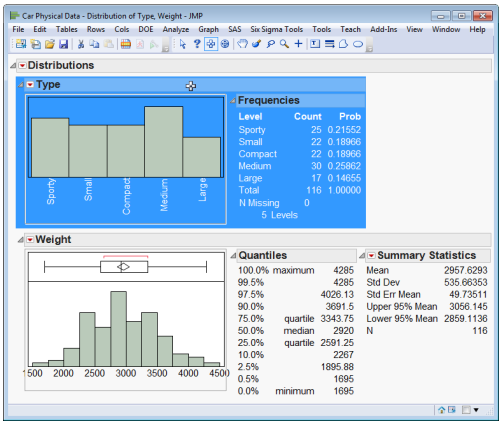
Notes: Data can also be summarized using **Analyze > Distribution** and **Analyze > Tabulate**. For more information on using the Tables Menu, see the book ***Discovering JMP*** (under **Help > Books**).

Saving JMP® Results

This page gives information on saving JMP output and results.

The Selection Tool – Copy and Paste to Another Program





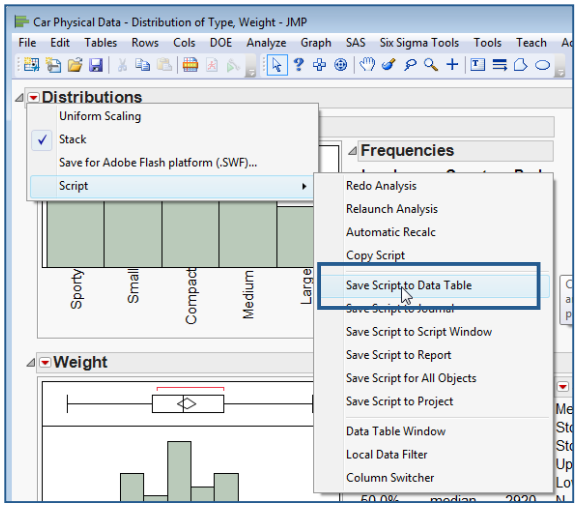
1. From any JMP output window, click on the **selection tool** in the toolbar or use the keyboard shortcut (S).
2. Click on the content you'd like to copy – selected content is highlighted. Click near the edge of the report to select all content. To extend a selection, hold the shift key.
3. Click **Edit > Copy** (or **Control-C**).
4. Open the program where you'd like to paste the content, and select **Paste**. To paste as an object, select **Paste > Paste Special** and from the list select **Picture (Enhanced Metafile).**

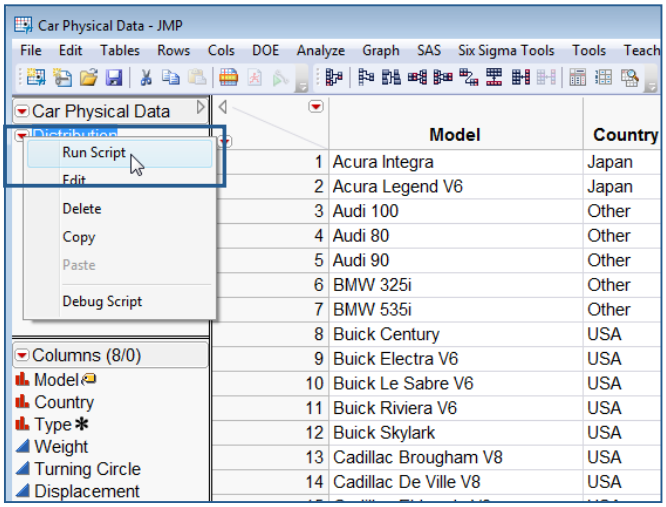
   If using a Mac, select **Paste**, or use **Paste Special > PDF** for high-quality graphics.

Save Your Work Using Scripts

You can save the steps taken to produce a report as a JSL script (JSL is "JMP Scripting Language"). This enables you to recreate the report at any time.

1. From any JMP output window, click the **top red triangle** and select **Script > Save Script to Data Table**.
2. The saved script will appear in the **tables panel** of the data table.
3. To run the script, click on the red triangle and select **Run Script**. To change the name or edit, select **Edit**.
4. Select **File > Save** to save the saved script and any other changes to the data table.





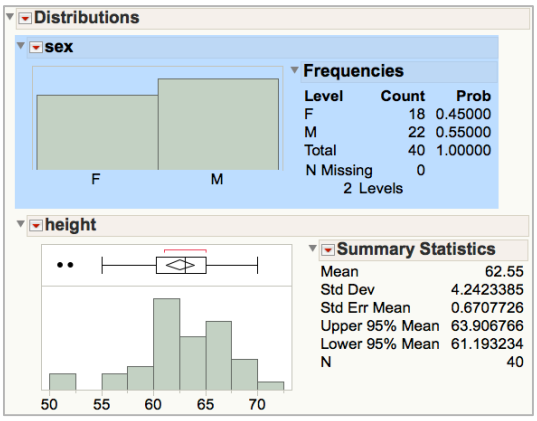
Notes: Select **Edit > Save Selection As** (or **File > Export** on the Mac) to save the selection in a variety of graphical formats, including JPG, EPS, SVG and GIF. To change default graphic formats, use **File > Preferences > Windows Specific** (or **JMP > Preferences > Mac OS Settings** on the Mac).

Publication-Quality Graphics – Mac

This page provides information on saving publication-quality graphics on the Mac version of JMP®. For information on creating publication-quality graphics on the Windows version of JMP, see the page **Publication-Quality Graphics – Windows**. For generic information on saving your work, see the page **Saving JMP Results**.

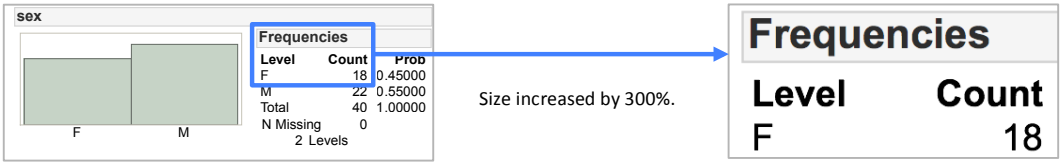
Saving Vector Images

Example: Big Class.jmp (Help > Sample Data)



1. From any JMP output window, click on the **selection tool** in the toolbar or use the keyboard shortcut (S).
2. Click on the content you'd like to copy – selected content is highlighted. Click near the edge of the report to select all content. To extend a selection, hold the shift key.
3. Click **Edit > Copy** (or **CMD-C**).
4. Open Apple's **Preview** application, and select **File > New from Clipboard** (or **CMD-N**). This will create a vector PDF file from copied JMP output.
5. Select **File > Save** in Preview to save the file.

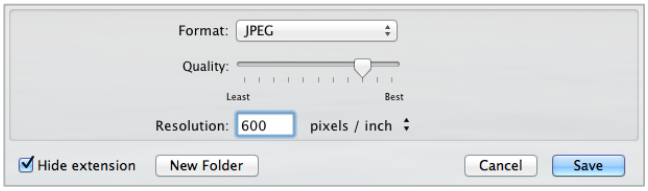
The resulting images can be inserted into PowerPoint or Word documents (use **Insert > Photo > Picture from File** on the Mac), and can be rescaled or resized as needed without losing quality or clarity. They can also be emailed and viewed on mobile devices, and will satisfy the graphics guidelines of most journals.



Creating High-Resolution Graphics

1. Follow steps 1-4 above to create a vector PDF file of your image.
2. In Preview, select **File > Export**. Select the desired format and resolution, and click **Save**.

   In this example, a JPEG file with a resolution of 600 pixels/inch will be created.



The dimensions of the resulting file are 4,458 x 1,608 pixels – more than 7 megapixels!

Notes: To save JMP reports in a number of different formats, including PNG, TIFF, SVG, EPS, HTML and Interactive HTML5 with Data, use **File > Export** in JMP. For more details, search for Mac OS Settings or Saving Reports in the **JMP Help** or see **Chapter 5, Saving and Sharing Your Work** in the book ***Discovering JMP*** (under **Help > Books**).

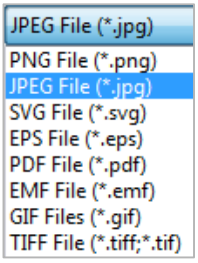
Publication-Quality Graphics – Windows

This page provides information on saving publication-quality graphics on the Windows version of JMP. For information on creating publication-quality graphics on the Mac version of JMP, see the page **Publication-Quality Graphics – Mac**. For generic information on saving your work, see the page **Saving JMP Results**.

Saving Graphic Images

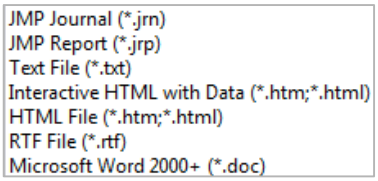
1. From any JMP output window, click on the **selection tool** in the toolbar or use the keyboard shortcut (S).
2. Click on the content you'd like to copy – selected content is highlighted. Click near the edge of the report to select all content. To extend a selection, hold the shift key.
3. Select **Edit > Save Selection As**.
4. Under **Save as Type** (at the bottom of the window), select the desired graphic format.

   For printed media (presentations, journals, etc.) a vector image, such as **EMF** (enhanced metafile) is recommended. This format preserves transparency, can be edited in image-editing software, and can be scaled or resized without losing clarity.



5. If a bitmap graphic format (PNG, JPEG, GIF or TIFF) is selected, change the **Image DPI Setting** to 300 for a high-resolution graphic.
6. Enter a file name, specify the folder to save the file to, and click **Save**.

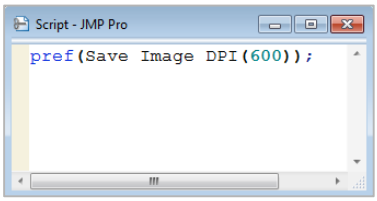
   Note: To save all of the output in the active window, use **File > Save As**. In addition to the graphics formats, several report formats are available.



Changing the Default Resolution for Bitmap Images

1. In JMP, go to **File > New > Script**.
2. Type the following code in this window: *pref(Save Image DPI(600));*
3. Right-click, and select **Run Script**.

   This will change the default for all saved graphics to 600 (or whatever number you plug into the parentheses) until you change the default.



Tips:

- Edit the graph in JMP prior to saving in a graphics format. For example, change the size of the graph frame, change marker sizes and/or colors, and edit axes, legends and titles prior to saving.
- When copying and pasting into Microsoft Office products, use **Paste Special > Picture Enhanced Metafile** to paste output as vector images.
- The EPS vector format does not preserve graph transparency (EMF does).
- JMP report elements that use Open GL (surfaces, scatterplot 3-D, etc.) cannot be output as vector images.

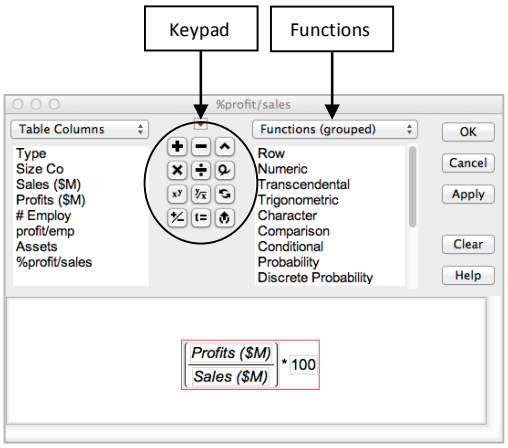
Notes: Visit Print-Ready Graphics from JMP on creating print-ready graphics for recommendations and information on supported graphic and report types, or search for **Save and Share Reports** in the **JMP Help**.

Creating Formulas in JMP®

This page describes two methods for creating formulas in JMP. Formulas are used to create transformed or derived variables using built-in functions, constants and/or existing variables.

Method 1 (Create Formula With Formula Editor)

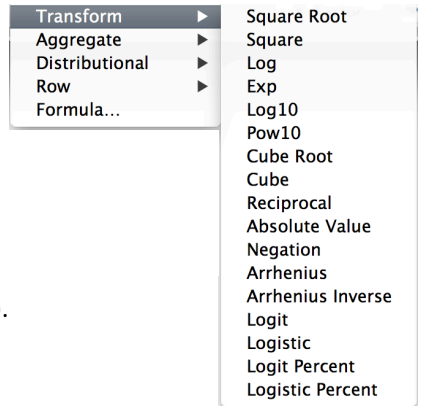
1. From an open JMP data table, select **Cols > New Column**.
2. Under **Column Name**, assign a name for the column. In this example, we name the column **%profit/sales**.
3. Click **Column Properties**, and select **Formula**. This takes you to the **JMP Formula Editor** (shown at right).
4. To create this formula, we take the ratio and multiply by 100.
   - Select **Profits ($M)** from **Table Columns**.
   - Click on the **divide by** symbol on the **keypad**.
   - Select on **Sales ($)** from **Table Columns**.
   - Click on the **outer gray box** (surrounding the ratio).
   - Click on the **multiply** symbol on the **keypad**.
   - Type "**100**" on your keyboard, and click **OK**.



Example: Companies.jmp (Help > Sample Data)

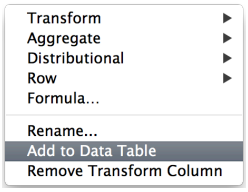
This populates the data table column with the calculated % Profit ($M)/Sales ($M) for each observation.

Method 2 (Create Formulas Using Temporary Columns)



From any launch window or data table in JMP, **right-click on a column** or **multiple columns** to display available formula functions:

- **Transform**: Performs common transformations (shown right).
- **Character**: Provides basic character functions (e.g., concatenate).
- **Combine**: Provides derived measures from selected columns.
- **Aggregate**: Provides aggregate measures (e.g., mean).
- **Distributional**: Performs centering and standardization (e.g. z-score).
- **Date**: Provides date and time functions (e.g., day, month).
- **Row**: Performs row functions (e.g., random normal).
- **Formula**: Calculates values for user-specified formulas.



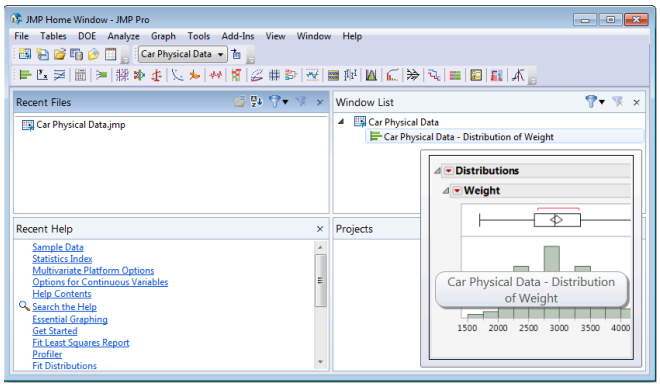
1. **In launch windows,** select the desired function and JMP creates a temporary (or virtual) column, which is listed in italics and can be used in the current analysis. To add this temporary column to the data table as a formula column, **right-click** on the column and select **Add to Data Table**. This adds a new column and creates the formula, which is accessible through the Formula Editor.
2. **In data tables,** right-click on a column header or (multiple columns headers), select **New Formula Column**, and select a function to instantly create a column (or columns) with the stored formula function(s).

Notes: To access the **Formula Editor** for any column, right-click on the column name and select **Formula**. Common **transformations** are available in the Formula Editor under **Functions > Transcendental**. For more details on creating formulas, search for **Formula Editor** or **Virtual Columns** in JMP Help or in the book ***Using JMP*** (under **Help > Books**).

Navigating JMP® in Windows

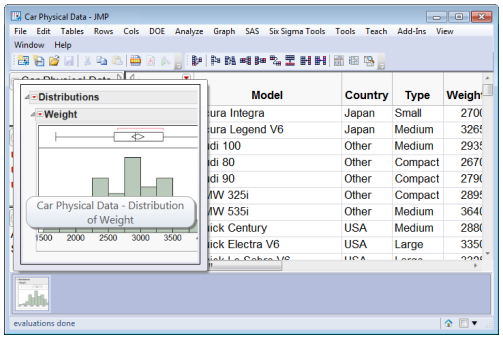
This page gives information on the Windows JMP interface. For information on creating a new data table, opening data tables, and finding help within JMP see the page **Opening JMP and Getting Started**.

The Home Window



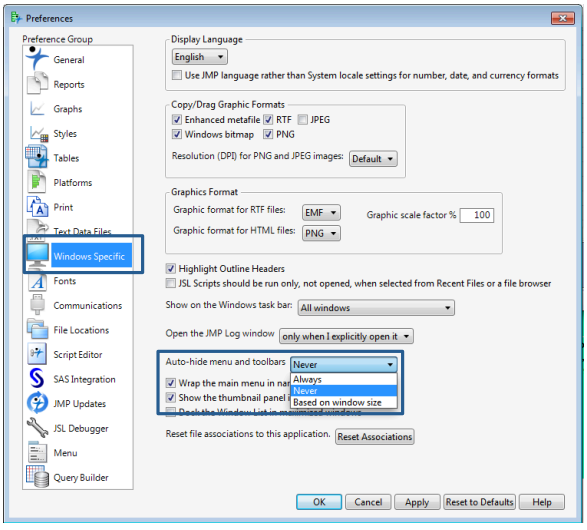
- When you first open JMP, you'll see the **Tip of the Day** window.
- You'll also see the new **JMP Home Window** (to the right), which provides access to:
  - Menus and toolbars (top).
  - Recently used files and help (on the left).
  - All open data tables and windows (on the right). Hover over an item in the list for a preview.
- The JMP Starter, Home Window and other features can be accessed via the **View** menu.

Navigation



- Data tables display thumbnails of open reports (bottom left). Hover over a thumbnail for a preview.
- Each data table and report provides icons (bottom, right corner) to facilitate navigation between windows:
  - Return to the Home Window (or, click CNTL – 1).
  - Go to the data table.
  - Select to arrange with other windows.

Tips:



- Each window has a JMP menu and toolbar.
- To view a hidden menu click **Alt**, or hover on the report window where the menu would normally appear.
- To have menus and toolbars always display, go to **File > Preferences > Windows Specific** and change **Auto-hide menus and toolbars** from **Based on window size** to **Never**.
- The JMP Home Window and Tip of the Day appear by default when JMP is opened. To change the default windows, use **File > Preferences > General**.

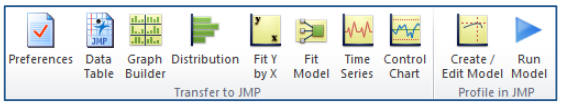
Note: For more details, see the book ***Using JMP*** (under **Help > Books**).

Excel Add-In I (Passing Data to JMP®)

Use the Excel JMP add-in to transfer data from an Excel worksheet into a JMP data table or to launch basic JMP analysis platforms. Available in Windows only. For information on using the JMP profiler with Excel models, see the page **Excel Add-In II (Profiling Excel Models in JMP)**.

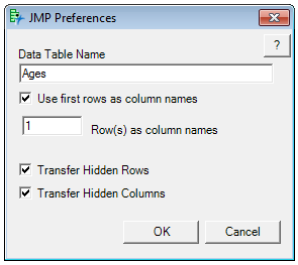
The Excel Add-In: Passing Data to JMP®

When you install JMP, the JMP add-in is automatically installed for your version of Excel. In Excel 2007 and 2010, click on the JMP tab to open the JMP ribbon.

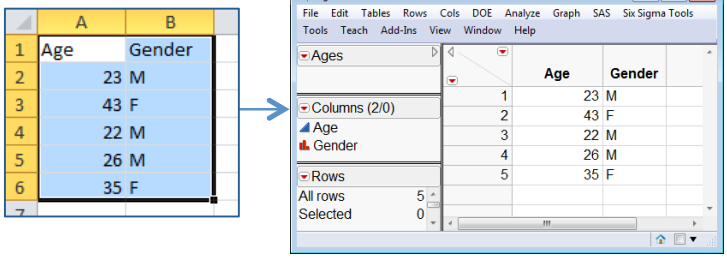


The first four buttons described below:

1. **Preferences**: Use to specify:
   - The name to use for the JMP data table.
   - Whether to use the first row as column names (checked by default).
   - The number of rows to use for column name (up to four can be used).
   - Whether to transfer hidden rows and/or columns.



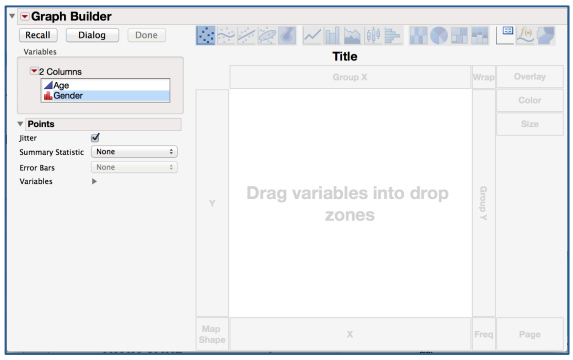
2. **Data Table**: Send selected data to JMP. A JMP data table will be created containing the selected data.

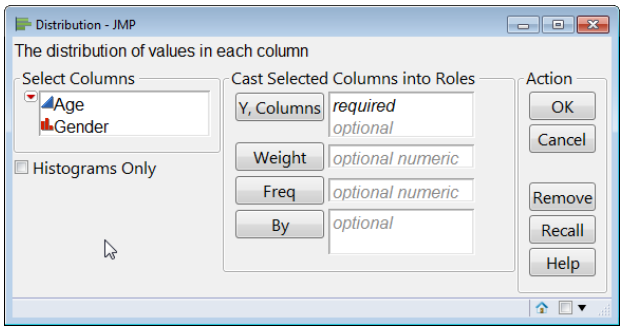


Tips:
- If the data table does not automatically display, bring JMP to the foreground.
- Review the modeling types in JMP – variables will be assigned either Continuous or Nominal modeling types.
- JMP will recognize dates and other Excel formats.

3. **Graph Builder**: Send selected data to JMP and launch the Graph Builder (bottom left). Interactively create graphs, including line plots, splines, box plots, bar charts, histograms, mosaic plots and geographic maps.

4. **Distribution**: Send selected data to JMP and launch the Distribution Platform (bottom right). Produce histograms, bar charts, univariate statistics and confidence intervals, and perform hypothesis tests.





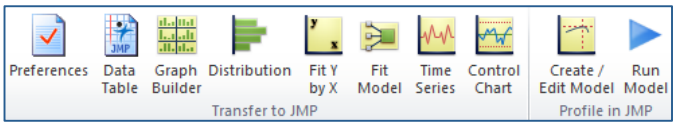
Note: For more information on using the Excel JMP add-in, including Excel version differences and installation instructions, search for "working with Excel" in the JMP Help (under **Help > Search**).

Excel Add-In II (Profiling Excel Models in JMP®)

Use the Excel JMP add-in to visualize and explore Excel models in JMP using the Prediction Profiler. Available in Windows only. For information on transferring data from an Excel worksheet to a JMP data table or launching basic JMP analysis platforms, see **Excel Add-In I (Passing Data to JMP)**.

The Excel Add-In: Profiling Excel Models in JMP®

When you install JMP, a JMP add-in tab is automatically installed in the Excel menu system. Click on the tab to open the JMP add-In.



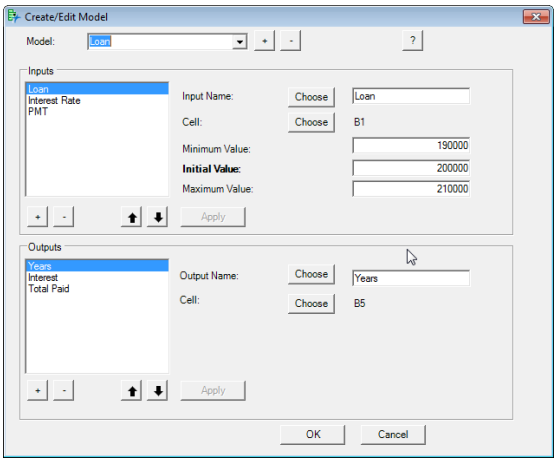
1. Build an Excel model.

   In this example, an Excel worksheet is used to model loan amortization results. Loan (loan amount), Interest Rate and PMT (monthly payment) are inputs, and Years to Payoff, Total Interest and Total Paid are the outputs. The output values are derived from the input values using Excel formulas.

	A	B
1	Loan	$200,000.00
2	Interest Rate	4.50%
3	PMT	$1,000.00
4		
5	Years to Payoff	30.86
6	Total Interest	$170,369.61
7	Total Paid	$370,369.61

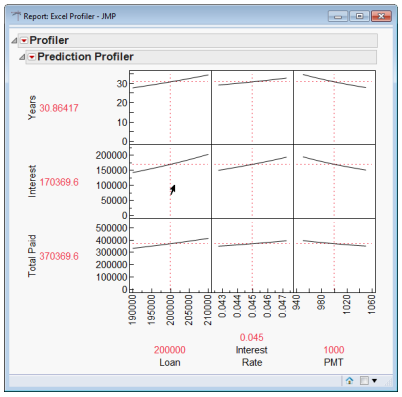
2. Select **Create/Edit Model** to define the model for JMP.

   - **Define the Model**: Click on "**+**" next to **Model** to add a new model.
   - **Define Inputs**:
     a. Click on the **"+"** to add an input.
     b. Type the input variable name in the **Input Name** field, or click **Choose** to select it in the worksheet.
     c. Next to **Cell**, click **Choose** to select the cell that is an input to the formula in the worksheet.
     d. Enter **Minimum, Initial** and **Maximum** values, or accept the defaults, and hit **Apply**.
     e. Repeat until all inputs have been entered.
   - **Define Outputs**: Repeat steps a-c above for each of the outputs, then click **OK**.



3. Select **Run Model** to profile the model in JMP.

   - Choose the model you want to profile, then click **Profile in JMP**.
   - The **Prediction Profiler** window will open in JMP. If JMP is not already open, it will open automatically.
   - In the Prediction Profiler, change values of the inputs by dragging the vertical red lines to observe changes in the predicted outputs.

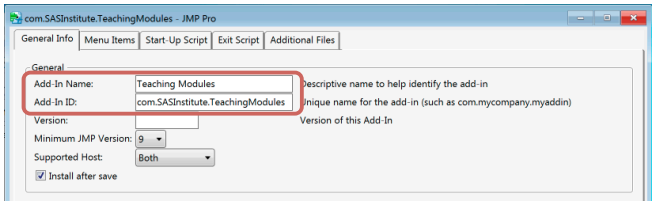


Notes: To access the simulator, interaction profiler, or to set desirability functions, click the red triangle next to **Prediction Profiler**. For more information on how to use the Prediction Profiler, see the "**Profiling**" chapter in the book ***Modeling and Multivariate Methods*** (under **Help > Books**).

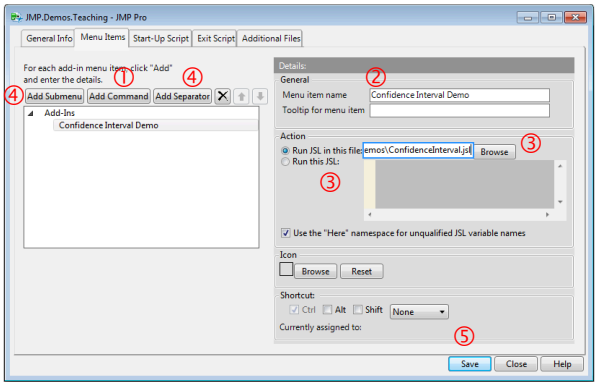
Add-In Builder

Use a **JMP® Add-In** to create custom menus and easily distribute JMP scripts, applications, data tables and more. See the page "Application Builder" for information on building custom JMP applications.

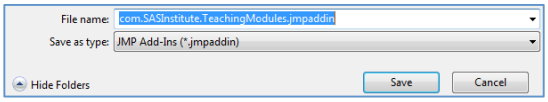
Create an Add-In with the Add-In Builder



1. Choose **File > New > Add-In** (or **File > New > New Add-In** on the Mac).
2. In the **General Information** tab, provide an Add-in Name and an Add-in ID.



3. In the **Menu Items** tab, for each menu item:
   - Click **Add Command** to add the menu item ① and provide a menu item name ②.
   - **Browse** for the JSL script the menu item will run. Or, copy and paste the script next to **Run this JSL** ③.
   - Click **Add Submenu** (if needed) and provide a name to group items below a single heading, or **Add Separator** to add a separating line ④.
4. If desired, use the **Start-Up Script**, **Exit Script**, or **Additional Files** tabs to add other scripts, graphics or data tables to the add-in.
5. Click **Save** ⑤. Edit the file name if desired (the Add-in ID will default, with a .jmpaddin extension), and click **Save**.

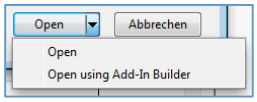


By default, the add-in will automatically install under the Add-in menu in JMP when saved. Test the menu items to ensure that everything works as intended, and fine-tune as needed. The Add-in Builder will stay open until you close it, and saved changes will override the previously installed version of the add-in.

Share the add-in with other users. When the file is opened in JMP, all files are extracted into the appropriate folder, and the add-in is installed in the JMP Add-in menu.

Tips and Limitations

- To **disable** (remove from menu) or **unregister** (uninstall) an add-in, use **View > Add-Ins**.
- To edit an add-in use **File > Open**, then click the arrow next to Open and select **Open Using Add-In Builder** (on Mac, use **Edit after opening**).
- To save an application as an add-in, select **Script > Save Script to Add-In** from the Application Builder red triangle (saving an application as an add-in requires JMP 10 or higher).



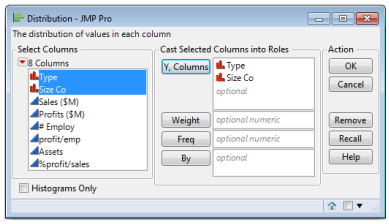
Note: For more information on developing and deploying add-ins, search for **"**Add-In**"** in the JMP Help or in the JMP Scripting Guide (under **Help > Books**). Explore jmp.com/addins for available add-ins.

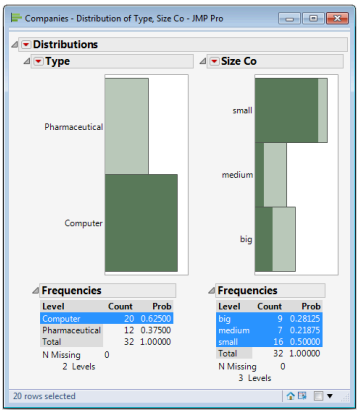
Bar Charts and Frequency Distributions

Use to display the distribution of categorical (nominal or ordinal) variables. For the continuous (numeric) variables, see the page Histograms, Descriptive Stats and Stem and Leaf.

Bar Charts and Frequency Distributions

Example: Companies.jmp (Help > Sample Data)



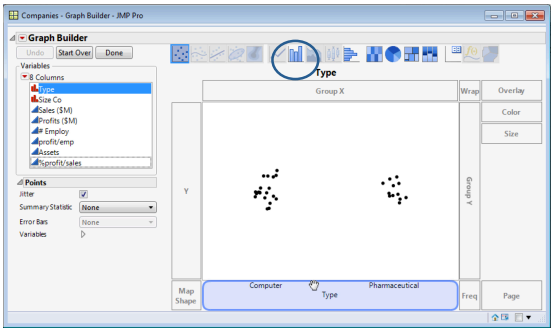


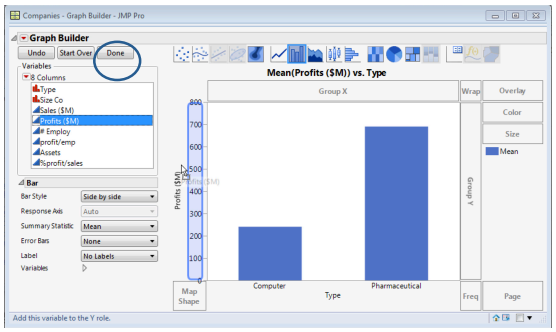
1. From an open JMP data table, select **Analyze > Distribution**.
2. Click on one or more nominal or ordinal variables from **Select Columns**, and click **Y, Columns** (nominal variables have red bars, and ordinal variables have green bars).
3. If you have summarized data (a column with counts), enter the column into **Freq**.
4. Click **OK** to generate bar charts and frequency distributions for each variable.

Tips:

- To change the display from vertical to horizontal, click on the top red triangle and select **Stack**.
- To change future output to horizontal, go to **Preferences > Platforms > Distribution**, click **Stack** and **Horizontal**, then click OK.
- To change the graphical display for a variable, or to select additional options, click on the **red triangle** for that variable.
- Click on bars in one graph to see the distribution the variable across other variables (dynamic linking).
- Categorical variables display in alphanumeric order. To change the display order, use the **Value Ordering** or **Row Order Levels** column property (right-click on the column, select **Column Info**, then **Column Properties**).

Bar Charts – Another Way





1. Select **Graph > Graph Builder**.
2. Click, then drag and drop a nominal variable from **Select Columns** to the X zone on the bottom of the graph.
3. Click on the bar chart icon above the graph.
4. Drag and drop a continuous weight variable from **Select Columns** to the Y zone on the left of the graph, or a drag and drop a count or frequency variable to the **Freq** field.
5. Select a statistic to be plotted from list of **Summary Statistics** (bottom left).
6. When finished, click **Done** (top left) to close the control panel.

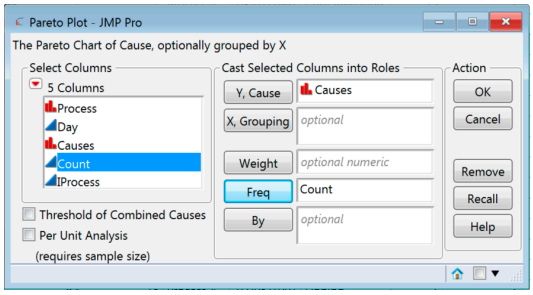
Notes: Bar charts can also be created in the **Chart** platform (**Graph > Chart**). For more details on creating bar charts, see the book **Essential Graphing** (under Help > Books).

Pareto Plots and Pie Charts

Use to display the distribution of categorical (nominal or ordinal) variables. Pareto plots sort in descending order of frequency of occurrence or weight (value).

Pareto Plots

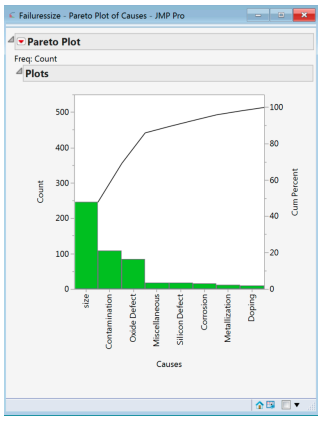
Example: Failuresize.jmp (Help > Sample Data > Quality Control)

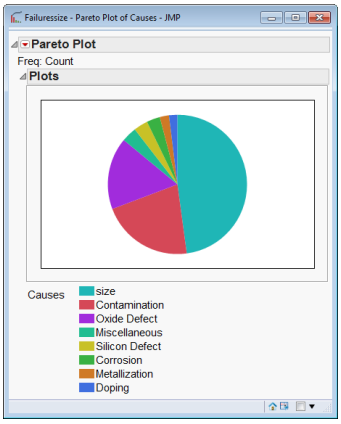


1. Select **Analyze > Quality and Process > Pareto Plot**.
2. Click on a nominal variable from **Select Columns**, and click **Y, Cause** (nominal variables have red bars, ordinal variables have green bars).
3. If you have summarized data, enter the Count column into **Freq**.
4. Click **OK** to generate the Pareto plot.

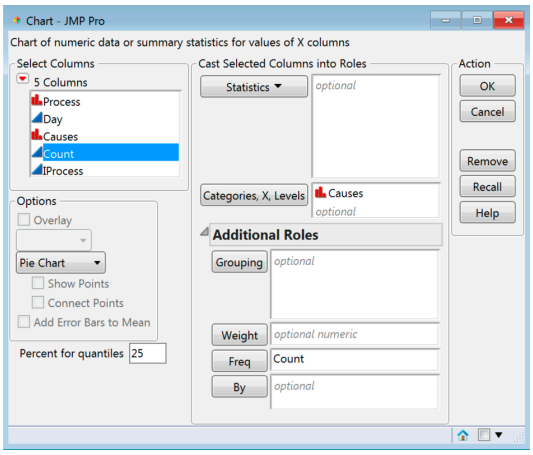
Tips:

- To change the display or select additional options, click on the **red triangle**.
- To change the display from a Pareto plot to a pie chart, click on the **red triangle** and select **Pie Chart**.
- To label a bar or slice of the pie, right-click on the category and select **Causes > Label**.





Pie Charts – Another Way



1. Select **Graph > Chart**.
2. Click on a nominal variable from **Select Columns**, and click **Categories, X, Levels**.
3. If you have summarized data, click on the **blue triangle** next to **Additional Roles**, and enter the Count column into **Freq**.
4. Under **Options**, click on the **small black triangle** next to **Bar Chart** and select **Pie Chart**.
5. Click **OK** to generate the pie chart.
6. To change the display from a pie chart to a bar chart, click on the **red triangle** and select **Pie Chart**.

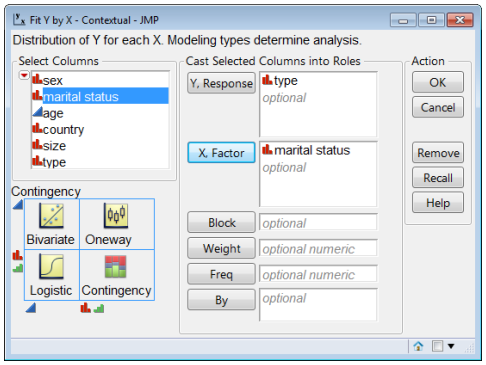
Notes: Bar charts can also be produced from **Analyze > Distribution** or **Graph > Graph Builder**. For more details on creating pie charts and Pareto plots, see the books ***Essential Graphing*** and ***Quality and Process Methods*** (under **Help > Books**).

Mosaic Plot and Contingency Table

Use to examine the relationship between two categorical variables. A contingency table shows the frequency distribution of the variables in a matrix format, while a mosaic plot graphically displays the information.

The Contingency Table Analysis

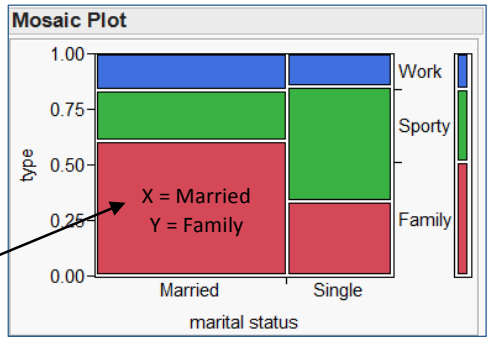
Example: Car Poll.jmp (Help > Sample Data)



1. Select **Analyze > Fit Y by X**.
2. Click on a categorical variable from **Select Columns**, and click **Y, Response** (categorical variables have red or green bars).
3. Click on another categorical variable and click **X, Factor**.
4. Click **OK**. The Contingency Analysis output will display.

Mosaic Plot

The mosaic plot is a side-by-side divided bar chart that allows you to visually compare proportions of levels of one variable across the levels of a second variable.



Interpretation:

1. The widths of horizontal bars represent the proportions of the levels of the X variable (in this example, marital status).
2. The heights of vertical bars on the far right represent the proportions of the levels of the Y variable (type).
3. The cells in the plot represent the proportions for every combination of category levels. In this example, Married and Family is the largest overall proportion.

Contingency Table

The body of the contingency table displays:

- **Count** – the cell frequencies (counts).
- **Total %** - the cell's percentage of the total count.
- **Col %** - the cell's percentage of the count for the column. The column variable is the Y variable, type.
- **Row %** - the cell's percentage of the count for the row. The row variable is the X variable, marital status.

Legend

Contingency Table

marital status	Count / Total % / Col % / Row %	Family	Sporty	Work	
		type			
Married		119	45	32	196
		39.27	14.85	10.56	64.69
		76.77	45.00	66.67	
		60.71	22.96	16.33	
Single		36	55	16	107
		11.88	18.15	5.28	35.31
		23.23	55.00	33.33	
		33.64	51.40	14.95	
		155	100	48	303
		51.16	33.00	15.84	

The borders of the contingency table display the column totals (across the bottom), row totals (on the right), and the grand total (lower right corner).

Tips:

- Click on the **red triangle next to Contingency Table** to select or deselect display options.
- **Right-click** on the mosaic plot to change colors (**Set Colors**) or label cells (**Cell Labeling**).

Note: See the ***Essential Graphing*** book (under **Help > Books**) for more details.

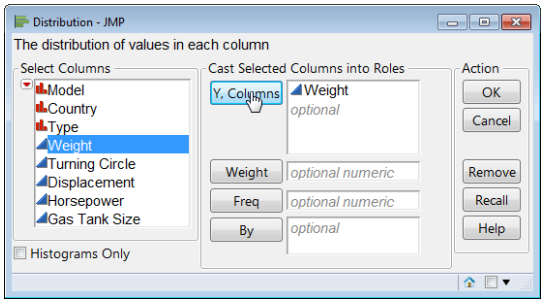
Histograms, Descriptive Statistics, and Stem and Leaf

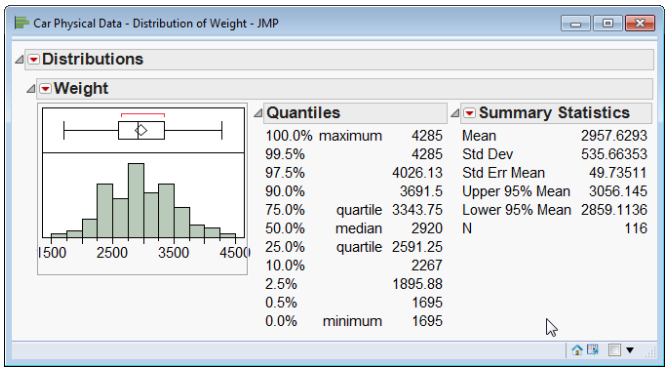
Use to display and describe the distribution of continuous (numeric) variables. Histograms and stem and leaf plots allow you to quickly assess the shape, centering and spread of a distribution. For categorical (nominal or ordinal) variables, see the page **Bar Charts and Frequency Distributions**.

Histograms and Descriptive Statistics

1. From an open JMP® data table, select **Analyze > Distribution**.
2. Click on one or more continuous variables from **Select Columns**, and click **Y, Columns** (continuous variables have blue triangles).
3. Click **OK** to generate a histogram, outlier box plot and descriptive statistics.
   - The percentiles, including quartiles and the median, are listed under **Quantiles**.
   - The sample mean, standard deviation and other statistics are listed under **Summary Statistics**.

Example: Car Physical Data.jmp (Help > Sample Data)



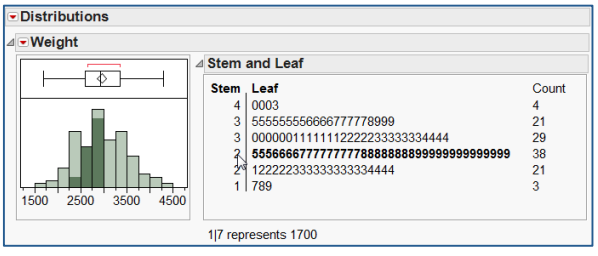


Tips:

- To change the display from vertical to horizontal (as shown), click on the **top red triangle** and select **Stack**.
- To change the graphical display for a variable, or to select additional options, click on the **red triangle** for that variable.
- To display different summary statistics, use the **red triangle** next to **Summary Statistics**.
- To change all future output to horizontal, go to **Preferences > Platforms > Distribution**, click **Stack** and **Horizontal**, then click **OK**.

Stem and Leaf Plot

To generate a stem and leaf plot, click on the **red triangle** for the variable and select **Stem and Leaf**.



Tips:

- A key to interpret the values is at the bottom of the plot. The top value in this example is 4300, the bottom value is 1700 (values have been rounded to the nearest 100).
- Click on values in the stem and leaf plot to select observations in both the histogram and the data table. Or, select bars in the histogram to select values in the stem and leaf plot and data table.

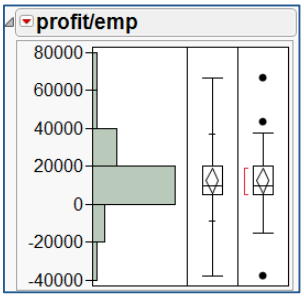
Note: For more information, see the book ***Basic Analysis*** (under **Help > Books**).

Box Plots

Use to display the distribution of continuous variables. They are also useful for comparing distributions.

Box Plots – One Variable

1. From an open JMP® data table, select **Analyze > Distribution**.
2. Click on one or more continuous variables from **Select Columns**, and Click **Y, Columns** (continuous variables have blue triangles).
3. Click **OK**. An outlier box plot is displayed by default next to the histogram (or above if horizontal layout). To display a quantile box plot, select the option from the **red triangle** for the variable.



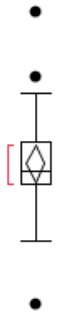
Quantile Box Plot

Outlier Box Plot

The lines on the Quantile Box Plot correspond to the quantiles in the distribution output.

Quantiles

100.0%	maximum	66530.1
99.5%		66530.1
97.5%		66530.1
90.0%		36859.4
75.0%	quartile	20481.3
50.0%	median	9975.31
25.0%	quartile	5421.51
10.0%		-8428.6
2.5%		-37800
0.5%		-37800
0.0%	minimum	-37800



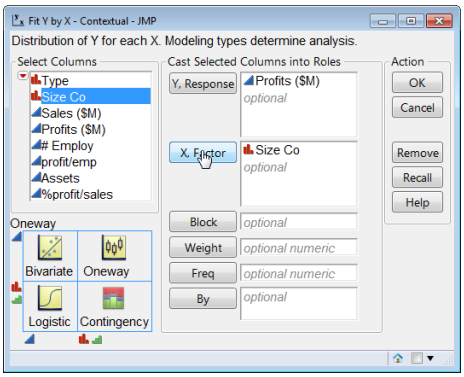
The Outlier Box Plot shows the box, plus:

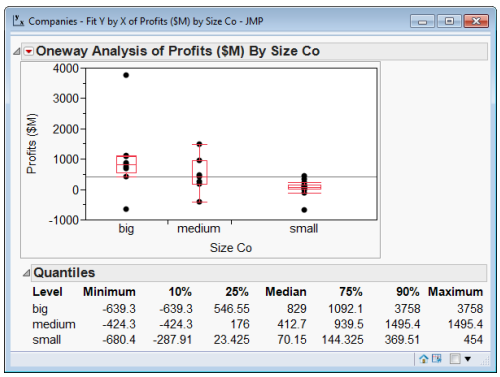
- IQR = the 3rd quartile minus the 1st quartile.
- Whiskers drawn to the furthest point within 1.5 x IQR from the box.
- Potential outliers (disconnected points).
- A red bracket defining the shortest half of the data (the densest region).

Box Plots – Two Variables

1. Select **Analyze > Fit Y by X**.
2. Click on a continuous variable from **Select Columns**, and Click **Y, Response**.
3. Click on a categorical variable and click **X, Factor** (categorical variables have red or green bars).
4. Click **OK**. The Oneway Analysis output window will display.
5. Click on the **red triangle**, and select **Display Options > Box Plots** to display quantile box plots, or select **Quantiles** to display both box plots and quantiles (shown right).

Example: Companies.jmp (Help > Sample Data)





Notes: Box plots for one or more variables can also be generated from **Graph > Graph Builder**. For more information on box plots, see the book ***Basic Analysis*** (under **Help > Books**).

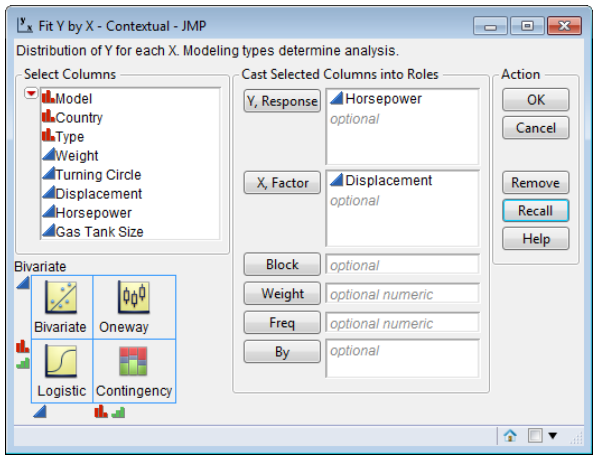
Scatterplots

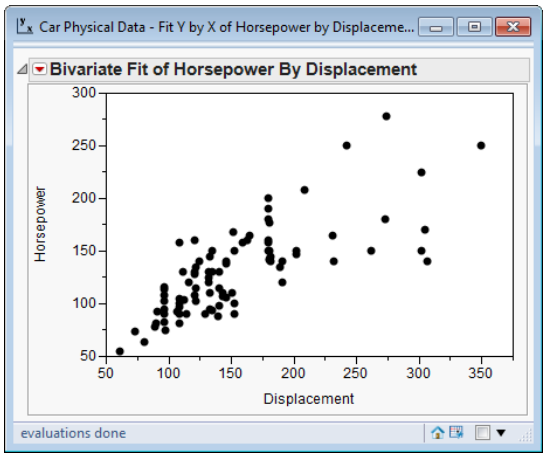
Use to display the relationship between two continuous variables. Continuous variables have blue triangles.

Scatterplots – Two Variables

1. From an open JMP® data table, select **Analyze > Fit Y by X**.
2. Click on a continuous response (or dependent) variable in **Select Columns**, and Click **Y, Columns**.
3. Click on a continuous predictor (or independent) variable, and click **X, Factor**.
4. Click **OK** to generate a scatterplot.

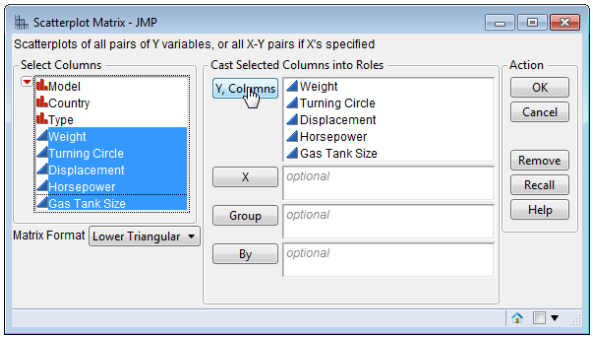
Example: Car Physical Data.jmp (under Help > Sample Data)

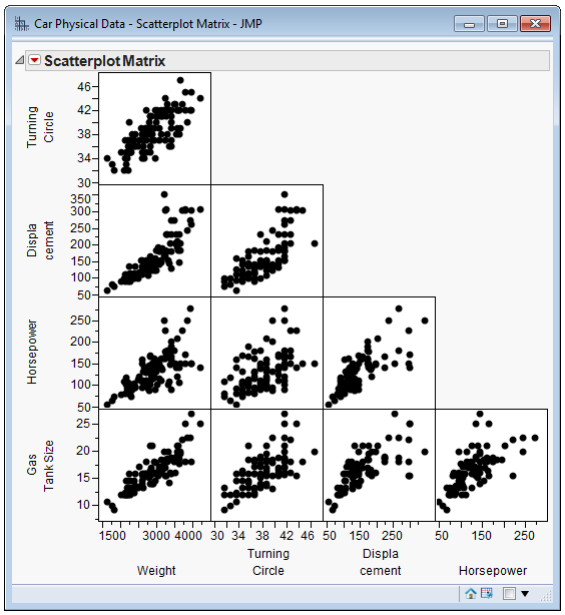




Scatterplots – More than Two Variables

1. Select **Graph > Scatterplot Matrix**.
2. Select all continuous responses of interest, and click **Y, Columns**.
3. Click **OK** to generate the scatterplot matrix.





Notes: Scatterplots and scatterplot matrices can also be generated from **Analyze > Multivariate Methods > Multivariate** and from **Graph > Graph Builder**. For more information, see the book ***Essential Graphing*** (under **Help > Books**).

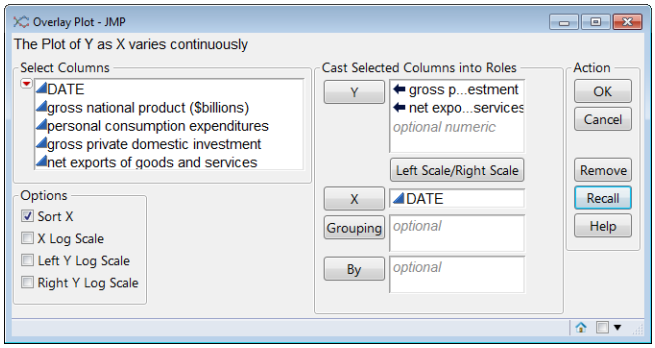
Run Charts (Line Graphs)

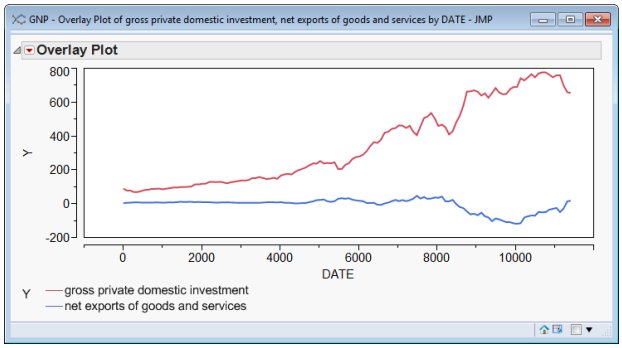
Use to display continuous data in time sequence.

Run Charts (Overlay Plot)

1. Select **Graph > Overlay Plot**.
2. Select one or more continuous variables from **Select Columns** and click **Y**.
3. If you have a column that indicates time ordering, enter the column into **X**, and click **OK**.
4. Click on the **red triangle** and select **Y Options > Connect Points** to draw a line through the points, and **Y Options > Show Points** to hide the points.
5. Right-click on the graph to change graph properties (select **Line Width Scale** to change the line thickness).

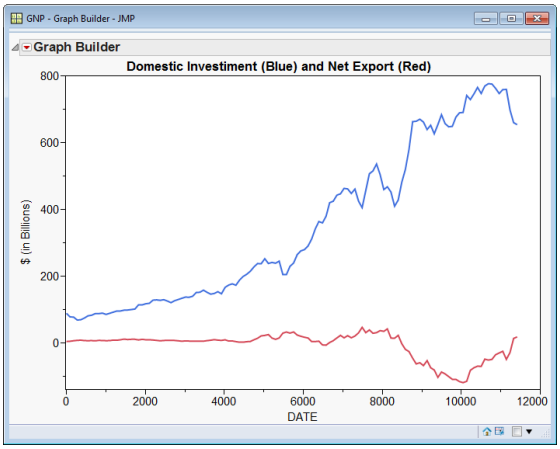
Example: GNP.jmp (under Help > Sample Data > Time Series)





Run Charts – Another Way (Graph Builder)

1. From an open JMP® data table, select **Graph > Graph Builder**.
2. Drag a variable (or multiple variables at once) from the **Variables** list and drop in the **Y zone**.
3. Drag and drop a variable indicating the time ordering in the **X zone**.
4. Click on the **Line icon** in the graph pallet (top middle).
5. Click **Done**, and fine tune as desired (see tips below).



Tips:

- Right-click on the graph and select **Graph** to change the line thickness or other graph properties.
- Click on the **graph title** or **axis labels** to change, or double-click on an axis to change the **scaling**.
- Click on the **red triangle** next to Graph Builder to re-open the control panel, hide the legend, and more.

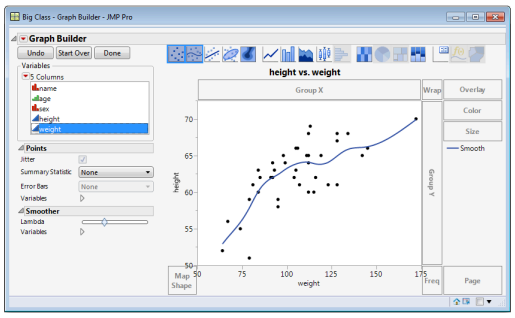
Notes: Run charts can also be produced from the Control Chart platform (**Analyze > Quality and Process > Control Chart > Run Chart**). For more information on creating line graphs or run charts, see the books ***Essential Graphing*** *and* ***Quality and Process Methods*** (under **Help > Books**).

Interactive Graphing with Graph Builder

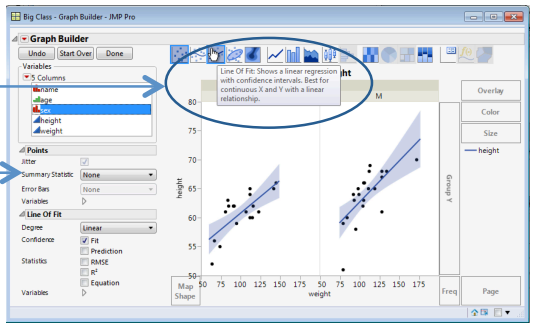
Use Graph Builder to interactively create graphs for one or more variables, including line plots, splines, box plots, bar charts, histograms, mosaic plots, maps and more.

Drag and Drop to Visualize Data

Example: Big Class.jmp (under Help > Sample Data)

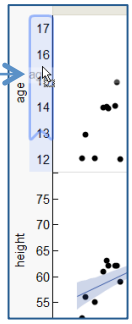


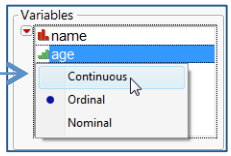
1. From an open JMP® data table select **Graph > Graph Builder**.
2. Drag a variable from the **Variables** list and drop it in the desired drop zone. In the examples (right), Weight is in the **Y** zone and Height is in the **X** zone.
3. To add a grouping variable, drag and drop a variable in the **Group X** or **Group Y** zone. In the example, Sex is in the **Group X** zone.
4. To change the graphical display, **click on a graph element icon**. Or, click and drag an icon onto a graph frame. Here, Line of Fit has been selected.
5. Change **Summary Statistics** and other display options for the selected graph elements.
6. Click the **Done** button (top left) when finished.



Tips:

- Right-click in the graph to change graph properties.
- To replace a variable with a new variable, drag the new variable and drop it in the center of the drop zone.
- By default, Graph Builder displays data points. If continuous variables are in both the X and Y zones a smooth spline will display (lambda = 0.05).
- More than one variable can be assigned to an X or Y zone, or to a group zone. Drag a variable to either side of the existing variable in the zone – a blue ribbon will indicate where the new variable will be placed when dropped.
- To change the modeling type (to use different graph elements), right-click on the variable and select the new data type (if available).





Other Drop Zones:

- Drop a variable in **Wrap** to trellis the graph horizontally and vertically.
- Drop a variable in **Color** to create a legend and color by values of the variable.
- Drop a variable in **Overlay** to color and overlay graphs for each value of the variable on one graph.
- If data has been summarized (a frequency variable exists), drag the variable to the **Freq** zone.
- If a column defines a physical shape, drag the variable to **Shape** to create a map (shape files must exist).
- Drop a variable in **Size** to scale markers or map shapes according to the value of the size variable.

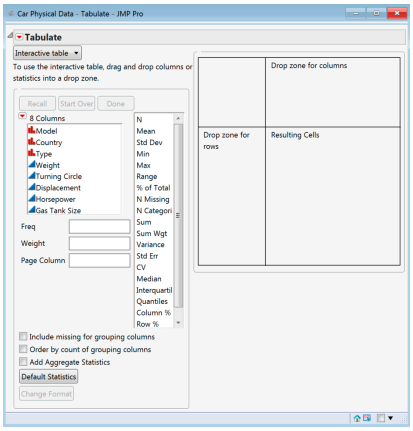
Note: Instructions also apply to the **iPad® Graph Builder Application** (see jmp.com/iPad). For more details on creating interactive graphics with the Graph Builder, see the book ***Essential Graphing*** (under **Help > Books**) and other one-page guides (at jmp.com/learn).

Summarizing Data Using Tabulate

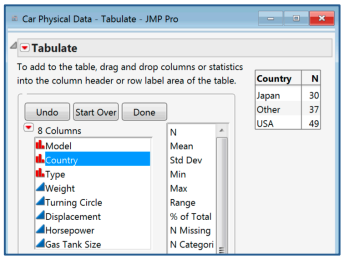
Use Tabulate to interactively summarize data and construct tables of descriptive statistics.

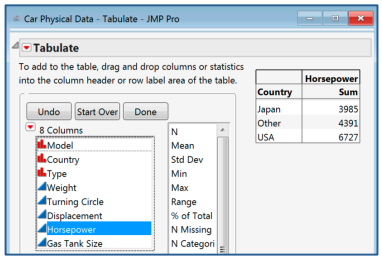
Drag and Drop to Summarize Data

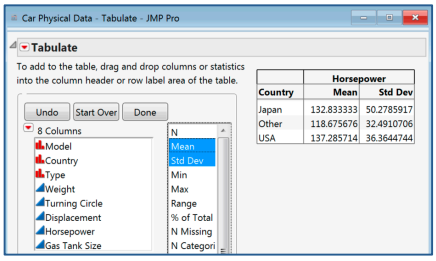
Example: Car Physical Data.jmp (Help > Sample Data)



- From an open JMP® data table select **Analyze > Tabulate**.
- Drag and drop variables from the column list to the drop zone for rows and columns.
  - **Country** (below, left) is in the rows drop zone – the number of observations per country is displayed.
  - **Horsepower** (middle) is in the columns drop zone as an analysis column – the sum for horsepower is displayed for each country.
- Drag and drop one or more summary statistics from the middle panel into the results area. **Mean** and **Std Dev** are displayed for each country (below, right).







Tips:

- Click **Undo** to reverse the last change, or use **Start Over** to clear the display.
- Click and drag variables in the table to rearrange, or right-click on a variable to delete or change the format.
- To change the numeric formats (i.e., decimal places), use **Change Format** at the bottom of the window and select the desired format.
- To add **new summary panels** to the table, drag and drop the new variable to the bottom or left of the table. Here, Type has been added to the bottom of the original table.

	Horsepower	
Country	**Mean**	**Std Dev**
Japan	132.83	50.28
Other	118.68	32.49
USA	137.29	36.36
Type		
Compact	124.86	21.63
Large	139.76	26.25
Medium	152.90	43.54
Small	88.82	16.62
Sporty	137.56	42.86

- To **add additional row or column variables**, drag and drop a new variable on either side of the current variable in the table. Here, Type has been added next to Country and Horsepower has been added next to Weight.
- To create a data table, click **Done**, then select **Make Into Data Table** from the **top red triangle**.

		Weight		Horsepower	
Country	**Type**	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Japan	Compact	2925.00	182.55	127.33	22.03
	Large	3506.25	256.66	125.25	22.20
	Medium	3559.17	334.64	199.33	52.24
	Small	2196.43	337.17	87.14	23.98
	Sporty	2690.00	444.43	129.60	36.81
Other	Compact	2855.00	137.86	130.50	20.49
	Large	3460.00	.	90.00	.
	Medium	3159.38	248.98	143.63	34.77
	Small	2243.75	141.29	87.33	12.43
	Sporty	2635.00	263.63	134.50	31.37
USA	Compact	2701.43	178.65	114.14	22.49
	Large	3724.17	301.01	148.75	21.86
	Medium	3282.19	303.74	140.13	33.29
	Small	2401.67	138.95	98.67	12.50
	Sporty	2988.64	226.15	145.91	52.44

Note: For more details, see the book ***Basic Analysis*** (under **Help > Books**).

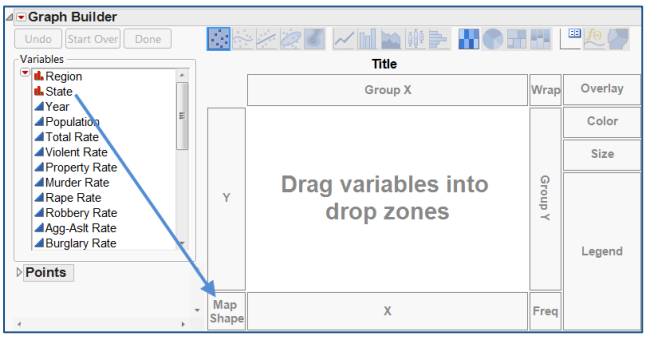
Mapping in Graph Builder

Use the Graph Builder to create interactive maps of U.S. states, U.S. counties, and worldwide countries and provinces. JMP® ships with these shape files, and you can use other shape files (for example ESRI) or create your own custom maps. See the page **Interactive Graphing with Graph Builder** for general information on using the Graph Builder.

Basic Mapping

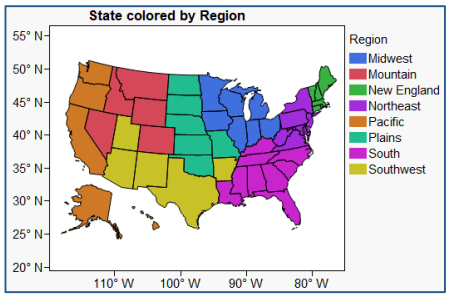
1. From an open data table, select **Graph > Graph Builder.**
2. Drag a shape variable from the **Variables** list (for example, State) to the map shape drop zone.
3. Drag variables into other drop zones until the desired map is produced.
4. Use the **Undo** and **Start Over** buttons to try several options. Click **Done** when finished.

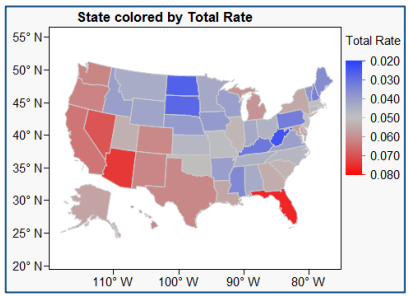
Example: CrimeData.jmp (Help > Sample Data)

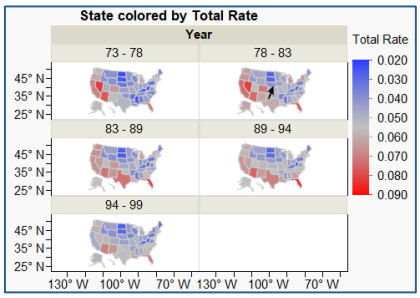


The resulting display depends on the modeling type of the variables and the drop zone(s) used. Examples:

- Left: Region (Nominal) was dropped in the Color zone.
- Middle: Total Rate (Continuous) was dropped in the Color zone.
- Right: Total Rate was dropped in the Color zone, and Year (Continuous) was dropped in the Wrap zone.

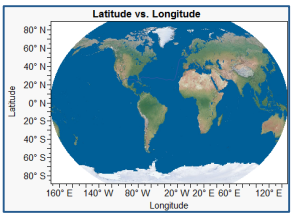






Tips:

- Right-click on the legend to change the color gradient or transparency.
- Use the **Data Filter** or **Local Data Filter** to dynamically select, show and include values of selected variables. The Data Filter, under the Rows menu, is a global filter (selections apply to the data table and all open windows). The Local Data Filter applies to only the active window (from the window red triangle, select **Script > Local Data Filter**). See "data filter" in JMP Help for additional information.
- If your data set contains latitudinal and longitudinal data, you can add a background map or image. Drag these variables to the X and Y zones, right-click on the graph, select **Graph > Background Map** and choose the desired image. Double-click on the axes to change the scale to geodesic, add grid lines or make other changes.



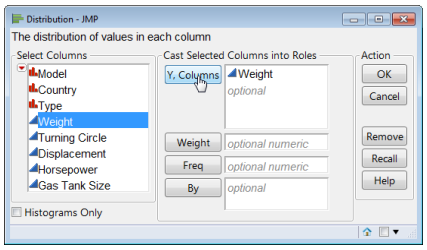
Notes: To draw a map, shape files must exist for the shape variable selected. For more information on mapping, such as creating custom maps, using other shape files or working with background maps, search for "creating maps" in JMP Help or in the book ***Essential Graphing*** (under **Help > Books**).

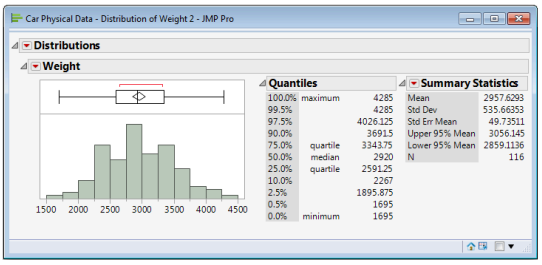
Assessing Normality

This page documents some ways to assess normality for a continuous (quantitative) variable.

1. From an open JMP® data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns** and click **Y, Columns**.
3. Click **OK** to generate a histogram and descriptive statistics (a horizontal layout is shown below).

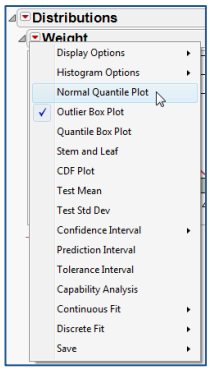
Example: Car Physical Data.jmp (Help > Sample Data)

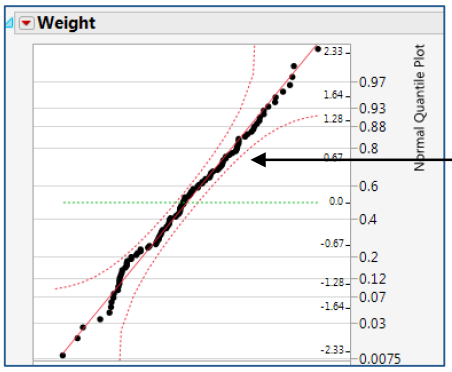




Normal Quantile Plot

Click on the **red triangle** for the variable (Weight, in this example), and select **Normal Quantile Plot**.



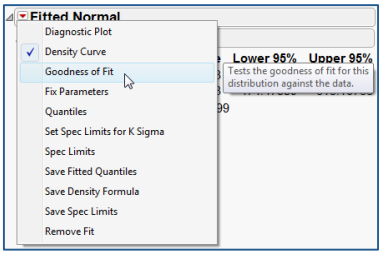


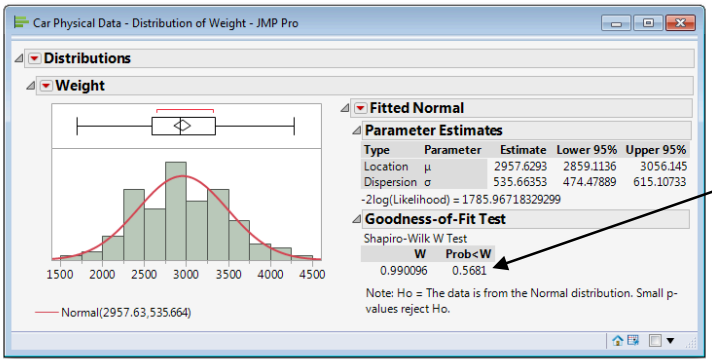
If the data more or less follows a straight line (fat pen test), we can conclude that the data came from a normal distribution.

For this example, we would conclude the distribution is approximately normal.

Fitting a Normal Distribution

1. Select **Continuous Fit > Normal** from the **lower red triangle**.
2. In the resulting output, click on the **red triangle** for **Fitted Normal** and select **Goodness of Fit**.





Interpretation (using a significance level of 0.05):

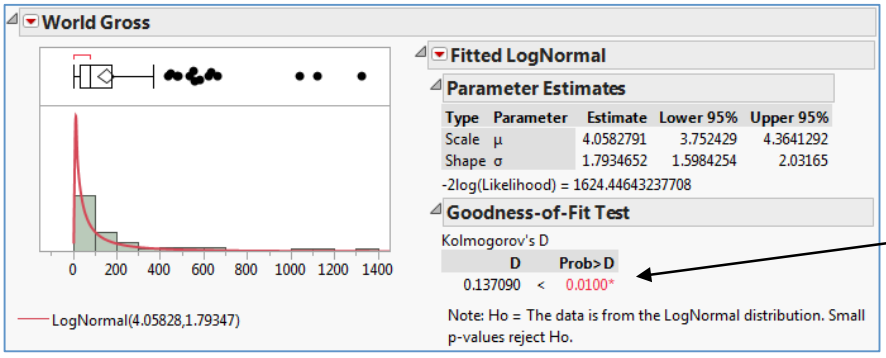
- Prob<W is the p-value for this test.
- Our p-value is 0.5681.
- A p-value less than 0.05 would indicate that the underlying distribution is not normal.
- We do not have sufficient evidence to conclude that the underlying distribution is not normally distributed.

Fitting Distributions

This page provides information on fitting continuous or discrete distributions in the JMP Distribution platform.

Fitting One Continuous Distribution

1. From an open JMP® data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns**, click **Y, Columns**, then click **OK**.
3. Select **Continuous Fit** from the red triangle for the variable and select a distribution (LogNormal was selected in the example below).
4. In the resulting fitted distribution output, click on the red triangle and select **Goodness of Fit** (shown) or **Diagnostic Plot** to assess the fit of the distribution.

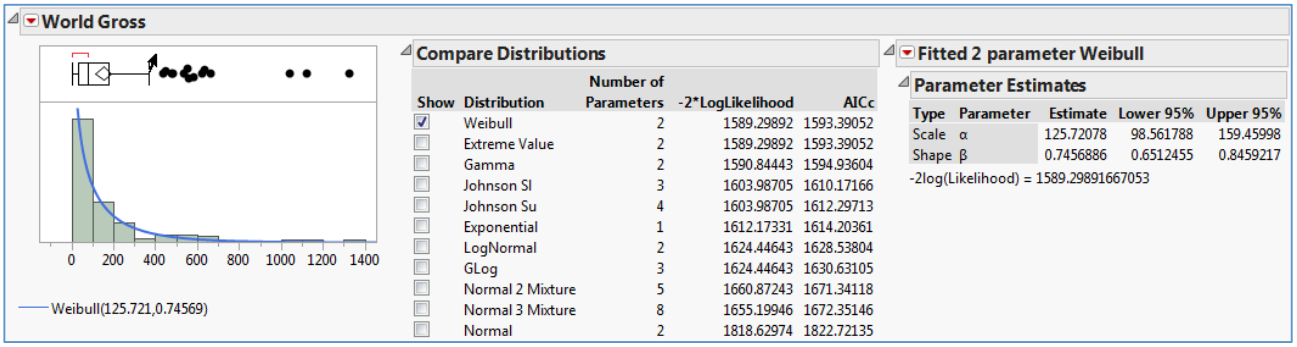


Example: Hollywood Movies.jmp
(Help > Sample Data)

The small *p*-value, and the note provided, indicate that the underlying distribution is not LogNormal.

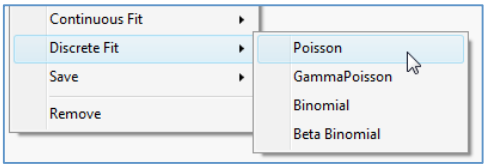
Fitting All Continuous Distributions

Select **Continuous Fit**, then **All** from the red triangle for the variable. JMP will compare available continuous distributions and will select and fit the best distribution (the distribution with the lowest AICc value).



Fitting Discrete Distributions

If the continuous variable contains discrete values, four discrete distributions are available under **Discrete Fit**.



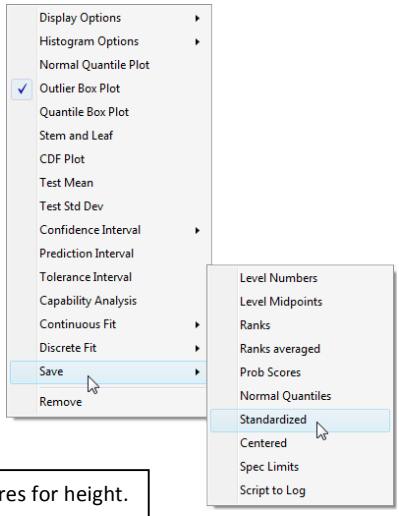
Note: For more details on fitting continuous or discrete distributions, search for **Fit Distributions** in JMP Help or in the book ***Basic Analysis*** (under **Help > Books**).

Finding Standardized Values (z-Scores)

This page documents three methods for calculating standardized values (z-scores) in JMP®.

Method 1 (Save Standardized)

1. From an open JMP data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns** and click **Y, Columns**.
3. Click **OK** to generate a histogram and descriptive statistics.
4. Click on the **red triangle** for the variable, and select **Save > Standardized** – a new column, **Std Variable Name**, will be saved to the data table.



	name	age	sex	height	weight	Std height
1	KATIE	12	F	59	95	-0.8368[illegible]2628
2	LOUISE	12	F	61	123	-0.3653645[illegible]28
3	JANE	12	F	55	74	-1.7796788[illegible]28

The column **Std height** contains z-scores for height. Save the data table to save this new column.

Method 2 (Instant Formula)

1. From an open JMP data table, right click on the column and select **New Formula Column > Distributional > Standardize**.
2. A new column, **Standardize [Variable Name]**, will be created in the data table.

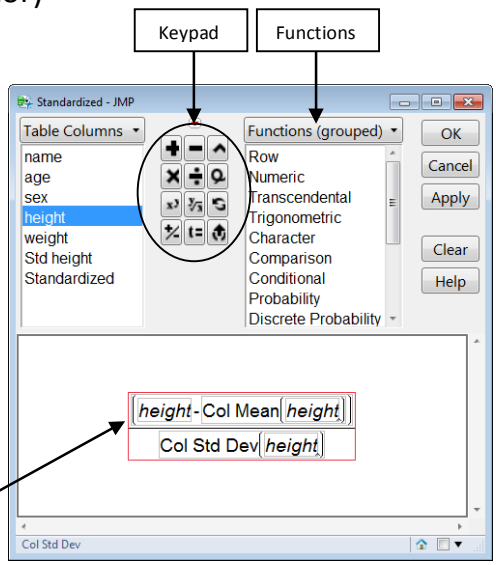
To view the formula, right-click on the column header for this new column and select **Formula**.

Method 3 (Manually Create Formula with Formula Editor)

1. From an open JMP data table, select **Cols > New Column**.
2. Under **Column Name**, assign name for the column. We'll name our column **Standardized**.
3. Click **Column Properties**, and select **Formula**. This takes you to the **JMP Formula Editor**.

   A standardized value is in the form: (variable - Mean) / Standard Deviation

4. Create the formula, and click **OK**. This will populate the column in the data table with standardized values for the variable.



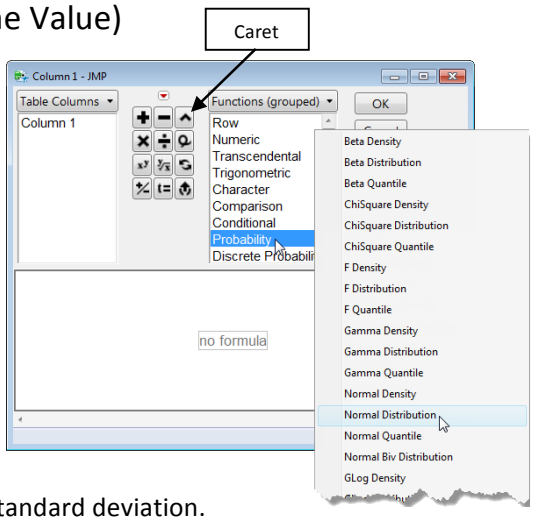
To create the formula for the standardized value:

1. Click on the variable under Table Columns.
2. Click "-"on your keyboard (or the minus sign on the keypad).
3. Select **Statistical > Col Mean** under Functions (grouped). Then, click on the variable under Table Columns.
4. Click on the outer gray box, and click "/" on your keyboard (or the divide-by sign on the keypad).
5. Select **Statistical > Col Std Dev** under Functions (grouped). Then, click again on the variable name.

Finding the Area Under a Normal Curve

This page shows how to find the under the normal curve using formulas and the **Distribution Calculator**.

Column Formula for Area Under a Normal Curve (One Value)



1. Select **File > New > Data Table**.
2. Add one row - select **Rows > Add Rows**, and type "1."
3. Right-click on **Column 1**, and select **Formula** to access the formula editor.
4. Under **Functions (grouped)**, select **Probability > Normal Distribution.** This will give the following formula:

   Normal Distribution(x)

5. Click the caret on the keypad twice to add fields for the mean and standard deviation.

   Normal Distribution(x , mean , std dev)

6. In the fields provided, type the value of x, the mean, and the standard deviation.
7. Click **OK**. JMP will populate the row in the data table with the cumulative probability value (the area under the lower tail of the normal curve).

   Note: To find the area in the upper tail, or the area between two values, use the following formulas:

   - Upper tail: 1 - Normal Distribution(x , mean , std dev)
   - Between two values: Normal Distribution(x , mean , std dev) - Normal Distribution(x , mean , std dev)

Column Formula for Area Under a Normal Curve (Multiple Values)

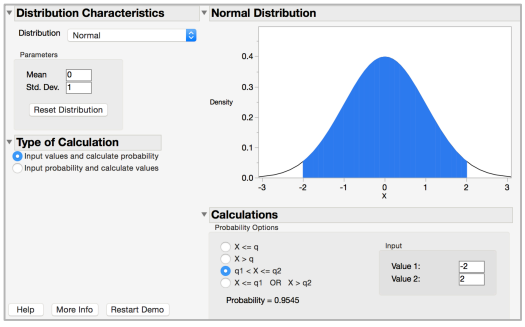
1. Open an existing data table (**File > Open**), or open a new data table (**File > New > Data Table**) and create a column containing the values of interest.
2. Select **Cols > New Column** to create an additional column, and rename the column. We'll name our column **Prob Height**.
3. Click **Column Properties**, and select **Formula** to access the **JMP Formula Editor**.
4. Follow steps 4 and 5 above.
5. Click on the box containing "x," and from **Table Columns**, select the variable name.
6. Type the mean and standard deviation in the fields provided.
7. Click **OK**. JMP will populate the column with cumulative probability values for each value of the variable.

Normal Distribution(*height* , 62.55 , 4.24)

	name	age	sex	height	weight	Prob Height
1	KATIE	12	F	59	95	0.2012220526
2	LOUISE	12	F	61	123	0.3573444607
3	JANE	12	F	55	74	0.0374839749
4	JACLYN	12	F	66	145	0.7920856365
5	LILLIE	12	F	52	64	0.0064194391
6	TIM	12	M	60	84	0.2737817738
7	JAMES	12	M	61	128	0.3573444607

Distribution Calculator

- In JMP 12: **Help > Sample Data > Teaching Scripts > Interactive Teaching Modules > Distribution Calculator**.
- In JMP 11 and earlier, download add-in from **jmp.com/tools**.



Enter the mean and the standard deviation, select the type of calculation, and enter the values or the probabilities. Click the **Help** button for instructions and use notes.

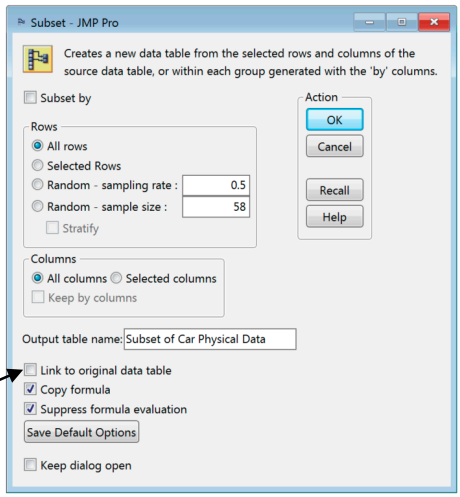
Random Sampling and Random Data

This page documents methods for selecting a random sample and generating random data in JMP®.

Random Sampling

1. From an open JMP data table, select **Tables > Subset**.
2. Specify how you'd like the sample to be selected:
   - **Random – sampling rate** (specify the proportion).
   - **Random – sample size** (specify the desired sample size).
   - To select a stratified sample across another variable, check **Stratify** and select the variable.
3. Under Columns, specify **All columns** or **Selected columns**.
4. Click **OK** to generate the random sample.

Example: Car Physical Data.jmp (Help > Sample Data)

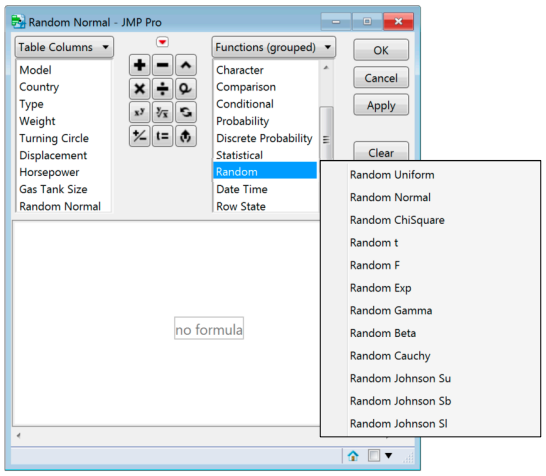


JMP will produce a subset of the original table. To connect the subset to the original table, select **Link to original data table** before clicking **OK**.

Generating Random Data

Manually Create Formula:

1. Select **Cols > New Column**.
2. Under **Column Name**, assign a name for the column. We'll name our column **Random Normal**.
3. Click **Column Properties**, and select **Formula**. This takes you to the **JMP Formula Editor**.
4. From **Functions (grouped)**, scroll down to **Random**.
5. Select the distribution of interest. Here, we will select **Random Normal**.
6. Click **OK**.

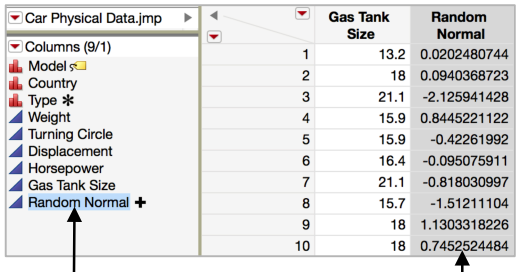


JMP will populate the new column with simulated random normal data.

Instant Formula (JMP 12):

Right click any continuous column in the data table and select **New Formula Column > Row > Random Normal**.

A new column containing a formula will be added to the data table. To reveal or modify the formula, right click on the column header for the new column and select **Formula.**



	Gas Tank Size	Random Normal
1	13.2	0.0202480744
2	18	0.0940368723
3	21.1	-2.125941428
4	15.9	0.8445221122
5	15.9	-0.42261992
6	16.4	-0.095075911
7	21.1	-0.818030997
8	15.7	-1.51211104
9	18	1.1303318226
10	18	0.7452524484

Simulated random standard normal data.

The fat plus next to the variable name under the Columns panel tells us that a formula is stored in the Random Normal column.

Hypothesis Tests and CIs for Proportions

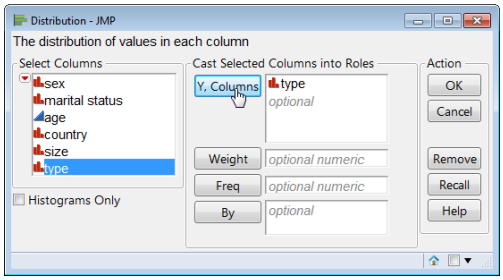
Use to estimate population proportions, and to perform hypothesis tests for population proportions using the Distribution platform.

Confidence Intervals for Population Proportions

1. From an open JMP® data table, select **Analyze > Distribution**.
2. Select one or more categorical variables from **Select Columns**, click **Y, Columns** (categorical variables have red or green bars).
3. If you have summarized data (a column with counts), enter the column into **Freq**.
4. Click **OK**.
5. In the resulting window, click on the **red triangle** for the variable and select **Confidence Interval > 0.95**.

   JMP will produce 95% confidence intervals for the true population proportion for each level. Note that these intervals are computed using the score method (see the JMP help for details).

Example: Car Poll.jmp (Help > Sample Data)



Confidence Intervals

Level	Count	Prob	Lower CI	Upper CI	1-Alpha
Family	155	0.51155	0.455476	0.567337	0.950
Sporty	100	0.33003	0.279504	0.384817	0.950
Work	48	0.15842	0.121615	0.20377	0.950
Total	303				

Note: Computed using score confidence intervals.

Hypothesis Tests for Population Proportions

1. From the Distribution output window, click on the **red triangle** for the variable and select **Test Probabilities.**
2. Entered the hypothesized proportions under **Hypoth Prob**, and click **Done.**

   JMP will provide the results of two chi-square tests: **Likelihood Ratio** and **Pearson** (again, see the JMP help for more information).

Test Probabilities

Level	Estim Prob	Hypoth Prob
Family	0.51155	0.50000
Sporty	0.33003	0.30000
Work	0.15842	.2

Click then Enter Hypothesized Probabilities.

Choose rescaling method to sum probabilities to 1.

- ○ Fix omitted at estimated values, rescale hypothesis
- ◉ Fix hypothesized values, rescale omitted

Done Help

Test Probabilities

Level	Estim Prob	Hypoth Prob
Family	0.51155	0.50000
Sporty	0.33003	0.30000
Work	0.15842	0.20000

Test	ChiSquare	DF	Prob>Chisq
Likelihood Ratio	3.7853	2	0.1507
Pearson	3.6117	2	0.1643

Method: Fix hypothesized values, rescale omitted

Interpretation (using a significance level of 0.05):

- The null hypothesis is that the true proportions are equal to the hypothesized values.
- **Prob>Chisq** gives p-values for the two chi-square tests.
- Small p-values (<0.05) indicate that at least one sample proportion is significantly different from the hypothesized value.
- Since the p-values in this example are large (> 0.05), we **cannot reject the null hypothesis**.

Notes: The hypothesized probabilities must sum to one. If the proportions entered do not sum to one, JMP will scale the values. If proportions are missing for some categories, JMP will supply the values. See the ***Basic Analysis*** book, Chapter 2 (under **Help > Books**) for more details. If working with summary statistics instead of raw data, use a calculator under **Help > Sample Data > Calculators** (under Teaching Resources).

Chi Square Tests for a Two-Way Table

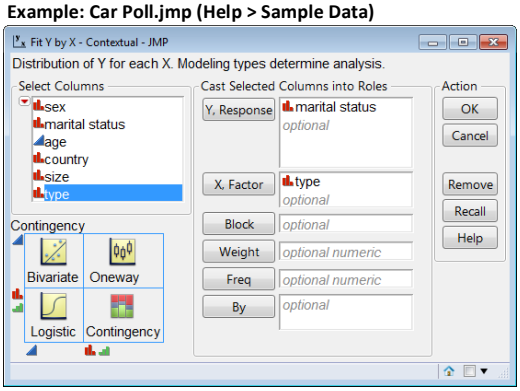
Use to test for independence or homogeneity of two categorical variables in a contingency table.

The Contingency Table Analysis

1. Select **Analyze > Fit Y by X**.
2. Click on a categorical variable from **Select Columns**, and click **Y, Response** (categorical variables have red or green bars).
3. Click on another categorical variable and click **X, Factor**.
4. Click **OK**. The Contingency Analysis output will display.

   See the page **Mosaic Plot and Contingency Table** for information on mosaic plots and contingency tables (cross-tabs).

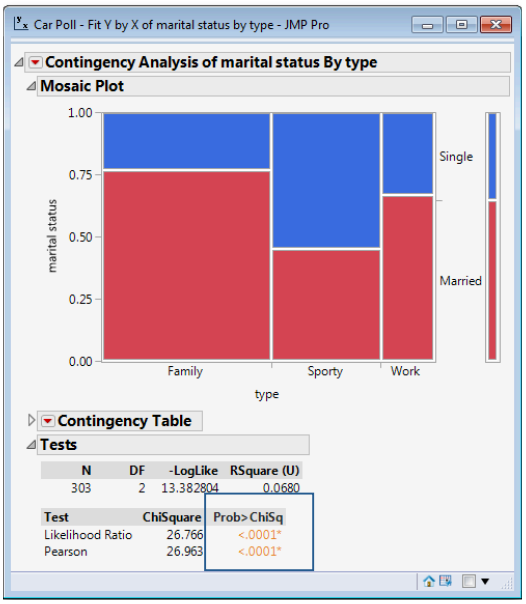
Example: Car Poll.jmp (Help > Sample Data)



Chi-Square Tests

By default, JMP® provides results for two chi-square tests under "Tests," the **Likelihood Ratio** and **Pearson**:

- If both variables are responses (Y) variables, the chi-square statistics test that the variables are independent.
- If one variable is considered a Y and the other is a fixed X, the tests are for homogeneity.



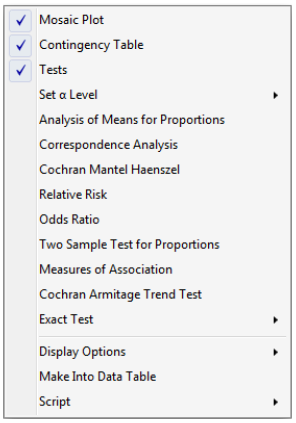
Interpretation (using a significance level of 0.05):

- **P-values** for the two tests are given under **Prob>ChiSq**.
- Since the p-values are less than 0.05, conclude that there is a significant difference in the probability of purchasing a particular type of car for married and single adults.

Two-by-Two Tables

For two-by-two tables, additional tests and results are provided:

- By default, the **Fisher's exact test** and p-values for the one-tailed and two-tailed tests are displayed in addition to the **Likelihood Ratio** and **Pearson** tests.
- Other options are available under the **top red triangle**, including **Analysis of Means for Proportions** and **Odds Ratios** (including confidence intervals).



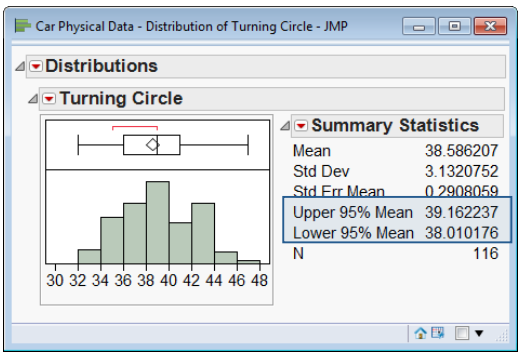
Note: See the ***Basic Analysis*** book (under **Help > Books**) for more details.

One Sample t-Test and CI

Use to estimate the population mean from a sample (confidence interval for the mean) or perform a hypothesis test for a mean (one sample t-Test).

Confidence Interval for the Mean

Example: Car Physical Data.jmp (Help > Sample Data)



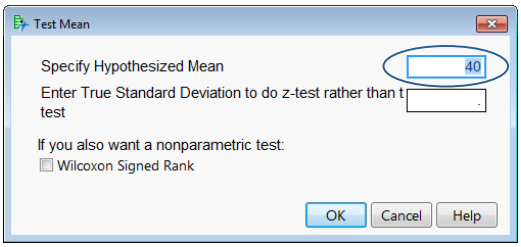
1. From an open JMP® data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns**, click **Y, Columns** (continuous variables have blue triangles), and click **OK**.

   The **Upper 95% Mean** and **Lower 95% Mean** give the 95% confidence interval for the true mean (39.163 and 38.01).

Tips:

- To change the display from vertical to horizontal (as shown), click on the **top red triangle** and select **Stack**.
- To change the confidence level, request a one-sided confidence limit or specify sigma, click on the **red triangle** for the variable, select **Confidence Interval**, and select the confidence level or click **Other**.

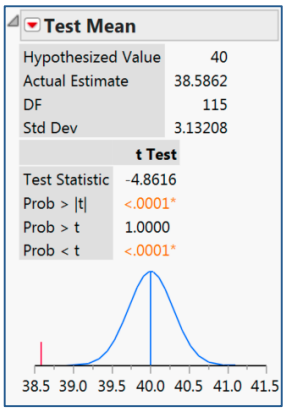
One Sample t-Test for the Mean



1. From the Distributions report window (shown above), click on the **red triangle** for the variable and select **Test Mean**.
2. Enter the hypothesized value under **Specify Hypothesized Mean**, and click **OK**.

   JMP will generate:

   - The **t-Ratio** (next to **Test Statistic**).
   - **P-values** for the two-tailed and one-tailed tests.
   - A graph to aid in interpreting the p-values, showing the hypothesized mean (center of the curve) and the sample mean (red line).



Interpretation of p-values for this example (using a significance level of 0.05):

1. **Prob > |t| is less than 0.05 - reject the null hypothesis** that the true mean is 40. This is the two-tailed test. Conclude that the true mean is not 40.
2. **Prob > t is greater than 0.05 - fail to reject the null hypothesis** that the true mean is <= 40. This is a one-tailed test. There is insufficient evidence to reject the null hypothesis.
3. **Prob < t is less than 0.05 - reject the null hypothesis** that the true mean is >= 40. Conclude that the true mean is less than 40.

Notes: To explore how the p-value changes as a function of the difference between the hypothesized mean and the sample mean, click on the **red triangle** next to **Test Mean=value** and select **PValue animation**. See the ***Basic Analysis*** book (under **Help > Books**) for more details. If working with summary statistics instead of raw data, use a calculator under **Help > Sample Data > Calculators** (under Teaching Resources).

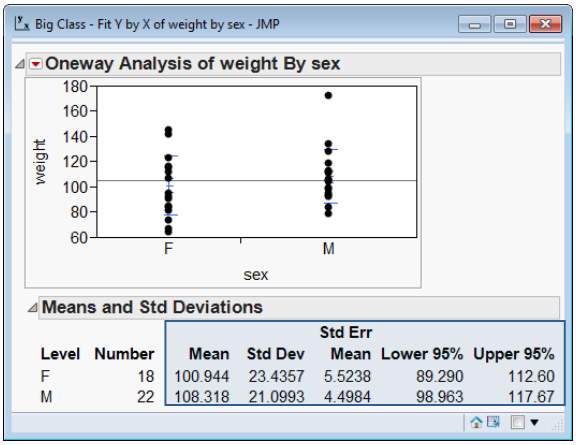
Two Sample t-Test and CIs

Estimate two population means (confidence intervals) or perform a hypothesis test for the difference between two independent means (two sample t-test) using the Fit Y by X platform. Note: If more than two means (more than two levels of the categorical X variable), refer to the page **One-Way ANOVA**.

Confidence Intervals

1. Select **Analyze > Fit Y by X**.
2. Click on a continuous variable from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Click on a two-level categorical variable and click **X, Factor** (categorical variables have red or green bars).
4. Click **OK**. The Oneway Analysis output window will display.
5. Click on the **red triangle**, and select **Means and Std Dev** to produce summary statistics and individual confidence intervals for each mean (Lower 95% and Upper 95%).

Example: Big Class.jmp (Help > Sample Data)



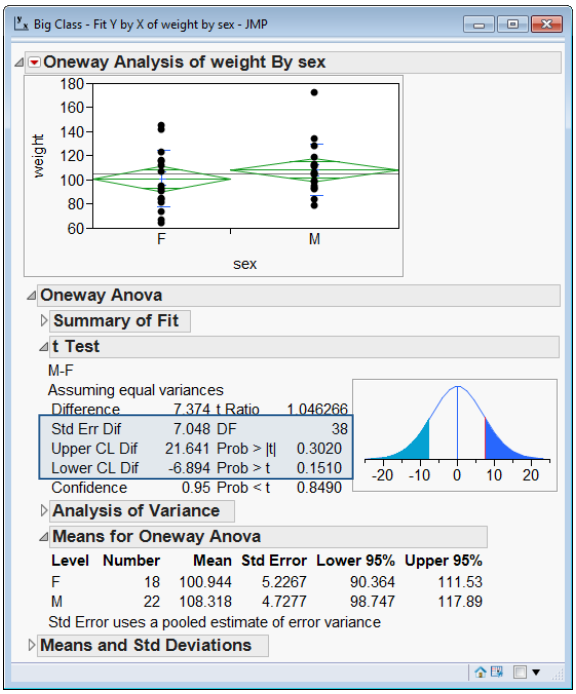
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
F	18	100.944	23.4357	5.5238	89.290	112.60
M	22	108.318	21.0993	4.4984	98.963	117.67

Two Sample t-Test

From the Oneway Analysis output window (shown above), click on the **red triangle** and select **Means/Anova/Pooled t**.

JMP® will plot **means diamonds (95% confidence intervals for each mean**), and will generate:

- The Summary of Fit (not shown).
- The t-test report, with a graph to aid in interpreting the results.
- The Analysis of Variance table.
- Means for Oneway Anova (not shown), which includes confidence intervals based on the pooled estimate of the standard error.



Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	18	100.944	5.2267	90.364	111.53
M	22	108.318	4.7277	98.747	117.89

Std Error uses a pooled estimate of error variance

Interpretation of the results (using a significance level of 0.05 - click **the red triangle, Set α Level** to change significance level):

1. **Upper CL Dif** and **Lower CL Dif** give the 95% CI for the true difference. Since the **95% CI contains zero, conclude that there is not a significant difference** between the means.
2. **Prob > |t|** is the p-value for the two-tailed test. The null hypothesis is that means are equal (the mean difference is zero). Since the **Prob > |t| is greater than 0.05, cannot reject the null hypothesis** (i.e., we cannot conclude that there is a significant difference).

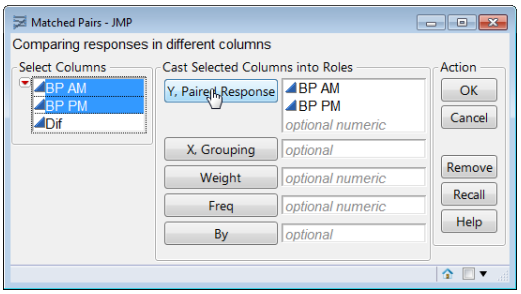
Notes: **Means/Anova/Pooled t** is the test under the assumption of equal variances. For a test without the assumption of equal variances, select **t Test** instead. See the ***Basic Analysis*** book (under **Help > Books**) for more details.

Paired t-Test and CI

Use to test if the means of two paired (dependent or correlated) samples are statistically different. Note: The paired measurements must be stored in separate columns.

Paired t-Test Using Matched Pairs

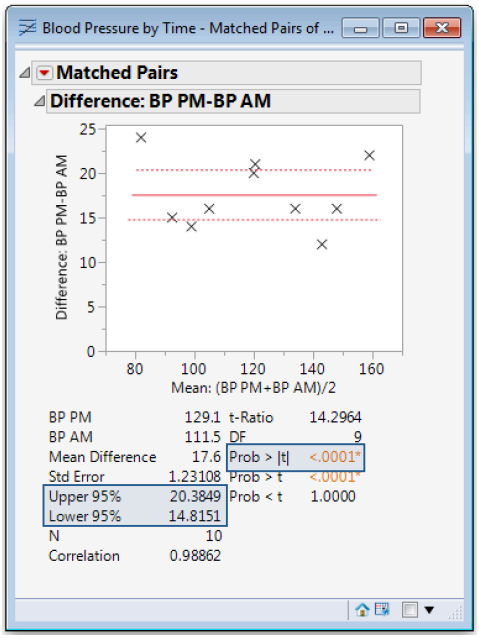
Example: Blood Pressure by Time.jmp (Help > Sample Data)



1. From an open JMP® data table, select **Analyze > Matched Pairs**.
2. Select two or more continuous variables from **Select Columns**, click **Y, Paired Responses** (continuous variables have blue triangles), and click **OK**.

   By default, JMP will generate:

   - A graph, containing:
     - The differences between the paired readings.
     - The mean difference (solid red line).
     - The 95% confidence interval for the mean difference (dashed lines).
     - A reference diamond that's displayed on the graph when the range of differences is greater than half the range of the data.
   - Summary statistics, including:
     - The sample means for each variable.
     - The mean difference.
     - The 95% confidence interval for the mean difference.
     - The correlation.
     - The t-ratio and p-values.



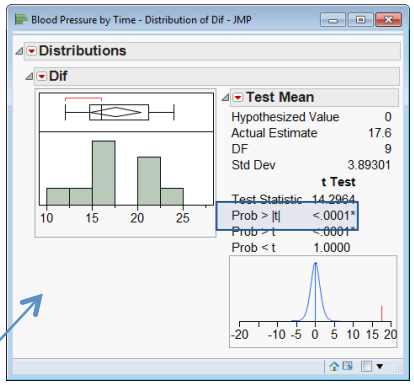
Interpretation (using a significance level of 0.05 - click **the red triangle, Set α Level** to change significance level):

- **Upper 95%** and **Lower 95%** give the 95% CI for the true difference between the means.

  Since the **95% CI does not contain zero**, conclude that there is a significant difference.

- **Prob > |t|** is the p-value for the two-tailed test. The null hypothesis is that the mean difference is zero.

  Since the **Prob > |t| is less than 0.05, reject the null hypothesis**. Conclude that there is a significant difference between the means.



Notes: A paired t-test is equivalent to performing a **one sample t-test** on a column of differences using the **Distribution** platform, where the null hypothesis is that the mean difference is zero. See the page **One Sample t-Test and CI** or the book ***Basic Analysis*** (under **Help > Books**) for more details.

One-Way ANOVA

Test for differences between three or more population means using the Fit Y by X platform. Note: If testing two means (two levels of the categorical X variable), refer to the page **Two Sample t-Test and CIs**.

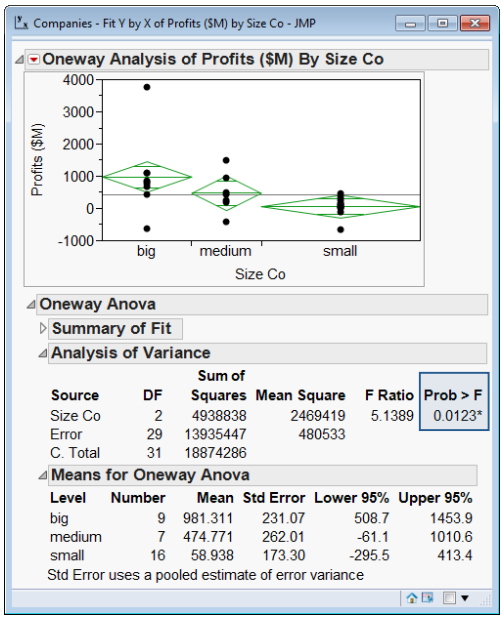
One-Way Analysis of Variance

1. Select **Analyze > Fit Y by X**.
2. Click on a continuous variable from **Select Columns**, and Click **Y, Response** (continuous variables have blue triangles).
3. Click on a categorical variable and click **X, Factor** (categorical variables have red or green bars).
4. Click **OK**. The Oneway Analysis output window will display.
5. Click on the **red triangle**, and select **Means/Anova**.

   JMP® will plot means diamonds (95% confidence intervals for each mean), and will generate:

   - The Summary of Fit.
   - The Analysis of Variance (Anova) table.
   - Means for Oneway Anova, containing summary statistics and confidence intervals for each mean (based on the pooled estimate of the standard error).

Example: Companies.jmp (Help > Sample Data)

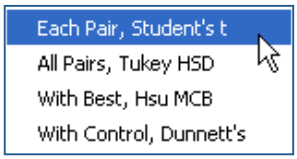


Interpretation of the results in the Anova table (using a significance level of 0.05 – click **the red triangle, Set α Level** to change significance level):

- The null hypothesis is that there are no differences between the population means (i.e., all means are equal).
- **Prob > F** is the p-value for the whole model test. Since the **Prob > F is less than than 0.05, reject the null hypothesis**. Conclude that there are differences between at least two of the means.
- To determine which means are different, a post hoc multiple comparison technique can be used.

Multiple Comparison Procedures

From the Oneway Analysis output window (shown above), click on the **red triangle**, select **Compare Means**, and select one of the four methods (described in JMP Help).

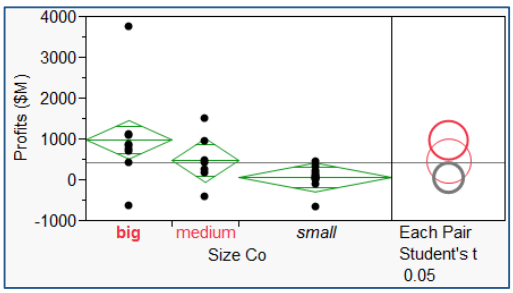


Each Pair, Student's t has been selected. This produces comparison circles (shown), along with statistical output (not shown).

Click on a circle for a mean to test for paired differences.

- The **selected mean** will have a **bold, red circle and variable label**.
- Means that **are not significantly different** from the selected mean will have **unbolded, red circles and variable labels**.
- Means that **are significantly different** from the selected mean will have **gray circles** and **gray italicized variable labels**.

In this example, the mean for **big** is significantly different from the mean for **small**, but is not significantly different from the mean for **medium**.

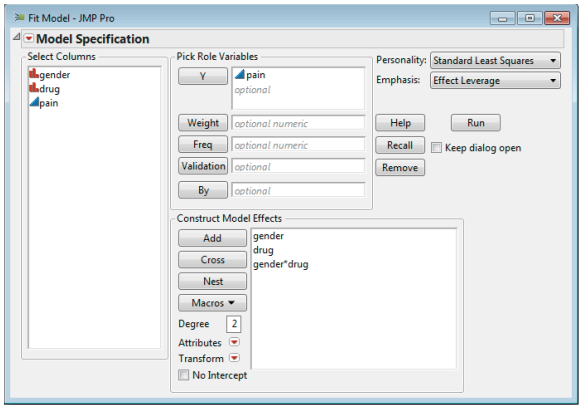


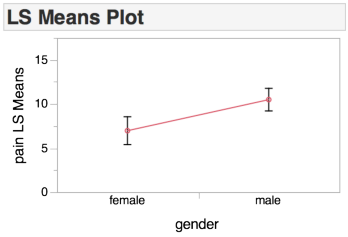
Two-Way (Factorial) ANOVA

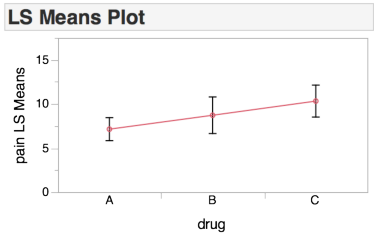
A two-way (factorial) analysis of variance tests the effects of two categorical variables (factors) and their interaction on one continuous (response) variable.

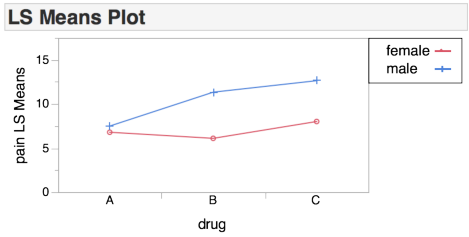
1. Select **Analyze > Fit Model**.
2. Click on a continuous variable from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Click on two categorical variables from **Select Columns**, and click **Macros, Full Factorial** (categorical variables have red or green bars). This adds each factor and the interaction between the two factors as model effects.
4. Click **OK**. The Fit Model output window will display.
5. Above the leverage plots select **LS Means Plot** from the **red triangles** to display least square means plots.

Example: Analgesics.jmp (Help > Sample Data)









Interpretation of the results in the ANOVA table under **Effects Tests**:

- The null hypothesis for a main effect is that there are no differences between the population means (i.e., all means are equal) in that factor, averaging over all other factors.
- The null hypothesis for the interaction between two effects is that the pattern of effects for one of the factors does not depend on the level of the second factor.
- **Prob > F** is the p-value useful for testing whether a particular source explains more variation in the data than would be expected by chance. Using alpha = 0.05:
  - Both main effects are significant, indicating that the mean for males differs from the mean for females, and that not all the means for the three drugs are the same.
  - We do not have evidence that the effect of drug depends on the gender of an individual, and equivalently, that the "effect" of gender does not depend on what drug someone is taking.

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
gender	1	1	73.808295	12.6378	0.0014*
drug	2	2	51.059196	4.3713	0.0227*
gender*drug	2	2	30.542763	2.6148	0.0916

Tips:

- To determine which means are different (simple effects), a post hoc multiple comparison technique can be used (for details see the page **One-Way ANOVA**).
- The **Parameter Estimates** table provides results from tests of the parameterized (dummy) variables accounting for each source of variation (factors and interactions).

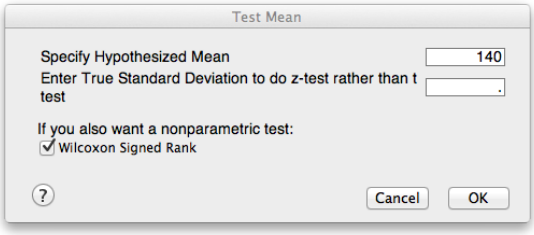
Notes: For more information on two-way analysis of variance, search for **Two-Way** in the book ***Fitting Linear Models*** (under **Help > Books**).

Nonparametric Tests

This page describes how to perform nonparametric tests in JMP®. For information on nonparametric correlations and measures of association, see the page **Nonparametric Correlations**.

One-Sample Nonparametric Tests

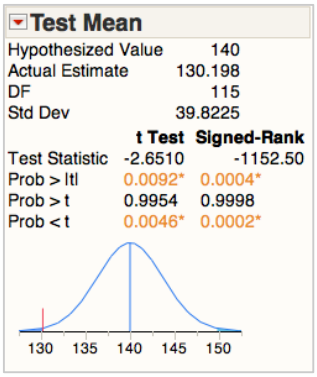
Example: Car Physical Data.jmp (Help > Sample Data)



1. From an open JMP data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns**, click **Y, Columns,** and click **OK**.
3. From the Distributions report window, click on the **red triangle** for the variable and select **Test Mean**.
4. Enter the hypothesized value under **Specify Hypothesized Mean**, check the **Wilcoxon Signed Rank** box, and click **OK**.

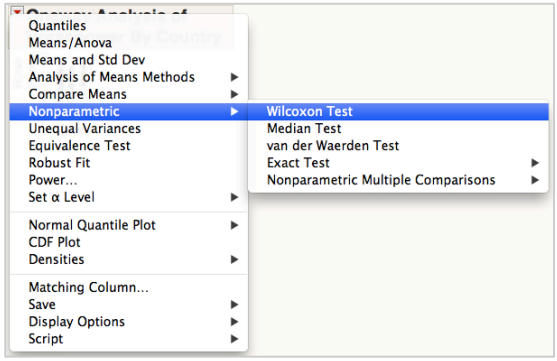
   The following results for both the one-sample t-Test and the Signed-Rank are given (for the variable Horsepower):

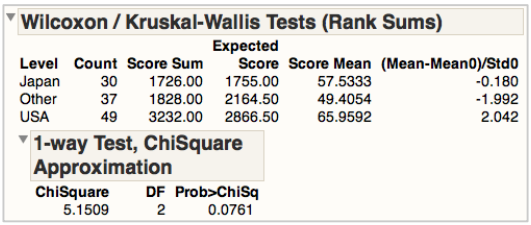
   - The **test statistics** (the t-Ratio and Signed-Rank).
   - **P-values** for both one- and two-tailed tests. The p-value for the two-tailed test is next to **Prob > |t|.**
   - A graph to aid in interpreting the t-Test, showing the hypothesized mean (center of the curve) and the sample mean (red line).



Two-Sample and Oneway Nonparametric Tests

1. Select **Analyze > Fit Y by X**.
2. Select a continuous variable and click **Y, Response**, and select a categorical variable and click **X, Factor**, then click **OK**.
3. The **Oneway Analysis** output window will display.
4. Under the red triangle, select **Nonparametric > Wilcoxon Test**.
   - If the categorical variable has two levels, the **Wilcoxon Rank Sum Test** (also called the **Mann-Whitney Test**) will be performed, along with the **2-Sample Test, Normal Approximation**.
   - If the variable has three or more levels (example shown right), the **Kruskal-Wallis Test** will be performed.





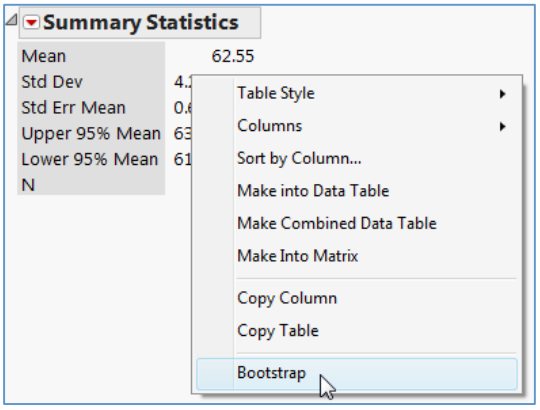
Notes: For paired data, use **Analyze > Matched Pairs**. Exact versions of nonparametric tests are available in JMP Pro only. See the ***Basic Analysis*** book (under **Help > Books**) or the online documentation (jmp.com/support/help/) for more information.

Bootstrapping in JMP® Pro

JMP PRO This page provides information on bootstrapping, which is a re-sampling method for estimating the sampling distribution of a statistic. Bootstrapping is available from nearly all JMP Pro reports (exceptions are Time Series and analyses using REML).

Bootstrapping in JMP® Pro Report Windows

Example: Big Class.jmp (Help > Sample Data)

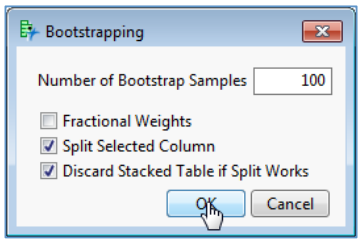


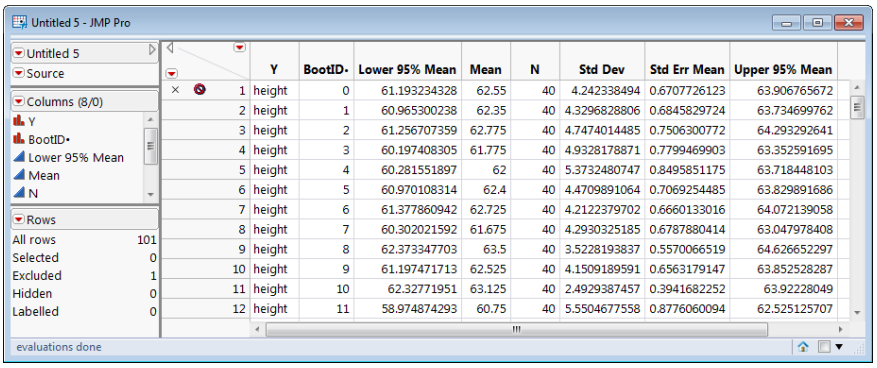
1. From an analysis platform report window, **right-click** on the report of interest and select **Bootstrap**.

   In this example we use the Distribution platform and bootstrap the statistics in the Summary Statistics report for a continuous variable.

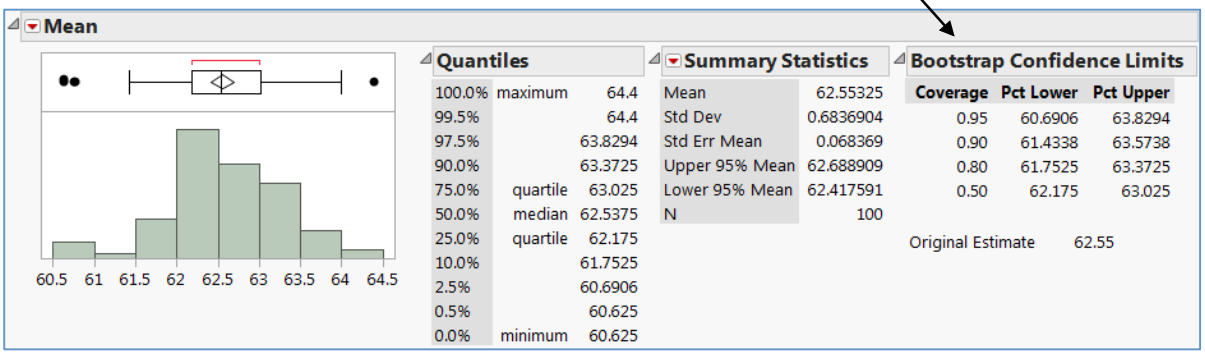
2. In the Bootstrapping window (below, left), click **OK**.

   JMP creates a data table (below, right) with statistics for the original sample (excluded) and each of the bootstrap samples. The BootID• column identifies the bootstrap sample number.





3. Use the **Distribution** platform to explore the statistics of interest for the bootstrap samples. Bootstrap percentile confidence intervals for different confidence levels are provided.

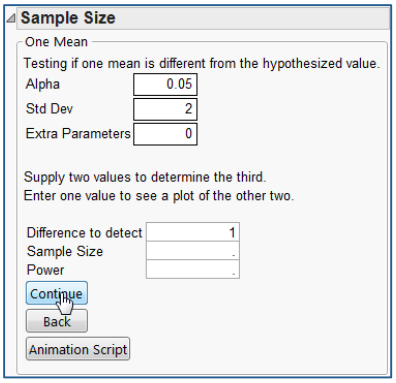


Note: Advanced bootstrap methods are available in the Partition and Neural Platforms in JMP Pro. For more details on bootstrapping in JMP Pro, including information on options in the Bootstrapping window (above) search for **Bootstrap** in JMP Help or in the book ***Basic Analysis*** (under **Help > Books**).

Sample Size and Power for Testing Means

Use to calculate sample size and power for tests involving means. For sample size and power calculations for tests involving proportions, see the page **Sample Size and Power for Testing Proportions.**

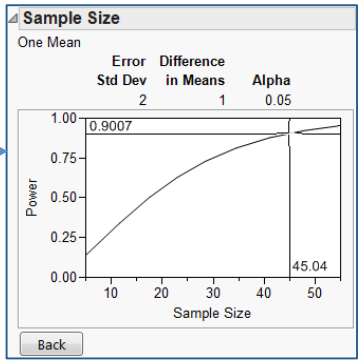
Sample Size and Power - One or Two Sample Means



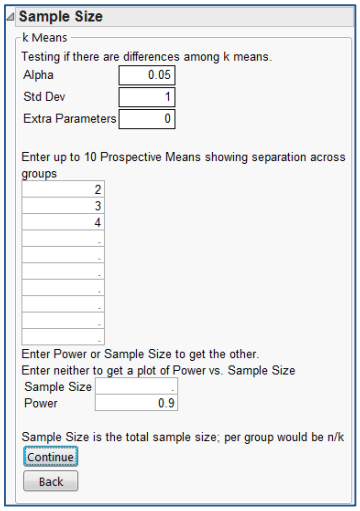
1. Select **DOE > Sample Size and Power** and choose **One Sample Mean** or **Two Sample Means**.
2. Enter the significance level, **Alpha** (0.05 by default).
3. Enter the **Std Dev** (the historical standard deviation).
4. Leave **Extra Parameters** at the default, 0.
5. Enter the values for any two of the following:
   - **Difference to detect** (the difference between the hypothesized and observed mean, or the difference between two means.)
   - **Sample Size**.
   - **Power**.
6. Click **Continue.** JMP® will calculate the third value.

   If you enter only one value, JMP will plot the relationship between the other two. Use the cross-hair tool (⊞ - keyboard shortcut is C) to explore values.

   Hint: For One Sample Mean, click the **Animation Script** to open the **Power Animator**.



Sample Size and Power - More than Two Samples



1. Select **DOE > Sample Size and Power** and choose **k Sample Means.**
2. Enter the significance level, **Alpha** (0.05 by default).
3. Enter the **Std Dev** (the historical standard deviation).
4. Leave **Extra Parameters** at the default, 0.
5. Enter the values for up to 10 **Prospective Means**. Hint: To detect a difference of *d* units between any two means, enter two means at values *d* units apart, and enter all of the other means at the average value.
6. Enter a value for either **Power** or the total **Sample Size**, or leave both blank.
7. Click **Continue**.

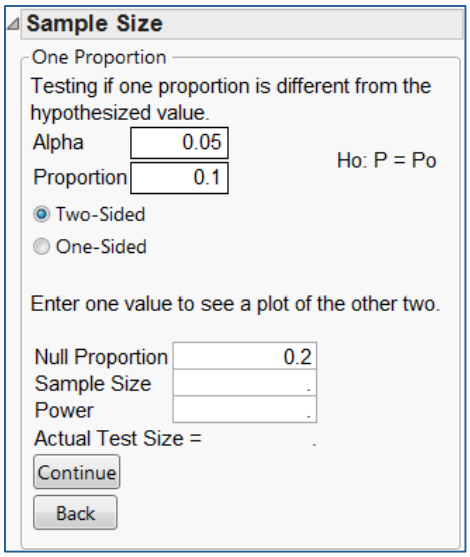
   JMP will calculate the other value, or will plot the relationship between power and sample size (if both fields were blank).

Notes: For two samples and k samples, the total sample size is calculated - divide by the number of groups for the sample size per group. For more details, search for "power" under **Help > Search** or in the book ***Design of Experiments Guide*** (under **Help > Books**). To calculate the sample size for the confidence interval for a mean, use the calculator under **Help > Sample Data > Calculators** (under Teaching Resources).

Sample Size and Power for Testing Proportions

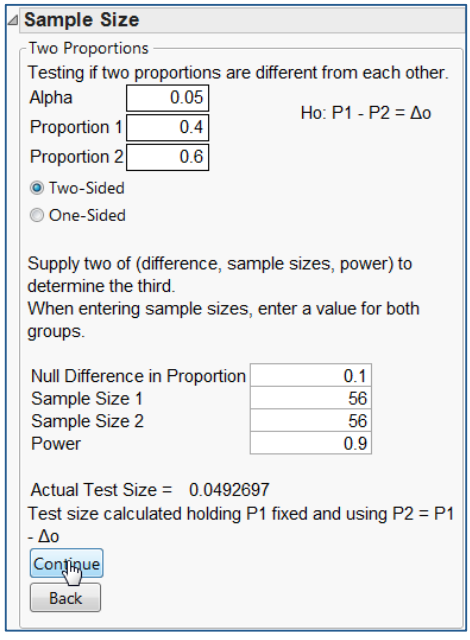
Use to calculate sample size and power for tests involving one or two sample proportions. For sample size and power calculations for tests involving means, see the page **Sample Size and Power for Testing Means.**

Sample Size and Power - One Sample Proportion



1. Select **DOE > Sample Size and Power** and choose **One Sample Proportion**.
2. Enter the significance level, **Alpha** (0.05 by default).
3. Enter the **Proportion** (the true or hypothesized proportion).
4. Choose the type of test: **Two-Sided** or **One-Sided**.
5. Enter the values for one or two of the following: **Null Proportion** (the proportion to test against), **Sample Size** and **Power**.
6. Click **Continue.**
   - If you entered two values, JMP® will calculate the third value, along with the Actual Test Size (the actual significance level).
   - If you enter only one value, JMP will plot the relationship between the other two.

Sample Size and Power- Two Sample Proportions



1. Select **DOE > Sample Size and Power** and choose **Two Sample Proportions**.
2. Enter the significance level, **Alpha**.
3. Enter **Proportion 1** and **Proportion 2** (the true or hypothesized proportions, where Δ_0 is the hypothesized difference).
4. Choose the type of test: **Two-Sided** or **One-Sided**.
6. Enter the values for any two of the following:
   - **Null Difference in Proportion** (the difference in proportions to test against).
   - **Sample Size 1** and **Sample Size 2** (you do not need the same value for both sample sizes).
   - **Power**.
6. Click **Continue.** JMP will calculate the other value(s), and the Actual Test Size.

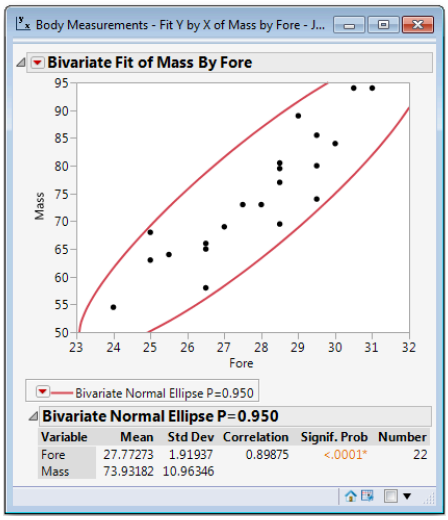
Notes: All calculations are based on exact methods, which are more reliable for small sample sizes and proportions. For additional information, search for "power and sample size proportions" under **Help > Search**. To calculate the sample size for the confidence interval for a proportion, use the calculator under **Help > Sample Data > Calculators** (under Teaching Resources).

Correlation

Correlation is a measure of the linear association between two variables. This page documents the two platforms in JMP® for assessing correlation.

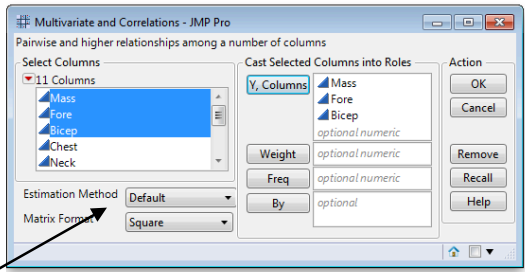
Correlation Between Two Variables

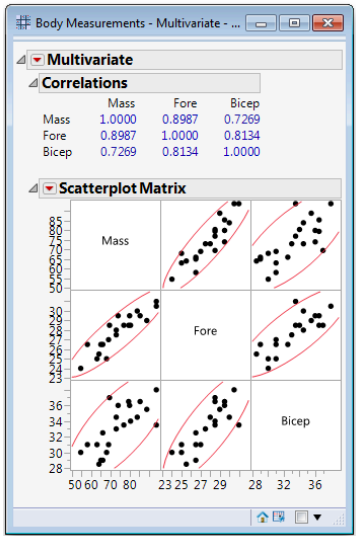
Example: Body Measurements.jmp (Help > Sample Data)



1. From an open JMP data table, select **Analyze > Fit Y by X.**
2. Click on a continuous variable from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Click on a second continuous variable, and click **X, Factor**.
4. Click **OK** to generate a scatterplot.
5. To display the correlation, click on the **red triangle** and select the **Density Ellipse > 0.95**.
   - A 95% density ellipse, which graphically shows the correlation, will display on the scatterplot.
   - To show the correlation coefficient, click on the **gray icon** next to **Correlation**.

Correlations Between Multiple Pairs of Variables





1. From an open JMP data table, select **Analyze > Multivariate Methods > Multivariate**.
2. Click on two or more continuous variables from **Select Columns**, and click **Y, Columns.**
3. Click **OK** to produce a scatterplot matrix with density ellipses and a table of correlations.
   - The **Default** estimation method allows JMP to determine the method for estimating correlations that is most appropriate for your data set.

Tips:

- Many additional correlation options are available under the **red triangle** next to **Multivariate**, including:
  - CI of Correlations.
  - Inverse Correlations.
  - Partial Correlations.
  - Pairwise Correlations (Pearson product-moment).
  - Nonparametric Correlations (including Spearman's rho).
- Scatterplot options are available under the **red triangle** next to **Scatterplot Matrix**.

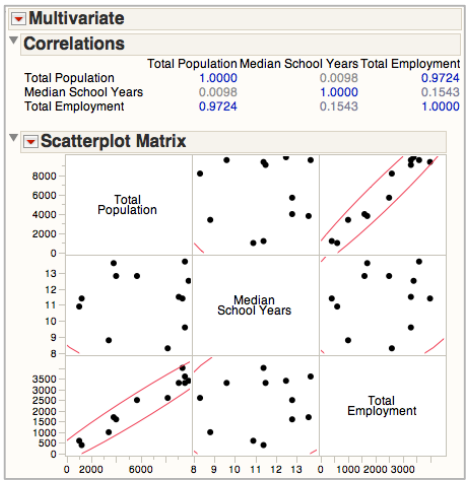
Notes: Density ellipses can also be generated from **Graph > Scatterplot Matrix** and **Graph > Graph Builder**. For additional information, search for "correlation" in the JMP Help.

Nonparametric Correlations

This page describes how to compute the following nonparametric measures of association in JMP®: **Spearman's Rho**, **Kendall's Tau**, and **Hoeffding's D**. For information on nonparametric tests, see the page **Nonparametric Tests**. For details on calculating other correlation measures in JMP, see the page **Correlations**.

Nonparametric Correlations

Example: Socioeconomic.jmp (Help > Sample Data)



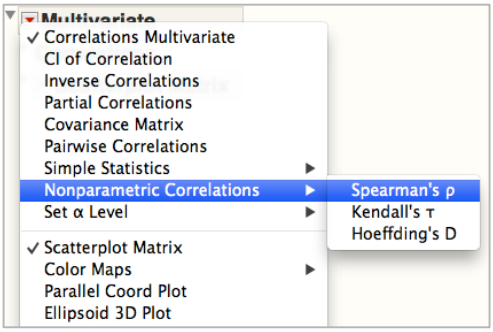
1. From an open JMP data table, select **Analyze > Multivariate Methods > Multivariate**.
2. Select two or more discrete numeric (nominal or ordinal) or continuous variables from **Select Columns**, click **Y, Columns,** then click **OK**.

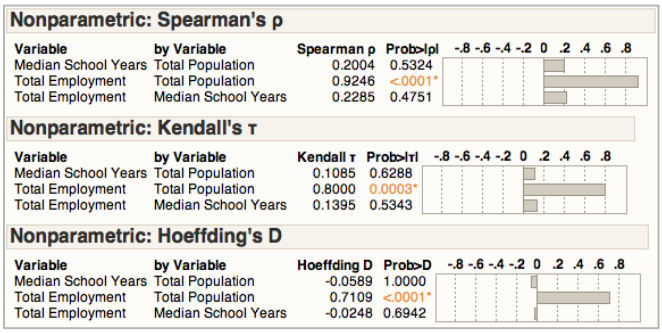
   JMP produces a table of pairwise correlations and a scatterplot matrix.

3. From the top red triangle, select **Nonparametric Correlation**, then the measure of interest (shown below, left).

   The following results are provided (below, right):

   - The calculated correlation coefficient for the pair of variables.
   - The p-value, showing the significance of the correlation.
   - A bar chart showing the correlation coefficients.





Spearman's Rho (ρ) is similar to Pearson's correlation, but is based on ranks rather than the original values. Like the Pearson correlation, values range from -1 to +1, with larger absolute values indicating a stronger relationship.

Kendall's Tau (T) is based on the number of concordant and discordant pairs of rank-ordered data. It also ranges from -1 to +1.

Hoeffding's D ranges from -.5 to 1. It measures the difference between the joint ranks of paired data and the product of their marginal ranks, and can capture nonlinear relationships.

Notes: Additional options are available under the top red triangle (shown above, left). **Nonparametric Density** and other options are also available under the red triangle for the scatterplot matrix. For additional information and statistical details, see the book ***Multivariate Methods*** (under **Help > Books**) or the online documentation (jmp.com/support/help/).

Simple Linear Regression

Simple linear regression is used to model the relationship between two continuous variables.

Simple Linear Regression Using Fit Y by X

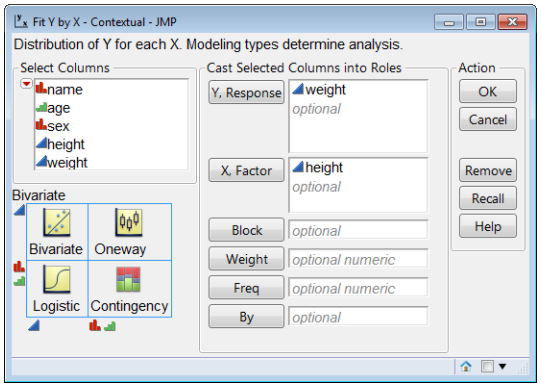
1. From an open JMP® data table, select **Analyze > Fit Y by X**.
2. Click on a continuous variable from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Select a second continuous variable, and click **X, Factor**.
4. Click **OK** to generate a scatterplot.
5. To fit a regression line, click on the **red triangle** and select **Fit Line**.

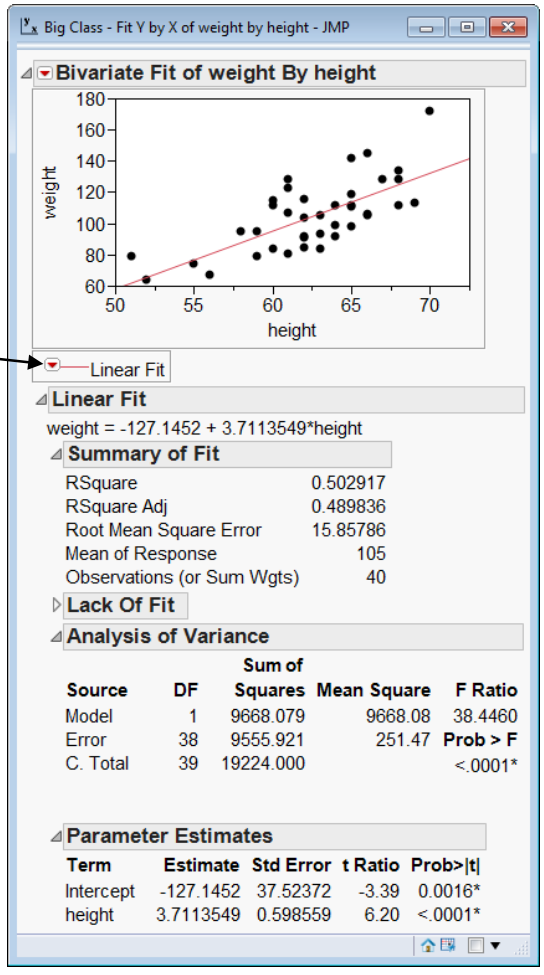
   By default, JMP will provide the following results:

   - The regression equation (under Linear Fit).
   - The Summary of Fit.
   - Lack of Fit (if the data table includes replicates of X values).
   - The ANOVA table.
   - The parameter estimates.

   Additional options, such as **residual plots** and **confidence curves**, are available from the **red triangle** next to **Linear Fit** (directly under the graph).

Example: Big Class.jmp (Help > Sample Data)





Tips:

- For other fit options, such as **polynomial**, **transformation** (fit special) and **spline**, use the **top red triangle**.
- To add a legend, change markers, or make other changes to the graphical display, right-click on the graph.
- To fit separate lines for categories of a grouping variable, click on the **top red triangle**, select **Group By**, and choose a grouping variable. Then, click on the **top red triangle** and select **Fit Line**.

  JMP will fit separate lines and provide results for each level of the grouping variable.

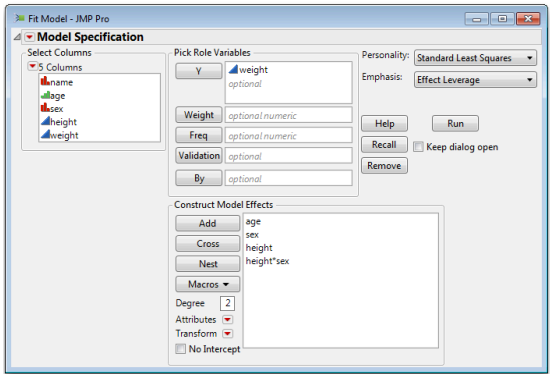
Notes: Simple linear regression can also be performed from **Analyze > Fit Model**. For more details on regression analysis, see the book ***Basic Analysis*** (under **Help > Books**) or search for "regression" in the JMP Help.

Multiple Linear Regression

Multiple linear regression is used to model the relationship between a continuous response variable and continuous or categorical explanatory variables.

Multiple Linear Regression Using Fit Model

Example: Big Class.jmp (Help > Sample Data)

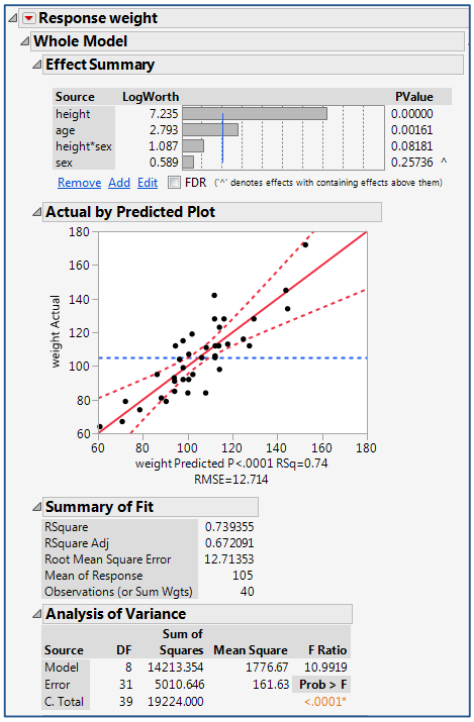


1. From an open JMP® data table, select **Analyze > Fit Model**.
2. Click on a continuous variable from **Select Columns**, and click **Y** (continuous variables have blue triangles).
3. Choose explanatory variables from **Select Columns**, and click **Add**.
4. Click **Run Model**.

   By default, JMP will provide the following results:

   - Effect Summary
   - Actual by Predicted Plot.
   - Summary of Fit table.
   - Analysis of Variance table.
   - Parameter Estimates table, and more (not shown).

   JMP also provides Leverage Plots for each explanatory variable in the model, and for nominal and ordinal variables, the least squares means tables.

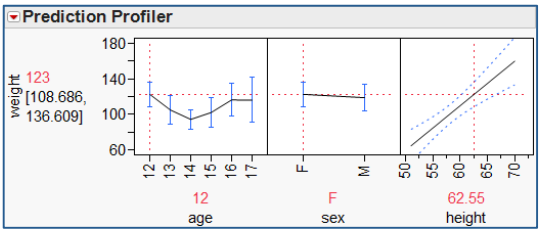


Tips:

- To add interactions terms: In the **Fit Model Specification** window, select the variables under **Select Columns** and click **Cross**. The term **age*height** in the first figure is a two-way interaction. Higher-order terms can also be added.
- To save the prediction formula, predicted values, residuals or other values to the data table, click on the **top red triangle**, select **Save Columns.**

  JMP will create new columns in the data table.
- To view **indicator parameterization** (using 0, 1 coding), select **Estimates > Indicator Parameterization Estimates** from the **top red triangle**.
- To view the effect of an explanatory variable on the predicted response, click on the **top red triangle**, select **Factor Profiling** and choose **Profiler**.

  In the **Prediction Profiler**, click and drag the vertical red line for a variable to change the level or value. The predicted mean response and CI are displayed.



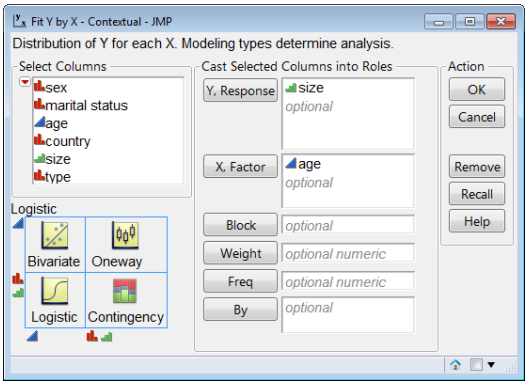
Note: For more details on regression analysis, see the book ***Fitting Linear Models*** (under **Help > Books**) or search for "regression" in the JMP Help.

Simple Logistic Regression

Logistic regression is used to predict the probability of the occurrence of an event.

Logistic Regression Using Fit Y by X

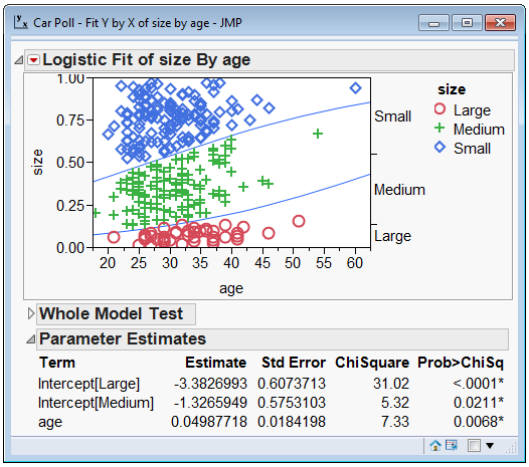
Example: Car Poll.jmp (Help > Sample Data)



1. From an open JMP® data table, select **Analyze > Fit Y by X**.
2. Click on a categorical variable from **Select Columns**, and click **Y, Response** (nominal variables have red bars, ordinal variables have green bars).
3. Click on a continuous variable, and click **X, Factor** (continuous variables have blue triangles).
4. Click **OK** to run the analysis.

   By default, JMP will provide the following results:

   - The logistic plot, with curves of cumulative predicted (fitted) probabilities.
   - The whole model test for model significance.
   - Parameter estimates for the fitted model.

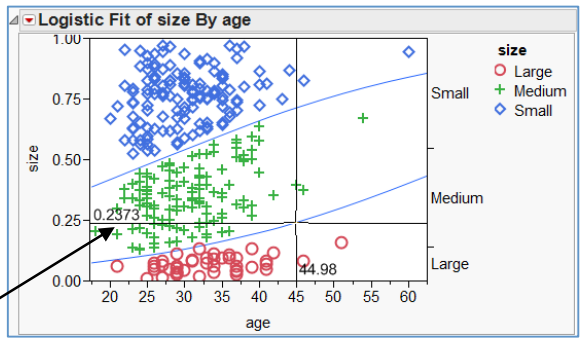


Tips:

- When the response is nominal, a nominal logistic model will be fit. When the response is ordinal, as in this example, an ordinal logistic model will be fit.
- To color points and add a legend, right-click in the graph and select **Row Legend**. Select a variable under **Mark by Column**, and select **Markers** to change the marker, and click **OK**.
- To save the **probability formula** or request other options, click on the **top red triangle** and select the option.
- To find the fitted probability for a given value of X, select the **cross-hair** tool (+) from the toolbar or use the keyboard shortcut (C), and click on the graph.

Interpretation (for this example, X = buying age and Y = car size):

- The **bottom curve** represents the predicted probability that for a given age, someone will buy a **large car**.
- The **second curve** represents the probability that someone will buy a **large or medium car**.
- The **distance between the two curves** represents the probability that someone will buy a **medium car**.
- The **distance between 1.00 and the top curve** represents the probability that someone will buy a **small car**.
- The cross-hairs show that the predicted probability that someone aged 44.98 years will purchase a large car is 0.2373.



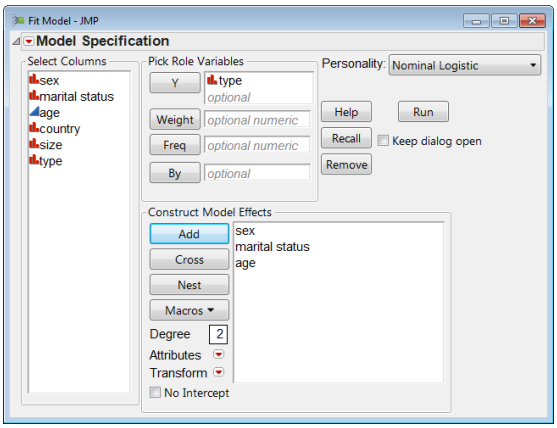
Notes: Simple nominal and ordinal logistic regression can also be performed from **Analyze > Fit Model**. For more details see the book ***Basic Analysis*** (under **Help > Books**) or search for "simple logistic regression" in the JMP Help.

Multiple Logistic Regression

Multiple logistic regression is used to predict the probability of the occurrence of an event using more than one explanatory variable.

Multiple Logistic Regression Using Fit Model

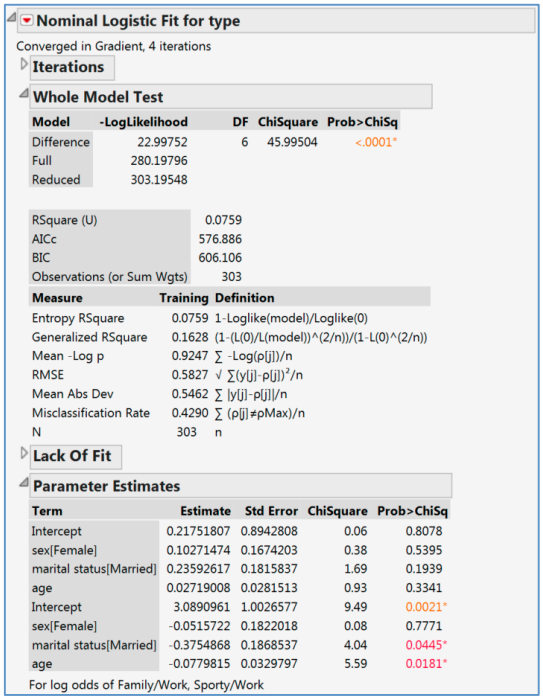
Example: Car Poll.jmp (Help > Sample Data)



1. From an open JMP® data table, select **Analyze > Fit Model**.
2. Click on a categorical variable from **Select Columns**, and click **Y** (nominal variables have red bars, ordinal variables have green bars).
3. Choose explanatory variables from **Select Columns**, and click **Add**.
4. Click **Run Model**.

   By default, JMP will provide the following results:

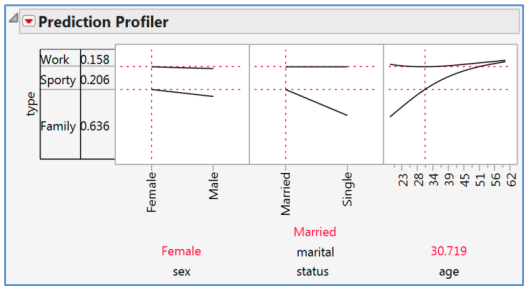
   - The Iterations history (not shown).
   - The Whole Model Test.
   - Lack of Fit (not shown).
   - Parameter Estimates for the model.
   - Effect Likelihood Ratio Tests (not shown).



Tips:

- When the response is ordinal, an ordinal logistic model will be fit. When the response is nominal, as in this example, a nominal logistic model will be fit.
- To save the predicted probabilities to the data table, click on the **top red triangle**, select **Save Probability Formula**.
- To fit a model for grouped or summarized data, use **Freq** in the **Fit Model Specification** window - specify the variable that contains the frequency (count) for each level of the response.
- To view the effect of an explanatory variable on the predicted probabilities, click on the **top red triangle** and select **Profiler**.

  In the **Prediction Profiler**, click and drag the vertical red line for a variable to change the level or value. The predicted probabilities are displayed.



Note: For more details on logistic regression, see the book ***Fitting Linear Models*** (under **Help > Books**) or search for "multiple logistic regression" in the JMP Help.

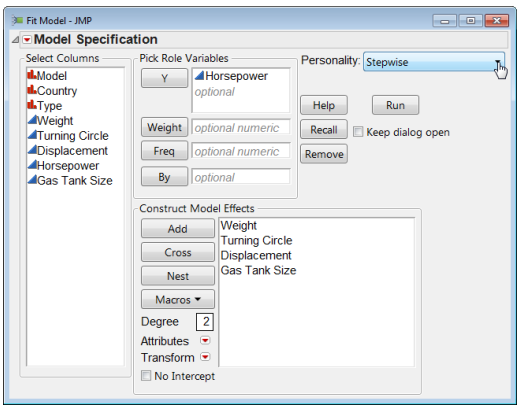
Stepwise Regression

Use for least squares or logistic regression variable selection, model comparison and model creation.

Stepwise Regression

1. From an open table, select **Analyze > Fit Model.**
2. Select a response variable from **Select Columns** and click **Y**.
3. Select predictor variables and click **Add**.
4. If desired, select a validation column **(JMP® Pro only)**.
5. Select **Stepwise** from the **Personality** drop-down menu.
6. In the resulting **Stepwise Fit** window (shown below):
   - Select a **Stopping Rule**.
   - Select the step **Direction** (forward, backward or mixed).
   - To run the regression automatically, click **Go**. To proceed manually, click **Step**.

Example: Car Physical Data.jmp (Help > Sample Data)

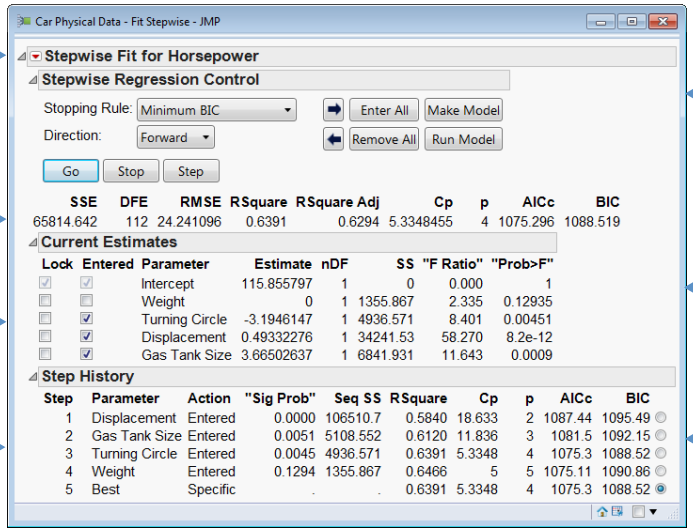


Click the **red triangle** for cross-validation, all possible models (all subsets regression), model averaging and other options.

Results for current model.

Check/uncheck **Entered** terms to change the model. **Locked** terms are used (or **not** used) in later steps.

Each time the model is changed, a new line is added to the **Step History** panel.



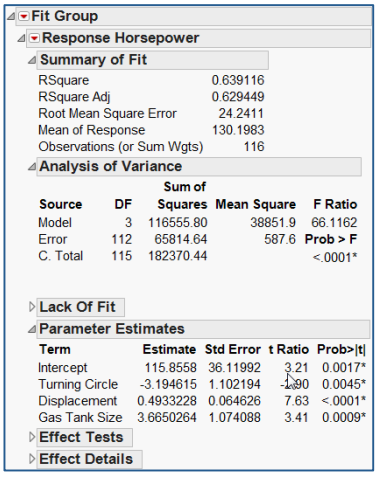
Use the **arrows** to step forward or backward.

P-values are displayed under **Prob<F**.

Use the radio buttons to select a model.

Tips:

- For **Forward** regression, remove all terms, then click **Step** or **Go**.
- For **Backward** regression, enter all terms, then click **Step** or **Go**.
- The **Mixed** direction is only available with the p-value stopping rule.
- To run the model shown in the Current Estimates table, click **Run Model.** JMP generates a report, including fit statistics and information on parameter estimates and effect tests. See the **Multiple Linear Regression** or **Multiple Logistic Regression** one-page guides for details.



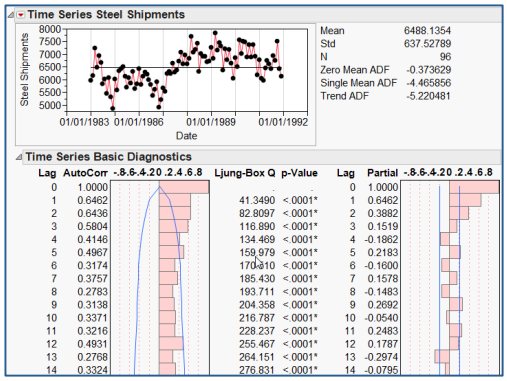
Note: For additional details search for "stepwise regression" in the JMP Help or in the ***Fitting Linear Models*** book (under **Help > Books**).

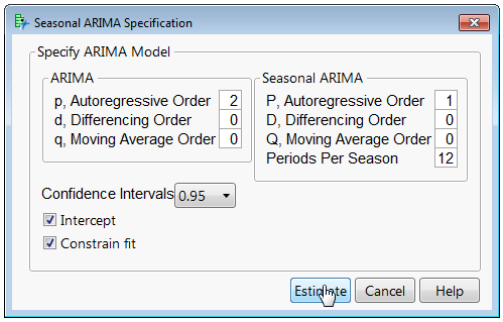
ARIMA Modeling

Use ARIMA models to explore and forecast a single time series.

ARIMA Modeling

Example: Steel Shipments.jmp (Help > Sample Data)





1. Select **Analyze > Modeling > Time Series**.
2. Select a continuous variable from **Select Columns**, and click **Y, Time Series** (continuous variables have blue triangles).
3. Select a time and click **X, Time ID** (*optional*).

   Data must be sorted by time and equally spaced. If no time variable is used, JMP® will assume equal spacing.
4. Click **OK**.

   The autocorrelation (ACF) and partial autocorrelation (PACF) plots suggest an ARIMA model with a seasonal component of AR (1) and a non-seasonal component of AR (2).
5. Click on the **top red triangle** and select **Seasonal ARIMA.** Enter the values as shown (right), and click **Estimate**. JMP displays model results.
6. For the fitted model, check the ACF, PACF and Residual plots to determine if a different model should be fit.

   Here, we repeat Step 5 by adding MA (3) under ARIMA.

   JMP provides a **Model Comparison** report (shown below), which indicates that the new model fits the data better (according to criteria such as AIC and SBC). Click and drag the slider bar at the bottom of the report to see all of the statistics.

Model Comparison

ReportGraph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights
☑ ☐	Seasonal ARIMA(2, 0, 3)(1, 0, 0)12	89	109138.37	1401.9792	1419.9297	0.710	1387.9792	0.987792
☑ ☐	Seasonal ARIMA(2, 0, 0)(1, 0, 0)12	92	124674.02	1410.7659	1421.0233	0.660	1402.7659	0.012208

Tips:

- To simultaneously fit a range of ARIMA or Seasonal ARIMA models, select **ARIMA Model Group** from the **top red triangle**.
- Other options, such as **Variogram**, **Spectral Density**, **Difference**, **Smoothing Models** and **Number of Forecast Periods** are available under the **top red triangle**.
- Use the **red triangle** for a model to **save a forecast**, **create SAS® code** (PROC ARIMA), and **submit code to SAS** (requires an active SAS connection).
- ARMA models require that the time series be stationary. If the series has a trend over time, differencing will remove the trend. If the series has a non-stationary variance, taking the log of the series may help.
- To forecast the time series with input variables, use T**ransfer Function.** Transfer function models are also referred to as **ARIMA models with Input Series**.

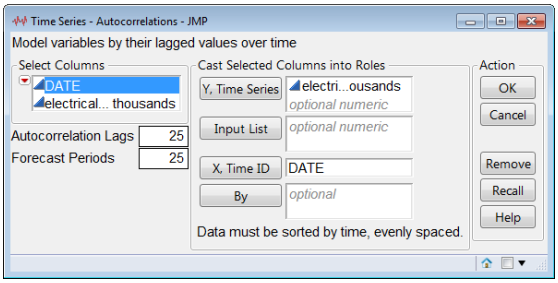
Note: For more information on time series and ARIMA models, search for "ARIMA" in the JMP Help or in the book ***Specialized Models*** (under **Help > Books**).

Time Series Smoothing Models

Use smoothing models to generate interpretable forecasts quickly and easily.

Smoothing Models

Example: Workers.jmp (Help > Sample Data > Time Series)



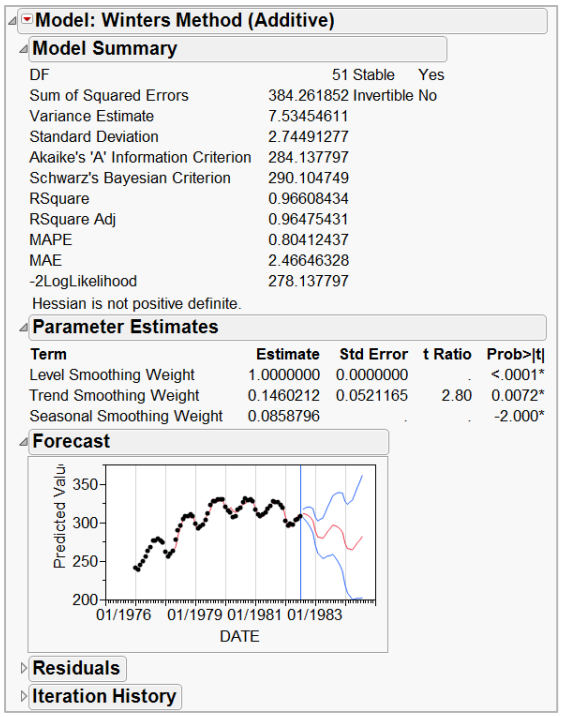
1. Select **Analyze > Modeling > Time Series**.
2. Select a continuous variable from **Select Columns**, and click **Y, Time Series** (continuous variables have blue triangles).
3. Select a time and click **X, Time ID** (*optional*).

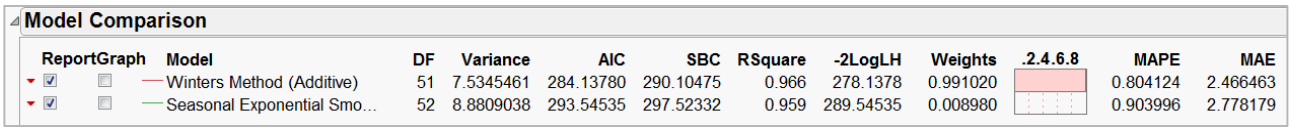
   Data must be sorted by time and equally spaced. If no time variable is used, JMP® will assume equal spacing.
4. Click **OK**.
5. Click on the **top red triangle**, select **Smoothing Model** and choose an appropriate method from the list (Winters Method, in this example).
6. In the resulting dialog window, click **Estimate**.

   JMP displays the Model Summary, Parameter Estimates and a Forecast plot that shows the fit and forecasts from the model.
7. To estimate an alternative smoothing model, click on the **red triangle**, and choose another method (Seasonal Exponential Smoothing in this example).
8. Click **Estimate**.

   JMP provides a **Model Comparison** report, (shown below) that compares the two methods. Click and drag the slider bar at the bottom of the report to see all of the statistics.

   In this example, the Winters Method fits the data better than the Seasonal Exponential Smoothing model (according to criterion such as AIC and SBC).





Tips:

- The default number of forecast periods is 25. To change, enter a different value in the **Time Series** launch dialog window**.**
- To save the forecast, select **Save Columns** or **Save Prediction Formula** under the red triangle for that model. A new table with the actual and predicted values will be generated.

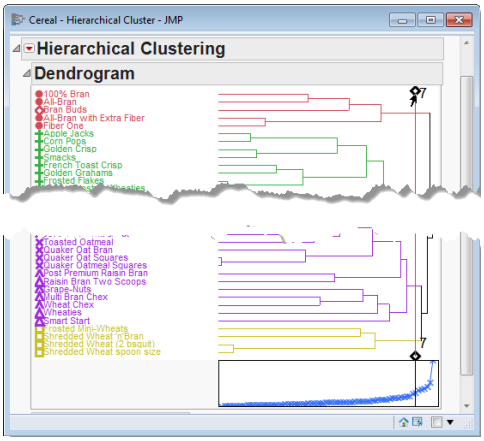
Note: For more information on time series and smoothing models, search for "smoothing models" in the JMP Help or in the book ***Specialized Models*** (under **Help > Books**).

Clustering

Use clustering to automatically group rows having similar characteristics.

Hierarchical Clustering

Example: Cereal.jmp (Help > Sample Data)



1. From an open JMP® data table, select **Analyze > Multivariate Methods > Cluster.**
2. Select one or more variables from **Select Columns** and click **Y, Columns**.
3. If available, select a **Label** variable.
4. Select the desired **method** (bottom left corner) and click **OK**.

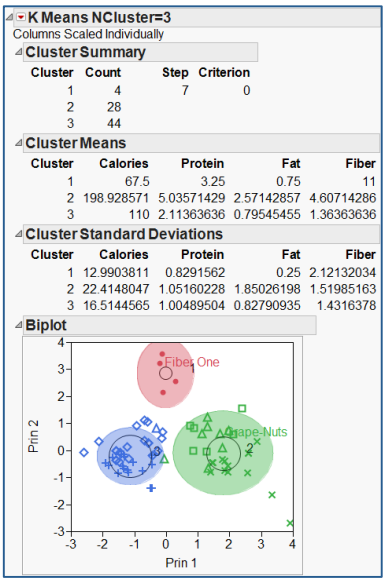
   JMP will generate:

   - A **dendrogram**, showing the clusters formed at each step.
   - A **scree plot**, showing the distance bridged each step.
   - The **clustering history**, giving cluster statistics for each step.

Tips:

- To **color clusters**, to **mark or save clusters**, or to **request other options**, click the **top red triangle**.
- To dynamically change the number of clusters, click and drag one of the **black diamonds** left or right.

K-Means Clustering



1. From an open table, select **Analyze > Multivariate Methods > Cluster.**
2. Select one or more continuous variables from **Select Columns** and click **Y, Columns** (continuous variables have blue triangles).
3. Under **Options**, change Hierarchical to **KMeans**, and click **OK**.
4. In the resulting **Control Panel**, enter the number of clusters and click **Go**.

   JMP will generate:

   - A **summary** of the cluster sizes.
   - Tables of **cluster means** and **standard deviations** for each variable.

Tips:

- To obtain biplots, parallel plots or request other options, click the **red triangle** for the **K Means** heading.
- To perform analyses for a range of cluster sizes: In the **Control Panel**, enter the lower limit in **number of clusters** and the upper limit in **range of clusters**, then click **Go**.
- To step through the formation of the clusters: In the **Control Panel**, check **Single Step** then click **Go**.
- To locate potential multivariate outliers, select **Declutter** in the Control Panel.

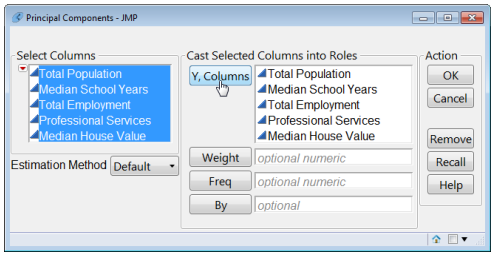
Note: For more information on Declutter and additional discussion of these and other clustering methods, search for "cluster" in the JMP Help or see the book ***Multivariate Methods*** (under **Help > Books**).

Principal Component Analysis

Use principal components analysis (PCA) to reduce the dimensionality of a data set.

Principal Components

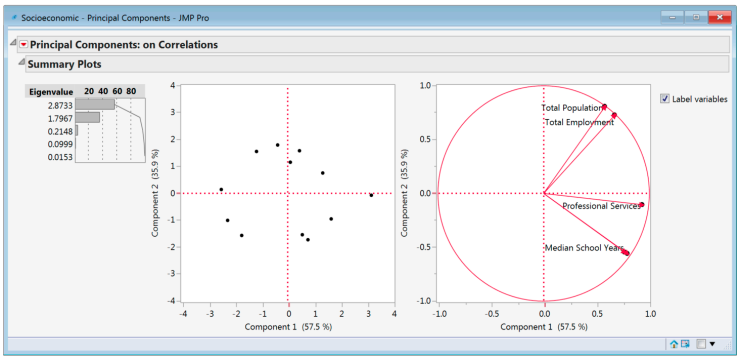
Example: Socioeconomic.jmp (Help > Sample Data)



1. Select **Analyze > Multivariate Methods > Principal Components**.
2. Select continuous variables from **Select Columns**, and Click **Y, Columns** (continuous variables have blue triangles).
3. Click **OK.**

   By default, JMP® displays the eigenvalues and three **Summary Plots** (below, from left to right).

   - **Eigenvalue Pareto Plot**: The percent and cumulative total percent of the variation accounted for by each principal component.
   - **Score Plot** (middle): A scatterplot of the first two principal components.
   - **Loading Plot**: Correlations between the original variables and the first two principal components. (Note: The factor loadings are unrotated.)

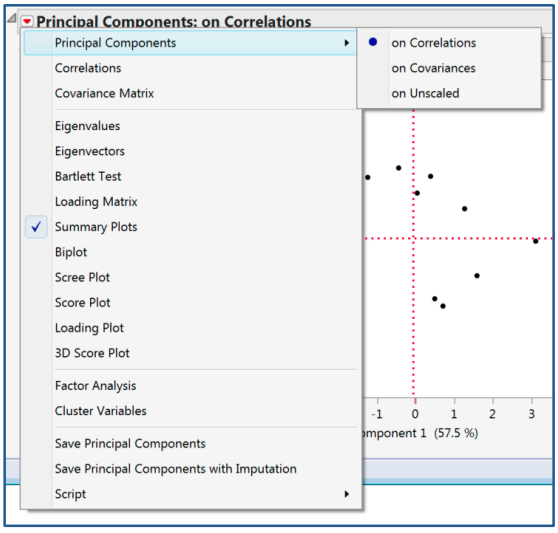


Interpretation:

- The first two principal components account for 93.4% (57.5 + 35.9 = 93.4) of the total variation in the data (see the Pareto Plot). These numbers are displayed on the graph axes of the Score Plot and Loading Plot.
- All of the original variables are positively correlated with the first principal component (see the Loading Plot). Total Population and Total Employment are positively correlated with the second principal component, while the other variables are negatively correlated with the second principal component.

Tips:

- By default, PCA is performed on correlations.
- Click on the **top red triangle** to change the method of calculation, view additional results, save the principal components to the data table, or view detailed information associated with the eigenvalues.
- Principal component analysis can also be accessed through the **Scatterplot 3D** platform or the **Multivariate** platform.

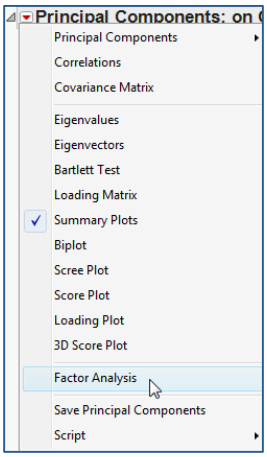


Note: For more information about principal components analysis, see "principal components" in the JMP Help or see the book ***Multivariate Methods*** (under **Help > Books**).

Factor Analysis

Use to describe the variability in observed variables in terms of a smaller number of unobserved variables or factors. In JMP®, Factor Analysis is accessed through the **Principal Components** platform.

Factor Analysis

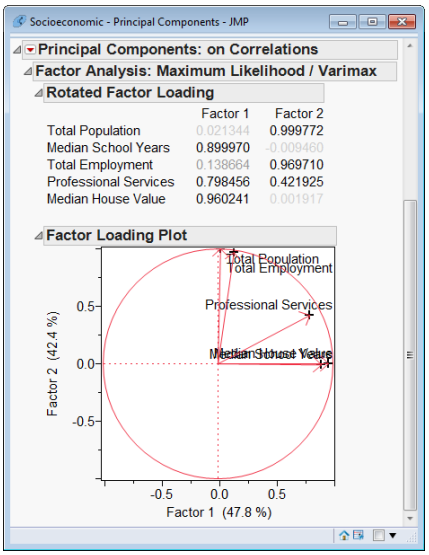


1. Select **Analyze > Multivariate Methods > Principal Components**.
2. Select continuous variables from **Select Columns**, and Click **Y, Columns** (continuous variables have blue triangles).
3. Click **OK.**
4. Click on the **top red triangle** and select **Factor Analysis**.
5. Accept the default selections (shown and described at the bottom) and click **OK.**

   JMP displays a number of statistical results, including a rotated factor loading report and plot:

   - **Rotated Factor Loading** table: The estimated loadings of the observed variables on the factors.
   - **Factor Loading Plot**: A graph of the original variables using the factor loadings, or correlations, as coordinates. Note: When extracting more than two factors, JMP will display a matrix of two-dimensional plots for all pairs of factors.
   - Click on the gray disclosure icon to display other reports.

Example: Socioeconomic.jmp (Help > Sample Data)

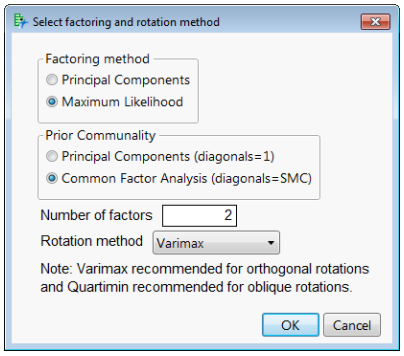


Interpretation of results:

- Factor 1 seems to be related to socioeconomic status, as Median House Value and Median School Years have large loadings on the factor.
- Factor 2 seems related to the labor force condition, as Total Population and Total Employment load highly on this factor.
- Professional Services loads on both factors.
- Factor 1 and Factor 2 account for 47.8% and 42.4% of the total sample variation, respectively.

Tips:

- The default factoring method is **Maximum Likelihood**, the number of **factors to extract** is 2, and the rotation method is **Varimax**. These options can be changed in the Factor Analysis selection window (shown right).
- The other statistical reports provided include **Final Communality Estimates, Std Score Coefs** and **Significance Tests** (for Maximum Likelihood method only).
- To save the factor scores as new columns to the data table, click on the **red triangle** and select **Save Rotated Components**.



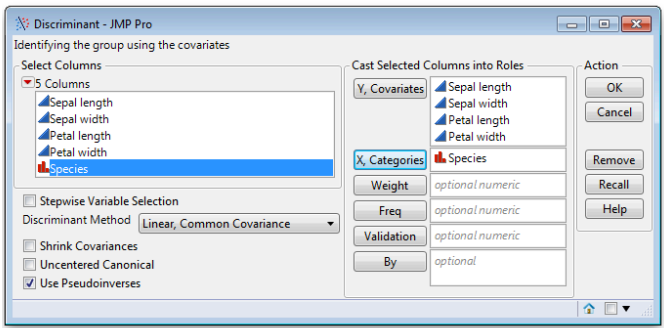
Note: For more information, search for "factor analysis" in the JMP Help or see the book ***Multivariate Methods*** (under **Help > Books**).

Discriminant Analysis

Discriminant analysis seeks to predict a categorical variable based on continuous covariates.

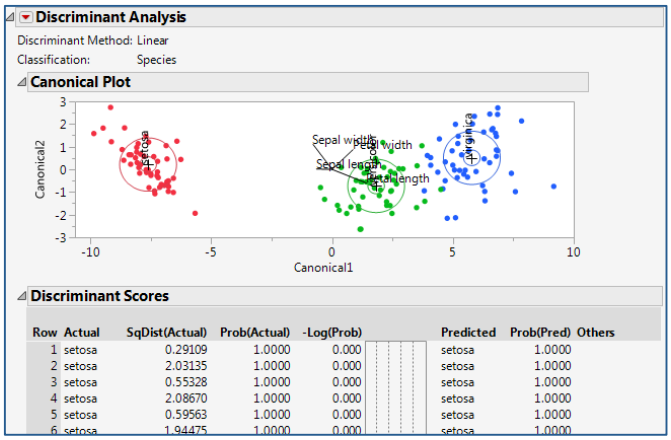
Discriminant Analysis

Example: Iris.jmp (Help > Sample Data)



1. Select **Analyze > Multivariate Methods > Discriminant**.
2. Select one or more continuous variables from **Select Columns**, and click **Y, Covariates** (continuous variables have blue triangles).
3. Click on a categorical variable from **Select Columns**, and click **X, Categories** (nominal variables have red bars, ordinal variables have green bars).
4. Click **OK.**

   By default, JMP® displays the **Canonical Plot** and **Discriminant Scores**.

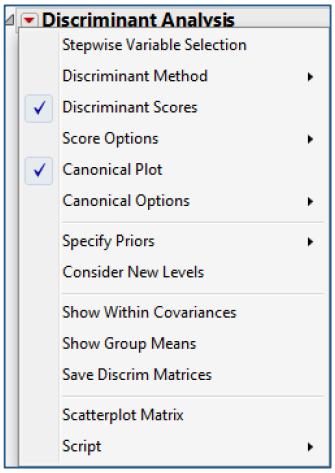


   - The **Canonical Plot** shows the points and multivariate least-squares means on the first two canonical variables that best separate the groups.
   - The **Biplot Rays** on the Canonical Plot indicate the directions of the predictors in the canonical space.
   - The **Discriminant Scores** report shows the number and percent of misclassified cases. It also gives information on the actual versus predicted values for each row.
   - At the bottom of the Discriminant Scores panel is a **Counts** table that tabulates the number of correctly and incorrectly classified cases.

Actual Species	Predicted setosa	versicolor	virginica
setosa	50	0	0
versicolor	0	48	2
virginica	0	1	49

Tips:

- JMP provides **Stepwise Variable Selection** and three **Discriminant Methods** (**Linear**, **Quadratic** and **Regularized**).
- Click on the **red triangle** to select Stepwise Variable Selection, change the discriminant method, show canonical details, specify prior probabilities, save results, customize plots or select other options.



Notes: For more details on discriminant analysis, search for “discriminant analysis” in the JMP Help or see the book ***Multivariate Methods*** (under **Help > Books**).

Mixed Model Analysis

This page provides information on the analysis of linear mixed models (linear regression models with at least one factor specified as a random variable). A factor is considered random if the levels are randomly selected from a large population. The example below is an unbalanced design involving six people chosen at random to take measurements on three different machines.

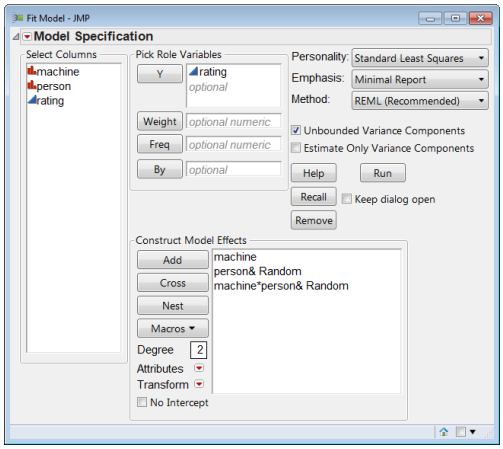
Analysis of Linear Mixed Models

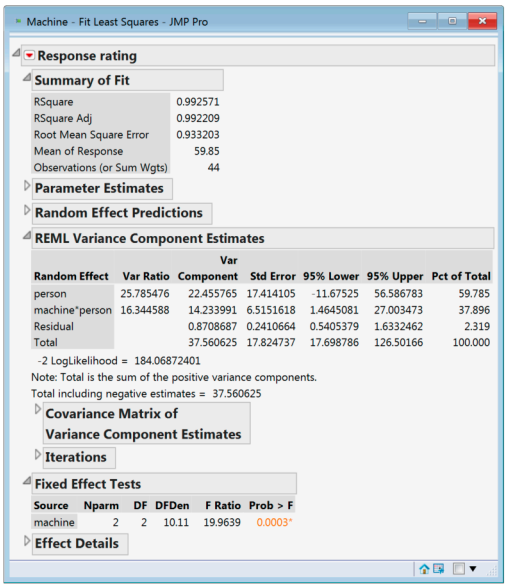
1. From an open JMP® data table, select **Analyze > Fit Model**.
2. Add the response: From **Select Columns**, select a continuous variable (continuous variables have blue triangles), and click **Y**.
3. Add model effects: Select variables and click **Add** (under **Construct Model Effects**). To specify an interaction term, select multiple columns, then click **Cross**.
4. Specify random effect(s): Select a model effect, then select **Random** from the **red triangle** next to **Attribute**. Here, "person" is specified as a random effect. So, the "person*machine" interaction is also a random effect.
5. Accept the defaults (the **REML Method** with **Unbounded Variance Components** selected), and click **Run**.

   By default, JMP will display the **Summary of Fit** table**, REML Variance Components Estimates**, **Fixed Effect Tests** and more.

   Additional options are available under the **top red triangle**.

Example: Machine.jmp (Help > Sample Data)





Interpretation:

1. Variance Components Estimates: The total estimated variance is 37.56, which can be decomposed into three sources: person (22.46, or 59.8%), person*machine (14.23, or 37.9%) and residual (0.87, or 2.3%).
2. Fixed Effect Tests: The p-value for the fixed effect (machine) is 0.0003. Kenward-Roger F tests are used.

Tips:

- **REML** (restricted maximum likelihood) is the preferred estimation method over **EMS** (Method of Moments). REML estimates are properly shrunk and the standard errors are properly scaled.
- **Unbounded Variance Components** is the default method for estimating the variance components. Unchecking this box will restrict the variance estimates to be non-negative.
- Check the **Estimate Only Variance Components** box to estimate only the variance components.
- JMP assumes a simple correlation matrix with **compound symmetry** (i.e., correlation is constant).

Notes: For information on repeated measures analysis, refer to the **Repeated Measures** one-page guides at jmp.com/learn. For additional details, search for "REML" in the JMP Help or in the book ***Fitting Linear Models*** (under **Help > Books**).

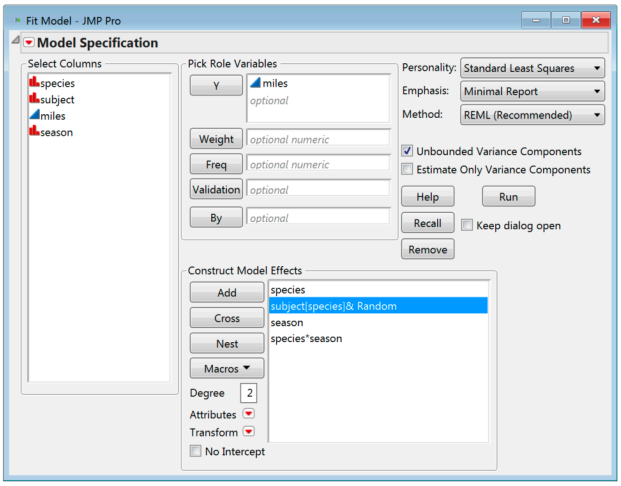
Repeated Measures Analysis (Mixed Model)

This page provides information on the analysis of repeated measures data using mixed models. The term of *repeated measures* refers to data with multiple measurements taken on the same subjects, often taken over a period of time.

The example below involves six animal subjects randomly selected from two species. The miles traveled by each animal were measured over time. Since this data is in a tall format (stacked), a mixed model analysis is used.

Analysis of Repeated Measures: Mixed Model

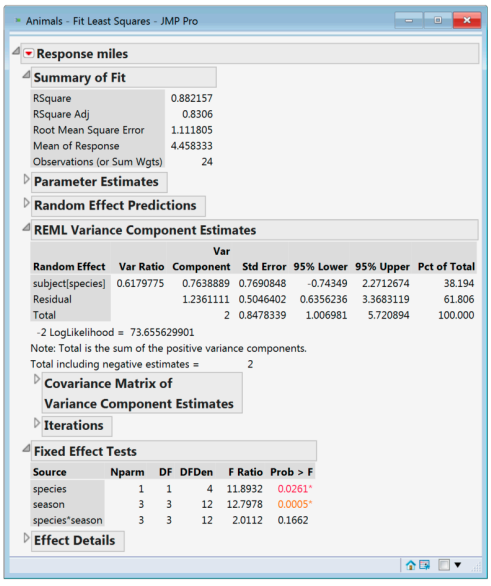
Example: Animals.jmp (Help > Sample Data)



1. From an open JMP® data table, select **Analyze > Fit Model**.
2. Add the response: From **Select Columns**, select a continuous variable (continuous variables have blue triangles), and click **Y**.
3. Add model effects: Select variables and click **Add** (under **Construct Model Effects**). To specify an interaction term, select multiple columns, then click **Cross**.
4. Specify the nesting structure: Here, subject is nested within species. Select subject from **Construct Model Effects**, select species from **Select Columns**, and click **Nest**. (If the subject ID is uniquely valued, skip this step.)
5. Specify random effect(s): Select a model effect, then select **Random** from the **red triangle** next to **Attributes**. Here, "subject[species]" is specified as a random effect.
6. Accept the defaults (the **REML Method** with **Unbounded Variance Components** selected), and click **Run**.

   By default, JMP will display the **Summary of Fit** table**, REML Variance Components Estimates**, **Fixed Effect Tests** and more.

   Additional options are available under the **top red triangle**.



Interpretation:

1. Variance Components Estimates: Show the estimated variances for random effects and the residual error. In this example, the estimated variation between animals is 0.76, or 38% of the total variation.
2. Fixed Effect Tests: Show the F-test results for the fixed effects using the appropriate variance component estimate as an error term in the denominator. Here, species and season are both significant at alpha = 0.05, while the interaction is not.

Notes: For more information on mixed model analysis, refer to the **Mixed Model Analysis** one-page guide at jmp.com/learn. **MANOVA** is used for data in a "wide" (split) format. For additional details on repeated measures analysis, search for "REML" or "MANOVA" in the JMP Help or in the book ***Fitting Linear Models*** (under **Help > Books**).

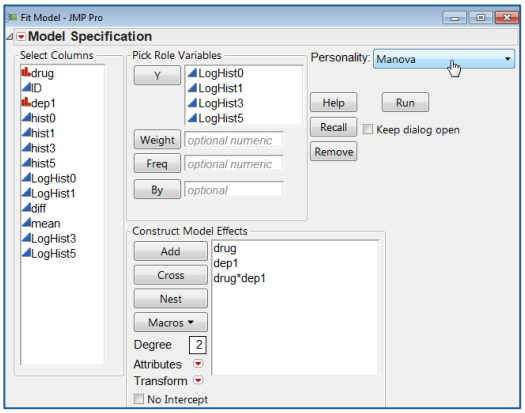
Analysis of Repeated Measures (MANOVA)

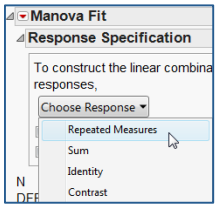
This page provides information on the analysis of repeated measures data using MANOVA (multivariate analysis of variance). MANOVA tests between and within subject effects across repeated measurements.

The example below involves 16 dogs assigned to different treatment groups. Blood concentration of histamine is measured at four points in time. The data is arranged in a wide format (log histamine measures are in separate columns), so a MANOVA analysis is used.

Example: Dogs.jmp (Help > Sample Data)

Analysis of Repeated Measures: MANOVA





1. From an open JMP data table, select **Analyze > Fit Model**. Select **Manova** from the **Personality** drop-down menu.
2. Add the responses: From **Select Columns**, select the continuous response variables (continuous variables have blue triangles), and click **Y**.
3. Add model effects: Select variables and click **Add** (under **Construct Model Effects**). To specify an interaction term, select multiple columns, then click **Cross**.
4. Click **Run**.
5. In the resulting fit window, select **Repeated Measures** from the **Choose Response** drop-down menu.
6. Accept the defaults, then click **OK**.

By default, JMP will display the **Parameter Estimates**, **Least Squares Means**, **Between Subjects** and **Within Subjects** results and more. Additional options are available under the **red triangles.**

- **Within Subjects** results include the multivariate significance tests for the differences over time for both the whole model and each effect.
- **Between Subjects** results include the multivariate significance tests for the differences in the repeated measures across subjects for both the whole model and each effect**.**

Within Subjects

Contrast

M Matrix

M-transformed Parameter Estimates

All Within Interactions

Test	Value	Approx. F	NumDF	DenDF	Prob>F
Wilks' Lambda	0.0198871	9.8056	9	22.054	<.0001*
Pillai's Trace	1.7570944	5.1836	9	33	0.0002*
Hotelling-Lawley	13.863757	13.0935	9	11.333	<.0001*
Roy's Max Root	11.007649	40.3614	3	11	<.0001*

Time

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	8.0108714	24.0326	3	9	0.0001*

Time*drug

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	1.9277447	5.7832	3	9	0.0175*

Time*dep1

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	7.1037357	21.3112	3	9	0.0002*

Time*drug*dep1

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	4.1591573	12.4775	3	9	0.0015*

Between Subjects

Sum

M Matrix

M-transformed Parameter Estimates

All Between

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	1.1101495	4.0705	3	11	0.0359*

Intercept

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	9.7533317	107.2866	1	11	<.0001*

drug

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.246166	2.7078	1	11	0.1281

dep1

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.634514	6.9797	1	11	0.0229*

drug*dep1

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.1926688	2.1194	1	11	0.1734

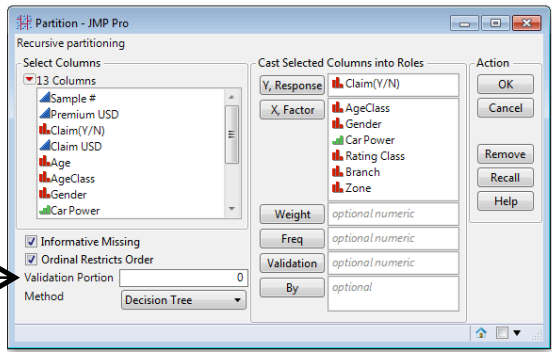
Notes: Mixed models are used for data in a "tall" (stacked) format. For information on mixed model analysis, refer to the **Mixed Model** pages at jmp.com/learn. For additional details, search for "MANOVA" in the JMP Help or in the book, ***Fitting Linear Models*** (under **Help > Books**).

Classification Trees (Partition)

Use this data mining technique to predict a categorical (nominal or ordinal) response as a function of potential predictor variables using recursive partitioning.

Classification Trees

Example: Auto Raw Data.jmp (Help > Sample Data)



1. From an open table, select **Analyze > Modeling > Partition.**
2. Select a nominal or ordinal response variable from **Select Columns** and click **Y, Response**.
3. Select explanatory variables and click **X, Factor**.
4. If desired, enter the **Validation Portion** (a proportion, as shown) or select a validation column and click **Validation** (**JMP® Pro only**).
5. In **JMP Pro only**, select the tree **Method**: **Decision Tree** (Default in JMP, shown), **Bootstrap Forest**, **Boosted Tree**, or **K Nearest Neighbors**
6. Click **OK.** JMP displays:
   - A graph, with horizontal lines drawn at the proportion of observations in each response level.
   - Statistics for the training and validation set(s). Note that results will vary if **Validation Portion** is used.
   - A summary of **All Rows**. Click on the **gray triangle** next to **Candidates** to view split statistics for each column.
7. Click the **Split** button. The original observations will be split into two nodes, or leaves (as shown).

Note: Click on the **top red triangle** and select **Display Options > Show Split Prob** to show **Rates** (proportion of observations) and **Probs** (predicted probabilities) for the response levels in each leaf.

Interpretation (the response, in this example, is Claim (Y/N)):

- There are 1,165 rows in the left leaf, corresponding to AgeClass(Young). The response rate (predicted probability) for Claim(Y/N) = Y is 0.361.
- There are 12,840 rows in the right leaf, corresponding to AgeClass(Elder). The response rate (predicted probability) for Claim(Y/N) = Y is 0.097.

8. Click **Split** to make an additional split. Click **Prune** to remove a split. If a validation portion or validation column is used, click **Go** to perform automatic splitting.

Notes:

For additional options, such as **Column Contributions**, **ROC** and **Lift Curves**, click the **top red triangle**. Other options, such as **Save Prediction Formula** and **Make SAS® DATA Step**, are available from the **top red triangle > Save Columns**. For split options for a particular node, click on the **red triangle for that node**.

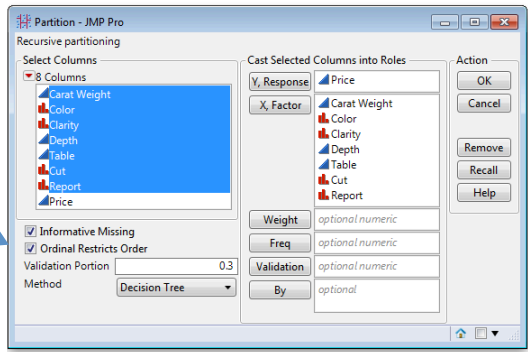
For more information on fitting and evaluating classification trees, including **Validation**, **Bootstrap Forest** and **Boosted Trees**, search for "partition trees" in the JMP Help or in the ***Specialized Models*** book (under **Help > Books**).

Regression Trees (Partition)

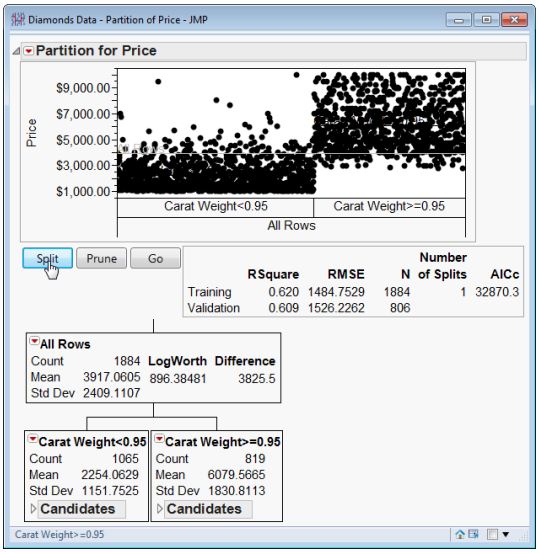
Use this data mining technique to predict a numeric (continuous) response as a function of potential predictor variables using recursive partitioning.

Regression Trees

Example: Diamonds Data.jmp (Help > Sample Data)



1. From an open table, select **Analyze > Modeling > Partition.**
2. Select a continuous response variable from **Select Columns** and click **Y, Response**.
3. Select explanatory variables and click **X, Factor**.
4. If desired, enter the **Validation Portion** (a proportion, as shown) or select a validation column and click **Validation** (**JMP® Pro only**).
5. In **JMP Pro only**, select the tree **Method**: **Decision Tree**, **Bootstrap Forest**, **Boosted Tree** or **K Nearest Neighbors**
6. Click **OK.** JMP displays:
   - A graph with lines drawn at the overall mean response value.
   - Statistics for the training and validation set(s). Note that results will vary if Validation Portion is used.
   - A summary of **All Rows**. Click on the **gray triangle** next to **Candidates** to view split statistics for each column.
7. Click the **Split** button. The original observations will be split into two nodes, or leaves (as shown).



Note: In the graph, horizontal lines are drawn at the mean response within each leaf and vertical lines depict the leaf's relative size.

> Interpretation (the response, in this example, is Diamond Price in $):
>
> - In the left leaf there are 1,065 rows with Carat Weight < 0.95. The mean cost of these diamonds is $2,254.06.
> - In the right leaf there are 819 rows with Carat Weight >= 0.95. The mean cost of these diamonds is $6,079.57.

8. Click **Split** to make an additional split. Click **Prune** to remove a split. If a validation portion or validation column are used, click **Go** to perform automatic splitting.

Notes:

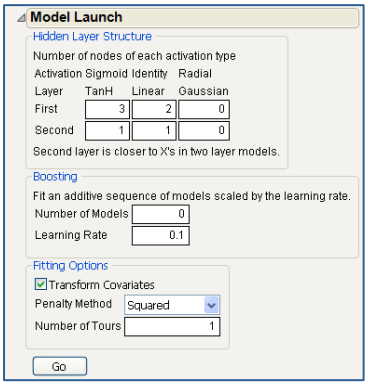
For additional options, such as **Leaf Report**, **Small Tree View**, **Column Contributions**, click the **top red triangle**. Other options, such as **Save Prediction formula** and **Make SAS® DATA Step**, are available from the **top red triangle > Save Columns**. For split options for a particular node, click on the **red triangle for that node**.

For more information on fitting and evaluating regression trees, including **Validation**, **Bootstrap Forest** and **Boosted Trees**, search for "partition trees" in the JMP Help or in the ***Specialized Models*** book (under **Help > Books**).

Neural Networks

Use to create neural networks: flexible models based on a layering of S-shaped and linear functions.

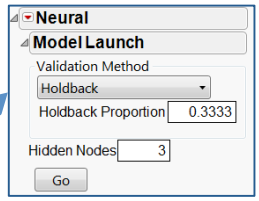
Neural Networks



1. From an open table, select **Analyze > Modeling > Neural.**
2. Select a response variable from **Select Columns** and click **Y, Response**.
3. Select explanatory variable(s) from **Select Columns** and click **X, Factor**.
4. Select the validation column and click Validation (**JMP® Pro only**).
5. In the resulting Model Launch window:

   In JMP Pro:

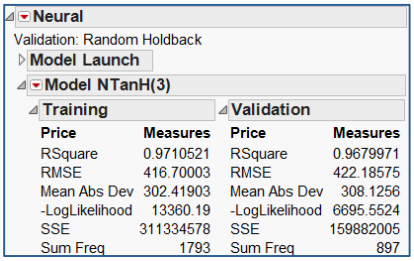
   - Specify the **hidden layer structure** by entering the number of TanH, Linear and Gaussian functions to use in each layer.
   - If using **boosting**, specify the number of models and the learning rate.
   - Select the desired **fitting options**, and click **Go.**



   In JMP:

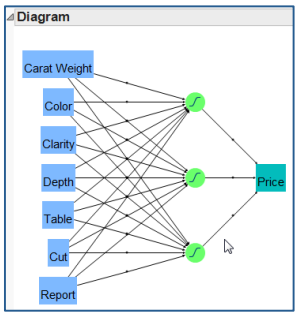
   - Select the **validation** method (Excluded Rows Holdback, Holdback, KFold).
   - Specify the **Holdback Proportion** or the number of **Folds**.
   - Specify the number of **Hidden Nodes**, and click **Go.**

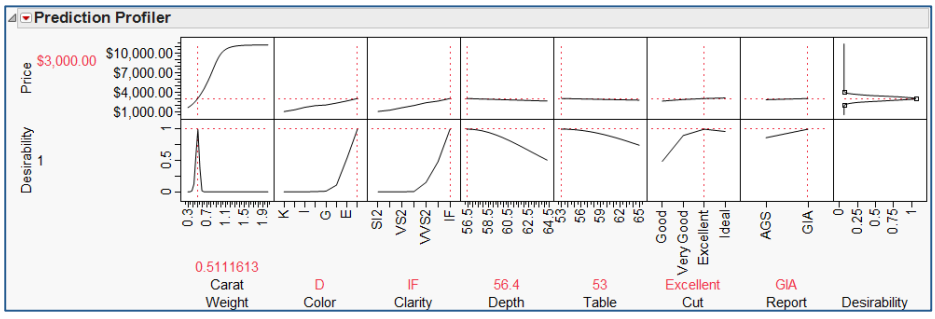
   JMP and JMP Pro will generate fit statistics for both the training and validation data. For categorical responses, a **Confusion matrix** and **Confusion Rates matrix** are also generated.



Tips:

- To view estimates, diagrams (below, left) and interactive profilers, click the **red triangle** for the model. The **Profiler** (below, right) is particularly useful for visualizing models.
- Options such as **Save Formulas** and **Make SAS® DATA Step** are also available from the model red triangle.
- To view a saved formula: In the **column panel** of the data table, click the **gray triangle** to reveal the **hidden layers**. Then, click the **plus sign** next to the name of the desired hidden layer (below, right).





Note: For more information on fitting and evaluating neural networks, search for "neural networks" in the JMP Help or in the ***Specialized Models*** book (under **Help > Books**).

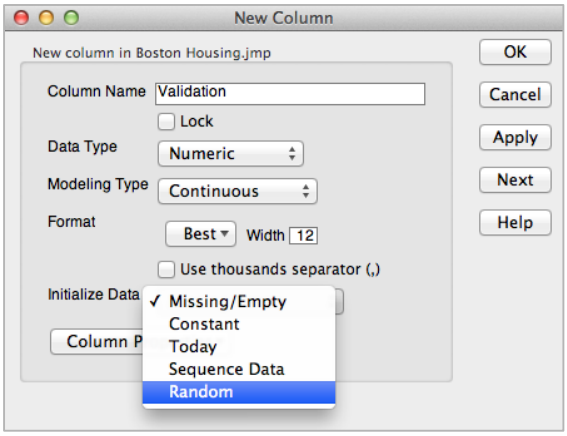
Creating a Validation Column (Holdout Sample)

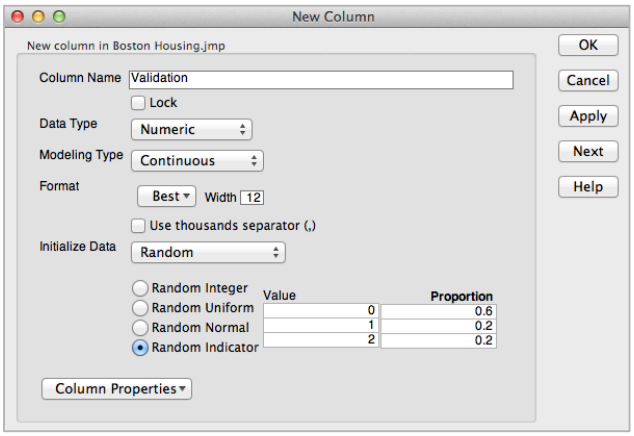
This page describes how to create a validation column in JMP®. Validation, or out-of-sample cross-validation, is used to assess the predictive ability of a model. Different methods for model validation are available in JMP. In **JMP Pro**, a validation column (example at right) can be used for automated model cross-validation in many modeling platforms.

Validation
Test
Test
Train
Test
Train
Test
Train
Validate
Train
Train
Validate
Train

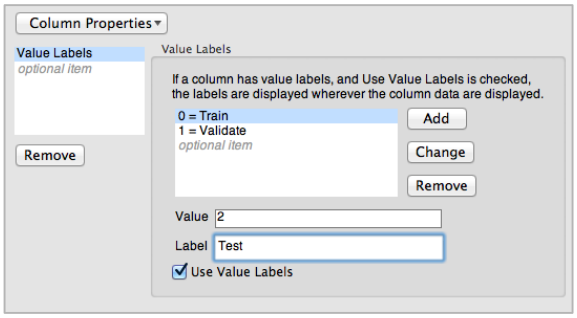
Creating a Validation Column (Train, Validate, Test)

1. From an open JMP data table, select **New Column** from the **Cols** menu.
2. In the resulting **New Column** window, change the **Column Name** to **Validation**.
3. Next to **Initialize Data**, click on the arrow and select **Random** (shown below, left).
4. Select **Random Indicator** (shown below, right). By default, the new column will contain 80% 0s, 20% 1s and 0% 2s.
    - The 0s will be used to train the model.
    - The 1s will be used to validate the model.
    - The 2s (if created) will be used to test the model.
5. Change the default proportions as desired. In the example (below, right), 60% of the data will be used to train (develop) the model, 20% will be used to validate the model, and the remaining 20% will be used to test the final selected model.





6. To display the labels Train, Validate and Test rather than 0, 1 and 2, apply **value labels** (as shown, right) by selecting **Value Labels** under **Column Properties.** Enter the values and the desired labels, then click **Add**.
7. Click **Apply** to view the new column in the data table (to verify that the column will be created as desired). Then click **OK** to create the column.



Notes: For information on validation options available in the different modeling platforms and model validation in JMP Pro, see the books ***Fitting Linear Models*** or ***Specialized Models*** (under **Help > Books**) or search for "validation" in the online documentation (jmp.com/support/help/).

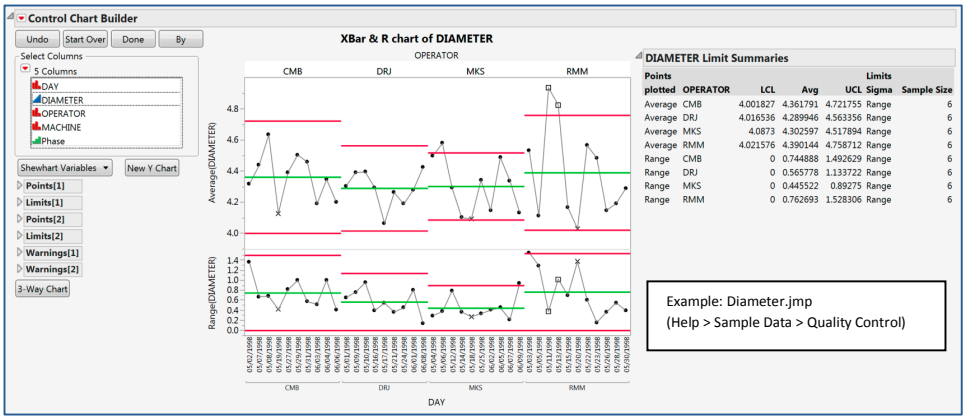
Variables Control Charts – XBar Charts

This page provides information on two methods for creating XBar (XBar R or XBar S) control charts – the Control Chart Builder and the Control Chart platform under **Analyze > Quality and Process**.

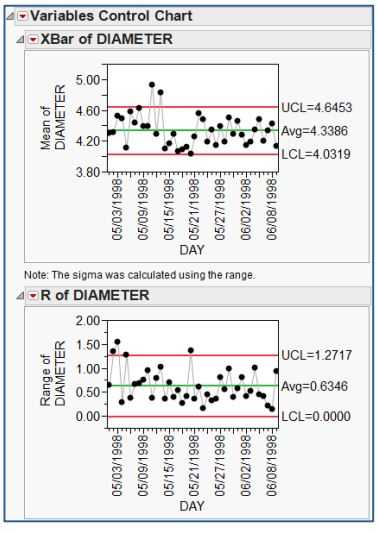
XBar Charts – Control Chart Builder

1. From an open JMP® data table, select **Analyze > Quality and Process > Control Chart Builder**.
2. Drag a continuous variable from **Select Columns** (continuous variables have blue triangles), and drop it in the **Y zone**.
3. Drag and drop a subgroup variable in the **Subgroup** zone (at the bottom).

   By default, JMP produces a control limit summaries table and two charts: **XBar** (subgroup average) and **Range** (subgroup range). Hint: **Right-click** on the bottom graph and select **Points > Statistic** to change from a Range chart, and use **Limits > Sigma** to change the method for estimating the standard deviation.
4. If available, drag and drop a variable in the **Phase zone** (top), and click the **Done** button when finished.



XBar Charts – Control Chart Platform



1. From an open JMP data table, select **Analyze > Quality and Process > Control Chart > XBar**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Select a **Sample Label**, and click **OK**. (Note: Additional dialog window options are available).

Notes:

Additional options, such as **tests** for special causes and **Capability** analysis, are available from the **red triangles** in the Control Chart platform. **Right-click** on the graph in the Control Chart Builder for many of these same options.

For information on capability analysis or producing other types of control charts, see the one-page guides at jmp.com/learn. For more details on creating XBar charts and using the Control Chart Builder, search for "control chart" in the JMP Help or see the book ***Quality and Process Methods*** (under **Help > Books**).

Variables Control Charts – I/MR Charts

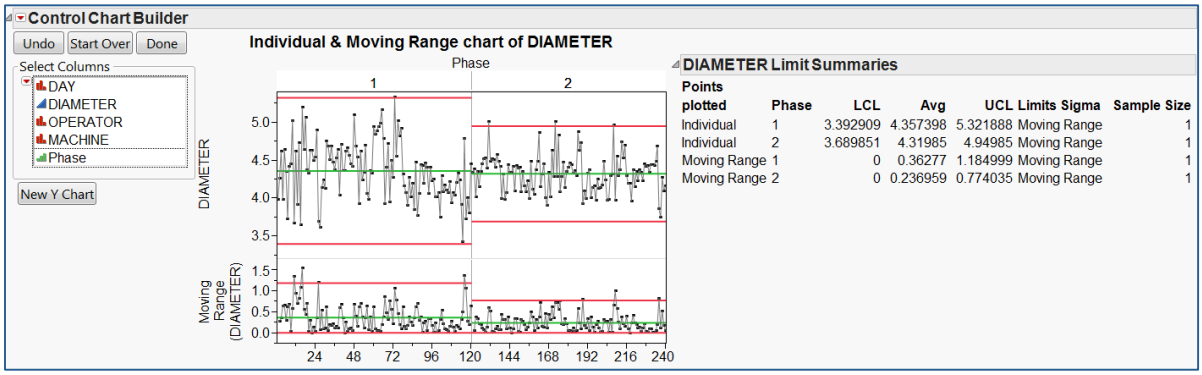
This page provides information on two methods for creating I/MR (Individuals and Moving Range) control charts – the Control Chart Builder and the Control Chart platform (both under **Analyze > Quality and Process**).

I/MR Charts – Control Chart Builder

1. From an open JMP® data table, select **Analyze > Quality and Process > Control Chart Builder**.
2. Drag a continuous variable from **Select Columns** (continuous variables have blue triangles), and drop it in the **Y zone**.

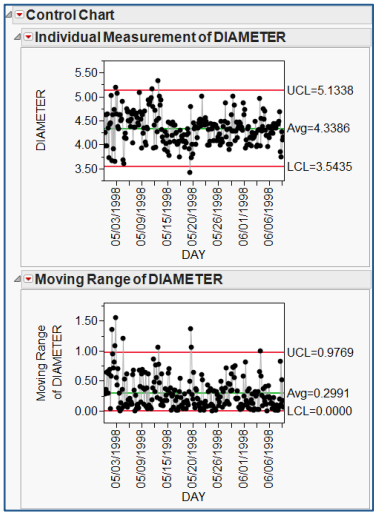
   By default, JMP produces a control limit summaries table and two charts: **Individuals** (Individual Measurements) and **Moving Range** (the moving range between each pair of consecutive points).

   Hint: Right-click on the graph and select **Limits > Sigma** to change the method for estimating the standard deviation.
3. If available, drag and drop a variable in the **Phase zone** (top), and click the **Done** button when finished.



Example: Quality Control/Diameter.jmp (Help > Sample Data)

I/MR Charts – Control Chart Platform



1. From an open JMP data table, select **Analyze > Quality and Process > Control Chart > IR**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Select a **Sample Label**, and click **OK**. (Note: Additional options are available).

Notes:

Additional options, such as **tests** for special causes and **Capability** analysis, are available from the **red triangles** in the Control Chart platform. **Right-click** on the graph in the **Control Chart Builder** for many of these same options.

For information on capability analysis or producing other types of control charts, see the one-page guides at jmp.com/learn. For more details on creating IR charts and using the Control Chart Builder, search for "control chart" in the JMP Help or see the book ***Quality and Process Methods*** (under **Help > Books**).

Attribute Control Charts – P and NP Charts

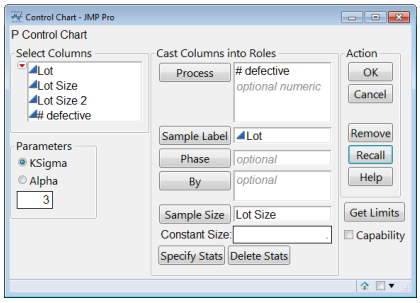
This page provides information on creating P and NP attribute control charts. P charts are used to plot the **proportion** on nonconforming (defective) items, while NP charts are used to plot the **number** of nonconforming items.

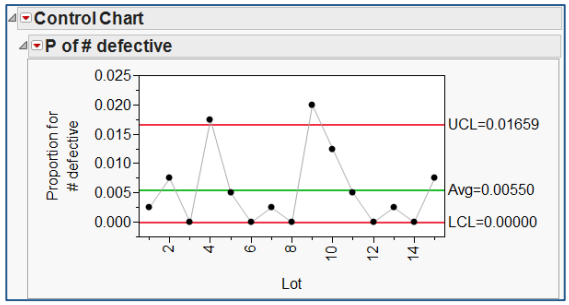
P Charts

1. From an open JMP® data table, select **Analyze > Quality and Process > Control Chart > P**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Select a **Sample Size** and a **Sample Label**, and click **OK**.

   In the example below, the proportion of defective washers per lot is plotted on a P chart. Note: If sample sizes are not constant, the control limits will vary.

Example: Washers.jmp
(Help > Sample Data)



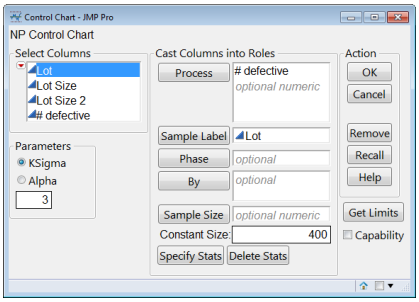


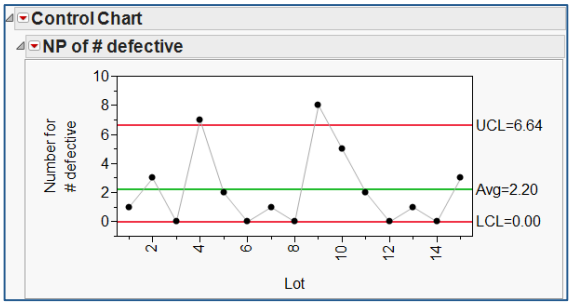
NP Charts

1. From an open JMP data table, select **Analyze > Quality and Process > Control Chart > NP**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Type a **Constant Size** (or select a constant **Sample Size** variable), select a **Sample Label**, and click **OK**.

   In the example below, the number of defective washers per lot is plotted on an NP Chart.

Example: Washers.jmp
(Help > Sample Data)





Tips:

- The process variable must be sorted in time order.
- Many options, such as **tests** for special causes and **capability** analysis, are available from the **red triangles**.

Notes: For information on capability analysis or producing other types of control charts, see the one-page guides at jmp.com/learn. For more details, search for "attribute control chart" in the JMP Help or see the book ***Quality and Process Methods*** (under **Help > Books**).

Attribute Control Charts – C and U Charts

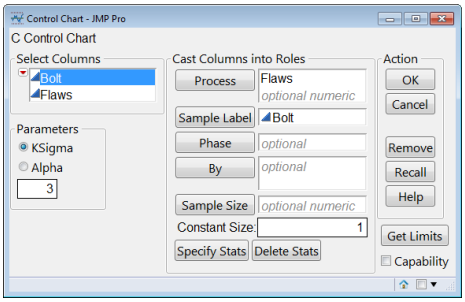
This page provides information on creating C and U attribute control charts. C charts are used to plot the number of nonconformities (or defects) in a sample, where the sample size is constant. U charts are used to plot the number of nonconformities per unit, where the sample size (or number of units) can vary.

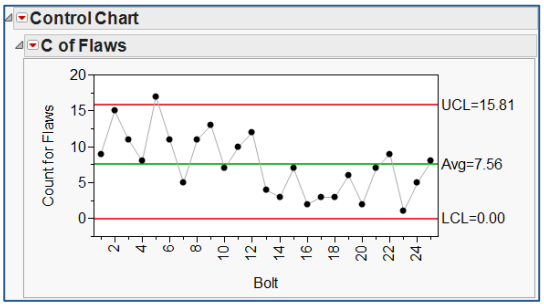
C Charts

1. From an open JMP® data table, select **Analyze > Quality and Process > Control Chart > C**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Type a **Constant Size** (or select a constant **Sample Size** variable), select a **Sample Label**, and click **OK**.

   In the example below, the number of Flaws per Bolt of fabric is plotted on a C chart.

Example: Fabric.jmp
(Help > Sample Data)



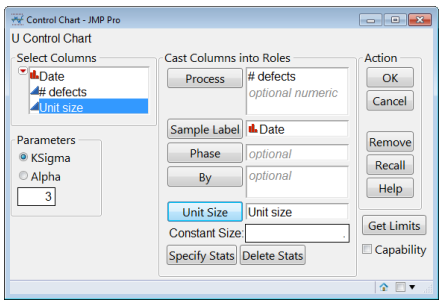


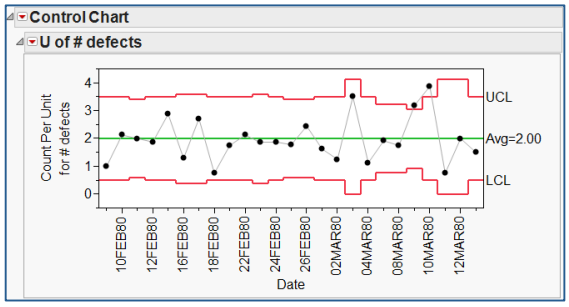
U Charts (or DPU Charts)

1. From an open JMP data table, select **Analyze > Quality and Process > Control Chart > U**.
2. Select one or more continuous variables from **Select Columns**, and click **Process**.
3. Select a **Unit Size** variable (the sample size), select a **Sample Label**, and click **OK**.

   In the example below, the number of defects (# defects) per unit inspected (Unit Size) is plotted on a U Chart. Hint: Since the Unit size is not constant, the control limits vary.

Example: Braces.jmp
(Help > Sample Data)





Tips:

- The process variable must be sorted in time order.
- Many options, such as **tests** for special causes and **capability** analysis, are available from the **red triangles**.

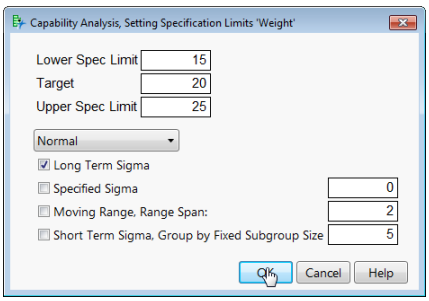
Notes: For information on capability analysis or producing other types of control charts, see the one-page guides at jmp.com/learn. For more details, search for "attribute control chart" in the JMP Help or see the book ***Quality and Process Methods*** (under **Help > Books**).

Capability Analysis

This page provides information on performing a capability analysis using the Distribution and Control Chart platforms. Capability analysis can also be performed in the **Capability** platform under **Analyze > Quality and Process**.

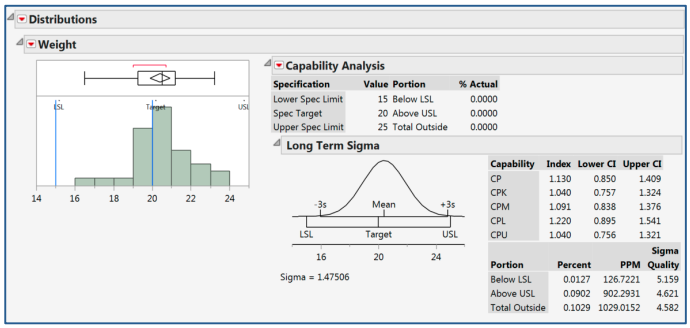
Example: Coating.jmp (Help > Sample Data > Quality Control)

Capability Analysis – Distribution Platform



1. From an open JMP® data table, select **Analyze > Distribution**.
2. Select one or more continuous variables from **Select Columns** (continuous variables have blue triangles), click **Y, Columns**, and click **OK** to generate a histogram and summary statistics.
3. From the **red triangle** for the variable, select **Capability Analysis**.
4. Enter the **spec limits** and **target**.

   Specify the distribution (if the underlying distribution is not normal), and select the estimate(s) to use for sigma. Note: If **moving range** and/or **fixed subgroup size** are selected, data must be sorted in time order.
5. Click **OK** to perform a capability analysis for each estimate of sigma selected.

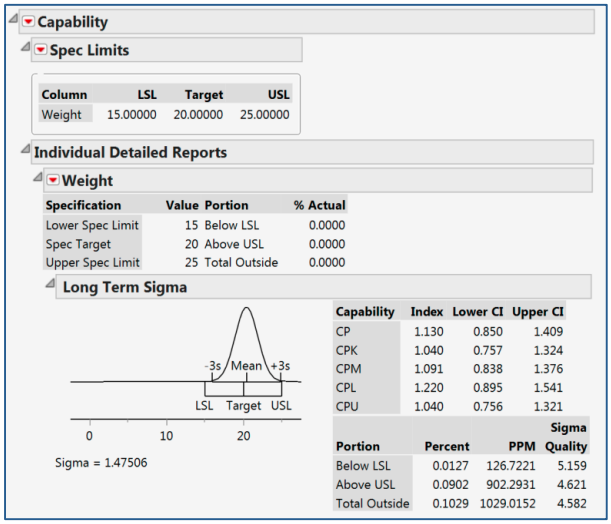


Capability Analysis – Capability Platform

1. Generate a control chart using **Analyze > Quality and Process > Capability**
2. Enter the **spec limits** and **target**, and click **OK**.

   By default, the following will be added to the output:

   - The observed (actual) capability.
   - Capability analyses based on the overall standard deviation (**Long Term Sigma**)



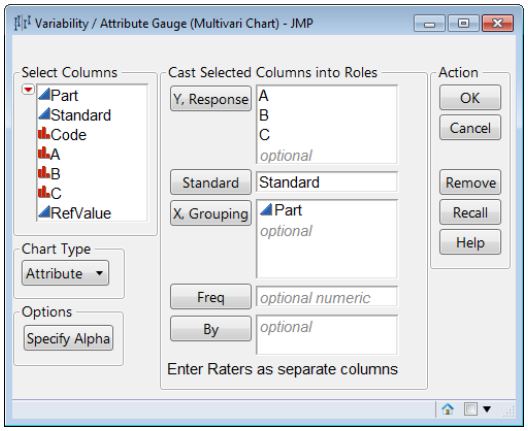
Notes: Long term (P_{pk}) capability labeling can be turned on using the JMP Preferences (under **Preferences > Platforms > Distribution**). For information on creating control charts, see the guides under **Quality, Reliability and DOE** at jmp.com/learn. For additional details, search "capability" in the JMP Help or see the book ***Quality and Process Methods*** (under **Help > Books**).

MSA Attribute Data

Attribute measurement systems produce categorical responses (ex: pass or fail, classification into multiple categories, and ordinal ratings). This page provides information on attribute measurement systems analysis (MSA), including **between** and **within rater** (or **appraiser**) **agreement** studies, and **standard** (or **expert**) **agreement** studies. For these studies, rater results are stored in separate columns.

Attribute Measurement Systems Analysis

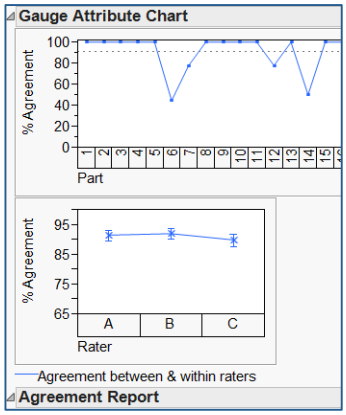
Example: Attribute Gauge.jmp (Help > Sample Data)

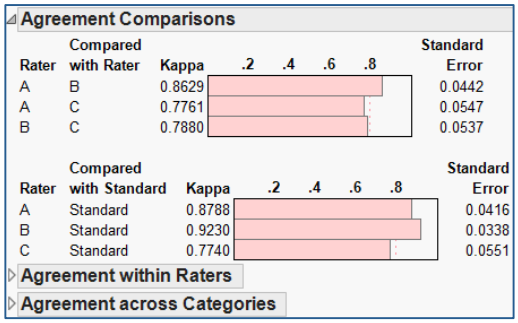


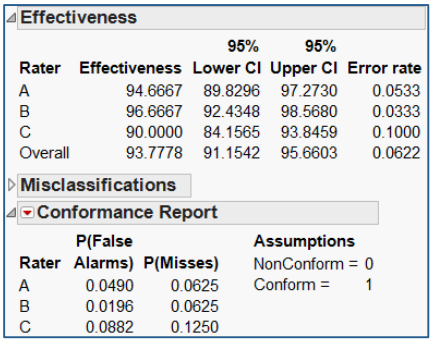
1. Select **Analyze > Quality and Process > Variability/Attribute Gauge Chart**.
2. Select categorical variables (usually raters) from **Select Columns**, and click **Y, Response** (categorical variables have red or green bars).
3. Select a grouping variable (often part), and click **X, Grouping**.
4. For an expert agreement study, select the standard (expert or reference) and click **Standard**.
5. Ensure **Attribute** is displayed under **Chart Type** (it will change by default) then click **OK.**

JMP displays a **Gauge Attribute Chart** and several reports to assess agreement:

- The **Gauge Attribute Chart** (bottom, left) displays the percent agreement within each part (top) and within each rater. Here we see that parts 6 and 14 were problematic for the raters (low agreement), and that raters A and B had slightly higher overall agreement than rater C. The **Agreement Report** (not shown) summarizes rater and overall agreement.
- The **Agreement Comparisons** report (bottom, middle) provides **Kappa** statistics for each pair of raters and for each rater against the standard. Kappa is a measure of non-chance agreement. Generally, Kappa values of 0.6 or higher indicate acceptable agreement.
- The **Effectiveness** report (bottom, right) summarizes rater agreement with the standard. It includes a **Misclassification Matrix** and a **Conformance Report**, which provides the probabilities of false alarms (Type I errors) and misses (Type II errors) for each rater.







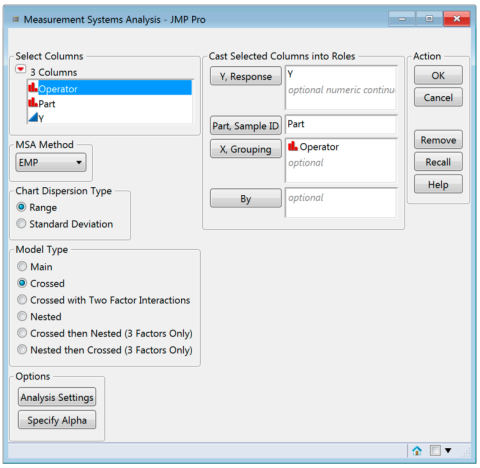
Notes: For more details, search for "Kappa" in the JMP Help, or refer to the "Variability Charts" chapter of the ***Quality and Process Methods*** book (under **Help > Books**).

MSA Continuous Data – EMP Method

This page provides information on the EMP (Evaluating the Measurement Process) MSA method, which is largely based on the methods presented in Donald J. Wheeler's book, *EMP III Using Imperfect Data* (2006). The results are visual and easily interpretable, offering an alternative to the traditional Gauge R&R approach.

Measurement Systems Analysis: EMP Method

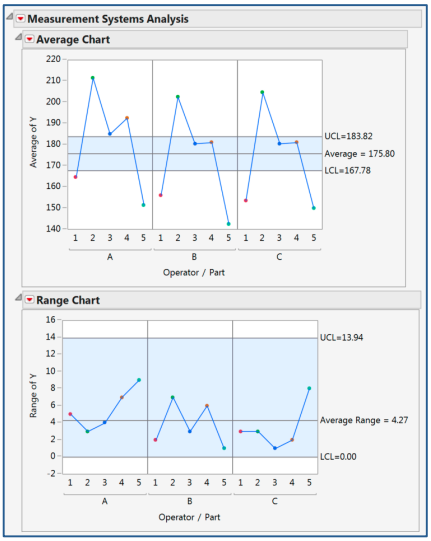
Example: Gasket.jmp (Help > Sample Data > Variability Data)



1. Select **Analyze > Quality and Process > Measurement Systems Analysis**.
2. Click on a continuous variable from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Select a part or sample variable and click **Part, Sample ID**.
4. Select one or more grouping variables and click **X, Grouping**.
5. Ensure that **EMP** is the **MSA Method**, and click **OK.**

   (Notes: If desired, change the **Chart Dispersion Type** to **Standard Deviation** to base analyses on variances instead of ranges, and change **Model Type** if required.)

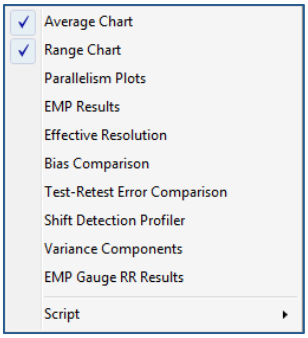
By default, JMP displays an **Average Chart** and a **Range Chart**:



- The **Average Chart** shows the average measurement for each combination of the part and the grouping variables. Out-of-control points are desirable, as they indicate the ability to detect part-to-part variation.
- The **Range Chart** shows the range for each combination of the part and the grouping variables. Having all points within the control limits is desirable, as this indicates similar measurement error across groups.

  (Note: A **Standard Deviation Chart** displays if the **Chart Dispersion Type** has been changed to **Standard Deviation**.)

Many additional options are available under the **top red triangle**:



- **Parallelism Plots**, for assessing interactions between the parts and the grouping variables.
- **EMP Results**, for evaluating and classifying the measurement system.
- **Effective Resolution**, for determining the resolution of the measurement system.
- **Bias Comparison** and **Test-Retest Error Comparison** plots, for assessing differences in grouping variable means and errors, respectively.
- **Shift Detection Profiler**, for dynamically exploring the probability of a warning.
- **Variance Components** and **EMP Gauge RR Results**, for quantifying sources of measurement system variation.

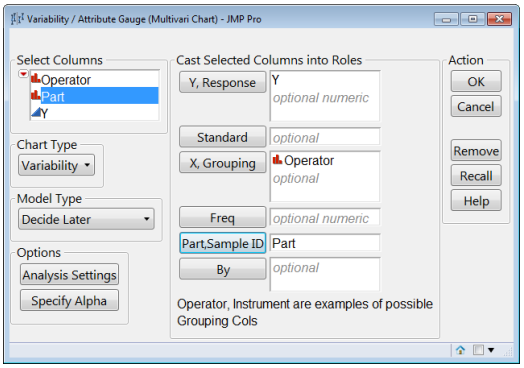
Notes: For more details, search for "EMP" in the JMP Help, or refer to the "Assess Measurement Systems" chapter of the ***Quality and Process Methods*** book (under **Help > Books**).

MSA Continuous Data – Gauge R&R

This page provides information on the creating a variability chart and performing a continuous gauge R&R (Repeatability and Reproducibility) measurement system analysis (MSA). For information on using the EMP (Evaluating the Measurement Process) method, see the page **MSA Continuous Data – EMP Method**.

Measurement Systems Analysis: Variability Chart

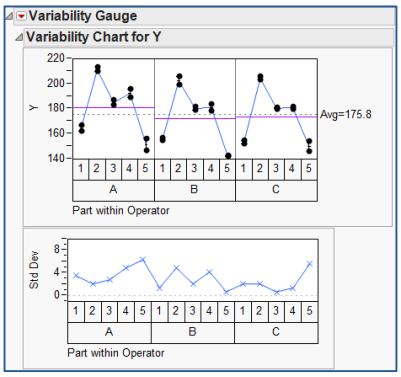
Example: Gasket.jmp (Help > Sample Data)



1. Select **Analyze > Quality and Process > Variability/Attribute Gauge Chart**.
2. Click on a continuous variables from **Select Columns**, and click **Y, Response** (continuous variables have blue triangles).
3. Select a part or sample variable and click **Part, Sample ID**.
4. Select one or more grouping variables and click **X, Grouping**.

   (Note: To conduct **Bias** and **Linearity** studies, select a standard or reference column and click **Standard**.)

By default, JMP displays two plots:

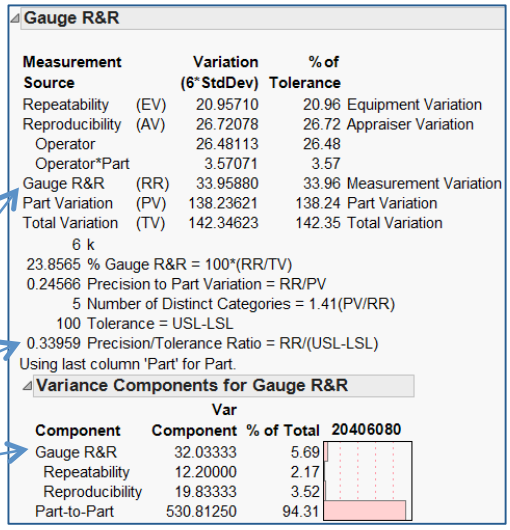


- The **Variability Chart for Y** shows the individual measurements and range bars for each combination of the part and the grouping variables. To better visualize sources of variation, select **Connect Cell Means**, **Show Group Means** and **Show Grand Mean** from the **top red triangle**.
- The standard deviations plot shows the standard deviation for each combination of the part and the grouping variables.

Performing a Gauge R&R:

1. Select **Gauge Studies > Gauge RR** from the **top red triangle**.
2. Under **Variability Model**, select the model type and click **OK** (the default is **Crossed**).
3. If specs are available, choose the tolerance entry method, enter either the **Tolerance Interval** or the **Spec Limits**, and click **OK**.

The resulting **Gauge R&R** and **Variance Components for Gauge R&R** reports quantify sources of measurement system variation.



Interpretation (for this example – USL–LSL = 100):

1. The **% Gauge R&R** is 33.96: Measurement system (Gauge Repeatability and Reproducibility) variation is 33.96% of the tolerance interval.
2. The **Precision/Tolerance Ratio** (or the **P/T Ratio**) is 0.3396.
3. **Variance Components for Gauge R&R**: The measurement system (Gauge R&R) accounts for 5.69% of the total variation in the study.

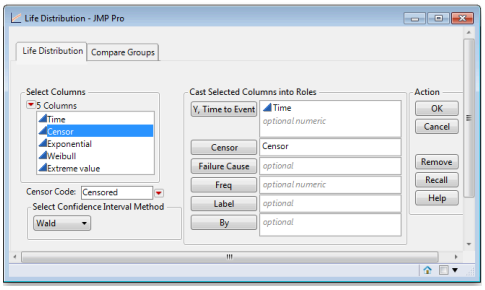
Notes: Additional options are available from the **top red triangle**. For more details, search for "gauge" or "variability charts" in the JMP Help or in the book ***Quality and Process Methods*** (under **Help > Books**).

Distribution Fitting (Life Distribution)

Use the Life Distribution platform to explore and fit distributions for time-to-event data.

Distribution Fitting (Life Distribution)

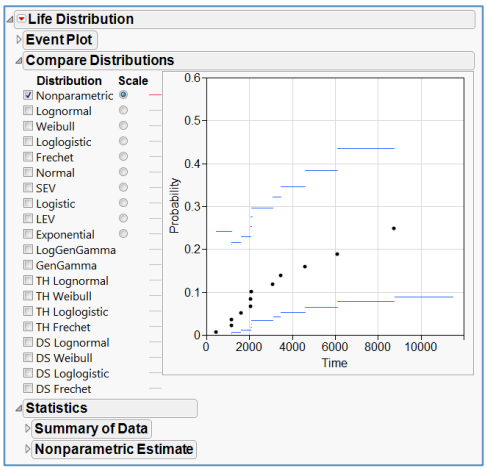
Example: Fan.jmp (Help > Sample Data, Reliability)



1. Select **Analyze > Reliability and Survival > Life Distribution.**
2. Select a continuous time variable from **Select Columns**, then click **Y, Time to Event** (continuous variables have blue triangles).
3. If the data contains censored values, select the censoring variable and click **Censor**. Change the **Censor Code** if needed (the default is 1).
4. Select the **Confidence Interval Method** (the default is Wald), and click **OK**.

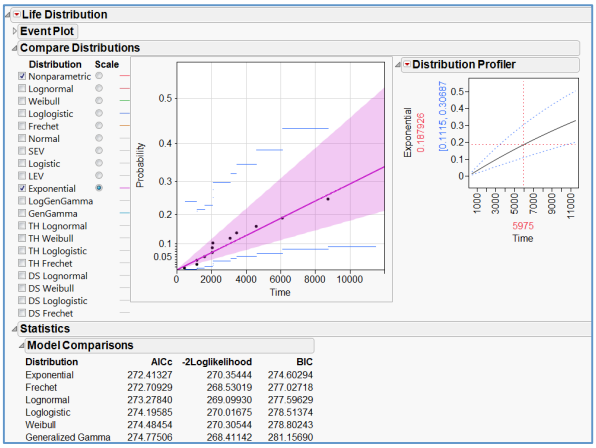
   JMP® will display:

   - An **Event Plot** (click on the gray icon to open), which graphically depicts failures (denoted by X's) and censored events (denoted by triangles).
   - The **Compare Distributions** panel, which allows you to compare the fit of various distributions.
   - The **Statistics** panel, with summary statistics, parameter estimates and profilers for each distribution selected.



To Compare Distributions:

- Click a radio button under **Scale** to apply the scale for a distribution. If the selected distribution fits the data well, the plotted points will approximate a straight line.
- Check a box under **Compare Distributions** to fit a distribution and display a **fitted line**, shaded **confidence bands** and a **Profiler** for the distribution.
- Select **Fit All Distribution** or **Fit All Non-negative** under the **top red triangle** to compare all distributions using model comparison criteria such as AIC and BIC.



Tips:

- To compare the same life distribution across groups, use the **Compare Groups** option in the Life Distribution dialog.
- Other options, such as show survival curve and view tabbed report are available from the **top red triangle**. Click on **red triangles** for **Parameter Estimates** to access other options for fitted distributions.
- If studying competing failure causes, enter the variable in the **Failure Cause** field in the launch window.
- Continuous distributions can also be fit in **Analyze > Distribution**.

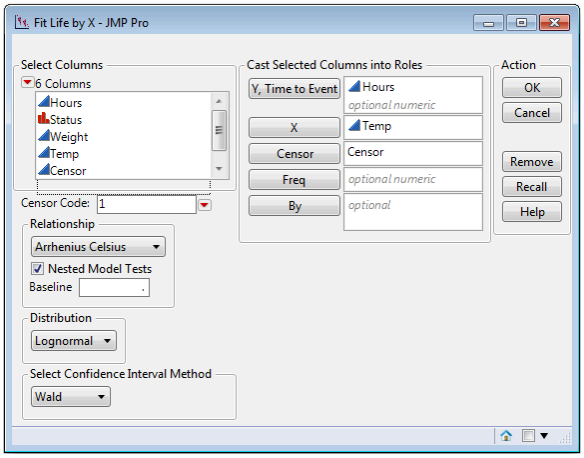
Note: For more information, search for "life distribution" in the JMP Help or see the "Lifetime Distribution" section of the book ***Reliability and Survival Methods*** (under **Help > Books**).

Accelerated Life Testing (Fit Life by X)

Use Fit Life by X for accelerated life-testing analysis. In particular, the platform can be used to model the relationship between the time to an event and a factor of interest.

Accelerated Testing (Fit Life by X)

Example: Reliability/Devalt.jmp (Help > Sample Data)



1. Select **Analyze > Reliability and Survival > Fit Life by X.**
2. Select a continuous time variable from **Select Columns**, then Click **Y, Time to Event** (continuous variables have blue triangles).
3. Select the factor and click **X**.
4. If the data contains censored values, select the censoring variable and click **Censor**. Change the **Censor Code** if needed (the default is 1).
5. Select the **Relationship**, the **Distribution** and the **Confidence Interval Method**, and click **OK**.

   Note: Check **Nested Model Tests** to append nested model tests and other plots to the report window.

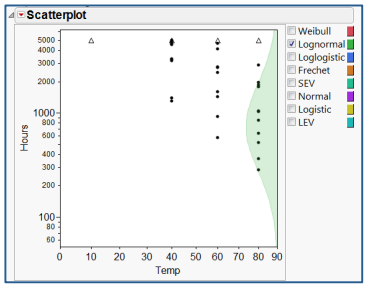
JMP® will display:

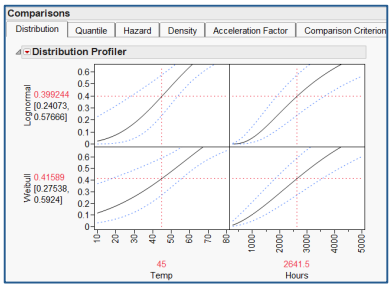
- A **scatterplot** of the data, with the time to event (Y) variable plotted against the factor (X). Triangles indicate censored values.

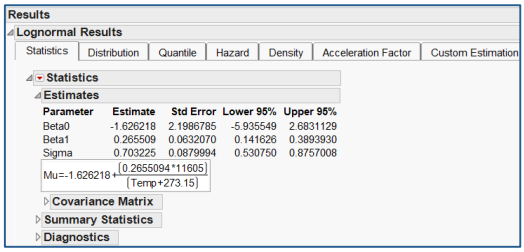
  Under the **red triangle** next to **Scatterplot** select **Add Density Curve** (displayed below, left) and **Add Quantile Line** to compare density curves and quantiles for different values of the factor. Click to select different distributions.

- The **Comparisons** panel, which allows you to compare various **profilers** and **statistics** for each of the selected distributions (below, middle).

- The **Results** panel for each selected distribution, containing diagnostic plots, statistical output, profilers, and **Custom Estimation** calculators to compute quantiles and probabilities (below, right).







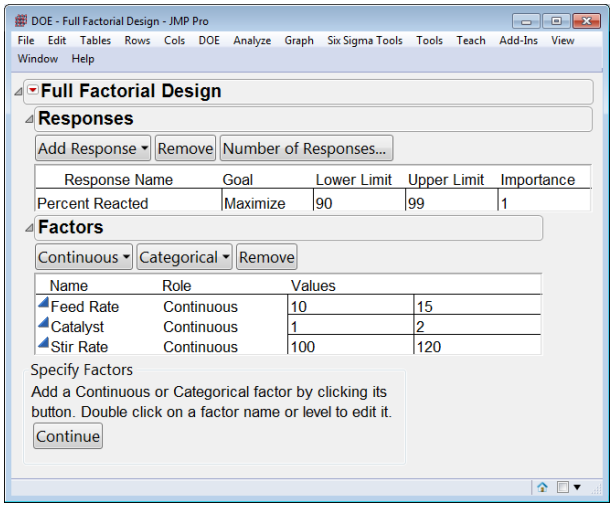
Notes: Other options, such as fit individual distribution, fit all distributions, and view tabbed or individual reports are available under the **top red triangle.** Click on **red triangles** throughout the report to access additional features. For more information, search for "fit life by X" in the JMP Help or in the book ***Reliability and Survival Methods*** (under **Help > Books**).

DOE Full Factorial Design

This page provides information on designing a full factorial experiment using the JMP® DOE Full Factorial Design platform. Note that full factorial experiments, along with a wide variety of other designs, can be generated from the Custom Design platform. For analysis of full factorial experiments, see the page **DOE Full Factorial Analysis**.

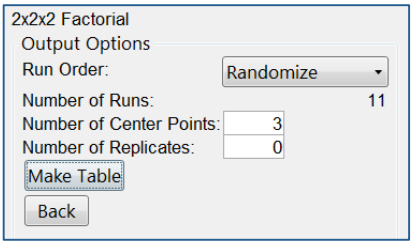
Create the Design (Using DOE > Full Factorial Design)

1. Specify the **Response(s):**
   - Double-click on **Y**, under **Response Name**, to name the response.
   - If needed, change the response **Goal** and **Upper** and **Lower Limits**.
   - Click **Add Response** to add additional responses.
2. Specify the **Factors**:
   - Click **Continuous** or **Categorical**, then the number of levels to add a factor. Click **Remove** to remove a factor.
   - Double-click to change the factor name.
   - Tab to change the values for the factor.
   - Repeat for all factors.

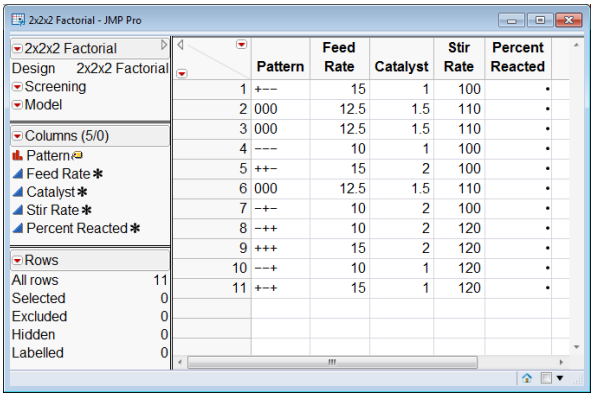


3. Click **Continue**.
4. Specify the **Run Order** (default is Randomize), the **Number of Center Points** and the **Number of Replicates** (the number of additional sets of runs for each design point).

   Here, we have specified an unreplicated fully randomized 2^3 full factorial design with 3 center points, totaling 11 runs.



5. Select **Make Table** to generate the design (or **Back** to make changes). In the design table:
   - The **Pattern** column provides a key to the factor levels for each trial.
   - The factor settings are indicated in the columns for each factor.
   - The response for each trial will be recorded in the last column (here, **Percent Reacted**).
   - The **Model** script has been saved to the data table (top right).



Notes: The design specification window stays open – use this window to change or regenerate the design. Full factorial designs can also be generated from the Custom Design platform. For more details on creating full factorial experiments, search for "full factorial" in the JMP Help or in the book ***Design of Experiments Guide*** (under **Help > Books**).

DOE Full Factorial Analysis

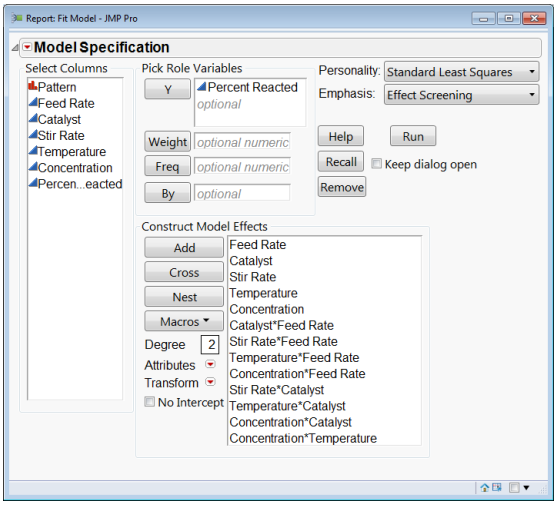
This page provides information on analyzing a full factorial experiment. For design of full factorial experiments, see **DOE Full Factorial Designs**.

Specify the Model and Analyze

1. From an open JMP® table (for a completed full factorial experiment) select **Analyze > Fit Model**.
2. In the **Model Specification** window:
   - Click on the response under **Select Columns**, and click **Y** (under **Pick Role Variables**).
   - Select the factors of interest. Under **Macros**, select **Full Factorial** to enter all main effects and interactions into the model.
   - To remove higher-order interactions, select the interactions under **Construct Model Effects** and hit **Remove**.
3. Click **Run**. JMP will display the following results:
   - The Actual by Predicted plot.
   - The Summary of Fit table.
   - The ANOVA table.
   - The Lack of Fit table (if replicates were used).
   - Parameter estimates and effect tests (shown).
   - The Prediction Profiler and more.

   Other options are available under the **top red triangle**.
4. To **reduce the model**, remove non-significant terms starting with the highest-order interactions. To remove a term:
   - Click on the **top red triangle** and select **Model Dialog** (check **Keep Dialog Open** to keep this window open).
   - Select the non-significant term(s) and click **Remove**.
   - Click **Run** to re-run the model.
   - Repeat until the model has been reduced.
   - Use the **Prediction Profiler** to explore the model, to optimize, and/or to simulate response values.

Example: Design Experiment/Reactor 32 Runs.jmp (Help > Sample Data)

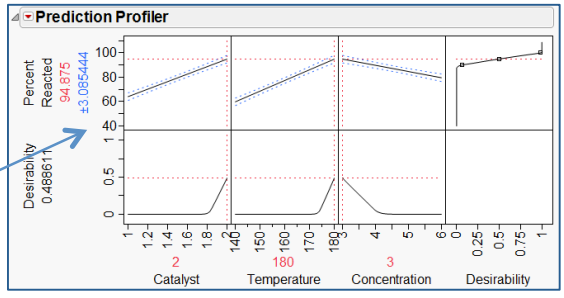


Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Feed Rate(10,15)	1	1	15.1250	1.3200	0.2656
Catalyst(1,2)	1	1	3042.0000	265.4836	<.0001*
Stir Rate(100,120)	1	1	3.1250	0.2727	0.6079
Temperature(140,180)	1	1	924.5000	80.6836	<.0001*
Concentration(3,6)	1	1	312.5000	27.2727	<.0001*
Catalyst*Feed Rate	1	1	15.1250	1.3200	0.2656
Stir Rate*Feed Rate	1	1	4.5000	0.3927	0.5387
Temperature*Feed Rate	1	1	6.1250	0.5345	0.4741
Concentration*Feed Rate	1	1	0.1250	0.0109	0.9180
Stir Rate*Catalyst	1	1	6.1250	0.5345	0.4741
Temperature*Catalyst	1	1	1404.5000	122.5745	<.0001*
Concentration*Catalyst	1	1	32.0000	2.7927	0.1120
Concentration*Temperature	1	1	968.0000	84.4800	<.0001*

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Catalyst(1,2)	1	1	3042.0000	296.4912	<.0001*
Temperature(140,180)	1	1	924.5000	90.1072	<.0001*
Concentration(3,6)	1	1	312.5000	30.4581	<.0001*
Temperature*Catalyst	1	1	1404.5000	136.8908	<.0001*
Concentration*Catalyst	1	1	32.0000	3.1189	0.0896
Concentration*Temperature	1	1	968.0000	94.3470	<.0001*

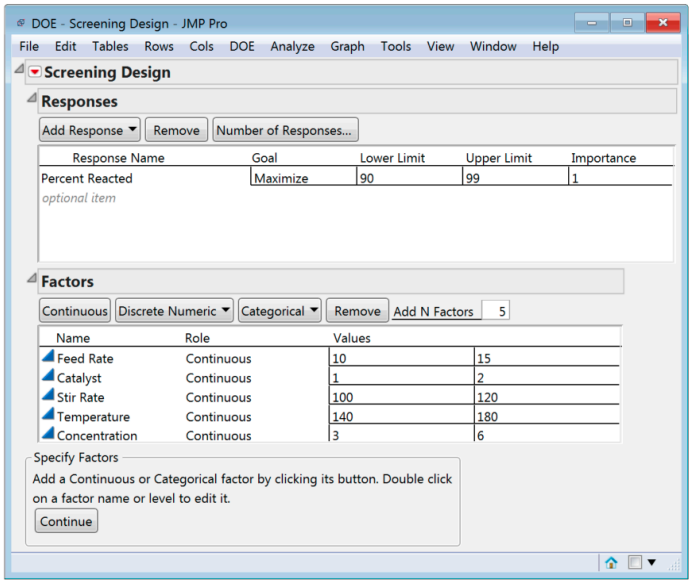


Notes: Designs created in JMP will have a saved **Model** script in the **Tables** panel (top left). For more details on designing or analyzing full factorial experiments, search for "full factorial" in the JMP Help or see Chapter 6, "Full Factorial Designs" in the book ***Design of Experiments Guide*** (under **Help > Books**).

DOE Fractional Factorial Design

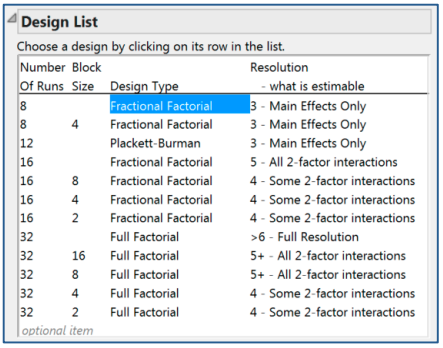
This page provides information on designing a fractional factorial experiment using the JMP® DOE Screening Design platform. Note that the Custom Design platform can also be used to create efficient screening designs.

Create the Design
(DOE > Screening Design)



1. Specify the **Response(s):**
   - Double-click on **Y**, under **Response Name**, to name the response.
   - If needed, change the response **Goal** and **Upper** and **Lower Limits**.
   - Click **Add Response** to add additional responses.
2. Specify the **Factors**:
   - Add the desired number of **Continuous** (2-level) and **2-** or **3-Level Categorical** factors.
   - Double-click to change the factor names.
   - Tab to change the values for each factor.
3. Click **Continue**.
4. From the **Design List**, select the desired design and click **Continue**.

   Note that **Plackett-Burman** screening designs, and **Incomplete Block Designs** (with a value under **Block Size**) are also available.



5. Specify the **Run Order** (default is Randomize), the **Number of Center Points** and the **Number of Replicates** (the number of additional sets of runs for each design point).

   We will design an unreplicated fully randomized 2^{5-2} fractional factorial design with 3 center points, totaling 11 runs.

6. Select **Make Table** to generate the design table (or **Back** to make changes).

   Screening and **Model** scripts will be saved to the data table (top right), and the design specification window stays open to change or regenerate the design.

	Pattern	Feed Rate	Catalyst	Stir Rate	Temperature	Concentration	Percent Reacted
1	00000	12.5	1.5	110	160	4.5	•
2	++−−−	15	2	100	140	3	•
3	+−+−−	15	1	120	140	3	•
4	−−++−	10	1	120	180	3	•
5	00000	12.5	1.5	110	160	4.5	•
6	−+−+−	10	2	100	180	3	•
7	+++++	15	2	120	180	6	•
8	−++−+	10	2	120	140	6	•
9	−−−−+	10	1	100	140	6	•
10	+−−++	15	1	100	180	6	•
11	00000	12.5	1.5	110	160	4.5	•

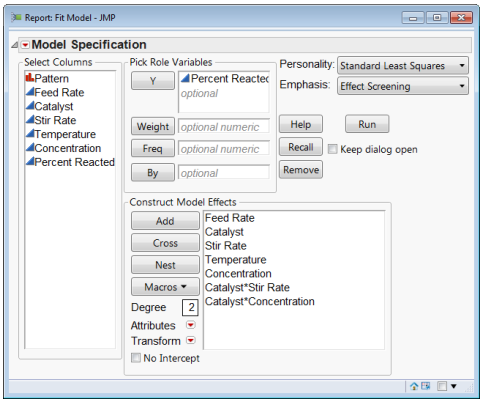
Notes: Screening designs can also be generated from the Custom Design platform. For more details, search for "fractional factorial" or "screening designs" in the JMP Help or see the ***Design of Experiments Guide*** (under **Help > Books**).

DOE Fractional Factorial Analysis

This page provides information on analyzing fractional factorial experiments. The example below is an 8 run, 2^{5-2} Resolution III fractional factorial generated from the **Screening** design platform (**DOE > Screening**).

Specify the Model and Analyze

Example: Design Experiment/Reactor 8 Runs.jmp (Help > Sample Data)



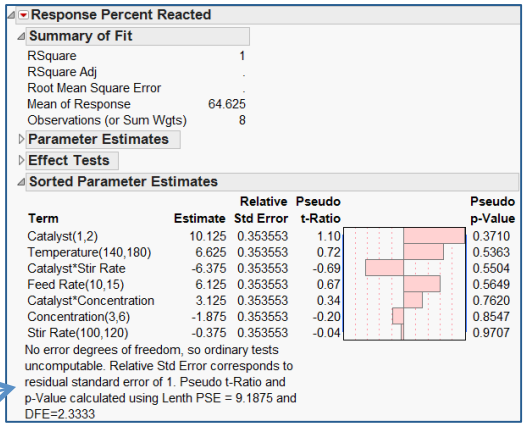
1. From an open JMP table (for a completed fractional factorial experiment) select **Analyze > Fit Model**.

   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:

   - Click on the response under **Select Columns**, and click **Y** (under **Pick Role Variables**).
   - 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**.

2. Check the **Keep dialog open** box, and click **Run**.

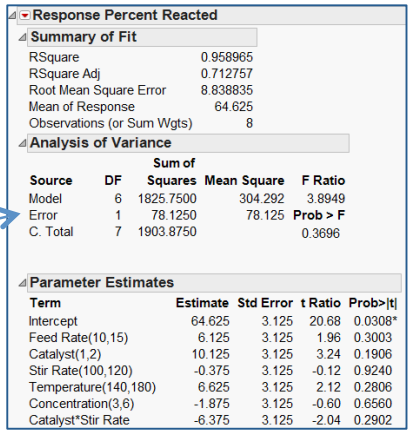
   Note: If aliased effects were entered into the model, JMP will display **Singularity Details** and will indicate that estimates are **zeroed** or **biased**. Return to the **Model Specification** window, remove the extraneous (zeroed) terms, and click **Run**.



3. If your design is **saturated** (there are no error degrees of freedom), JMP provides p-values based on **Lenth Pseudo Standard Error** (PSE, an estimate of residual standard error).

   Other options, such as the **Normal Plot**, are available under **Effect Screening** under the **top red triangle**.

   Return to the **Model Specification** window, remove a term (typically a 2-way interaction with the largest Pseudo p-Value) and click **Run**. This frees one degree of freedom for estimation of error.



4. **Reduce the model** as desired, slowly removing non-significant terms (starting with the interactions).

Notes:

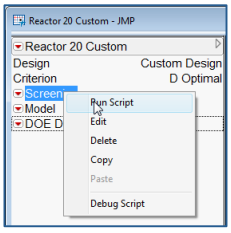
Additional options – such as **residual plots**, the **prediction profiler** and **interaction plots** – are available under the **top red triangle**.

For design of fractional factorial experiments or analysis of general screening designs using the **Screening** analysis platform, see the one-page guides at jmp.com/learn. For additional details, search for "**fractional factorial**" or "**screening designs**" in the JMP Help or in the book ***Design of Experiments Guide*** (under **Help > Books**).

DOE Screening Experiment Analysis

This page provides information on analyzing screening experiments using the **Screening** platform (under **Analyze > Modeling**), which is ideal for analyzing 2-level screening designs (and works best with orthogonal designs). The example below is a 20 run 5 factor (2-level) screening experiment generated from the **Custom Design** platform (**DOE > Custom Design**). The design allows estimation of all main effects and two-factor interactions.

Specify the Model and Analyze



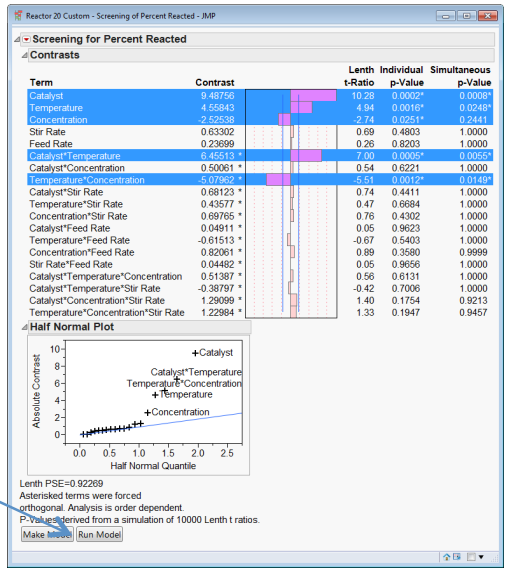
Most experiments designed in JMP will have **Screening** and **Model** scripts saved to the data table. For this analysis, we use the **Screening** script, which launches the **Screening** analysis platform and automatically fits a saturated model.

1. Click on the **red triangle** next to the **Screening** script and select **Run Script**.
2. JMP fits a saturated model (here, 19 terms plus the intercept). The **Contrasts** table and **Half Normal Plot** identify active factors using **Lenth Pseudo Standard Error** (PSE).

   Notes: In screening experiments, we assume that most effects are inactive and estimates of those effects are essentially random noise.

   The line in the **Half Normal Plot** is drawn with a slope equal to the **Lenth PSE** (an estimate of the residual standard error). Most effects are inactive and fall close to this line. Effects that deviate substantially from this line are labeled as active.

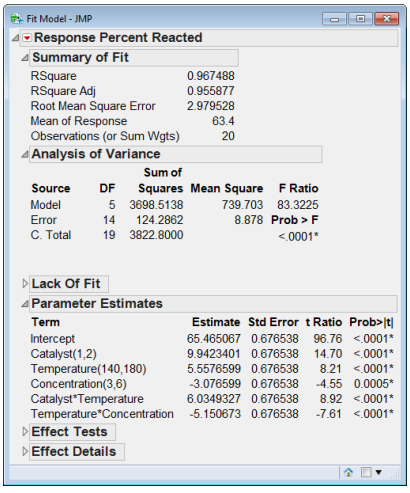
Example: Reactor 20 Custom.jmp (Help > Sample Data)



3. Select **Run Model** (at the bottom) to launch the **Fit Model** platform with only the active effects.

   The following results display: **Summary of Fit**, **ANOVA table**, **Lack of Fit** (if replicated points) and more.

   Other options – such as **residuals plots, normal plot, the profiler** and **interaction plots** – are available under the **top red triangle**.



Tips:

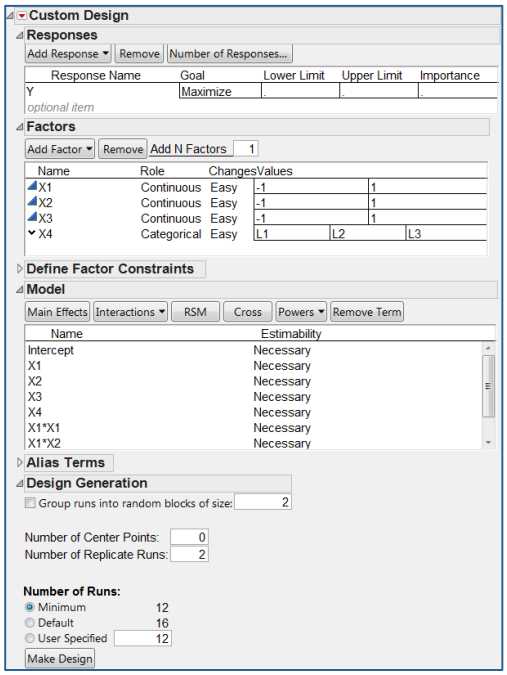
- In the **Screening** platform, to highlight additional terms hold the **Control** key and click on the term(s) to select.
- **Individual** and **Simultaneous p-Values** in the **Screening** platform are based on Monte Carlo simulation (and will vary).
- An alternative approach to analyzing screening experiments is to run the **Model** script or use **Analyze > Fit Model** to specify the model. See the page "DOE Full Factorial Analysis" at jmp.com/learn for information on reducing models.

Notes: For more information on Lenth PSE and analyzing screening designs, search for "**screening**" in the JMP Help or in the ***Design of Experiments Guide*** (under **Help > Books**).

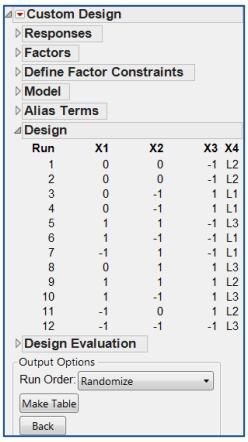
DOE - Custom Designs

This page provides information on designing optimal experiments using the flexible Custom Design platform. The Custom Designer can be used for almost any experimental situation, including factor screening, optimization, and mixture problems, and can accommodate designs with hard-to-change factors and other constraints.

DOE: Generating A Custom Design



1. Select **DOE > Custom Design**.
2. Under **Responses**, specify the response(s):
   - Double-click to rename the response (default is **Y**).
   - Change the response goal (default is **Maximize**).
   - Click **Add Response** to add additional responses.
3. Under **Factors**, specify the experimental factors:
   - Click **Add Factor**, and select the factor type and number of levels. To add several factors of the same type and number of levels use **Add N Factors** (enter a number) and click **Add Factor**.
   - Double-click to rename the factors.
   - Change the factor values (the experimental settings).
   - Change "Easy" under **Changes** to "Hard" or "Very Hard" to generate a split-plot or split-split plot design.
4. Click **Continue**.
5. Under **Model**, specify the statistical model to be estimated:
   - To add all **interaction** or **power** terms up to a given degree, click the corresponding button.
   - To add terms needed to perform a response surface analysis, click **RSM** (or **Scheffe Cubic** for mixture designs).
   - To add specific interaction or power terms, highlight one or more factors under **Factors** and click **Interactions** or **Powers**.
   - To remove a term, highlight it and click **Remove Term**.
   - To reduce the number of runs needed (at the expense of effect aliasing), click "Necessary" for a term (under **Estimability**) and change to "If Possible."
6. Under **Design Generation**, fine-tune the design (as needed):
   - Specify the **block size** or number of **whole plots** (with "Hard" to change factors).
   - Enter the **Number of Center Points** and/or **Number of Replicate Runs**.
   - Select (or specify) the desired **number of runs**.
7. Click **Make Design.** The resulting design displays under **Design**.
8. Select the desired **Run Order**, then click **Make Table** to generate the design table (or **Back**) to make changes.



Screening, **Model** and **DOE Dialog** scripts are saved to the data table (top left), and the design specification window stays open to change or regenerate the design if needed.

Notes: For more options, including optimality settings and other advanced options, click the **red triangle** next to **Custom Design**. The **Design Evaluation** panel houses a variety of diagnostics. For more information on creating and evaluating custom designs, see the "Custom Design" chapter of the ***Design of Experiments Guide*** (under **Help > Books**).

Connect to SAS® OnDemand for Academics from JMP®

This document describes how to connect to **SAS OnDemand for Academics** from JMP on a Mac or Windows machine. This connection allows you to browse SAS data sets, transfer data between SAS and JMP, run stored processes, create and run a SAS program, and more.

Note: Before using the connection to SAS OnDemand for Academics, you'll need to follow the instructions provided at support.sas.com/ondemand/jmp.html to:

- **Register** to use SAS OnDemand for Academics.
- Download the **SODAJMP** file, and run the installer to place the three .jar files in the correct directory (jar files are required to access SAS 9.3 OnDemand hosted servers).
- Create a **SAS server profile** in JMP.

Connect to SAS® OnDemand for Academics from JMP®

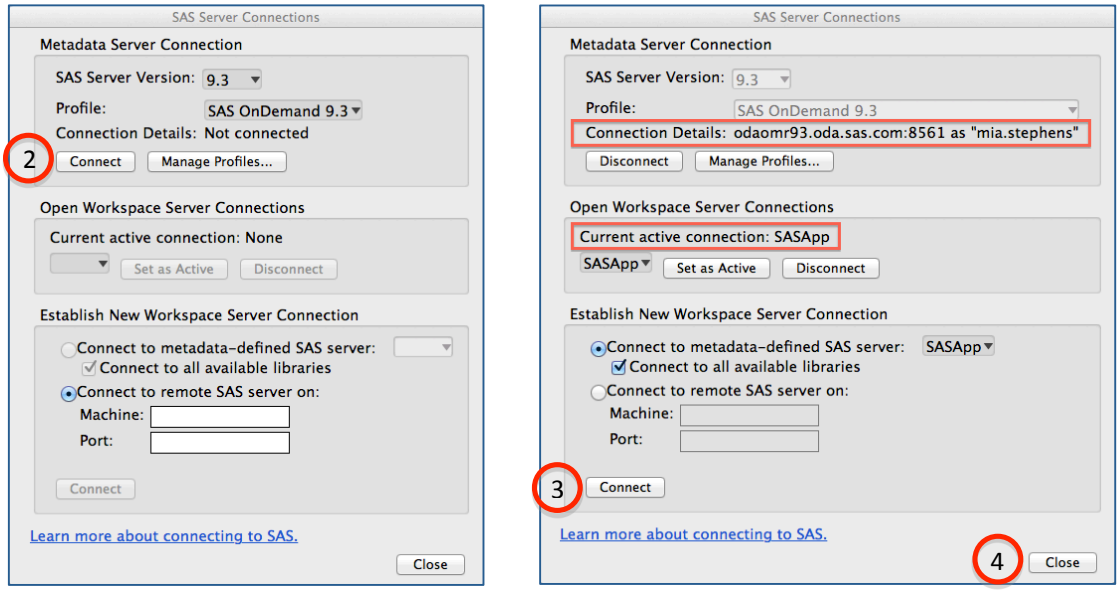
1. Open the **SAS Server Connections** window (**File > SAS > Server Connections**) and select the **SAS Server Version**.

   Note: If a SAS add-in has been installed, SAS Server Connections can also be accessed from the SAS menu on the main JMP menu.

2. Click **Connect** under **Metadata Server Connection.** The metadata server **Connection Details** will update once connected.

3. Click **Connect** under **Establish New Workspace Server Connection**. The workspace server **Current active connection** will update once connected.

4. Click **Close**. You are now connected to SAS!



Notes: See the SAS OnDemand for Academics website for restrictions on use of jar files and SAS OnDemand for Academics. For more information on connecting to SAS from JMP, refer to the **Using SAS from JMP** one-page guides at jmp.com/learn. Or click on **Learn more about connecting to SAS** from the SAS Server Connections window or search for "connecting to SAS" in the book ***Using JMP*** (under **Help > Books**).

Connect to Your School's SAS® Server from JMP®

This document describes how to connect to your school's SAS server from JMP on a Mac or Windows machine. This connection allows you to browse SAS data sets, transfer data between SAS and JMP, run stored processes, create and run a SAS program, and more.

Connect to Your School's SAS® Server

1. Open the **SAS Server Connections** window (**File > SAS > Server Connections**) and select the **SAS Server Version**.

   Note: If a SAS add-in has been installed, SAS Server Connection can also be accessed from the SAS menu on the main JMP menu.

2. Click **Manage Profiles...**, and select a SAS server profile from the list.

   If no profile exists, see the shaded box below.

3. Click **Connect**.

   The metadata server **Connection Details** will update once connected.

4. Click **Connect to metadata-defined SAS server**, and select the desired workspace server.

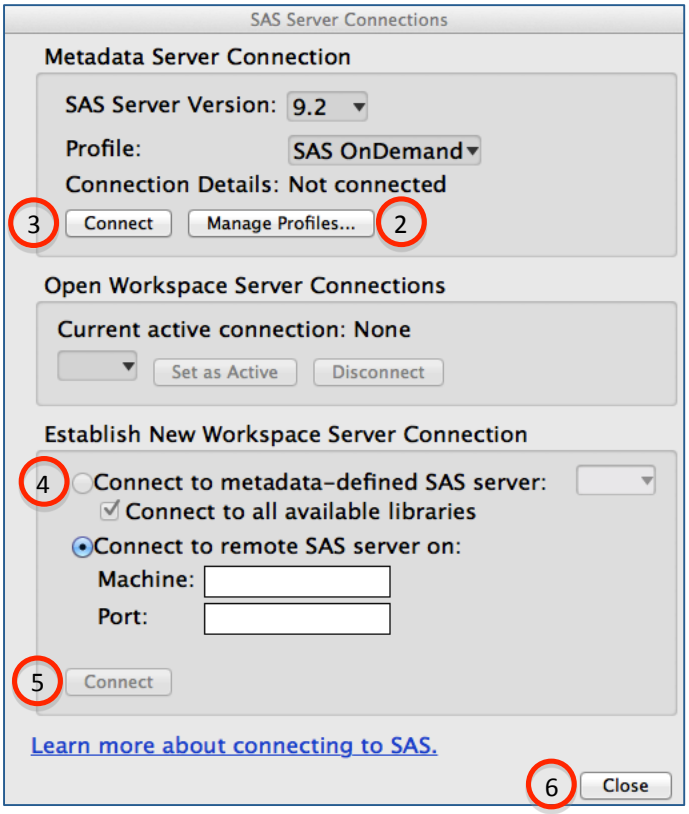
   Note: If your school does not have a metadata server, you can connect directly to a remote SAS server. See your SAS administrator for details.

5. Click **Connect** under **Establish New Workspace Server Connection**.

   The workspace server **Current active connection** will update once connected.

6. Click **Close**.

   You are now connected to SAS!



How to create a metadata server profile:

1. In the **SAS Server Connections** window, select the version for the SAS server.
2. Click **Manage Profiles...**
3. Click **Add** to add a new profile.
4. Fill in the information as required, and click **Save**.

Click on **Learn more about metadata profiles** for help. See your SAS administrator for profile information.

Notes: For more information on connecting to SAS from JMP, refer to the **Using SAS from JMP** one-page guides at www.jmp.com/learn. Or, click on **Learn more about connecting to SAS** from the SAS Server Connections window or search for "connecting to SAS" in the book ***Using JMP*** (under **Help > Books**).

Connect to SAS® on Your PC (Windows) from JMP®

This document describes how to connect to a local installation of SAS from JMP on a Windows machine. This connection allows you to browse SAS data sets, open SAS data sets in JMP, run stored processes, create a SAS program, submit SAS code, and more.

Connect to a Local Installation of SAS® on Your PC (Available on Windows Only)

1. Open the **SAS Server Connections** window (**File > SAS > Server Connections**).

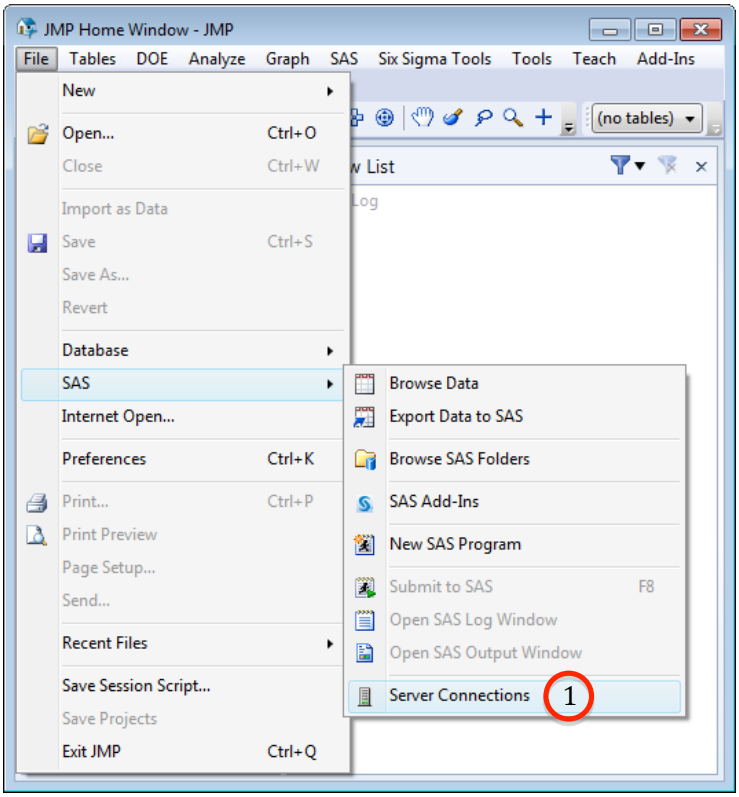
   Note: If a SAS add-in has been installed in JMP 10, Server Connections can also be accessed from the SAS menu on the main JMP menu.

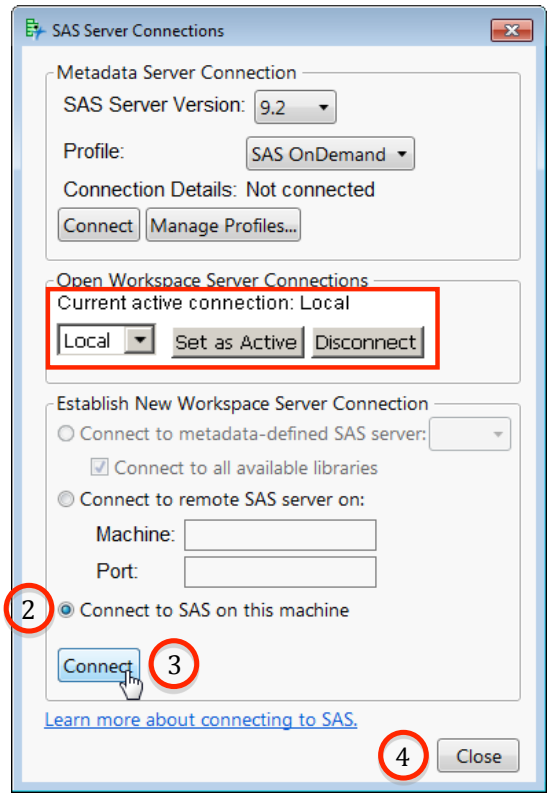
2. Select **Connect to SAS on this machine**.

3. Click **Connect**.

   When the connection to SAS has been established, "Local" will display under **Current active connection**.

4. Click **Close.** You are now connected to SAS!





Notes: For more information on connecting to SAS from JMP, refer to the **Using SAS from JMP** one-page guides at www.jmp.com/learn. Or, click on **Learn more about connecting to SAS** from the SAS Server Connections window or search for "connecting to SAS" in the book ***Using JMP*** (under **Help > Books**).

SAS® Structural Equation Modeling for JMP®

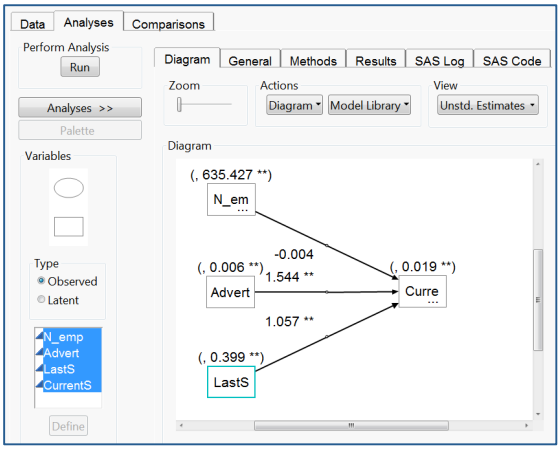
Use SAS SEM for JMP to specify a path diagram for a variety of structural equation models, analyze the models using SAS, and display the results in JMP. This guide walks through steps to create a simple path diagram, analyze the model, change the model, and save the analysis. For more information, including download and installation instructions go to www.jmp.com/software/jmpsas.

Create a Path Diagram

1. Open a data table, and select **Analyze > Structural Equation Modeling > Single Group Analysis**.
2. Select the **Data Structure**, and enter the number of observations (if Covariances, Correlations).
3. Click the **Analyses** tab.
4. Select **Palette** to show the list of variables.
5. **Draw the diagram**:
   - Drag **observed** variables into the **Diagram** area.
   - Drag oval shapes to the diagram for **latent** variables.
   - Click and drag to **move** the variables.
   - Double-click to **rename latent** variables.
   - To **draw paths**, rest the cursor on a variable, select the single- or double-headed arrow, and drag the cursor toward another variable and release.
   - Right-click on diagram elements to **change properties**.

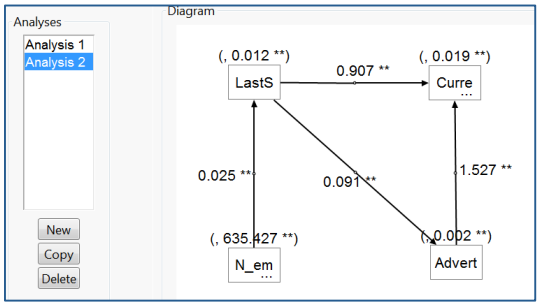
Click **Run** to perform the analysis. Estimates will display on the diagram, and results can be found under the **Results** tab. Click on tabs to view the **SAS Log** and **SAS Code**.

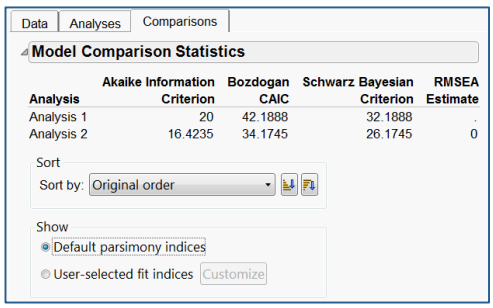
Example: Sales Data (from the SEM Sample Data)



Modify, Compare and Save Analyses

- To modify an existing model, click the **Analyses** button (above Palette) and click **Copy** to create a copy of your model. Modify the path diagram (add or remove variables or paths, change paths, etc.), and click **Run** when done. A revised path diagram with estimates is shown (below, left).
- Click the **Comparisons** tab to compare models (below, right).
- To save analyses as a JMP project, click **Save**.





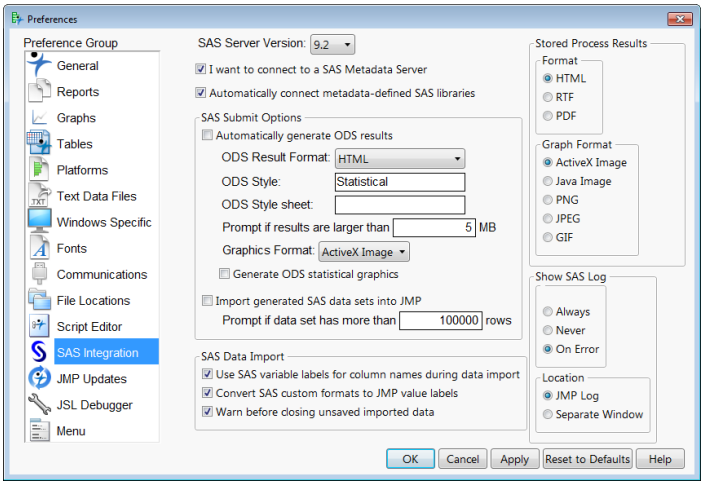
Note: A connection to SAS is required. For more information and examples, see the SEM Help documentation (under **SAS > Structural Equation Modeling**) or visit the JMP website provided above. For information on connecting to SAS from JMP, see the **Using SAS from JMP** one-page guides at www.jmp.com/learn.

Setting SAS® Integration Preferences

Specify how JMP® works with SAS by modifying the default SAS Integration settings. For information on connecting to SAS, see the **Connect to SAS** one-page guides under **Using SAS from JMP**.

Setting SAS® Integration Preferences

From an open JMP window, select **File > Preferences** (or **JMP >Preferences** on a Mac). Under Preference Group select **SAS Integration.**



Selection options include the following:

1. **SAS Server Version:** Select the version of the SAS server you will be connecting to. This option does not apply when connecting to SAS on a local machine.

   I want to connect to a SAS Metadata Server is checked by default. Clear this option if you do not have a SAS Metadata Server available.

2. **SAS Submit Options**

   a. Select **Automatically Generate ODS Results** if you want to generate Output Delivery System (ODS) results. You may specify:

   - **ODS Result Format**: HTML, RDF, PDF or JMP report.
   - **ODS Style:** The style name for ODS reports (Statistical is the default).
   - **ODS Style Sheet:** The style sheet name for ODS reports.
   - **Prompt if results are larger than:** The size in MB. If exceeded, will prompt to continue or cancel.
   - **Graphics Format:** ActiveX (Windows only), Java, PNG, JPEG or GIF.
   - Select **Generate ODS statistical graphics** to include statistical graphics in ODS reports.

   b. **Import generated SAS data sets into JMP:** If selected, any SAS data sets generated by submitted SAS code will automatically be imported into JMP. Large data sets prompt for confirmation.

3. **SAS Data Import:** The three options are selected by default:

   a. **Use SAS variable labels for column names during data import** (instead of SAS column names).
   b. **Convert SAS custom formats to JMP value labels** when importing.
   c. **Warn before closing unsaved imported data** (triggers to save before closing).

4. **Stored Process Results**: Specify the following formats:

   a. **Format** (of reports): HTML, RTF or PDF.
   b. **Graph Format:** ActiveX (Windows only), Java, PNG, JPEG or GIF.

5. **Show SAS Log:**

   a. **Always**, **Never** or **On Error**.
   b. **Location:** In the JMP Log window, or in a separate window.

Note: For more information on using SAS with JMP, search for "SAS integration" in the JMP Help or see Chapter 11, "External Data and Analytical Sources" in the book ***Using JMP*** (under **Help > Books**).

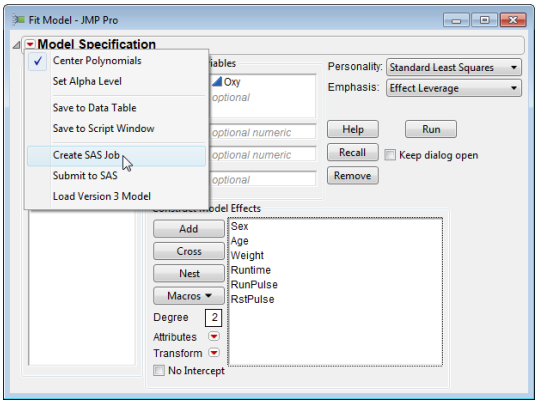
Using JMP® to Generate SAS® Programs

Automatically generate SAS programs using the JMP Fit Model and Time Series (ARIMA or Seasonal ARIMA) platforms. SAS scoring code can also be generated from the Partition and Neural platforms (not covered here).

Using JMP® to Generate SAS® Programs

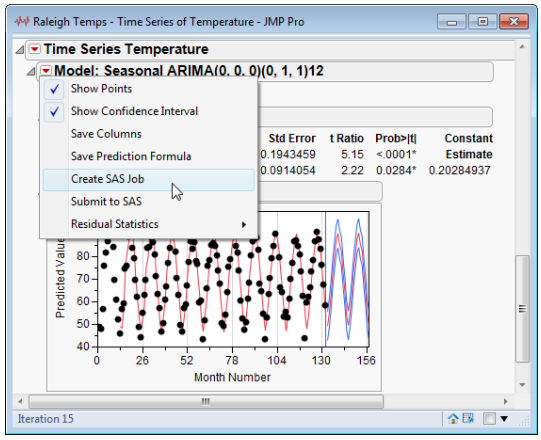
To generate SAS programs with the Fit Model platform:

- From an open data table select **Analyze** > **Fit Model.**
- Specify a model: Select your response (**Y**) and predictors (**Model Effects**).
- Specify the type of model under **Personality**.
- Click on the **top red triangle** and select **Create SAS Job** (see resulting code, bottom right).
- Note: Will only produce simple PROC GLM, PROC Logistic, PROC GENMOD or PROC Mixed code.

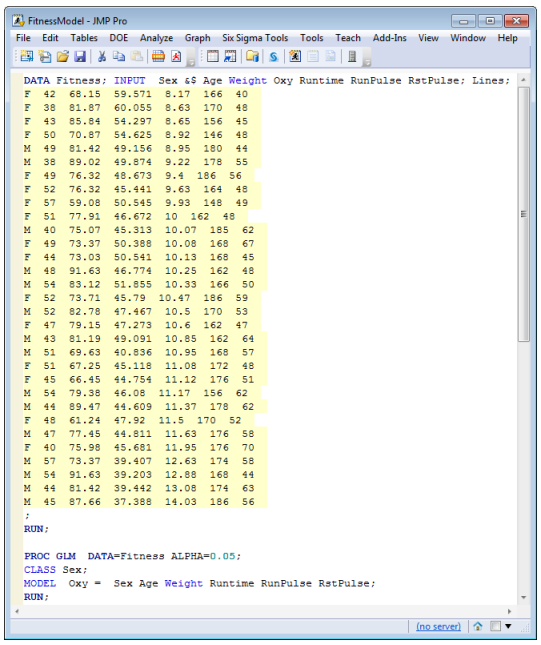


To create SAS code for ARIMA models from within the Time Series platform:

- From an open a data table select **Analyze > Modeling > Time Series**.
- Select the **Y, Time Series** column and columns for other roles (if needed), and click **OK**.
- Click on the **red triangle** and select **ARIMA** or **Seasonal ARIMA**. Specify the model, and click **Estimate**.
- Click on the **red triangle** for the model and select **Create SAS Job**.



JMP generates the SAS code for the specified model in a new SAS Program Editor window. To submit code to SAS, right-click and select **Submit to SAS**.



Notes:

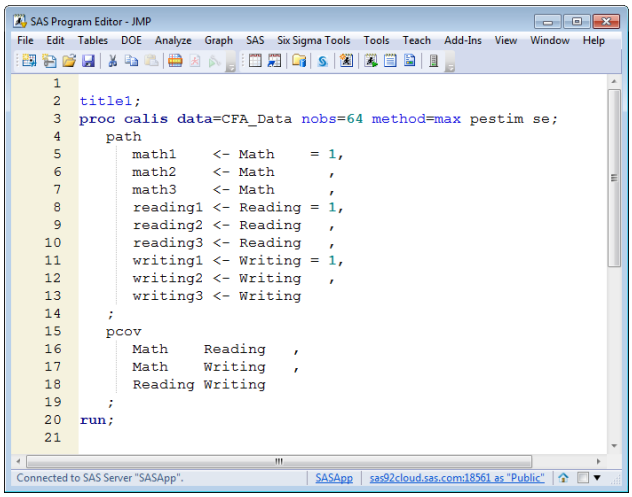
- To submit SAS code, JMP must be connected to SAS. For information on connecting to SAS, either locally or on a server, see the page **Using SAS from JMP**.
- For more information on using SAS with JMP, search for "SAS integration" in the JMP Help or see Chapter 11, "External Data and Analytical Sources" in the book ***Using JMP*** (under **Help > Books**).
- For more information on using the Fit Model or Time Series platforms, see the ***Fitting Linear Models*** and ***Specialized Models*** books (under **Help > Books**).

Entering and Running SAS® Programs

Write and submit your own SAS programs or submit existing SAS programs. This enables JMP® to be used as a client to SAS, leveraging the depth and breadth of statistical and analytical techniques in SAS.

Entering SAS® Programs

1. To bring an existing SAS program into JMP:
   - From an open JMP window, select **File > Open.**
   - Browse to the desired SAS program file, and click **Open**. The SAS file will open in the SAS Program Editor window in JMP.
2. To create (or cut and paste) a new SAS program from within JMP, select **File > SAS > New SAS Program** to open the SAS Program Editor.



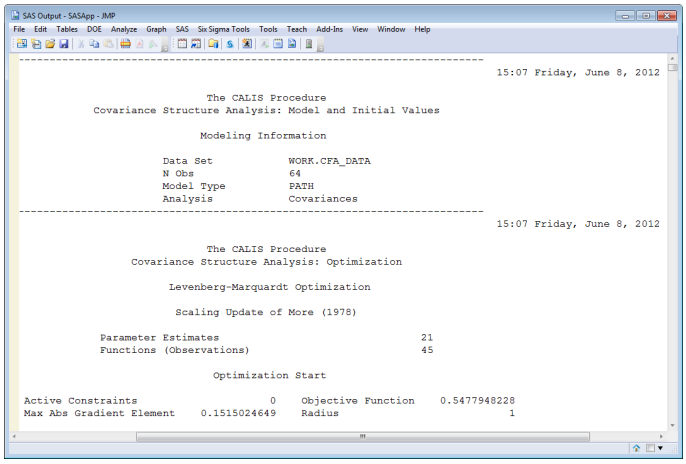
The SAS Program Editor is color-coded for easy reference:

- Dark Blue: PROC and DATA statements.
- Blue: Keywords.
- Magenta: Text strings.
- Green: Constants.
- Beige Highlighting: Data lines in a DATA Step.

Running SAS® Programs

To run the SAS program from the SAS Program Editor in JMP:

- Select **Edit > Submit to SAS.** (If prompted to connect to SAS, enter the appropriate details and click **OK** – see the first note below).
- The code will be sent to SAS, and the SAS output will be returned to JMP according to the **SAS Integration** preference settings.
- To view the SAS log and/or output windows if they are not already open, select **File > SAS > Open SAS Log Window** or **File > SAS > Open SAS Output Window**, respectively.



Notes:

To submit SAS code, JMP must be connected to SAS. For information on connecting to SAS, either locally or on a server, see the **Connecting to SAS** one-page guides under **Using SAS from JMP** at www.jmp.com/learn.

For information on setting SAS preferences, see the **Setting SAS Integration Preferences** one-page guide.

SAS Institute Inc. World Headquarters +1 919 677 8000

JMP is a software solution from SAS. To learn more about SAS, visit **www.sas.com**
For JMP sales in the US and Canada, call 877 594 6567 or go to **www.jmp.com**