SAS® Studio 3.1

User's Guide

SAS® Documentation

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SAS® Studio 3.1: User's Guide

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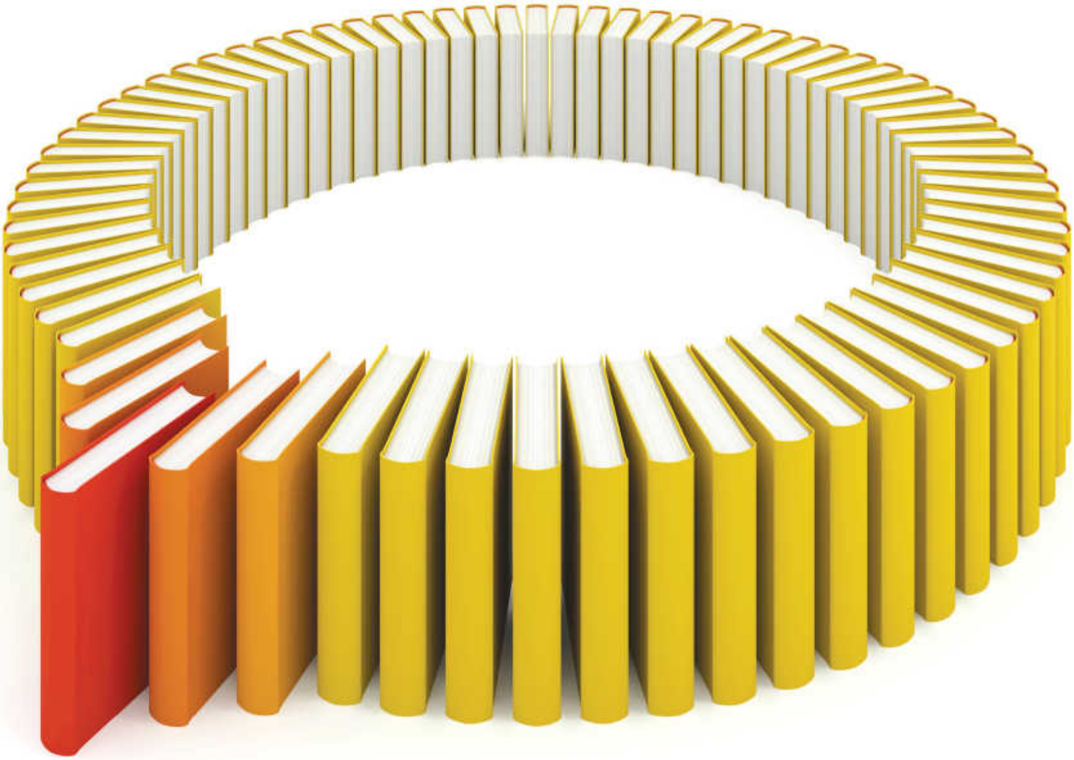

Contents

Using This Book

Audience

This book is designed for all users of SAS Studio. SAS Studio runs on the first maintenance release for SAS 9.4.

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Accessibility

For information about the accessibility of this product, see Accessibility Features of SAS Studio 3.1 at support.sas.com.

Recommended Reading

- *Getting Started with Programming in SAS Studio*
- *The Little SAS Book: A Primer* (Buy)
- *Learning SAS by Example: A Programmer's Guide* (Buy)
- *SAS Statistics by Example* (Buy)
- *Elementary Statistics Using SAS* (Buy)

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Introduction to SAS Studio

About SAS Studio

SAS Studio is a development application for SAS that you access through your web browser. With SAS Studio, you can access your data files, libraries, and existing programs, and you can write new programs. You can also use the predefined tasks in SAS Studio to generate SAS code. When you run a program or task, SAS Studio connects to a SAS server to process the SAS code. The SAS server can be a hosted server in a cloud environment, a server in your local environment, or a copy of SAS on your local machine. After the code is processed, the results are returned to SAS Studio in your browser.

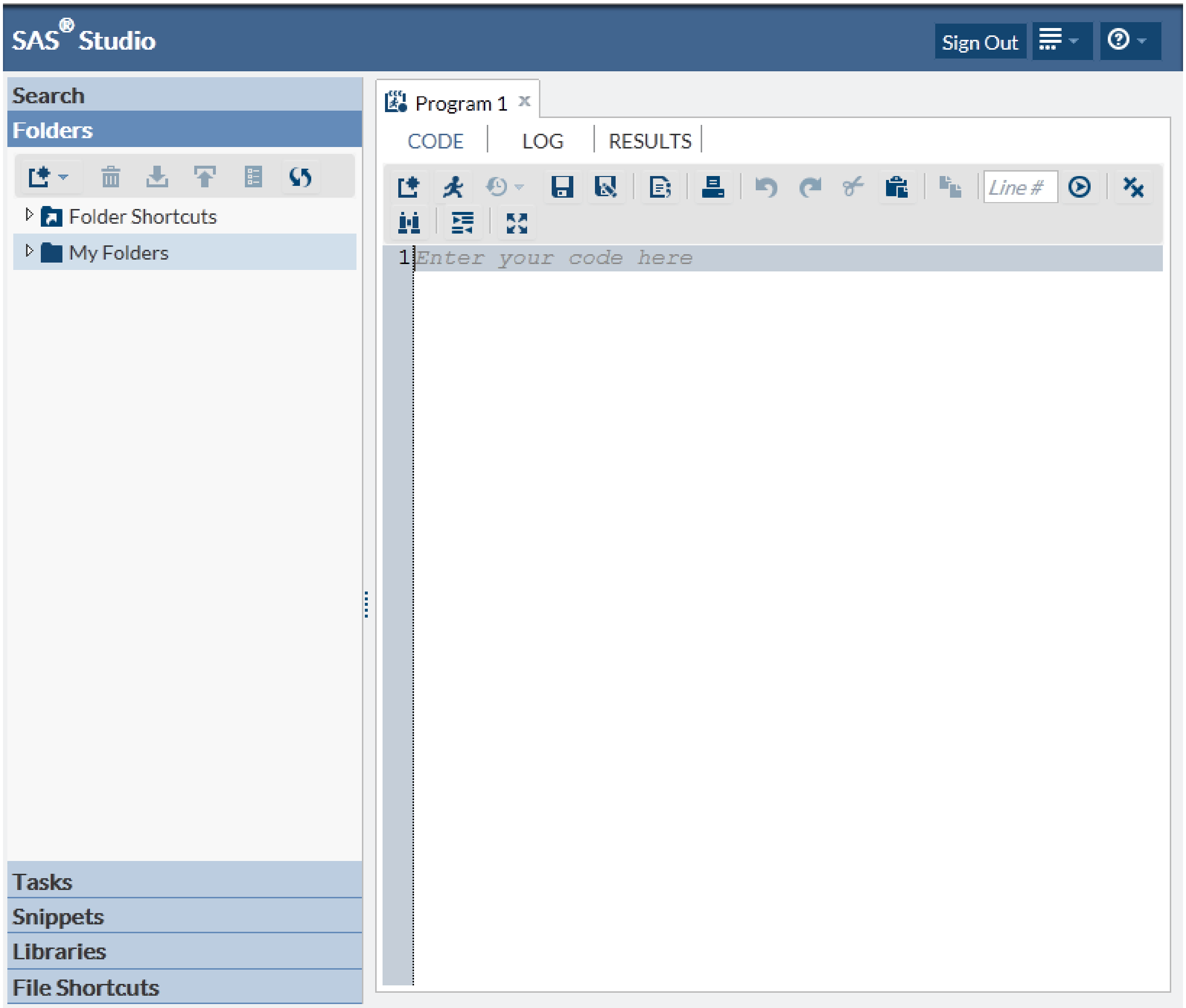
SAS Studio supports multiple web browsers, such as Microsoft Internet Explorer, Apple Safari, Mozilla Firefox, and Google Chrome.

In addition to writing and running your own SAS programs, you can use the predefined tasks that are included with SAS Studio to analyze your data. The tasks are based on SAS System procedures and provide access to some of the most commonly used graph and analytical procedures. You can also use the default task template to write your own tasks.

Using SAS Studio

About Using SAS Studio

When you sign on to SAS Studio, the main SAS Studio window appears with a blank program window so that you can start programming immediately. You also have access to all six sections of the navigation pane.



The main window of SAS Studio consists of a navigation pane on the left and a work area on the right. The navigation pane provides access to the search feature, your folder shortcuts and folders, your tasks and snippets, the libraries that you have access to, and your file shortcuts. The Folders section is displayed by default.

The work area is used to display your data, code, tasks, logs, and results. As you open these items, they are added to the work area as windows in a tabbed interface.

Using the Navigation Pane

About Using the Navigation Pane

You can expand the sections of the navigation pane by clicking the section that you want to view.

Using the Search Section

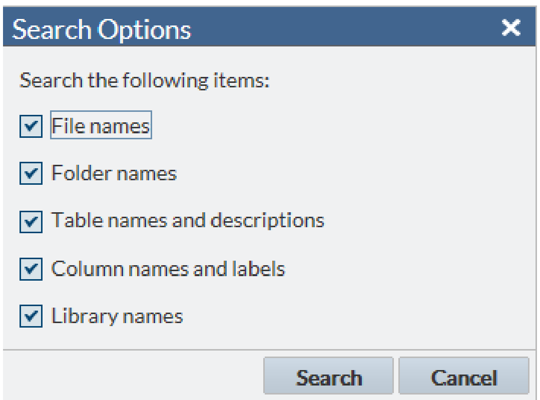
The Search section of the navigation pane enables you to search the directory that is specified by the Authentication Provider for filenames, folder names, table names and descriptions, column names and labels, and library names. You can open items directly from your search results by double-clicking them or dragging them to the work area.

To use the search option:

1 In the navigation pane, click **Search** to open the Search section.

2 In the search box, enter the text that you want to search for.

3 Click  to open the Search Options window and specify the types of items that you want to search. By default, all types of items are searched.



4 Click **Search**.

Working with Folders

The Folders section of the navigation pane enables you to access your folders, create folder shortcuts, download and upload files, and create a new SAS program. You can expand and collapse folders, and you can open items in the folders, such as a SAS program or table, by double-clicking them or dragging them to the work area.

To create a new folder shortcut, click in the Folders section and select **Folder Shortcut**. Enter the shortcut name and full path and click **Save.** The new shortcut is added to the list of folder shortcuts.

To download a file, select the file that you want to download and click . You are prompted to open the file in the default application or save it to your local computer.

To upload one or more files from your local computer, click . Specify the folder to which you want to upload the files, and click **Choose Files** to browse for the files that you want to upload.

Working with Tasks

The Tasks section of the navigation pane enables you to access tasks in SAS Studio. Tasks are based on SAS procedures and generate SAS code and formatted results for you. SAS Studio is shipped with several predefined tasks that you can run. You can also edit a copy of these predefined tasks, and you can create your own new tasks.

To create a new task, click . SAS Studio creates a template in the work area that you can use to create custom tasks for your site. Custom tasks can be accessed from the My Tasks folder. For more information, see "Understanding Tasks in SAS Studio" on page 51.

To edit a task that you have created, select the task from the My Tasks folder and click . The XML code that is used to create the task is opened in the work area. If you want to edit a predefined task, you must first right-click the task and select **Add to My Tasks**. For more information, see "Edit a Predefined Task" on page 56.

Note: You can edit only the tasks that are in the My Tasks folder.

Working with Snippets

The Snippets section of the navigation pane enables you to access your code snippets. *Code snippets* are samples of commonly used SAS code that you can insert into your SAS program. SAS Studio is shipped with several predefined code snippets that you can use. You can also edit a copy of these snippets and create your own custom snippets. Your custom snippets can be accessed from the My Snippets folder. For more information, see "Working with Programs" on page 13.

To edit a snippet that you have created, select the snippet from the My Snippets folder and click . If you want to edit a predefined snippet, you must first right-click the snippet and select **Add to My Snippets**.

Note: You can edit only the snippets that are in the My Snippets folder.

Working with Libraries

The Libraries section of the navigation pane enables you to access all of your libraries and the tables in the libraries. You can use the Libraries section to expand a table and view the columns in that table. The icon in front of the column name indicates the type.

Here are examples of common icons for the column types.

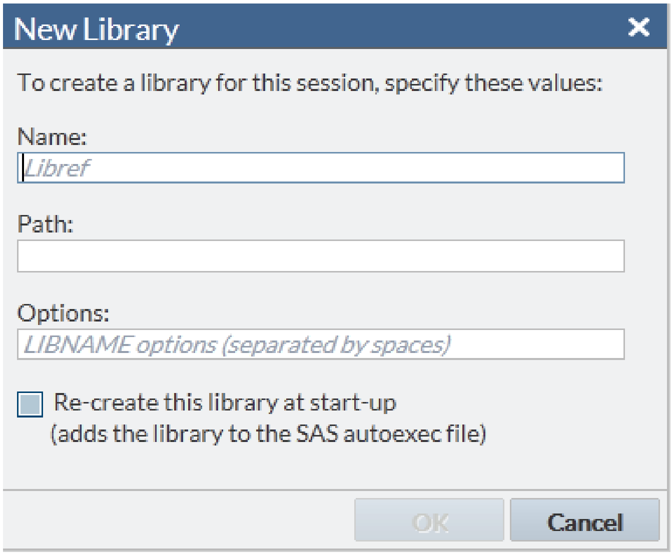
Icon	Type of Column
	Character
	Numeric
	Date
	Datetime

You can drag tables and columns from the Libraries section to a program, and SAS Studio adds code for the dragged items to your program. For more information, see "Opening and Creating Programs" on page 14.

You can also create new libraries and assign existing libraries.

To create a new library:

1 Click **Libraries** in the navigation pane and then click . The New Library window appears.



2 In the **Name** box, enter the libref for the library. The libref must be eight characters or fewer.

3 In the **Path** box, enter the physical path where the library resides.

4 In the **Options** box, specify any configuration options that you need. For the appropriate options, see the documentation for your operating environment.

5 If you want to access this library each time you use SAS Studio, select **Re-create this library at start-up**.

6 Click **OK** to create the library. The new library is added to the list of libraries in the navigation pane.

To assign unassigned libraries, click . If you want to access the selected libraries each time you use SAS Studio, select **Assign selected libraries at start-up**. If a library is unassigned, then you cannot access the tables in that library.

Using File Shortcuts

File shortcuts enable you to quickly access files that you specify. You can create a file shortcut to a file on your SAS server or via a URL.

To create a new file shortcut, click . You can define the shortcut by specifying a complete path and filename or by specifying a URL. If you want this shortcut to be available the next time you use SAS Studio, select **Re-create this file shortcut at start-up**.

You can open a file from a file shortcut by double-clicking it or dragging it to the work area.

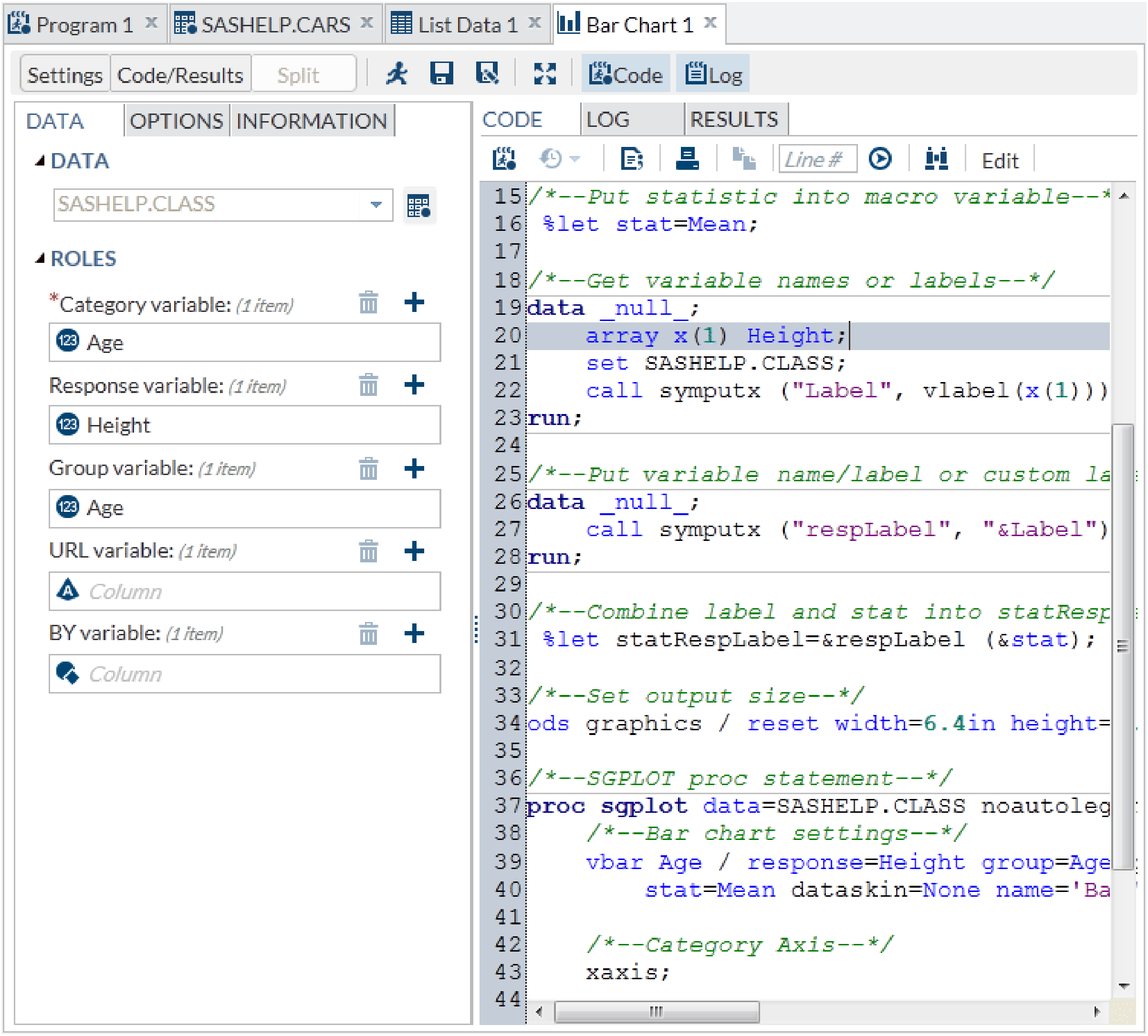
Customizing the Navigation Pane

By default, all six sections of the navigation pane are displayed when you open SAS Studio. To customize which sections are displayed, click and select **View**. Select or clear any sections that you want to add or remove. The navigation pane is updated immediately.

Using the Work Area

About Using the Work Area

The work area is the main portion of the SAS Studio application for accessing programs and tasks and for viewing data. The work area is always displayed and cannot be minimized. When you open a program, task, or table, the windows open as new tabs in the work area. The code, log, and results that are associated with programs and tasks are grouped together under the main tab for the program or task.



Customizing the Work Area

By default, the work area is displayed beside the navigation pane, but you can use the options menu to maximize the work area and hide the navigation pane. You can also close all of the tabs in the work area at once.

To maximize the work area, click and select **Maximize View**.

Note: To reopen the navigation pane, click and select **Exit Maximized View**.

To close all tabs that are open in the work area, click and select **Close All Tabs**. You are prompted to save any unsaved programs or tasks.

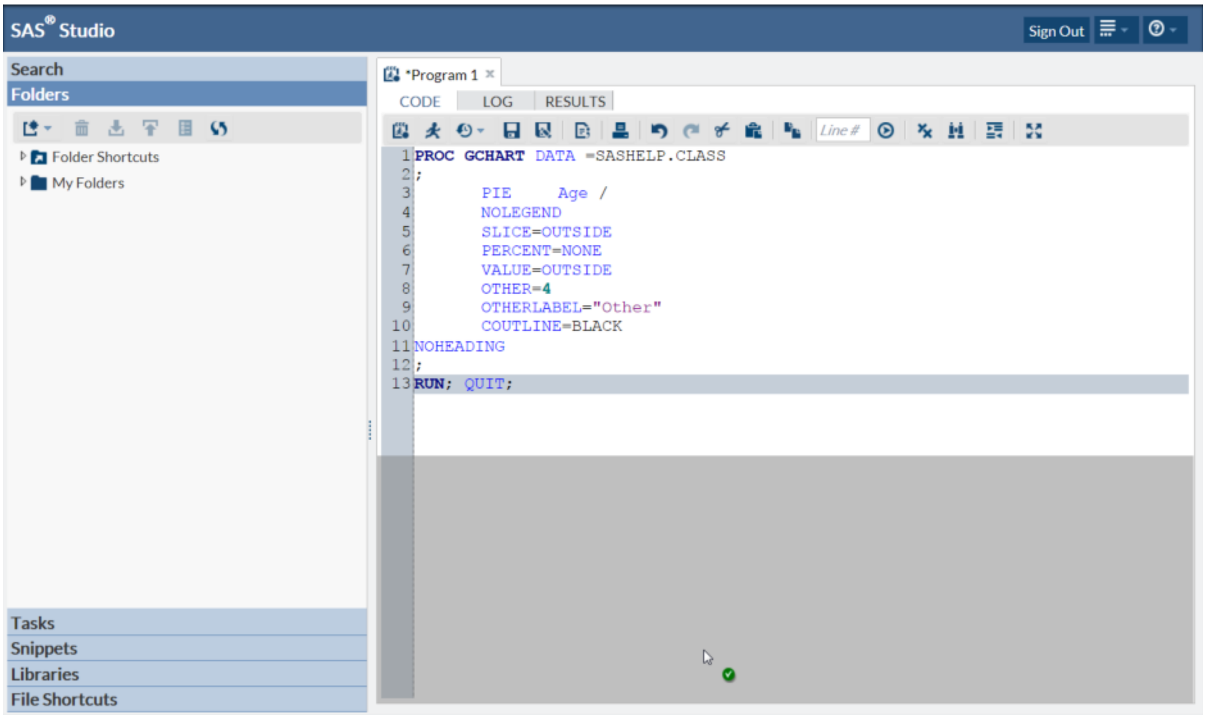
Customizing the View of the Program Tab

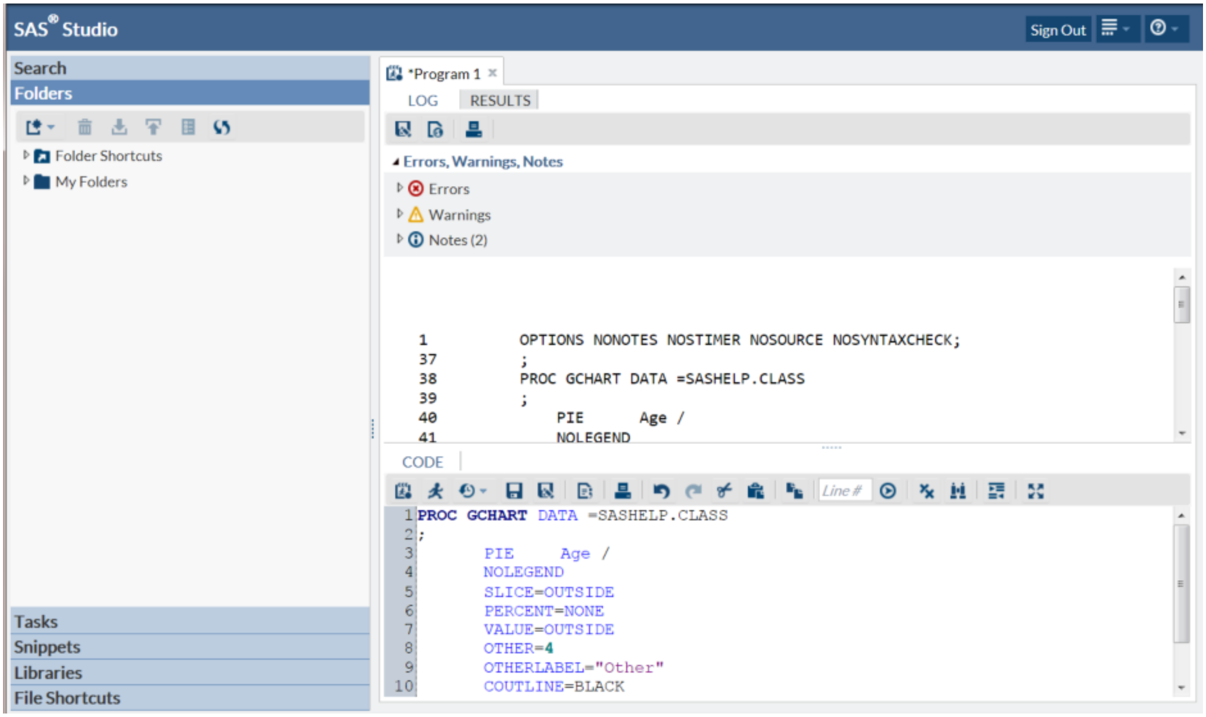
On the **Program** tab, you can rearrange the tabs by using a drag-and-drop operation to move them to the left or right. You can also dock a tab on the right side or bottom of the work area to view more than one tab at a time.

To rearrange a tab:

1 Select the tab that you want to move.

2 Move the tab icon to the location where you want to view this content. The icon indicates a valid location.





Setting General Preferences

The Preferences window enables you to change several options that affect SAS Studio.

To access the general options, click and select **Preferences**. Click **General**.

Option	Description
Show generated code in the SAS log	displays the ODS statements, %LET statements, and any other code that is automatically generated by SAS in the log file. This option applies to both SAS tasks and SAS program files.
Include a Show Details button in error messages	adds a Show Details button to any error messages that SAS Studio generates.
Time-out interval: (hours)	specifies the amount of time that SAS Studio allows you to be logged on without any activity. The default value is one hour.

Option	Description
Start new programs in interactive mode	opens new programs with the interactive mode on. This option is available only if you are running the first maintenance release for SAS 9.4. For more information, see “Working in Interactive Mode” on page 23.

Changing Your SAS Workspace Server

If you have access to more than one SAS workspace server, you can change the server that SAS Studio connects to. To change the server, click and select **Change SAS Workspace Server**. Select the server that you want to use. When you change servers, any libraries and file shortcuts that you created are deleted. For more information, see *SAS Studio 3.1: Administrator's Guide*.

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Working with Programs

About the Code Editor

SAS Studio includes a color-coded, syntax-checking editor for editing new or existing SAS programs. The editor includes a wide variety of features such as autocomplete, automatic formatting, and pop-up syntax help. With the code editor, you can write, run, and save SAS programs. You can also modify and save the code that is automatically generated when you run a task.

SAS Studio also includes several sample code snippets that you can use to make programming common tasks easier.

Opening and Creating Programs

Opening a Program

You can open SAS programs from the Folders section of the navigation pane. To open a program, expand the appropriate folder and double-click the program that you want to open, or drag it into the work area. The program opens in a new tab in the work area.

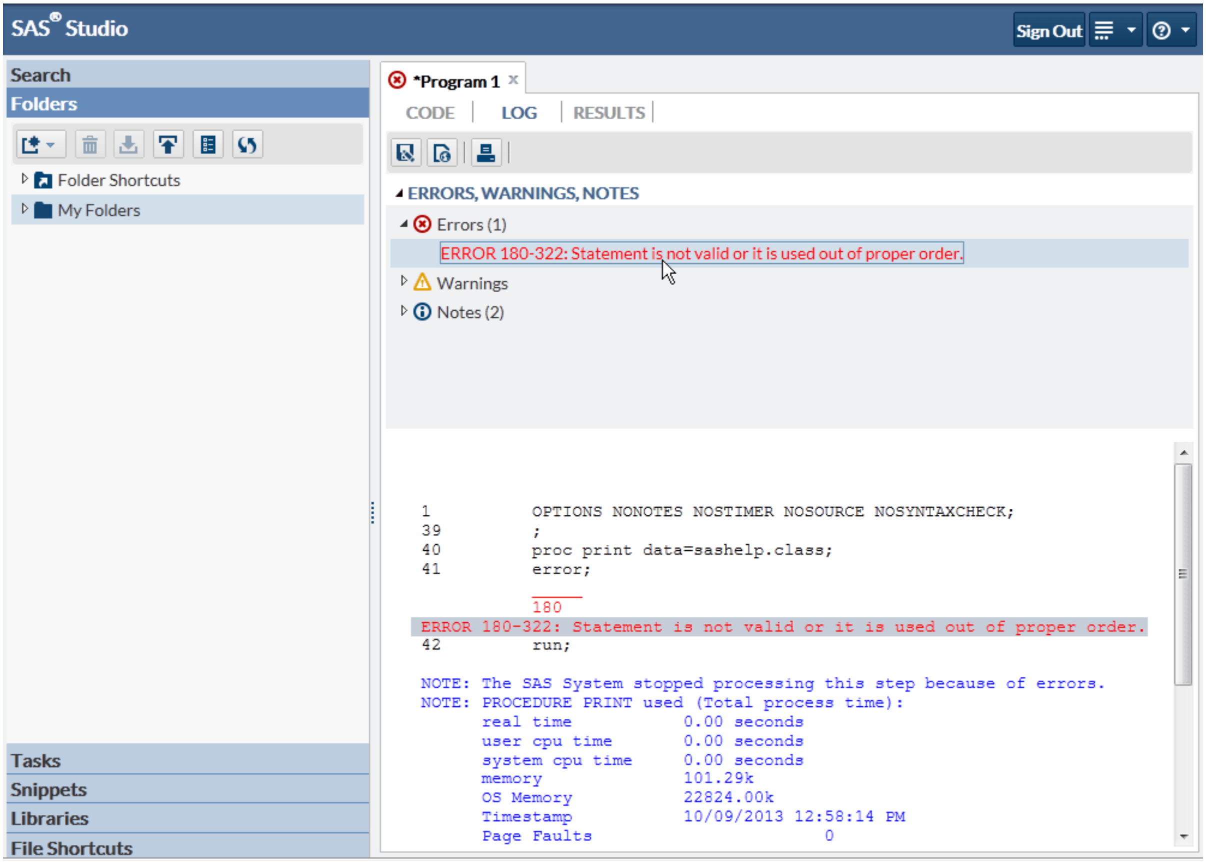
Creating a New Program

You can create a new SAS program from the Folders section of the navigation pane. To create a new program, click and select **SAS Program**. A program window appears in a new tab in the work area.

Note: You can also click on the toolbar in a program window.

Running a Program

After you have written your program, you can run it by clicking . If there are no errors, the results open automatically. If there are errors, the **Log** tab opens by default. You can expand the **Errors**, **Warnings,** and **Notes** sections to view the messages. When you click on a message, SAS Studio highlights it for you in the log so that you can see exactly where the message occurs in the log.



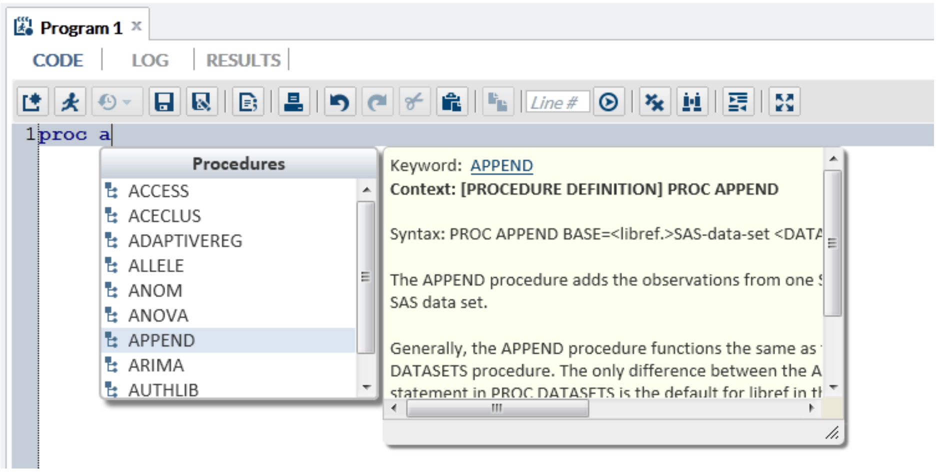
Using the Autocomplete Feature

About the Autocomplete Feature

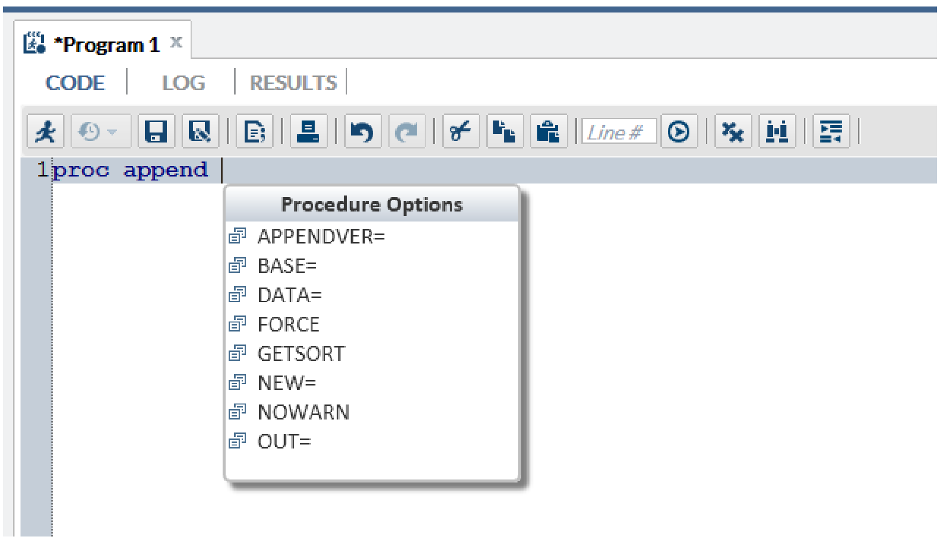
The autocomplete, or code completion, feature in the code editor can predict the next word that you want to enter before you actually enter it completely. The autocomplete feature can complete keywords that are associated with SAS procedures, statements, macros, functions, CALL routines, formats, informats, macro variables, SAS colors, style elements, style attributes, and statistics keywords, and various SAS statement and procedure options.

Note: The autocomplete feature is available only for editing SAS programs.

This example shows the keywords and help that appear when you enter `proc a` in the code editor.



In this example, you select **APPEND** from the list of procedures, so that `proc append` appears in the code editor. When you enter a space, the code editor displays a list of options for the APPEND procedure.



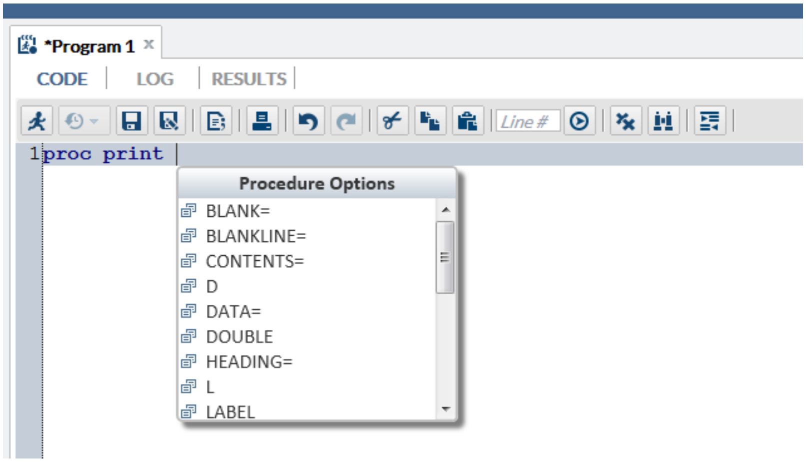
How to Use the Autocomplete Feature

To use the autocomplete feature:

1 How you open the autocomplete list depends on the keyword that you want to add.

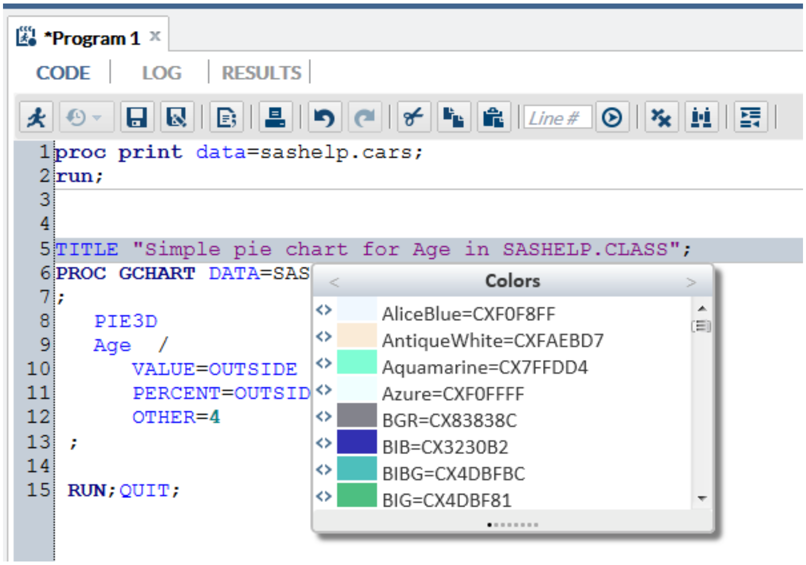
- If you want to add a global statement, DATA step statement, CALL routine, procedure, macro statement, or automatic macro variable, enter the first one or more letters of the keyword that you want to use.

  A window opens with a list of suggested keywords that begin with those letters.



- If you want to specify colors, formats, informats, macro functions, SAS functions, statistics keywords, style elements, or style attributes, position your mouse pointer in a comment and press Ctrl+spacebar. To navigate through the list of options backward, press Ctrl+Shift+spacebar.

  Note: These shortcuts work even if you have deselected the **Enable autocomplete** option in the Preferences window. For more information, see “Customizing the Code Editor” on page 30.



2 You can navigate to the keyword that you want to use in several ways:

- Continue to type until the correct keyword is selected (because the matching improves as you type).
- Scroll through the list by using the up and down arrow keys, the Page Up and Page Down keys, or your mouse.

3 You can add the keyword to your program by double-clicking the selected keyword or by pressing the Enter key.

Using the Syntax Help

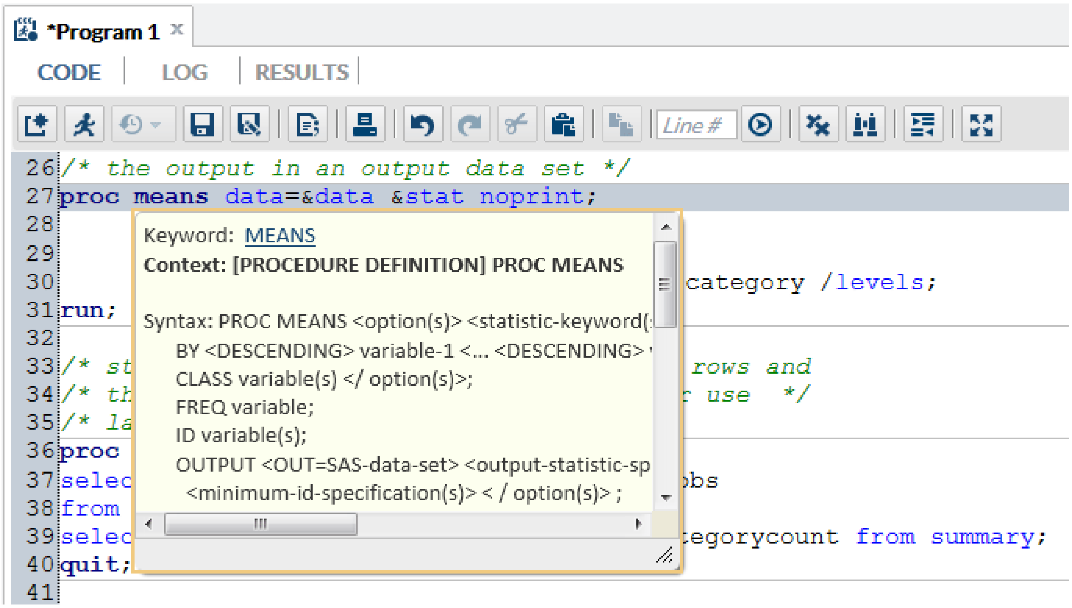
The code editor displays brief SAS syntax documentation as you write and edit your programs. You can display the Help in the following ways:

- Right-click a keyword in your program and select **Syntax Help**.
- Start typing a valid SAS keyword, and then click a suggested keyword in the autocomplete window.

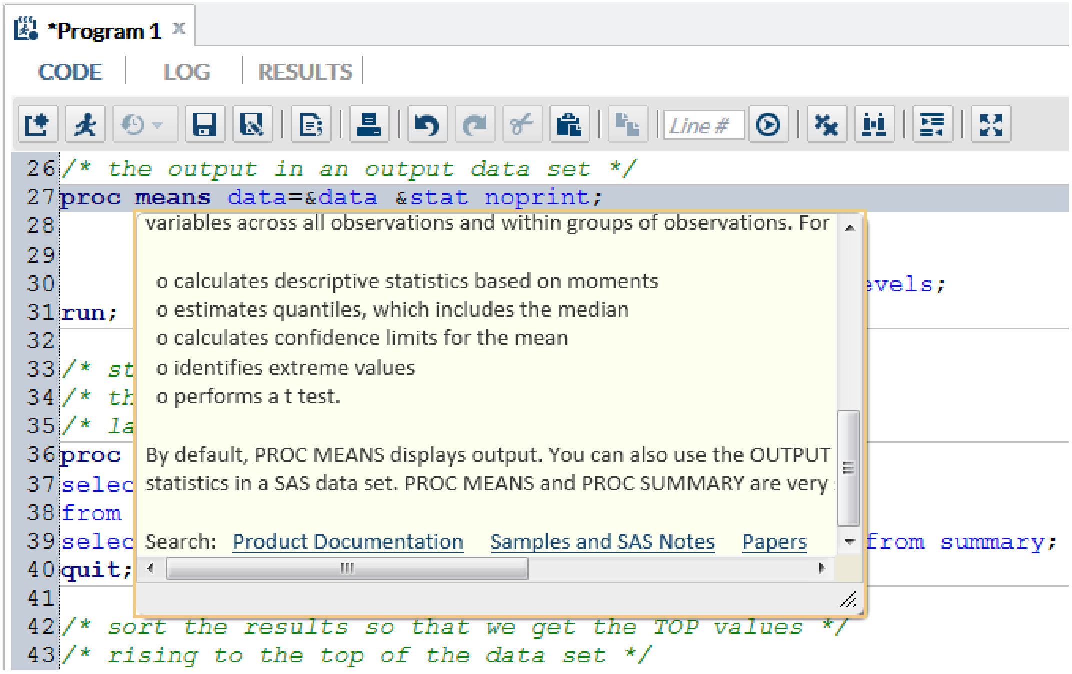
- Position the mouse pointer over a valid SAS keyword in your program. This works only if you have selected the **Enable hint** option in the Editor preferences. For more information, see "Customizing the Code Editor" on page 30.

The SAS Product Documentation provides more comprehensive usage information about the SAS language, but the syntax help in the code editor can get you started with a hint about the syntax or a brief description of the keyword. You can get additional help by clicking links in the syntax help window as follows:

- Click the keyword link at the top of the window to search the support.sas.com website for the keyword.

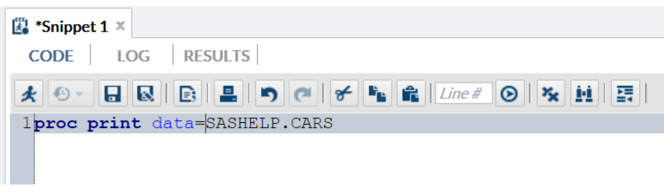


- Click the links at the bottom of the window to search for the keyword in the SAS Product Documentation, Samples and SAS Notes, and SAS Technical Papers.



Adding Table Names and Column Names

From the Libraries section of the navigation pane, you can use a drag-and-drop operation to move table names and column names into the SAS code. For example, you can move the Sashelp.Cars table into the DATA option for the PRINT procedure. When you release the mouse, the fully qualified name for the table appears in your code.



Editing the Code from a Task

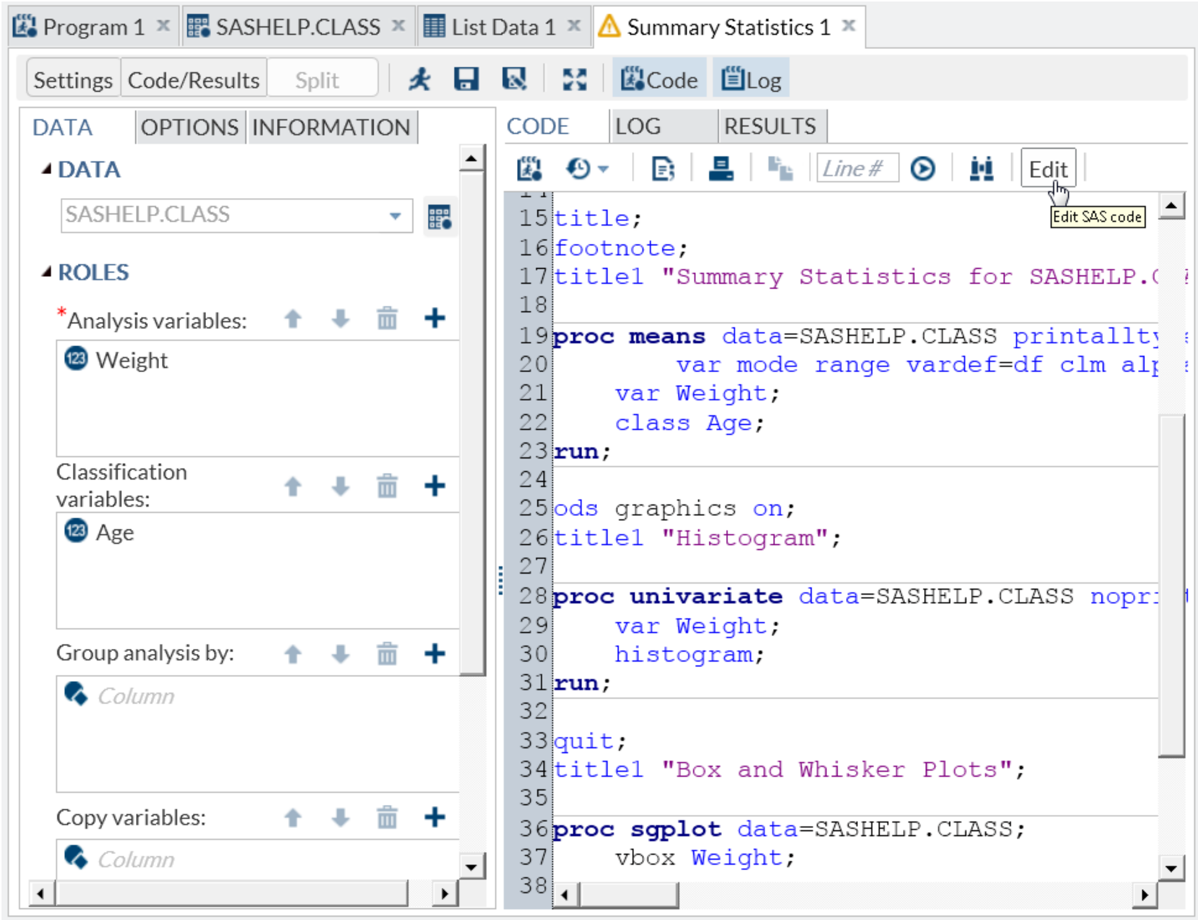
You can edit the code that is generated automatically when you run a task and then run it with your modifications. When you edit the code, SAS Studio opens it in a separate program window. The code is no longer associated with the original task.

To edit a program generated by a task:

1. On the appropriate task tab in the work area, click **Code** to display the code that is associated with the task.

   Note: In order to edit the code that is associated with a task, you must first display the code with the task. If the task code is not displayed, click and select **Preferences**. Click **Tasks**, and then select **Show Task Code**.

2. On the toolbar, click **Edit**. The code is opened in a new program window.



Using Your Submission History

SAS Studio maintains a log with entries for each time you run a program or task. You can use this log, or submission history, to access prior versions of your submitted code. To view your submission history, click the **Code** tab in your program or task window. On the toolbar, click and select the version that you want to open. The prior version of the program opens in a new window from which you can copy and paste the code as needed.

Note: The submission history is cleared when you sign off from SAS Studio.

Automatically Formatting Your SAS Code

You can use the code editor to make your programs easier to read by automatically formatting your code. When you automatically format your code, line breaks are added, and each line is correctly indented according to its nesting level. To format the code in the code editor, click .

For example, the following code is difficult to read because it lacks indention and logical line breaks:

```
data topn;
length rank 8; label rank="Rank";
set topn; by &category descending &measure;
if first.&category then rank=0; rank+1;
if rank le &n then output;
run;
```

After you use the automatic code-formatting feature, the program looks like this:

```
data topn;
    length rank 8;
    label rank="Rank";
    set topn;
    by &category descending &measure;

    if first.&category then
        rank=0;
    rank+1;

    if rank le &n then
        output;
run;
```

Working in Interactive Mode

Some SAS procedures are interactive, which means they remain active until you submit a QUIT statement, or until you submit a new PROC or DATA step. In SAS Studio, you can use the code editor to run these procedures, as well as other SAS procedures, in interactive mode.

By using interactive mode, you can run selected lines of code from your SAS program and use the results to determine your next steps. For example, the OPTMODEL procedure in SAS/OR enables you to model and solve mathematical programming models. By running this procedure interactively, you can quickly check results for parts of the program and determine whether you need to make any modifications without running the entire program.

To run a program in interactive mode, click on the toolbar. To turn off interactive mode, click again. If you change modes while a program is open, the log and results for that program are cleared.

Note: Interactive mode is available only if you are running the first maintenance release for SAS 9.4.

When you run a program in interactive mode, SAS Studio does not add any automatically generated code, such as ODS and %LET statements, to your program. In addition, results are generated only in HTML. In interactive mode, the log and results are appended to the existing log and results. Previously submitted code remains active until you terminate it.

For example, suppose you have the following program:

```
proc sql;
  select * from sashelp.cars;

  select * from sashelp.class;
  quit;
```

In noninteractive mode, if you select the first two lines of code and submit them, the code runs successfully. If you then select the last two lines of code and submit them, the code fails because the PROC SQL statement is missing.

If you switch to interactive mode and follow the same steps, the last two lines of code run successfully because the PROC SQL statement is still active.

Note: For documentation about specific procedures, see the SAS Programmer's Bookshelf on support.sas.com.

Working with Code Snippets

Why Use Code Snippets?

Code snippets enable you to quickly insert SAS code into your program and customize it to meet your needs. SAS Studio is shipped with several code snippets. You can also create your own snippets and add snippets to your list of favorites.

Snippet Name	Description
Data	
Import CSV File	The Import CSV File snippet enables you to import a comma-separated file and write the output to a SAS data set.
Import XLS File	The Import XLS File snippet enables you to import a Microsoft XLS file and write the output to a SAS data set.
DS2 Package	The DS2 Package snippet provides a template for a DS2 package. A package is similar to a DS2 program. The package body consists of a set of global declarations and a list of methods. The main syntactical differences are the PACKAGE and ENDPACKAGE statements. These statements define a block with global scope. For more information, see *SAS DS2 Language Reference*.

Snippet Name	Description
DS2 Code	The DS2 Code snippet provides a template for a DS2 program. DS2 is a SAS programming language that is appropriate for advanced data manipulation. DS2 is included with Base SAS and shares core features with the SAS DATA step. DS2 exceeds the DATA step by adding variable scoping, user-defined methods, ANSI SQL data types, and user-defined packages. The DS2 SET statement accepts embedded FedSQL syntax, and the run-time-generated queries can exchange data interactively between DS2 and any supported database. This allows SQL preprocessing of input tables, which effectively combines the power of the two languages. For more information, see *SAS DS2 Language Reference*.
DS2 Thread	The DS2 Thread snippet provides a template for a DS2 threaded program. Typically, DS2 code runs sequentially. That is, one process runs to completion before the next process begins. It is possible to run more than one process concurrently, using threaded processing. In threaded processing, each concurrently executing section of code is said to be running in a thread. For more information, see *SAS DS2 Language Reference*.
Generate CSV File	The Generate CSV File snippet enables you to export SAS data as a comma-separated text file.
Generate PowerPoint Slide	The Generate PowerPoint Slide snippet enables you to stream Microsoft PowerPoint output to your web browser.
Generate XML File	The Generate XML File snippet enables you to export SAS data as an XML file that you can view in your web browser.
Simulate Linear Regression Data	The Simulate Linear Regression Data snippet creates an input data source that you can use for linear regression analysis. Linear regression analysis tries to assign a linear function to your data by using the least squares method.
Simulate One-Way ANOVA Data	The Simulate One-Way ANOVA Data snippet creates an input data source that considers one treatment factor with three treatment levels. When you analyze this data by using the One-Way ANOVA task, the goal is to test for differences among the means of the levels and to quantify these differences.

Snippet Name	Description
Descriptive	
PROC SQL	The PROC SQL snippet provides a template for writing SQL queries. For more information, see *SAS SQL Procedure User's Guide*.
Custom ODS Output	The Custom ODS Output snippet provides a template for creating HTML, PDF, and RTF output by using the SAS Output Delivery System. For more information, see *SAS Output Delivery System: User's Guide*.
Graph **Note:** For more information about the SGPLOT, SGPANEL, and SGSCATTER procedures, see *SAS ODS Graphics: Procedures Guide*.	
Bar Panel	The Bar Panel snippet uses the VBAR statement in the SGPANEL procedure and enables you to create multiple bar charts.
Box Panel	The Box Panel snippet uses the VBOX statement in the SGPANEL procedure and enables you to create multiple box plots.
Comparative Scatter Plot	The Comparative Scatter Plot snippet uses the COMPARE statement in the SGSCATTER procedure. This code snippet creates a comparative panel of scatter plots with shared axes.
Dot Plot	The Dot Plot snippet uses the DOT statement in the SGPLOT procedure. Dot plots summarize horizontally the values of a category variable. By default, each dot represents the frequency for each value of the category variable.
Fit Plot	The Fit Plot snippet uses the REG statement in the SGPLOT procedure. This code snippet produces a regression plot with a quadratic fit and includes confidence limits.

Snippet Name	Description
HBar Plot	The HBar Plot snippet uses the HBAR statement in the SGPLOT procedure. This code snippet creates a horizontal bar chart that summarizes the values of a category variable.
HighLow Plot	The HighLow Plot snippet uses the HIGHLOW statement in the SGPLOT procedure. High-low charts show how several values of one variable relate to one value of another variable. Typically, each variable value on the horizontal axis has several corresponding values on the vertical axis.
Histogram Plot	The Histogram Plot snippet uses the HISTOGRAM statement in the SGPLOT procedure. This code snippet produces a histogram with two density plots. In this snippet, one density plot uses a normal density estimate and the other density plot uses a kernel density estimate.
Scatter Plot Matrix	The Scatter Plot Matrix snippet uses the MATRIX statement in the SGSCATTER procedure. This code snippet creates a scatter plot matrix.
VBox Plot	The VBox Plot snippet uses the VBOX statement in the SGPLOT procedure. A box plot summarizes the data and indicates the median, upper and lower quartiles, and minimum and maximum values. The plot provides a quick visual summary that easily shows center, spread, range, and any outliers. The SGPLOT and the SGPANEL procedures have separate statements for creating horizontal and vertical box plots.
Macro	
SAS Macro	The SAS Macro snippet provides a template for creating a SAS macro program. For more information, see *SAS Macro Language: Reference*.
IML	
Find Roots of Nonlinear Equation	The Find Roots of Nonlinear Equation snippet enables you to find the roots of a function of one variable. Finding the root (or zero) of a function enables you to solve nonlinear equations.

Snippet Name	Description
Integrate a Function	The Integrate a Function snippet enables you to numerically integrate a one-dimensional function by using the QUAD subroutine in SAS/IML software. Use the QUAD subroutine to numerically find the definite integral of a function on a finite, semi-infinite, or infinite domain.
Generate a Bootstrap Distribution	The Generate a Bootstrap Distribution snippet uses the IML procedure to create and analyze a bootstrap distribution of the sample mean.
Fit by using Maximum Likelihood	The Fit by using Maximum Likelihood snippet uses maximum likelihood estimation to estimate parameters for the normal density estimate.
Simulate Multivariate Normal Data	The Simulate Multivariate Normal Data snippet simulates data from a multivariate normal distribution with a specified mean and covariance.

To add a snippet to your list of favorites, select the snippet name and click .

Create a Code Snippet

To create your own snippet:

1 Open your .sas file in SAS Studio and select the code that you want to save as a snippet.

2 On the **Code** tab, click . The Add to My Snippets dialog box appears.

3 Enter a name for the snippet and click **Save**.

This snippet is now available from the **My Snippets** folder.

How to Insert a Code Snippet

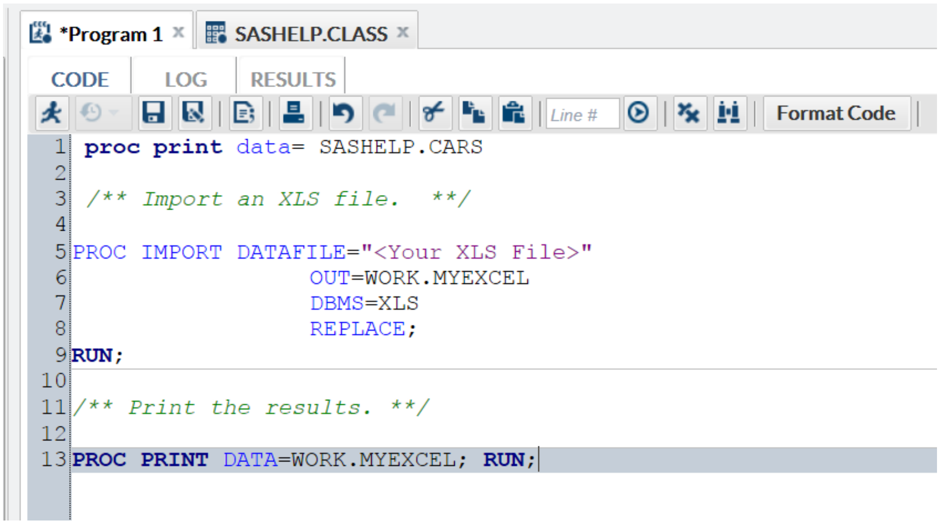
To include a code snippet in your program:

1 Click the location in your program where you want to insert the snippet.

2 In the navigation pane, open the **Snippets** section.

3 You can add the snippet to your program in these ways:

- use a drag-and-drop operation to move the snippet.
- double-click the name of the snippet.
- right-click the name of the snippet and select **Insert**. To select multiple snippets, use the Ctrl key. Then right-click and select **Insert**.



Customizing the Code Editor

The **Preferences** window enables you to change several options that affect the features in the code editor, including autocomplete and color coding.

To access the editor options, click ☰ and select **Preferences**. Click **Editor**.

Option	Description
Enable autocomplete	turns on the autocomplete feature of the code editor. This feature can predict the next keyword that you want to type before you actually type it completely. For more information, see "Using the Autocomplete Feature" on page 15.
Enable hint	displays the syntax help window when you position the mouse pointer over a valid SAS keyword in your program. If this option is not selected, then you can view the syntax help by right-clicking a keyword and selecting **Syntax Help**. This option is not selected by default.
Tab width	displays the number of spaces that are inserted into your text when you insert a tab character. The default value is four spaces for each tab character.
Substitute spaces for tabs	inserts the number of spaces listed in the **Tab width** box instead of a single tab character. This option applies to both text that you type in the code editor and text that you paste into the code editor. **Note:** In Microsoft Internet Explorer and Apple Safari, spaces are used instead of Tab characters. If you are using those browsers, you must select the **Substitute spaces for tabs** check box in order for the value of the tab width to be used.
Enable color coding	displays the text in the code editor in different colors to help you identify different elements in the syntax.
Show line numbers	displays line numbers in the leftmost column of the program and log windows.

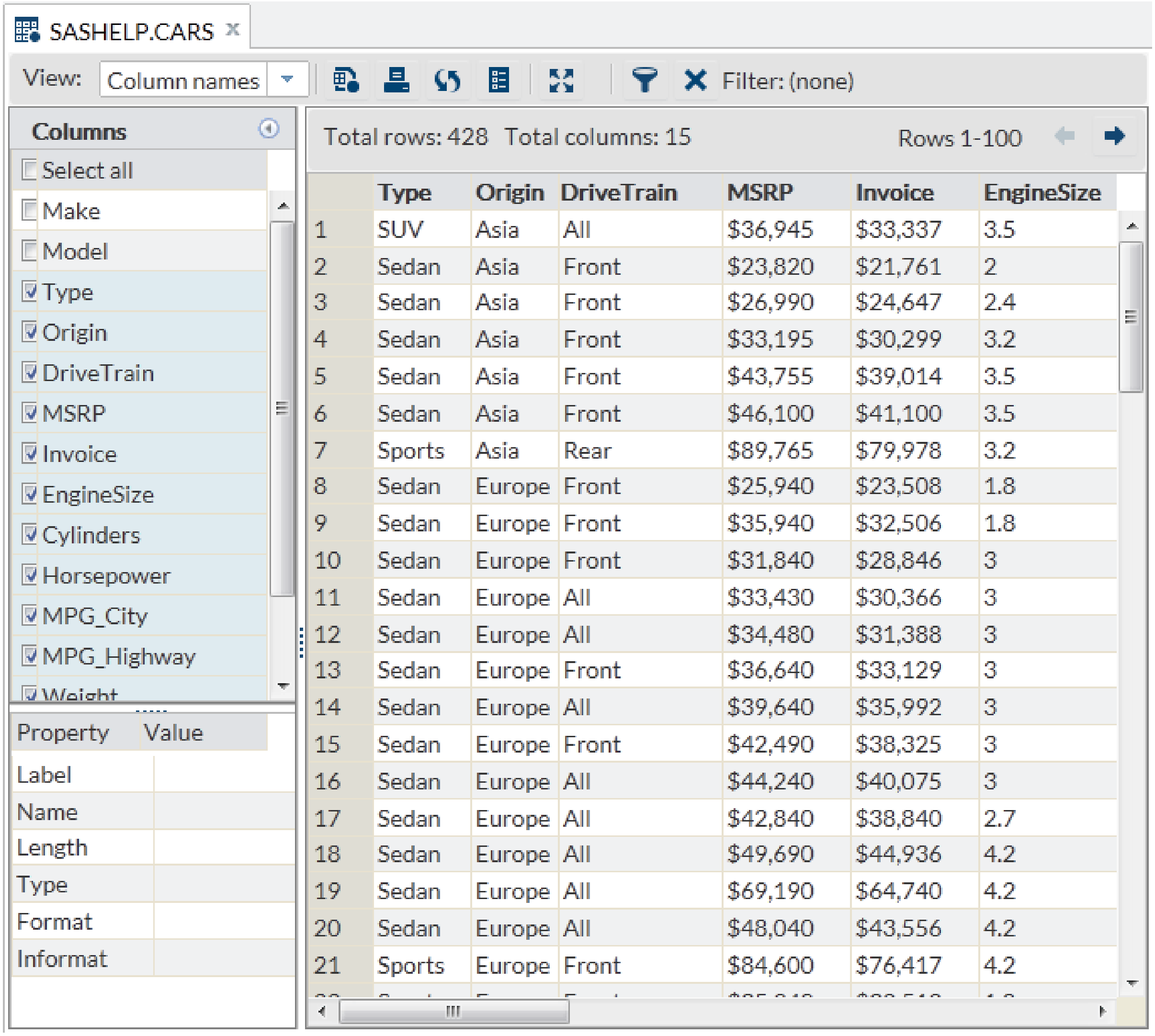
Option	Description
Font size	specifies the font size of the text in the code editor and log window.

3

Working with Data

About the Table Viewer

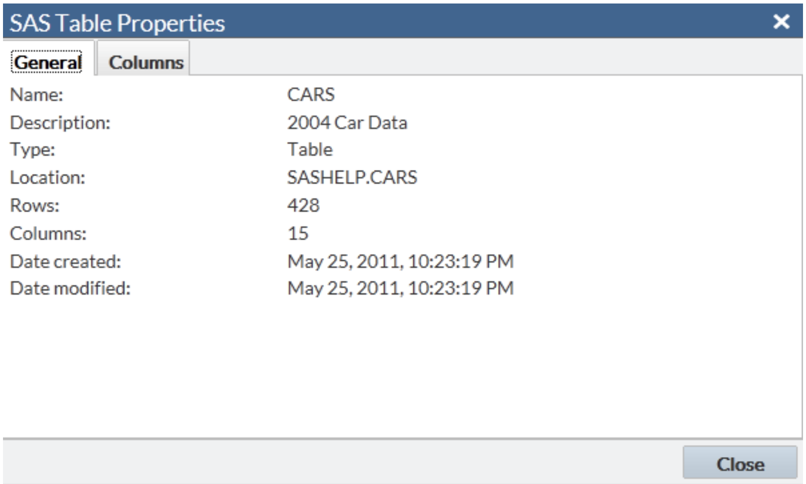
When you open a table in SAS Studio, you use the table viewer.

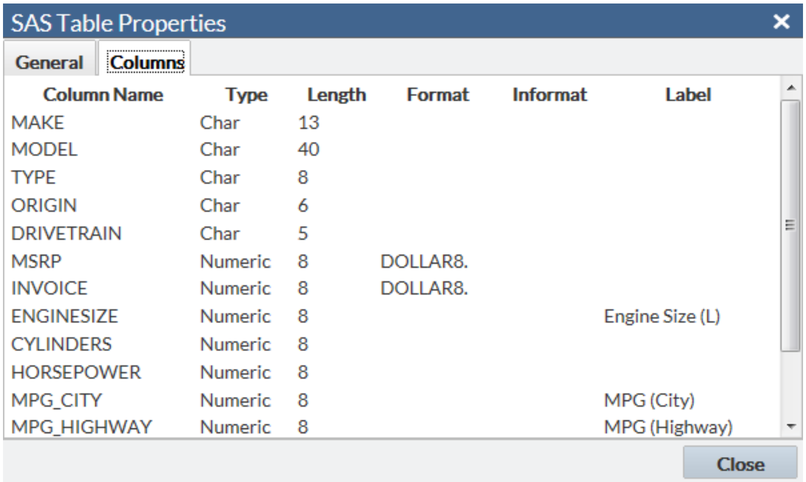


	Type	Origin	DriveTrain	MSRP	Invoice	EngineSize
1	SUV	Asia	All	$36,945	$33,337	3.5
2	Sedan	Asia	Front	$23,820	$21,761	2
3	Sedan	Asia	Front	$26,990	$24,647	2.4
4	Sedan	Asia	Front	$33,195	$30,299	3.2
5	Sedan	Asia	Front	$43,755	$39,014	3.5
6	Sedan	Asia	Front	$46,100	$41,100	3.5
7	Sports	Asia	Rear	$89,765	$79,978	3.2
8	Sedan	Europe	Front	$25,940	$23,508	1.8
9	Sedan	Europe	Front	$35,940	$32,506	1.8
10	Sedan	Europe	Front	$31,840	$28,846	3
11	Sedan	Europe	All	$33,430	$30,366	3
12	Sedan	Europe	All	$34,480	$31,388	3
13	Sedan	Europe	Front	$36,640	$33,129	3
14	Sedan	Europe	All	$39,640	$35,992	3
15	Sedan	Europe	Front	$42,490	$38,325	3
16	Sedan	Europe	All	$44,240	$40,075	3
17	Sedan	Europe	All	$42,840	$38,840	2.7
18	Sedan	Europe	All	$49,690	$44,936	4.2
19	Sedan	Europe	All	$69,190	$64,740	4.2
20	Sedan	Europe	All	$48,040	$43,556	4.2
21	Sports	Europe	Front	$84,600	$76,417	4.2

Note: The table viewer displays the first 100 rows of the table. If the structure or data values of the table change while the table is open, you must refresh the table viewer to see the changes. If the structure of the table changes and you do not refresh the table, the columns that are listed in the **Libraries** section of the navigation pane might be different from the columns that are displayed in the table viewer.

You can view the properties of the table and its columns by clicking on the toolbar.





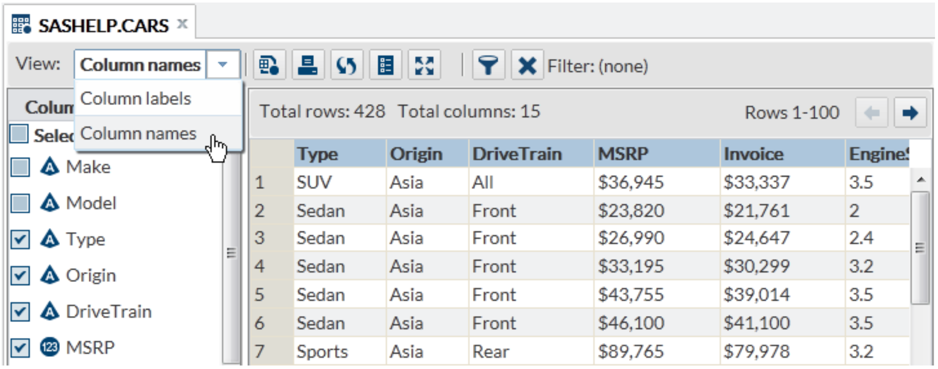
Opening and Viewing Data

You can open files in SAS Studio in several ways:

- You can double-click a file in the **Folders** and **Libraries** sections.
- You can drag a file from the **Folders** and **Libraries** sections to the work area.
- You can search for a file in the **Search** section and open it from the search results. You can open the file by double-clicking it or by dragging it to the work area.

- You can open a file by using a file shortcut in the **File Shortcuts** section. You can open the file by double-clicking it or by dragging it to the work area.

When you open a table, all of the columns in the table are displayed. You can use the Columns area to specify which columns you want to include in the table viewer. By default, the column names are displayed, but you can choose to display the column labels by selecting **Column labels** from the **View** drop-down list.

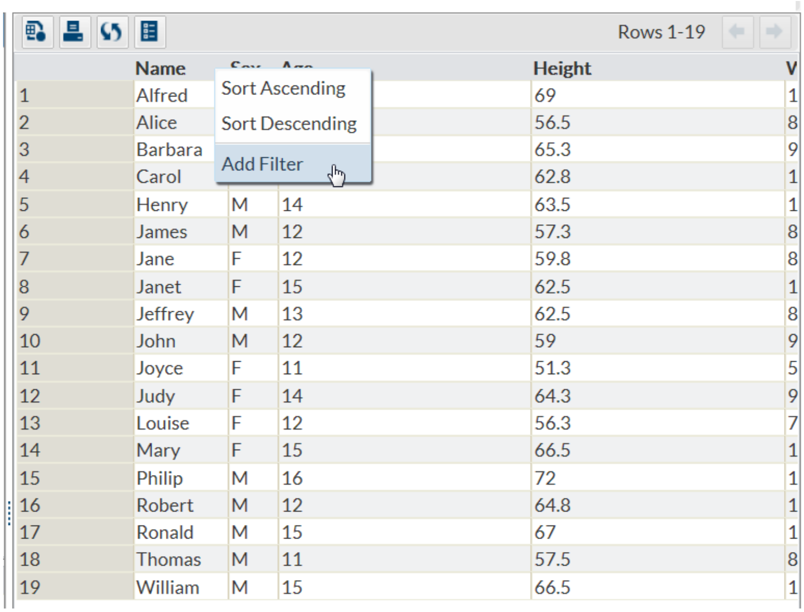


Viewing the Query Code That Is Used to Create a Table

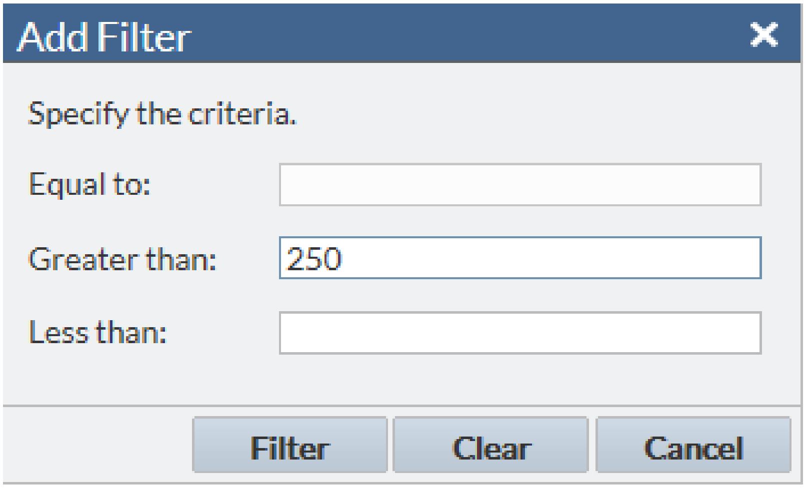
While you select options and customize the table to look the way you want it to, SAS Studio is generating SAS code that you can use. To view the query code, click on the toolbar. A new program window appears with the code that was used to create the view of the table in the table viewer. The program is a copy of the query code and is no longer associated with the original query. Editing the code does not affect the data that is displayed in the table viewer, and modifying the table viewer does not affect the contents of the code.

Filtering and Sorting Data

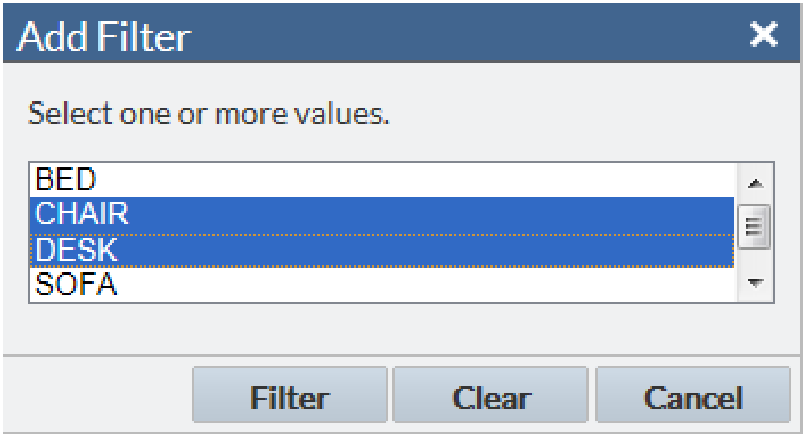
In the table viewer, you can right-click a column heading to filter and sort the data by that column.



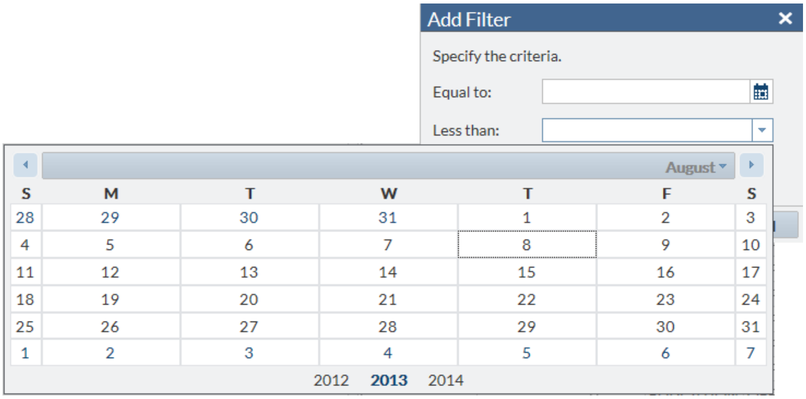
The filter options vary depending on the type of column that you have selected. The Add Filter window for a numeric column enables you to specify a single value for each criterion.



The Add Filter window for a character column enables you to select one or more values in the column.



The Add Filter window for a date column enables you to select a date value from a pop-up calendar window.



When you create a filter on your data, the filter criteria are displayed at the top of the workspace. You can click  to edit the filter and  to delete the filter.

Exporting Data

You can use SAS Studio to export your data as another file type to a folder that you specify.

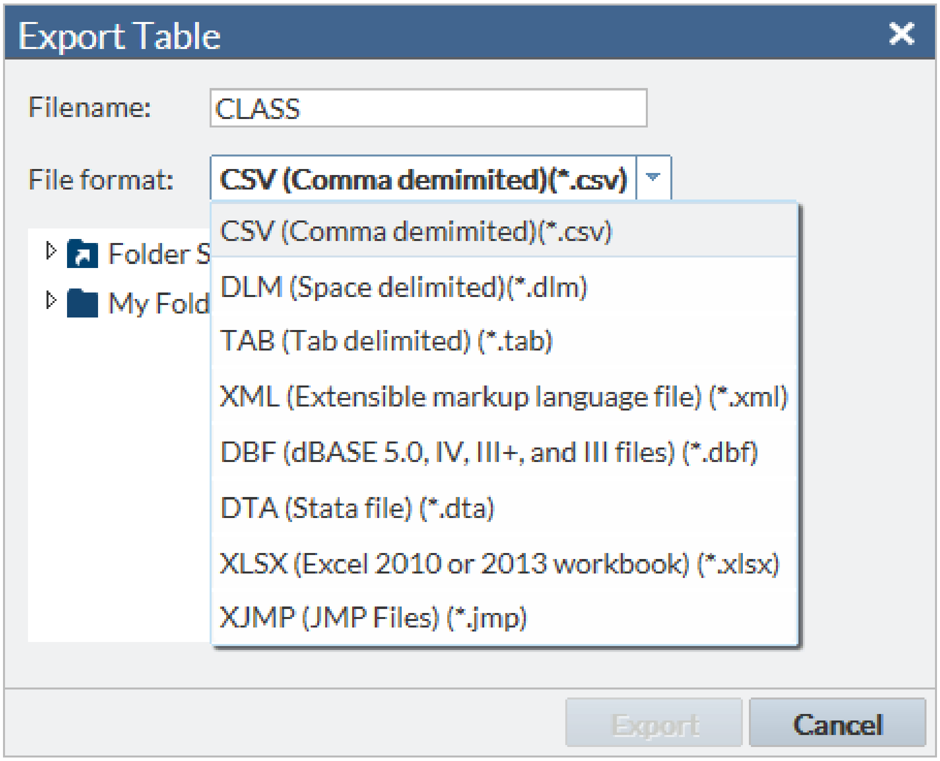
To export your data:

1 Click **Libraries** in the navigation pane and browse to find the file that you want to export.

2 Right-click the file that you want to export and select **Export**. The Export Table window appears.

3 In the **Filename** box, enter the name of the exported file.

4 From the **File format** drop-down list, select the format of the exported file.



5 Select the folder in which you want to save the exported file.

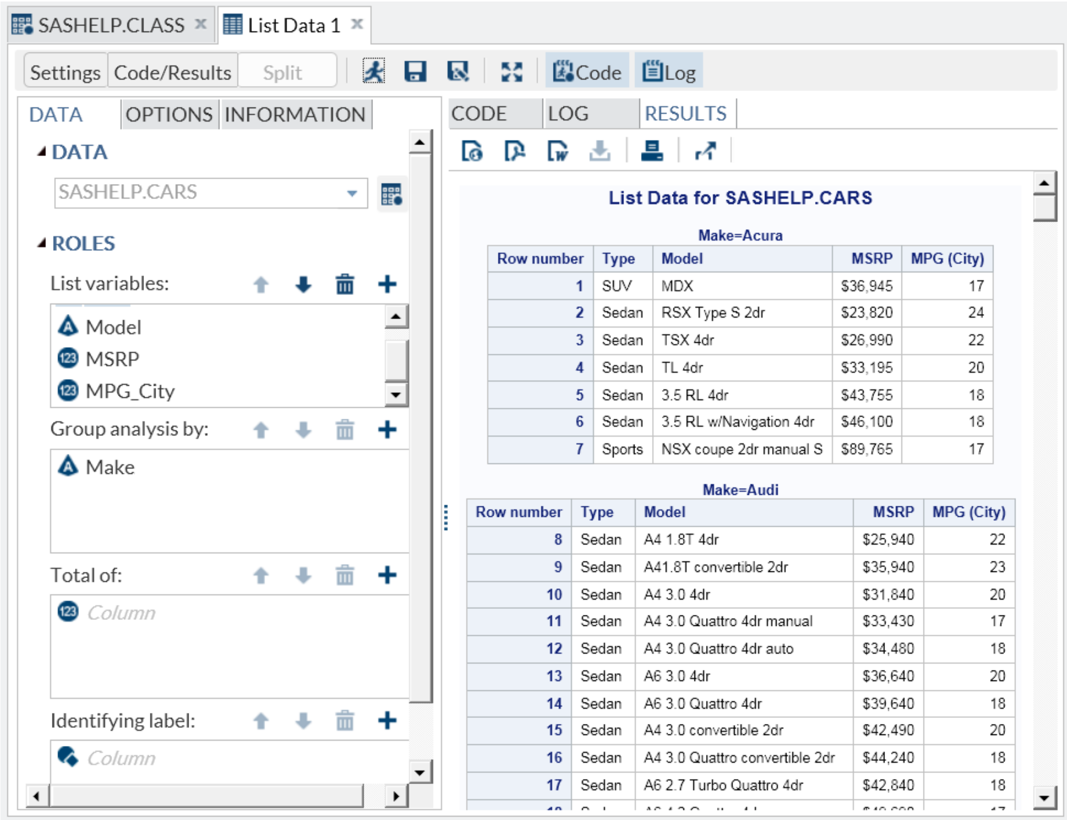
6 Click **Export** to export the file.

4

Working with Results

Viewing Results

When you run a task or a program in SAS Studio, the results are displayed in the work area. You can save the results as an HTML, PDF, or RTF file. You can also download any generated data.



About the SAS Output Delivery System

The SAS Output Delivery System (ODS) gives you greater flexibility in generating, storing, and reproducing SAS procedure and DATA step output along with a wide range of formatting options. ODS provides formatting functionality that is not available when using individual procedures or the DATA step without ODS.

SAS Studio uses very specific ODS options and the GOPTIONS statements so that the output is displayed properly in the web environment. To view all of the ODS options in your code, click and select **Preferences**. In the Preferences window, click **General** and select the **Show generated code in the SAS log** option.

Note: To ensure that your output is displayed properly, do not change the settings of the ODS options or GOPTIONS statements in the generated code.

About SAS ODS Statistical Graphics

About SAS ODS Statistical Graphics

SAS ODS Statistical Graphics, more commonly referred to as SAS ODS Graphics, is an extension of the SAS Output Delivery System (ODS). ODS manages all output that is created by procedures and enables you to display the output in a variety of forms, including HTML and PDF.

Many SAS analytical procedures use ODS Graphics functionality to produce graphs as automatically as these procedures produce tables. ODS Graphics uses the Graph Template Language (GTL) syntax, which provides the power and flexibility to create many complex graphs. The GTL is a comprehensive language for defining statistical graphics.

In SAS Studio, you can use the ODS Graphics Designer to define these statistical graphics without knowing the GTL. After a graph definition is created, you can use that graph definition to create an ODS statistical graph in SAS Studio.

SAS ODS Graphics Designer

What Is the SAS ODS Graphics Designer?

The SAS ODS Graphics Designer is an interactive graphical application that you can use to create and design custom graphs. The designer creates graphs that are based on the Graph Template Language (GTL), which is the same language that is used by SAS analytical procedures and SAS ODS Graphics procedures. The ODS Graphics Designer provides a graphical user interface so that you can design graphs easily without knowing the details of templates and the GTL.

Using point-and-click interaction, you can create simple or complex graphical views of data for analysis. The ODS Graphics Designer enables you to design sophisticated graphs by using a wide array of plot types. You can design multi-cell graphs, classification panels, and scatter plot matrices. Your graphs can have titles, footnotes, legends, and other graphics elements. You can save the results as an image for inclusion in a report or as an ODS Graphics Designer file (SGD) that you can later edit.

For more information, see *SAS ODS Graphics Designer: User's Guide*, which is available from `support.sas.com`.

How to Install the SAS ODS Graphics Designer

If you have SAS Foundation installed on your machine, the SAS ODS Graphics Designer is already available. For example, if you are using the single-user edition of SAS Studio, the SAS ODS Graphics Designer is already installed because you are running SAS Foundation and SAS Studio on the same machine.

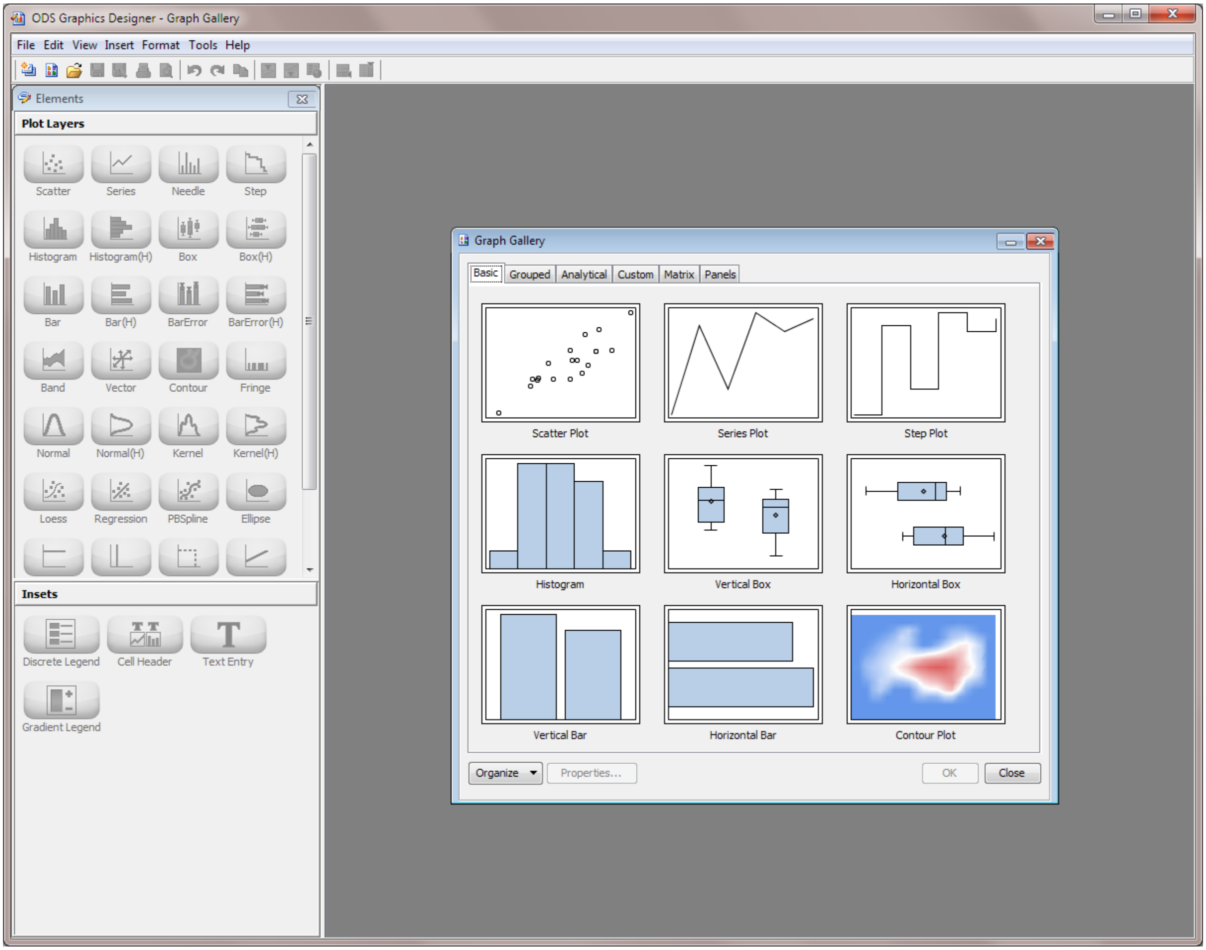
Note: The SAS ODS Graphics Designer is available only in the SAS Studio Single-User edition.

To install the SAS ODS Graphics Designer:

1. Click . Select **Tools** ▶ **Install ODS Graphics Designer**. The downloads and hot fixes page for Base SAS Software on `support.sas.com` opens.
2. Under the SAS 9.4M1 heading, click **SAS ODS Graphics Designer**.
3. From the list of download pages, click **Request download** for your Windows operating environment and follow the subsequent installation steps.

Open the SAS ODS Graphics Designer

After the SAS ODS Graphics Designer is installed, you can open it by using a menu option in SAS Studio. To open SAS ODS Graphics Designer, click and select **Tools**. Then select **ODS Graphics Designer**.



SAS ODS Graphics Editor

What Is the SAS ODS Graphics Editor?

The ODS Graphics Editor enables you to edit the various elements in the output graph while keeping the underlying data unchanged. In addition, you can annotate a graph by inserting text, lines, arrows, images, and other items in a layer above the graph. You can save the results of your customization as an ODS Graphics Editor (SGE) file and make incremental changes to the file. You can also save the results as a Portable Network Graphics (PNG) image file for inclusion in other documents.

For more information about the SAS ODS Graphics Editor, see *SAS ODS Graphics Editor: User's Guide*, which is available from **`support.sas.com`**.

How to Install the SAS ODS Graphics Editor

When you install the SAS ODS Graphics Editor, SAS Studio automatically creates the **`~/Projects/ODSEditorFiles`** directory.

Note: If you are running the single-user edition of SAS Studio, then the SAS ODS Graphics Editor is already installed.

To install the SAS ODS Graphics Editor:

1 Click . Select **Tools** ▶ **Install ODS Graphics Editor**. The downloads and hot fixes page for Base SAS Software on **`support.sas.com`** opens.

2 For your release of SAS, click **ODS Graphics Editor**. (For example, if you are running on SAS 9.4, select ODS Graphics Editor under the SAS 9.4 heading.)

3 From the list of download pages, click **Request download** for your Windows operating environment and follow the subsequent installation steps.

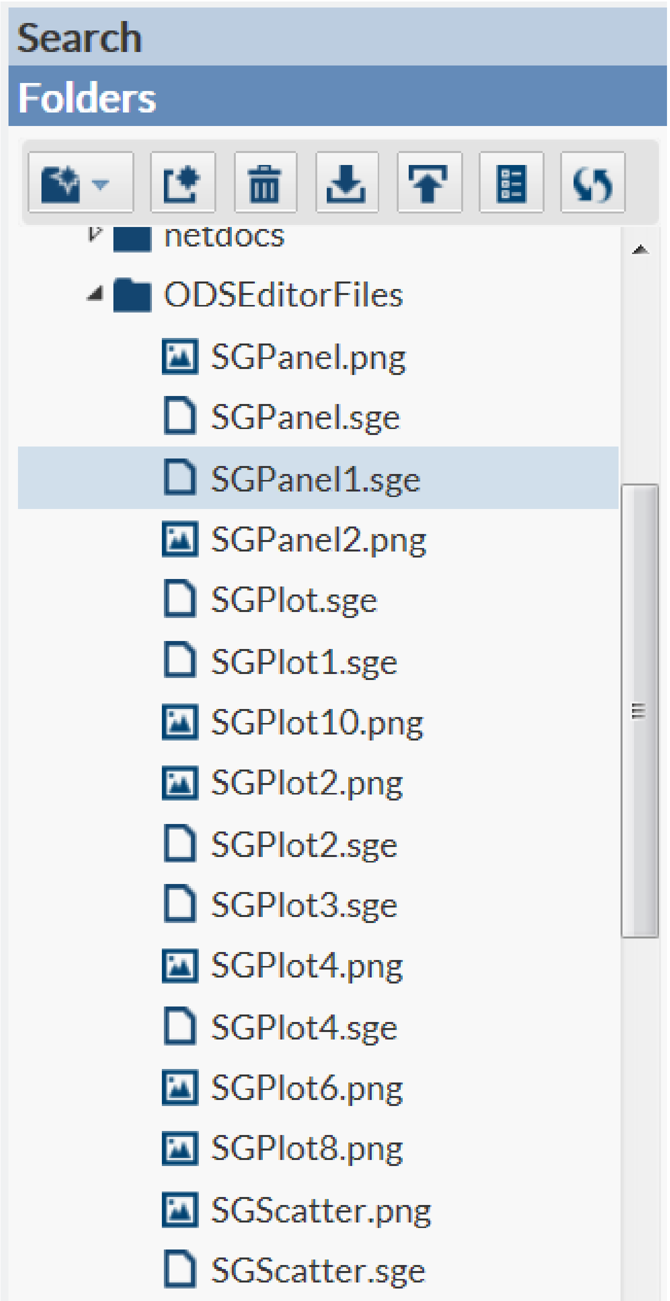
How to Edit Your Graphics Output

1 Include this statement in your SAS code so that you can edit your graphics output:

```
ods listing sge=on gpath="{home}/Projects/ODSEditorFiles";
```

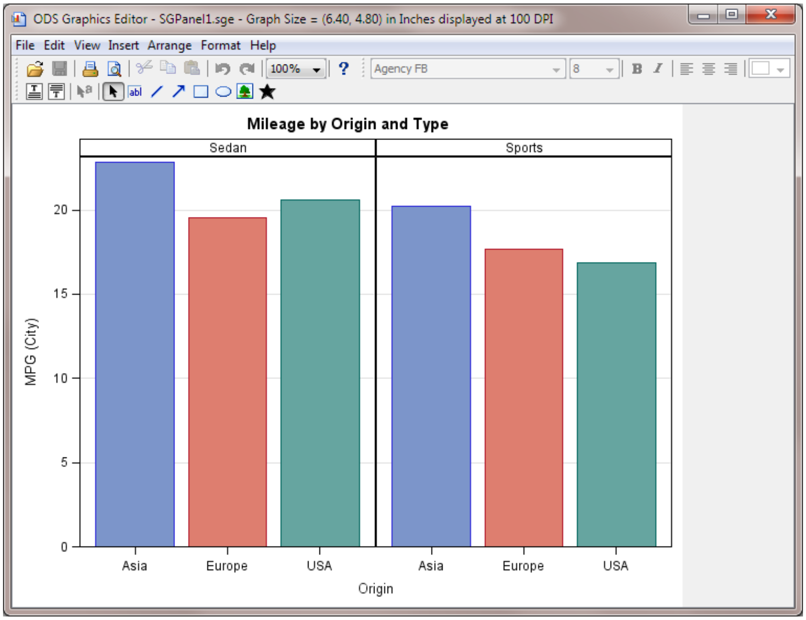
When you run this program, the graphical output is saved as an SGE file in your **`~/Projects/ODSEditorFiles`** directory.

2 In the **Folders** section of the navigation pane, expand the ODSEditorFiles folder.



3 Double-click the filename to open the graph in the SAS ODS Graphics Editor.

For example, here is the SGPanel1.sge file in the SAS ODS Graphics Editor.



Note: The default list of files in your ODSEditorFiles folder is created by the code snippets in the **Snippets** section. For more information, see "Working with Code Snippets" on page 25.

Specifying the Style for Your Results

The Preferenceswindow enables you to change several options that affect how your results are displayed.

To access the editor options, click and select **Preferences**. Click **Results**.

Option	Description
Display warning if results are larger than **n** MB	displays a warning message when you attempt to open a results file that is larger than **n** megabytes (MB). The default value is 4 MB.

Option	Description
HTML output style	displays the style that is applied to results in HTML. To change the style that is applied to the results, select another style from the drop-down list.
Produce PDF output	generates results in PDF format. This option is selected by default.
PDF output style	displays the style that is applied to results in PDF. To change the style that is applied to the results, select another style from the drop-down list.
Generate the default table of contents	automatically creates a table of contents in the PDF file.
Produce RTF output	generates results in RTF format. This option is selected by default.
RTF output style	displays the style that is applied to results in RTF. To change the style that is applied to the results, select another style from the drop-down list.

5

Understanding Tasks in SAS Studio

What Is a Task?

A task is an XML and Apache Velocity code file that generates SAS code and formats results for you. Tasks include SAS procedures from simple data listings to complex analytical procedures. SAS Studio is shipped with several predefined tasks. You can edit a copy of these predefined tasks in order to customize the tasks for your site. You can also build your own tasks.

How to Run a Task

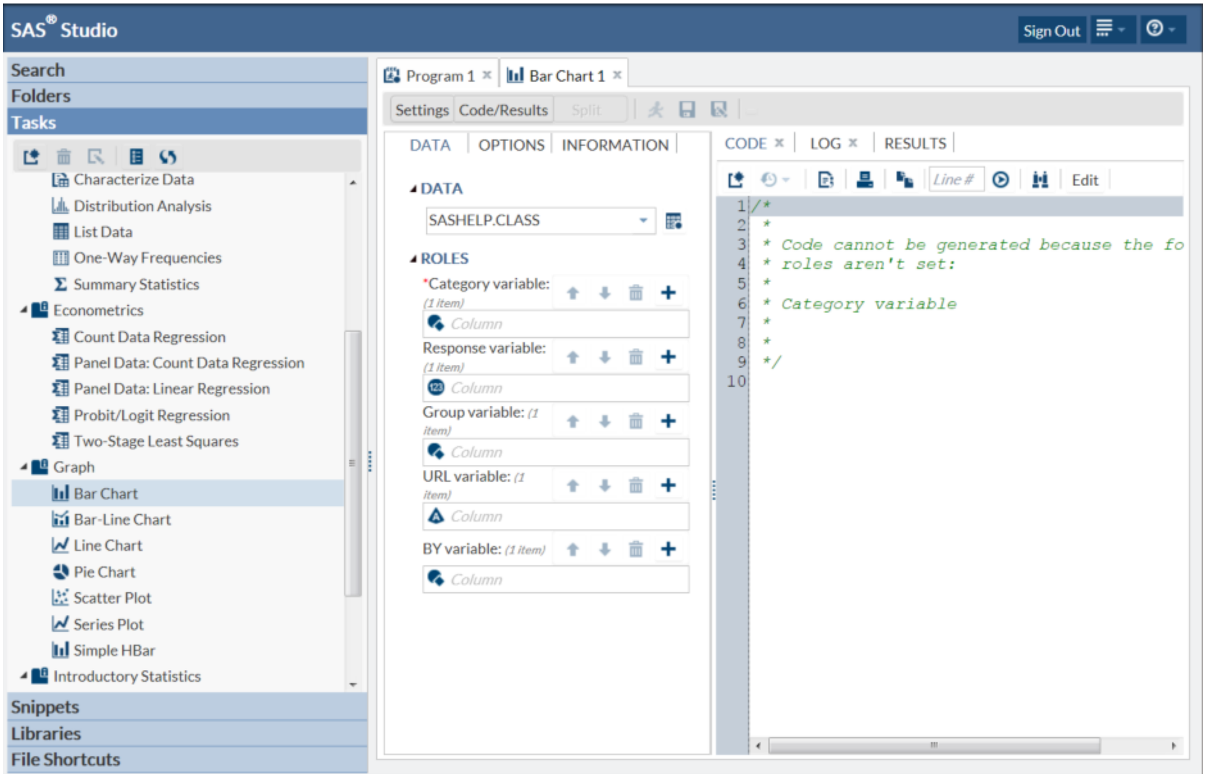
To run a predefined task:

1 In the navigation pane, click the **Tasks** section.

2 Expand the folder that contains the task.

3 Right-click the task name and select **Open**. Alternatively, you can double-click the task to open it.

The task opens to the right of the work area.

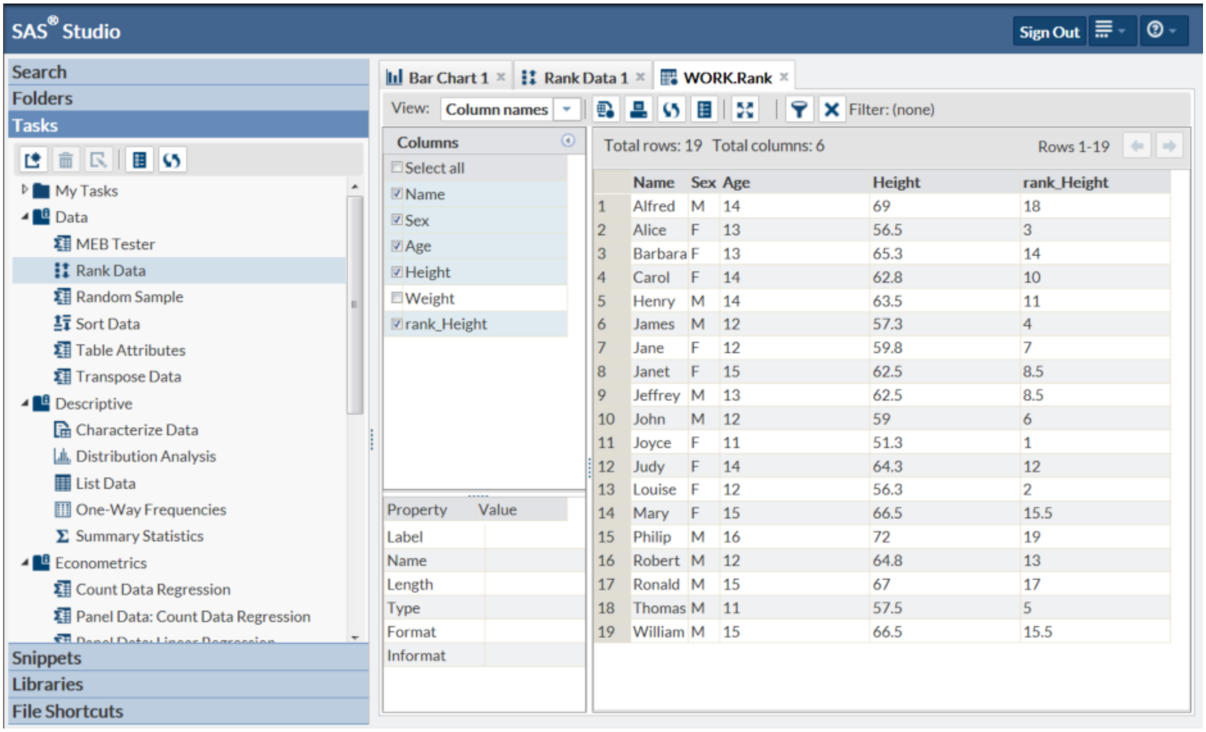


4 If the **Data** tab is available, specify an input data source and select columns for the roles in the data source. A role is a description of a variable's purpose in the task. To add a column to a role, click +. A list of available columns for that role appears. If only one column can be assigned to the role, you select a column and the list disappears. If multiple columns can be assigned, you can press Ctrl or Shift to select multiple columns from the list and click **OK**.

5 On the remaining tabs, specify any other required options, which are denoted with a red asterisk. As you assign values to the task, the relevant SAS code is generated.

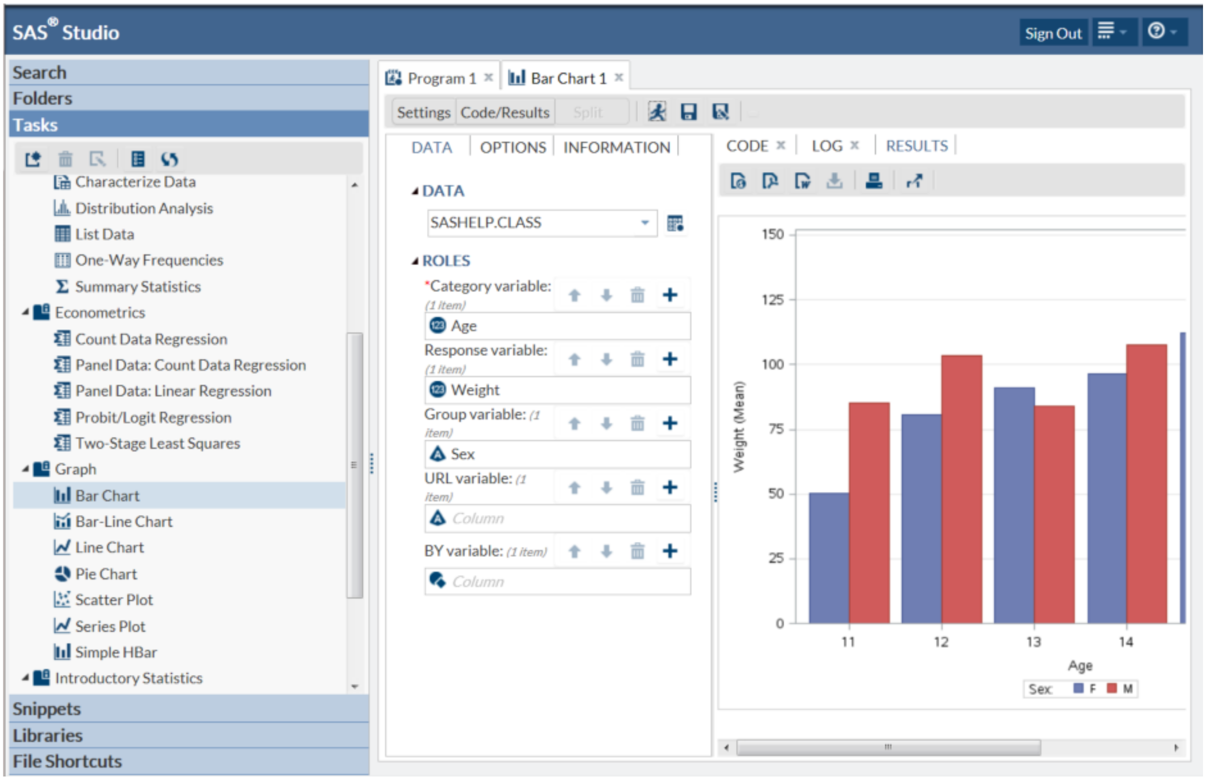
6 Click [run icon] to run the task.

If the task generates output data, the table opens in your work area.



	Name	Sex	Age	Height	rank_Height
1	Alfred	M	14	69	18
2	Alice	F	13	56.5	3
3	Barbara	F	13	65.3	14
4	Carol	F	14	62.8	10
5	Henry	M	14	63.5	11
6	James	M	12	57.3	4
7	Jane	F	12	59.8	7
8	Janet	F	15	62.5	8.5
9	Jeffrey	M	13	62.5	8.5
10	John	M	12	59	6
11	Joyce	F	11	51.3	1
12	Judy	F	14	64.3	12
13	Louise	F	12	56.3	2
14	Mary	F	15	66.5	15.5
15	Philip	M	16	72	19
16	Robert	M	12	64.8	13
17	Ronald	M	15	67	17
18	Thomas	M	11	57.5	5
19	William	M	15	66.5	15.5

If the task generates results, the output appears on the **Results** tab under the tab for the current task.



By default, the task settings appear on the left and the results on the right. To change this configuration, click and select **View ▸ Task Settings on Right**.

Save a Task and Its Option Settings

If you use a task frequently, you might want to save the task after you specify the input data source and the option settings. In SAS Studio, you can save a task as a CTK file in your `Folders` directory. The next time that you need to run the task, double-click the task in your `Folders` directory and the task appears with all of your previous settings.

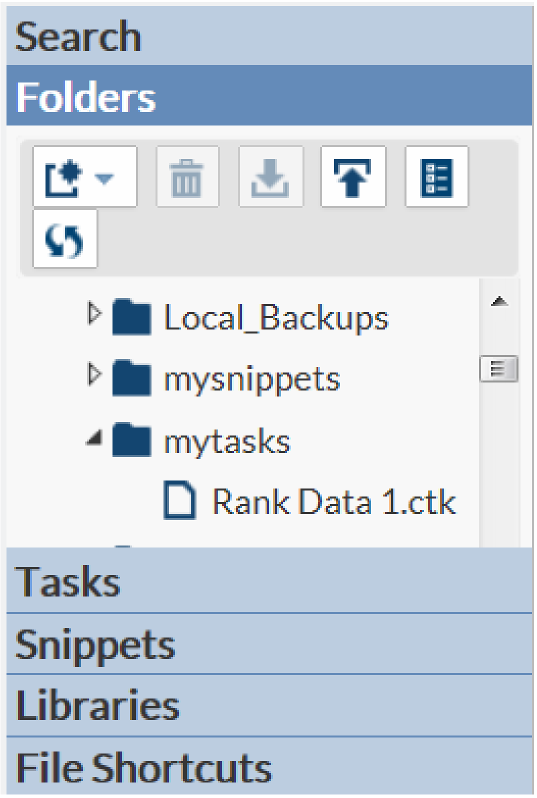
Note: Before you can save a task, you must specify an input data set and all the options that are required to run the task.

To save a task:

1 Click . The Save As window appears.

2 In the `My Folders` directory, select the location where you want to save the task file and specify a name for this file. For the file type, select **CTK Files (*.CTK)**. Click **Save**.

The task is now available from the **Folders** section.



Note: In the **Tasks** section, you are still working with this task. If you save the task again, the CTK file in the **Folders** section is updated.

Edit a Predefined Task

To customize the predefined tasks for your site, you can edit the XML code that is used to create the task.

To edit a predefined task:

1 In the navigation pane, open the **Tasks** section.

2 Expand the folder that contains the task.

3 Right-click the name of the task that you want to edit and select **Add to My Tasks**. A copy of the task is added to your **My Tasks** folder.

4 Open the **My Tasks** folder and select the copied task.

5 Click . The XML file for the task appears.

6 Edit the XML file and save your changes. To preview your changes, click .

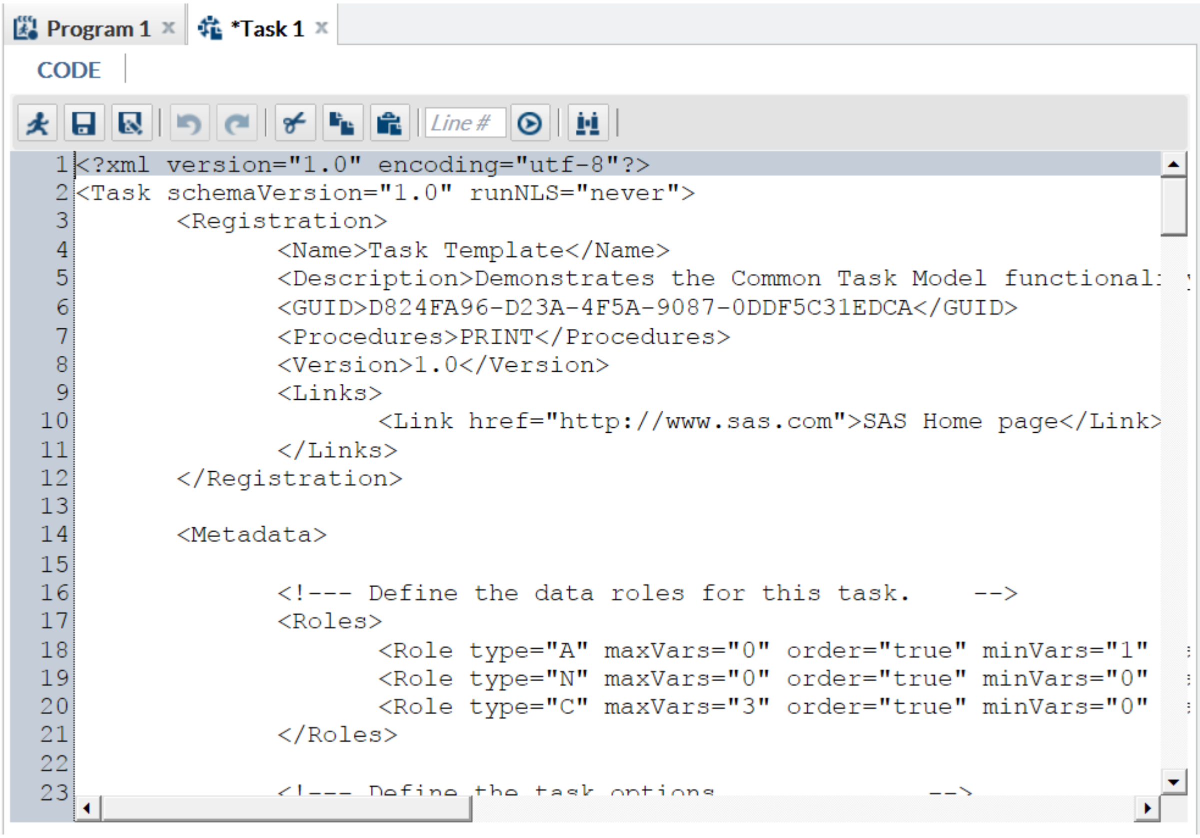
Create a New Task

SAS Studio provides a template that you can use to create custom tasks for your site.

To create a custom task:

1 In the navigation pane, open the **Tasks** section.

2 Click and select **New Task**. A task template opens.



3 Edit the code in the task template to create your task. To view the user interface for the task template, click . In the user interface for the task template, you can see examples of radio buttons, check boxes, combination boxes, and other types of options. For more information about this file, see *SAS Studio: Developer's Guide to Writing Custom Tasks*.

Customizing the Task Code

The Preferences window enables you to change several options that affect what and how the task code is displayed.

To access these options, click and select **Preferences**. Click **Tasks**.

Trim all leading and trailing blank spaces in generated code	removes any blank spaces that appear before or after the generated code.
Generate header comments for task code	adds comments before the generated code for a SAS task.
Automatically format generated code	automatically formats any code that is generated by a task and displayed in the code editor.

6

Data Tasks

Characterize Data Task

About the Characterize Data Task

The Characterize Data task creates a summary report, graphs, and frequency and univariate SAS data sets that describe the main characteristics of the data.

Example: Characterize Data Task

In this example, you want a better understanding of the contents in the Sashelp.Pricedata data set.

To create this example:

1 In the **Tasks** section, expand the **Data** folder and double-click **Characterize Data**. The user interface for the Characterize Data task opens.

2 On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3 To run the task, click .

Here is a sample of the results:

Summary of Character Variables for SASHELP.PRICEDATA
Limited to the 30 Most Frequent Distinct Values per Variable

Variable	Label	Value	Frequency Count	Percent of Total Frequency
productLine	Name of product line	Line2	240	23.5294
		Line3	240	23.5294
		Line4	240	23.5294
		Line1	180	17.6471
		Line5	120	11.7647

Variable	Label	Value	Frequency Count	Percent of Total Frequency
		Product1	60	5.8824
		Product10	60	5.8824
		Product11	60	5.8824
		Product12	60	5.8824
		Product13	60	5.8824
		Product14	60	5.8824

Summary of Numeric Variables for SASHELP.PRICEDATA

Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
cost	Unit Cost	1020	0	37419.00	16.400	36.685	29.7	78.0	0.55372

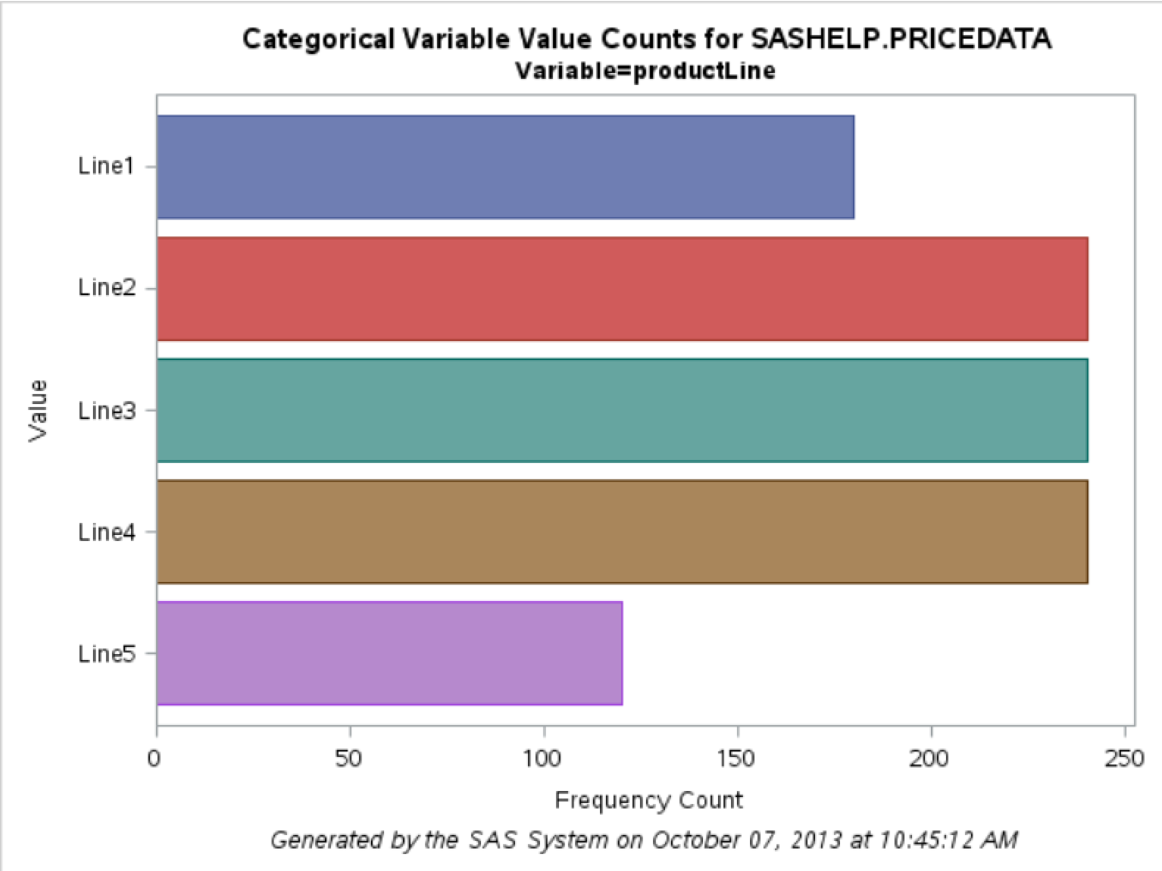
Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
discount	Price Discount	1020	0	11.50	0.000	0.011	0.0	0.2	0.00122

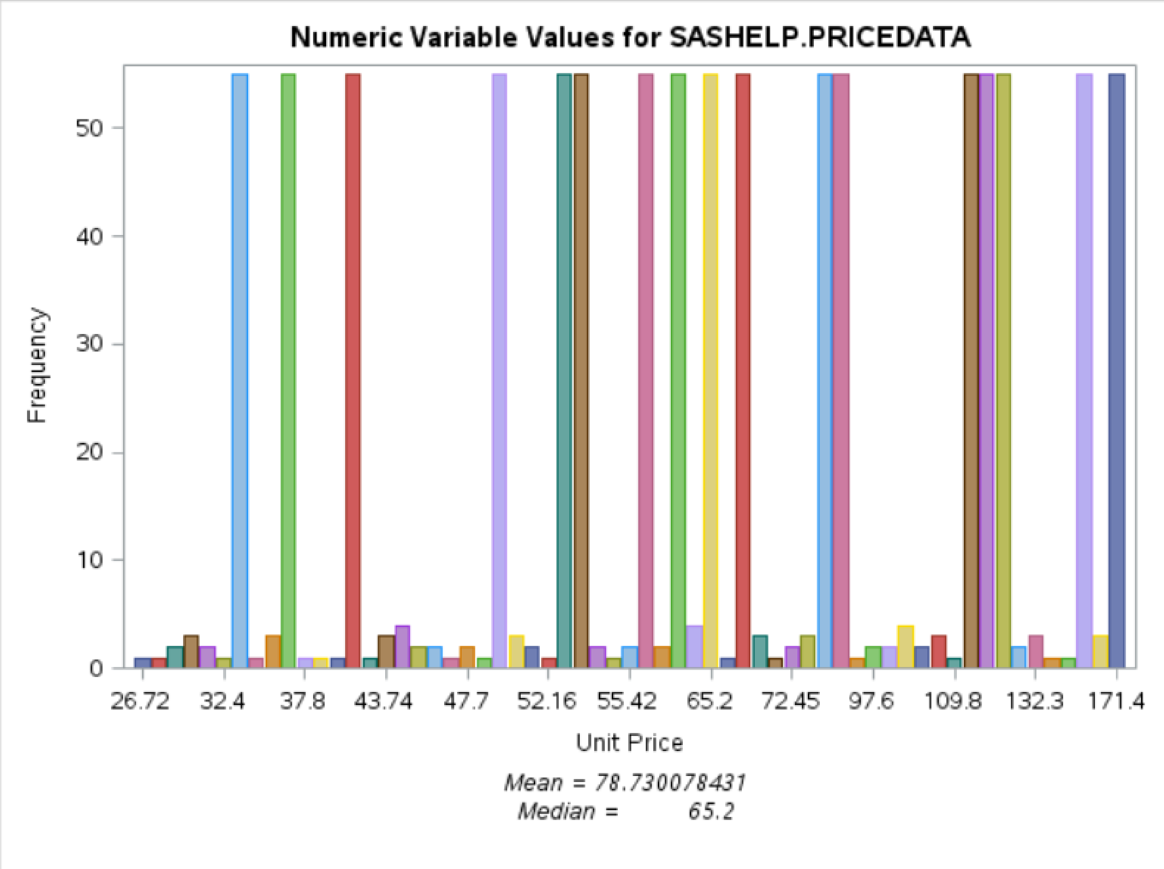
Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
line	Product Line ID	1020	0	2940.00	1.000	2.882	3.0	5.0	0.04003

Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
price	Unit Price	1020	0	80304.68	26.720	78.730	65.2	171.4	1.23613

Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
price1	Product 1 Unit Price	1020	0	52723.63	44.455	51.690	52.3	52.3	0.06410

Variable	Label	N	NMiss	Total	Min	Mean	Median	Max	StdMean
price10	Product 10 Unit Price	1020	0	57312.53	45.520	56.189	56.9	56.9	0.07740


Categorical Variable Value Counts for SASHELP.PRICEDATA
Variable=productLine
Value
Line1
Line2
Line3
Line4
Line5
0
50
100
150
200
250
Frequency Count
Generated by the SAS System on October 07, 2013 at 10:45:12 AM



By default, the task also creates output data—a table with the frequency data and a table with the univariate data. Both of these tables are saved in the Work library.

Assigning Data to Roles

You must select a data source to run the Characterize Data task. However, no roles are available.

Setting Options

Option Name	Description
Output Options	You must select at least one output option. By default, a summary report, graphs, and output tables for the frequency data and univariate data are created.
Limit categorical values	Specifies the maximum number of categorical values to report per variable. By default, 30 values are reported. You can change this maximum value in the **Maximum number of unique values per variable** box.

List Data Task

About the List Data Task

The List Data task displays the contents of a table as a report. For example, you can use the List Data task to create a report that sums the expenses and revenues for each sales region.

Example: Reports of Drive Train, MSRP, and Engine Size by Car Type

In this example, you want to create reports for each car type. Each report lists the drive train, MSRP, and engine size.

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **List Data**. The user interface for the List Data task opens.

2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column Name
List variables	**DriveTrain** **MSRP** **EngineSize**
Group analysis by	**Type**

4 To run the task, click .

Here is a subset of the results:

List Data for SASHELP.CARS

Type=Hybrid

Row number	DriveTrain	MSRP	Engine Size (L)
1	Front	$20,140	1.4
2	Front	$19,110	2.0
3	Front	$20,510	1.5

Type=SUV

Row number	DriveTrain	MSRP	Engine Size (L)
4	All	$36,945	3.5
5	All	$37,000	3.0
6	All	$52,195	4.4
7	All	$37,895	4.2
8	Front	$26,545	3.4
9	Front	$52,795	5.3
10	Front	$46,995	4.6
11	Front	$42,735	5.3
12	All	$41,465	5.3
13	Front	$30,295	4.2
14	Front	$20,255	2.5
15	All	$32,235	4.7

Assigning Data to Roles

Role	Description
List variables	Prints the variables in the order in which they are listed.

Role	Description
Group analysis by	When you assign one or more variables to this role, the table is sorted by the selected variable or variables, and a listing is generated for each distinct value, or BY group, in the variable or combination of variables.
Total of	Prints the sum of the selected variable at the bottom of the listing report.
Identifying label	When you specify one or more variables in this role, the List Data task uses the formatted values of these variables to identify the rows, rather than observation numbers (designated in the results by the column heading "Obs").

Setting Options

Option Name	Description
Basic Options	
Display row numbers	Includes in the output a column that lists the row number for each observation. You can specify a label for this column in the **Column label** text box. By default, the name of this column is **Row number**.
Use column labels as column headings	Uses the column label instead of the column name as the column heading.
Display number of rows	Reports the number of rows in the table at the end of the output, or the number of rows in each BY group at the end of each BY group’s output.

Option Name	Description
Round values before summing the variable	Rounds each numeric value to the number of decimal places in its format, or to two decimal places if no format is specified. If this option is specified, the List Data task performs the rounding before summing the variable.
Heading direction	Column headings can be printed horizontally or vertically, or you can select **Default** and let SAS determine the optimal arrangement for each column.
Column width	Specifies how the List Data task determines column widths: **Default** determines the column widths on a per-page basis. **Full** uses a format width (or default width if no format is specified) for all pages. **Minimum** uses the smallest possible column width on a per-page basis. **Uniform** reads the entire table to determine the appropriate column widths before generating output. When this option is not selected, different pages could have different widths for the same column. **Uniform by** formats all columns uniformly within a BY group, using each variable's formatted width as its column width. If the variable does not have a format that explicitly specifies a field width, the task uses the widest data value as the column width.

Option Name	Description

Split labels	If the variable labels contain one of the split characters (*, !, @, #, $, %, ^, &, or +), the labels will be split at the split character or characters. For example, for a variable label that reads "This is*a label" and the * character is selected as the split character, the column heading will read
	`This is`
	`a label`
	You do not need to select both the **Use variable label as column headings** and **Split labels** options. The **Split labels** option implies that you want to use variable labels.

Rows to list	specifies the number of rows to list in the output. By default, all rows are listed.

Rank Data Task

About the Rank Data Task

The Rank Data task computes ranks for one or more numeric variables across the rows in a table and includes the ranks in an output table.

For example, you might want to rank the sales for each product that your company sells. In this case, the ranking variable would show the order of product sales. The product with the highest number of sales would be ranked first.

Example: Ranking Students by Age and Height

In this example, you want to rank the students in your class by age and height.

To create this example:

1. In the **Tasks** section, expand the **Data** folder and double-click **Rank**. The user interface for the Rank Data task opens.

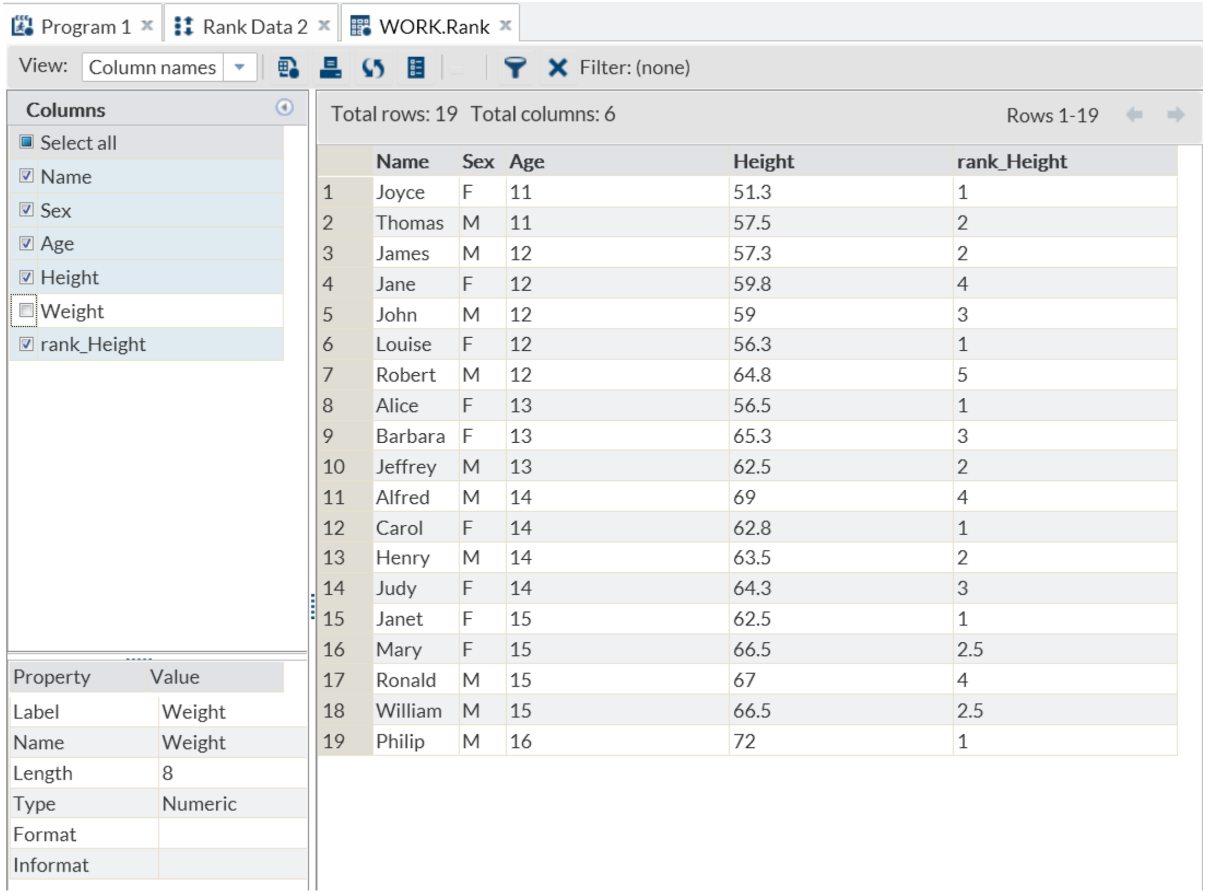
2. On the **Data** tab, select the **SASHELP.CLASS** data set.

3. Assign columns to these roles:

Role	Column Name
Columns to rank	**Height**
Rank by	**Age**

4. To run the task, click .

The Rank Data task creates an output data set. In SAS Studio, this data set opens on the **WORK.Rank** tab. This data set contains the additional rank_Height column, which shows where that student ranks within her age group. For example, in the 11-year-old age group, Joyce is ranked number one. In the 12-year-old age group, Louise is ranked number 1.



	Name	Sex	Age	Height	rank_Height
1	Joyce	F	11	51.3	1
2	Thomas	M	11	57.5	2
3	James	M	12	57.3	2
4	Jane	F	12	59.8	4
5	John	M	12	59	3
6	Louise	F	12	56.3	1
7	Robert	M	12	64.8	5
8	Alice	F	13	56.5	1
9	Barbara	F	13	65.3	3
10	Jeffrey	M	13	62.5	2
11	Alfred	M	14	69	4
12	Carol	F	14	62.8	1
13	Henry	M	14	63.5	2
14	Judy	F	14	64.3	3
15	Janet	F	15	62.5	1
16	Mary	F	15	66.5	2.5
17	Ronald	M	15	67	4
18	William	M	15	66.5	2.5
19	Philip	M	16	72	1

Assigning Data to Roles

To run the Rank Data task, you must assign a column to the **Columns to rank** role.

Role	Description
Columns to rank	Each column that is assigned to this role is ranked. You must assign at least one variable to this role. By default, the rankings column is given the name `rank_`*column-name*, where *column-name* is the name of the original column.

Role	Description
Rank by	When you assign one or more columns to this role, the input table is sorted by the selected column or columns and rankings are calculated within each group.

Setting Options

You must select at least one output option.

Option Name	Description
Options	

Option Name	Description
Ranking method	specifies the method to use when ranking the data. Here are the valid values: **None** does not use a method to rank the data. **Percentile ranks** partitions the original values into 100 groups, in which the smallest values receive a percentile value of 0 and the largest values receive a percentile value of 99. **Deciles** partitions the original values into 10 groups, in which the smallest values receive a decile value of 0 and the largest values receive a decile value of 9. **Quartiles** partitions the original values into four groups, in which the smallest values receive a quartile value of 0 and the largest values receive a quartile value of 3. **Group = n (NTILES)** partitions the original values into *n* groups, in which the smallest values receive a value of 0 and the largest values receive a value of *n*–1. Specify the value of *n* in the **Number of groups** box. **Fractional ranks with denominator = n** computes fractional ranks by dividing each rank by the number of observations that have nonmissing values of the ranking variable.

Option Name	Description
Ranking method (continued)	**Fractional ranks with denominator = n+1** computes fractional ranks by dividing each rank by the denominator n+1, where n is the number of observations that have nonmissing values of the ranking variable. **Percents** divides each rank by the number of observations that have nonmissing values of the variable and multiplies the result by 100 to get a percentage. **Normal scores (Blom formula)**, **Normal scores (Tukey formula)**, **Normal scores (van der Waerden formula)** computes normal scores from the ranks. The resulting variables appear normally distributed. Here are the formulas: Blom formula $y_i = \Phi^{-1}\left(\frac{\left(r_i - \frac{3}{8}\right)}{\left(n + \frac{1}{4}\right)}\right)$ Tukey formula $y_i = \Phi^{-1}\left(\frac{\left(r_i - \frac{1}{3}\right)}{\left(n + \frac{1}{3}\right)}\right)$ van der Waerden $y_i = \Phi^{-1}\left(\frac{r_i}{(n + 1)}\right)$ In these formulas, Φ^{-1} is the inverse cumulative normal (PROBIT) function, r_i is the rank of the ith observation, and n is the number of nonmissing observations for the ranking variable. **Note:** If you set the **If values tie, use** option, the Rank Data task computes the normal score from the ranks based on non-tied values and applies the ties specification to the resulting score.

Option Name	Description
Ranking method (continued)	**Savage scores (exponential)** computes Savage (or exponential) scores from the ranks. **Note:** If you set the **If values tie, use** option, the Rank Data task computes the Savage score from the ranks based on non-tied values and applies the ties specification to the resulting score.
If values tie, use:	specifies how to compute normal scores or ranks for tied data values. **Mean (Midrank)** assigns the mean of the corresponding rank or normal scores **High rank** assigns the largest of the corresponding ranks or normal scores **Low rank** assigns the smallest of the corresponding ranks or normal scores **Dense rank** computes scores and ranks by treating tied values as a single-order statistic. For the default method, ranks are consecutive integers that begin with the number one and end with the number of unique, nonmissing values of the variable that is being ranked. Tied values are assigned the same rank.
Rank order	specifies whether to list the values from smallest to largest or from largest to smallest.
Results	
Location to save output data	specifies the location of the output table. By default, the table is saved in the temporary Work library.

Option Name	Description
Include ranked columns	specifies that the output table contains the original columns as well as the ranked columns. If you want to replace the original column with the ranked columns, deselect the **Include ranking columns** check box. By default, the ranked column is given the name **`rank_`***column-name*, where *column-name* is the name of the original column.

Random Sample Task

About the Random Sample Task

The Random Sample task creates an output table that contains a random sample of the rows in the input table.

You might use this task when you need a subset of the data. For example, suppose you want to audit employee travel expenses in an effort to improve the expense reporting procedure and possibly reduce expenses. Because you do not have the resources to examine all expense reports, you can use statistical sampling to objectively select expense reports for audit.

Example: Creating a Random Sample of the Sashelp.Pricedata Data Set

In this example, you want to create a subset of the data in the Sashelp.Pricedata data set.

To create this example:

1 In the **Tasks** section, expand the **Data** folder and double-click **Random Sample**. The user interface for the Random Sample task opens.

2 On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3 To run the task, click .

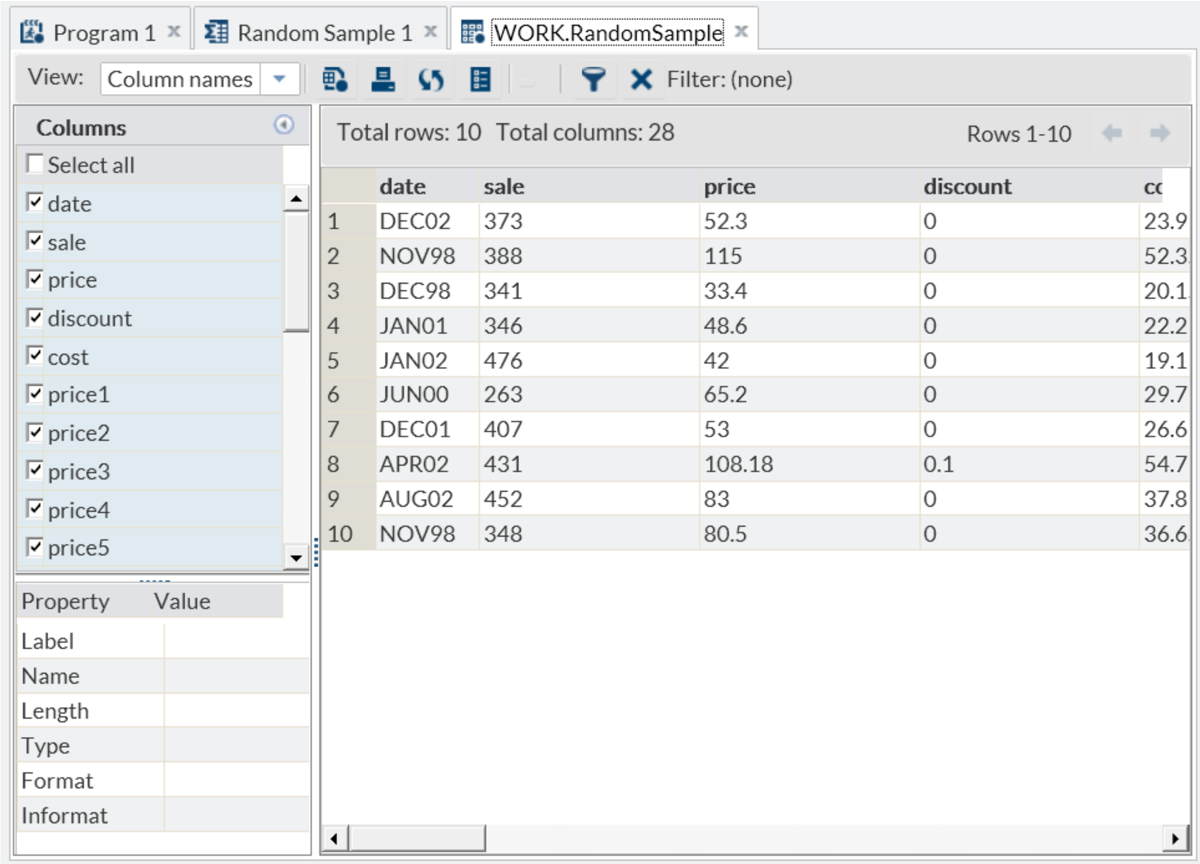
Here are the tabular results:

The SURVEYSELECT Procedure

Selection Method	Simple Random Sampling

Input Data Set	PRICEDATA
Random Number Seed	496093001
Sample Size	10
Selection Probability	0.009804
Sampling Weight	102
Output Data Set	RANDOMSAMPLE

The task also creates a sample data set in the Work library. In SAS Studio, this data set opens on the **WORK.RandomSample** tab.



Assigning Data to Roles

For the Random Sample task, you must specify an input data source. No roles are required to run the task.

Role	Description
Output columns	specifies the variables to include in the output table. By default, all variables are included in the output table. However, you can select the variables to include in the output.

Role	Description
Strata columns	specifies the variables to use to partition the input table into mutually exclusive, nonoverlapping subsets that are known as strata. Each stratum is defined by a set of values of the strata variables, and each stratum is sampled separately. The complete sample is the union of the samples that are taken from all the strata. **Note:** If you do not assign any variables to this role, then the entire input table is treated as a single stratum. You can allocate the total sample size among the strata in proportion to the size of the stratum. For example, the variable GENDER has possible values of M and F, and the variable VOTED has possible values of Y and N. If you assign both GENDER and VOTED to the **Strata columns** role, then the input table is partitioned into four strata: males who voted, males who did not vote, females who voted, and females who did not vote. The input table contains 20,000 rows, and the values are distributed as follows: ■ 7,000 males who voted ■ 4,000 males who did not vote ■ 5,000 females who voted ■ 4,000 females who did not vote Therefore, the proportion of males who voted is 7,000/20,000=0.35 or 35%. The proportions in the sample should reflect the proportions of the strata in the input table. For example, if your sample table contains 100 observations, then 35% of the values in the sample must be selected from the males who voted stratum to reflect the proportions in the input table.

Setting Options

Option Name	Description
Sample size	specifies the sample size in the desired number of rows or in the desired percentage of input rows. For example, if you specify 3% of rows and there are 400 input rows, then the resulting samplehas 12 rows. **Note:** If you assign variables to the **Strata columns** role, then the sample size specification that you make here applies to each stratum rather than to the entire input table.

Option Name	Description
Sample method	specifies the method to use when sampling the data. Here are the valid values: **Simple (no duplicates)** specifies the simple method when sampling the input data. When a row is selected, it is removed from eligibility for subsequent selections. This makes it impossible to select the same row more than once. **Unrestricted (duplicates allowed)** specifies the unrestricted method when sampling the input data. When a row is selected, it remains eligible for subsequent selections. This makes it possible to select the same row more than once. You can specify how multiple selections of the same row are recorded in the output table. You can choose from the following options: **Show each observations once in output (exclude duplicates)** a row that is selected *n* times occurs in the sample once. In the output, the NumberHits variable (which is calculated automatically by the Random Sample task) lists the number of times that the observation occurred in the input table. **Show all observations in output (include duplicates)** a row that is selected *n* times occurs in the sample *n* times.
Location of output data set	specifies the name and location for the output data. By default, the data is saved to the Work library.
Random seed number	specifies the initial seed for the generation of random numbers. If you do not specify a random seed number, then a seed that is based on the system clock will be used to produce the sample.

Option Name	Description
Generate a sample selection summary	generates a summary table that includes the seed that was used to produce the sample. By specifying this same seed later with the same input table, you can reproduce the same sample.

Sort Data Task

About the Sort Data Task

The Sort Data task enables you to sort the table by any of its columns. The result from this task is a sorted table in the Work library. No results or output data is displayed when you run this task.

Assigning Data to Roles

To run the Sort Data task, you must assign a column to the **Sort by** role.

Role	Description
Sort by	When you assign one or more variables to this role, the table is grouped by the selected variable or variables. The order in which the variables appear within this role determines which variable is the primary sort key, which variable is the secondary sort key, and so on. The primary sort key is always the first variable that is listed within the Sort by role.
Columns to drop	When you assign one or more variables to this role, the output that is generated does not contain the specified variables. You can assign a maximum of (*n* – 1) variables to this role, where *n* is the total number of variables in the table.

Setting Options

Option Name	Description
Output Order	
Collating sequence	indicates what collating sequence to use when sorting character variables. You can use these collation standards: ■ sequence that is defined on the server (**Server default**) ■ the ASCII or EBCDIC collating sequences ■ the reverse collation order for character variables ■ a national standard, such as Danish, Finnish, Italian, Norwegian, Spanish, or Swedish ■ a custom-defined collating sequence that is defined by your installation site
Maintain original data order within ‘Sort by’ groupings	groups the data according to the order that you set for the **Sort by** role. If this option is not selected, then the output table is grouped in an undefined order within the sorted key groups.
Duplicate Records	
Keep all records	keeps all of the records that are in the output table, including all duplicates of records.

Option Name	Description
Keep only the first record for each 'Sort by' group	eliminates any duplicate observations that have the same values for the **Sort by** group. If the **Group data in the order of the Sort by variable** option is selected, then the observation that is retained for each **Sort by** group is the first one that is read from the original table. However, if the **Group data in the order of the Sort by variable** option is not selected, then the observation that is kept for each **Sort by** group cannot be predetermined.
Do not keep adjacent duplicate records	compares each record to the previous record in the output table. If an exact match is found, the duplicate record is not written to the output table. **Note:** If you do not assign all variables to the **Sort by** role, some duplicate records might not be removed because the records are not adjacent.
Advanced Sorting	
Memory for sorting	specifies the maximum amount of memory that can be used for the Sort Data task. You can specify the amount of memory in bytes (B), kilobytes (KB), megabytes (MB), or gigabytes (GB). You can also specify to use all of the available memory or to use the default amount of memory that has been allocated on the server.
Reduce temporary disk space requirements	indicates that during the Sort Data process, only the **Sort by** variables and the observation numbers are stored within temporary files, reducing the amount of storage necessary to perform the sort. In the final phase of the sort, the temporary file is used as an index to access the original table and then to send the data to the results table in the correctly sorted sequence.

Option Name	Description
Force a sort of indexed data	indicates that you want to sort all tables even if the table is already sorted in the desired sequence or the table contains a user-created index with keys that reflect those specified in the **Sort by** role. If you specify this option, the table is sorted regardless of the current order of the table or whether it contains an index.
Results	
Location to save output data	specifies the location for the output table. By default, this table is saved to the temporary Work library.

Table Attributes Task

About the Table Attributes Task

The Table Attributes task enables you to create these types of reports:

- a default report that includes the following data attributes: the date on which the table was created and last modified, the number of rows, the encoding, any engine-dependent or host-dependent information, and an alphabetic list of the variables and their attributes.
- an enhanced report displays the table and variable attributes. Unlike the default report, you can specify the order of the contents in the report. From this report, you can determine the table type, the date on which the table was created and modified, the number of observations, the variable labels, and the variable types.

Example: Table Attributes for the Sashelp.Pricedata Data Set

In this example, you want to view the table attributes for the Sashelp.Pricedata data set.

To create this example:

1 In the **Tasks** section, expand the **Data** folder and double-click **Table Attributes**. The user interface for the Table Attributes task opens.

2 On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3 On the **Options** tab, deselect the **Default report** check box.

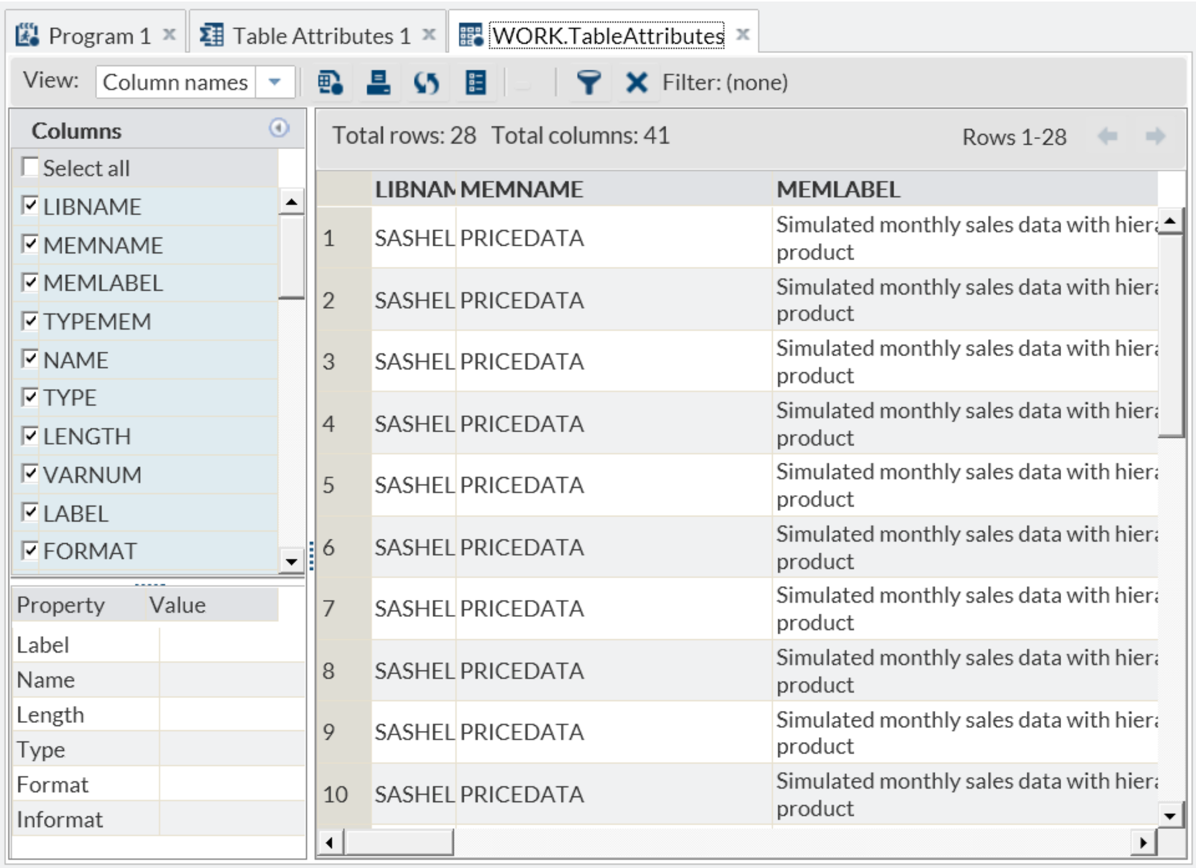
4 To run the task, click .

Here is a subset of the results for the Table Attributes task. These results are the enhanced report for the Sashelp.Pricedata data set.

Table Name	Label	Type	Date Created	Date Modified	Number of Obs.	Char. Set	Password Protected	Data Set Type
PRICEDATA	Simulated monthly sales data with hierarchy of region, line, product	DATA	20JUN13:00:29:56	20JUN13:00:29:56	1020		---	

Name	Variable Number	Type	Format	Label	Length
cost	5	Numeric		Unit Cost	8
date	1	Numeric	MONYY	Order Date	8
discount	4	Numeric		Price Discount	8
line	27	Numeric		Product Line ID	8
price	3	Numeric		Unit Price	8
price1	6	Numeric		Product 1 Unit Price	8
price10	15	Numeric		Product 10 Unit Price	8
price11	16	Numeric		Product 11 Unit Price	8
price12	17	Numeric		Product 12 Unit Price	8
price13	18	Numeric		Product 13 Unit Price	8
price14	19	Numeric		Product 14 Unit Price	8
price15	20	Numeric		Product 15 Unit Price	8

An output data set also opens on the **WORK.TableAttributes** tab.



Setting Options

Option Name	Description
Default report	contains the output from the DATASETS procedure. This report includes the following data attributes: the date on which the table was created and last modified, the number of observations, the encoding, any engine-dependent or host-dependent information, and an alphabetic list of the variables and their attributes.

Option Name	Description
Enhanced report	contains the output from the DATASETS procedure. The REPORT procedure is used to create the enhanced report. This report displays the table and variable attributes. From this report, you can determine the table type, the date on which the table was created and modified, the number of observations, the variable labels, and the variable types.
Sort variables by	sorts the rows in the variable table by variable name, variable order in the table, variable type, variable format, or variable label. **Note:** This option affects only the enhanced report.
Order sequence	specifies whether to sort the rows in the table by ascending or descending order. **Note:** This option affects only the enhanced report.
Location to save output data	specifies the location of the output table. By default, this table is saved to the temporary Work library.

Transpose Data Task

About the Transpose Data Task

The Transpose Data task turns selected columns of an input table into the rows of an output table. If you do not use grouping variables, then each selected column is turned into a single row. If you use grouping variables, then the selected columns are divided into subcolumns based on the values of the grouping variables. Each subcolumn is turned into a row of the output table.

Assigning Data to Roles

To run the Transpose Data task, you must assign a column to the **Transpose variables** role.

Role	Description
Transpose variables	Each column that you assign to this role becomes one or more rows of the output table. If you do not select any grouping variables, then an entire column is turned into a single row. If you select one or more grouping variables, then the grouping variables are used to segment each column into subcolumns, each of which is turned into a row. In this case, a column is transposed to the number of rows that is equal to the number of groups that are defined by the grouping variables. You must assign at least one column to the **Transpose variables** role. To select a grouping variable, assign a column to the **Group analysis by** role.
Copy variables	Each column that you assign to this role is copied directly from the input table to the output table without being transposed. Because these columns are copied directly to the output table, the number of rows in the output table equals the number of rows in the input table. The output table is padded with missing values if the number of rows in the input table does not equal the number of variables that it transposes.
Group analysis by	Each variable that you assign to this role is used to segment the about-to-be-transposed columns into subcolumns that will be transposed separately. Each subcolumn, defined by a set of values of the grouping variables, becomes a row of the output table.

Setting Options

Option Name	Description
Source Column	
Name	Each row of the output table includes the name of the variable in the input table to which the values in that output row belong. To specify a heading for the output column that contains these variable names, enter the heading in the **Name** box. The name can include special characters, leading numbers, and white space, but it cannot exceed 32 characters. The default name is Source.
Label	Each row of the output table includes the label of the variable in the input table to which the values in that output row belong. To specify a heading for the output column that contains these variable labels, enter the heading in the **Label** box. The label can include special characters, leading numbers, and white space, but it cannot exceed 32 characters. The default label is Label.
Results	
Name of output table	You can designate a different name for the output table. By default, the table is saved in the temporary Work library.

7

Econometrics Tasks

Count Data Regression Task

About the Count Data Regression Task

Count regression fits regression models where the dependent variable has nonnegative integer or count values.

Note: The version of the task depends on what version of SAS/ETS is available at your site. For example, if your site is running SAS 9.4 (or earlier), SAS Studio is running version 1 of the Count Data Regression task. If you are running the first maintenance release for SAS 9.4, SAS/ETS 13.1 is available, and SAS Studio is running version 2 of the Count Data Regression task. The difference between the two versions is the addition of new options in SAS/ETS 13.1.

Example: Count Data Regression

To create this example:

1 Create the WORK.LONG97DATA data set. For more information, see "LONG97DATA Data Set" on page 262.

2 In the **Tasks** section, expand the **Econometrics** folder and double-click **Count Data Regression**. The user interface for the Count Data Regression task opens.

3 On the **Data** tab, select the **WORK.LONG97DATA** data set.

4 Assign columns to these roles:

Role	Column Name
Dependent variable	**art**
Continuous variables	**ment** **phd** **mar**
Categorical variables	**kid5**

5 To run the task, click .

Here is a subset of the results:

Class Level Information		
Class	Levels	Values
kid5	4	0 1 2 3

Model Fit Summary	
Dependent Variable	art
Number of Observations	915
Data Set	WORK.LONG97DATA
Model	Poisson
Log Likelihood	-1659
Maximum Absolute Gradient	4.52499E-9
Number of Iterations	5
Optimization Method	Newton-Raphson
AIC	3334
SBC	3372
Number of Threads	4

Algorithm converged.

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	-0.570945	0.296411	-1.93	0.0541
ment	1	0.026211	0.002014	13.01	<.0001
phd	1	0.015683	0.026428	0.59	0.5529
mar	1	0.179880	0.062563	2.88	0.0040
kid5 0	1	0.726607	0.280831	2.59	0.0097
kid5 1	1	0.594124	0.283226	2.10	0.0359
kid5 2	1	0.451952	0.288913	1.56	0.1177
kid5 3	0	0	.	.	.

Assigning Data to Roles

To run the Count Data Regression task, you must assign a column to the **Dependent variable** role.

Role	Description
Dependent variable	specifies the numeric column that has nonnegative integer or count values. The **Distribution** option specifies the type of model to be analyzed. You can specify these types of models: ▪ Poisson regression model ▪ negative binomial regression model with a linear variance function ▪ negative binomial regression model with a quadratic variance function ▪ a zero-inflated Poisson model ▪ a zero-inflated negative binomial model
Continuous variables	specifies the independent covariates (regressors) for the regression model. If you do not specify a continuous variable, the task fits a model that contains only an intercept.
Categorical variables	specifies the variables to use to group data in the analysis.

Setting Options

Option	Description
Methods	

Option	Description
Type of covariances of the parameter estimates	specifies the type of covariance matrix of the parameter estimates. You can specify these types of matrices: ■ the covariance from the inverse Hessian matrix ■ the covariance from the outer product mix ■ the covariance from the outer product and Hessian matrices (also called the quasi-maximum-likelihood-estimates)
Include the intercept in the model	specifies whether to include the intercept in the model.
Optimization	
Method	specifies the iterative minimization method to use.
Maximum number of iterations	specifies the maximum number of iterations for the selected method.
Plots **Note:** The plot options are available only if you are running the first maintenance release for SAS 9.4.	
Diagnostic Plots	
Profile likelihood plot	produces the profile likelihood functions of the model parameters. The model parameter on the X axis is varied, whereas all other parameters are fixed at their estimated maximum likelihood estimates.
Overdispersion diagnostic plot	produces the overdispersion diagnostic plot.
Probability Plots	

Option	Description
Specified count levels	supplies the values of the response variable for the overall predictive probabilities plot and the predictive probability profiles plot. Each value should be a nonnegative integer. Nonintegers are rounded to the nearest integer. This value can also be a list in the form X TO Y BY Z. For example, COUNTS(0 1 2 TO 10 BY 2 15) creates a plot for counts 0, 1, 2, 4, 6, 8, 10, and 15.
Overall predictive probabilities plot	produces the overall predictive probabilities of the specified count levels.
Predictive probability profiles plot	produces the predictive probability profiles of specified count levels against model regressors. The regressor on the X axis is varied, whereas all other regressors are fixed at the mean of the observed data set.
Zero-inflation Plots	
Probability profiles plot of zero-inflation process selection	produces the probability profiles of zero-inflation process selection and zero count prediction against model regressors. The regressor on the X axis is varied, whereas all other regressors are fixed at the mean of the observed data set.
Display plots	specifies whether to display the plots in a panel or individually.
Output Tables	
You can specify whether to include any output tables in the results. Here is the information that you can include in the results: ▪ correlation matrix of the parameter estimates ▪ covariance matrix of the parameter estimates ▪ iteration history of the objective function and parameter estimates	

Heckman Selection Model Task

About the Heckman Selection Model Task

The Heckman's two-step selection method provides a means of correcting for non-randomly selected samples. It is a two-stage estimation method. The first stage performs a probit analysis on a selection equation. The second stage analyzes an outcome equation based on the first-stage binary probit model.

Note: This task is available only if you are running SAS 9.4, which includes SAS/ETS 12.3.

Example: Heckman Selection Model Task

To create this example:

1 Create the Work.Mroz data set. For more information, see "MROZ Data Set" on page 282.

2 In the **Tasks** section, expand the **Econometrics** folder and double-click **Heckman Selection Model**. The user interface for the Heckman Selection Model task opens.

3 On the **Data** tab, select the **WORK.MROZ** data set.

4 Assign columns to these roles:

Role	Column Name
Selection Equation	
Dependent variable	**inlf**

Role	Column Name
Continuous variables	**nwifeinc** **exper** **expersq** **age** **kidslt6** **kidsge6**
Outcome Equation	
Dependent variable	**lwage**
Continuous variables	**exper** **expersq**
Categorical variables	**educ**

5 To run the task, click .

Here is a subset of the results:

Summary Statistics of Continuous Responses								
Variable	N	Mean	Standard Error	Type	Lower Bound	Upper Bound	N Obs Lower Bound	N Obs Upper Bound
lwage	428	1.190173	0.723198	Regular				

Discrete Response Profile of inlf		
Index	Value	Total Frequency
1	0	325
2	1	428

Class Level Information		
Class	Levels	Values
educ	13	5 6 7 8 9 10 11 12 13 14 15 16 17

Heckman First Step Model Fit Summary	
Number of Endogenous Variables	1
Endogenous Variable	inlf
Number of Observations	753
Log Likelihood	-415.37436
Maximum Absolute Gradient	0.0001730
Number of Iterations	13
Optimization Method	Quasi-Newton
AIC	844.74872
Schwarz Criterion	877.11718

Goodness-of-Fit Measures		
Measure	Value	Formula
Likelihood Ratio (R)	199	2 * (LogL - LogL0)
Upper Bound of R (U)	1029.7	- 2 * LogL0
Aldrich-Nelson	0.209	R / (R+N)
Cragg-Uhler 1	0.2322	1 - exp(-R/N)
Cragg-Uhler 2	0.3116	(1-exp(-R/N)) / (1-exp(-U/N))

Assigning Data to Roles

To run the Heckman Selection Model task, you must assign columns to the **Dependent variable** roles for the selection and outcome equations.

Role	Column Name
Selection Equation	

Role	Column Name
Dependent variable	specifies a single numeric column that takes binary values. By default, the task uses samples where the dependent variable is equal to 1.
Continuous variables	specifies the independent columns (or regressors) to use in the model for the selection equation dependent variable.
Categorical variables	specifies how to group the values into levels.
Include the intercept	specifies whether to include the intercept in the selection equation.
Outcome Equation	
Dependent variable	specifies a single numeric column to use.
Continuous variables	specifies the independent columns (or regressors) to use in the model for the outcome equation dependent variable.
Categorical values	specifies how to group the values into levels.
Include the intercept	specifies whether to include the intercept in the selection equation.

Setting Options

Option	Description
Methods	
Variance estimation method	specifies whether to calculate the standard errors by using the corrected standard errors or the OLS standard errors.

Option	Description
Type of covariances of the parameter estimates	specifies the method to calculate the covariance matrix of parameter estimates. You can select the covariance from the outer product matrix, from the inverse Hessian matrix, or from the output product and Hessian matrices (the quasi-maximum likelihood estimates).
Optimization method	specifies the optimization method. You can also specify the maximum number of iterations for this method.
Output Tables	
You can specify whether the results include the tables created by the task by default, the default tables and any additional tables that you select, or no tables. Here is the information that you can include in the results: ■ correlation matrix of the parameter estimates ■ covariance matrix of the parameter estimates ■ iteration history of the objective function and parameter estimates	

Panel Data: Count Data Regression Task

About the Panel Data: Count Data Regression Task

The Panel Data: Count Data Regression task analyzes regression models for panel data in which the dependent variable is a nonnegative integer or count values. This task fits a one-way model where the cross-sectional effect is modeled in the error term.

Note: This task is available only if you are running the first maintenance release for SAS 9.4, which includes SAS/ETS 13.1.

Example: Count Data Regression with Panel Data

To create this example:

1. Create the WORK.LONG97DATA data set. For more information, see "LONG97DATA Data Set" on page 262.

2. In the **Tasks** section, expand the **Econometrics** folder and double-click **Panel Data: Count Data Regression**. The user interface for the Panel Data: Count Data Regression task opens.

3. On the **Data** tab, select the **WORK.LONG97DATA** data set.

4. Assign columns to these roles:

Role	Column Name
Dependent variable	**art**
Continuous variables	**ment** **phd** **mar**
Categorical variables	**kid5**
Cross-sectional ID	**fem**

5. To run the task, click .

Here is a subset of the results:

Class Level Information		
Class	**Levels**	**Values**
kid5	4	0 1 2 3

Model Fit Summary	
Dependent Variable	art
Number of Observations	915
Data Set	WORK.COUNTPANELREGDATA
Model	Poisson
Error Component	Random
Optimization Method	Newton-Raphson
Log Likelihood	-1654
Maximum Absolute Gradient	1.87227E-6
Number of Iterations	13
AIC	3323
SBC	3362

Algorithm converged.

Parameter Estimates					
Parameter	**DF**	**Estimate**	**Standard Error**	**t Value**	**Approx Pr > |t|**
Intercept	1	-0.615254	0.305887	-2.01	0.0443
ment	1	0.025452	0.002024	12.57	<.0001
phd	1	0.013129	0.026437	0.50	0.6195

Assigning Data to Roles

To run the Count Panel Data Regression task, you must assign columns to the **Dependent variable** and **Cross-sectional ID** roles.

Role	Description
Dependent variable	specifies the numeric column that has nonnegative integer or count values. The **Distribution** option specifies the type of model to be analyzed. You can specify these types of models: ■ Poisson regression model ■ negative binomial regression model with a linear variance function ■ negative binomial regression model with a quadratic variance function
Continuous variables	specifies the independent covariates (regressors) for the regression model. If you do not specify a continuous variable, the task fits a model that contains only an intercept.
Categorical variables	specifies the variables to use to group data in the analysis.
Cross-sectional ID	specifies the cross-section for each observation. You can specify whether the error component model is fixed or random.

Setting Options

Option	Description
Methods	

Option	Description
Type of covariances of the parameter estimates	specifies the type of covariance matrix of the parameter estimates. You can specify these types of matrices: - the covariance from the inverse Hessian matrix - the covariance from the outer product mix - the covariance from the outer product and Hessian matrices (also called the quasi-maximum-likelihood-estimates)
Include the intercept in the model	specifies whether to include the intercept in the model.
Optimization	
Method	specifies the iterative minimization method to use. You can specify the maximum number of iterations to perform for the selected method.
Plots	
Diagnostic Plots	
Profile likelihood plot	produces the profile likelihood functions of the model parameters. The model parameter on the X axis is varied, whereas all other parameters are fixed at their estimated maximum likelihood estimates.
Overdispersion diagnostic plot	produces the overdispersion diagnostic plot.
Probability Plots	

Option	Description
Specified count levels	supplies the values of the response variable for the overall predictive probabilities plot and the predictive probability profiles plot. Each value should be a nonnegative integer. Nonintegers are rounded to the nearest integer. You can also specify a list in the form of X TO Y BY Z. For example, COUNTS(0 1 2 TO 10 BY 2 15) specifies to plot counts for 0, 1, 2, 4, 6, 8, 10, and 15.
Overall predictive probabilities plot	produces the overall predictive probabilities of the specified count levels.
Predictive probability profiles plot	produces the predictive probability profiles of specified count levels against model regressors. The regressor on the X axis is varied, whereas all other regressors are fixed at the mean of the observed data set.
Display plots	specifies whether to display the plots in a panel or individually.
Output Tables	
You can specify whether to include any output tables in the results. Here is the information that you can include in the results: ■ correlation matrix of the parameter estimates ■ covariance matrix of the parameter estimates ■ iteration history of the objective function and parameter estimates	

Panel Data: Linear Regression

About the Panel Data: Linear Regression Task

The Panel Data: Linear Regression task analyzes a class of linear econometric models that commonly arise when time series and cross-sectional data are combined. This type of pooled data on time series cross-sectional bases is often referred to as panel data. Typical examples of panel data include observations over time on households, countries, firms, trade, and so on. For example, in the case of survey data on household income, the panel is created by repeatedly surveying the same households in different time periods (years).

Note: The version of the task depends on what version of SAS/ETS is available at your site. For example, if your site is running the second maintenance release for SAS 9.3, SAS/ETS 12.1 is available, and SAS Studio is running version 1 of the Panel Data: Linear Regression task. If you are running SAS 9.4, SAS/ETS 12.3 is available, and SAS Studio is running version 2 of the Panel Data: Linear Regression task. The difference between the two versions is the addition of new options in SAS/ETS 12.3.

Example: Linear Regression with Panel Data

To create this example:

1 Create the WORK.GREENE data set. For more information, see "GREENE Data Set" on page 261.

2 In the **Tasks** section, expand the **Econometrics** folder and double-click **Panel Data: Linear Regression**. The user interface for the Panel Data: Linear Regression task opens.

3 On the **Data** tab, select the **WORK.GREENE** data set.

4 Assign columns to these roles:

Role	Column Name
Dependent variable	**cost**
Continuous variables	**production**
Cross-sectional ID	**firm**
Time series ID	**year**

5 To run the task, click .

Wansbeek and Kapteyn Variance Components (RanOne)
Dependent Variable: cost

Model Description	
Estimation Method	RanOne
Number of Cross Sections	3
Time Series Length	4
HAC Kernel	Bartlett
HAC Bandwidth	Newey and West

Fit Statistics			
SSE	0.1541	DFE	8
MSE	0.0193	Root MSE	0.1388
R-Square	0.8774		

Variance Component Estimates	
Variance Component for Cross Sections	0.058961
Variance Component for Error	0.018214

Hausman Test for Random Effects		
DF	m Value	Pr > m
1	2.82	0.0930

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-2.16577	0.6317	-3.43	0.0090

Assigning Data to Roles

To run the Panel Data: Linear Regression task, you must assign columns to the **Dependent variable**, **Cross-sectional ID**, and **Time series ID** roles.

Role	Description
Dependent variable	specifies the numeric column that contains the count values. The dependent count variable should take on only nonnegative integer values in the input data set.
Continuous variables	specifies the independent covariates (regressors) for the regression model. If you do not specify a continuous variable, the task fits a model that contains only an intercept.
Categorical variables	specifies the variables to use to group data in the analysis.
Cross-sectional ID	specifies the cross section for each observation. The task verifies that the input data is sorted by the cross-sectional ID and by the time series ID within each cross section.
Time series ID	specifies the time period for each observation. The task verifies that the time series ID values are the same for all cross sections.

Setting Options

Option	Description
Model	

Option	Description
Model type	specifies that a one-way random-effects model be estimated or a one-way fixed-effects model be estimated with the one-way model corresponding to cross-sectional effects only. **Note:** The remaining options that are available in the Model Options section depend on whether you are creating a random or fixed effect.
Include the intercept in the model	specifies whether to include the model. This option applies whether you are creating a random effects model or a fixed effects model. **Note:** This option is available only if you are running on SAS 9.4.
Random Effects	
Random effects	specifies whether a one-way or two-way random-effects model is estimated. By default, a one-way random-effects model is estimated.
Variance component estimation method	specifies the type of variance component estimate to use. For more information about the type of estimations, see the PANEL procedure in *SAS/ETS User's Guide*.
Test for Random Effects	
One-way Breusch-Pagan test **Two-way Breusch-Pagan test**	requests the Breusch-Pagan one-way or two-way test for random effects.
Fixed Effects	
Fixed effects	specifies whether a one-way or two-way fixed-effects model is estimated.

Option	Description
Display the fixed effects	specifies whether to include the fixed effects in the results. **Note:** This option is available only if you are running on SAS 9.4.
Methods	
Covariance matrix estimator	specifies the estimator of the covariance matrix. You can select from these options: ■ **Newey and West** **Note:** This option is available only if you are running on SAS 9.4. ■ **OLS estimator** specifies that the variance-covariance matrix is not corrected. ■ **HCCME 0–4** specifies a heteroscedasticity-corrected covariance matrix
Cluster correction for heteroscedasticity-consistent covariance matrix	specifies the cluster correction for the variance-covariance matrix.

Setting the Output Options

Option	Description
Plots	
Diagnostic Plots	
You can display these types of diagnostic plots: ■ Plot of the predicted and actual values ■ QQ plot of residuals ■ Plot of residuals ■ Histogram of residuals	
Cross Sections Plots	

Option	Description
The number of cross sections to be combined into one time series plot	specifies the number of cross sections to be combined into one time series plot. **Note:** This option is available only if you display the plots individually.
You can display these types of cross-sectional plots: ■ Plot of actual values by time series ■ Predicted values by time series ■ Stacked residuals by time series ■ Residuals by time series	
Display plots	specifies whether to display the plots in a panel or individually.
Output Tables	
You can specify whether the results include the tables created by the task by default, the default tables and any additional tables that you select, or no tables. Here is the information that you can include in the results: ■ correlation matrix of the parameter estimates ■ covariance matrix of the parameter estimates ■ iteration history of the objective function and parameter estimates	

Probit/Logit Regression Task

About the Probit/Logit Regression Task

The Probit/Logit Regression task analyzes univariate dependent variable models. In these models, the dependent variable takes binary values and assumes either a standard normal distribution or a logistic distribution.

Note: The version of the task depends on what version of SAS/ETS is available at your site. For example, if your site is running the second maintenance release for SAS 9.3, SAS/ETS 12.1 is available, and SAS Studio is running version 1 of the Probit/Logit Regression task. If you are running SAS 9.4, SAS/ETS 12.3 is available, and SAS Studio is running version 2 of the Probit/Logit Regression task. The difference between the two versions is the addition of new options in SAS/ETS 12.3.

Example: Probit/Logit Regression Task

To create this example:

1. Create the Work.Mroz data set. For more information, see "MROZ Data Set" on page 282.

2. In the **Tasks** section, expand the **Econometrics** folder and double-click **Probit/ Logit Regression**. The user interface for the Probit/Logit Regression task opens.

3. On the **Data** tab, select the **WORK.MROZ** data set.

4. Assign columns to these roles:

Role	Column Name
Dependent variable	**inlf**
Continuous variables	**nwifeinc** **exper** **expersq** **age** **kidslt6** **kidsge6**
Categorical variables	**educ**

5. To run the task, click .

Here is a subset of the results:

Discrete Response Profile of inlf		
Index	**Value**	**Total Frequency**
1	0	325
2	1	428

Class Level Information		
Class	**Levels**	**Values**
educ	13	5 6 7 8 9 10 11 12 13 14 15 16 17

Model Fit Summary	
Number of Endogenous Variables	1
Endogenous Variable	inlf
Number of Observations	753
Log Likelihood	-396.16371
Maximum Absolute Gradient	1.27229
Number of Iterations	157
Optimization Method	Quasi-Newton
AIC	830.32742
Schwarz Criterion	918.18466

Goodness-of-Fit Measures		
Measure	**Value**	**Formula**
Likelihood Ratio (R)	237.42	2 * (LogL - LogL0)
Upper Bound of R (U)	1029.7	- 2 * LogL0
Aldrich-Nelson	0.2397	R / (R+N)

Assigning Data to Roles

To run the Probit/Logit Regression task, you must assign a column to the **Dependent variable** role.

Role	Description
Dependent variable	specifies the numeric column to use as the dependent variable for the regression analysis. Use the **Distribution** drop-down list to specify whether to create a probit or logit model.
Continuous variables	specifies the numeric columns to use as the independent regressor (explanatory) variables for the regression model.
Categorical variables	specifies how to group values into levels.

Setting Options

Option	Description
Methods	
Type of covariances of the parameter estimates	specifies the type of covariance matrix of the parameter estimates. You can specify these types of matrices: ■ the covariance from the inverse Hessian matrix ■ the covariance from the outer product mix ■ the covariance from the outer product and Hessian matrices (also called the quasi-maximum-likelihood-estimates)
Include the intercept in the model	specifies whether to include the intercept in the model.

Option	Description
Optimization	
Method	specifies the iterative minimization method to use. By default, the Quasi-Newton method is used.
Maximum number of iterations	specifies the maximum number of iterations for the selected method.
Heteroscedasticity	
Variables on the variance function	specifies the columns that are related to heteroscedasticity of the residuals and how these variables are used to model error variances. Here is the heteroscedastic regression model that is supported by this task: $y_i = x_i^{'}\beta + \varepsilon_i$ $\varepsilon_i \sim N\left(0,\ \sigma_i^2\right)$
Form of variance function	specifies the link function to use. You can choose from these options: ■ **Exponential** $\sigma_i^2 = \sigma^2\left(1 + \exp\left(z_i^{'}\gamma\right)\right)$ ■ **Exponential with no constant** $\sigma_i^2 = \sigma^2 \exp\left(z_i^{'}\gamma\right)$ ■ **Linear** $\sigma_i^2 = \sigma^2\left(1 + z_i^{'}\gamma\right)$ ■ **Linear with no constant** $\sigma_i^2 = \sigma^2\left(z_i^{'}\gamma\right)$ ■ **Square of linear function** $\sigma_i^2 = \sigma^2\left(1 + \left(z_i^{'}\gamma\right)^2\right)$ ■ **Square of linear function with no constant** $\sigma_i^2 = \sigma^2\left(z_i^{'}\gamma\right)^2$

Setting Output Options

Option	Description
Plots	
Diagnostic Plots	
Error standard deviations by observed regressor	displays the error standard deviation versus observed regressors when you assign a column to the **Variables on the variance function** option.
Profiled log likelihood	displays the profiled log likelihood. Each profiled graph is obtained by setting all the parameters to their maximum likelihood estimate except for the profiling parameter. The profiling parameter takes values on a predefined grid that is determined by the maximum likelihood estimate of the corresponding standard deviation.
Output Plots	
Predicted values by regressor	displays the model predicted values. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.
Marginal effects by regressor	displays the marginal effects. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.
Inverse Mills ratio by regressor	displays the inverse Mills ratio. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.

Option	Description
Predicted response probability by regressor	displays the predicted response probability. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.
Predicted probabilities for each level of the response by regressor	displays the predicted probabilities for each level of the response. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.
Linear predictor values by regressor	displays the structural part on the right side of the model. Each contributing regressor is set equal to its mean, except for the parameter that is reported on the X axis.
Display plots	specifies whether to display the plots in a panel or individually.
Output Tables	
You can specify whether to include any output tables in the results. Here is the information that you can include in the results: ■ correlation matrix of the parameter estimates ■ covariance matrix of the parameter estimates ■ iteration history of the objective function and parameter estimates	

8

Graph Tasks

Bar Chart Task

About the Bar Chart Task

The Bar Chart task creates horizontal or vertical bar charts that compare numeric values or statistics between different values of a chart variable. Bar charts show the relative magnitude of data by displaying bars of varying height. Each bar represents a category of data.

Example: Bar Chart of Mean Sales for Each Product Line

For example, you can create a bar chart that compares the total amount of sales for each product line in the Sashelp.Pricedata data set. By default, the task calculates the mean of the response variable for each product line. This bar chart shows that Line 2 has the highest mean product sales.

To create this example:

1. In the **Tasks** section, expand the **Graph** folder and double-click **Bar Chart**. The user interface for the Bar Chart task opens.

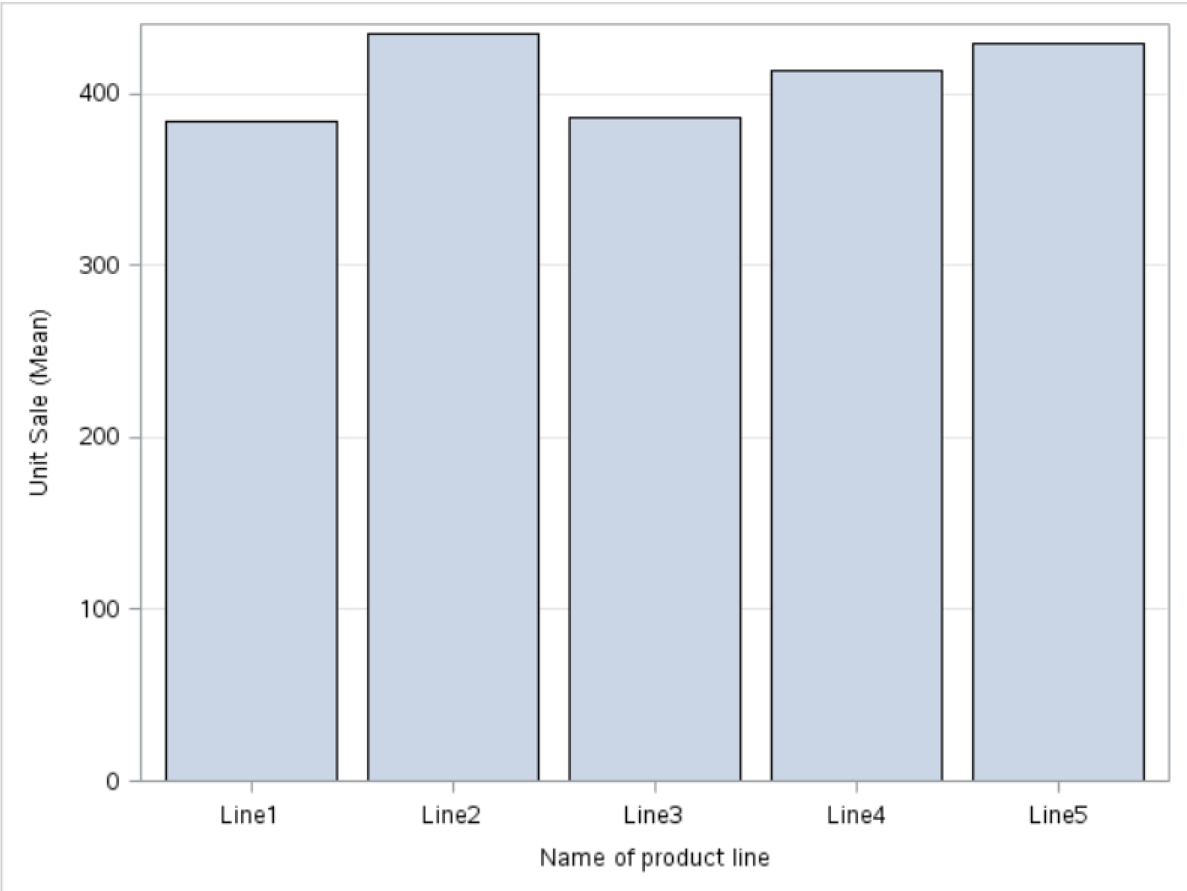
2. On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3. Assign columns to these roles:

Role	Column Name
Category variable	**productLine**
Response variable	**sale**

4. To run the task, click .

Here are the results:



Assigning Data to Roles

To run the Bar Chart task, you must assign a column to the **Category variable** role.

Role	Description
Category variable	specifies the variable that classifies the observations into distinct subsets.
Response variable	specifies a numeric response variable for the plot.

Role	Description
Group variable	specifies a variable that is used to group the data.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.
BY variable	creates a separate graph for each BY group.

Setting Options

Option Name	Description
Direction	
You can create either a vertical or horizontal bar chart.	
Title and Footnote	
You can specify a custom title and footnote for the output.	
Group Layout	
Cluster	displays group values as separate adjacent bars that replace the single category bar. Each set of group values is centered at the midpoint tick mark for the category.
Stack	overlays group values without any clustering. Each group is represented by unique visual attributes derived from the GraphData1... GraphData*n* style elements in the current style.
Statistics	
Mean	calculates the mean of the response variable.

Option Name	Description
Sum	calculates the sum of the response variable.
Limits	
Limits	specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end that extends from each bar. Limit lines are displayed only if you select the **Mean** statistic.
Limit statistic	specifies the statistic for the limit lines.
Limit multiplier	specifies the number of standard units for the limit lines. By default, this value is 1.
Bar Details	
Apply bar color	specifies the color for the bars when a column is not assigned to the **Group variable** role.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Data skin	specifies a special effect to be used on all filled bars.
Bar Labels	
Show bar labels or statistics	displays the values of the calculated response as data labels.
Category Axis	
Reverse	specifies that the values for the tick marks are displayed in reverse (descending) order.
Show values in data order	places the discrete values for the tick marks in the order in which they appear in the data.

Option Name	Description
Show label	enables you to display a label for the axis. Enter this label in the **Custom label** box.
Response Axis	
Show grid	creates grid lines at each tick on the axis.
Append statistics to axis label	includes the name of the calculated statistic in the axis label. For example, if you are calculating the mean, the axis label could be Weight (Mean).
Custom Label	enables you to customize the label for the response axis. By default, the axis label is the name of the variable.
Legend Details	
Show legend	specifies whether to display a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Bar-Line Chart Task

About the Bar-Line Chart Task

The Bar-Line Chart task creates a vertical bar chart with a line chart overlay.

You can use this task to perform the following tasks:

- display and compare exact and relative magnitudes

- examine the contribution of each part to the whole
- determine trends and patterns in the data

Example: City and Highway Mileage by Origin

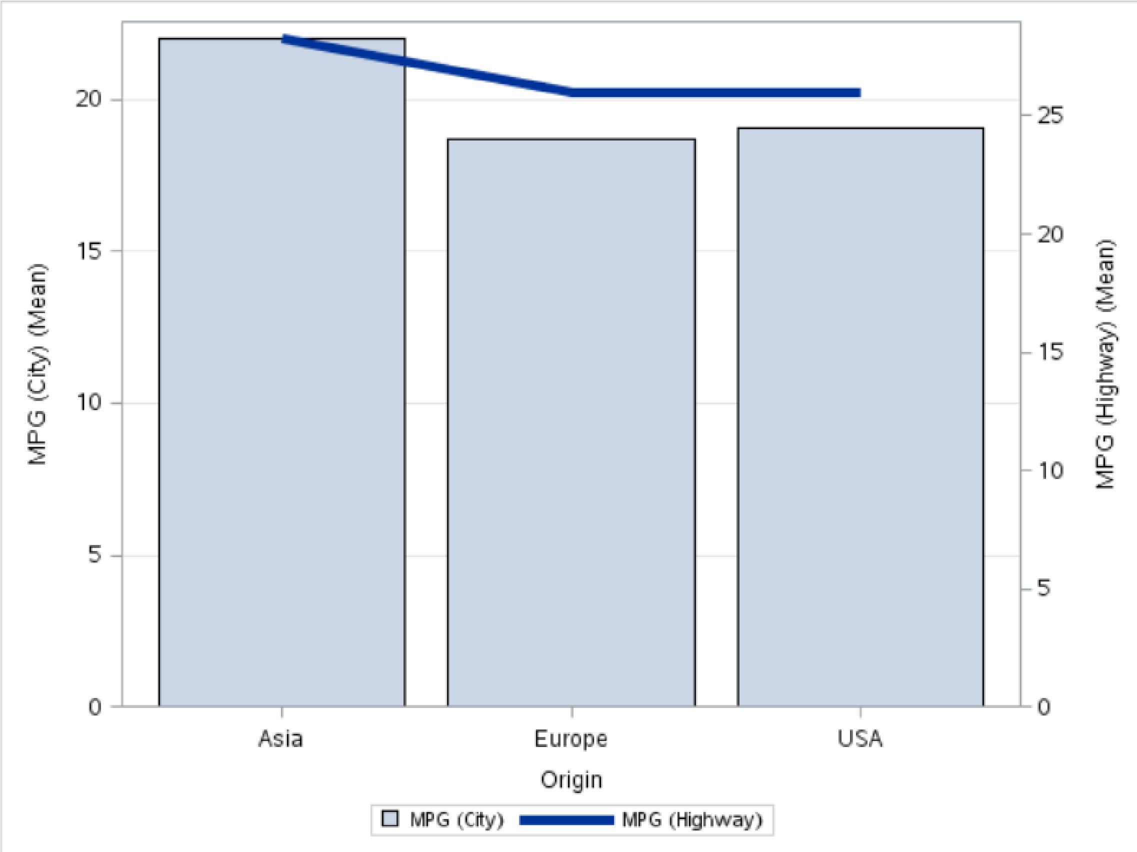
For example, you can create a bar-line chart that compares the number of miles per gallon (in the city and on the highway) that cars use depending on their country of origin. The task calculates the mean of the number of miles per gallon in the city and in the highway for each country. This bar-line chart shows that cars from Asia tend to get the highest number of miles per gallon in city and highway driving.

To create this example:

1. In the **Tasks** section, expand the **Graph** folder and double-click **Bar-Line Chart**. The user interface for the Bar-LineChart task opens.
2. On the **Data** tab, select the **SASHELP.CARS** data set.
3. Assign columns to these roles:

Role	Column Name
Category variable	**Origin**
Bar response variable	**MPG_City**
Line response variable	**MPG_Highway**

4. To run the task, click .



Assigning Data to Roles

To run the Bar-Line Chart task, you must assign a column to the **Category variable**, **Bar response variable**, and **Line response variable** roles.

Role	Description
Category variable	specifies the variable that classifies the observations into distinct subsets.
Bar response variable	specifies a numeric response variable for the bar chart.

Role	Description
Line response variable	specifies a numeric response variable for the line plot.
Group variable	specifies a variable that is used to group the data.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Statistics	
Mean	calculates the mean of the response variables.
Sum	calculates the sum of the response variables.
Bar Details	
Apply bar color	specifies the color for the bars.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Data skin	specifies a special effect to be used on all filled bars.
Line Details	

Option Name	Description
Apply line color	specifies the color for the line.
Line thickness	specifies the thickness (in pixels) of the line.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Use solid line pattern	specifies a solid pattern for the line.
Category Axis	
Reverse	specifies that the values of the tick marks are displayed in reverse (descending) order.
Show values in data order	places the discrete values for the tick marks in the order in which they appear in the data.
Show label	enables you to display a label for the axis. Enter this label in the **Custom label** box.
Response Axes	
Use zero baseline	specifies whether to offset all lines from the discrete category values and all bars from category midpoints. By default, there is no offset.
Use uniform scale	uses the same scale for both response axes.
Show grid on left (bar) axis	creates grid lines at each tick on the axis for the bar chart.
Append statistics to axis labels	includes the name of the calculated statistic in the axis label. For example, if you are calculating the mean, the axis label could be Weight (Mean).
Add plot prefix to axis labels	adds (Bar) and (Line) to the labels for the response axes.

Option Name	Description
Custom label for left (bar) axis	enables you to specify a custom label for the response axis in the bar chart. The default label is the name of the bar response variable.
Custom label for right (line) axis	enables you to specify a custom label for the response axis in the line chart. The default label is the name of the line response variable.
Legend Details	
Show legend	specifies whether to display a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Histogram Task

About the Histogram Task

The Histograms task creates a chart that displays the frequency distribution of a numeric variable.

Example: Histogram of Stock Volume

To create this example:

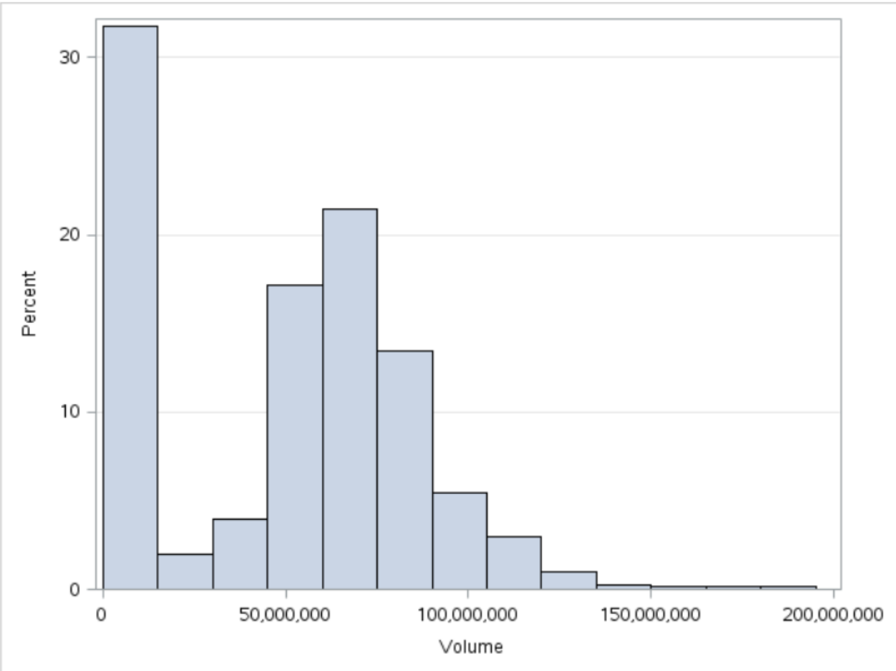
1 In the **Tasks** section, expand the **Graph** folder and double-click **Histogram**. The user interface for the Histogram task opens.

2 In the **Data** tab, select the **SASHELP.STOCKS** data set.

3 To the **Analysis variable** role, assign the **Volume** column.

4 To run the task, click .

Here are the results:



Assigning Data to Roles

To run the Histogram task, you must assign a column to the **Analysis variable** role.

Setting Options

Option Name	Description
Title and Footnote	

Option Name	Description
You can specify a custom title and footnote for the output.	
Density Curves	
You can specify whether to create a density curve that shows the distribution of values for a numeric variable. You can create density curves for normal and kernel distributions.	
Bin Details	
For the bins in the histogram, you can specify the color and the transparency.	
Horizontal Axis	
Interval axis	creates tick marks at regular intervals on the horizontal axis based on the minimum and maximum values of the analysis variable.
Bin axis	creates tick marks at the midpoints of the value bins on the horizontal axis.
Specify number of bins	enables you to specify the number of bins in the histogram. Valid values range from 2 to 20. The bins always span the range of data. The task tries to produce tick values that are easily interpreted (for example, 5, 10, 15, 20). Sometimes the location of the first bin and the bin width might be adjusted. By default, the task automatically determines the number of bins.
Show label	displays the label for the analysis variable along the horizontal axis. You can also enter a custom label.
Vertical Axis	

Option Name	Description
Specify axis scaling	specifies the scaling that is applied to the vertical axis. You can choose from these options: **COUNT** the axis displays the frequency count **PERCENT** the axis displays values as a percentage of the total. **PROPORTION** the axis displays values as proportions (0.0 to 1.0) of the total.
Show grid	specifies whether to show the grid lines for the vertical axis.
Show label	specifies whether to show the label for the type of axis scaling.
Legend Details	
Show legend	specifies whether to display a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Line Chart Task

About the Line Chart Task

The Line Chart task assumes that the values in the category variable are discrete. The task groups these values into distinct categories. If you assign a column from the input data source to the **Response variable** role, you can select the statistic (either mean or sum) for the response values. By default, the task calculates the mean of the values for the response variable. If no response variable is assigned, a frequency chart by category is created.

Example: Displaying the Mean Horsepower for Each Car Type

In this example, you want to display the mean horsepower for each car type in a line plot. The result shows that sports cars have the highest average horsepower and hybrid cars have the lowest average horsepower.

To create this example:

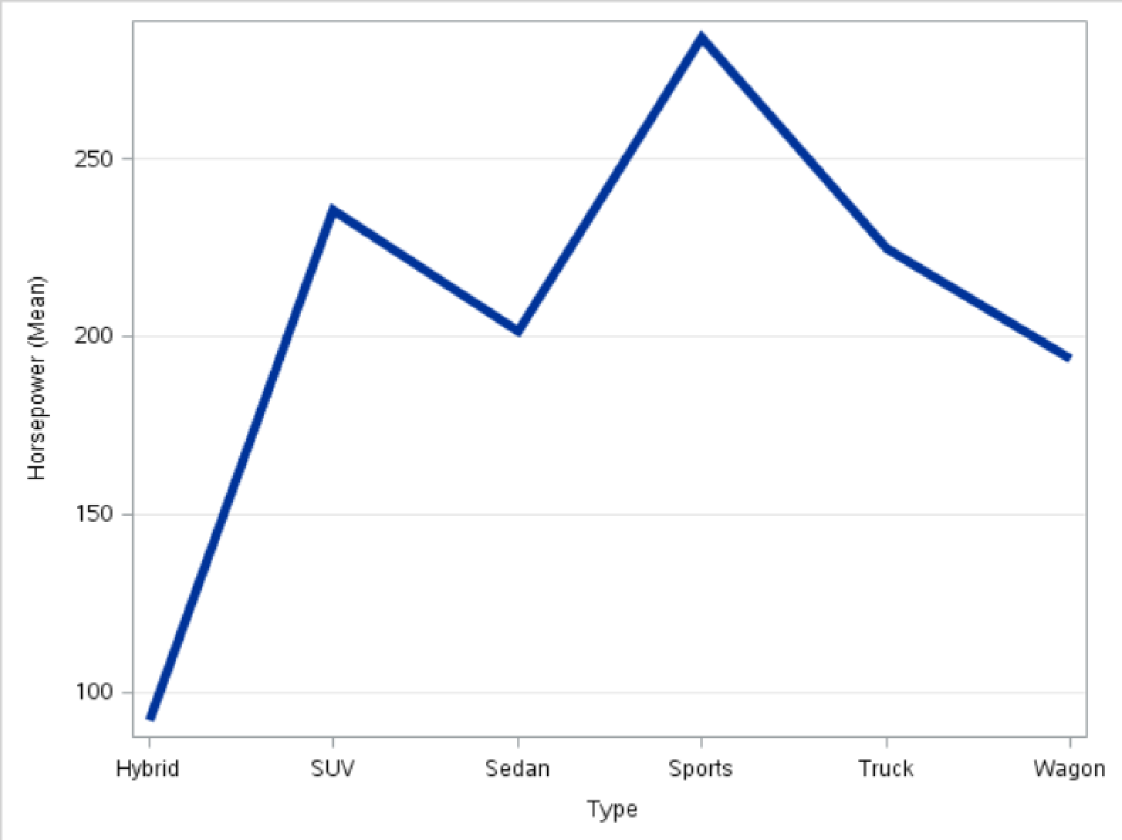
1 In the **Tasks** section, expand the **Graph** folder and double-click **Line Chart**. The user interface for the Line Chart task opens.

2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column Name
Category variable	**Type**
Response variable	**Horsepower**

4 To run the task, click .



Assigning Data to Roles

To run the Line Chart task, you must assign a column to the **Category variable** role.

Role	Description
Category variable	specifies the variable that classifies the observations into distinct subsets.
Response variable	specifies a numeric response variable for the plot.
Group variable	specifies a variable that is used to group the data.

Role	Description
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Statistics	
Mean	calculates the mean of the response variable.
Sum	calculates the sum of the response variable.
Line Details	
Apply line color	specifies the color for the line when you do not assign a column to the **Group variable** role.
Line thickness	specifies the thickness (in pixels) of the line.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Use solid line	specifies a solid pattern for the line.
Line Labels	
Show line labels	displays the label from the response variable. If you assign a column to the **Group variable** role, each line is labeled with the group value.

Option Name	Description
Category Axis	
Reverse	specifies that the values of the tick marks are displayed in reverse (descending) order.
Show values in data order	places the discrete tick values in the order in which they appear in the data.
Show label	enables you to display a label for the axis. By default, the label is the variable name. To customize this label, enter this label in the **Custom label** box.
Response Axis	
Show grid	creates grid lines at each tick on the axis.
Append statistics to axis label	includes the name of the calculated statistic in the axis label. For example, if you are calculating the mean, the axis label could be Weight (Mean).
Custom label	enables you to customize the label for the response axis. By default, the axis label is the name of the variable.
Legend Details	
Show legend	specifies whether to display a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Pie Chart Task

About the Pie Chart Task

The Pie Chart task creates pie charts that represent the relative contribution of the parts to the whole by displaying data as wedge-shaped "slices" of a circle. Each slice represents a category of data. The size of a slice represents the contribution of the data to the total chart statistic.

Example: Pie Chart That Shows Total MSRP for Each Car Type by Region

In this example, you want to compare the manufacturer's suggested retail price (MSRP) for each car type grouped by region of origin. The resulting pie chart consists of six rings—one for each car type. The rings are then subset into the MSRP values for the three regions: Asia, Europe, and USA. Using this chart, you can compare the total MSRP values for each region. The ring for the SUV car type shows that the USA has the highest MSRP and that Europe has the lowest MSRP.

To create this example:

1 In the **Tasks** section, expand the **Graph** folder and double-click **Pie Chart**. The user interface for the Pie Chart task opens.

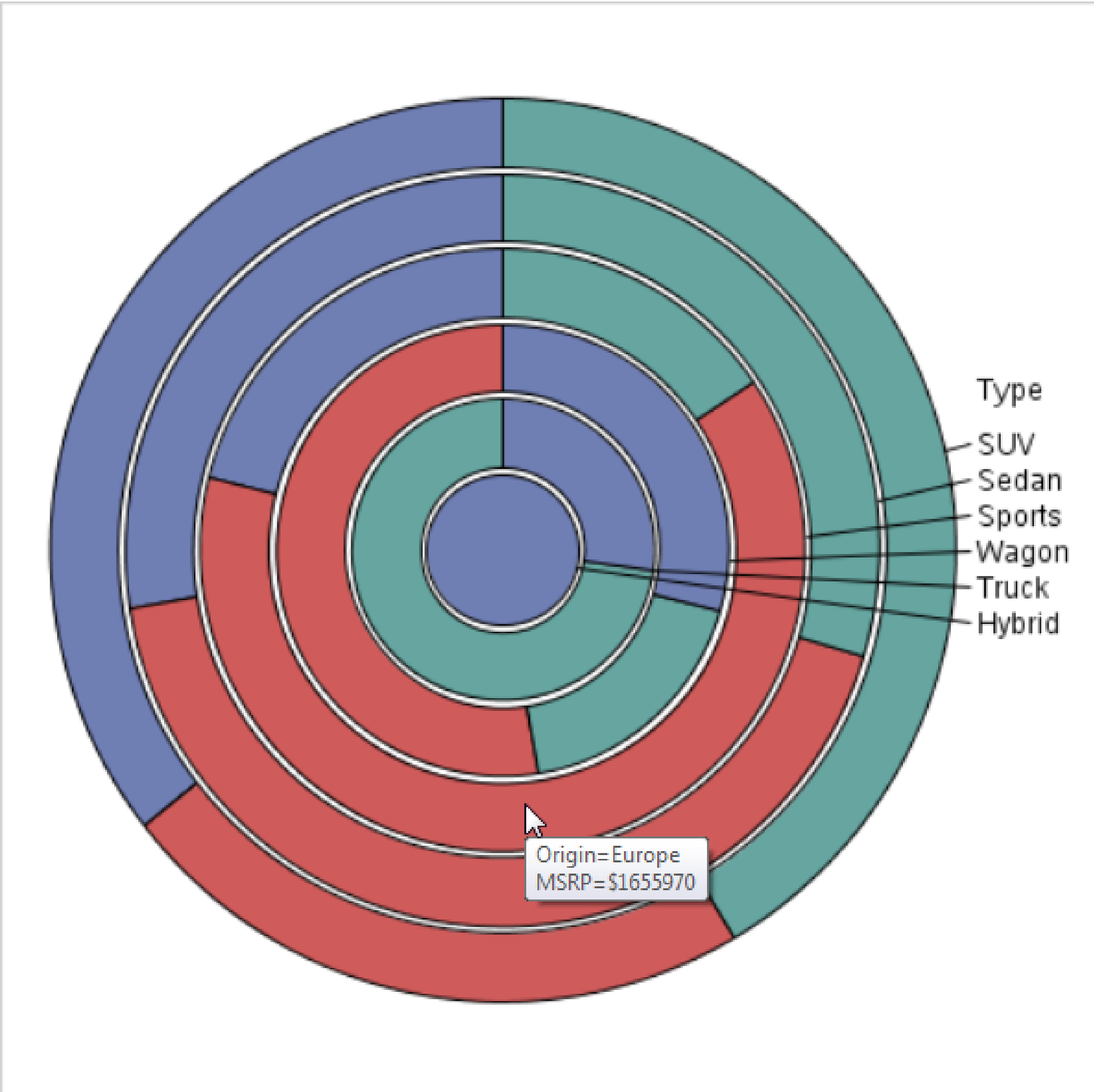
2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column Name
Category variable	**Origin**
Response variable	**MSRP**
Group variable	**Type**

4 To run the task, click .

Here is the result:



Assigning Data to Roles

To run the Pie Chart task, you must assign a column to the **Category variable** role.

Role	Description
Category variable	specifies the variable that classifies the observations into distinct subsets.
Response variable	specifies a numeric response variable for the plot.
Group variable	specifies a variable that is used to group the data.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Orientation	
Starting point	specifies where to create the first slice in the pie chart. The remaining slices appear counterclockwise.
Center the first slice	specifies whether to offset the first slice.
Pie Details	

Option Name	Description
Data skin	specifies a special effect to be used on all filled bars.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Pie Labels	
Location	specifies whether to display the label inside or outside the slice in the pie chart. By default, the Pie Chart task determines the best location for the slice.
Font size	specifies the font size of the label for each slice.
Graph Size	
You can specify the width and height of the graph in inches.	

Scatter Plot Task

About the Scatter Plot Task

The Scatter Plot task creates plots that show the relationships between two or three variables by revealing patterns or concentrations of data points. For example, a two-dimensional scatter plot can display the heights and weights of all students in a class.

Example: Scatter Plot of Height versus Weight

In this example, you want to create a scatter plot of height versus weight.

To create this example:

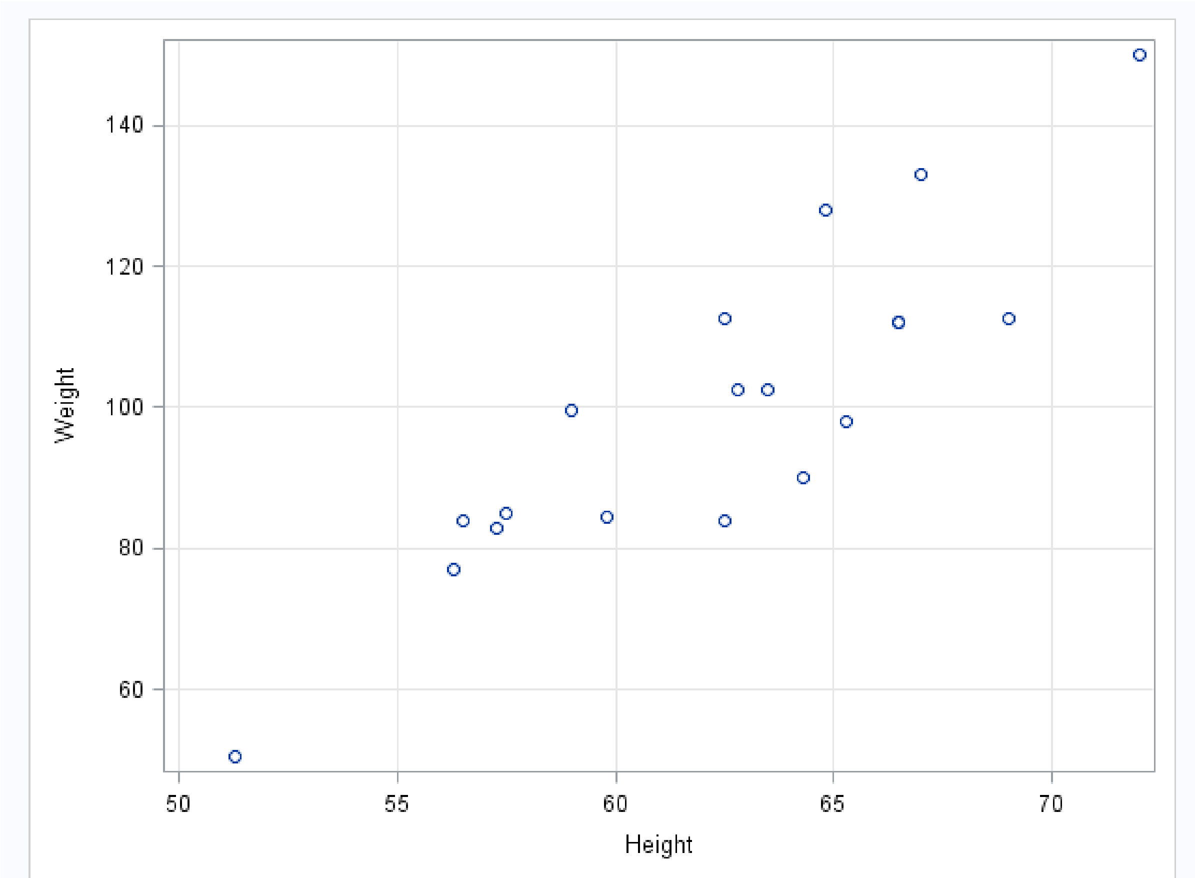
1 In the **Tasks** section, expand the **Graph** folder and double-click **Scatter Plot**. The user interface for the Scatter Plot task opens.

2 On the **Data** tab, select the **SASHELP.CLASS** data set.

3 Assign columns to these roles:

Role	Column Name
X variable	**Height**
Y variable	**Weight**

4 To run the task, click .



Assigning Data to Roles

To run the Scatter Plot task, you must assign columns to the **X variable** and **Y variable** role.

Role	Description
X variable	specifies the variable for the x axis.
Y variable	specifies the variable for the y axis.

Role	Description
Group variable	specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.
Marker label variable	displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Marker Details	
You can specify the symbol type, color, and size of the markers. You can also specify the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).	
Marker Labels	
Font size	specifies the appearance of the labels in the plot when you assign a variable to the **Marker label variable** role.
X Axis, Y Axis	

Option Name	Description
Show grid lines	creates grid lines at each tick on the axis.
Show label	displays the label for the axis. By default, the label is the variable name. To customize, enter this label in the **Custom label** box.
Legend Details	
Show legend	displays a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Series Plot Task

About the Series Plot Task

The Series Plot task creates a line plot. Series plots display a series of line segments that connect observations of input data.

Example: Series Plot of Stock Trends

In this example, you want to create a series plot that shows stock trends.

To create this example:

1 In the **Tasks** section, expand the **Graph** folder and double-click **Series Plot**. The user interface for the Series Plot task opens.

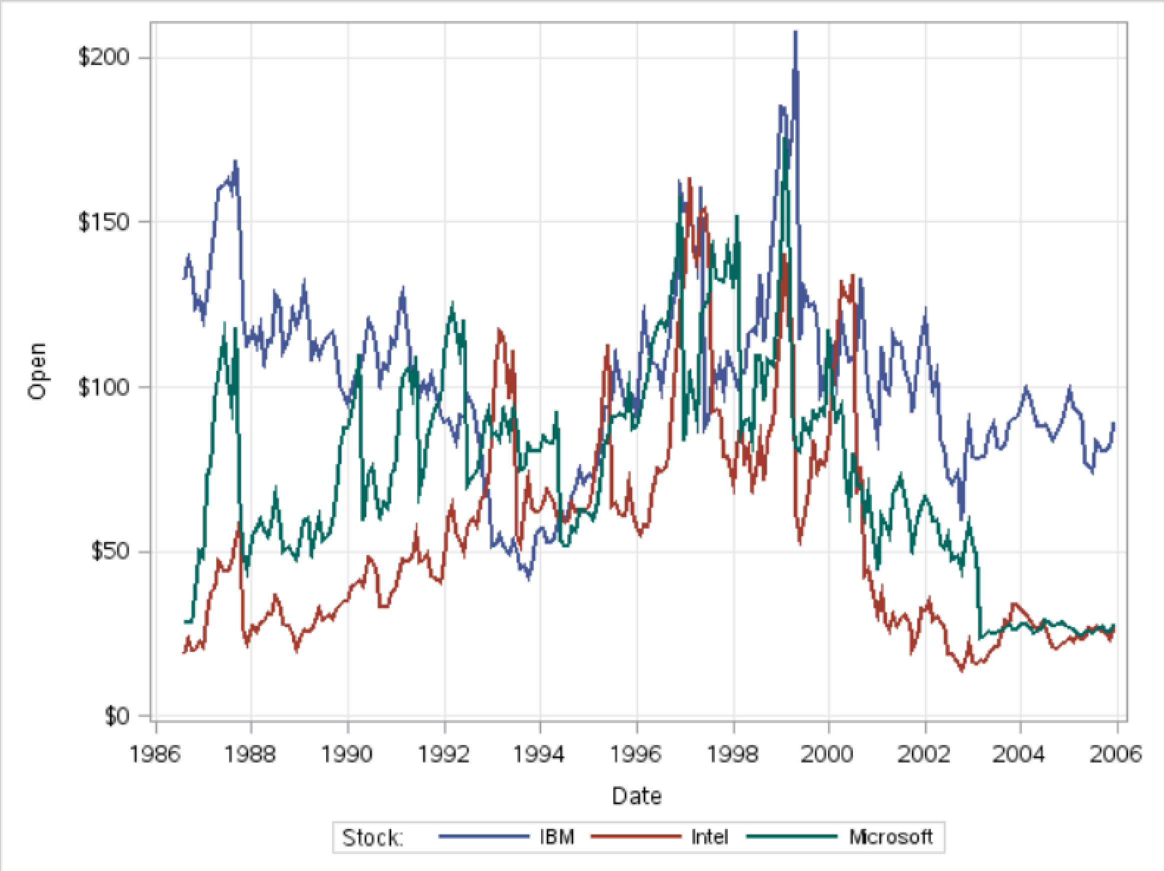
2 On the **Data** tab, select the **SASHELP.STOCKS** data set.

3 Assign columns to these roles:

Role	Column Name
X variable	**Date**
Y variable	**Open**
Group variable	**Stock**

4 To run the task, click .

The resulting series plot shows the stock values for three companies.



Assigning Data to Roles

To run the Series Plot task, you must assign columns to the **X variable** and **Y variable** roles.

Role	Description
X variable	specifies the variable for the x axis.
Y variable	specifies the variable for the y axis.

Role	Description
Group variable	specifies a variable that is used to group the data.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Plot Details	
You can specify the symbol type, color, and size of the markers in the scatter plot. You can also specify the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).	
Plot Labels	
Show plot labels	adds a label for the curve. You can also specify the size of this text.
X Axis, Y Axis	
Show grid lines	creates grid lines at each tick on the axis.
Show label	displays the label for the axis. By default, the label is the variable name. To customize, enter this label in the **Custom label** box.
Legend Details	

Option Name	Description
Show legend	displays a legend in the output.
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

Simple HBar Task

About the Simple HBar Task

The Simple HBar task creates a simple horizontal bar chart. You can customize the title, footnotes, axes, and legends for the horizontal bar chart.

Example: Horizontal Bar Chart of Mileage by Origin and Type

To create this horizontal bar chart:

1. In the **Tasks** section, expand the **Graphs** folder and double-click **Simple HBar**. The user interface for the Simple HBar task opens.

2. On the **Data** tab, select the **SASHELP.CARS** data set.

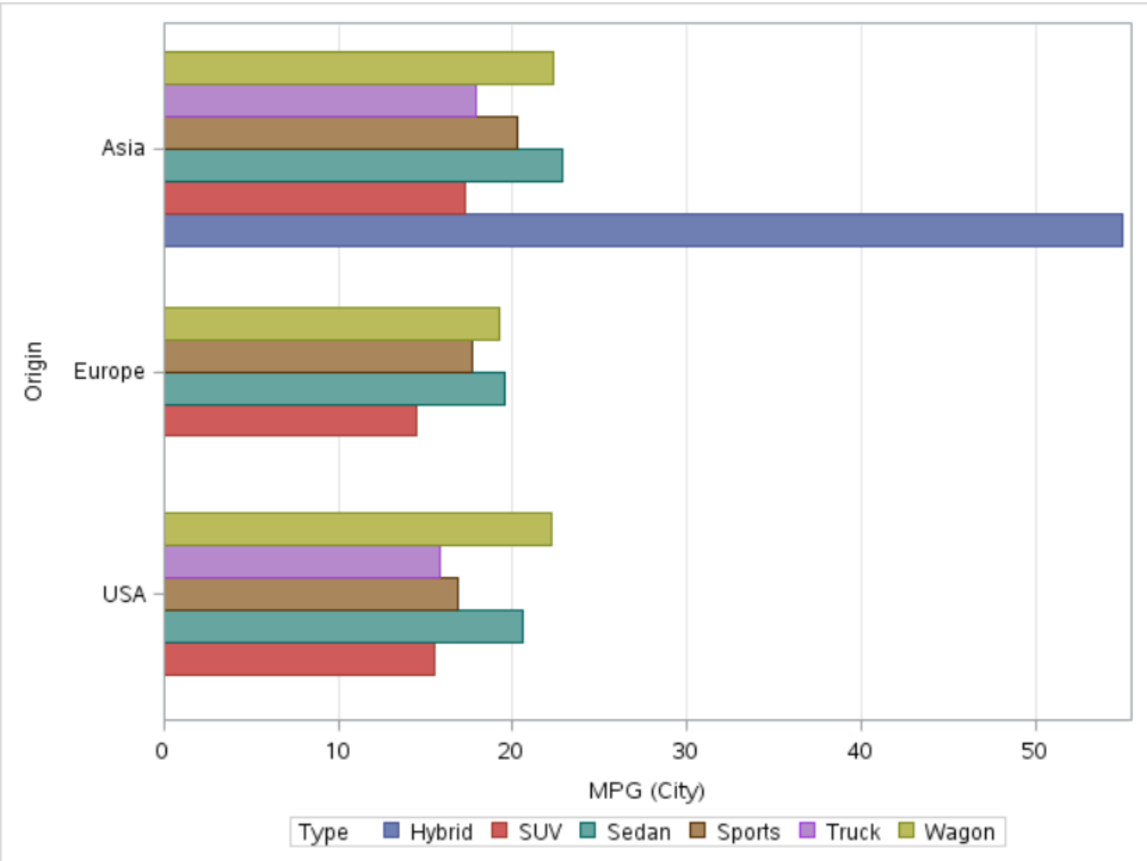
3. Assign columns to these roles:

Role	Column Name
Category variable	**Origin**
Response variable	**MPG_City**

Role	Column Name
Group variable	Type

4 To run the task, click .

Here are the results:



Assigning Data to Roles

To run the Simple HBar task, you must assign a column to the **Category variable** role.

Role	Description
Category variable	specifies the variable that classifies the observations into distinct subsets.
Response variable	specifies a numeric response variable for the plot.
Group variable	specifies a variable that is used to group the data.
URL variable	specifies a character variable that contains URLs for web pages to be displayed when parts of the plot are selected within an HTML page.

Setting Options

Option Name	Description
Title and Footnote	
You can specify a custom title and footnote for the output.	
Group Layout	
Cluster	displays group values as separate adjacent bars that replace the single category bar. Each set of group values is centered at the midpoint tick mark for the category.

Option Name	Description
Stack	overlays group values without any clustering. Each group is represented by unique visual attributes that are derived from the GraphData1... GraphData*n* style elements in the current style.
Statistics	
Mean	calculates the mean of the response variable.
Sum	calculates the sum of the response variable.
Bar Details	
Apply bar color	specifies the color for the bars when a column is not assigned to the **Group variable** role.
Transparency	specifies the degree of transparency for the plot. The range is 0 (completely opaque) to 1 (completely transparent).
Data skin	specifies a special effect to be used on all filled bars.
Bar Labels	
Show bar labels	displays the values of the calculated response as data labels.
Category Axis	
Reverse	specifies that the values of the tick marks are displayed in reverse (descending) order.
Show values in data order	places the discrete tick values in the order in which they appear in the data.
Show label	enables you to display a label for the axis. Enter this label in the **Custom label** box.
Response Axis	

Option Name	Description
Show grid	creates grid lines at each tick on the axis.
Append statistics to axis label	includes the name of the calculated statistic in the axis label. For example, if you are calculating the mean, the axis label could be Weight (Mean).
Custom Label	enables you to customize the label for the response axis. By default, the axis label is the name of the variable.
Legend Details	
Legend location	specifies whether the legend is placed outside or inside of the axis area.
Graph Size	
You can specify the width and height of the graph in inches.	

9

High-Performance Tasks

About the High-Performance Tasks

The high-performance tasks are designed to be used with large data sets.

Bin Continuous Data Task

About the Bin Continuous Data Task

The Bin Continuous Data task is a data preparation task. This task divides the data values of a continuous variable into intervals and replaces the values for each interval with a single value that is representative of the interval.

Note: This task is available only if you are running SAS 9.4.

Example: Winsorized Binning

In this example, the task provides the basic Winsorized statistical information for the input data.

To create this example:

1 To create the Work.Ex12 data set, enter this code into a **Program** tab:

```
data ex12;
   length id 8;
   do id=1 to 10000;
      x1 = ranuni(101);
      x2 = 10*ranuni(201);
      x3 = 100*ranuni(301);
      output;
```

```
   end;
run;
```

Click .

2 In the **Tasks** section, expand the **High Performance** folder and double-click **Bin Continuous Data**. The user interface for the Bin Continuous Data task opens.

3 On the **Data** tab, select the **WORK.EX12** data set.

4 To the **Variables to bin** role, assign the **x1** and **x2** columns.

5 Select the **Options** tab and set these options:

- In the **Number of bins** box, enter `10`.
- From the **Method** drop-down list, select **Winsorized binning**.

6 To run the task, click .

Here is a subset of the results:

Performance Information	
Execution Mode	Single-Machine
Number of Threads	4

Binning Information	
Method	Winsor Binning
Number of Bins Specified	10
Number of Variables	2

Mapping				
Variable	Binned Variable	Range	Frequency	Proportion
x1	BIN_x1	x1 < 0.137722	1405	0.14050
		0.137722 <= x1 < 0.227865	849	0.08490
		0.227865 <= x1 < 0.318007	897	0.08970
		0.318007 <= x1 < 0.408150	864	0.08640
		0.408150 <= x1 < 0.498293	906	0.09060
		0.498293 <= x1 < 0.588435	899	0.08990
		0.588435 <= x1 < 0.678578	935	0.09350
		0.678578 <= x1 < 0.768720	901	0.09010
		0.768720 <= x1 < 0.858863	948	0.09480
		0.858863 <= x1	1396	0.13960
x2	BIN_x2	x2 < 1.398500	1385	0.13850
		1.398500 <= x2 < 2.301366	941	0.09410
		2.301366 <= x2 < 3.204232	888	0.08880
		3.204232 <= x2 < 4.107099	855	0.08550

Assigning Data to Roles

To run the Bin Continuous Data task, you must assign a variable to the **Variables to bin** role.

Role	Description
Roles	
Variables to bin	specifies one or more variables as input variables for binning. The specified variables must be interval variables.
Additional Roles	
Frequency count	specifies a numeric variable that contains the frequency of occurrence for each observation. If the frequency value is less than 1 or is missing, the observation is not used in the analysis. By default, each observation is assigned a frequency of 1.

Setting Options

Option Name	Description
Methods	
Number of bins	specifies the global number of binning levels for all binning variables. This value can be any integer between 2 and 1,000, inclusive. The default number of binning levels is 16.

Option Name	Description
Method	specifies which binning method to use. ■ **Bucket binning** creates equal-length bins and assigns the data to one of these bins. You can choose the number of bins during the binning. The default number of bins (the binning level) is 16. ■ **Winsorized binning** is similar to bucket binning except that both tails are cut off to obtain a smooth binning result. This technique is often used to remove outliers during the data preparation stage. You must specify a value for the **Winsor rate** option. Valid values are from 0.0 to 0.5 (exclusive). ■ **Pseudo-quantile binning** mimics the results of the quantile binning method but is more efficient by consuming less CPU time and memory.
Tables	
Select tables to display	In the results, you can specify whether to include no tables, the default tables for the task, or customized tables. If you create customized tables, you can choose from these options: ■ **Basic statistics** displays the mean, pseudo-median, standard deviation, minimum, maximum, and number of bins for each binning variable. ■ **Quantile statistics** displays the estimated quantiles and extremes table.
Output Data Sets	
You can specify whether to save the results to an output table. If the table is created, it is saved in the Work library by default. In the **Additional variables to include in the output data set** role, specify any columns from the input data set that you want to include in the output data set.	

High-Performance CorrelationsTask

About the High-Performance Correlations Task

Correlation is a statistical procedure for describing the relationship between numeric variables. The relationship is described by calculating correlation coefficients for the variables. The High-Performance Correlations task calculates a Pearson product-moment correlation. This is a parametric measure of association for two continuous random variables. Correlations range from –1 to 1.

Note: This task is available only if you are running SAS 9.4.

Example: Correlation between Engine Size and the Number of Cylinders

To create this example:

1 Create the Work.Fitness data set. For more information, see “FITNESS Data set” on page 257.

2 In the **Tasks** section, expand the **High Performance** folder and double-click **Correlations**. The user interface for theHigh-Performance Correlations Analysis task opens.

3 On the **Data** tab, select the **WORK.FITNESS** data set.

4 To the **Analysis variables** role, assign the **Weight**, **Oxygen**, and **RunTime** columns.

5 To run the task, click .

Here are the results:

Performance Information	
Execution Mode	Single-Machine
Number of Threads	4

3 Variables:	Weight Oxygen RunTime

Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations			
	Weight	Oxygen	RunTime
Weight	1.00000 31	-0.15358 0.4264 29	0.20072 0.2965 29
Oxygen	-0.15358 0.4264 29	1.00000 29	-0.86843 <.0001 28
RunTime	0.20072 0.2965 29	-0.86843 <.0001 28	1.00000 29

Assigning Data to Roles

To run the High-Performance Correlations task, you must assign two columns to the **Analysis variables** role.

Role	Description
Analysis variables	specifies the columns to use to calculate the correlation coefficients.
Frequency count	specifies a numeric column whose value represents the frequency of the observation.

Role	Description
Weight	specifies the weights to use in the calculation of Pearson weighted product-moment correlation.

Setting Options

Option Name	Description
Methods	
Missing values	specifies whether to include missing values in the calculations. ■ If you select the **Use non-missing values for all selected variables** options, any observations that have missing values are excluded from the analysis. ■ If you select the **Use non-missing values for pairs of variables** option, the data for an observation contributes to the correlation between two variables as long as both values are nonmissing. As a result, the correlations that are calculated for the analysis variable might be based on a different number of observations.
Tables	
You can specify whether the results include only the tables that the task automatically generates, the default tables and any additional tables that you selected, or no tables. By default, only the correlations table is displayed in the results. You can also include these values in the tables: ■ covariances ■ sum of squares and cross-products ■ corrected sum of squares and cross-products ■ descriptive statistics	

Option Name	Description
Display p-values	specifies whether to display the probabilities that are associated with each correlation coefficient.
Order correlations from highest to lowest	displays the ordered correlation coefficients for each variable. Correlations are ordered from highest to lowest in absolute value.
Output Data Set	
You can specify whether to save the results to an output data set, which is saved in the Work library by default. By default, the output data set contains the correlations. You can also include covariances, sum of squares and cross-products, and corrected sum of squares and cross-products.	

Generalized Linear Models

About the Generalized Linear Models Task

The Generalized Linear Models task is a high-performance task that provides model fitting and model building for generalized linear models. It fits models for standard distributions such as normal, Poisson, and Tweedie in the exponential family. This task also fits multinomial models for ordinal and nominal responses. The task provides forward, backward, and stepwise selection methods.

Note: This task is available only if you are running SAS 9.4.

Example: Model Selection

To create this example:

1 Create the Work.getStarted data set. For more information, see “GETSTARTED Data Set” on page 258.

2 In the **Tasks** section, expand the **High Performance** folder and double-click **Generalized Linear Models**. The user interface for the Generalized Linear Models task opens.

3 On the **Data** tab, select the **WORK.GETSTARTED** data set.

4 Assign columns to these roles:

Role	Description
Response variable	**Y** From the **Distribution** drop-down list, select **Poisson**.
Classification variables	**C1** **C2** **C3** **C4** **C5**

5 Click the **Models** tab. From the **Selection method** drop-down list under the **Model Selection** heading, select **Forward selection**.

6 To run the task, click .

Here is a subset of the results:

Performance Information	
Execution Mode	Single-Machine
Number of Threads	4

Model Information	
Data Source	WORK.GETSTARTED
Response Variable	Y
Class Parameterization	GLM
Distribution	Poisson
Link Function	Log
Optimization Technique	Newton-Raphson with Ridging

Selection Information	
Selection Method	Forward
Select Criterion	Significance Level
Stop Criterion	Significance Level
Effect Hierarchy Enforced	None
Entry Significance Level (SLE)	0.05
Stop Horizon	1

Number of Observations Read	100
Number of Observations Used	100

Class Level Information		
Class	Levels	Values
C1	4	0 1 2 3
C2	4	0 1 2 3

Assigning Data to Roles

To run the Generalized Linear Model task, you must assign a column to the **Response variable** role.

Role	Description
Roles	
Response variable	specifies the numeric column that contains the count values. The dependent count variable should be only nonnegative integer values in the input data set. You can specify these distributions for your model: ■ Binary ■ Gamma ■ Inverse Gaussian ■ Multinomial ■ Negative binomial ■ Normal ■ Poisson You can specify these link functions for your model: ■ complementary log-log ■ log-log ■ logit ■ generalized logit ■ probit ■ identity ■ reciprocal ■ reciprocal square ■ logarithm

Role	Description
Response variables (continued)	If you select **Default** for the link function, then the default link function for the model distribution is used. Here is the list of distributions with the corresponding default link function: ■ Binomial distribution uses the logit link function. ■ Gamma distribution uses the reciprocal link function. ■ Inverse Gaussian distribution uses the reciprocal square link function. ■ Multinomial distribution uses the cumulative logit link function. ■ Negative binomial distribution uses the log link function. ■ Normal distribution uses the identity link function. ■ Poisson distribution uses the log link function.
Continuous variables	specifies the independent covariates (regressors) for the regression model. If you do not specify a continuous variable, the task fits a model that contains only an intercept.
Classification variables	specifies the variables to use to group (classify) data in the analysis. Classification variables can be either character or numeric.
Additional Roles	
Frequency count	specifies the numeric column that contains the frequency of occurrence for each observation.
Weight variable	specifies the column to use as a weight to perform a weighted analysis of the data.

Building a Model

Requirements for Building a Model

By default, no effects are specified, which results in the task fitting an intercept-only model. To specify an effect, you must assign at least one variable to the **Continuous variables** or **Classification variables** role. You can select combinations of variables to create crossed, factorial, or polynomial effects.

Create a Main Effect

1 Select the variable name in the **Variables** box.

2 Click **Add** to add the variable to the **Model effects** box.

Create Crossed Effects (Interactions)

1 Select two or more variables in the **Variables** box. To select more than one variable, press Ctrl.

2 Click **Cross**.

Create a Two-Way Factorial Model

1 Select two or more variables in the **Variables** box.

2 Click **Two-way Factorial**.

For example, if you select the Height, Weight, and Age variables and then click **Two-way Factorial**, these model effects are created: Age, Height, Weight, Age*Height, Age*Weight, and Height*Weight*Age.

Create a Full Factorial Model

1 Select two or more variables in the **Variables** box.

2 Click **Full Factorial**.

For example, if you select the Height, Weight, and Age variables and then click **Full Factorial**, these model effects are created: Age, Height, Weight, Age*Height, Age*Weight, Height*Weight, and Age*Height*Weight.

Create N-Way Factorial

1 Select two or more variables in the **Variables** box.

2 Click **N-way Factorial** to add these effects to the **Model effects** box.

For example, if you select the Height, Weight, and Age variables and then specify the value of N as 3, when you click **N-way Factorial**, these model effects are created: Age, Height, Weight, Age*Height, Age*Weight, Height*Weight, and Age*Height*Weight.

Create Polynomial Effects

1 Select one variable in the **Variables** box.

2 Specify higher-degree crossings by adjusting the number in the **N** field.

3 Click **Polynomial, Degree=N** to add the polynomial effects to the **Model effects** box.

Create Polynomial Effects of the N Order

1 Select one variable in the **Variables** box.

2 Specify higher-degree crossings by adjusting the number in the **N** field.

3 Click **Polynomial, Order=N** to add the polynomial effects to the **Model effects** box.

For example, if you select the Age and Height variables and then you specify 3 in the **N** field, when you click **Polynomial, Order=N**, these model effects are created: Age, Age*Age, Age*Age*Age, Height, Height*Height, and Height*Height*Height.

Setting the Model Options

Option	Description
Model	

Option	Description
Include an intercept in the model	specifies whether to include the intercept in the model.
Offset variable	specifies a variable to be used as an offset to the linear predictor. An offset plays the role of an effect whose coefficient is known to be 1. Observations that have missing values for the offset variable are excluded from the analysis.
Model Selection	
Selection method	specifies the model selection method for the model. The task performs model selection by examining whether effects should be added to or removed from the model according to the rules that are defined by the selection method. Here are the valid values for the selection methods: ■ **None** fits the full model. ■ **Forward selection** started with no effects in the model and adds effects based on the **Significance level to add an effect to the model** option. ■ **Backward elimination** starts with all the effects in the model and deletes effects based on the value in the **Significance level to remove an effect from the model** option. ■ **Stepwise regression** is similar to the forward selection model. However, effects that are already in the model do not necessarily stay there. Effects are added to the model based on the **Significance level to add an effect to the model** option and are removed from the model based on the **Significance level to remove an effect from the model** option.
Select best model by	specifies what criterion to use to select the best model.

Setting Options

Option	Description
Tables	

You can specify whether to include any output tables in the results.

Here are the additional tables that you can include:

- Confidence limits for estimates
- Correlations of parameter estimates
- Covariances of parameter estimates

Option	Description
Output Data Set	

You can specify whether to create an output data set. By default, the data set is saved in the Work library. In the output, you can also include these statistics:

- linear predictors $\eta = x'\beta$
- predicted values
- lower confidence limit for predicted values
- upper confidence limit for predicted values
- residuals
- Pearson residuals
- adjusted Pearson residuals

You can also select any columns from the input data set to include in the output data.

Option	Description
Optimization	
Method	specifies the optimization technique to use.
Maximum number of iterations	specifies the maximum number of iterations to perform for the selected optimization technique.

Replace Missing Values Task

About the Replace Missing Values Task

The Replace Missing Values task performs high-performance numeric variable imputation. Imputation is a common step in data preparation. This task can replace numeric missing values with a specified value. This task can also replace numeric missing values with the mean, the pseudo-median, or some random value between the minimum value and the maximum value of the nonmissing values.

Assigning Data to Roles

Role	Description
Roles	
Replace missing values in the variables with the mean	replaces missing values with the mean for the variable.
Replace missing values in the variables with the pseudo-median	replaces missing values with the pseudo-median of the variable. If there is no nonmissing value, the pseudo-median is 0.
Replace missing values in the variables with a random number	replaces missing values with a random value that is drawn between the minimum and maximum of the variable. If there is no nonmissing value, the random value is 0.
Additional Roles	
Frequency count	specifies a numeric variable that contains the frequency of occurrence for each observation. If the frequency value is less than 1 or is missing, the observation is not used in the analysis. By default, each observation is assigned a frequency of 1.

Setting Options

Option Name	Description
Output Data Set	

You can specify whether to create an output data set. This output data set includes the data, imputation indicator variables (0 for not imputed or 1 for imputed), and imputed variables. You can also include any variables from the input data set.

By default, this table is saved in the Work library.

Random Sampling Task

About the Random Sampling Task

The Random Sampling task is a high-performance procedure that performs either simple random sampling or stratified sampling. The output from this task includes an output data set and the sample data, a table with performance information, and a table with frequency information for the population and sample.

Assigning Data to Roles

If you want to perform stratified sampling, you must assign a column to the **Stratify by** role. Otherwise, the **Stratify by** role is optional.

Role	Description
Stratify by	specifies the variables to use to partition the input table into mutually exclusive, nonoverlapping subsets that are known as strata. Each stratum is defined by a set of values of the strata variables, and each stratum is sampled separately. The complete sample is the union of the samples that are taken from all the strata. **Note:** If you do not assign any variables to this role, then the entire input table is treated as a single stratum. You can allocate the total sample size among the strata in proportion to the size of the stratum. For example, the variable GENDER has possible values of M and F, and the variable VOTED has possible values of Y and N. If you assign both GENDER and VOTED to the **Stratify by** role, then the input table is partitioned into four strata: males who voted, males who did not vote, females who voted, and females who did not vote. The input table contains 20,000 rows, and the values are distributed as follows: ■ 7,000 males who voted ■ 4,000 males who did not vote ■ 5,000 females who voted ■ 4,000 females who did not vote Therefore, the proportion of males who voted is 7,000/20,000=0.35 or 35%. The proportions in the sample should reflect the proportions of the strata in the input table. For example, if your sample table contains 100 observations, then 35% of the values in the sample must be selected from the males who voted stratum to reflect the proportions in the input table.

Creating the Output Data Set

By default, the output data set is saved in the Work library. You can select the numeric and character variables from the input data set to include in the output data. Select the **Include all input observations and a sampling indicator variable** to produce an output table with the same number of rows as the input table. The output table has an additional partition indicator (_PARTIND_) to indicate whether an observation is included in the sample (1) or not (0).

Setting Options

Option Name	Description
Methods	
Sample by	specifies the sample size in the desired number of rows or in the desired percentage of input rows. For example, if you specify 3% of rows and there are 400 input rows, then the resulting sample has 12 rows. By default, the number of desired rows is 1, and the desired percentage of input rows is 10. **Note:** If you assign variables to the **Stratify by** role, then the sample size specification that you make here applies to each stratum rather than to the entire input table.
Random seed	specifies the initial seed for the generation of random numbers. If you set this value to zero or a negative number, then a seed that is based on the system clock is used to produce the sample.

Option Name	Description
Ignore case of character stratification values	distinguishes stratified variables that share the same normalized value when you perform stratified sampling. For example, if a target has three distinct values, “A”, “B”, and “b”, and you want to treat “B” and “b” as different levels, you need to select this option. Otherwise, “B” and “b” are treated as the same level. The task normalizes a value as follows: 1 Leading blanks are removed. 2 The value is truncated to 32 characters. 3 Letters are changed from lowercase to uppercase.

10

Statistics Tasks

Summary Statistics Task

About the Summary Statistics Task

The Summary Statistics task provides data summarization tools to compute descriptive statistics for variables across all observations and within groups of observations. You can also summarize your data in a graphical display, such as a histogram.

For example, you could use this task to create a report on the number of new sales, arranged by product type and country.

Example: Summary Statistics of Unit Sales

In this example, you want to analyze unit sales. In addition to the tabular results, you choose to display a histogram of the distribution.

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **Summary Statistics**. The user interface for the Summary Statistics task opens.

2 On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

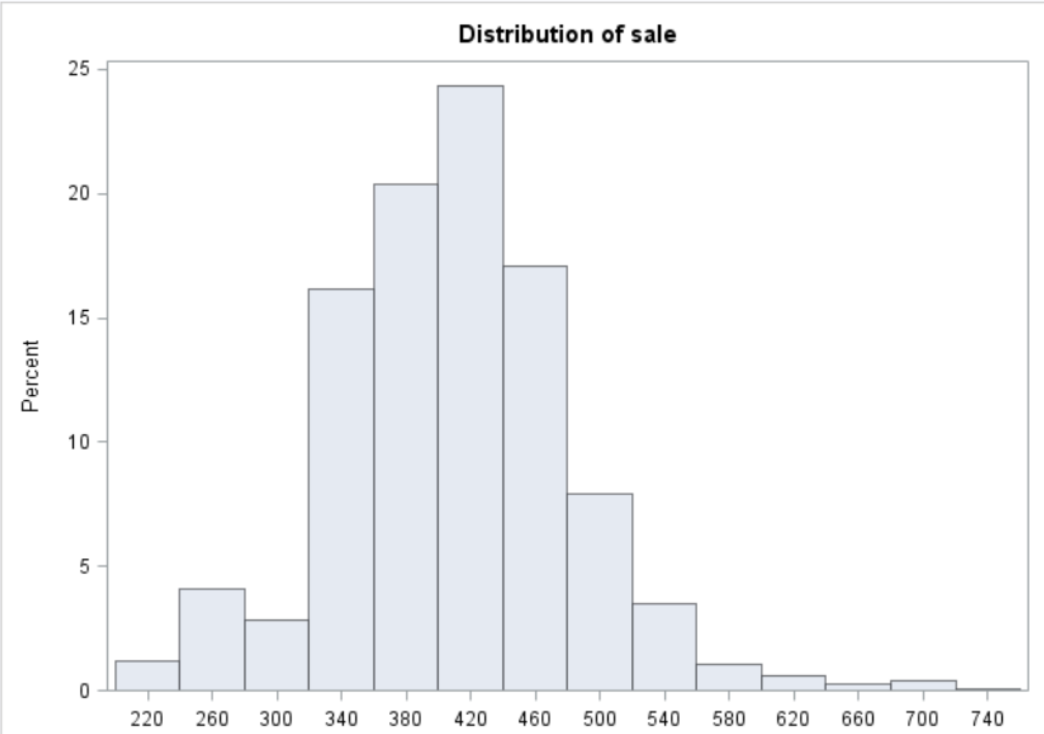
3 To the **Analysis variables** role, assign the **sale** column.

4 On the **Options** tab, expand the **Plots** section and select the **Histogram** check box.

5 To run the task, click .

Here are the results:

Analysis Variable : sale Unit Sale				
Mean	Std Dev	Minimum	Maximum	N
408.5558824	73.0840041	203.0000000	747.0000000	1020



Assigning Data to Roles

To run the Summary Statistics task, you must assign a column to the **Analysis variables** role.

Role	Description
Roles	

Role	Description
Analysis variables	The variables that you assign to this role are the numeric variables for which you want statistics. You must assign at least one variable to this role.
Classification variables	The variables that you assign to this role are character or discrete numeric variables that are used to divide the input data into categories or subgroups. The statistics are calculated on all selected analysis variables for each unique combination of classification variables.
Additional Roles	
Group analysis by	The variables that you assign to this role are used to compute separate statistics for each distinct value or combination of values of the Group analysis by variables. The data is automatically sorted by the variables in this role before the statistics are computed.
Frequency count	When you assign a variable to this role, each observation in the table is assumed to represent *n* observations, where *n* is the value of the frequency count for that row. Statistics are calculated accordingly. You can assign a maximum of one variable to this role.
Weight variable	If you assign a variable to this role, the value of the variable for each observation is used to calculate weighted means, variances, and sums. You can assign a maximum of one variable to this role.

Setting Options

Option Name	Description

Basic Statistics	
Mean	is the arithmetic average, calculated by adding the values of an analysis variable and dividing this sum by the number of nonmissing observations.
Standard deviation	is a statistical measure of the variability of a group of data values. This measure, which is the most widely used measure of the dispersion of a frequency distribution, is equal to the positive square root of the variance.
Minimum value	is the smallest value for an analysis variable.
Maximum value	is the largest value for an analysis variable.
Median	is the middle value for an analysis variable.
Number of observations	is the total number of observations with nonmissing values.
Number of missing values	is the number of observations with missing values.
Additional Statistics	
Standard error	is the standard deviation of the sample mean. The standard error is defined as the ratio of the sample standard deviation to the square root of the sample size. **Note:** This option is available only if **Degrees of freedom** is selected in the **Divisor for standard deviation and variance** drop-down list.
Variance	is a statistical measure of dispersion of data values. This measure is an average of the total squared dispersion between each observation and the sample mean.
Mode	is the most frequent value for the analysis variable.

Range	is the difference between the largest and the smallest values in the data.
Sum	is the sum of all values in the analysis variable.
Sum of weights	is the sum of the numeric variable that is used to weight each observation. **Note:** You cannot compute the sum of the weights unless you assign a variable to the **Weight variable** role.
Confidence limits for the mean	are the two-sided confidence limits for the mean. A two-sided $100(1-\alpha)\,\%$ confidence interval for the mean has the following upper and lower limits: $\bar{x} \pm t_{\left(1-\frac{\alpha}{2};n-1\right)} \frac{s}{\sqrt{n}}$, where s is $\sqrt{\frac{1}{n-1}\Sigma(x_i-\bar{x})^2}$ and $t_{\left(1-\frac{\alpha}{2};n-1\right)}$ is the $1-\frac{\alpha}{2}$ of the Student's t statistics with $n-1$ degrees of freedom.
Coefficient of variation	is a unitless measure of relative variability. This measure is defined as the ratio of the standard deviation to the mean expressed as a percentage. The coefficient of variation is meaningful only if the variable is measured on a ratio scale.
Skewness	is skewness, which measures the tendency of the deviations to be larger in one direction than in the other.
Kurtosis	is the kurtosis, which measures the heaviness of tails.
Percentile Statistics	
1st, 5th, 10th, Lower quartile, Median, Upper quartile, 90th, 95th, 99th, Interquartile range	choose the percentiles and quantiles to compute.

Quantile method	specifies the method that is used to compute the quantiles, median, and percentiles. **Order statistics** reads all of the data into memory and sorts it by the unique values. **Piecewise-parabolic algorithm** approximates the quantile and is a less memory-intensive method.
Plots	
Histogram	creates a graph that is used to determine the distribution of the data. If you add a normal density curve, the task uses the sample mean and sample standard deviation for μ and σ. If you add a kernel density curve, the task uses the AMISE method to compute the kernel density estimates. To include the statistics in the graph, select the **Add inset statistics** check box.
Comparative box plot (when classification variable is specified)	creates a graph that shows a measure of central location (the median), two measures of dispersion (the range and interquartile range), the skewness (from the orientation of the median relative to the quartiles), and potential outliers. Box plots are especially useful in comparing two or more sets of data. You can choose to add the overall inset statistics to the graph or only the inset statistics for each group.
Plot combines histogram and box plot (when no classification variable is specified)	displays the histogram and box plots together in a single panel, sharing common X axes.
Methods	

Divisor for standard deviation and variance	specifies the divisor to use in the calculation of the variance and standard deviation. Here are the valid options: **Degrees of freedom** $n - 1$ By default, the divisor for the variance is the degrees of freedom. **Number of observations** n **Sum of weights minus one** $(\Sigma_i w_i) - 1$ **Sum of weights** $\Sigma_i w_i$
Output Data Set	
You can specify whether to save the statistics in an output data set. By default, this data set is saved in the Work library.	

Distribution Analysis Task

About the Distribution Analysis Task

Distribution analysis provides information about the distribution of numeric variables. A variety of plots such as histograms, probability plots, and quantile-quantile plots can be used in this analysis.

Example: Distribution Analysis of Sales for Each Region

In this example, you want to analyze the sales for each region. Because the data contains three regions, you get three sets of results.

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **Distribution Analysis**. The user interface for the Distribution Analysis task opens.

2 On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3 Assign columns to these roles:

Role	Column Name
Analysis variables	**sale**
Classification variables	**regionName**

4 Click the **Options** tab. In the **Checking for Normality** group, select the **Goodness-of-fit tests**, **Histogram with normal curve**, and **Normal quantile-quantile plot** options. For the quantile-quantile plot, also select the **Add a reference line** check box.

5 To run the task, click .

Here is a subset of the results:

Variable: sale (Unit Sale)
regionName = Region1

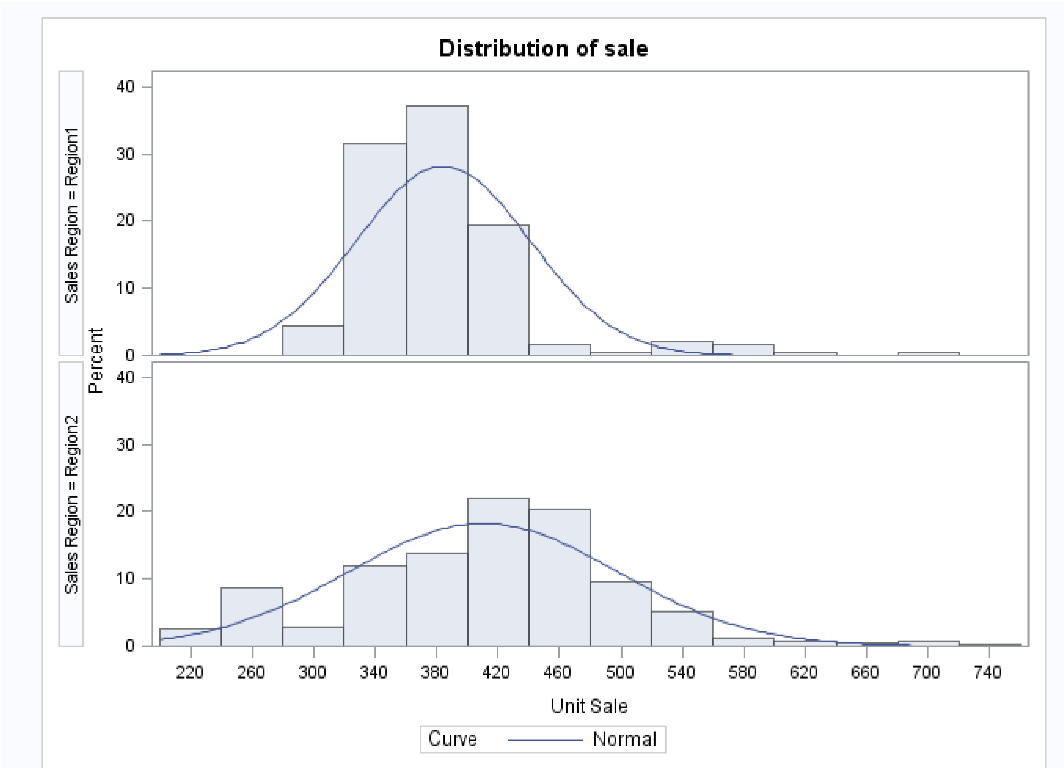
Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.820125	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.13683	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.010612	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	6.983479	Pr > A-Sq	<0.0050

Variable: sale (Unit Sale)
regionName = Region2

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.97464	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.061254	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.427045	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	3.168043	Pr > A-Sq	<0.0050

Variable: sale (Unit Sale)
regionName = Region3

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.981731	Pr < W	0.0002
Kolmogorov-Smirnov	D	0.039274	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.060449	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.604514	Pr > A-Sq	0.1180



Assigning Data to Roles

To run the Distribution Analysis task, you must assign a column to the **Analysis variables** and select a plot or test on the **Options** tab.

Role	Description
Roles	
Analysis variables	specifies the analysis variables and their order in the results.
Classification variables	specifies the variables that are used to group the analysis variables into classification levels. You can assign only two columns to this role.
Additional Roles	

Role	Description
Frequency count	specifies a numeric variable whose value represents the frequency of the observation. The Distribution Analysis task assumes that each observation represents *n* observations, where *n* is the value of the variable.
Group analysis by	specifies the variables that the Distribution Analysis task uses to form groups.

Setting Options

Option Name	Description
Exploring Data	
Select the **Histogram** check box to create a histogram of the data. You can also specify whether to superimpose a kernel density estimate and the normal density curve on the histogram. Finally, you can specify whether to include an inset box of selected statistics in the graph.	
Checking for Normality	
Goodness-of-fit tests	requests tests for normality that include a series of goodness-of-fit tests based on the empirical distribution function. The table provides test statistics and *p*-values for the Shapiro-Wilk test (provided the sample size is less than or equal to 2,000), the Kolmogorov-Smirnov test, the Anderson-Darling test, and the Cramér-von Mises test.
Histogram with normal curve	displays fitted normal density curve on the histogram. The normal distribution has a mean of μ and a standard deviation of σ. You can also specify whether to include an inset box of selected statistics in the graph.

Option Name	Description
Normal probability plot	creates a probability plot, which compares ordered variable values with the percentiles of the normal distribution. If the data distribution matches the normal distribution, the points on the plot form a linear pattern. Probability plots are preferable for graphical estimation of percentiles. The distribution reference line on the plot is created from the maximum likelihood estimate for the parameter. You can also specify whether to include an inset box of selected statistics in the graph.
Normal quantile-quantile plot	creates quantile-quantile plots (Q-Q plots) and compares ordered variable values with quantiles of the normal distribution. If the data distribution matches the normal distribution, the points on the plot form a linear pattern. Q-Q plots are preferable for graphical estimation of distribution parameters. The distribution reference line on the plot is created from the maximum likelihood estimate for the parameter. You can also specify whether to include an inset box of selected statistics in the graph.
Fitting Distributions	
Beta	
Histogram	fits beta distribution with threshold parameter θ, scale parameter σ, and shape parameters α and β.
Probability plot	specifies a beta probability plot for shape parameters α and β.
Quantile-quantile plot	specifies a beta Q-Q plot for shape parameters α and β.
Exponential	

Option Name	Description
Histogram	fits exponential distribution with threshold parameter θ and scale parameter σ.
Probability plot	specifies an exponential probability plot.
Quantile-quantile plot	specifies an exponential Q-Q plot.
Gamma	
Histogram	fits gamma distribution with threshold parameter θ, scale parameter σ, and shape parameter α.
Probability plot	specifies a gamma probability plot for shape parameter α.
Quantile-quantile plot	specifies a gamma Q-Q plot for shape parameter α.
Lognormal	
Histogram	fits lognormal distribution with threshold parameter θ, scale parameter ζ, and shape parameter σ.
Probability plot	specifies a lognormal probability plot for shape parameter σ.
Quantile-quantile plot	specifies a lognormal Q-Q plot for shape parameter σ.
Weibull	
Histogram	fits Weibull distribution with threshold parameter θ, scale parameter ζ, and shape parameter c.
Probability plot	specifies a two-parameter Weibull probability plot.

Option Name	Description
Quantile-quantile plot	specifies a two-parameter Weibull Q-Q plot.

One-Way Frequencies Task

About the One-Way Frequencies Task

The One-Way Frequencies task generates frequency tables from your data. You can also use this task to perform binomial and chi-square tests.

You might want to use this task to analyze the efficiency of a new drug. For example, suppose a group of medical researchers are interested in evaluating the efficacy of a new treatment for a skin condition. Dermatologists from participating clinics are trained to conduct the study and to evaluate the condition. After the training, two dermatologists examine patients with the skin condition from a pilot study and rate the same patients. The One-Way Frequencies task can be used to evaluate the agreement of the diagnoses.

Example: One-Way Frequencies of Unit Sales

In this example, you want to analyze unit sales for each sales region.

To create this example:

1. In the **Tasks** section, expand the **Statistics** folder and double-click **One-Way Frequencies**. The user interface for the One-Way Frequencies task opens.
2. On the **Data** tab, select the **SASHELP.PRICEDATA** data set.
3. Assign columns to these roles:

Role	Column Name
Analysis variables	**sale**
Group analysis by	**regionName**

4 To run the task, click .

Here is a subset of the results:

Frequency for SASHELP.PRICEDATA

Sales Region=Region1

Unit Sale				
sale	Frequency	Percent	Cumulative Frequency	Cumulative Percent
298	1	0.56	1	0.56
300	1	0.56	2	1.11
301	1	0.56	3	1.67
307	1	0.56	4	2.22
308	1	0.56	5	2.78
314	1	0.56	6	3.33
316	1	0.56	7	3.89
318	1	0.56	8	4.44
320	1	0.56	9	5.00
321	1	0.56	10	5.56
322	2	1.11	12	6.67
323	1	0.56	13	7.22
324	2	1.11	15	8.33
328	1	0.56	16	8.89
331	3	1.67	19	10.56

Assigning Data to Roles

To run the One-Way Frequencies task, you must assign a column to the **Analysis variables** role.

Role	Description
Roles	
Analysis variables	specifies the variables to be analyzed. For each variable that you assign to this role, the task creates a one-way frequency table. You must assign at least one variable to this role.
Additional Roles	
Frequency count	specifies the variable to use as the frequency count. When you assign a variable to this role, each observation in the table is assumed to represent *n* observations. In this example, *n* is the value of the frequency count for that row. You can assign only one variable to this role.
Group analysis by	specifies one or more variables to sort the table by. Analyses are performed on each group.

Setting Options

Option Name	Description
Plots	
By default, plots are included in the results. Select the **Show frequencies table** check box to create the frequency and cumulative frequency plots. Select the **Asymptotic test** check box for the chi-square goodness-of-fit to create the deviation plot. To suppress the plots from the results, select the **Suppress plots** check box.	

Option Name	Description
Frequency Table	
Show frequency table	specifies whether to create the frequency table.
Include percentages	creates a table that contains the frequencies and percentages of total frequencies for each value of the analysis variable.
Include cumulative frequencies and percentages	creates a table that contains the frequencies and cumulative frequencies for each value of the analysis variable.
Statistics	
Binomial proportions	
Select the tests to perform. For binomial proportions, specify a test proportion (null hypothesis proportion value) and confidence level.	
Chi-square goodness-of-fit	
Select the tests to perform. To compute the Monte Carlo estimates of the exact *p*-values instead of directly computing the exact *p*-values, select the **Use Monte Carlo estimation** check box. Monte Carlo estimation can be useful for large problems that require a great amount of time and memory for exact computations but for which asymptotic approximations might be insufficient.	
Exact Computations Methods	
Limit computation time	specifies the time limit (in seconds) for the computation of each *p*-value for each crosstabulation table. The default is 300 seconds (or 5 minutes).
Missing Values	
Show frequencies	includes missing values in the frequency tables.

Option Name	Description
Include in calculations	includes the frequencies of missing values in binomial or chi-square tests and in the calculations of percentages.

Correlations Task

About the Correlations Task

Correlation is a statistical procedure for describing the relationship between numeric variables. The relationship is described by calculating correlation coefficients for the variables. By default, the Correlations task calculates a Pearson product-moment correlation. This is a parametric measure of association for two continuous random variables. The correlations range from –1 to 1.

Example: Correlations in the Sashelp.Cars Data Set

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **Correlation**. The user interface for the Correlations task opens.

2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column
Analysis variables	**EngineSize** **Horsepower**

Role	Column
Correlate with	**Cylinders** **MPG_Highway**

4 To run the task, click .

Here are the results:

2 With Variables:	Cylinders MPG_Highway
2 Variables:	EngineSize Horsepower

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	EngineSize	**Horsepower**
Cylinders	0.90800 <.0001 426	0.81034 <.0001 426
MPG_Highway MPG (Highway)	-0.71730 <.0001 428	-0.64720 <.0001 428

Assigning Data to Roles

To run the Correlations task, you must assign at least two columns to the **Analysis variables** role, or you must assign at least one column to the **Analysis variables** role and one column to the **Correlate with** role.

Roles	Description
Roles	
Analysis variables	lists the variables for which to compute correlation coefficients.
Correlate with	lists the variables with which the correlations of the analysis variables are to be computed.
Partial variables	removes the correlation of these variables from the analysis and correlates with variables before calculating the correlation.
Additional Roles	
Frequency count	lists a numeric variable whose value represents the frequency of the observation. If you assign a variable to this role, the task assumes that each observation represents *n* observations, where *n* is the value of the frequency variable. If *n* is not an integer, SAS truncates it. If *n* is less than 1 or is missing, the observation is excluded from the analysis. The sum of the frequency variable represents the total number of observations.
Weight	lists the weights to use in the calculation of Pearson weighted product-moment correlation.
Group analysis by	enables you to obtain separate analyses of observations in groups that are defined by the BY variables.

Setting Options

Option Name	Description
Methods	
Missing values	specifies how to treat observations with missing values. If you select the **Use nonmissing values for all selected variables** option, all observations with missing values are excluded from the analysis. If you select the **Use nonmissing values for pairs of variables** option, the correlation statistics are computed using the nonmissing pairs of variables.
Tables	

Option Name	Description
	By default, the results contain a table with the correlations and *p*-values. You can also include these statistics: **Correlations** Selecting this option includes the correlations in the results. You can also specify probabilities that are associated with each correlation coefficient and whether to order the correlations from highest to lowest in absolute value. **Covariances** Selecting this option includes the variance and covariance matrix in the results. Also, the Pearson correlations are displayed. If you assign a column to the **Partial variables** role, the task computes a partial covariance matrix. **Sum of squares and cross-products** Selecting this option displays a table of the sums of squares and cross products in the results. The Pearson correlations are also included in the results. If you assign a column to the **Partial variables** role, the unpartial sums of squares and cross-products matrix is displayed. **Corrected sum of squares and cross-products** Selecting this option displays a table of the corrected sums of squares and cross products. The Pearson correlations are also inclued in the results. If you assign a column to the **Partial variables** role, the task computes both an unpartial and a partial corrected sum of squares and cross-products matrix. **Descriptive statistics** Selecting this option includes the simple descriptive statistics for each variable. Even if you do not select this option and you choose to create an output data set, the data set contains the descriptive statistics for the variables. **Fisher's z transformation** For a Pearson correlation, you can use the Fisher transformation options to request confidence limits and *p*-values under a specified alternative (null) hypothesis, $H_0 : \rho = \rho_0$, for correlation coefficients that use Fisher's *z* transformation. If you select the **Fisher's z transformation** check box, you must specify a value in the **Alternative hypothesis** box. You can choose from these types of confidence limits: ■ **Two-sided confidence limits** requests two-sided confidence limits for the test of the null hypothesis, $H_0 : \rho = \rho_0$. This is the default. ■ **Lower confidence limit** requests a lower confidence limit for the test of the one-sided null hypothesis, $H_0 : \rho \leq \rho_0$. ■ **Upper confidence limit** requests an upper confidence limit for the test of the one-sided null hypothesis, $H_0 : \rho \geq \rho_0$. By default, the level of the confidence limits for the correlation is 95%.

Option Name	Description
Nonparametric Correlations	
Spearman’s rank-order correlation	calculates Spearman rank-order correlation. This is a nonparametric measure of association that is based on the rank of the data values. The correlations range from –1 to 1.
Kendall’s tau-b	calculates Kendall tau-b. This is a nonparametric measure of association that is based on the number of concordances and discordances in paired observations. Concordance occurs when paired observations vary together, and discordance occurs when paired observations vary differently. Kendall's tau-b ranges from –1 to 1.
Hoeffding’s measure of dependence	calculates Hoeffding's measure of dependence, D. This is a nonparametric measure of association that detects more general departures from independence. This D statistic is 30 times larger than the usual definition and scales the range between –0.5 and 1 so that only large positive values indicate dependence.
Plots	
You can include either of these plots in your results: ■ a scatter plot matrix for variables. You can also choose to include a histogram of the analysis variables in the symmetric matrix plot. ■ a scatter plot for each applicable pair of distinct variables from the analysis variables. You can specify whether to display the prediction ellipses for new observations or the confidence ellipses for the mean. You can also specify the number of variables to plot and the maximum number of points to plot.	
Output Data Set	

Option Name	Description
	You can specify whether to create an output data set that contains the Pearson correlation statistics. This data set also includes means, standard deviations, and the number of observations. By default, this data set is saved in the Work library. You can also choose to include these statistics in the output data set: ■ **Correlations** – By default, the output data set contains the correlation coefficients with the corresponding _TYPE_ variable value of ‘CORR’. ■ **Covariances** – When you select this option, the output data set contains the covariance matrix with the corresponding _TYPE_ variable value of ‘COV’. ■ **Sum of squares and cross-products** – If you assign a column to the **Partial variables** role, the output data set does not contain a sum of squares and cross-products matrix. ■ **Corrected sum of squares and cross-products** — If you assign a column to the **Partial variables** role, the output data set contains a partial corrected sum of squares and cross-products matrix.

Table Analysis Task

About the Table Analysis Task

The Table Analysis task enables you to generate crosstabulation tables, also known as contingency tables, from your data.

Example:

To create this example:

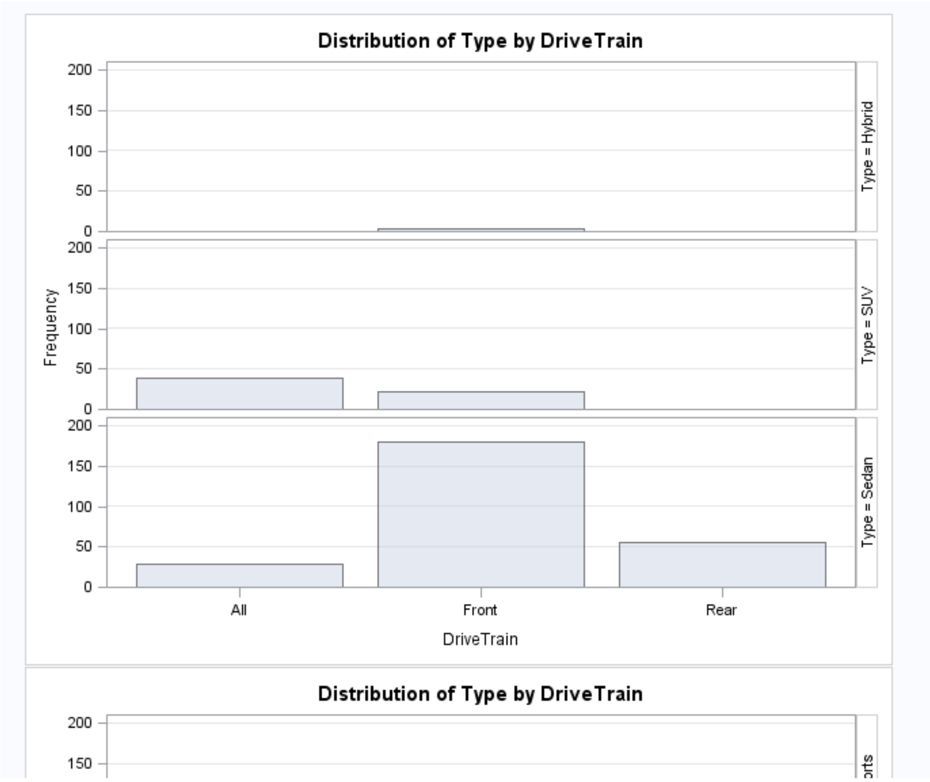
1. In the **Tasks** section, expand the **Statistics** folder and double-click **Table Analysis**. The user interface for the Table Analysis task opens.
2. On the **Data** tab, select the **SASHELP.CARS** data set.
3. Assign columns to these roles:

Role	Column
Row variable	Type
Column variable	DriveTrain

4 To run the task, click .

Here is a sample of the results:

Frequency	Table of Type by DriveTrain				
		DriveTrain			
	Type	All	Front	Rear	Total
	Hybrid	0	3	0	3
	SUV	38	22	0	60
	Sedan	28	179	55	262
	Sports	5	8	36	49
	Truck	12	0	12	24
	Wagon	9	14	7	30
	Total	92	226	110	428



Assigning Data to Roles

To run the Table Analysis task, you must first assign at least one column to the **Role variables** or **Column variables** roles. After you have assigned a row variable or a column variable, you can assign a column to the **Strata variable** role.

Roles	Description
Roles	
Row variables	creates the rows for two-way to n-way frequency and crosstabulation tables.
Column variables	creates the columns for two-way to n-way frequency and crosstabulation tables.

Roles	Description
Strata variables	creates the separate tables for n-way frequency and crosstabulation tables.
Additional Roles	
Frequency count	specifies that each row in the table is assumed to represent *n* observations. In this example, *n* is the value of the frequency count for that observation.

Setting Options

Option Name	Description
Plots	
By default, plots are included in the results. To suppress these plots, select the **Suppress plots** check box.	
Frequency Table	
Frequencies	
Observed	displays the frequency count for each cell.
Expected	displays the expected cell frequency for each cell.
Deviation	displays the deviation of the cell frequency from the expected value for each cell.
Percentages	
Cell	display of overall percentages in crosstabulation tables.
Row	display of row percentages in crosstabulation table cells.

Option Name	Description
Column	display of column percentages in crosstabulation table cells.
Cumulative	
Column percentages	displays the cumulative column percentage in each cell.
Frequencies and percentages	displays the cumulative frequencies and percentages in one-way frequency tables.
Cell contributions to the chi-square statistics	displays each table cell’s contribution to the Pearson chi-square statistic in the crosstabulation table.
Statistics	
Chi-square statistics	requests chi-square tests of homogeneity or independence and measures of association that are based on the chi-square statistic. The tests include the Pearson chi-square, likelihood-ratio chi-square, and Mantel-Haenszel chi-square. For 2×2 tables, this test includes Fisher's exact test and the continuity-adjusted chi-square.
Measures of association	computes several measures of association and their asymptotic standard errors (ASE). The measures include gamma, Kendall's tau-*b*, Stuart's tau-*c*, Somers' D (*C*|*R*), Somers' D (*R*|*C*), the Pearson and Spearman correlation coefficients, lambda (symmetric and asymmetric), and uncertainty coefficients (symmetric and asymmetric).
Cochran-Mantel-Haenszel statistics	requests Cochran-Mantel-Haenszel statistics, which test for association between the row and column variables after adjusting for the remaining variables in a multiway table. These statistics include the CMH correlation statistic, the row mean scores (ANOVA), and the adjusted relative risks and odds ratios.

Option Name	Description
Measures of agreement (for square tables)	computes tests and measures of classification agreement for square tables. This option provides McNemar's test for 2×2 tables and Bowker's test of symmetry for tables with more than two response categories. It also produces the simple kappa coefficient, the weighted kappa coefficient, the asymptotic standard errors for the simple and weighted kappas, and the corresponding confidence limits. When there are multiple strata and two response categories, this option also computes Cochran's Q test.
Odds ratio and relative risk (for 2x2 tables)	requests relative risk measures and their asymptotic Walk confidence limits for 2x2 tables.
Binomial proportions and risk differences (for 2x2 tables)	requests risks (binomial proportions) and risk differences for 2x2 tables.
Methods	
Missing value treatment	specifies how to treat missing values: **Exclude missing values** specifies that an observation is excluded from a table if the observation has a missing value for any of the variables. **Display missing value frequencies** displays the frequencies of the missing values in the frequency and crosstabulation tables. These frequencies are not included in any computations of percentages, tests, or measures. **Include missing values in calculations** treats the missing values as valid for all variables.
Exact Test	
Fisher's exact test	requests Fisher's exact test for tables that are larger than 2x2.

One-Sample t Test Task

About the One-Sample t Test Task

A one-sample *t* test compares the mean of the sample to the null hypothesis mean.

To compare an individual mean with a sample size of *n* to a value *m*, use $t = \frac{\bar{x} - m}{\frac{s}{\sqrt{n}}}$

where $\bar{x}$ is the sample mean of the observations and s^2 is the sample variance of the observations.

For example, you want to perform a one-sample *t* test on the horsepower values in the Sashelp.Cars data set. The null hypothesis is 300.

Example: One-Sample t Test for Horsepower

To create this example:

1. In the **Tasks** section, expand the **Introductory Statistics** folder and double-click **One-sample t Test**. The user interface for the One-Sample t Test task opens.

2. On the **Data** tab, select the **SASHELP.CARS** data set.

3. To the **Analysis variable** role, assign the **Horsepower** column.

4. On the **Options** tab, enter `300` in the **Alternative hypothesis** field.

5. To run the task, click .

Here is a subset of the results:

Variable: Horsepower

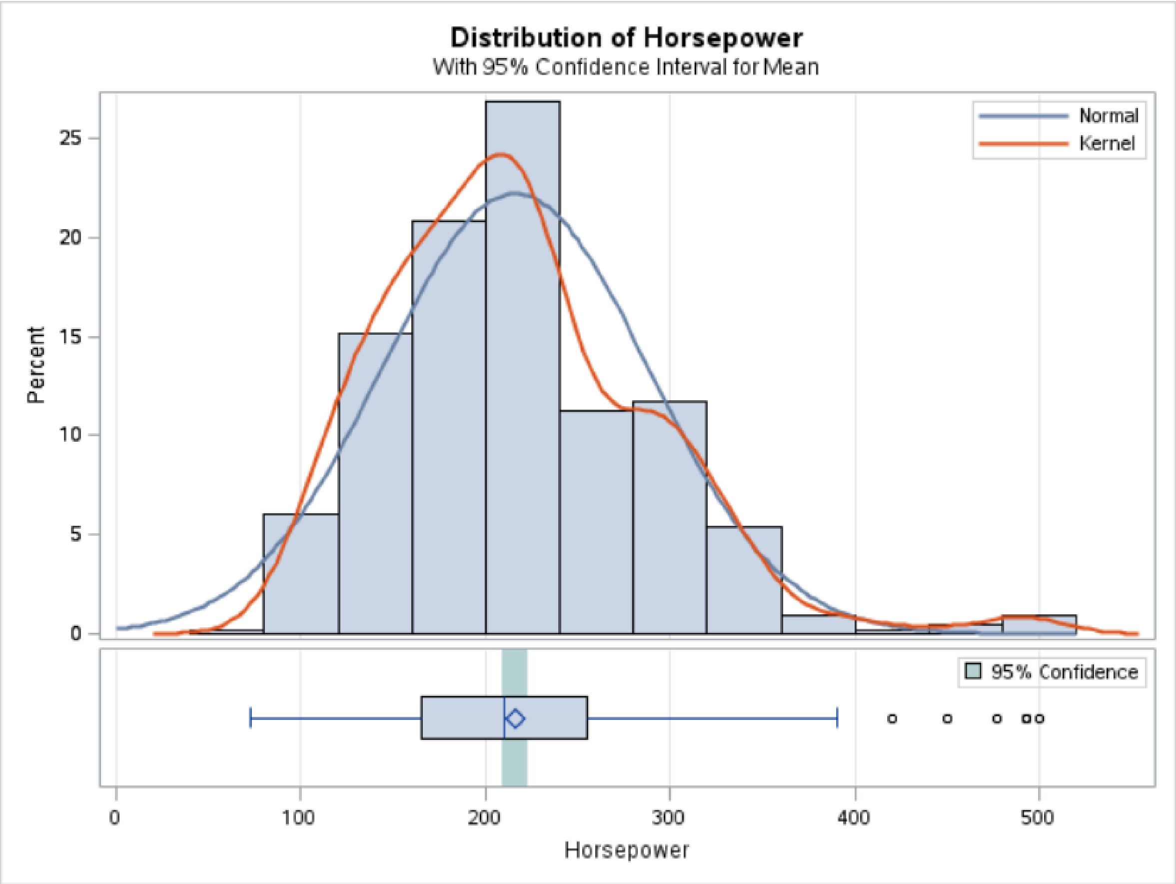
Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	W	0.949922	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.090516	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.589806	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	3.685805	Pr > A-Sq	<0.0050

Variable: Horsepower

N	Mean	Std Dev	Std Err	Minimum	Maximum
428	215.9	71.8360	3.4723	73.0000	500.0

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
215.9	209.1	222.7	71.8360	67.3244	77.0007

DF	t Value	Pr > |t|
427	-24.22	<.0001



Assigning Data to Roles

To run the One-Sample t Test task, you must assign a numeric column to the **Analysis variable** role.

Setting Options

Option Name	Description
Test	

Option Name	Description
Tails	specifies the number of sides (or tails) and direction of the statistical tests and test-based confidence intervals. You can choose from these options: ■ **Two-tailed test** specifies two-sided tests and confidence intervals for means. ■ **Upper one-tailed test** specifies upper one-sided tests in which the alternative hypothesis indicates a mean greater than the null value, and upper one-sided confidence intervals between the lower confidence limit and infinity. ■ **Lower one-tailed test** specifies lower one-sided tests in which the alternative hypothesis indicates a mean less than the null value, and lower one-sided confidence intervals between minus infinity and the upper confidence limit.
Alternative hypothesis	specifies the value of the null hypothesis. By default, the null hypothesis has a value of 0.
Normality Assumption	
Tests for normality	runs tests for normality that include a series of goodness-of-fit tests based on the empirical distribution function. The table provides test statistics and *p*-values for the Shapiro-Wilk test (provided the sample size is less than or equal to 2000), the Kolmogorov-Smirnov test, the Anderson-Darling test, and the Cramér-von Mises test.
Nonparametric Tests	

Option Name	Description
Sign test and Wilcoxon signed rank test	generates the results from these tests: ■ The sign test statistic is $M = (n^{+} - n^{-})/2$, where n^{+} is the number of values that are greater than μ_0, and n^{-} is the number of values that are less than μ_0. Values equal to μ_0 are discarded. ■ The Wilcoxon signed rank statistic S is calculated as $S = \sum_{i:\lvert x_i - \mu_0\rvert > 0} r_i^{+} - \frac{n_t(n_t + 1)}{4}$, where r^{+}_i is the rank of $x_i - \mu_0$ after discarding values of $x_i - \mu_0$, and n_t is the number of x_i values not equal to μ_0. Average ranks are used for tied values.
Plots	
Histogram and box plot	creates a histogram and box plot together in a single panel, sharing common X axes.
Normality plot	creates a normal quantile-quantile (Q-Q) plot.
Confidence interval plot	creates a plot of the confidence interval for the means.

Paired-sample t Test Task

About the Paired-sample t Test Task

A paired-sample *t* test compares the mean of the differences in the observations to a given number, the null hypothesis difference. The paired-sample *t* test is used when the two samples are correlated, such as two measures of blood pressure from the same person.

To compare n paired differences to a value m, use $t = \frac{\bar{d} - m}{\frac{s_d}{\sqrt{n}}}$, where $\bar{d}$ is the sample mean of the paired differences and s^2_d is the sample variance of the paired differences.

Example: Determining the Distribution of Price - Cost

In this example, you want to compare the means of differences in price and cost in the Sashelp.Pricedata data set. The null hypothesis for this test is 30.

To create this example:

1. In the **Tasks** section, expand the **Introductory Statistics** folder and double-click **Paired-sample t Test**. The user interface for the Paired-sample t Test task opens.

2. On the **Data** tab, select the **SASHELP.PRICEDATA** data set.

3. Assign columns to these roles:

Role	Column Name
Group 1 variable	**price**
Group 2 variable	**cost**

4. On the **Options** tab, enter `30` in the **Alternative** field.

5. To run the task, click .

Here is a subset of the results:

Variable: _Difference_ (Difference: price - cost)

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.896986	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.1888	Pr > D	<0.0100
Cramer-von Mises	W-Sq	7.159388	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	39.28743	Pr > A-Sq	<0.0050

Difference: price - cost

N	Mean	Std Dev	Std Err	Minimum	Maximum
1020	42.0448	21.9813	0.6883	6.5700	93.4000

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
42.0448	40.6942	43.3954	21.9813	21.0671	22.9791

DF	t Value	Pr > |t|
1019	17.50	<.0001

Assigning Data to Roles

To run the Paired-sample t Test, you must assign columns to the **Group 1 variable** and **Group 2 variable** roles. The task compares these two variables. Because paired *t* tests are performed by subtracting each value of the **Group 2 variable** from the corresponding value of the **Group 1 variable**, the designation of the variables matters.

Setting Options

Option Name	Description
Test	

<table>
<tr><th>Option Name</th><th>Description</th></tr>
<tr><td>Tails</td><td>specifies the number of sides (or tails) and direction of the statistical tests and test-based confidence intervals. You can choose from these options:
Two-tailed test specifies two-sided tests and confidence intervals for means.
Upper one-tailed test specifies upper one-sided tests in which the alternative hypothesis indicates a mean greater than the null value. The upper one-sided confidence intervals range between the lower confidence limit and infinity.
Lower one-tailed test specifies lower one-sided tests in which the alternative hypothesis indicates a mean less than the null value. The lower one-sided confidence intervals range between minus infinity and the upper confidence limit.</td></tr>
<tr><td>Alternative</td><td>specifies the value of the null hypothesis.</td></tr>
<tr><td colspan="2">Normality Assumption</td></tr>
<tr><td>Tests for normality</td><td>runs tests for normality that include a series of goodness-of-fit tests based on the empirical distribution function. The table provides test statistics and p-values for the Shapiro-Wilk test (provided the sample size is less than or equal to 2000), the Kolmogorov-Smirnov test, the Anderson-Darling test, and the Cramér-von Mises test.</td></tr>
<tr><td colspan="2">Nonparametric Tests</td></tr>
</table>

Option Name	Description
Sign test and Wilcoxon signed rank test	generates the results from these tests: ■ The sign test statistic is $M = (n^+ - n^-)/2$, where n^+ is the number of values that are greater than μ_0, and n^- is the number of values that are less than μ_0. Values equal to μ_0 are discarded. ■ The Wilcoxon signed rank statistic S is calculated as $S = \sum_{i:\lvert x_i - \mu_0 \rvert > 0} r_i^+ - \frac{n_t(n_t+1)}{4}$, where r^+_i is the rank of $x_i - \mu_0$ after discarding values of $x_i - \mu_0$ and n_t is the number of x_i values not equal to μ_0. Average ranks are used for tied values.
Plots	
Histogram and box plot	creates a histogram and box plot together in a single panel, sharing common X axes.
Normality plot	creates a normal quantile-quantile (Q-Q) plot.
Agreement plot	plots the second response in each pair against the first response, with the mean shown as a large bold symbol. A diagonal line with slope=0 and y-intercept=1 is overlaid. The location of the points with respect to the diagonal line reveals the strength and direction of the difference or ratio. The tighter the clustering along the same direction as the line, the stronger the positive correlation of the two measurements for each subject. Clustering along a direction perpendicular to the line indicates negative correlation.

Option Name	Description
Response profile plot	creates a plot where a line is drawn for each observation from left to right that connects the first response to the second response. The mean first response and mean second response are connected with a bold line. The more extreme the slope, the stronger the effect. A wide spread of profiles indicates high between-subject variability. Consistent positive slopes indicate strong positive correlation. Widely varying slopes indicate lack of correlation. Consistent negative slopes indicate strong negative correlation.
Confidence interval plot	creates a plot of the confidence interval for the means.

Two-Sample t Test Task

About the Two-Sample t Test Task

A two-sample *t* test compares the mean of the first sample minus the mean of the second sample to a given number, the null hypothesis difference.

To compare means from two independent samples with n_1 and n_2 observations to a value m, use $t = \frac{(\bar{x}_1 - \bar{x}_2) - m}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$. In this example, s^2 is the pooled variance $s^2 = \frac{(n_1 - 1)s_1^2 + (n_1 - 1)s_2^2}{n_1 + n_2 - 2}$, and s^2_1 and s^2_2 are the sample variances of the two groups.

The use of this *t* statistic depends on the assumption that $\sigma_1^2 = \sigma_2^2$, where σ_1^2 and σ_2^2 are the population variances of the two groups.

Example: Two-Sample t Test

In this example, you want to analyze the height values for males and females in your class.

To create this example:

1. In the **Tasks** section, expand the **Introductory Statistics** folder and double-click **Two-sample t Test**. The user interface for the Two-Sample t Test task opens.

2. On the **Data** tab, select the **SASHELP.CLASS** data set.

3. Assign columns to these roles:

Role	Column Name
Analysis variable	**Height**
Groups variable	**Sex**

4. To run the task, click .

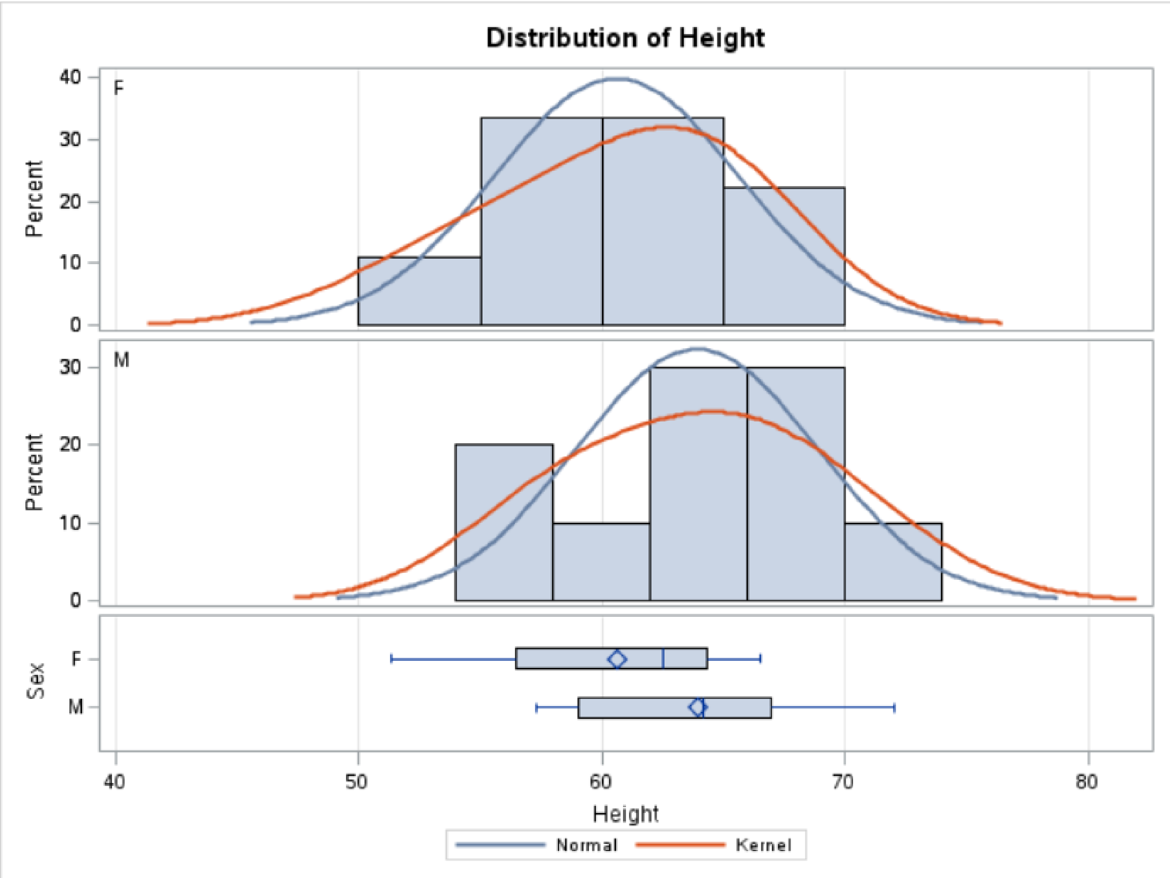
Here is a subset of the results:

Variable: Height
Sex = F

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.931231	Pr < W	0.4932
Kolmogorov-Smirnov	D	0.203889	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.049919	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.308707	Pr > A-Sq	>0.2500

Variable: Height
Sex = M

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.954758	Pr < W	0.7249
Kolmogorov-Smirnov	D	0.139972	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.025769	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.202753	Pr > A-Sq	>0.2500



Assigning Data to Roles

To run the Two-Sample t Test task, you must assign a column to these roles:

Role	Description
Analysis variable	specifies the column to use in the analysis.
Groups variable	specifies the column to use for grouping. This column must have only two levels.

Setting Options

<table>
<tr><th>Option Name</th><th>Description</th></tr>
<tr><td colspan="2">Test</td></tr>
<tr><td>Tails</td><td>specifies the number of sides (or tails) and direction of the statistical tests and test-based confidence intervals. You can choose from these options:
Two-tailed test specifies two-sided tests and confidence intervals for means.
Upper one-tailed test specifies upper one-sided tests in which the alternative hypothesis indicates a mean greater than the null value, and upper one-sided confidence intervals between the lower confidence limit and infinity.
Lower one-tailed test specifies lower one-sided tests in which the alternative hypothesis indicates a mean less than the null value, and lower one-sided confidence intervals between minus infinity and the upper confidence limit.</td></tr>
<tr><td>Alternative hypothesis</td><td>specifies the value of the null hypothesis.</td></tr>
</table>

Option Name	Description
Cox and Cochran probability approximation for unequal variances	calculates the Cochran and Cox approximation. This approximation of the *p*-value of the t_u is the value of *p* such that $t_u = \frac{\left(\frac{s_1^2}{\sum_{i=1}^{n_1^*} f_{1i} w_{1i}}\right) t_1 + \left(\frac{s_2^2}{\sum_{i=1}^{n_2^*} f_{2i} w_{2i}}\right) t_2}{\left(\frac{s_1^2}{\sum_{i=1}^{n_1^*} f_{1i} w_{1i}}\right) + \left(\frac{s_2^2}{\sum_{i=1}^{n_2^*} f_{2i} w_{2i}}\right)}$. In this example, t_1 and t_2 are the critical values of the *t* distribution corresponding to a significance level of *p* and sample sizes n_1 and n_2, respectively. The degrees of freedom is undefined when $n_1 \neq n_2$.[1]
Normality Assumption	
Tests for normality	runs tests for normality that include a series of goodness-of-fit tests based on the empirical distribution function. The table provides test statistics and *p*-values for the Shapiro-Wilk test (provided the sample size is less than or equal to 2000), the Kolmogorov-Smirnov test, the Anderson-Darling test, and the Cramér-von Mises test.
Nonparametric Tests	
Wilcoxon rank-sum test	generates an analysis of Wilcoxon scores. When there are two classification levels (samples), this option produces the Wilcoxon rank-sum test.
Plots	
Histogram and box plot	creates a histogram and box plot together in a single panel, sharing common X axes.

1 Cochran, W. G., and G. M. Cox. 1950. *Experimental Designs*. New York, : Wiley.

Option Name	Description
Normality plot	creates a normal quantile-quantile (Q-Q) plot.
Confidence intervals plot	creates plots of the confidence interval for means. This plot is not created by default.

One-Way ANOVA Task

About the One-Way ANOVA Task

A one-way analysis of variance (ANOVA) considers one treatment factor with two or more treatment levels. The goal of the analysis is to test for differences among the means of the levels and to quantify these differences. If there are two treatment levels, then this analysis is equivalent to a *t*-test that compares two group means.

You might use the One-Way ANOVA task to do the following:

- study the effect of bacteria on the nitrogen content of red clover plants. The factor is the bacteria strain, and it has six levels.
- compare the life spans of three different brands of batteries. The factor is the brand, and it has three levels.

Example: Testing for Differences in the Means for MPG_Highway by Car Type

In this example, you want to study the differences in the means for the number of highway miles per gallon for six car types.

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **One-Way ANOVA**. The user interface for the One-Way ANOVA task opens.

2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column Name
Dependent variable	**MPG_Highway**
Explanatory variable	**Type**

4 To run the task, click .

Here is a subset of the results:

Class Level Information		
Class	Levels	Values
Type	6	Hybrid SUV Sedan Sports Truck Wagon

Number of Observations Read	428
Number of Observations Used	428

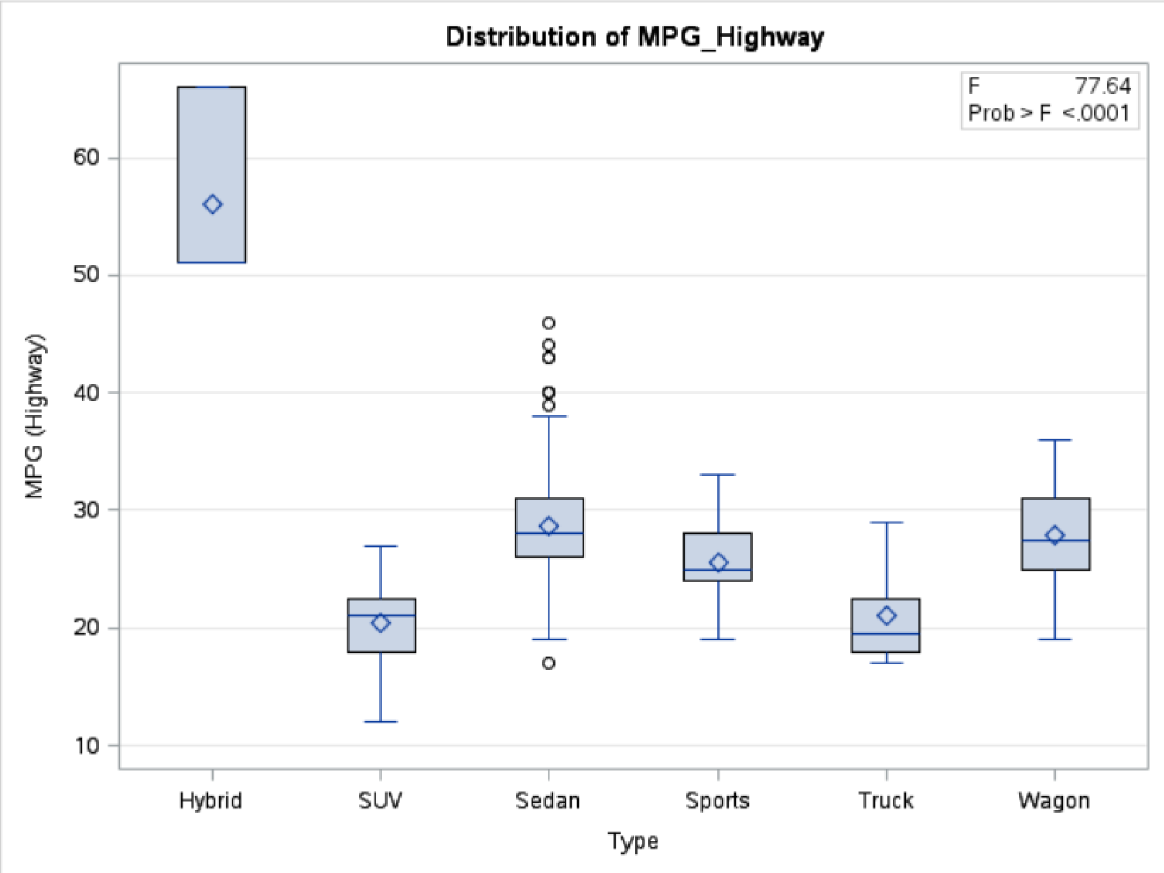
Dependent Variable: MPG_Highway MPG (Highway)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	6743.47900	1348.69580	77.64	<.0001
Error	422	7331.03268	17.37212		
Corrected Total	427	14074.51168			

R-Square	Coeff Var	Root MSE	MPG_Highway Mean
0.479127	15.52701	4.167987	26.84346

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Type	5	6743.478998	1348.695800	77.64	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Type	5	6743.478998	1348.695800	77.64	<.0001



Assigning Data to Roles

To run the One-Way ANOVA task, you must assign columns to these roles:

Role Name	Description
Dependent variable	specifies a continuous numeric column.
Explanatory variable	specifies a character or numeric column with values that specify the levels of the groups. The column that you assign to this role must have two or more distinct values.

Setting Options

Option Name	Description
Normality Assumption	
Tests for normality	runs tests for normality that include a series of goodness-of-fit tests based on the empirical distribution function. The table provides test statistics and *p*-values for the Shapiro-Wilk test (provided the sample size is less than or equal to 2,000), the Kolmogorov-Smirnov test, the Anderson-Darling test, and the Cramér-von Mises test.
Homogeneity of Variance	

Option Name	Description
Test	specifies the type of test to perform. Here are the valid values: **None** specifies that no test is performed. **Bartlett** computes accurate Type I error rates when the distribution of the data is normal. **Brown & Forsythe** is a variation of Levene's test. Equal variances are determined by using the absolute deviations from the group medians. Although this is a good test for determining variance differences, it can be resource intensive if your data contains several large groups. **Levene** computes the squared residuals to determine equal variance. Levene’s test is considered to be the standard homogeneity of variance test. This is the default. **O’Brien** specifies O’Brien’s test, which is a modification of Levene’s test that uses squared residuals.
Welch’s variance-weighted ANOVA	tests the group means using a weighted variance. You can use this test if the assumption of equal variances is rejected.
Comparisons	

Option Name	Description
	You can select from these comparison methods: **Bonferroni** performs Bonferroni *t* tests of differences between means for all means of the main effect. **Duncan multiple range** performs Duncan’s multiple range test on all means of the main effect. **Gabriel** performs Gabriel’s multiple-comparison procedure on all means of the main effect. **Ryan-Einot-Gabriel-Welsch** performs the Ryan-Einot-Gabriel-Welsch multiple range test on all means of the main effect. **Scheffé** performs Scheffé’s multiple-comparison procedure on all means of the main effect. **Sidak** performs pairwise *t* tests on differences between means with levels adjusted according to Sidak’s inequality for all means of the main effect. **Student-Newman-Keuls** performs the Student-Newman-Keuls multiple range test on all main effect means. **Least significant difference (LSD)** performs pairwise *t* tests for all means of the main effect. In the case of equal cell sizes, this test is equivalent to Fisher’s least significant difference test. **Tukey studentized range (HSD)** performs Tukey’s studentized range test (HSD) on all means of the main effect. When the group sizes are different, this is the Tukey-Kramer test. You can also specify the level of significance for the selected test.
Plots	

Option Name	Description
	By default, the results include a box plot. You can also specify to include these diagnostic plots: ■ scatter plots of residuals, studentized residuals, and observed responses by predicted values ■ studentized residuals by leverage ■ Cook's *D* by observations ■ a Q-Q plot of residuals ■ a residual histogram ■ a residual-fit spread plot For these diagnostic plots, you can specify whether to display them in a panel or as individual plots. You can also specify the maximum number of points to include in these plots.

Nonparametric One-Way ANOVA Task

About the Nonparametric One-Way ANOVA Task

The Nonparametric One-Way ANOVA task consists of nonparametric tests for location and scale differences across a one-way classification. The task also provides a standard analysis of variance on the raw data and statistics based on the empirical distribution function.

Example: Wilcoxon Scores for MPG_Highway Classified by Origin

To create this example:

1 In the **Tasks** section, expand the **Statistics** folder and double-click **Nonparametric One-Way ANOVA**. The user interface for the Nonparametric One-Way ANOVA task opens.

2 On the **Data** tab, select the **SASHELP.CARS** data set.

3 Assign columns to these roles:

Role	Column Name
Dependent variable	**MPG_Highway**
Classification variable	**Origin**

4 To run the task, click .

Wilcoxon Scores (Rank Sums) for Variable MPG_Highway Classified by Variable Origin					
Origin	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Asia	158	37704.0	33891.00	1231.66801	238.632911
Europe	123	24687.0	26383.50	1155.00991	200.707317
USA	147	29415.0	31531.50	1211.97891	200.102041
Average scores were used for ties.					

Kruskal-Wallis Test	
Chi-Square	9.5856
DF	2
Pr > Chi-Square	0.0083

Assigning Data to Roles

To run the Nonparametric One-Way ANOVA task, you must assign columns to the **Dependent variable** and **Classification variable** roles.

Role Name	Description
Roles	
Dependent variable	specifies the column to use as the dependent variable.
Classification variable	defines the subgroups. Separate analyses are performed for each subgroup. You can specify whether to treat missing values as a valid level.
Additional Roles	
Frequency count	specifies that each row in the table is assumed to represent *n* observations. In this example, *n* is the value of the frequency count for that observation.
Group analysis by	sorts the table by these columns. The task performs analyses on each group.

Setting Options

Option Name	Description
Plots	

Option Name	Description
	By default, plots are included in the results. These plots are determined by the options that you select. Here are some of the plots that you can create: ■ By selecting the options in the **Location Differences** section, you can create a box plot of Wilcoxon scores, a stacked bar chart showing frequencies above or below the overall median, a box plot of Van der Waerden scores, and a box plot of Savage scores. ■ By selecting the options in the **Scale Differences** section, you can create a box plot of Ansari-Bradley scores, a box plot of Klotz scores, a box plot of Mood scores, and a box plot of Siegel-Tukey scores. ■ By selecting the options in the **Location and Scale Differences** section, you can create a box plot of Conover scores. ■ By selecting the **Empirical distribution function tests, including Kolmogorov-Smirnov and Cramer-von Mises tests** option, you can create a plot of the empirical distribution test. You can specify whether to display the *p*-values in the plot. To suppress the plots from the results, select the **Suppress plots** check box.
Tests	
Tests	specifies whether to calculate only the asymptotic tests or both the asymptotic tests and exact tests for the various analyses.
Location Differences	
Wilcoxon scores	ranks of the observations.
Median scores	equals 1 for observations greater than the median and 0 otherwise.
Van der Waerden scores	the quantiles of a standard normal distribution. These scores are also known as quantile normal scores.
Savage scores	the expected values of order statistics from the exponential distribution with 1 subtracted to center the scores around 0.
Scale Differences	
Ansari-Bradley scores	similar to the Siegel-Tukey scores, but assigns the same scores to corresponding extreme ranks.
Klotz scores	the squares of the Van der Waerden (or quantile normal) scores.

Option Name	Description
Mood scores	the square of the difference between each rank and the average rank.
Siegel-Tukey scores	scores are computed as $a(1) = 1,\ a(n) = 2,\ a(n-1) = 3,\ a(2) = 4,\ a(3) = 5,\ a(n-2) = 6,\ ....$ The score values continue to increase in this pattern toward the middle ranks until all observations are assigned a score.
Location and Scale Differences	
Conover scores	based on the squared ranks of the absolution deviations from the sample means.
Empirical distribution function tests, including Kolmogorov-Smirnov and Cramer-von Mises tests	the empirical distribution function statistics (EDF).
Pairwise multiple comparison analysis (asymptotic only)	computes the Dwass, Steel, Critchlow-Fligner (DSCF) multiple comparison analyses.
Methods	
Continuity Correction	
Continuity correction for two sample Wilcoxon and Siegel-Tukey tests	uses a continuity correction for the asymptotic two-sample Wilcoxon and Siegel-Tukey tests by default. The task incorporates this correction when computing the standardized test statistic *z* by subtracting 0.5 from the numerator $\left(S - E_0(S)\right)$ if it is greater than zero. If the numerator is less than zero, the task adds 0.5.
Exact Statistics Computation	
Use Monte Carlo estimation	requests the Monte Carlo estimation of the exact *p*-values instead of using the direct exact *p*-value computation. You can also specify the level of the confidence limits for the Monte Carlo *p*-value estimates.

Option Name	Description
Limit computation time	specifies the time limit for calculating each exact *p*-value. Calculating exact *p*-values can consume a large amount of time and memory.
Output Data Set	
You can specify whether to save the statistics to a data set. By default, the data set is saved to the Work library.	

Linear Regression Task

About the Linear Regression Task

Linear regression analysis tries to assign a linear function to your data by using the least squares method. Using the Linear Regression task, you can perform linear regression analysis on multiple dependent and independent variables.

Example: Predicting Weight Based on a Student's Height

In this example, you want to use regression analysis to find out how well you can predict a child's weight if you know the child's height.

To create this example:

1. In the **Tasks** section, expand the **Statistics** folder and double-click **Linear Regression**. The user interface for the Linear Regression task opens.

2. On the **Data** tab, select the **SASHELP.CLASS** data set.

3. Assign columns to these roles:

Role	Column Name
Dependent variable	**Weight**
Explanatory variables	**Height** **Age**

4 To run the task, click .

Here are the results:

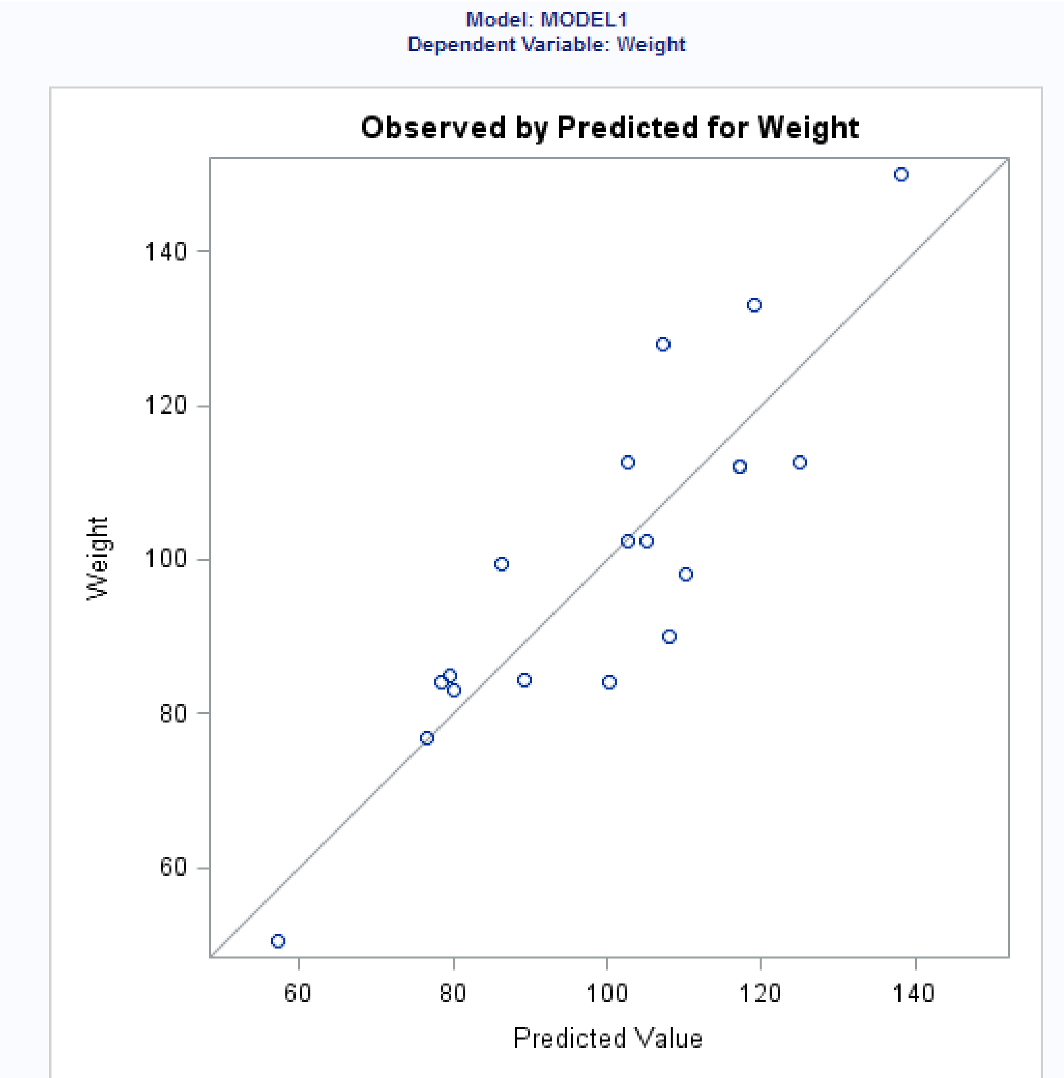
Model: MODEL1
Dependent Variable: Weight

Number of Observations Read	19
Number of Observations Used	19

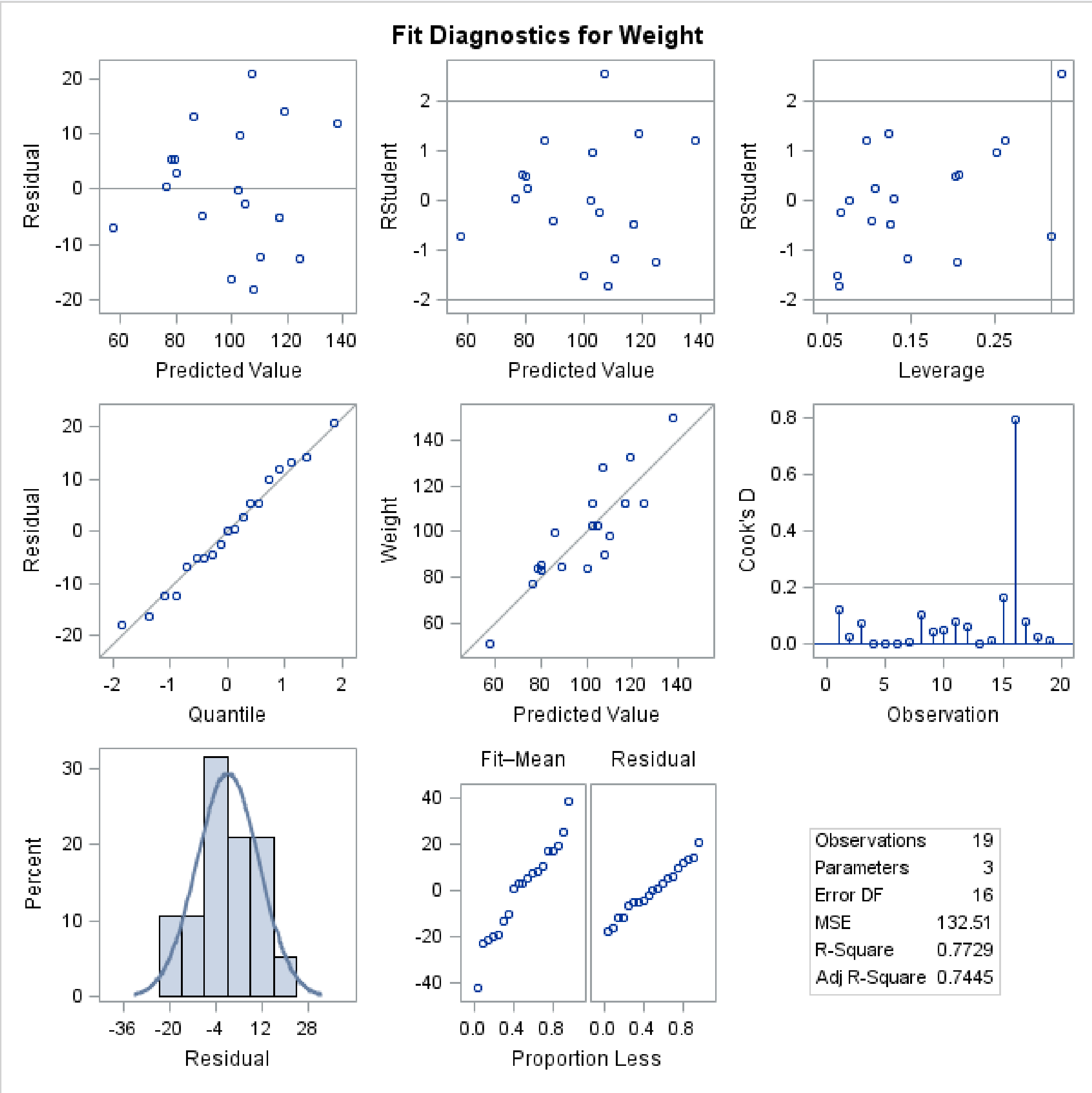
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7215.63710	3607.81855	27.23	<.0001
Error	16	2120.09974	132.50623		
Corrected Total	18	9335.73684			

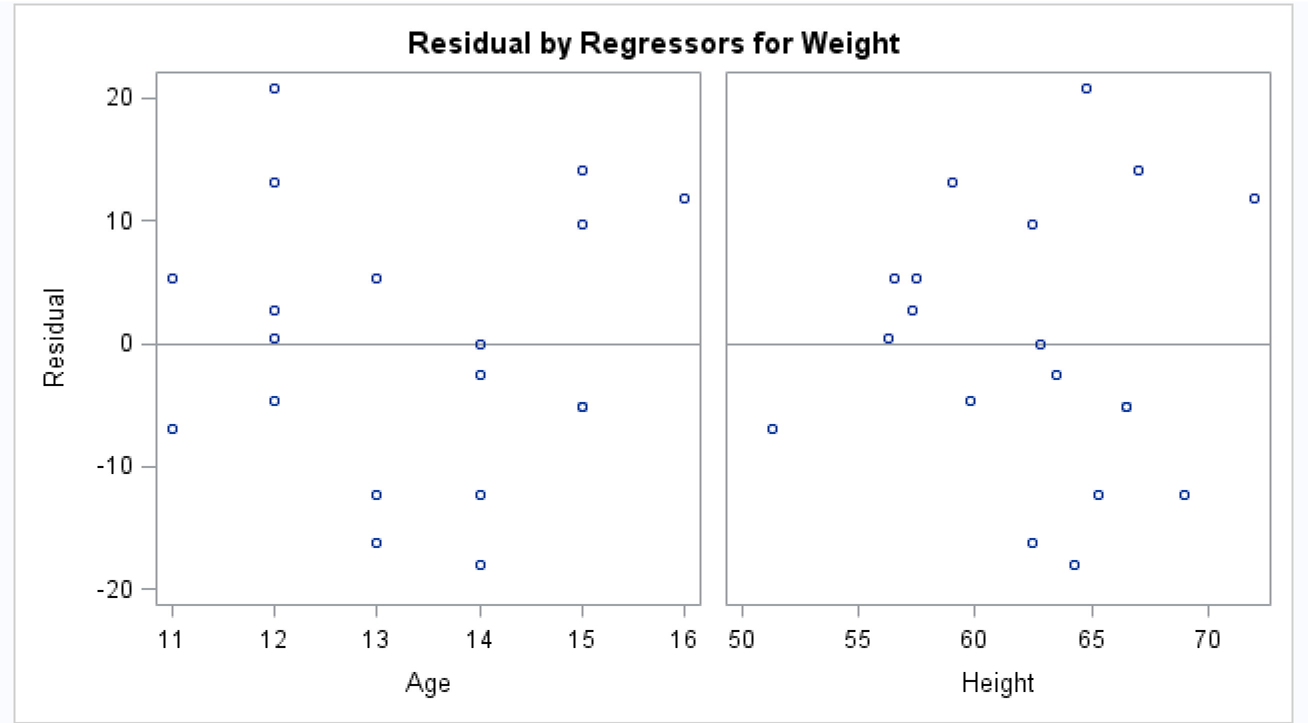
Root MSE	11.51114	R-Square	0.7729
Dependent Mean	100.02632	Adj R-Sq	0.7445
Coeff Var	11.50811		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-141.22376	33.38309	-4.23	0.0006
Age	1	1.27839	3.11010	0.41	0.6865
Height	1	3.59703	0.90546	3.97	0.0011


Model: MODEL1
Dependent Variable: Weight
Observed by Predicted for Weight
Weight
140
120
100
80
60
60
80
100
120
140
Predicted Value

Model: MODEL1
Dependent Variable: Weight





Assigning Data to Roles

To run the Linear Regression task, you must assign columns to the **Dependent variable** and **Explanatory variables** roles.

Role	Description
Role	
Dependent variable	specifies the numeric column to use as the dependent variable for the regression analysis. You must assign a numeric column to this role.
Explanatory variables	specifies the numeric columns to use as the independent regressor (explanatory) columns for the regression model. You must assign at least one numeric column to this role.

Role	Description
Additional Roles	
Frequency count	lists a numeric variable whose value represents the frequency of the observation. If you assign a variable to this role, the task assumes that each observation represents *n* observations, where *n* is the value of the frequency variable. If *n* is not an integer, SAS truncates it. If *n* is less than 1 or is missing, the observation is excluded from the analysis. The sum of the frequency variable represents the total number of observations.
Weight	lists the values that are relative weights for a weighted least squares fit.
Group analysis by	sorts the table by the selected variables. Analyses are performed on each group.

Selecting a Model

Option Name	Description
Methods	
Confidence level	specifies the significance level to use for the construction of confidence intervals.
Model	
Include intercept	includes the effect of the intercept in the regression equation. To exclude the intercept parameter from the model, clear this check box.
Model Selection	

Option Name	Description
	By default, the complete model that you specified is used to fit the model. However, you can also use one of these selection methods: **Forward selection** The forward selection method begins with no variables in the model. For each of the explanatory variables, this method calculates *F* statistics that reflect the variable's contribution to the model if it is included. The *p*-values for these *F* statistics are compared to the significance level that is specified for including a variable in the model. By default, this value is 0.05. To change this significance level, enter the value in the **Significance level to add an effect to the model** text box. If no *F* statistic has a significance level greater than this value, the forward selection stops. Otherwise, the forward selection method adds the variable that has the largest *F* statistic to the model. The forward selection method then calculates *F* statistics again for the variables that still remain outside the model, and the evaluation process is repeated. Thus, variables are added one by one to the model until no remaining variable produces a significant *F* statistic. After a variable is added to the model, it stays there. **Backward elimination** The backward elimination method begins by calculating *F* statistics for a model, including all of the explanatory variables. Then the variables are deleted from the model one by one until all the variables that remain produce *F* statistics significant at the **Significance level to remove an effect from the model** value. (By default, this value is 0.05.) At each step, the variable that shows the smallest contribution to the model is deleted.

Option Name	Description
Stepwise selection The stepwise method is a modification of the forward selection method. The stepwise method is differerent because the variables that are already in the model do not necessarily stay there. As in the forward selection method, variables are added one by one to the model, and the *F* statistic for a variable to be added must be significant at the **Significance level to add an effect to the model** value. After a variable is added, the stepwise method looks at all the variables already included in the model and deletes any variable that does not produce an *F* statistic significant at the **Significance level to remove an effect from the model** value. Only after this check is made and the necessary deletions are accomplished can another variable be added to the model. The stepwise process ends under either of these conditions: - when no variable outside the model has an *F* statistic significant at the **Significance level to add an effect to the model** value and every variable in the model is significant at the **Significance level to remove an effect from the model** value. - when the variable to be added to the model is the variable that was just deleted from it.	
Minimum R square improvement The minimum R-square improvement method closely resembles the maximum R-square improvement method, but the variables that are chosen produce the smallest increase in R^2. For a given number of variables in the model, the maximum R-square and minimum R-square methods usually produce the same "best" model, but the minimum R-square method considers more models of each size.	
Maximum R square improvement The maximum R-square improvement method does not settle on a single model. Instead, it tries to find the "best" one-variable model, the "best" two-variable model, and so on, although it is not guaranteed to find the model with the largest R^2 for each size. This method begins by finding the one-variable model that produces the highest R^2. Then another variable, the one that yields the greatest increase in R^2, is added. After the two-variable model is obtained, each variable in the model is compared to each variable not in the model. For each comparison, this method determines whether removing one variable and replacing it with the other variable increases R^2. After comparing all possible switches, this method makes the switch that produces the largest increase in R^2. Comparisons begin again, and the process continues until this method finds that no further switch could increase R^2. Thus, the resulting two-variable model is considered the "best" two-variable model that the method can find. Another variable is then added to the model, and the comparing-and-switching process is repeated to find the "best" three-variable model, and so on. The difference between the stepwise selection method and the maximum R^2 selection method is that in the maximum R^2 method, all switches are evaluated before any switch is made. In the stepwise selection method, the "worst" variable might be removed without considering what adding the "best" remaining variable might accomplish.	

Option Name	Description
All possible regressions The Linear Regression task fits all possible regression models from the selected explanatory variables. You select the statistic by which to order the best-fitting models. You can choose from these statistics: R square, Adjusted R square, and Mallows' Cp. You can also specify the number of best-fitting models to display.	
Model Selection Statistics Model Selection Plots	
For each method, you can choose from these model selection statistics and model selection plots: ■ adjusted R-square ■ R-square (available for plots only) ■ Akaike's information criterion ■ Bayesian information criterion ■ Mallows' Cp statistic ■ Schwarz' Bayesian information criterion	

Setting Options

Option Name	Description
Statistics	
Parameter Estimates	
Standardized regression coefficients	displays the standardized regression coefficients. A standardized regression coefficient is computed by dividing a parameter estimate by the ratio of the sample standard deviation of the dependent variable to the sample standard deviation of the regressor.
Confidence limits for estimates	displays the $100(1 - \alpha)$ % upper and lower confidence limits for the parameter estimates.

Option Name	Description
Sums of Squares	
Sequential sum of squares (Type I)	displays the sequential sums of squares (Type I SS) along with the parameter estimates for each term in the model.
Partial sum of squares (Type II)	displays the partial sums of squares (Type II SS) along with the parameter estimates for each term in the model.
Partial and Semipartial Correlations	
Squared partial correlations	displays the squared partial correlation coefficients computed by using Type I and Type II sum of squares.
Squared semipartial correlations	displays the squared semipartial correlation coefficients computed by using Type I and Type II sum of squares. This value is calculated as sum of squares divided by the corrected total sum of squares.
Collinearity	
Collinearity analysis	requests a detailed analysis of collinearity among the regressors. This includes eigenvalues, condition indices, and decomposition of the variances of the estimates with respect to each eigenvalue.
Tolerance values for estimates	produces tolerance values for the estimates. Tolerance for a variable is defined as $1 - R^2$, where R square is obtained from the regression of the variable on all other regressors in the model.
Variance inflation factors	produces variance inflation factors with the parameter estimates. Variance inflation is the reciprocal of tolerance.
Heteroscedasticity	

Option Name	Description
Heteroscedasticity analysis	performs a test to confirmthat the first and second moments of the model are correctly specified.
Asymptotic covariance matrix	displays the estimated asymptotic covariance matrix of the estimates under the hypothesis of heteroscedasticity and heteroscedasticity-consistent standard errors of parameter estimates.
Autocorrelation	
Durbin-Watson statistic	calculates a Durbin-Watson statistic and a *p*-value to test whether the errors have first-order autocorrelation.
Plots	

Option Name	Description

You can select the diagnostic, residual, and scatter plots to include in the results.

By default, these plots are included in the results:

- plots of the fit diagnostics:
  - residuals versus the predicted values
  - studentized residuals versus the predicted values
  - studentized residuals versus the leverage
  - normal quantile plot of the residuals
  - dependent variable versus the predicted values
  - Cook's *D* versus observation number
  - histogram of residuals
  - residual-fit plot, which includes side-by-side quantile plots of the centered fit and the residuals
- residuals plot for each explanatory variable
- a scatter plot of the observed values by predicted values

You can also include these diagnostic plots:

- **Rstudent statistic by predicted values** plots studentized residuals by predicted values. If you select the **Label extreme points** option, observations with studentized residuals that lie outside the band between the reference lines *RSTUDENT* = ± 2 are deemed outliers.
- **DFFITS statistic by observations** plots the DFFITS statistic by observation number. If you select the **Label extreme points** option, observations with a DFFITS statistic greater in magnitude than $2\sqrt{\frac{p}{n}}$ are deemed influential. The number of observations used is n, and the number of regressors is p.
- **DFBETAS statistic by observation number for each explanatory variable** produces panels of DFBETAS by observation number for the regressors in the model. You can view these plots as a panel or as individual plots. If you select the **Label extreme points** option, observations with a DFBETAS statistics greater in magnitude than $\frac{2}{\sqrt{n}}$ are deemed influential for that regressor. The number of observations used is n.

You can also include these scatter plots:

- **Fit plot for a single explanatory variable** produces a scatter plot of the data overlaid with the regression line, confidence band, and prediction band for models that depend on at most one regressor. The intercept is excluded. When the number of points exceeds the value for the **Maximum number of plot points** option, a heat map is displayed instead of a scatter plot.
- **Partial regression plots for each explanatory variable** produces partial regression plots for each regressor. If you display these plots in a panel, there is a maximum of six regressors per panel.

Creating Output Data Sets

Option Name	Description
Output Data Sets	

You can create two types of output data sets. By default, these data sets are saved in the Work library.

Parameter estimates data set
: outputs a data set that contains parameter estimates and other model fit summary statistics. Any model selection statistics that you selected on the **Methods** tab are included in the parameter estimates.

Observationwise statistics data set
: outputs a data set that contains sums of squares and cross-products.

Appendix 1

Input Data Sets for Task Examples

About the Task Data Sets

To complete some of the examples in the task documentation, you might need to create one or more data sets. This appendix provides the SAS code that you need. To create these data sets, copy and paste this code into a **Program** tab in SAS Studio and click .

FITNESS Data set

To create the Fitness data set, enter this code into a **Program** tab:

```
data Fitness;
   input Age Weight Oxygen RunTime @@;
   datalines;
44 89.47 44.609 11.37
40 75.07 45.313 10.07
44 85.84 54.297 8.65
42 68.15 59.571 8.17
38 89.02 49.874 .
47 77.45 44.811 11.63
40 75.98 45.681 11.95
43 81.19 49.091 10.85
44 81.42 39.442 13.08
38 81.87 60.055 8.63
44 73.03 50.541 10.13
45 87.66 37.388 14.03
45 66.45 44.754 11.12
47 79.15 47.273 10.60
54 83.12 51.855 10.33
49 81.42 49.156 8.95
51 69.63 40.836 10.95
51 77.91 46.672 10.00
48 91.63 46.774 10.25
49 73.37 . 10.08
57 73.37 39.407 12.63
54 79.38 46.080 11.17
52 76.32 45.441 9.63
50 70.87 54.625 8.92
51 67.25 45.118 11.08
54 91.63 39.203 12.88
51 73.71 45.790 10.47
57 59.08 50.545 9.93
49 76.32 . .
48 61.24 47.920 11.50
52 82.78 47.467 10.50
;
```

GETSTARTED Data Set

To create the getStarted data set, enter this code into a **Program** tab:

```
data getStarted;
   input C1-C5 Y Total;
   datalines;
0 3 1 1 3 2 28.361
```

```
2 3 0 3 1 2 39.831
1 3 2 2 2 1 17.133
1 2 0 0 3 2 12.769
0 2 1 0 1 1 29.464
0 2 1 0 2 1 4.152
1 2 1 0 1 0 0.000
0 2 1 1 2 1 20.199
1 2 0 0 1 0 0.000
0 1 1 3 3 2 53.376
2 2 2 2 1 1 31.923
0 3 2 0 3 2 37.987
2 2 2 0 0 1 1.082
0 2 0 2 0 1 6.323
1 3 0 0 0 0 0.000
1 2 1 2 3 2 4.217
0 1 2 3 1 1 26.084
1 1 0 0 1 0 0.000
1 3 2 2 2 0 0.000
2 1 3 1 1 2 52.640
1 3 0 1 2 1 3.257
2 0 2 3 0 5 88.066
2 2 2 1 0 1 15.196
3 1 3 1 0 1 11.955
3 1 3 1 2 3 91.790
3 1 1 2 3 7 232.417
3 1 1 1 0 1 2.124
3 1 0 0 0 2 32.762
3 1 2 3 0 1 25.415
2 2 0 1 2 1 42.753
3 3 2 2 3 1 23.854
2 0 0 2 3 2 49.438
1 0 0 2 3 4 105.449
0 0 2 3 0 6 101.536
0 3 1 0 0 0 0.000
3 0 1 0 1 1 5.937
2 0 0 0 3 2 53.952
1 0 1 0 3 2 23.686
1 1 3 1 1 1 0.287
2 1 3 0 3 7 281.551
1 3 2 1 1 0 0.000
2 1 0 0 1 0 0.000
0 0 1 1 2 3 93.009
0 1 0 1 0 2 25.055
1 2 2 2 3 1 1.691
0 3 2 3 1 1 10.719
3 3 0 3 3 1 19.279
2 0 0 2 1 2 40.802
```

```
2 2 3 0 3 3 72.924
0 2 0 3 0 1 10.216
3 0 1 2 2 2 87.773
2 1 2 3 1 0 0.000
3 2 0 3 1 0 0.000
3 0 3 0 0 2 62.016
1 3 2 2 1 3 36.355
2 3 2 0 3 1 23.190
1 0 1 2 1 1 11.784
2 1 2 2 2 5 204.527
3 0 1 1 2 5 115.937
0 1 1 3 2 1 44.028
2 2 1 3 1 4 52.247
1 1 0 0 1 1 17.621
3 3 1 2 1 2 10.706
2 2 0 2 3 3 81.506
0 1 0 0 2 2 81.835
0 1 2 0 1 2 20.647
3 2 2 2 0 1 3.110
2 2 3 0 0 1 13.679
1 2 2 3 2 1 6.486
3 3 2 2 1 2 30.025
0 0 3 1 3 6 202.172
3 2 3 1 2 3 44.221
0 3 0 0 0 1 27.645
3 3 3 0 3 2 22.470
2 3 2 0 2 0 0.000
1 3 0 2 0 1 1.628
1 3 1 0 2 0 0.000
3 2 3 3 0 1 20.684
3 1 0 2 0 4 108.000
0 1 2 2 1 1 4.615
0 2 3 2 2 1 12.461
0 3 2 0 1 3 53.798
2 1 1 2 0 1 36.320
1 0 3 0 0 0 0.000
0 0 3 2 0 1 19.902
0 2 3 1 0 0 0.000
2 2 2 1 3 2 31.815
3 3 3 0 0 0 0.000
2 2 1 3 3 2 17.915
0 2 3 2 3 2 69.315
1 3 1 2 1 0 0.000
3 0 1 1 1 4 94.050
2 1 1 1 3 6 242.266
0 2 0 3 2 1 40.885
2 0 1 1 2 2 74.708
```

```
2 2 2 2 3 2 50.734
1 0 2 2 1 3 35.950
1 3 3 1 1 1 2.777
3 1 2 1 3 5 118.065
0 3 2 1 2 0 0.000
;
```

GREENE Data Set

To create the Greene data set, enter this code into a **Program** tab:

```
data greene;
   input firm year production cost @@;
datalines;
1 1955   5.36598   1.14867  1 1960   6.03787   1.45185
1 1965   6.37673   1.52257  1 1970   6.93245   1.76627
2 1955   6.54535   1.35041  2 1960   6.69827   1.71109
2 1965   7.40245   2.09519  2 1970   7.82644   2.39480
3 1955   8.07153   2.94628  3 1960   8.47679   3.25967
;
```

IN Data Set

To create the In data set, enter this code into a **Program** tab:

```
data in;
   label q = "Quantity"
         p = "Price"
         s = "Price of Substitutes"
         y = "Income"
         u = "Unit Cost";
   drop i e1 e2;
   p = 0; q = 0;
   do i = 1 to 60;
      y = 1 + .05*i  + .15*rannor(123);
      u = 2          + .05*rannor(123) + .05*rannor(123);
      s = 4 - .001*(i-10)*(i-110) + .5*rannor(123);
      e1 = .15 * rannor(123);
      e2 = .15 * rannor(123);
      demandx = 1 + .3 * y + .35 * s + e1;
      supplyx = -1 - 1 * u + e2 - .4*e1;
```

```
         q = 1.4/2.15 * demandx + .75/2.15 * supplyx;
         p = ( - q + supplyx ) / -1.4;
         output;
      end;
   run;
```

The output data set (IN) is saved in your Work library.

LONG97DATA Data Set

To create the In data set, enter this code into a **Program** tab:

```
data long97data;
   input fem ment phd mar kid5 art lnart;
datalines;
0   7.99999860   1.38000000  1  2  3   1.25276290
0   6.99999950   4.29000000  0  0  0  -0.69314720
0  47.00000760   3.84999990  0  0  4   1.50407740
0  19.00000190   3.58999990  1  1  1   0.40546510
0   0.00000000   1.80999990  1  0  1   0.40546510
0   6.00000050   3.58999990  1  1  1   0.40546510
0   9.99999900   2.11999990  1  1  0  -0.69314720
0   1.99999990   4.29000000  1  0  0  -0.69314720
0   1.99999990   2.57999990  1  2  3   1.25276290
0   3.99999900   1.80000000  1  1  3   1.25276290
0   0.00000000   4.29000000  1  2  1   0.40546510
0   3.00000000   2.76000000  1  1  0  -0.69314720
0   9.99999900   3.41000010  1  1  1   0.40546510
0   6.99999950   4.34000020  1  3  2   0.91629080
0  15.00000100   3.84999990  1  2  5   1.70474800
0   1.99999990   2.09999990  1  0  2   0.91629080
0  13.00000000   4.29000000  1  0  2   0.91629080
0  15.00000100   4.29000000  0  0  1   0.40546510
0   4.99999810   2.26000000  1  1  0  -0.69314720
0   6.00000050   2.09999990  0  0  0  -0.69314720
0  12.00000000   2.26000000  1  0  3   1.25276290
0  15.99999810   3.84999990  1  1  6   1.87180220
0   6.99999950   4.29000000  0  0  4   1.50407740
0   6.00000050   1.80000000  1  2  2   0.91629080
0   1.99999990   2.26000000  0  0  2   0.91629080
0   0.00000000   2.09999990  0  0  0  -0.69314720
0  30.00000190   4.29000000  1  0  4   1.50407740
0   9.99999900   4.29000000  1  2  1   0.40546510
0   1.99999990   2.09999990  1  0  1   0.40546510
```

0	0.99999990	3.58999990	1	0	7	2.01490310
0	3.00000000	3.42000010	1	1	2	0.91629080
0	9.99999900	4.29000000	1	2	2	0.91629080
0	9.99999900	4.29000000	0	0	2	0.91629080
0	0.99999990	3.33999990	1	2	0	-0.69314720
0	1.99999990	4.29000000	0	0	0	-0.69314720
0	10.99999710	4.29000000	1	0	1	0.40546510
0	4.99999810	3.61999990	1	0	4	1.50407740
0	0.00000000	4.29000000	1	3	1	0.40546510
0	3.99999900	4.34000020	1	1	1	0.40546510
0	1.99999990	1.25000000	1	1	2	0.91629080
0	19.00000190	4.34000020	0	0	7	2.01490310
0	3.00000000	1.67000000	1	3	1	0.40546510
0	0.00000000	3.47000000	0	0	0	-0.69314720
0	0.99999990	2.26000000	1	1	1	0.40546510
0	0.99999990	1.80000000	1	0	1	0.40546510
0	17.00000000	4.34000020	1	2	2	0.91629080
0	3.00000000	3.58999990	0	0	2	0.91629080
0	0.99999990	1.75000000	1	2	1	0.40546510
0	6.00000050	4.29000000	0	0	1	0.40546510
0	0.00000000	2.09999990	1	1	0	-0.69314720
0	15.00000100	4.29000000	1	2	0	-0.69314720
0	0.00000000	2.09999990	1	1	0	-0.69314720
0	26.99999810	3.31999990	1	2	2	0.91629080
0	4.99999810	4.34000020	1	0	2	0.91629080
0	6.99999950	3.41000010	0	0	4	1.50407740
0	0.00000000	4.29000000	1	0	1	0.40546510
0	10.99999710	3.19000010	1	0	2	0.91629080
0	13.00000000	4.29000000	1	0	2	0.91629080
0	3.99999900	1.74000000	1	2	1	0.40546510
0	3.99999900	2.76000000	0	0	1	0.40546510
0	26.99999810	3.58999990	1	1	7	2.01490310
0	9.99999900	1.80999990	1	0	4	1.50407740
0	13.00000000	4.29000000	1	1	2	0.91629080
0	0.99999990	4.29000000	1	1	1	0.40546510
0	6.00000050	2.76000000	0	0	1	0.40546510
0	6.00000050	3.47000000	0	0	6	1.87180220
0	4.99999810	2.50000000	1	2	2	0.91629080
0	1.99999990	1.25000000	1	0	5	1.70474800
0	13.99999710	3.58999990	1	1	3	1.25276290
0	0.00000000	2.09999990	1	1	0	-0.69314720
0	12.00000000	3.58999990	1	0	1	0.40546510
0	6.99999950	3.58999990	1	3	0	-0.69314720
0	3.00000000	1.75000000	1	0	1	0.40546510
0	1.99999990	1.75000000	1	2	1	0.40546510
0	1.99999990	3.58999990	1	1	1	0.40546510
0	1.99999990	4.29000000	0	0	1	0.40546510

```
0   0.00000000   4.29000000  0  0  0  -0.69314720
0   0.00000000   2.09999990  1  1  0  -0.69314720
0   0.00000000   2.60999990  1  0  3   1.25276290
0  30.00000190   4.29000000  1  0  5   1.70474800
0  21.00000000   1.74000000  1  0 16   2.80336050
0   4.99999810   2.76000000  1  0  1   0.40546510
0   9.00000000   4.29000000  0  0  0  -0.69314720
0   7.99999860   2.76000000  1  2  1   0.40546510
0  25.00000000   4.29000000  1  2  3   1.25276290
0   0.00000000   3.47000000  1  1  5   1.70474800
0   4.99999810   2.57999990  1  2  0  -0.69314720
0   0.99999990   2.14000010  1  0  0  -0.69314720
0   4.99999810   2.26000000  0  0  0  -0.69314720
0   0.00000000   4.29000000  1  2  3   1.25276290
0  15.00000100   4.29000000  1  0  3   1.25276290
0  30.00000190   4.29000000  0  0  3   1.25276290
0   1.99999990   2.20000000  1  0  0  -0.69314720
0   6.00000050   1.80000000  1  2  3   1.25276290
0   0.00000000   2.09999990  1  2  1   0.40546510
0  13.00000000   4.29000000  1  1  1   0.40546510
0   0.00000000   4.29000000  0  0  0  -0.69314720
0  12.00000000   2.09999990  1  1  0  -0.69314720
0  30.00000190   4.29000000  1  2  2   0.91629080
0   4.99999810   1.80999990  1  1  1   0.40546510
0   9.99999900   4.34000020  1  0  1   0.40546510
0   4.99999810   4.29000000  1  1  0  -0.69314720
0   3.99999900   2.50000000  1  2  1   0.40546510
0  13.00000000   2.05000000  1  2  4   1.50407740
0   7.99999860   3.47000000  1  0  3   1.25276290
0   6.00000050   2.60999990  1  1  1   0.40546510
0   6.00000050   4.29000000  1  2  1   0.40546510
0  25.00000000   4.29000000  0  0  2   0.91629080
0   1.99999990   4.29000000  1  1  2   0.91629080
0   9.00000000   4.34000020  1  0  6   1.87180220
0   9.99999900   2.11999990  1  1  0  -0.69314720
0   3.00000000   2.76000000  1  0  2   0.91629080
0   1.99999990   4.29000000  1  2  0  -0.69314720
0   0.00000000   2.50000000  1  0  1   0.40546510
0   6.00000050   4.34000020  1  0  5   1.70474800
0   7.99999860   2.76000000  1  1  2   0.91629080
0   9.99999900   3.19000010  1  1  2   0.91629080
0   7.99999860   4.61999990  0  0  3   1.25276290
0   6.00000050   3.15000010  1  2  0  -0.69314720
0  21.00000000   2.55000000  1  1  4   1.50407740
0   3.99999900   1.52000000  1  0  0  -0.69314720
0   1.99999990   1.72000000  1  2  4   1.50407740
0   0.99999990   1.78000000  1  1  2   0.91629080
```

0	17.00000000	2.85999990	1	1	1	0.40546510
0	30.00000190	4.61999990	1	2	0	-0.69314720
0	4.99999810	4.13999990	0	0	1	0.40546510
0	13.00000000	2.96000000	1	1	6	1.87180220
0	10.99999710	2.55000000	1	0	1	0.40546510
0	19.00000190	2.21000000	1	1	0	-0.69314720
0	4.99999810	3.08999990	1	0	3	1.25276290
0	66.00000760	4.54000000	1	2	4	1.50407740
0	0.00000000	1.78000000	1	0	3	1.25276290
0	3.00000000	2.21000000	1	3	0	-0.69314720
0	3.00000000	2.39000010	1	1	1	0.40546510
0	0.00000000	2.96000000	1	0	0	-0.69314720
0	7.99999860	2.51000000	1	1	0	-0.69314720
0	0.00000000	1.97000000	1	2	2	0.91629080
0	4.99999810	4.13999990	0	0	0	-0.69314720
0	29.00000000	4.25000000	1	1	4	1.50407740
0	10.99999710	2.85999990	1	2	0	-0.69314720
0	22.99999620	2.96000000	1	1	9	2.25129180
0	45.99999240	2.96000000	1	2	2	0.91629080
0	7.99999860	4.61999990	1	1	6	1.87180220
0	4.99999810	3.69000010	1	2	0	-0.69314720
0	0.99999990	3.15000010	1	1	0	-0.69314720
0	9.00000000	4.61999990	0	0	2	0.91629080
0	1.99999990	3.35999990	1	0	0	-0.69314720
0	6.99999950	3.69000010	0	0	4	1.50407740
0	10.99999710	3.54000000	1	0	1	0.40546510
0	56.99999620	2.96000000	1	1	4	1.50407740
0	15.99999810	2.55999990	1	1	1	0.40546510
0	0.00000000	2.31999990	1	0	0	-0.69314720
0	3.00000000	2.31999990	1	0	0	-0.69314720
0	0.99999990	0.92000000	1	2	0	-0.69314720
0	9.99999900	4.54000000	1	0	0	-0.69314720
0	10.99999710	4.54000000	1	3	0	-0.69314720
0	10.99999710	1.76000000	1	1	5	1.70474800
0	15.99999810	2.55999990	0	0	1	0.40546510
0	4.99999810	2.39000010	1	1	0	-0.69314720
0	9.00000000	3.40000010	1	0	2	0.91629080
0	19.99999620	2.86999990	1	2	2	0.91629080
0	21.00000000	4.54000000	1	2	4	1.50407740
0	4.99999810	2.82999990	1	0	4	1.50407740
0	6.00000050	1.67999990	1	0	0	-0.69314720
0	12.00000000	3.54000000	0	0	3	1.25276290
0	0.00000000	1.76000000	1	0	2	0.91629080
0	10.99999710	3.15000010	1	3	1	0.40546510
0	3.00000000	2.51000000	1	0	0	-0.69314720
0	15.99999810	3.69000010	1	1	0	-0.69314720
0	10.99999710	1.76000000	1	1	4	1.50407740

```
0   4.99999810   1.86000000  1  1 12   2.52572870
0   0.99999990   2.76000000  1  3  0  -0.69314720
0  15.99999810   4.61999990  1  1  1   0.40546510
0  12.00000000   4.25000000  1  0  5   1.70474800
0  10.99999710   2.54000000  1  0  4   1.50407740
0   0.00000000   2.20000000  1  1  0  -0.69314720
0   0.00000000   1.76000000  1  0  2   0.91629080
0   3.00000000   2.85999990  1  3  3   1.25276290
0  13.00000000   3.40000010  1  2  0  -0.69314720
0  45.00000000   4.54000000  1  1  1   0.40546510
0  47.00000760   1.86000000  1  1  9   2.25129180
0   6.99999950   1.52000000  1  0  0  -0.69314720
0   6.99999950   2.55999990  1  1  2   0.91629080
0  19.00000190   2.21000000  1  0  0  -0.69314720
0   9.00000000   3.69000010  1  0  7   2.01490310
0  76.99998470   1.78000000  1  1  1   0.40546510
0   0.00000000   1.17999990  1  1  0  -0.69314720
0   3.99999900   2.00000000  1  0  1   0.40546510
0  19.00000190   2.21000000  1  0  0  -0.69314720
0  12.00000000   4.13999990  1  2  0  -0.69314720
0   0.99999990   2.85999990  1  3  0  -0.69314720
0  17.00000000   2.85999990  1  1  1   0.40546510
0   6.00000050   2.54000000  0  0  7   2.01490310
0   3.99999900   2.85999990  1  1  0  -0.69314720
0   6.00000050   2.52000000  0  0  4   1.50407740
0   3.00000000   1.52000000  1  1  2   0.91629080
0   4.99999810   3.08999990  1  1  3   1.25276290
0   3.00000000   1.17999990  1  1  0  -0.69314720
0   3.00000000   1.42000000  1  0  0  -0.69314720
0  15.00000100   4.61999990  0  0  7   2.01490310
0   0.00000000   2.96000000  1  2  1   0.40546510
0   9.99999900   4.54000000  0  0  2   0.91629080
0  41.99999620   4.54000000  0  0  7   2.01490310
0   3.00000000   2.51000000  1  2  1   0.40546510
0   6.99999950   3.15000010  1  1  2   0.91629080
0   0.00000000   2.50000000  1  0  1   0.40546510
0   6.00000050   2.96000000  1  3  1   0.40546510
0   3.99999900   1.67999990  1  0  0  -0.69314720
0   0.00000000   1.22000000  1  1  1   0.40546510
0   1.99999990   1.52000000  1  0  1   0.40546510
0   4.99999810   2.21000000  1  1  0  -0.69314720
0   0.99999990   3.92000010  1  1  0  -0.69314720
0  13.00000000   4.54000000  1  0  5   1.70474800
0   0.00000000   1.17999990  1  0  2   0.91629080
0  26.00000000   3.69000010  1  0  3   1.25276290
0   0.99999990   1.72000000  1  0  2   0.91629080
0  25.00000000   2.57999990  1  1  5   1.70474800
```

0	3.00000000	1.52000000	0	0	3	1.25276290
0	47.00000760	1.86000000	1	1	4	1.50407740
0	3.99999900	2.50000000	1	0	5	1.70474800
0	0.99999990	4.61999990	1	0	1	0.40546510
0	6.99999950	1.40000000	1	2	0	-0.69314720
0	4.99999810	4.54000000	1	0	3	1.25276290
0	26.99999810	1.67999990	1	1	0	-0.69314720
0	0.99999990	2.82999990	1	0	2	0.91629080
0	4.99999810	3.35999990	0	0	1	0.40546510
0	0.00000000	1.97000000	1	1	7	2.01490310
0	12.00000000	3.40000010	0	0	1	0.40546510
0	3.99999900	1.74000000	1	1	1	0.40546510
0	0.00000000	2.96000000	0	0	0	-0.69314720
0	25.00000000	2.57999990	1	1	4	1.50407740
0	3.00000000	4.54000000	1	1	1	0.40546510
0	1.99999990	3.15000010	1	1	0	-0.69314720
0	12.00000000	2.96000000	1	2	0	-0.69314720
0	15.99999810	3.54000000	1	2	2	0.91629080
0	4.99999810	2.96000000	1	1	3	1.25276290
0	12.00000000	4.25000000	1	0	1	0.40546510
0	4.99999810	2.55999990	1	1	2	0.91629080
0	4.99999810	1.86000000	1	0	1	0.40546510
0	3.00000000	4.61999990	1	1	1	0.40546510
0	3.99999900	2.85999990	0	0	2	0.91629080
0	4.99999810	3.15000010	1	1	5	1.70474800
0	0.00000000	2.51000000	1	0	2	0.91629080
0	26.99999810	3.15000010	1	1	5	1.70474800
0	4.99999810	2.51000000	1	0	2	0.91629080
0	0.00000000	1.52000000	1	1	0	-0.69314720
0	17.99999810	4.29000000	0	0	6	1.87180220
0	4.99999810	4.29000000	1	1	4	1.50407740
0	7.99999860	4.29000000	1	2	2	0.91629080
0	3.99999900	2.09999990	1	0	2	0.91629080
0	35.00000760	4.29000000	1	1	12	2.52572870
0	4.99999810	4.29000000	0	0	2	0.91629080
0	9.00000000	3.58999990	1	1	1	0.40546510
0	6.00000050	4.29000000	1	0	1	0.40546510
0	24.00000190	4.29000000	1	0	2	0.91629080
0	0.00000000	2.09999990	1	1	0	-0.69314720
0	4.99999810	1.80999990	1	1	0	-0.69314720
0	19.00000190	4.29000000	0	0	7	2.01490310
0	3.00000000	4.29000000	0	0	1	0.40546510
0	1.99999990	4.29000000	1	1	1	0.40546510
0	3.99999900	1.25000000	1	0	3	1.25276290
0	9.99999900	3.58999990	1	0	1	0.40546510
0	7.99999860	2.09999990	1	1	1	0.40546510
0	1.99999990	4.29000000	1	0	4	1.50407740

0	19.00000190	4.29000000	1	1	3	1.25276290
0	0.99999990	3.47000000	1	1	1	0.40546510
0	3.00000000	3.19000010	1	0	1	0.40546510
0	4.99999810	3.19000010	1	2	1	0.40546510
0	0.00000000	2.09999990	1	0	1	0.40546510
0	21.00000000	3.58999990	1	1	5	1.70474800
0	13.99999710	4.29000000	1	1	1	0.40546510
0	0.00000000	2.09999990	1	0	0	-0.69314720
0	6.99999950	2.76000000	1	1	1	0.40546510
0	4.99999810	2.60999990	1	0	3	1.25276290
0	22.00000000	4.29000000	1	0	4	1.50407740
0	19.99999620	3.41000010	0	0	7	2.01490310
0	38.00000380	4.29000000	1	0	3	1.25276290
0	19.00000190	4.29000000	0	0	4	1.50407740
0	3.00000000	2.26000000	0	0	2	0.91629080
0	15.99999810	3.58999990	0	0	3	1.25276290
0	1.99999990	4.29000000	1	1	0	-0.69314720
0	3.00000000	2.05000000	0	0	1	0.40546510
0	12.00000000	4.29000000	1	2	1	0.40546510
0	35.00000760	4.29000000	0	0	0	-0.69314720
0	19.00000190	4.29000000	1	0	0	-0.69314720
0	1.99999990	4.29000000	0	0	0	-0.69314720
0	6.99999950	2.76000000	0	0	1	0.40546510
0	3.99999900	2.09999990	1	2	3	1.25276290
0	13.99999710	2.35999990	0	0	1	0.40546510
0	9.00000000	4.29000000	0	0	0	-0.69314720
0	7.99999860	3.58999990	0	0	0	-0.69314720
0	12.00000000	4.29000000	1	1	2	0.91629080
0	3.00000000	4.29000000	1	1	0	-0.69314720
0	0.99999990	4.29000000	1	0	1	0.40546510
0	9.99999900	4.29000000	0	0	1	0.40546510
0	21.00000000	3.41000010	0	0	4	1.50407740
0	13.00000000	4.29000000	1	1	0	-0.69314720
0	17.00000000	4.29000000	1	0	2	0.91629080
0	4.99999810	4.29000000	0	0	0	-0.69314720
0	1.99999990	2.14000010	0	0	0	-0.69314720
0	7.99999860	4.29000000	1	0	0	-0.69314720
0	1.99999990	2.50000000	1	1	2	0.91629080
0	4.99999810	2.60999990	1	1	3	1.25276290
0	0.99999990	1.80999990	1	2	0	-0.69314720
0	1.99999990	2.26000000	1	1	0	-0.69314720
0	3.99999900	3.61999990	1	2	1	0.40546510
0	9.00000000	4.29000000	1	2	1	0.40546510
0	9.00000000	4.29000000	0	0	0	-0.69314720
0	17.00000000	4.29000000	0	0	2	0.91629080
0	24.00000190	4.29000000	1	2	0	-0.69314720
0	3.99999900	3.47000000	1	0	4	1.50407740

0	13.99999710	4.29000000	1	1	2	0.91629080
0	4.99999810	3.58999990	1	1	1	0.40546510
0	9.99999900	1.80999990	0	0	1	0.40546510
0	17.99999810	4.29000000	1	1	3	1.25276290
0	0.99999990	4.29000000	1	1	0	-0.69314720
0	0.00000000	2.09999990	1	0	1	0.40546510
0	3.99999900	2.15000010	1	2	0	-0.69314720
0	7.99999860	4.29000000	1	0	0	-0.69314720
0	0.99999990	2.26000000	1	0	1	0.40546510
0	7.99999860	4.29000000	1	0	0	-0.69314720
0	13.00000000	4.29000000	1	2	0	-0.69314720
0	4.99999810	3.58999990	1	2	0	-0.69314720
0	6.99999950	3.41000010	1	2	0	-0.69314720
0	6.99999950	3.58999990	0	0	3	1.25276290
0	4.99999810	3.61999990	1	1	3	1.25276290
0	0.00000000	2.09999990	1	3	1	0.40546510
0	13.99999710	4.29000000	0	0	1	0.40546510
0	6.00000050	4.29000000	1	0	0	-0.69314720
0	4.99999810	2.26000000	1	1	1	0.40546510
0	7.99999860	2.76000000	1	0	3	1.25276290
0	3.99999900	2.60999990	1	1	1	0.40546510
0	9.00000000	4.29000000	0	0	2	0.91629080
0	3.00000000	2.09999990	1	1	2	0.91629080
0	1.99999990	3.47000000	1	1	0	-0.69314720
0	0.00000000	2.09999990	0	0	0	-0.69314720
0	10.99999710	4.29000000	0	0	1	0.40546510
0	9.00000000	4.29000000	0	0	1	0.40546510
0	7.99999860	2.96000000	1	0	1	0.40546510
0	1.99999990	2.96000000	1	0	2	0.91629080
0	17.99999810	4.61999990	1	0	3	1.25276290
0	3.00000000	1.42000000	1	0	3	1.25276290
0	1.99999990	4.54000000	1	0	1	0.40546510
0	6.99999950	2.52000000	1	0	0	-0.69314720
0	9.99999900	4.54000000	1	1	2	0.91629080
0	15.99999810	2.00000000	1	1	1	0.40546510
0	4.99999810	2.54000000	1	0	0	-0.69314720
0	0.00000000	2.50000000	1	0	2	0.91629080
0	7.99999860	4.54000000	0	0	0	-0.69314720
0	9.99999900	3.35999990	0	0	1	0.40546510
0	17.99999810	3.40000010	1	1	0	-0.69314720
0	12.00000000	1.67999990	1	1	1	0.40546510
0	9.00000000	2.00000000	0	0	1	0.40546510
0	39.00000000	2.85999990	1	0	1	0.40546510
0	17.99999810	4.61999990	1	0	1	0.40546510
0	15.00000100	4.13999990	1	0	1	0.40546510
0	15.99999810	4.13999990	1	0	2	0.91629080
0	1.99999990	2.96000000	0	0	0	-0.69314720

0	6.99999950	2.82999990	1	2	3	1.25276290
0	24.00000190	2.55000000	1	0	2	0.91629080
0	7.99999860	1.67999990	1	0	1	0.40546510
0	6.99999950	2.00000000	0	0	1	0.40546510
0	10.99999710	2.00000000	1	1	1	0.40546510
0	0.00000000	2.96000000	1	1	4	1.50407740
0	3.99999900	1.50500000	1	0	4	1.50407740
0	21.00000000	3.54000000	1	0	2	0.91629080
0	6.00000050	3.40000010	0	0	1	0.40546510
0	6.00000050	4.61999990	0	0	0	-0.69314720
0	7.99999860	2.82999990	0	0	3	1.25276290
0	3.99999900	2.54000000	1	0	1	0.40546510
0	12.00000000	2.86999990	0	0	1	0.40546510
0	15.00000100	1.86000000	0	0	1	0.40546510
0	0.00000000	3.92000010	1	1	1	0.40546510
0	4.99999810	3.69000010	1	1	1	0.40546510
0	15.00000100	2.85999990	1	2	4	1.50407740
0	4.99999810	4.54000000	0	0	0	-0.69314720
0	7.99999860	4.61999990	0	0	0	-0.69314720
0	13.00000000	2.85999990	1	1	0	-0.69314720
0	1.99999990	3.40000010	0	0	1	0.40546510
0	6.00000050	2.57999990	1	2	4	1.50407740
0	19.99999620	4.25000000	1	0	3	1.25276290
0	6.99999950	1.76000000	1	1	2	0.91629080
0	6.99999950	2.85999990	1	3	0	-0.69314720
0	15.99999810	3.69000010	1	2	4	1.50407740
0	13.00000000	3.40000010	1	0	0	-0.69314720
0	0.00000000	3.40000010	1	2	0	-0.69314720
0	0.99999990	4.54000000	1	2	0	-0.69314720
0	12.00000000	2.86999990	0	0	3	1.25276290
0	6.99999950	1.76000000	1	0	4	1.50407740
0	3.99999900	4.25000000	0	0	1	0.40546510
0	0.00000000	3.92000010	0	0	3	1.25276290
0	3.99999900	3.35999990	1	0	2	0.91629080
0	3.99999900	2.31999990	1	0	1	0.40546510
0	36.99999240	4.54000000	0	0	2	0.91629080
0	22.99999620	3.35999990	1	1	0	-0.69314720
0	7.99999860	2.00000000	1	3	2	0.91629080
0	7.99999860	3.92000010	1	1	1	0.40546510
0	1.99999990	3.92000010	0	0	1	0.40546510
0	0.00000000	3.35999990	0	0	1	0.40546510
0	0.99999990	1.78000000	1	0	1	0.40546510
0	21.00000000	3.54000000	1	1	1	0.40546510
0	9.99999900	3.92000010	0	0	2	0.91629080
0	7.99999860	2.31999990	0	0	3	1.25276290
0	33.99999240	1.67999990	1	0	1	0.40546510
0	13.99999710	3.08999990	0	0	2	0.91629080

0	6.00000050	2.57999990	1	1	0	-0.69314720
0	13.99999710	3.40000010	0	0	6	1.87180220
0	12.00000000	2.86999990	0	0	3	1.25276290
0	17.99999810	4.61999990	0	0	4	1.50407740
0	3.00000000	2.96000000	1	3	0	-0.69314720
0	6.00000050	1.86000000	1	2	2	0.91629080
0	1.99999990	1.22000000	1	1	0	-0.69314720
0	10.99999710	2.51000000	1	2	6	1.87180220
0	10.99999710	2.51000000	1	0	8	2.14006610
0	4.99999810	3.69000010	1	0	2	0.91629080
0	7.99999860	2.96000000	1	0	3	1.25276290
0	3.99999900	1.78000000	1	0	1	0.40546510
0	0.99999990	1.22000000	1	1	1	0.40546510
0	7.99999860	2.85999990	1	0	0	-0.69314720
0	19.00000190	3.69000010	0	0	7	2.01490310
0	1.99999990	2.11999990	0	0	0	-0.69314720
0	9.99999900	2.52000000	1	1	2	0.91629080
0	3.99999900	2.31999990	1	0	1	0.40546510
0	3.00000000	4.61999990	1	0	2	0.91629080
0	1.99999990	3.54000000	1	2	4	1.50407740
0	0.99999990	2.50000000	1	0	0	-0.69314720
0	4.99999810	1.67999990	0	0	0	-0.69314720
0	1.99999990	3.40000010	1	1	1	0.40546510
0	4.99999810	3.92000010	0	0	0	-0.69314720
0	52.99998090	4.54000000	1	1	5	1.70474800
0	54.99998860	4.54000000	0	0	2	0.91629080
0	0.00000000	2.50000000	0	0	0	-0.69314720
0	10.99999710	4.54000000	1	0	2	0.91629080
0	25.00000000	3.54000000	0	0	3	1.25276290
0	4.99999810	1.52000000	1	0	2	0.91629080
0	1.99999990	3.92000010	1	2	0	-0.69314720
0	7.99999860	4.61999990	1	0	2	0.91629080
0	0.00000000	3.92000010	1	0	3	1.25276290
0	4.99999810	2.31999990	1	2	0	-0.69314720
0	7.99999860	2.96000000	1	2	2	0.91629080
0	6.99999950	2.85999990	1	2	1	0.40546510
0	13.99999710	1.95000000	1	1	3	1.25276290
0	1.99999990	3.92000010	1	2	1	0.40546510
0	4.99999810	2.86999990	0	0	1	0.40546510
0	24.00000190	3.69000010	1	0	3	1.25276290
0	3.00000000	3.69000010	1	0	0	-0.69314720
0	3.99999900	2.39000010	0	0	2	0.91629080
0	3.00000000	1.95000000	1	2	3	1.25276290
0	10.99999710	3.35999990	0	0	5	1.70474800
0	3.99999900	2.39000010	1	1	2	0.91629080
0	26.00000000	3.69000010	0	0	2	0.91629080
0	3.99999900	2.96000000	1	1	5	1.70474800

0	1.99999990	3.21000000	1	0	0	-0.69314720
0	0.00000000	2.11999990	1	2	0	-0.69314720
0	52.99998090	4.54000000	1	1	2	0.91629080
0	3.99999900	2.31999990	1	0	3	1.25276290
0	6.00000050	2.54000000	1	1	3	1.25276290
0	1.99999990	2.85999990	1	1	1	0.40546510
0	13.99999710	3.47000000	1	0	3	1.25276290
0	15.00000100	2.86999990	0	0	4	1.50407740
0	3.99999900	2.31999990	1	0	0	-0.69314720
0	15.00000100	1.86000000	1	2	4	1.50407740
0	3.99999900	1.95000000	1	0	2	0.91629080
0	1.99999990	2.31999990	1	2	0	-0.69314720
0	19.99999620	4.25000000	1	2	1	0.40546510
0	3.99999900	1.97000000	0	0	6	1.87180220
0	41.99999620	1.86000000	1	0	19	2.97041440
0	7.99999860	3.69000010	1	1	0	-0.69314720
0	3.00000000	4.54000000	1	1	0	-0.69314720
0	9.00000000	3.54000000	1	0	4	1.50407740
0	9.99999900	4.54000000	1	1	1	0.40546510
0	6.99999950	2.85999990	1	2	11	2.44234700
0	25.00000000	3.35999990	1	0	0	-0.69314720
0	3.00000000	2.85999990	0	0	0	-0.69314720
0	3.99999900	2.96000000	1	2	0	-0.69314720
0	22.00000000	2.55999990	1	2	1	0.40546510
0	7.99999860	1.63000000	1	0	2	0.91629080
0	13.99999710	2.96000000	0	0	0	-0.69314720
0	0.00000000	2.96000000	1	0	1	0.40546510
0	7.99999860	1.63000000	1	1	1	0.40546510
0	0.00000000	2.96000000	0	0	0	-0.69314720
0	21.00000000	2.96000000	1	2	2	0.91629080
0	6.99999950	2.96000000	1	0	1	0.40546510
0	30.99998860	4.54000000	1	2	3	1.25276290
0	1.99999990	4.54000000	1	2	2	0.91629080
0	9.99999900	2.15000010	0	0	1	0.40546510
0	6.00000050	4.54000000	1	1	2	0.91629080
0	12.00000000	2.21000000	1	2	2	0.91629080
0	0.99999990	2.21000000	1	1	0	-0.69314720
0	29.00000000	4.54000000	0	0	2	0.91629080
0	9.99999900	2.21000000	1	1	3	1.25276290
0	6.00000050	2.21000000	1	0	0	-0.69314720
0	36.99999240	4.54000000	1	0	3	1.25276290
0	4.99999810	4.54000000	0	0	4	1.50407740
1	9.00000000	2.11999990	0	0	0	-0.69314720
1	1.99999990	2.11999990	1	0	0	-0.69314720
1	1.99999990	2.11999990	1	0	2	0.91629080
1	3.00000000	2.11999990	1	0	3	1.25276290
1	9.00000000	2.11999990	1	1	1	0.40546510

1	10.99999710	2.39000010	0	0	3	1.25276290
1	4.99999810	2.57999990	0	0	2	0.91629080
1	6.99999950	3.19000010	1	0	4	1.50407740
1	4.99999810	3.75000000	0	0	0	-0.69314720
1	3.00000000	3.58999990	0	0	1	0.40546510
1	1.99999990	2.57999990	0	0	2	0.91629080
1	0.00000000	3.75000000	0	0	3	1.25276290
1	4.99999810	3.75000000	1	0	0	-0.69314720
1	0.99999990	3.75000000	0	0	0	-0.69314720
1	3.99999900	1.22000000	1	2	2	0.91629080
1	13.99999710	3.75000000	0	0	0	-0.69314720
1	6.99999950	3.75000000	1	0	0	-0.69314720
1	26.00000000	3.75000000	0	0	0	-0.69314720
1	7.99999860	3.75000000	0	0	2	0.91629080
1	3.00000000	3.75000000	0	0	4	1.50407740
1	6.00000050	3.75000000	0	0	0	-0.69314720
1	21.00000000	3.75000000	0	0	1	0.40546510
1	7.99999860	3.75000000	1	0	2	0.91629080
1	3.99999900	3.75000000	0	0	0	-0.69314720
1	6.99999950	3.75000000	1	1	1	0.40546510
1	0.00000000	3.75000000	1	0	2	0.91629080
1	0.00000000	2.54000000	1	1	0	-0.69314720
1	0.99999990	2.54000000	1	0	0	-0.69314720
1	3.99999900	2.76000000	0	0	0	-0.69314720
1	1.99999990	4.13999990	0	0	0	-0.69314720
1	3.99999900	0.92000000	0	0	1	0.40546510
1	0.00000000	1.00500000	0	0	0	-0.69314720
1	6.00000050	3.08999990	0	0	2	0.91629080
1	3.00000000	3.08999990	1	1	2	0.91629080
1	0.00000000	1.79000000	0	0	0	-0.69314720
1	3.00000000	1.40000000	0	0	1	0.40546510
1	3.00000000	1.40000000	0	0	4	1.50407740
1	0.00000000	1.40000000	1	0	2	0.91629080
1	0.00000000	1.40000000	0	0	2	0.91629080
1	13.99999710	1.40000000	0	0	0	-0.69314720
1	12.00000000	1.40000000	0	0	1	0.40546510
1	1.99999990	1.40000000	0	0	1	0.40546510
1	6.00000050	2.00000000	0	0	1	0.40546510
1	10.99999710	4.34000020	1	0	2	0.91629080
1	6.00000050	4.34000020	1	0	4	1.50407740
1	0.00000000	1.75000000	0	0	0	-0.69314720
1	36.00000000	2.09999990	1	0	6	1.87180220
1	7.99999860	2.09999990	0	0	1	0.40546510
1	1.99999990	2.09999990	0	0	0	-0.69314720
1	10.99999710	3.58999990	1	0	2	0.91629080
1	10.99999710	3.58999990	1	2	2	0.91629080
1	17.99999810	3.58999990	0	0	0	-0.69314720

1	3.99999900	3.58999990	0	0	0	-0.69314720
1	17.99999810	3.58999990	1	0	10	2.35137530
1	7.99999860	3.58999990	0	0	1	0.40546510
1	19.00000190	3.41000010	1	0	3	1.25276290
1	3.99999900	3.41000010	1	0	4	1.50407740
1	4.99999810	3.41000010	1	2	0	-0.69314720
1	6.99999950	3.40000010	0	0	1	0.40546510
1	3.99999900	3.40000010	1	1	2	0.91629080
1	4.99999810	3.40000010	1	0	4	1.50407740
1	13.99999710	3.40000010	1	0	1	0.40546510
1	3.99999900	3.40000010	1	0	0	-0.69314720
1	3.99999900	2.52000000	0	0	3	1.25276290
1	0.00000000	2.52000000	0	0	1	0.40546510
1	15.00000100	3.69000010	1	1	2	0.91629080
1	0.99999990	3.69000010	1	0	1	0.40546510
1	3.00000000	3.69000010	1	1	0	-0.69314720
1	17.99999810	3.69000010	0	0	1	0.40546510
1	15.00000100	2.86999990	0	0	0	-0.69314720
1	4.99999810	2.86999990	1	0	1	0.40546510
1	17.99999810	2.86999990	1	0	1	0.40546510
1	9.00000000	2.86999990	0	0	2	0.91629080
1	6.00000050	2.86999990	0	0	4	1.50407740
1	15.00000100	2.86999990	1	0	1	0.40546510
1	3.99999900	3.35999990	0	0	2	0.91629080
1	1.99999990	3.35999990	1	2	0	-0.69314720
1	3.00000000	3.35999990	0	0	2	0.91629080
1	6.99999950	3.35999990	0	0	0	-0.69314720
1	15.99999810	4.54000000	1	0	4	1.50407740
1	48.00000000	4.54000000	1	2	2	0.91629080
1	15.00000100	4.54000000	1	0	5	1.70474800
1	36.99999240	4.54000000	0	0	1	0.40546510
1	9.99999900	4.54000000	1	0	2	0.91629080
1	13.00000000	4.54000000	0	0	2	0.91629080
1	6.00000050	4.54000000	1	2	0	-0.69314720
1	13.00000000	0.75500000	0	0	0	-0.69314720
1	6.99999950	4.54000000	1	1	2	0.91629080
1	9.00000000	4.54000000	1	0	2	0.91629080
1	4.99999810	4.54000000	0	0	2	0.91629080
1	15.00000100	4.54000000	0	0	6	1.87180220
1	3.00000000	4.54000000	0	0	3	1.25276290
1	13.99999710	4.54000000	0	0	0	-0.69314720
1	1.99999990	1.28000000	1	0	1	0.40546510
1	3.99999900	1.28000000	1	0	4	1.50407740
1	3.99999900	1.28000000	1	0	0	-0.69314720
1	0.00000000	2.50000000	1	1	0	-0.69314720
1	47.00000760	3.84999990	1	2	2	0.91629080
1	29.00000000	3.84999990	1	0	1	0.40546510

1	0.99999990	3.84999990	1	1	5	1.70474800
1	17.99999810	3.84999990	0	0	1	0.40546510
1	13.00000000	2.05000000	0	0	1	0.40546510
1	17.00000000	2.05000000	0	0	1	0.40546510
1	1.99999990	2.05000000	0	0	2	0.91629080
1	3.99999900	1.78000000	1	0	4	1.50407740
1	0.99999990	1.17999990	1	0	1	0.40546510
1	3.00000000	1.52000000	1	0	0	-0.69314720
1	9.00000000	1.48000000	1	0	2	0.91629080
1	12.00000000	4.29000000	0	0	0	-0.69314720
1	17.00000000	4.29000000	0	0	1	0.40546510
1	4.99999810	4.29000000	0	0	3	1.25276290
1	1.99999990	3.08999990	1	0	2	0.91629080
1	0.00000000	3.08999990	0	0	2	0.91629080
1	3.00000000	3.61999990	0	0	5	1.70474800
1	6.99999950	3.61999990	0	0	0	-0.69314720
1	7.99999860	3.61999990	0	0	0	-0.69314720
1	0.00000000	4.29000000	0	0	0	-0.69314720
1	6.00000050	2.60999990	1	1	1	0.40546510
1	6.99999950	2.60999990	1	0	1	0.40546510
1	9.00000000	2.09999990	0	0	0	-0.69314720
1	7.99999860	2.96000000	1	0	2	0.91629080
1	9.99999900	2.39000010	0	0	0	-0.69314720
1	3.00000000	1.95000000	1	0	1	0.40546510
1	13.99999710	3.41000010	0	0	2	0.91629080
1	0.99999990	4.29000000	0	0	2	0.91629080
1	10.99999710	3.58999990	0	0	2	0.91629080
1	9.99999900	4.61999990	0	0	1	0.40546510
1	6.00000050	2.14000010	0	0	1	0.40546510
1	10.99999710	2.85999990	0	0	0	-0.69314720
1	4.99999810	3.47000000	0	0	2	0.91629080
1	13.99999710	4.61999990	1	1	3	1.25276290
1	9.00000000	3.19000010	1	3	1	0.40546510
1	0.99999990	2.51000000	0	0	1	0.40546510
1	0.00000000	2.11999990	0	0	0	-0.69314720
1	3.00000000	3.19000010	0	0	0	-0.69314720
1	3.99999900	1.74000000	1	1	2	0.91629080
1	0.00000000	1.25000000	1	0	0	-0.69314720
1	6.99999950	3.69000010	1	0	0	-0.69314720
1	4.99999810	3.21000000	0	0	0	-0.69314720
1	15.00000100	4.61999990	1	1	0	-0.69314720
1	24.00000190	2.85999990	1	0	5	1.70474800
1	9.00000000	2.39000010	1	1	1	0.40546510
1	0.00000000	1.17999990	1	0	3	1.25276290
1	6.99999950	3.35999990	0	0	2	0.91629080
1	7.99999860	1.97000000	0	0	2	0.91629080
1	22.00000000	1.64000000	1	0	1	0.40546510

```
1   6.99999950   3.92000010  1  0  2   0.91629080
1   6.00000050   3.31999990  0  0  6   1.87180220
1   6.00000050   2.57999990  0  0  5   1.70474800
1  22.99999620   4.54000000  0  0  2   0.91629080
1   1.99999990   2.39000010  1  0  0  -0.69314720
1   9.00000000   3.58999990  0  0  4   1.50407740
1   6.99999950   3.69000010  0  0  2   0.91629080
1   9.99999900   3.19000010  0  0  2   0.91629080
1   3.99999900   2.31999990  0  0  2   0.91629080
1  10.99999710   3.47000000  1  1  2   0.91629080
1   3.99999900   3.69000010  0  0  2   0.91629080
1   4.99999810   2.31999990  1  1  3   1.25276290
1  10.99999710   3.19000010  0  0  1   0.40546510
1  19.00000190   4.54000000  0  0  1   0.40546510
1   3.00000000   3.35999990  1  1  0  -0.69314720
1   4.99999810   2.57999990  1  0  2   0.91629080
1   6.99999950   3.21000000  1  1  2   0.91629080
1   3.00000000   1.40000000  0  0  1   0.40546510
1   9.99999900   2.50000000  0  0  4   1.50407740
1   0.00000000   3.19000010  1  2  0  -0.69314720
1   3.00000000   3.35999990  0  0  0  -0.69314720
1   9.00000000   3.15000010  0  0  6   1.87180220
1   6.99999950   1.45000000  1  0  2   0.91629080
1   6.99999950   2.85999990  1  2  1   0.40546510
1  48.99999240   4.61999990  1  1  3   1.25276290
1   1.99999990   3.69000010  1  0  0  -0.69314720
1  19.00000190   2.96000000  1  0  1   0.40546510
1  12.00000000   3.08999990  1  1  1   0.40546510
1   0.99999990   3.08999990  0  0  0  -0.69314720
1  12.00000000   4.61999990  0  0  2   0.91629080
1  13.00000000   2.85999990  1  0  0  -0.69314720
1   1.99999990   3.21000000  0  0  0  -0.69314720
1   3.00000000   2.82999990  1  0  2   0.91629080
1  22.00000000   4.29000000  0  0  1   0.40546510
1  35.00000760   4.29000000  0  0  0  -0.69314720
1   0.99999990   3.08999990  1  0  2   0.91629080
1   3.99999900   3.69000010  0  0  0  -0.69314720
1   0.99999990   1.79000000  1  0  0  -0.69314720
1   1.99999990   3.35999990  1  1  0  -0.69314720
1  13.99999710   2.57999990  1  0  4   1.50407740
1  24.00000190   3.75000000  0  0  1   0.40546510
1   4.99999810   3.19000010  0  0  2   0.91629080
1   0.99999990   2.09999990  0  0  0  -0.69314720
1   7.99999860   3.58999990  1  1  0  -0.69314720
1   0.99999990   3.92000010  0  0  0  -0.69314720
1  24.00000190   3.31999990  1  1  1   0.40546510
1   1.99999990   2.00000000  0  0  0  -0.69314720
```

1	1.99999990	3.47000000	1	0	0	-0.69314720
1	13.99999710	3.21000000	1	0	4	1.50407740
1	4.99999810	2.05000000	0	0	3	1.25276290
1	0.99999990	2.52000000	0	0	0	-0.69314720
1	6.99999950	3.15000010	1	0	0	-0.69314720
1	38.00000380	1.86000000	1	2	6	1.87180220
1	3.00000000	2.85999990	0	0	2	0.91629080
1	3.99999900	4.29000000	1	1	4	1.50407740
1	0.00000000	1.25500000	1	2	0	-0.69314720
1	19.00000190	3.21000000	1	0	5	1.70474800
1	4.99999810	2.31999990	1	1	1	0.40546510
1	3.00000000	3.19000010	0	0	4	1.50407740
1	1.99999990	3.19000010	1	0	1	0.40546510
1	10.99999710	3.35999990	1	0	3	1.25276290
1	13.99999710	3.54000000	1	1	1	0.40546510
1	6.00000050	1.86000000	1	0	0	-0.69314720
1	13.00000000	1.50500000	0	0	0	-0.69314720
1	6.99999950	2.39000010	1	0	1	0.40546510
1	10.99999710	4.29000000	1	1	2	0.91629080
1	9.00000000	2.00000000	1	1	0	-0.69314720
1	3.99999900	3.92000010	0	0	1	0.40546510
1	6.00000050	4.29000000	1	0	2	0.91629080
1	6.00000050	3.35999990	0	0	1	0.40546510
1	13.99999710	4.61999990	1	0	3	1.25276290
1	6.00000050	2.00000000	0	0	1	0.40546510
1	4.99999810	3.58999990	1	0	2	0.91629080
1	6.00000050	2.86999990	0	0	1	0.40546510
1	3.99999900	2.96000000	0	0	0	-0.69314720
1	10.99999710	3.47000000	1	0	0	-0.69314720
1	7.99999860	3.19000010	1	0	4	1.50407740
1	3.00000000	2.85999990	1	1	0	-0.69314720
1	15.99999810	2.52000000	1	0	2	0.91629080
1	6.00000050	4.29000000	0	0	1	0.40546510
1	0.00000000	1.25500000	0	0	1	0.40546510
1	1.99999990	1.83000000	1	0	0	-0.69314720
1	12.00000000	4.29000000	0	0	3	1.25276290
1	7.99999860	2.96000000	1	0	0	-0.69314720
1	0.99999990	2.31999990	1	0	1	0.40546510
1	10.99999710	1.22000000	1	1	0	-0.69314720
1	10.99999710	4.29000000	1	0	1	0.40546510
1	1.99999990	4.25000000	0	0	1	0.40546510
1	36.00000000	2.55000000	0	0	2	0.91629080
1	10.99999710	1.95000000	1	0	1	0.40546510
1	1.99999990	3.69000010	0	0	0	-0.69314720
1	25.00000000	4.29000000	0	0	1	0.40546510
1	4.99999810	3.19000010	1	0	2	0.91629080
1	12.00000000	3.54000000	1	1	4	1.50407740

1	4.99999810	3.54000000	1	0	4	1.50407740
1	7.99999860	3.54000000	1	1	0	-0.69314720
1	0.99999990	1.86000000	1	1	3	1.25276290
1	3.00000000	4.61999990	0	0	4	1.50407740
1	15.99999810	4.61999990	1	0	1	0.40546510
1	9.99999900	4.61999990	1	0	3	1.25276290
1	13.00000000	4.54000000	1	0	1	0.40546510
1	0.99999990	3.47000000	1	0	0	-0.69314720
1	15.99999810	2.85999990	0	0	0	-0.69314720
1	6.99999950	2.00000000	1	0	0	-0.69314720
1	1.99999990	2.00000000	0	0	0	-0.69314720
1	3.00000000	2.60999990	1	0	0	-0.69314720
1	6.00000050	2.05000000	0	0	0	-0.69314720
1	6.00000050	2.05000000	0	0	0	-0.69314720
1	4.99999810	3.54000000	0	0	0	-0.69314720
1	0.00000000	0.92000000	1	0	2	0.91629080
1	0.00000000	1.79000000	1	0	0	-0.69314720
1	6.00000050	2.00000000	1	0	0	-0.69314720
1	7.99999860	3.15000010	0	0	4	1.50407740
1	15.99999810	2.26000000	1	0	5	1.70474800
1	3.99999900	2.26000000	0	0	1	0.40546510
1	0.99999990	4.29000000	1	0	6	1.87180220
1	21.00000000	4.29000000	1	0	1	0.40546510
1	9.00000000	4.54000000	0	0	1	0.40546510
1	3.00000000	3.35999990	1	1	0	-0.69314720
1	1.99999990	2.52000000	0	0	0	-0.69314720
1	9.99999900	4.29000000	0	0	3	1.25276290
1	9.00000000	4.29000000	0	0	0	-0.69314720
1	12.00000000	4.54000000	0	0	2	0.91629080
1	0.00000000	2.50000000	0	0	0	-0.69314720
1	1.99999990	2.76000000	0	0	1	0.40546510
1	0.00000000	2.55000000	1	1	0	-0.69314720
1	0.00000000	4.61999990	1	0	0	-0.69314720
1	6.00000050	1.63000000	0	0	2	0.91629080
1	3.00000000	3.47000000	1	0	1	0.40546510
1	30.99998860	3.41000010	1	0	2	0.91629080
1	0.99999990	4.29000000	0	0	0	-0.69314720
1	6.99999950	2.96000000	1	0	0	-0.69314720
1	0.00000000	4.61999990	1	0	5	1.70474800
1	12.00000000	3.58999990	1	0	0	-0.69314720
1	12.00000000	3.69000010	1	0	3	1.25276290
1	1.99999990	4.54000000	1	0	1	0.40546510
1	10.99999710	3.33999990	0	0	4	1.50407740
1	1.99999990	2.51000000	1	1	4	1.50407740
1	3.99999900	3.15000010	1	0	3	1.25276290
1	3.00000000	3.19000010	1	0	1	0.40546510
1	17.99999810	3.19000010	0	0	1	0.40546510

1	1.99999990	3.84999990	0	0	1	0.40546510
1	3.99999900	3.33999990	1	1	2	0.91629080
1	15.00000100	4.29000000	0	0	2	0.91629080
1	3.99999900	4.29000000	0	0	2	0.91629080
1	21.00000000	4.29000000	0	0	2	0.91629080
1	3.99999900	4.29000000	1	1	0	-0.69314720
1	0.00000000	2.96000000	1	0	0	-0.69314720
1	0.99999990	1.78000000	1	0	0	-0.69314720
1	17.00000000	3.54000000	1	2	1	0.40546510
1	3.00000000	3.69000010	1	0	0	-0.69314720
1	1.99999990	3.35999990	0	0	3	1.25276290
1	1.99999990	3.54000000	1	0	0	-0.69314720
1	0.99999990	3.54000000	1	1	0	-0.69314720
1	3.00000000	1.22000000	1	1	3	1.25276290
1	3.99999900	3.35999990	0	0	1	0.40546510
1	1.99999990	2.21000000	0	0	1	0.40546510
1	3.99999900	2.25000000	0	0	1	0.40546510
1	17.00000000	4.61999990	1	1	2	0.91629080
1	4.99999810	3.58999990	1	0	1	0.40546510
1	0.99999990	4.29000000	1	0	0	-0.69314720
1	1.99999990	2.11999990	0	0	2	0.91629080
1	3.00000000	2.26000000	0	0	2	0.91629080
1	3.00000000	2.26000000	1	0	4	1.50407740
1	4.99999810	4.29000000	0	0	0	-0.69314720
1	3.00000000	3.58999990	1	1	3	1.25276290
1	13.00000000	4.29000000	1	2	1	0.40546510
1	1.99999990	2.00000000	0	0	1	0.40546510
1	0.00000000	1.97000000	1	2	0	-0.69314720
1	7.99999860	3.92000010	1	0	0	-0.69314720
1	39.00000000	2.85999990	0	0	4	1.50407740
1	26.00000000	2.82999990	0	0	2	0.91629080
1	3.00000000	3.35999990	1	1	3	1.25276290
1	22.99999620	2.55999990	0	0	4	1.50407740
1	7.99999860	1.63000000	0	0	1	0.40546510
1	22.00000000	4.61999990	0	0	3	1.25276290
1	4.99999810	4.61999990	0	0	1	0.40546510
1	21.00000000	4.29000000	1	0	3	1.25276290
1	6.00000050	4.29000000	1	1	0	-0.69314720
1	3.99999900	4.29000000	1	1	2	0.91629080
1	24.00000190	4.29000000	1	0	6	1.87180220
1	6.00000050	4.29000000	1	0	1	0.40546510
1	33.99999240	3.35999990	0	0	1	0.40546510
1	0.00000000	3.21000000	0	0	2	0.91629080
1	9.99999900	2.00000000	0	0	1	0.40546510
1	1.99999990	3.21000000	1	2	2	0.91629080
1	3.00000000	2.57999990	1	2	2	0.91629080
1	3.00000000	2.57999990	1	0	0	-0.69314720

```
1   0.99999990   2.82999990  0  0  0  -0.69314720
1   6.00000050   3.19000010  0  0  1   0.40546510
1   3.00000000   3.47000000  0  0  1   0.40546510
1  22.99999620   4.61999990  1  0  2   0.91629080
1  13.00000000   4.25000000  1  0  4   1.50407740
1   4.99999810   1.86000000  1  0  2   0.91629080
1   9.00000000   4.29000000  1  1  0  -0.69314720
1   9.00000000   3.35999990  0  0  0  -0.69314720
1   9.99999900   1.80000000  1  0  2   0.91629080
1   0.00000000   1.65500000  0  0  1   0.40546510
1   6.00000050   2.85999990  0  0  0  -0.69314720
1  13.99999710   4.61999990  0  0  2   0.91629080
1   3.00000000   4.29000000  0  0  0  -0.69314720
1   4.99999810   2.35999990  1  0  4   1.50407740
1  10.99999710   1.80999990  1  0  1   0.40546510
1  32.00001140   3.58999990  1  0  1   0.40546510
1   9.99999900   1.76000000  0  0  0  -0.69314720
1   4.99999810   2.00000000  1  0  1   0.40546510
1  13.99999710   3.58999990  0  0  5   1.70474800
1   6.00000050   2.26000000  1  0  3   1.25276290
1   3.99999900   2.26000000  0  0  1   0.40546510
1   3.99999900   1.76000000  1  1  1   0.40546510
1   0.99999990   3.58999990  1  0  1   0.40546510
1   0.99999990   3.58999990  1  0  0  -0.69314720
1   4.99999810   2.82999990  1  1  1   0.40546510
1   1.99999990   2.57999990  0  0  1   0.40546510
1  17.99999810   4.61999990  1  0  1   0.40546510
1  15.00000100   2.31999990  0  0  1   0.40546510
1   0.00000000   2.39000010  1  0  0  -0.69314720
1  22.00000000   2.96000000  1  0  3   1.25276290
1  10.99999710   2.11999990  0  0  0  -0.69314720
1  17.99999810   4.61999990  1  0  1   0.40546510
1   3.00000000   2.25000000  1  0  1   0.40546510
1   7.99999860   1.76000000  1  0  1   0.40546510
1  12.00000000   4.54000000  0  0  6   1.87180220
1   9.99999900   3.69000010  1  1  2   0.91629080
1   1.99999990   1.25000000  0  0  0  -0.69314720
1   4.99999810   1.25000000  1  0  1   0.40546510
1   3.99999900   3.19000010  1  0  0  -0.69314720
1   0.00000000   2.57999990  1  2  0  -0.69314720
1   6.99999950   2.00000000  1  1  2   0.91629080
1   0.99999990   2.76000000  0  0  0  -0.69314720
1   3.99999900   2.54000000  0  0  2   0.91629080
1   0.00000000   3.19000010  0  0  0  -0.69314720
1   9.00000000   3.08999990  1  2  1   0.40546510
1   3.99999900   3.19000010  0  0  2   0.91629080
1   0.00000000   3.08999990  0  0  0  -0.69314720
```

```
1   7.99999860   2.26000000  0  0  2   0.91629080
1   9.00000000   2.26000000  1  1  1   0.40546510
1   7.99999860   3.35999990  1  0  2   0.91629080
1   9.00000000   3.15000010  1  0  1   0.40546510
1   3.99999900   4.54000000  1  0  0  -0.69314720
1   0.00000000   3.58999990  1  0  2   0.91629080
1   3.00000000   3.47000000  1  0  1   0.40546510
1   1.99999990   2.85999990  1  1  1   0.40546510
1   6.00000050   2.26000000  1  0  0  -0.69314720
1   3.99999900   3.47000000  1  1  2   0.91629080
1   0.00000000   2.76000000  1  0  0  -0.69314720
1   1.99999990   3.58999990  1  2  0  -0.69314720
1  13.00000000   3.75000000  0  0  5   1.70474800
1   1.99999990   2.57999990  1  2  1   0.40546510
1   1.99999990   3.58999990  1  1  2   0.91629080
1  15.99999810   1.89000000  1  2  3   1.25276290
1   9.00000000   3.15000010  0  0  7   2.01490310
1  12.00000000   2.86999990  0  0  5   1.70474800
1   0.99999990   2.11999990  1  2  0  -0.69314720
1   3.99999900   4.61999990  1  0  1   0.40546510
1   0.00000000   2.39000010  0  0  0  -0.69314720
1  10.99999710   2.11999990  0  0  0  -0.69314720
1   4.99999810   1.80999990  1  0  0  -0.69314720
1   7.99999860   2.31999990  0  0  4   1.50407740
1  15.00000100   2.39000010  0  0  0  -0.69314720
1   6.00000050   3.75000000  1  0  3   1.25276290
1   0.00000000   2.00000000  0  0  0  -0.69314720
1  13.99999710   3.58999990  1  1  0  -0.69314720
1   4.99999810   4.29000000  0  0  2   0.91629080
1   0.00000000   2.57999990  1  0  0  -0.69314720
1   4.99999810   4.61999990  1  0  0  -0.69314720
1   3.00000000   1.50500000  0  0  0  -0.69314720
1   3.99999900   3.75000000  1  0  2   0.91629080
1   3.99999900   3.75000000  1  2  0  -0.69314720
1   0.00000000   1.75000000  1  0  1   0.40546510
1   0.00000000   2.11999990  1  0  1   0.40546510
1   4.99999810   3.75000000  0  0  2   0.91629080
1   0.00000000   0.75500000  0  0  0  -0.69314720
1   6.99999950   2.25000000  0  0  1   0.40546510
1   3.00000000   3.19000010  0  0  1   0.40546510
;
```

The output data set (LONG97DATA) is saved in your Work library.

MROZ Data Set

To create the Mroz data set, enter this code into a **Program** tab:

```
data mroz;
   input inlf nwifeinc educ exper expersq age kidslt6 kidsge6 lwage;
datalines;
1 10.91006    12 14  196   32  1   0   1.210154
1 19.49998    12 5   25    30  0   2   0.3285121
1 12.03991    12 15  225   35  1   3   1.514138
1 6.799996    12 6   36    34  0   3   0.0921233
1 20.10006    14 7   49    31  1   2   1.524272
1 9.859054    12 33  1089  54  0   0   1.55648
1 9.152048    16 11  121   37  0   2   2.12026
1 10.90004    12 35  1225  54  0   0   2.059634
1 17.305      12 24  576   48  0   2   0.7543364
1 12.925      12 21  441   39  0   2   1.544899
1 24.29995    12 15  225   33  0   1   1.401922
1 19.70007    11 14  196   42  0   1   1.524272
1 15.00001    12 0   0     30  1   2   0.7339532
1 14.6        12 14  196   43  0   2   0.8183691
1 24.63091    10 6   36    43  0   1   1.302831
1 17.53103    11 9   81    35  0   3   0.2980284
1 14.09998    12 20  400   43  0   2   1.16761
1 15.839      12 6   36    39  0   5   1.643839
1 14.1        12 23  529   45  0   0   0.6931472
1 10.29996    12 9   81    35  0   4   2.021932
1 22.65498    16 5   25    42  0   2   1.254248
1 8.090048    12 11  121   30  0   0   1.272958
1 17.479      13 18  324   48  0   0   1.178655
1 9.56        12 15  225   45  0   0   1.178655
1 8.274953    12 4   16    31  1   1   0.7675587
1 27.34999    17 21  441   43  0   2   1.331812
1 16          12 31  961   59  0   0   1.386294
1 16.99998    12 9   81    32  0   3   1.55327
1 15.10006    17 7   49    31  1   0   1.981815
1 15.69998    12 7   49    42  0   0   1.76936
1 5.11896     11 32  1024  50  0   0   0.4308079
1 16.75001    16 11  121   59  0   0   0.8997548
1 13.59993    13 16  256   36  0   2   1.76663
1 17.10005    12 14  196   51  0   1   1.272958
1 16.73405    16 27  729   45  0   3   1.336789
1 14.19698    11 0   0     42  0   1   0.9017048
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1	14.59408	14	24	576	51	0	0	1.726029
1	17.50044	17	11	121	30	0	0	2.683142
1	15.51	12	1	1	30	1	2	0.9852943
1	21.99998	12	14	196	57	0	0	1.365939
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1	6.352	12	6	36	30	0	2	0.9698315
1	27.31395	12	12	144	46	0	1	0.8285082
1	14.5	12	32	1024	58	0	0	0.0943096
1	16.25799	12	15	225	37	0	8	0.1625439
1	9.5	8	17	289	52	0	0	0.4700036
1	7.999956	10	34	1156	52	0	0	0.6292484
1	12.50003	16	9	81	31	0	0	1.39716
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1	19.38511	14	35	1225	55	0	0	1.525839
1	12.38699	12	6	36	39	0	2	0.7621601
1	28.5	14	19	361	40	0	3	1.481605
1	15.04991	12	10	100	43	0	4	1.262826
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1	12.08501	6	22	484	50	0	0	-0.1505904
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1	10.50008	13	36	1296	59	0	0	1.129853
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1	10.87702	12	2	4	37	0	1	0.4282046
1	25.61206	12	14	196	36	0	1	1.058415
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1	26.15	12	6	36	39	0	2	0.7827594
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1	13.19997	12	11	121	35	0	3	1.021659
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1	12	12	15	225	32	0	2	0.9555114
1	16.97992	12	13	169	45	0	0	1.316247
1	17.9	12	6	36	40	0	2	1.475906
1	15.53994	12	20	400	38	0	1	1.491397
1	9.883986	12	17	289	49	0	4	1.45575
1	28.59995	16	8	64	47	0	1	0.5108456
1	17.66001	13	13	169	52	0	0	1.180438
1	25.99992	13	15	225	34	0	1	1.688489
1	13.60201	12	14	196	44	0	2	0.7907275
1	15.8	16	14	196	36	0	3	1.401799
1	41.09999	17	6	36	50	0	0	-0.433556
1	10.77504	12	24	576	45	0	0	1.683172
1	9.000047	14	10	100	44	0	2	-1.766677
1	24.39899	12	2	4	57	0	2	3.155595
1	37.30009	17	9	81	35	0	0	2.259521
1	27.99995	12	23	529	46	0	0	1.306926
1	13.7	14	12	144	30	2	1	0.7984977
1	17.20994	12	8	64	42	0	3	0.5590442
1	14.00001	12	16	256	34	0	1	0.1479026
1	35.75502	17	10	100	45	0	2	1.944495
1	23.5	16	7	49	35	1	2	1.378338
1	31.99993	16	19	361	40	0	0	3.064745
1	17.15	12	2	4	32	0	1	-0.7419173
1	20.25002	9	9	81	54	0	0	0.7657004
1	5.485985	12	14	196	38	0	3	0.619393
1	25.07504	12	9	81	43	0	3	1.465452
1	18.21995	16	16	256	54	0	0	2.18926
1	26	14	7	49	39	0	3	1.021659
1	34.50007	12	6	36	37	0	1	0.9770095
1	12.4	12	22	484	46	0	2	0.9162908

1	10.78685	11	9	81	56	0	0	2.905096
1	16.32301	12	9	81	41	0	3	-0.1996712
1	30.5	16	14	196	45	0	1	0.6931472
1	51.29963	17	17	289	44	0	1	2.733393
1	33.04997	17	12	144	50	0	1	1.868335
1	34.75001	14	13	169	37	0	5	2.12026
1	16.40004	12	8	64	44	0	1	1.515193
1	19.70007	14	10	100	32	0	2	0.9146093
1	6.600003	12	16	256	34	1	1	1.499556
1	9.020008	10	1	1	32	0	2	0.8030772
1	10.40001	12	6	36	37	0	3	0.7280316
1	14.51999	13	4	16	44	0	1	0.51641
1	17.2	16	8	64	34	0	2	1.226448
1	43	12	4	16	33	1	3	0.9162908
1	13.87196	7	15	225	43	0	3	1.376471
1	-0.0290575	16	7	49	35	0	2	1.828975
1	16.76994	14	14	196	43	0	1	1.368283
1	7.8	12	16	256	34	0	0	1.064711
1	14.50006	10	15	225	36	0	3	1.406489
1	7.9	12	23	529	41	0	2	1.047319
1	79.80001	16	19	361	41	0	0	1.948093
1	7.17597	10	4	16	35	0	3	1.078001
1	17.50698	12	12	144	32	1	3	0.6539385
1	20.6	14	12	144	30	0	0	1.927892
1	18.55992	12	25	625	43	0	0	1.361028
1	9.3	6	14	196	54	0	0	0.6931472
1	5.120008	15	14	196	35	0	2	1.604687
1	14.50004	12	11	121	50	0	0	0.1839036
1	19.8	17	7	49	34	1	1	3.113515
1	18.29995	14	18	324	52	0	0	1.926829
1	33.99994	13	4	16	35	0	3	1.270126
1	11.62794	6	37	1369	55	0	0	0.6826927
1	11.80005	16	13	169	35	0	0	1.68107
1	39.09998	14	14	196	49	0	1	0.556296
1	18.43007	15	17	289	38	2	2	1.62822
1	21	14	5	25	42	0	2	0.9162908
1	59	8	2	4	48	0	1	1.341558
1	25.3	14	0	0	51	0	0	0
1	23.24899	12	3	9	43	0	2	1.122231
1	24.92809	12	21	441	43	0	1	0.5401708
1	14.78199	12	20	400	38	0	1	1.391506
1	18.90003	12	19	361	44	0	1	1.697174
1	21	12	4	16	36	1	3	3.218876
1	10.00001	12	19	361	38	0	0	0.8711678
1	29.30997	8	11	121	47	0	0	1.16733
1	13.14003	12	14	196	34	0	2	1.216988
1	25.08999	17	8	64	40	1	2	0.5753766

1	14.59993	12	13	169	31	0	1	1.151616
1	1.200001	12	24	576	46	0	0	0.9942513
1	32	14	1	1	36	0	3	0.5263249
1	16.11997	13	1	1	39	1	2	-1.543182
1	26.50002	17	3	9	36	0	2	1.912043
1	12.75006	8	4	16	37	0	4	0.5542873
1	12.9	12	21	441	39	0	4	0.9162908
1	10.69998	11	10	100	36	1	3	1.500939
1	14.43403	12	13	169	49	0	2	0.9446838
1	23.709	12	9	81	45	1	1	1.241269
1	15.1	17	14	196	32	2	0	1.564984
1	18.19998	10	2	4	36	0	5	0.8380265
1	22.64106	12	21	441	40	0	1	1.668857
1	21.64008	13	22	484	43	0	2	1.769429
1	23.99998	12	14	196	33	0	1	1.226448
1	16.00002	12	7	49	30	0	1	1.406489
0	21.025	12	2	4	49	0	1	.
0	23.6	16	5	25	30	2	0	.
0	22.8	12	12	144	30	1	0	.
0	35.91	12	1	1	41	0	4	.
0	21.7	12	12	144	45	0	1	.
0	21.823	12	4	16	43	0	5	.
0	31	13	9	81	42	0	1	.
0	15.3	12	9	81	60	0	0	.
0	12.925	12	6	36	57	0	0	.
0	15.83	10	5	25	38	0	2	.
0	30.2	12	5	25	56	0	0	.
0	16.6	12	8	64	32	0	3	.
0	11	7	2	4	49	0	1	.
0	15	12	6	36	55	0	0	.
0	20.528	9	0	0	36	1	1	.
0	13.126	12	3	9	44	0	3	.
0	15.55	10	7	49	44	0	1	.
0	18.01	14	3	9	35	1	2	.
0	18.874	14	10	100	44	2	3	.
0	24.8	12	3	9	45	0	1	.
0	17.5	12	2	4	34	1	0	.
0	16.15	17	12	144	30	2	0	.
0	15.189	8	15	225	39	0	1	.
0	6	12	5	25	36	0	2	.
0	37.25	17	4	16	38	0	2	.
0	27.76	12	10	100	53	0	0	.
0	9.09	12	1	1	36	0	2	.
0	14.5	12	8	64	32	1	1	.
0	19.7	9	20	400	51	0	3	.
0	16.788	11	4	16	38	0	0	.
0	18.52	12	7	49	33	2	0	.

0	20.95	12	10	100	54	0	0	.
0	7.574	9	3	9	38	0	3	.
0	10.027	11	5	25	30	2	2	.
0	5	12	10	100	34	2	3	.
0	7.04	9	0	0	34	0	1	.
0	40.8	12	3	9	50	0	2	.
0	16.05	17	10	100	30	2	0	.
0	33.1	12	2	4	38	0	2	.
0	33.856	14	10	100	54	0	0	.
0	20.5	12	4	16	30	1	2	.
0	28.6	12	0	0	55	0	0	.
0	18.75	10	10	100	51	0	1	.
0	20.3	12	5	25	44	0	1	.
0	13.42	12	0	0	53	0	0	.
0	18.4	10	0	0	42	0	2	.
0	16.682	12	19	361	38	0	2	.
0	32.685	13	2	4	38	1	3	.
0	7.05	12	12	144	41	1	4	.
0	10.867	8	5	25	35	0	3	.
0	18.22	12	5	25	33	1	2	.
0	26.613	13	5	25	48	0	0	.
0	25	12	10	100	47	0	0	.
0	15.7	12	0	0	34	0	5	.
0	40.25	13	4	16	33	2	1	.
0	73.6	13	3	9	31	3	1	.
0	10.592	8	2	4	58	0	0	.
0	8	12	1	1	49	0	0	.
0	13.4	8	0	0	55	0	1	.
0	23.7	14	1	1	44	0	0	.
0	18.9	9	1	1	44	0	0	.
0	48.3	16	6	36	36	0	3	.
0	24.47	12	12	144	38	0	3	.
0	28.63	16	6	36	37	0	3	.
0	25.32	12	9	81	47	0	0	.
0	13.53	12	14	196	47	0	3	.
0	14.8	12	13	169	32	1	1	.
0	17.4	12	8	64	43	1	2	.
0	15.98	11	0	0	42	1	4	.
0	16.576	12	1	1	56	0	0	.
0	21.85	13	3	9	38	0	5	.
0	14.6	12	13	169	52	0	2	.
0	21.6	12	3	9	50	0	0	.
0	24	16	8	64	33	0	0	.
0	20.883	16	8	64	44	0	2	.
0	19.5	12	18	324	41	0	1	.
0	42.8	12	2	4	45	0	1	.
0	41.5	14	3	9	53	0	0	.

0	18.965	14	5	25	53	0	0	.
0	16.1	12	2	4	42	0	1	.
0	14.7	13	10	100	32	2	0	.
0	18.8	12	30	900	56	0	0	.
0	14.75	11	1	1	37	1	3	.
0	21	12	5	25	40	1	2	.
0	35.4	15	8	64	54	0	3	.
0	10.7	7	0	0	53	0	0	.
0	24.5	12	4	16	48	0	1	.
0	17.045	12	2	4	36	1	2	.
0	18.8	12	30	900	57	0	0	.
0	14	12	25	625	51	0	0	.
0	18.214	13	3	9	33	0	4	.
0	20.177	12	20	400	52	0	0	.
0	8.3	10	20	400	56	0	0	.
0	14.2	12	0	0	36	1	2	.
0	21.768	14	15	225	36	1	0	.
0	29.553	12	10	100	46	0	1	.
0	4.35	10	4	16	31	0	3	.
0	24	11	3	9	52	0	0	.
0	18.3	12	10	100	46	0	2	.
0	17.2	12	9	81	35	2	0	.
0	16.476	12	7	49	59	0	0	.
0	13.4	8	12	144	36	0	1	.
0	44.988	7	0	0	51	1	3	.
0	18.2	16	16	256	31	1	0	.
0	28	14	4	16	31	0	2	.
0	11.55	12	7	49	32	1	1	.
0	28.45	16	7	49	35	1	2	.
0	15.096	12	14	196	40	0	3	.
0	8.009	10	2	4	33	1	2	.
0	10.04	7	20	400	54	0	0	.
0	16.7	12	5	25	36	1	1	.
0	8.4	10	10	100	50	0	1	.
0	13	8	20	400	54	0	0	.
0	17.97	11	10	100	48	0	1	.
0	18.45	15	8	64	41	0	4	.
0	31	12	11	121	50	0	4	.
0	24.135	12	3	9	46	0	2	.
0	31.7	13	6	36	42	0	1	.
0	10.19	9	4	16	31	1	2	.
0	21.574	12	4	16	53	0	0	.
0	26.68	12	9	81	51	0	1	.
0	17.7	12	10	100	47	0	1	.
0	29.4	12	3	9	50	0	1	.
0	22.159	6	2	4	37	0	1	.
0	35	12	2	4	30	2	2	.

0	8.63	12	0	0	49	0	0	.
0	17.08	12	8	64	52	0	2	.
0	32.5	12	6	36	47	0	2	.
0	16	12	15	225	49	0	0	.
0	18.85	12	15	225	44	0	4	.
0	17.5	8	9	81	53	0	0	.
0	19.392	12	8	64	30	1	0	.
0	14.45	12	18	324	54	0	2	.
0	21.8	7	3	9	47	1	1	.
0	7.7	15	10	100	56	0	0	.
0	31.8	12	6	36	49	0	1	.
0	17.258	6	20	400	48	0	0	.
0	13.399	12	8	64	49	0	1	.
0	16.073	12	3	9	56	0	1	.
0	23.26	12	4	16	46	0	0	.
0	37.3	12	13	169	45	0	2	.
0	11	12	4	16	32	0	2	.
0	13.075	12	17	289	43	1	1	.
0	13.7	12	4	16	34	1	1	.
0	25.1	12	0	0	30	1	1	.
0	18.6	17	15	225	38	2	0	.
0	29	16	11	121	33	1	1	.
0	19.237	12	23	529	52	0	0	.
0	19.855	11	1	1	43	0	3	.
0	9.45	12	5	25	33	1	1	.
0	30	10	1	1	45	0	0	.
0	15	10	5	25	36	2	1	.
0	24.701	12	3	9	34	1	1	.
0	15.9	14	3	9	37	0	2	.
0	16.24	10	19	361	46	0	1	.
0	21.1	12	20	400	47	0	0	.
0	23	16	5	25	31	2	1	.
0	6.34	5	0	0	57	0	0	.
0	42.25	12	3	9	30	1	1	.
0	14.694	12	3	9	30	0	0	.
0	21.417	12	7	49	44	0	3	.
0	20.2	13	7	49	53	0	0	.
0	12.09	8	1	1	51	0	0	.
0	24.76	12	13	169	39	1	3	.
0	23	8	0	0	52	0	0	.
0	19.365	8	0	0	46	0	4	.
0	5.55	12	12	144	47	0	5	.
0	68.035	8	0	0	52	0	2	.
0	29.3	12	5	25	45	0	2	.
0	18.5	11	45	2025	60	0	0	.
0	22.582	13	10	100	41	0	2	.
0	21.5	8	2	4	39	0	3	.

0	28.07	12	3	9	49	0	1	.
0	50.3	15	1	1	32	1	1	.
0	23.5	12	5	25	33	1	3	.
0	15.5	10	10	100	36	0	4	.
0	13.44	13	4	16	37	3	3	.
0	8.1	12	7	49	30	1	2	.
0	9.8	11	9	81	44	1	1	.
0	20.3	12	5	25	48	0	1	.
0	15	11	4	16	40	0	4	.
0	56.1	13	11	121	47	0	0	.
0	22.846	12	9	81	36	0	2	.
0	22.225	11	4	16	40	0	2	.
0	17.635	12	2	4	46	0	1	.
0	18.5	12	23	529	52	0	0	.
0	13.39	12	3	9	44	0	1	.
0	15.15	10	15	225	45	0	1	.
0	16.2	7	8	64	30	2	1	.
0	33.92	12	3	9	40	1	3	.
0	14	12	25	625	43	0	1	.
0	16.736	12	2	4	49	0	2	.
0	30.65	12	0	0	46	1	4	.
0	12.4	11	19	361	52	0	0	.
0	19.022	12	3	9	31	1	1	.
0	11.203	10	7	49	42	1	1	.
0	19.876	11	1	1	33	0	3	.
0	57	16	9	81	57	0	0	.
0	18.29	10	3	9	49	0	0	.
0	20.22	14	8	64	45	0	1	.
0	22.15	11	0	0	56	0	0	.
0	30.623	12	5	25	41	1	3	.
0	9.38	5	20	400	56	0	0	.
0	22	10	3	9	48	0	1	.
0	23.675	16	12	144	52	0	2	.
0	33.671	12	5	25	51	0	0	.
0	12.367	11	1	1	35	0	3	.
0	21.95	12	0	0	45	0	0	.
0	32	12	7	49	54	0	0	.
0	22.61	12	13	169	54	0	2	.
0	12.092	12	3	9	31	1	0	.
0	3.777	6	0	0	53	0	3	.
0	36	14	2	4	35	2	2	.
0	26.9	12	0	0	36	1	3	.
0	32.242	12	2	4	59	0	0	.
0	35.02	16	1	1	54	0	0	.
0	37.6	12	10	100	37	1	1	.
0	1.5	12	10	100	44	0	0	.
0	96	17	1	1	34	1	2	.

0	18.15	12	3	9	49	0	0	.
0	15.5	12	32	1024	49	0	0	.
0	14	9	0	0	60	0	0	.
0	14.756	12	7	49	51	0	0	.
0	22	12	5	25	30	1	1	.
0	24.466	12	2	4	47	0	2	.
0	24.4	12	5	25	36	0	4	.
0	24	12	3	9	35	1	3	.
0	15.5	12	25	625	58	0	0	.
0	30.8	14	0	0	41	1	3	.
0	10.66	10	3	9	51	0	1	.
0	13.35	12	10	100	47	0	0	.
0	10.09	9	10	100	45	1	2	.
0	55.6	14	7	49	60	0	0	.
0	25.7	16	5	25	30	1	1	.
0	29	11	15	225	55	0	0	.
0	7.286	12	1	1	32	1	2	.
0	37.752	12	5	25	36	0	2	.
0	13.072	12	9	81	55	0	0	.
0	7.044	12	18	324	47	0	0	.
0	18.2	12	1	1	47	0	1	.
0	27	11	0	0	37	0	1	.
0	30.3	12	6	36	50	0	2	.
0	12	12	1	1	30	0	3	.
0	31.5	17	2	4	48	0	1	.
0	27.092	10	15	225	43	0	2	.
0	20.968	11	25	625	48	1	0	.
0	27	14	1	1	41	1	2	.
0	11.225	12	0	0	50	0	0	.
0	37.7	8	0	0	58	0	0	.
0	28.2	13	0	0	38	0	5	.
0	34	12	8	64	37	0	1	.
0	63.2	16	22	484	50	0	0	.
0	7.5	8	5	25	42	0	4	.
0	17.41	9	10	100	37	1	3	.
0	51	16	1	1	41	0	2	.
0	12.916	12	1	1	31	0	2	.
0	21.9	12	6	36	51	0	0	.
0	17.64	12	4	16	36	1	2	.
0	20	15	6	36	54	0	0	.
0	15	12	0	0	49	0	0	.
0	14.06	9	1	1	48	1	1	.
0	15.825	9	3	9	42	0	2	.
0	16.51	12	15	225	41	1	2	.
0	13	16	33	1089	55	0	0	.
0	10	9	2	4	42	0	0	.
0	22	15	1	1	32	0	1	.

0	29.8	12	10	100	43	0	2	.
0	15	12	0	0	33	1	3	.
0	22.3	15	14	196	48	0	1	.
0	14.55	12	15	225	43	0	2	.
0	19.73	17	15	225	47	1	3	.
0	35	12	10	100	54	0	0	.
0	21.014	12	6	36	51	0	1	.
0	10.876	10	18	324	51	0	1	.
0	27.85	13	15	225	43	1	1	.
0	9.56	12	30	900	53	0	0	.
0	30.3	11	15	225	34	1	1	.
0	7.72	8	10	100	31	1	1	.
0	10.55	12	0	0	56	0	0	.
0	24.106	16	0	0	42	0	1	.
0	22.995	12	4	16	32	0	2	.
0	6	12	0	0	35	1	3	.
0	24.35	12	3	9	30	1	1	.
0	7.608	10	20	400	51	0	0	.
0	28.2	12	3	9	47	0	3	.
0	16.15	12	1	1	54	0	1	.
0	51.2	15	5	25	31	3	0	.
0	12.646	10	7	49	47	0	0	.
0	19	14	6	36	47	0	3	.
0	19	12	2	4	40	0	3	.
0	14.4	8	0	0	48	0	0	.
0	7.232	8	10	100	34	0	7	.
0	21.943	12	6	36	38	0	3	.
0	47.5	12	4	16	32	1	3	.
0	28.9	16	8	64	48	0	1	.
0	12.4	12	18	324	41	0	2	.
0	6.531	5	7	49	49	0	2	.
0	22.422	8	15	225	59	0	0	.
0	22.2	13	7	49	58	0	0	.
0	77	12	8	64	41	0	3	.
0	88	12	8	64	45	0	2	.
0	26.04	14	3	9	30	1	1	.
0	63.5	12	10	100	41	0	1	.
0	12.1	12	9	81	30	2	0	.
0	17.505	12	24	576	53	0	1	.
0	18	12	12	144	31	0	0	.
0	28.069	14	2	4	43	0	2	.
0	14	12	6	36	31	1	1	.
0	8.117	12	18	324	51	0	0	.
0	11.895	9	17	289	43	0	0	.
0	45.25	14	7	49	31	1	2	.
0	31.106	11	6	36	48	0	0	.
0	4	12	10	100	31	1	1	.

```
0 40.5       12 5    25    44  0   1   .
0 21.62      11 7    49    48  0   1   .
0 23.426     12 11   121   53  0   1   .
0 26         10 14   196   42  0   3   .
0 7.84       12 5    25    39  2   6   .
0 6.8        10 2    4     32  1   2   .
0 5.33       12 4    16    36  0   2   .
0 28.2       13 5    25    40  0   2   .
0 10         12 14   196   31  2   3   .
0 9.952      12 4    16    43  0   0   .
0 24.984     12 15   225   60  0   0   .
0 28.363     9  12   144   39  0   3   .
;
```

The output data set (MROZ) is saved in your Work library.

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