Using SPSS

for Windows and Macintosh

Analyzing and Understanding the Data

EIGHTH EDITION

SAMUEL B. GREEN · NEIL J. SALKIND

Pearson

Using SPSS for Windows and Macintosh

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Samuel B. Green
Arizona State University

Neil J. Salkind
University of Kansas

330 Hudson Street, NY NY 10013

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Printer/Binder: Courier Kendallville
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Library of Congress Cataloging-in-Publication Data

Names: Green, Samuel B., author. | Salkind, Neil J., author.
Title: Using SPSS for Windows and Macintosh: analyzing and understanding data/Samuel B. Green, Arizona State University, Neil J. Salkind, University of Kansas.
Description: Eighth Edition. | Hoboken: Pearson, 2016. | Revised edition of the authors' Using SPSS for Windows and Macintosh, 2014.
Identifiers: LCCN 2016014344 | ISBN 9780134319889 | ISBN 0134319885
Subjects: LCSH: SPSS (Computer file) | Social sciences—Statistical methods—Computer programs.
Classification: LCC HA32 .G737 2016 | DDC 005.5/5—dc23
LC record available at https://lccn.loc.gov/2016014344

10 9 8 7 6 5 4 3 2 1

ISBN-13: 978-0-13-431988-9
ISBN-10: 0-13-431988-5

This book is dedicated to our parents and to our children.

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Preface

It's our pleasure to be part of the eighth edition of *Using SPSS for Windows and Macintosh: Analyzing and Understanding Data*. Our objective has been to make each revision of our book more accessible and readable, so that readers can properly conduct statistical analyses with SPSS and make appropriate interpretations of the obtained results.

The development of easy-to-use statistical software like SPSS has changed the way statistics is being taught and learned. No longer do students have to learn a system of elaborate code to conduct simple or complex analyses. Instead, students simply enter their data into the easy-to-use Data Editor. They can then select items from a drop-down menu to make appropriate transformations of variables, click options from another menu to create graphs of distributions of variables, select among various statistical analyses by clicking on appropriate options, and more. With a minimal amount of time and effort, the output is displayed, showing the results.

Researchers also have benefited from applications like SPSS. They do not have to spend time reacquainting themselves with the ins and outs of a statistical software package or learning new programs for conducting analyses that take hours to master. They also do not have to teach assistants how to write code to produce analyses, or examine and reexamine code that has produced error messages that do not really indicate what is wrong. Everyone can just point and click. More sophisticated users can use the syntax features.

In general, programs like SPSS have made life easier for students who are learning statistics, for teachers who are teaching statistics, and for researchers who are applying statistics. Nevertheless, many users of these programs find "doing statistics" an arduous, unenjoyable task. They still are faced with many potential obstacles, and they feel overwhelmed and stressed rather than challenged and excited about the potential for mastering these important skills.

What are some of the obstacles that students, in particular, face when they are trying to conduct statistical analyses with SPSS?

- *Obstacle 1:* Although SPSS is easy to use, many students and first-time users find it very complex. They have to learn how to input data into the Data Editor, save and retrieve data, make transformations to data, conduct analyses, manipulate output, create graphs, edit graphs, and so on.
- *Obstacle 2:* Students can feel helpless. Although they know how to point and click, they are frequently confronted with new dialog boxes with many decisions to make. Their instructor does not have the time to talk about each of the options, so students feel as if they are making uninformed decisions.
- *Obstacle 3:* The amount of output and numbers produced by any statistical procedure is enough to cower most researchers if they are forced to explain their meaning. How can students who are taking statistics for the first time feel confident about interpreting output from an SPSS procedure? In trying to understand output, they are likely to face language problems. For example, "What is a significant F value? Is it the same as the *p* value that the instructor is talking about? No, it couldn't be, or she or he would have told us."

Researchers, graduate students, and more advanced undergraduate students are going to face additional obstacles.

- *Obstacle 4:* Users can think of a number of different ways to analyze their data, but they are unsure about which way would yield the most understanding of their results and not violate the assumptions underlying the analyses.
- *Obstacle 5:* Even if users make all good decisions about statistical approaches and understand the output, they still must write a Results section that conforms to the American Psychological Association (APA) format.

Using SPSS for Windows and Macintosh: Analyzing and Understanding Data for Version 23 of SPSS helps readers overcome all of the obstacles discussed earlier.

The book is divided into 10 units, which are as follows:

Units 1 to 4 guide students through the most basic of SPSS techniques and use a step-by-step description to master such techniques.

Unit 1, "Getting Started with SPSS," shows the student how to get started using SPSS, including a survey of the main menus, a description of how to use SPSS Help, and a brief tour of what SPSS can do.

Unit 2, "Creating and Working with Data Files," goes through the steps of defining variables, showing how data are entered and edited, how to use the Data Editor and the data view screens, how to print SPSS data files, and how to import and export information to and from SPSS.

Unit 3, "Working with Data," describes how to find and replace data, recode and compute values, sort data, and merge and split files.

Unit 4, "Working with SPSS Graphs and Output for Windows," teaches the student how to create and enhance SPSS charts as well as how to work with SPSS output including pivot tables. SPSS Windows (version 23)

and Macintosh (version 23) differ in the way that graphics are created and edited, and, thus, there is a separate section covering each—Lesson 16A for Windows and Lesson 16B for the Macintosh. SPSS is becoming increasingly cross-platform, and if you know the Windows version, you can easily adapt to the Macintosh version (and vice versa).

Each unit from 5 through 10 presents a set of statistical techniques and a step-by-step description of how to conduct the statistical analyses. This is not, however, a "cookbook" format. We provide extensive substantive information about each statistical technique, including a brief discussion of the statistical technique under consideration, examples of how the statistic is applied, the assumptions underlying the statistic, a description of the effect size for the statistic, a sample data set that can be analyzed with the statistic, the research question associated with the data set, step-by-step instructions for how to complete the analysis using the sample data set, a discussion of the results of the analysis, a visual display of the results using SPSS graphic options, a Results section describing the results in APA format, alternative analytical techniques (when available), and practice exercises.

Unit 5, "Creating Variables and Computing Descriptive Statistics," shows how to create new variables from existing ones and discusses the basic procedures for describing qualitative and quantitative variables.

Unit 6, "*t* Test Procedures," focuses on comparing means and shows how to use a variety of techniques, including independent and dependent *t* tests and the one-sample *t* test.

Unit 7, "Univariate and Multivariate Analysis-of-Variance Techniques," focuses on the family of analysis-of-variance techniques, including one-way and two-way analyses of variance, analysis of covariance, and multivariate analysis of variance.

Unit 8, "Correlation, Regression, and Discriminant Analysis Procedures," includes simple techniques such as bivariate correlational analysis and bivariate regression analysis, as well as more complex analyses such as partial correlational analysis, multiple linear regression, and discriminant analysis.

Unit 9, "Scaling Procedures," focuses on factor analysis, reliability estimation, and item analysis.

Unit 10, "Nonparametric Procedures," discusses a variety of nonparametric techniques, including such tests as the binomial, one-sample chi-square, Kruskal-Wallis, McNemar, Friedman, and Cochran tests.

New to This Edition

Version 23 of SPSS for Windows and the Macintosh offers additional features of great value. For more details about these features, refer to the SPSS Web site http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype%3DPM%26subtype%3DSP%26htmlfid%3DYTD03023USEN.

This eighth edition of *Using SPSS for Windows and Macintosh* includes the following changes:

- Revisions to instructions have been made to ensure they are consistent with the latest version of SPSS.
- New exercises have been added to the end of lessons.
- Revisions to statistical information have been made to make it more accessible to readers.

  Also, please note the following:
- While this edition of *Using SPSS for Windows and Macintosh* focuses on version 23, the material within the chapters is directly applicable to other versions of SPSS as well. In other words, version 23 is backward compatible with most earlier versions of SPSS. While there may be some slight differences, and earlier versions offer fewer features, the user should have no difficulty adapting these materials to the version he or she has available.

  Please note that SPSS is developed and owned by IBM and is formally referred to as IBM SPSS Statistics.

Online Data Files

All the data files that you will need to work through the lessons in *Using SPSS for Windows and Macintosh* are available on the Web through the instructor. You can request your instructors for the same who can download and distribute the data files from the Pearson's website at http://www.pearsonhighered.com. Several data sets—particularly, Crab Scale Results and Teacher Scale Results—will be introduced as you work through the first 18 lessons. A detailed description of these two files is provided in Appendix A.

There are two more types of data sets used in the later units. The first are data files that may be used when learning particular SPSS procedures, such as paired-samples, *t* test, or factor analysis. Any of these files can be easily identified since they are named, for example, *Lesson 23 Data File 1 or Lesson 36 Data File 1.* Also used in the second half of the book are data files for completing exercises at the end of lessons. These are named, for example, *Lesson 23 Exercise File 1 or Lesson 36 Exercise File 2.*

Please note that the Web site does not contain any executable SPSS data files. You need to have access to SPSS to use these files, as most users of this book will, at the school, company, or other institution. SPSS (at http://www.ibm.com/analytics/us/en/technology/spss/) offers a wide price range packages, including those for students.

Other Features of The Book

LEARNING OBJECTIVES At the beginning of each unit, you will see a list of objectives—skills that you will master when you successfully complete the content of the lesson and work through all of the exercises in the lesson. These advanced objectives indicate what you can expect, and what is expected of you.

TYPING CONVENTIONS There is only one typing convention you must attend to throughout this book. A sequence of actions is represented by what options are selected from what menu, connected by an arrow like this →.

For example, if a certain procedure requires clicking on the File menu and then clicking the New option, it would be represented as follows.

1. Click **File → New**.

EXAMPLES Each lesson includes step-by-step procedures, with copious illustrations of screen shots, for successfully completing a technique with sample data. Exercises at the end of each lesson allow you to practice what you have learned.

TIPS Some of the lessons contain tips (in the margins) that will help you learn SPSS and will teach you shortcuts that make SPSS easier to use.

System Requirements for SPSS 23 for Windows

If you are using SPSS 23 for Windows, then your system must meet the following minimal requirements:

- Microsoft Windows, Windows 7, and Windows 8 and 10 (plus Windows Server)
- Intel or AMD processor running at 1 gigahertz (GHz) or higher.
- 4 gigabytes (GB) of RAM or more.
- 2 gigabytes of available hard-disk space. If you install more than one help language, each additional language requires 60–70 MB of disk space.
- DVD/CD drive (unless downloaded online).
- 1024 × 768 or a higher-resolution monitor.

System Requirements for SPSS 23 for Mac OS X

If you are using SPSS 23 for Macintosh, then your system must meet the following minimal requirements:

- Mac OS® X 10.10 or higher (Yosemite).
- Intel processor.
- 4 gigabytes (GB) of RAM or more.
- 2 gigabytes of available hard-disk space. If you install more than one help language, each additional language requires 60–70 MB of disk space.
- DVD/CD drive.
- 1024 × 768 or a higher-resolution monitor.

Version 23 for both Windows and the Macintosh are virtually identical. The same differences in keystrokes that apply between the operating systems also apply for the use of SPSS. For example, to select all the files listed in a dialog box in the Mac version, use the Command (also known as the Apple key) + A key combination. For Windows, it's the CTRL+A key combination.

Acknowledgments

No book is ever the work of only the authors. *Using SPSS for Windows and Macintosh* was first contracted with Chris Cardone, whom we would like to thank for giving us the opportunity to undertake the project. Chris remains a good colleague and a better friend.

We would like to thank the many instructors and students who have contacted us about the book. We have very much appreciated your positive comments and your constructive suggestions.

Thank you for using this book. We hope it makes your SPSS activities easy to learn, fun to use, and helpful. Should you have any comments about the book (good, bad, or otherwise), feel free to contact us at the e-mail addresses listed below.

Samuel B. Green
samgreen@asu.edu

Neil J. Salkind
njs@ku.edu

About the Authors

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SAM GREEN is Professor in the T. Denny Sanford School of Social and Family Dynamics at the Arizona State University. He teaches undergraduate and graduate courses in statistics for students in the behavioral sciences. He conducts research primarily in the areas of structural equation modeling, multivariate analyses of means, exploratory factory analysis, measurement invariance, analysis of item data, and reliability. He is currently on the editorial boards of *Structural Equation Modeling: A Multidisciplinary Journal, Psychological Methods, Educational and Psychological Measurement*, and *Journal of Counseling Psychology*. He is also a past chair of the Structural Equation Modeling Special Interest Group of the American Educational Research Association.

Sam has a wonderful wife, Marilyn Thompson, and three terrific daughters, Julie, Sarah, and Leah. He enjoys playing with his grandchildren. To relax, he likes to run, read novels, eat good food, travel, and get together with friends.

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NEIL J. SALKIND received his Ph.D. from the University of Maryland in Human Development and is Professor Emeritus in the Department of Educational Psychology at the University of Kansas. He was a postdoctoral fellow at the University of North Carolina's Bush Center for Child and Family Policy. He has published more than 150 professional papers and presentations, has written more than 100 trade and textbooks, including *Statistics for People Who Think They Hate Statistics* (Sage), *Theories of Human Development* (Sage), and *Exploring Research* (Pearson), and has edited several encyclopedias including the *Encyclopedia of Human Development* and the *Encyclopedia of Measurement and Statistics*. He was the editor of *Child Development Abstracts and Bibliography*.

Neil has a wonderful wife, Leni, and three terrific children, Sara, Micah, and Ted. To relax, he likes to letterpress print using equipment dating back to Karl Pearson, read, swim with the River City Sharks, bake brownies (see the recipe at www.statisticsforpeople.com), and poke around old Volvos and old houses.

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Unit 1
Getting Started with SPSS

Outline

Lesson 1: Starting SPSS
- The SPSS Opening Window

Lesson 2: The SPSS Main Menus and Toolbar
- The SPSS Main Menus
- The Data Files

Lesson 3: Using SPSS Help
- How to Get Help
- Using Contents

Lesson 4: A Brief SPSS Tour
- Opening a File
- Working with Appearance
- Creating a New Variable
- A Simple Table
- A Simple Analysis

Learning Objectives

Lesson 1: Identify the steps of using SPSS with respect to Windows and Mac applications

Lesson 2: Describe the features and functions of the SPSS menu and its toolbar

Lesson 3: Outline the usefulness of the SPSS online help

Lesson 4: Recall how to utilize the analytic procedures of the SPSS

You're probably familiar with how other personal computer applications work, and you will find that many SPSS features operate exactly the same way. You probably already know about dragging, clicking, double-clicking, and working with files. If you don't, you can refer to one of the many basic operating systems books available for Windows or the Macintosh operating systems. We assume that you are familiar with basic operating systems skills, such as clicking with a mouse, dragging objects, naming and copying files, printing documents, and the everyday tasks associated with using a personal computer.

In this first unit, we introduce you to SPSS, beginning with how to start SPSS, and walk you through a tour so that you know some of the most important features of SPSS.

In Lesson 1, "Starting SPSS," the first of four lessons in this unit, you will find out how the SPSS Windows group is organized and how you start SPSS.

In Lesson 2, "The SPSS Main Menus and Toolbar," we introduce you to the opening SPSS window, point out the various elements in the window, and explain what they do. The main menus in the SPSS window are your opening to all the SPSS features you will learn about in *Using SPSS for Windows and the Macintosh*. We also introduce you to the toolbar, a collection of icons that perform important tasks with a click of the mouse.

Lesson 3, "Using SPSS Help," introduces you to SPSS online help. If you've ever used another Windows application, you know how handy it is to have this type of help immediately available and how it can get you through even the most difficult procedures.

In Lesson 4, "A Brief SPSS Tour," we provide a simple example of what SPSS can do, including simple analysis, the use of Data View and Variable View, and the creation of a chart. Here we'll whet your appetite for the terrific power and features of SPSS and what is in store for you throughout the book.

Lesson 1: Starting SPSS

Lesson 1 **Identify the steps of using SPSS with respect to Windows and Mac applications.**

With this lesson, you will start your journey on learning how to use SPSS, a powerful and easy to use data analysis package.

Keep in mind that throughout these lessons we expect you to work along with us. It's only through hands-on experiences that you will master the basic and advanced features of this program.

SPSS is started by clicking the icon (or, the name representing the program) that represents the application on your Windows or Macintosh desktop. You can also access the SPSS icon through whatever file access tool you regularly use. Finally, you can always click on any already existing SPSS file to open the application (and, of course, that file).

The file that executes SPSS may be located in a variety of places on your computer, depending upon how it was installed. If you are working off a server (e.g., at a college or university), you may have to ask for some assistance if the SPSS icon is not readily visible.

TIP

As SPSS has evolved over 23 versions, new features have been added along the way and most important, the various versions (Windows, Macintosh, and Linux) have become increasingly similar in their look, feel, and functionality. Such is the case now where version 23 for Windows and the Macintosh are almost identical in their performance and if you use one version, you should be able to use the other. Because there is such a large proportion of SPSS users who use the Windows version (although the Mac portion is increasing), *Using SPSS* will provide examples from the Windows version. However, in these first few lessons, we will provide some Mac screens so you can see the high degree of similarity between versions.

1.1: The SPSS Opening Window

As you can see in Figures 1.1 and 1.2, the opening screen for Windows and the Macintosh versions of SPSS presents a series of options that allow you to select from running the SPSS tutorial, typing in data, posing an existing query, or creating a new query. The opening screens for the Windows and the Mac applications are virtually identical.

Figure 1.2 shows the highly similar opening screen for the Macintosh version.

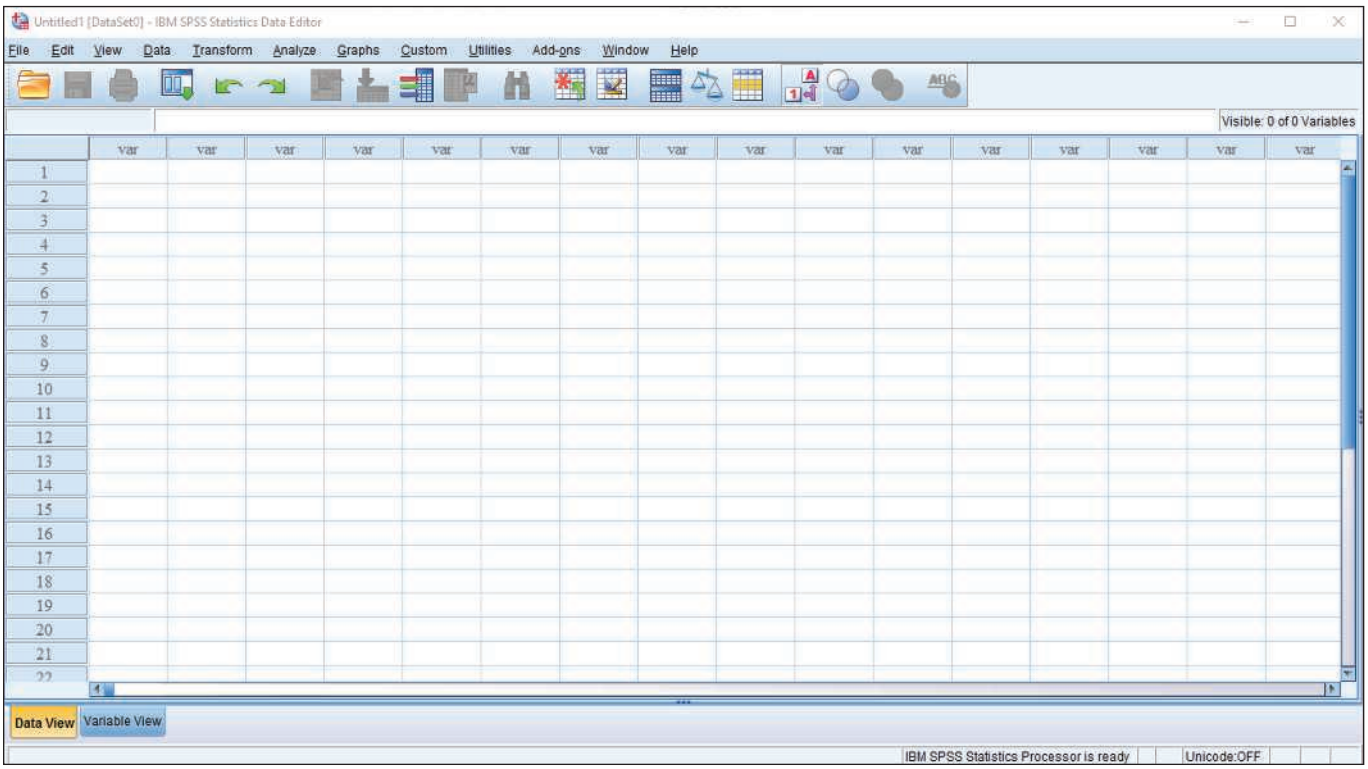

Figure 1.1. The IBM® SPSS® Statistics software ("SPSS") for Windows opening Screen.

SPSS Inc. was acquired by IBM in October, 2009.

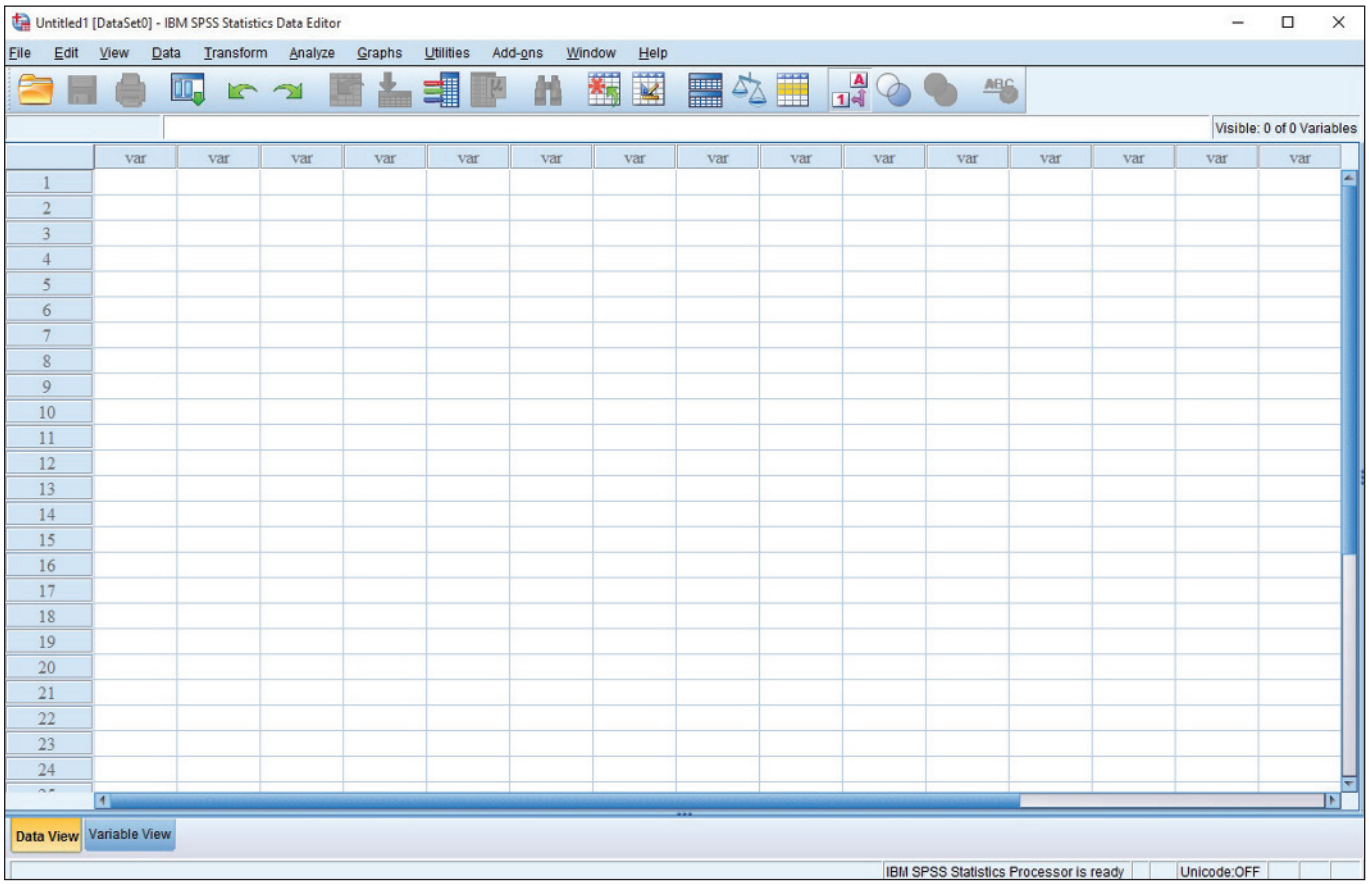

Figure 1.2. The SPSS for the Macintosh opening screen.

On either platform, you can do the following:

- Create a new file or a database query,
- Open a file that you have recently worked with,
- Review some of the new features offered by SPSS 23,
- Learn about the different modules that SPSS 23 offers,
- Use the SPSS Tutorial feature, and
- Move immediately to the use of several SPSS features.

Should you not want to see this screen each time you open SPSS, then click on the "Don't show this dialog in the future" box in the lower left corner of the window.

For our purposes, we will click the **Using the Data Editor** option (and then click OK) since it is likely to be the one you first select upon opening and learning SPSS. Once you do this, the **Variable View** window you see in Figure 1.3 becomes active. This is where you enter the names of the variables you want to work with and describe their parameters or characteristics.

Although you cannot see it when SPSS first opens, there is another open (but not active) window as well. This is the **Data View** where the actual data for the analysis will be entered. This is where you enter data you want to use with SPSS once that data have been defined. You can switch between the Variable and the Data views by clicking on the tab named as such. We will cover both views in Lesson 5 (Unit 2).

The **Viewer** displays the results of statistical analysis and charts that you create. An example of the Viewer window is shown in Figure 1.4 where the results of a very simple (descriptive) analysis are shown. A data set is created in the Data Editor, and once the set is analyzed or graphed, you examine the results of the analysis in the Viewer.

If you think the Data Editor is similar to a spreadsheet in form and function, you are right. In form, it certainly is, since the Data Editor consists of rows and columns just like offered, for example, by Excel and Open Office. Values can be entered and then manipulated. In function as well, the Data Editor is much like a spreadsheet. Values that are entered can be transformed, sorted, rearranged, and more.

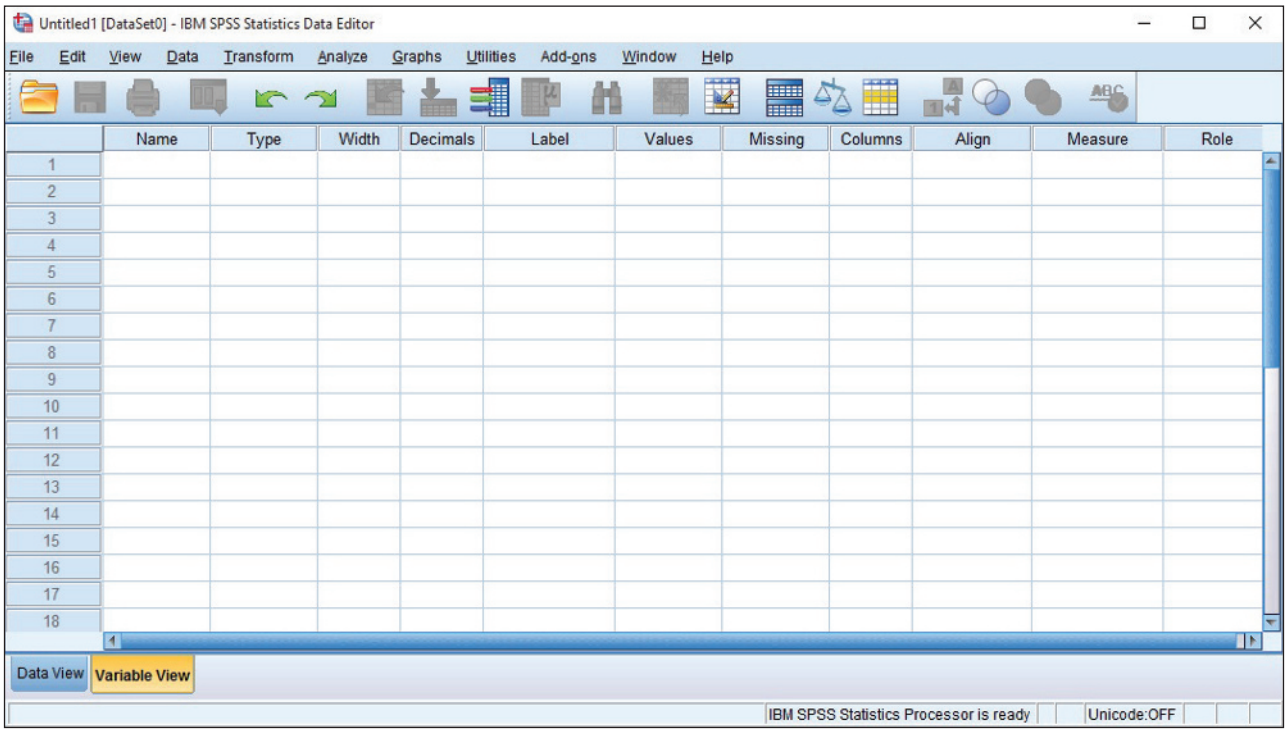

Figure 1.3. The SPSS Variable View window.

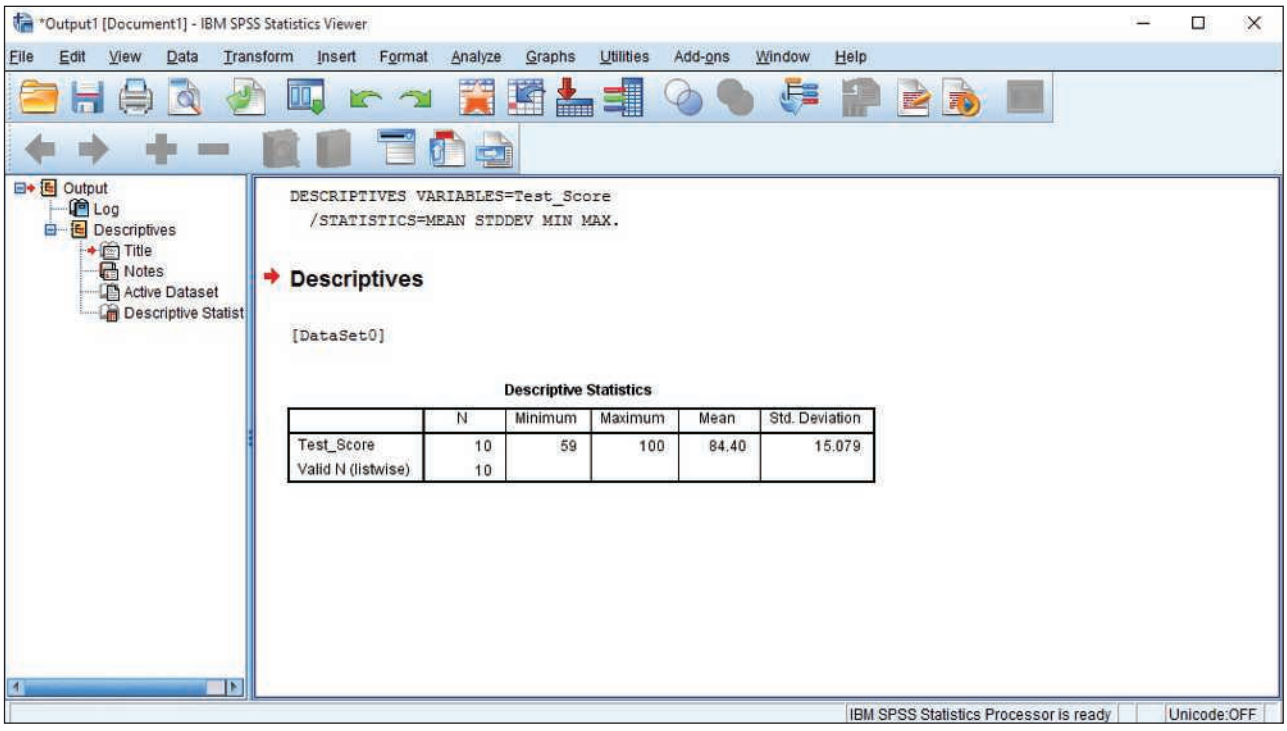

Figure 1.4. The Viewer.

In addition, SPSS can use formulas to compute new variables and values from existing ones, as you will learn in Lesson 12 (Unit 3).

Also, as you will learn in Lesson 10 (Unit 2), one of the many conveniences of SPSS is its ability to import data from a spreadsheet accurately and efficiently. This ability makes SPSS particularly well suited and powerful for further analysis of data already available in spreadsheet form.

> **TIP**
>
> To place SPSS on the desktop, open the File Explorer in Windows (in this case, version 10), locate the SPSS executive file (spss.exe), and drag it on to the desktop or right-click and pin it to the taskbar. To place it on the Mac desktop, just locate it on the hard drive (in the Applications folder) and drag it on to the desktop or to the Dock.

Exercises: Lesson 1

1. What are some of the purposes to which you think SPSS can be best used? Use examples from your own field of study.
2. Talk with a faculty member or a colleague who uses SPSS and ask him or her how this tool is used and how it helps them better understand their area of study.
3. Why do you think that SPSS may be superior to a spreadsheet for the recording and analysis of data?

Lesson 2: The SPSS Main Menus and Toolbar

Lesson 2 **Describe the features and functions of the SPSS menu and its toolbar.**

Menus are the key to operating any Windows or Mac application, and that is certainly the case with SPSS. Its main menus include Help menus for the Windows version (11 menus) and the 11 main menus for the Mac version. They provide access to every tool and feature that SPSS has to offer.

In this lesson, we will review the contents of each of these menus and introduce you to the toolbar, a set of icons that takes the place of menu commands. The icons make it quick and easy to do anything, from saving a file to printing a chart.

2.1: The SPSS Main Menus

SPSS comes to you with 11 main menus, as you can see in the opening screen in Figure 2.1. Although you think you may know all about the File menu and what options are available on it, stick with us through the rest of this lesson to see exactly what the File menu, and the other ten menus, can do for you.

THE FILE AND EDIT MENUS The purpose of the **File menu** (Figure 2.2) is to, obviously, work with files. Using the options on this menu, you create new files, open existing ones, save files in a variety of formats, display information about a file, print a file, and exit SPSS. The File menu can also list recently used data files (Recently Used Data) and other recently used files (Recently Used Files), so you can quickly return to a previous document.

For example, when it comes time to start working with the file named Teacher Scale Results, you would select Open from the File menu and then select the file name from the **Open dialog box**. You will learn more about this process in Lesson 7 (Unit 2).

When it comes time to cut or copy data and paste it in another location in the current, or another, data file, you will go to the **Edit menu**. You will also seek out options on the Edit menu to search for data or text, replace text, and

> **TIP**
>
> When items on a menu appear dimmed, it means they are not available.

Figure 2.1. The SPSS main menus.

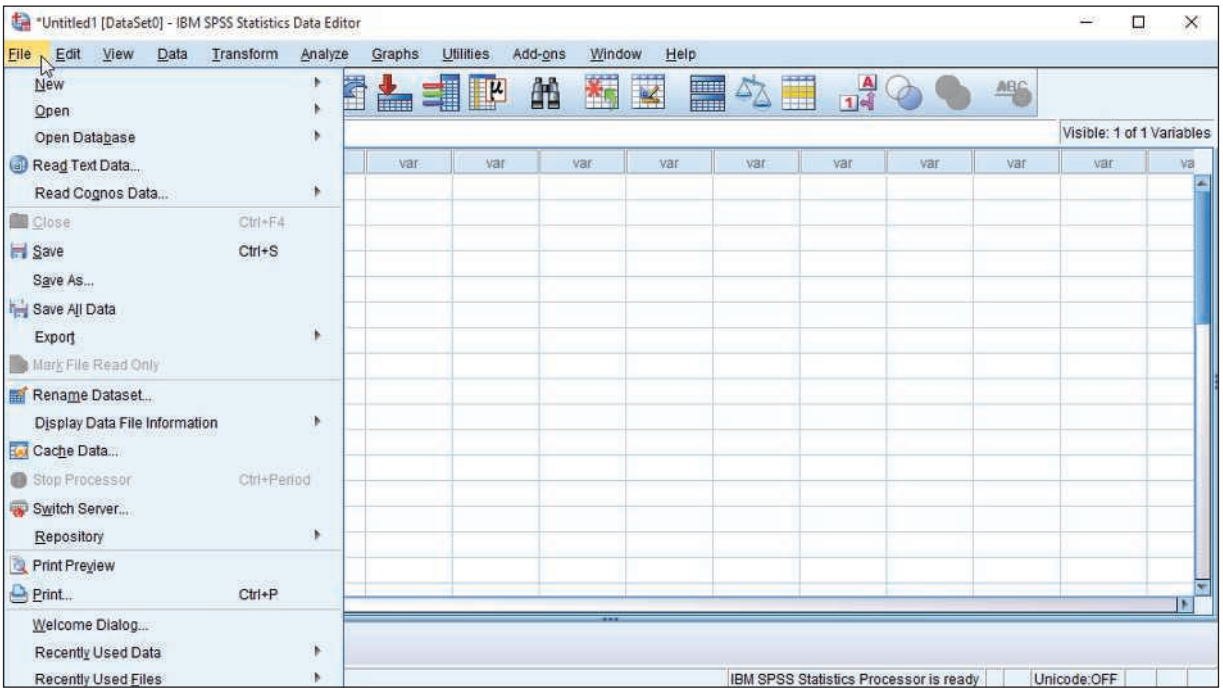

Figure 2.2. The File menu.

set SPSS preferences (or default settings). All these activities and more are found on the Edit menu shown in Figure 2.3.

For example, if you wanted to find what Mary Jones scored on the variable named test 1, you could use the Find menu command to search for "Mary Jones" and then read across the file to find her score on the variable named test 1.

THE VIEW AND DATA MENUS Here's a chance to customize your SPSS desktop. Using various commands on the **View menu**, you can choose to show or hide toolbars, **Status Bar**, and grid lines in the Data Editor; change fonts; and use Value Labels. You can see these commands in Figure 2.4.

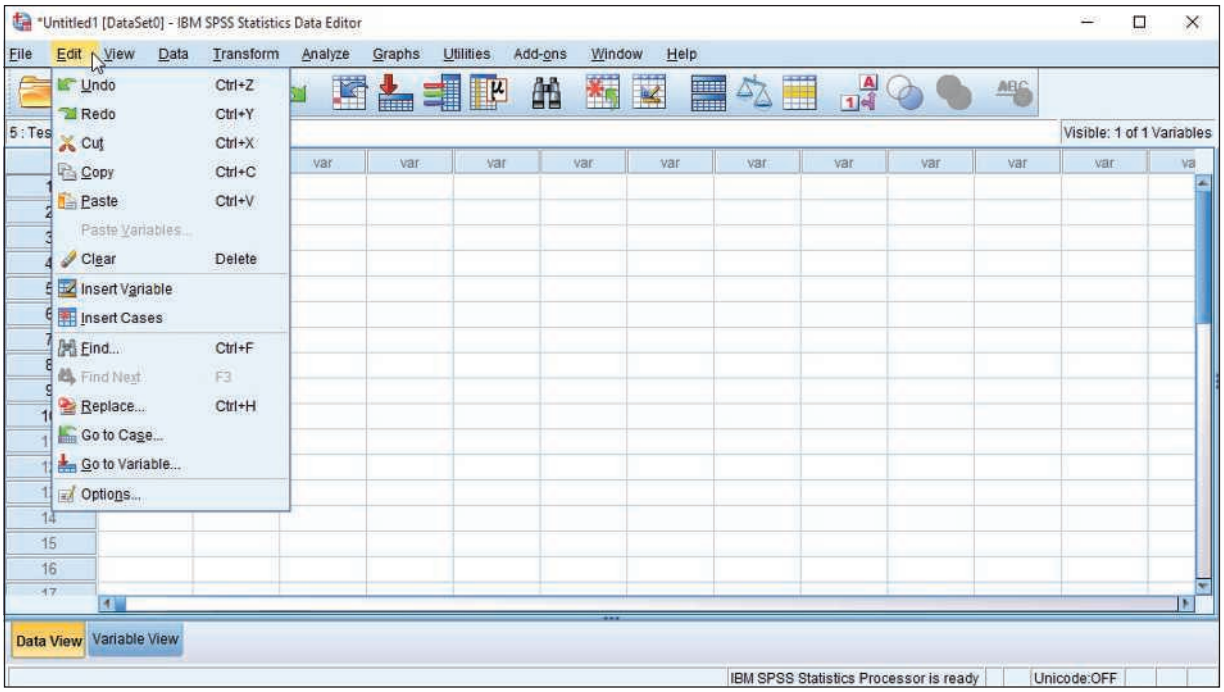

Figure 2.3. The Edit menu.

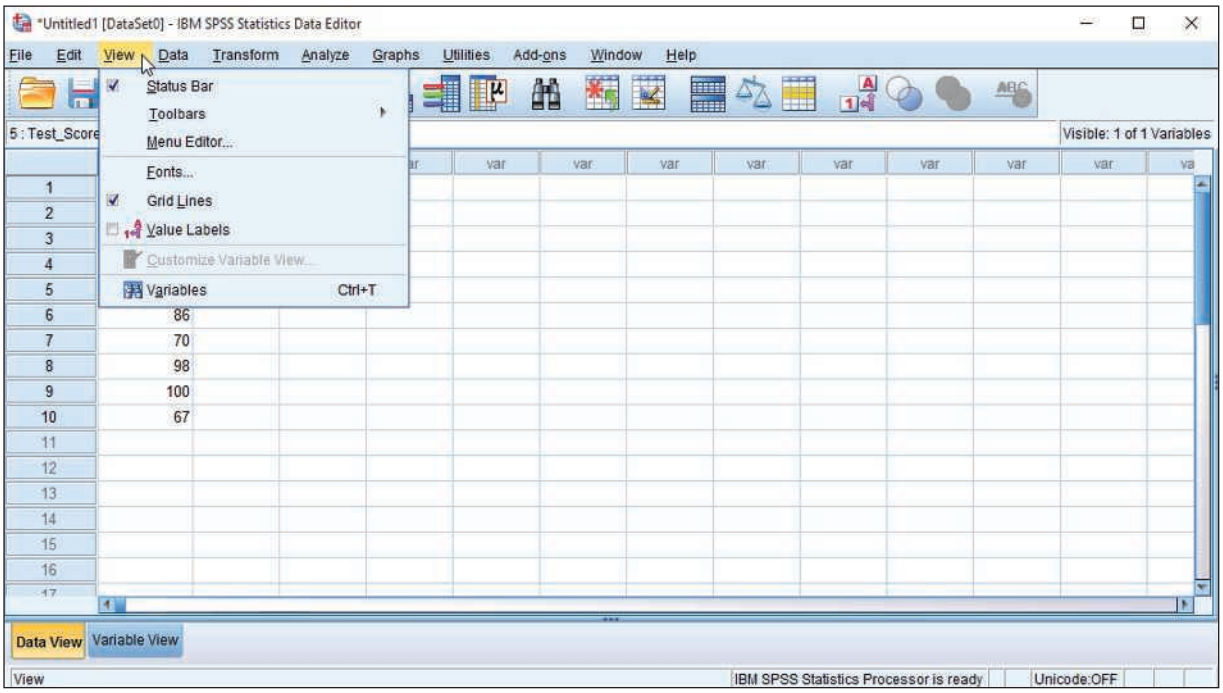

Figure 2.4. The View menu.

TIP

Perhaps the most valuable SPSS command (which is available on many Windows-based applications) is the CTRL+Z key combination, which reverses the last data entry you made.

For example, if we didn't want to use labels for variables or grid lines, we would be sure that these options (Value Labels and Grid Lines) were not selected.

Variables and their values are the central element in any SPSS analysis, and you need powerful tools to work with variables. You have them in SPSS. As you can see in Figure 2.5, on the **Data menu** there are commands that allow you to define variable properties, sort cases, merge

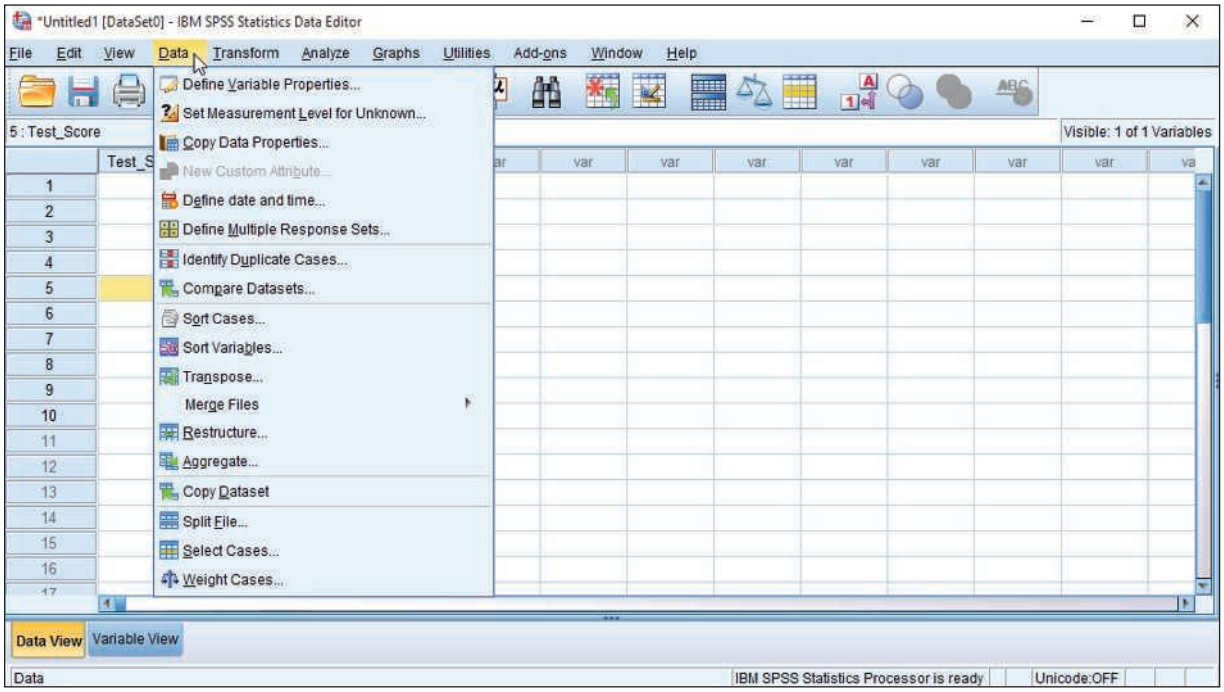

Figure 2.5. The Data menu.

and aggregate files, and assign weight to cases as you see fit.

> **TIP**
>
> You can set all kinds of default values through the Edit -> Options dialog box. For example, if you always want three decimal places for your data entry, then click the Data Tab and increase the number of decimal places from 2 to 3.

For example, if we want to sort variables or cases, this is the menu you would use and the Sort Cases option is the menu that would be selected.

THE TRANSFORM AND ANALYZE MENUS There will be times when a variable value needs to be transformed or converted to another form or another value. That's where the commands on the **Transform menu** you see in Figure 2.6 come in handy. On this menu, you will find commands that allow you to compute new values, create a set of random values, recode values, replace missing values, and do more.

For example, using the Compute Variable command on the Transform menu, you could easily compute a new variable that represents the mean of a set of items.

The **Analyze menu** is the meat-and-potatoes menu! As you can see in Figure 2.7, there are 20 different options on the Analyze menu (and many submenus) that lead to almost any statistical analysis technique you might want to use. These range from a simple computation of a mean and standard deviation to time series analysis and multiple regression to other very complex analyses as well.

For example, if you wanted to determine if there is a significant difference between the average rating that Professor 6 received on a teaching evaluation form versus the average rating received by Professor 4, you could look to the Compare Means option on the Analyze menu.

THE GRAPHS, UTILITIES, AND ADD-ONS MENUS Want to see what those numbers really look like? Go to the **Graphs menu** where you can create a bar, line, area, and other types of graphs. Graphs make numbers come alive, and you should pay special attention to Lessons 16, 17, and 18, where we show you how to create, edit, and print them. Take a look at Figure 2.8 to see what graph options are available. With version 23, you also have the opportunity to use the Chart Builder menu command (where SPSS walks you through the creation of a graph) or the Legacy Dialogs menu command where the SPSS interface from earlier versions is accessible.

For example, if you want to see test scores as a function of gender, a bar graph (on the Graphs menu) could do it quite nicely.

The **Utilities menu** is where you can find out information about variables and files, and you can define and use

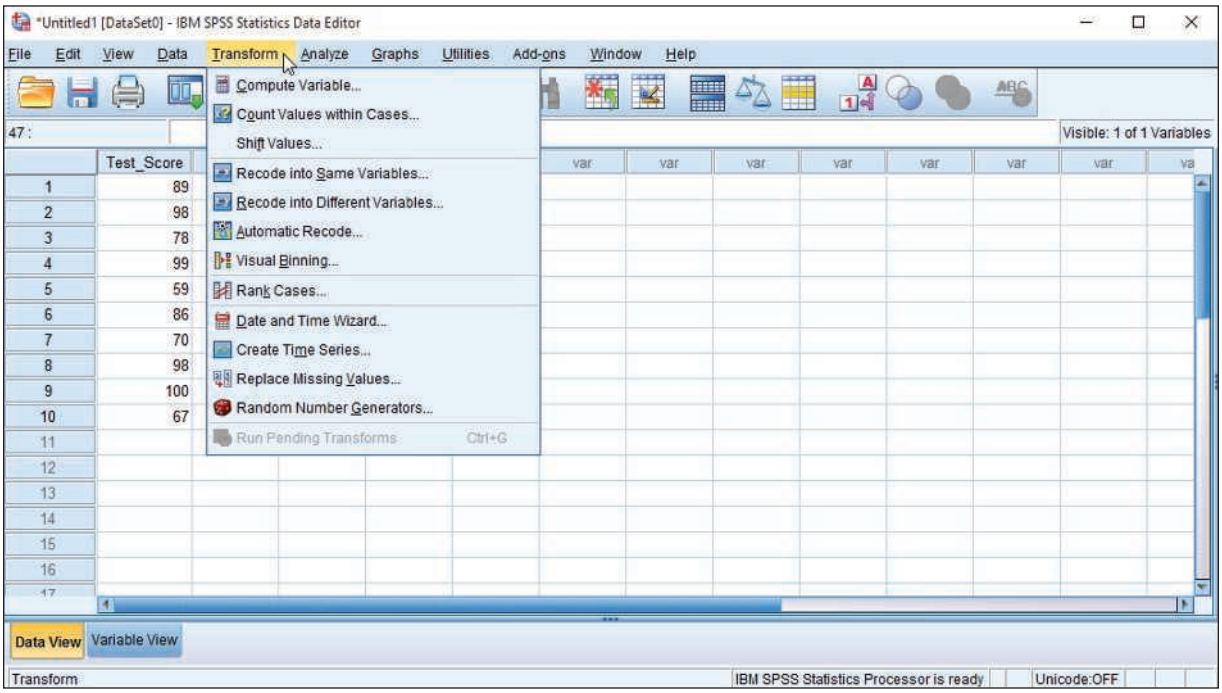

Figure 2.6. The Transform menu.

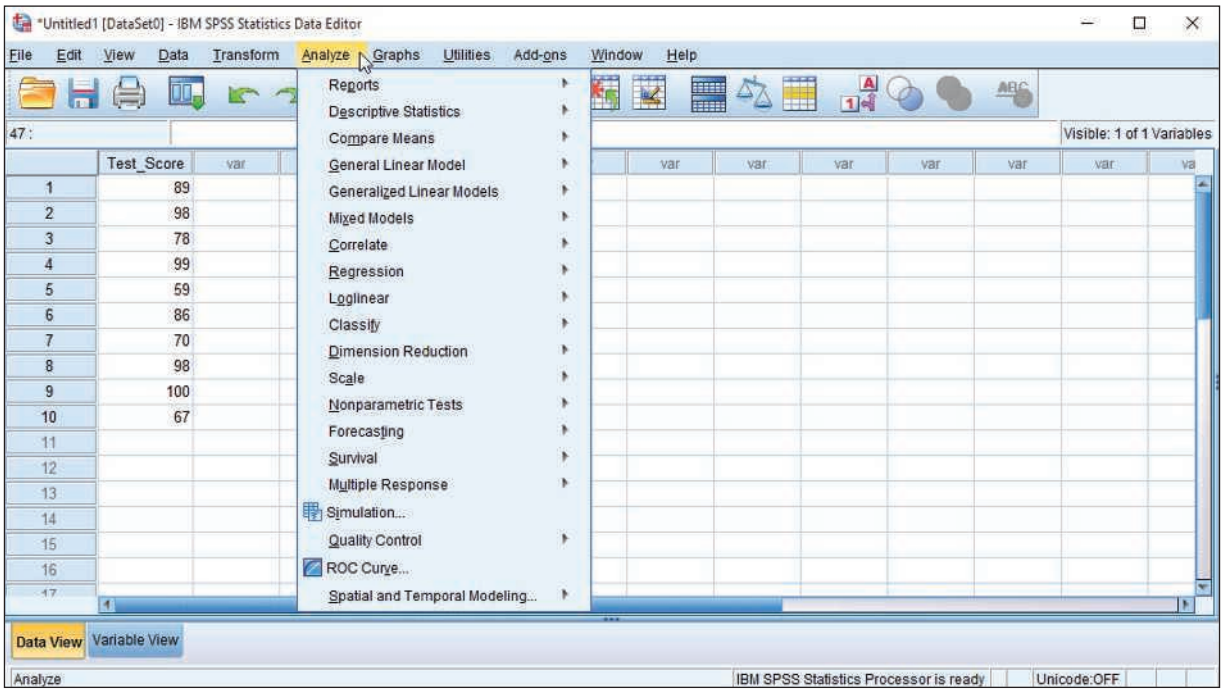

Figure 2.7. The Analyze menu.

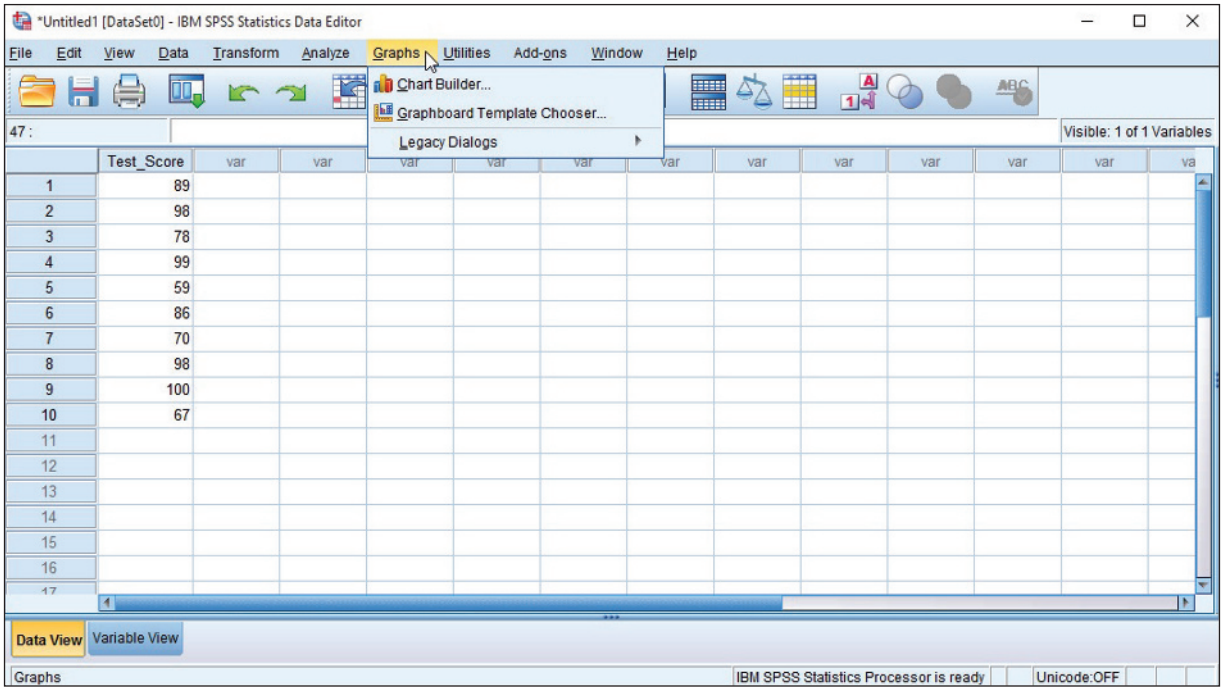

Figure 2.8. The Graphs menu.

sets of variables. You can see these options in Figure 2.9 on the Utilities menu.

For example, the Variables option tells us the specifics about each variable, including the name, label type, and more.

Add-ons is a kind of catchall menu for commands that do not conveniently fit elsewhere. For example, there is information on SPSS Forecasting and SPSS Data Preparation as add-ons.

THE WINDOW MENU, HELP MENU, AND THE SPSS TOOLBAR AND STATUS BAR The **Window menu** and the **Help menu** function much like any other Windows application menus. The Window menu helps you switch from