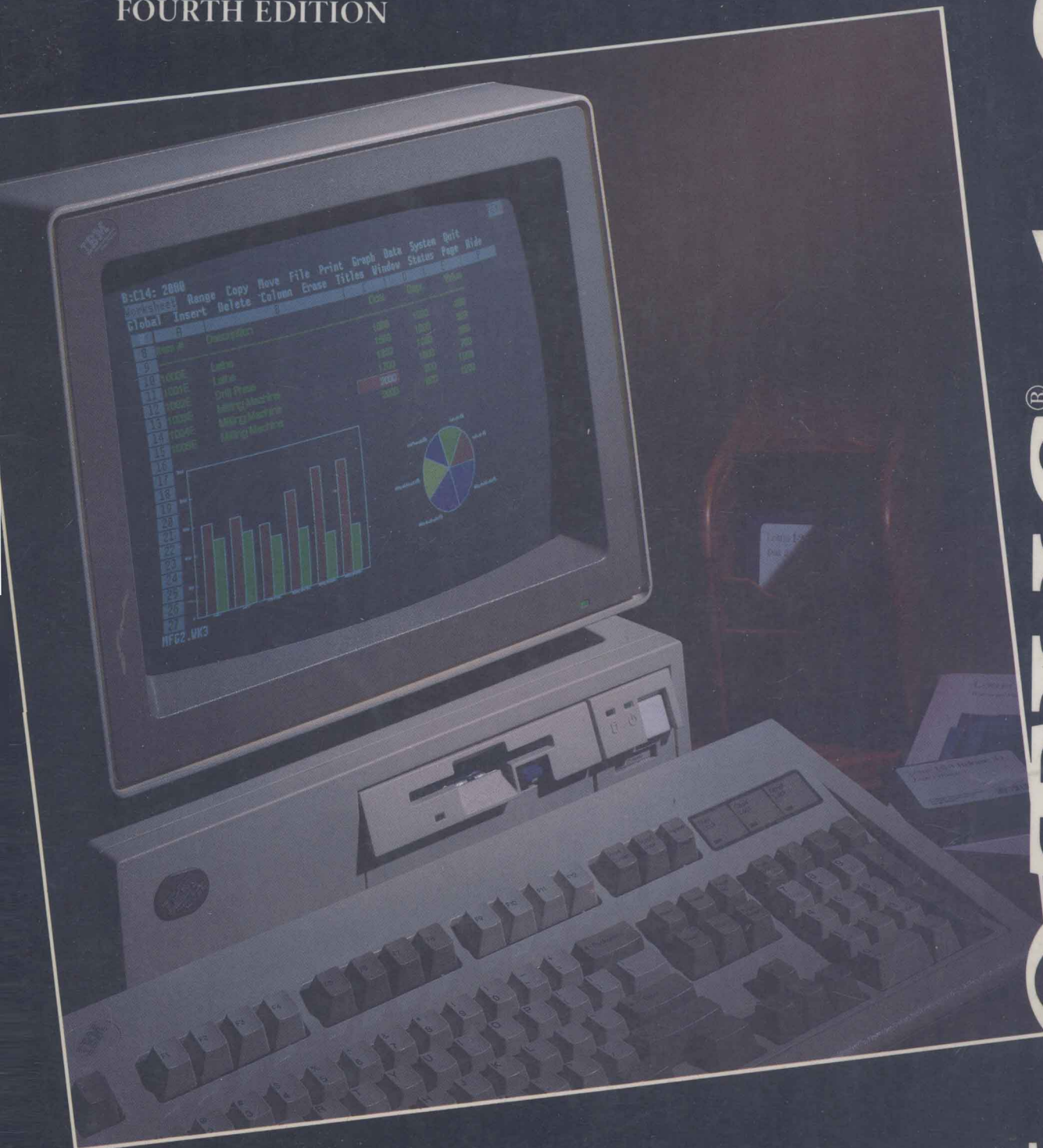# Cases and Applications in Lotus® 1-2-3®

Releases 2, 2.2, 2.3, 3, and 3.1

FOURTH EDITION

Jack A. Holt   John F. Kottas

CASES AND APPLICATIONS IN LOTUS® 1-2-3®

Releases 2, 2.2, 2.3, 3, and 3.1

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PREFACE

This book is an outgrowth of our many years of teaching people to use Lotus 1-2-3. We know students learn best through doing and practice. Hence we strongly believe in the utilization of hands-on tutorials followed by lots of practice with exercises and cases. As in many schools, our students have access to 1-2-3 in computer labs but are not provided with 1-2-3 reference materials. Consequently they need an economical reference guide to 1-2-3. In addition, we know that instructors like to pick and choose the material and exercises which they feel best meets their students' needs and abilities. Not finding a 1-2-3 book which satisfied these needs, Jack Holt wrote one which did.

Our goal is to take students with little or no spreadsheet experience and help them become confirmed, knowledgeable, and confident 1-2-3 users. Over 40 percent of this book is tutorials, exercises, and cases. The balance is a reference guide to using 1-2-3 Releases 2 through 3.1. Its guided hands-on examples and tutorials help new 1-2-3 users take those important early steps. Reinforcing practice is provided by over 40 exercises and cases whose areas of application range from accounting and finance to marketing and operations, whose range of difficulty varies from easy to challenging.

In Chapter 1 we seek to give perspective on the nature of this highly flexible and powerful tool for business analysis and presentation which has brought the microcomputer to the desks of middle and upper management. The purpose of Chapter 2 is to get the student manipulating the basic features of 1-2-3 as soon as possible. While 1-2-3 is easy to start using, it takes time and practice to become acquainted with the finer points of even the program's fundamental features. Chapters 3 through 15 provide a thorough introduction to these fundamental features. Advanced 1-2-3 features including data tables, database analysis, worksheet linking, regression analysis, and macro programming are covered in Chapters 16 through 20. Chapter 21 brings together a compilation of helpful hints spanning the topics of Chapters 3 through 20. With the exception of add-ins, Chapters 2 through 21 deal with the capabilities of 1-2-3 Releases 2, 2.2, and 2.3 which are also core to Releases 3 and 3.1. Other new technological features of Releases 3.0 and 3.1 are examined in Appendix A. The most recent and more powerful presentation enhancement add-in WYSIWYG of the Releases 2.3 and 3.1 (which replaces Allways) is covered in Appendix B. Appendix C introduces Allways, Release 2.2's presentation enhancement add-in.

Besides adding coverage of the latest releases of 1-2-3, the most significant changes from the third to the fourth edition include:

1. Addition of a new, first chapter providing an introductory perspective on 1-2-3, its major components, its history, and its uses.
2. Addition of a new second chapter which provides a quick start introduction to some of the basic features and operations of 1-2-3. This chapter addresses the student's desire to begin using the program right away. It establishes the background necessary for even the 1-2-3 neophyte to

successfully interact with the more advanced material in subsequent chapters.

3. Addition of more hands-on examples.

4. Rearrangement, consolidation, and modification of chapter materials in ways which should make 1-2-3 easier to learn and to use with this book as a reference guide.

5. Addition of a separate chapter on how to define cell ranges.

6. Deletion of material on installing 1-2-3. The vast majority of students have access to 1-2-3 already installed. Further, the latest releases of 1-2-3 have so simplified the installation process that a detailed explanation is no longer necessary.

7. Deletion of material on the Lotus Access System. This was done because virtually no one uses it. Instead, most people start 1-2-3 and the other programs on the Lotus Access System menu directly. This avoids giving up valuable computer memory to the Lotus Access System and permits larger and more complex spreadsheet analyses to be undertaken.

In our experience most students and professors have an overwhelming desire to become proficient users of 1-2-3. We hope this book assists anyone in learning to use Lotus 1-2-3 as easily and naturally as they use any other familiar tool. 1-2-3 is so rich in structures and options that becoming familiar with it is the beginning of a fascinating journey with ever-broadening vistas of opportunity. We feel sure you will experience the pleasure of learning to use one of the world's most powerful tools for business analysis. Finally, we hope you continue, as we have, to discover nuances of and new uses for Lotus 1-2-3. Bon Voyage!

Jack A. Holt
John F. Kottas

ACKNOWLEDGMENTS

CONTENTS

CHAPTER 1

Overview of Spreadsheet Analysis and 1-2-3

This chapter attempts to describe what a spreadsheet is and to give insight into why this genre of computer software has brought the microcomputer to the desks of managers and professionals. It explains why, since 1983, Lotus® 1-2-3® has been the world's preeminent spreadsheet program. The chapter concludes with a description of this book's organization and its contents. Included are suggestions for how to try its tutorials, exercises, and cases.

WHAT IS A SPREADSHEET

A computer-based spreadsheet is built around a huge, electronic sheet of paper designed to perform mathematical calculations with computer quickness. This electronic worksheet is gridded off into a multitude of columns and rows whose intersections form a matrix of cells. This matrix organization has important implications for this very visual and relatively easy-to-use, yet flexible and powerful, analytical millieu. Your computer screen provides a movable view of a very small fraction of the cells in the matrix.

In any cell, you can enter one of three types of information: a number, a formula, or text. A number is the lowest level input that forms the basis for numerical analysis. Cell formulas specify how to compute new values from the values associated with other cells. The values associated with these other cells are referenced in terms of the unique column and row designators identifying each cell. A formula can be as simple as one adding the numbers in two other cells or as complex as one for figuring the internal rate of return associated with the cash flow values found in a series of cell locations. It is important to recognize that a cell containing a formula does not display the formula; instead, what is displayed in the cell is a single number, the current computed value of the cell formula. Whenever any cell's value changes, every formula dependent on that cell is instantaneously revised and its new value displayed. Text entries are typically used to label and describe the various components of the numerical analysis undertaken and are given a null computational value.

Because every cell possesses identical capabilities, you can arrange the components of your analysis in whatever manner best meets your needs within this visually oriented matrix. It is this visual orientation coupled with design flexibility, automatic recalculation, and an arsenal of layout, formatting, and

analysis tools that have made the spreadsheet such a powerful and widely used business analysis tool.

ILLUSTRATIONS OF WHAT SPREADSHEET ANALYSIS CAN DO

To illustrate the use of the spreadsheet environment, consider its use in reporting and analyzing the profit/loss status of the hypothetical Ballwin plant, which is part of the XYZ Corporation. Figure 1 gives a summary of the plant's profit/loss statement for 1991. Notice how the two-dimensional worksheet matrix lends itself to laying out Ballwin's profit/loss statement. Notice, too, how the labels clarify what the numbers represent. In this case, you see that column B contains the financial figures for the first quarter of 1991; column C, for the second quarter; and so on until you reach column F, where compilations for the year are given. Each row describes a different financial category. Over the table is a title identifying that this is the profit/loss statement for the 1991 operations of the Ballwin plant. What is not seen in Figure 1 is how the "Total Expense", "Profit/Loss", and the "Total for 91" values were obtained. They are the result of cell formulas. The total expense formula for the first quarter in cell B14 simply adds the values in cells B10, B11, and B12. The formula in cell D16 for profit/ loss in the third quarter is the value associated with cell D7 minus the value in cell D14.

These cell formulas have two interesting characteristics. First, if a data error is discovered, entry of the correct value will result in instantaneous recalculation and display of the values of all formulas that reference the cell where the corrected value is located. The other implication is that, if the XYZ Corporation standardizes profit/loss reporting for all its plants using the model in Figure 1, the formulas and almost all of the text have only to be developed once. A prebuilt application like this, which is meant to be used by different people, is referred to as a template.

While worrying about rebuilding the Figure 1 model from scratch at each plant and for every year may seem ridiculous, you must consider the size and

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FIGURE 1

|	A	B	C	D	E	F
1		1991 - PROFIT AND LOSS STATEMENT				
2		BALLWIN PLANT				
3						
4						
5		Qtr 1	Qtr 2	Qtr 3	Qtr 4	YEAR
6						
7	REVENUE	25,578	28,072	28,053	22,275	103,978
8						
9	EXPENSES					
10	Cost of Goods Sold	12,533	13,755	13,746	10,915	50,949
11	Overhead	8,000	8,000	8,400	8,400	32,800
12	Other	2,450	1,500	3,000	1,200	8,150
13		---------	---------	---------	---------	---------
14	Total expenses	22,983	23,255	25,146	20,515	91,899
15		=========	=========	=========	=========	=========
16	PROFIT	2,595	4,817	2,907	1,760	12,079
17						
18		Note: All figures in thousands of dollars				
19						
20						

nature of the reporting/analysis templates used in business. These templates involve hundreds of row categories and tens of columns. Many man-hours are invested in evolving a template that best meets the needs of the firm. Great care is taken to insure the correctness of the formulas employed. Many hours are spent using the spreadsheet's extensive formatting and printing capabilities to achieve a desirable appearance. Frequently, the spreadsheet's protection features are used to limit where data entries can be made. On large, complex templates with many diverse parts, the spreadsheet's programming language is used to turn the template into a menu/macro driven application, which can be used by people with little or no knowledge of the spreadsheet package being employed.

Many firms today are using spreadsheets as a consolidation tool. Consider the XYZ Corporation again. Within two weeks after the fiscal end of the year, each of XYZ's 30 plants telecommunicates its completed profit/loss templates to corporate headquarters. XYZ headquarters has a master template that automatically draws in the data of the plant templates and consolidates this data to form the corporation's profit and loss report.

While the spreadsheet is frequently used in reporting and consolidation of historical data, its real power resides in its ability to help you project and analyze data. For example, it is natural that the XYZ Corporation would like to project profit/loss statements for each of its plants over the next five years and combine these plant projections into a consolidated one for the corporation. To make such projections, the spreadsheet's tools could be used to identify trends and seasonality in each plant's historical sales and expense data. Once these trends and seasonal patterns are discovered using the spreadsheet's ratio, graphic, and regression analysis capabilities, formulas can be developed that will project the plant's profit/loss statements for the next five years. The spreadsheet's graphing capabilities can be used to show how profits are likely to evolve. Figure 2 shows such a projection for the Ballwin plant under the anticipated 4 percent annual sales growth rate and other estimates of what is most likely to happen. Since there is significant uncertainty about some of the assumptions driving these projections, spreadsheet "what-if" analysis can be employed. Figure 2 shows the results of a what-if for how profits are affected by different assumed values of the annual sales growth rates. In this case, it is seen that annual profits will not continue to grow unless the sales growth rate is over 5 percent a year, an optimistic figure. This is a clear indication that something needs to be done. Possibly, the firm needs to undertake a cost-containment/ reduction program at the Ballwin plant. Or maybe its products need to be redesigned to become more competitive in the market place. Or maybe the firm needs to use a different advertising/promotion strategy. For the myriad of options open to XYZ, worksheet models can be built and what-if analysis performed to give the firm insight into how best to deal with the Ballwin situation.

While the worksheet, graphics, and macro programming capabilities of spreadsheets have been mentioned, its database capabilities have not. The row and column orientation of the worksheet cells is ideally suited to the storage of related information about a set of items (e.g., attendance histories of a firm's shop employees). Each row in this database can be related to a different employee. Each column may contain a specific type of information (e.g., name, department, supervisor, wage rate, days missed in each of the 12 months, Mondays missed, and so on). You can have the spreadsheet program sort employee records at computer speed so that they are ordered by department and within department by number of work days absent. You can issue commands to

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FIGURE 2

BALLWIN PLANT
PROJECTED ANNUAL PROFITS
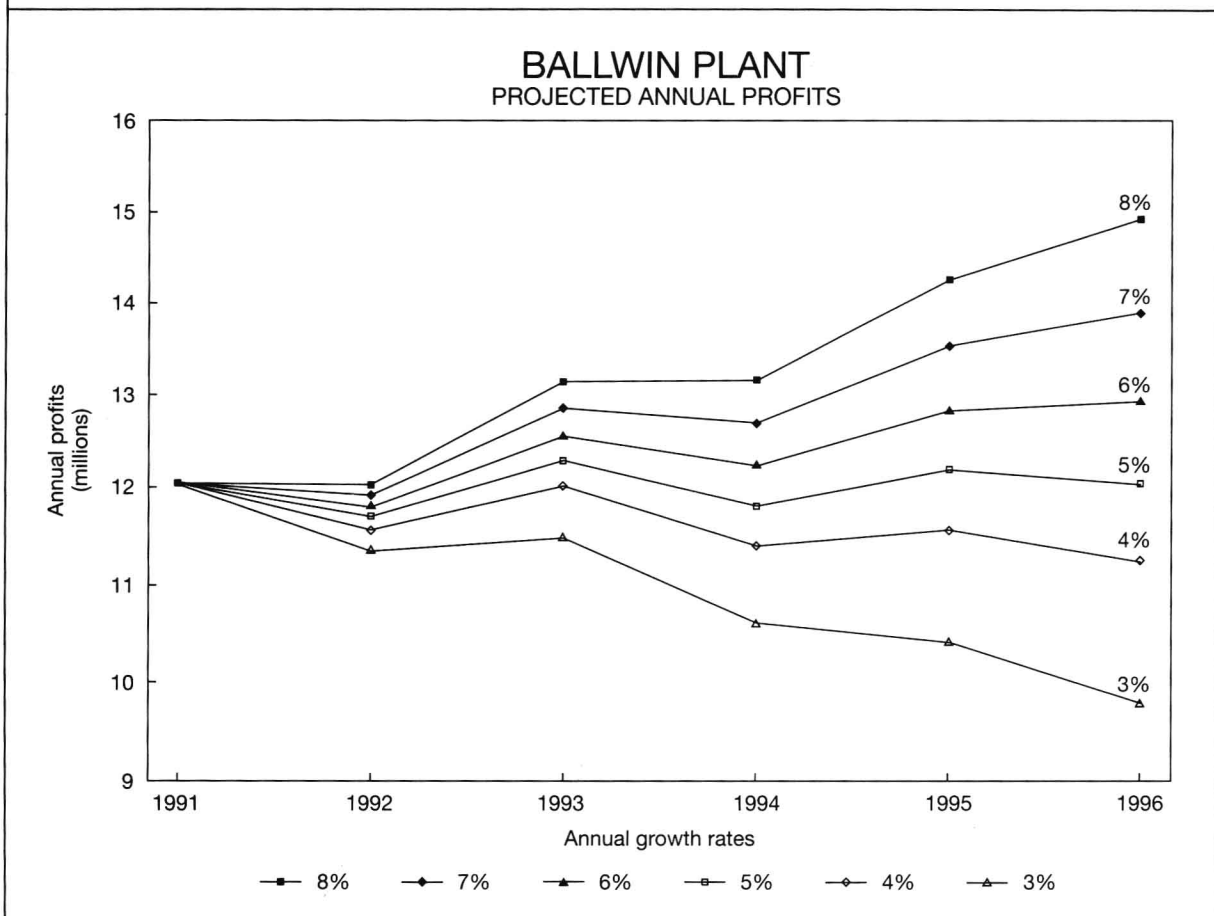
prepare a list of the employees who were late on more than five Mondays last year. You can ask for a table of the per capita absences by department and by supervisor.

LOTUS 1-2-3

1-2-3, a microcomputer software package offered by Lotus Corporation, combines graphics, database, programming, and other add-in capabilities with its formidable spreadsheet capabilities.

1. 1-2-3's spreadsheet is built around a worksheet with 256 columns and 8,192 rows. Each of its over two million cells can contain up to 240 characters of information. Assuming the standard-sized typed characters, the 1-2-3 worksheet is potentially equivalent to a piece of paper over a hundred feet long and 500 feet wide. Release 3 and 3.1 offer the ability to have a pad of up to 256 such pages active at a time. The 1-2-3 worksheet is supported by over 80 special functions (mathematical, statistical, accounting, financial, and other areas) that simplify writing cell formulas needed for complex analyses. There are hundreds of special commands that facilitate inserting and deleting rows and columns, changing column widths, altering the way descriptive labels and numbers are

displayed, copying and moving cell contents, printing and saving your worksheet models, and so on.

2. With 1-2-3, it is easy to translate worksheet information into attractive graphs that can be viewed on the computer screen and printed. Among the types that can be produced are line, bar, pie, area, and XY graphs. When changes made in the worksheet affect the information on which the graph is based, these changes are automatically reflected in the graph each time it is viewed or printed.

3. 1-2-3's row and column format is ideal for storing and analyzing information contained in a database. While 1-2-3 is limited in the amount of database information it can handle at one time, it has a formidable arsenal of analytical tools it can bring to bear on evaluating subsets of information downloaded into 1-2-3 from dedicated database management programs utilizing the same record structure as dBase III Plus®. These programs lack the diversity of analysis tools 1-2-3 possesses.

4. 1-2-3 contains a programming language that allows you to automate any sequence of manual 1-2-3 tasks. This language includes additional commands that permit 1-2-3 to be used as an environment for developing applications that can be used by others with little knowledge of 1-2-3.

5. 1-2-3 also provides the capability of attaching add-in programs that extend its capabilities and function seamlessly with it as if Lotus had developed them. There are add-ins that append new capabilities for facilitating investment and engineering computations, doing resource optimization, and running computer simulations to assess the risk associated with various models. The most popular add-ins to 1-2-3 are the ones for turning worksheets into presentation-quality printouts.

SPREADSHEET HISTORY

Few tools have had a greater impact on the management/professional ranks than the microcomputer and the spreadsheet. While the microcomputer has provided an ideal medium for the spreadsheet, it is the spreadsheet which has legitimized the microcomputer as a management/professional tool.

For the genesis of the spreadsheet, one has to only go back a little over a dozen years. Dan Bricklin was a Harvard M.B.A. student slugging his way through hundreds of accounting/financial/budgetary projections and related what-if analyses. He began to visualize a computer program that could be used by nonprogrammers to automate the repetitive aspects of these analyses. Upon graduation, he teamed up with a hot-shot programmer, Bob Frankston. They wrote a spreadsheet program named VisiCalc (an acronym for **Vis**ible **Calc**ulator) for the Apple II computer. After VisiCalc hit the market in 1979, thousands and thousands of financial analysts bought Apples so they could use it. VisiCalc turned Apple from a hobbyist's phenomenon into a major computer company.

Even though competing spreadsheets were introduced, VisiCalc reigned supreme until 1983, the year Mitch Kapor and Jonathan Sachs unleashed Lotus 1-2-3. Within 18 months of its introduction, 1-2-3 sales had exceeded 400,000 copies. By the end of 1990, over 12 million spreadsheet packages had been sold with Lotus having a 60 percent market share. 1-2-3's share of the critical business market has been even higher.

The reasons for 1-2-3's phenomenal success are many. One major factor is timing. In 1981, the IBM PC was introduced. 1-2-3 was the first spreadsheet specifically written to fully take advantage of the many-fold speed and memory advantages of this machine. In 1983, 1-2-3 seemed to be a lightning-fast pro-

gram. It could analyze 10 times larger spreadsheet models. Besides being attracted to its speed and capacity, buyers were drawn to 1-2-3's ease-of-use and its graphics and database capabilities. Two other features that consolidated 1-2-3's hold on the business market were its programming and add-in capabilities.

The original 1-2-3 series (Release 1, 1A, 2, and 2.01) has evolved into two related but separate spreadsheet programs, the most recent releases of which are 2.3 and 3.1. Release 3.1, the firm's flagship product, offers the latest in technological advances from Lotus. The most distinguishing feature of Release 3.1 is its three-dimensional matrix, which is a multipage pad of worksheets. This extra dimension is useful in arranging and processing divisional budgets so that each can be laid out on its own two-dimensional worksheet. Release 3.1, however, requires an IBM compatible microcomputer with a 80286 or higher processor plus over a one megabyte (1M = 1000K) of RAM memory. Release 2.3 runs on any IBM compatible machine with 640K of memory. Highlighting both these latest releases of 1-2-3 are their WYSIWYG (What You See Is What You Get) and file linking features. The WYSIWYG add-in allows you to see font and other presentation features reflected on the screen as they are entered in the spreadsheet and as they will appear in print. File linking facilitates the establishment and use of computational relationships between the worksheet models stored in separate files.

WHAT'S TO COME

This book has six main sections. The first section (Chapters 1 and 2) is introductory. Chapter 2 provides a hands-on tour highlighting some of the fundamental features of 1-2-3 Release 2.01 (hereafter referred to as Release 2), which still remains the most widely used version of 1-2-3. This tour prepares you to read the rest of the book with more understanding and enhances your ability to try the examples in subsequent chapters in a hands-on manner. The second part (Chapters 3–21) systematically examines the features, capabilities, and use of Release 2. Chapter 21 deserves special mention because it contains a compilation of helpful hints spanning the earlier chapters. The third section contains four extended tutorials providing guided practice using selected capabilities of 1-2-3. At a minimum, you should do the Chapter 2 tutorial and read Chapter 11 before you undertake the first tutorial; then Chapter 15, before the second; then Chapter 17, before the third; and finally Chapter 18, before the fourth. The fifth section contains 34 exercises and eight cases designed to further develop your ability to put 1-2-3 into use. At its beginning is guidance as to the level of difficulty of each exercise, the most relevant background chapters, and area of application, which ranges from finance and accounting to operations and general business. The sixth section, comprised of Appendixes A, B, and C, describes additional features of the Lotus Releases 2.2, 2.3, 3.0, and 3.1. Appendix B describes how to use WYSIWYG, a Release 2.3 and 3.1 add-in that permits you to add such presentation-quality features as fonts, shading, and continuous lines to printouts and what you see on your computer screen. WYSIWYG also permits you to perform 1-2-3 and WYSIWYG tasks with a mouse. Appendix A describes how to use the other, new, non-WYSIWYG features of Release 3 and 3.1. Appendix C covers Allways, the presentation enhancement of Release 2.2 that WYSIWYG has replaced.

CHAPTER 2

An Introductory Guided Tour of 1-2-3

When most people become interested in a computer software package like Lotus 1-2-3, they immediately want to try it. This is natural. The purpose of this chapter is to get you using 1-2-3 right away. Trying to learn about a program simply through reading about it is not nearly as effective and efficient as working hands-on with the program as you study the supporting text.

In this chapter you will start Lotus 1-2-3, examine the scope of the worksheet, build a student budget, print the budget, view a graph, and save your work. Those familiar with spreadsheets will recognize that some of the things you will be asked to do are not approached in the most efficient manner. That's all right. This chapter's rationale is not efficiency but general insight into the nature of 1-2-3. Consequently, it is *important* not to try to short cut what you are being asked to do in this tutorial.

FAMILIARIZING YOURSELF WITH THE COMPUTER

Before you can activate 1-2-3, it is necessary to understand a little about microcomputers. Besides the monitor and keyboard, your computer has a system unit that houses such things as the central processing unit (CPU), its RAM memory, and the disk drives. The CPU and its associated RAM memory is where 1-2-3 does its work and where 1-2-3 models are built and analyzed. However, once your computer's power is turned off, whatever is in the CPU and RAM memory is lost unless it has been saved using a disk drive. Today's microcomputers usually have a hard disk and at least one floppy-disk drive.

Floppy-disk drives are used to store your work on removable disks that are portable. They can be used to move your work between micros in computer labs, your dorm, your office, or your home. Floppy disks come in two physical sizes, 3½-inch and 5¼-inch. The 3½-inch size has a rigid case with a sliding metal door which, when opened, exposes the circular disk on which information is stored. With the older 5¼-inch size, the circular disk is enclosed in a nonrigid (hence the name floppy) cover. You should never touch the circular disk, as this can render it useless. Getting food, drinks, and dust on it can do the same. Since information is stored on these disks magnetically, disks must be kept away from magnets. Leaving your disks near a loudspeaker is asking for trouble.

Both 3½-inch and 5¼-inch disks come in two storage capacities, regular (double) density and high density. Regular density 5¼-inch disks can hold up to about 360K (360,000) characters of information; regular density 3½-inch disks, 720K characters; high density 5¼-inch disks, 1.2M (1.2 million) characters; and

high density 3½-inch disks, 1.44M characters. It takes about 1.7 million characters of disk space to store the contents of this book. If you are not sure what kinds of disk drives the computer you are using has, ask your lab assistant/instructor or read the computer's documentation. Be sure to select a disk type compatible with all various machines on which you will be working. For most people, this means using regular density 3½-inch or 5¼-inch disks.

The other type of disk drive is referred to as a hard or fixed drive. It is permanently located inside the system unit. Hard disks have many times the storage capacity of floppy disks and operate many times faster. Many programs require a hard disk to operate. This is true of 1-2-3 Releases 2.2 and higher. Today's microcomputers come with fixed disks that can store 20 to 300 million characters. 1-2-3 Release 3.1 requires over 5 million characters of hard-disk storage.

PREPARING YOUR FLOPPY DISK

Since this book assumes that you will be storing your work on a floppy disk, *you will need to acquire at least one floppy disk and a protective carrying case.* Every semester some of our students, who chose not to use protective cases, pull twisted/smashed/unusable disks out of their packs.

Any new disk needs to be formatted before being used the first time to prepare the disk to magnetically store information. Before formatting your disk, read the next four paragraphs.

If you work at a machine with a menuing system to insulate you from the DOS (Disk Operating System) program, formatting will be easy. Such menuing systems are set up to work as your interactive tutor, prompting you through just the right sequence of events. After turning on the computer, scan the menu choices and pick the one that mentions disk formatting or utilities. If other menus follow, keep making appropriate choices for your type of disk until the message to insert your disk appears on the screen. These messages typically say something like "Insert new diskette for drive A: and press ENTER when ready . . ." or "Insert new disk in drive B: . . . ." The latter message occurs for computers with two floppy-disk drives. When there are two floppy drives, the question is which is the A drive and which is the B drive. Figure 1 illustrates the two ways multiple floppy drives are arranged in microcomputers with the A and B drives notated.

Now continue by properly inserting your floppy disk into the appropriate drive slot. When inserting a disk, make sure the opening or metal door for magnetic surface goes in first with the side with the writing on top. With 5¼-inch drives, there is a handle that also needs to be turned clockwise a quarter turn. Now you are ready to hit the requested **[Enter]** key. After 20 to 50 seconds, formatting will be complete, and you will be asked if you want to give the disk a volume label. Giving the disk an identifying label (e.g., your name) is a good idea. It should be typed in now and before hitting the [Enter] key.

Next, the results of disk-formatting are reported. Make sure the reported total bytes (characters) of storage match the capacity of the type of disk you are using. For example, if you are formatting a regular 3½-inch disk, the reported total storage should be a little over 720,000 bytes. If the figures don't correspond, you have not selected the proper formatting option for your disk. Since this will, at some point in the future, cause grief, you should format the disk again but properly this time. The last thing the formatting procedure asks is whether you want to format another disk. Answer **Y** followed by pressing the **[Enter]** key if you do; otherwise **N** followed by **[Enter]**.

FIGURE 1
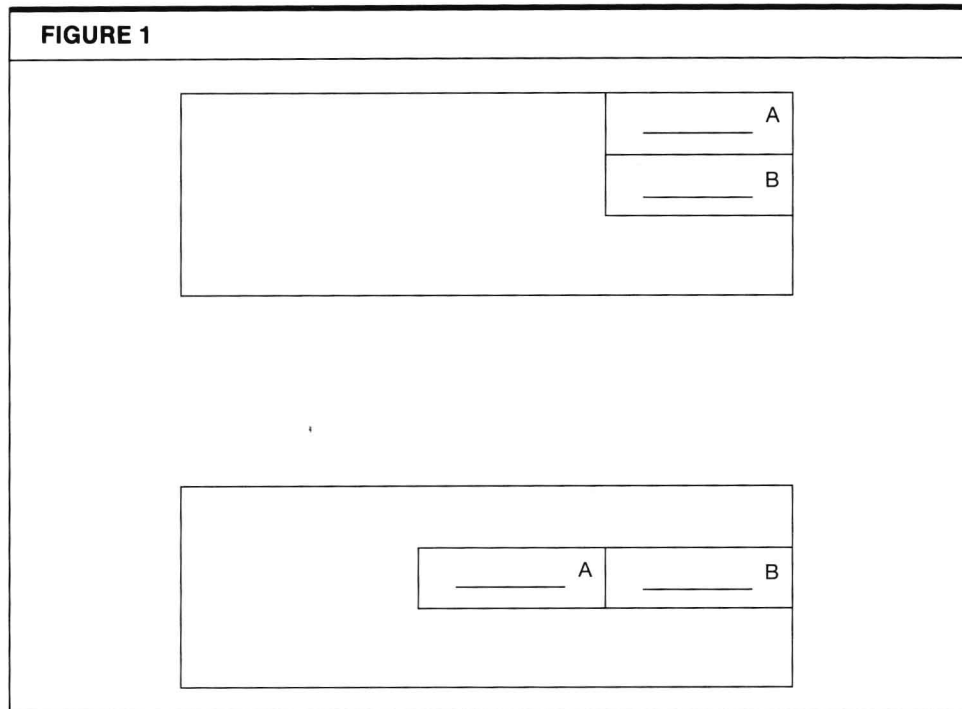
If the machine you are using doesn't have a menuing system for formatting your disks, then you have to issue the appropriate DOS command yourself. The appropriate command depends on the type of disk and drive being used, the drive's A or B designation, and the version of DOS the machine uses. Some disk drives can format both regular and high-density disks; others work for only one of these types. For those drives that can format only one type, you would type **Format A:** or **Format B:** and then hit the **[Enter]** key and follow the on-screen directions described previously. For formatting high-density diskettes in drives that can handle both types, you would do exactly the same as if the drive handled only one capacity of disk. If you want to format a regular-density disk in a 5¼-inch drive designated A that can handle both types, you would type **Format A: /N:9 /T:40** followed by hitting the [Enter] key. For a 3½-inch drive designated A that can handle both types, to format a regular-density disk, you type **Format A: /N:9 /T:80** before striking [Enter]. The same command rules work for the B drive except that the A in the commands is replaced with a B.

If necessary, format your disk now.

ACTIVATING 1-2-3

Since 1-2-3 usually resides on a hard disk with today's computers, this book assumes that this is how you will be using 1-2-3. How to start 1-2-3 from a hard disk depends on how the computer is set up. Many computers have a menuing system for accessing all resident programs like 1-2-3. If this is the case, you would use the arrow keys to highlight 1-2-3 as the program you wish to use, followed by hitting the [Enter] key.

If the computer doesn't have a menuing system, you are going to have to tell DOS to access the directory (section of the hard disk) in which Lotus 1-2-3 resides. 1-2-3 is usually stored in a directory named "123" or "Lotus". The