



DATA PROCESSING

*second edition*

COMPUTERS IN ACTION

Edwards and Broadwell

Wadsworth International Student Edition



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# DATA PROCESSING

*Second edition*

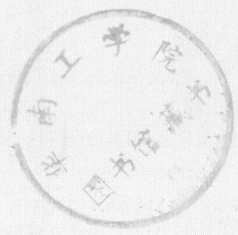
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## COMPUTERS IN ACTION

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Perry Edwards and Bruce Broadwell  
Sierra College



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To our wives, Kathleen and Celia, and to our children, Marcella, Lyman, James, Rosalie, Jennifer, Sarah, and Benjamin, who went with unanswered questions and unfinished chores, but who gave us encouragement and shared in our efforts.

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# PREFACE

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## TO THE INSTRUCTOR

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### Approach

*Data Processing: Computers in Action*, 2d edition, is designed for introductory data processing and information systems courses. It is written for students who have no prior knowledge of computing concepts, terminology, or programming languages. Its organization into modules allows maximum flexibility for use in courses of differing emphasis and organization.

With so many introductory computing texts already on the market, writing yet another might seem like processing another IBM card. However, we feel our book offers many unique features that can improve students' learning.

In hardware/software books, the opening chapters often present the history of computing. However, we decided to spread this material throughout the text so that the history can be linked to specific topics. Consequently, not only do students remember the history better (because they see how it fits in), but they also can be introduced immediately to contemporary, state-of-the-art topics.

Many textbooks treat programming in an "either/or" fashion—it is either stressed at the expense of other topics or virtually ignored. In contrast, we combine student-written programs with class material to make both more interesting and

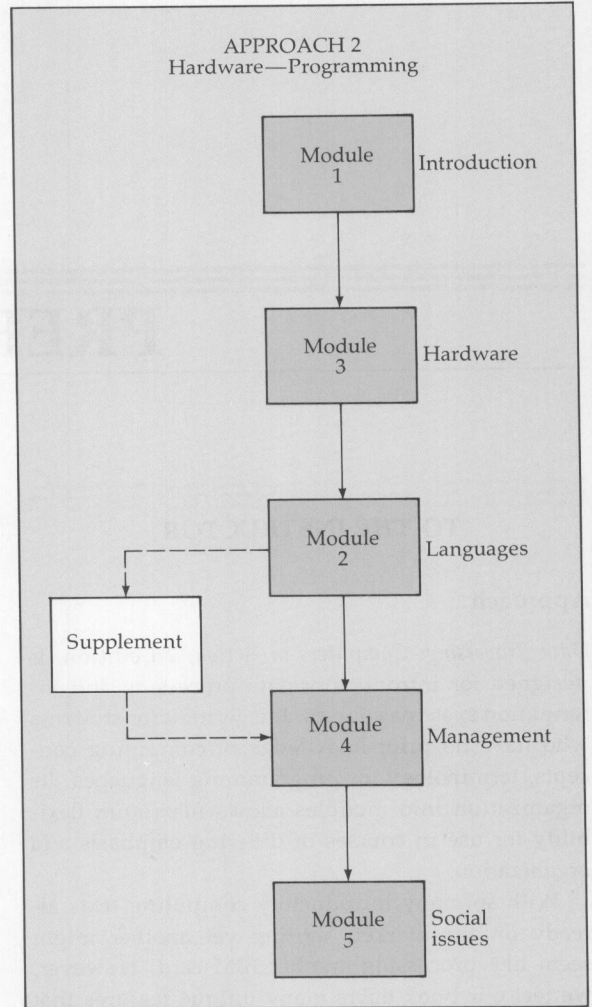
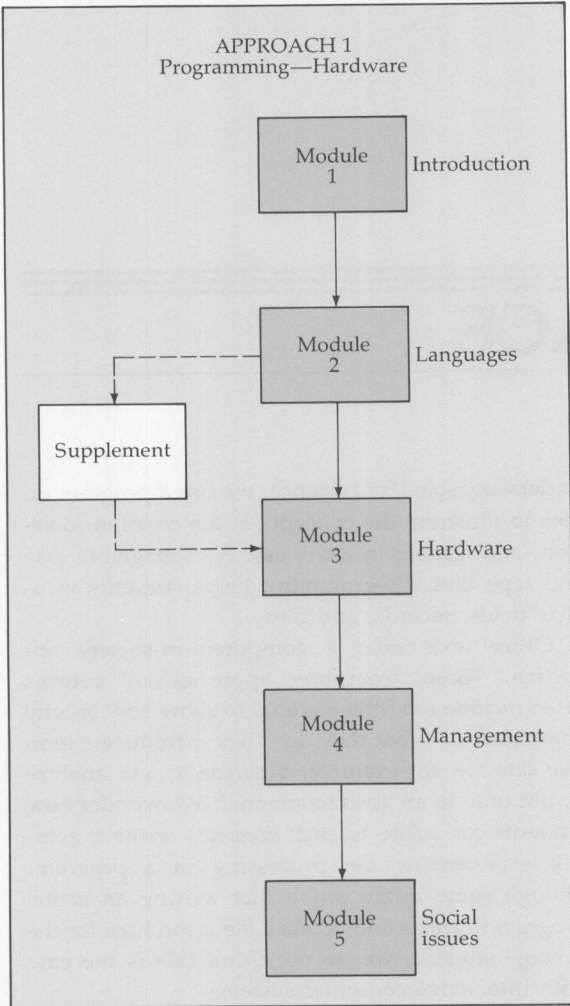
understandable. For instance, we use a program on files to illustrate the concepts of file creation, deletion, and update in a discussion of magnetic disk and tape files. Programming helps students visualize fields, records, and files.

Other texts offer a computers-in-society approach. These "computer appreciation" courses often include too little material to show how or why computers do what they do. They introduce a term like *data file*, for example, describe it, and analyze it, but only in an abstract manner. We wonder how students can relate to such concepts without actually experiencing file processing in a program. Though some might argue that writing an actual program to create and access a file is too hard for the average student, we do not think this is the case with interactive computer systems.

In essence, our approach combines the general study of the computer with a study of a specific language, so that students experience a sense of immediacy and learn about the computer directly. This has given our students the perspective and background to understand what computer use is really all about.

### Organization

The text is divided into six modules: Introduction, Language, Hardware, Management, Social Issues, and four supplements, including a group of problems for programming. Since everyone teaches differently, we have written the modules and many



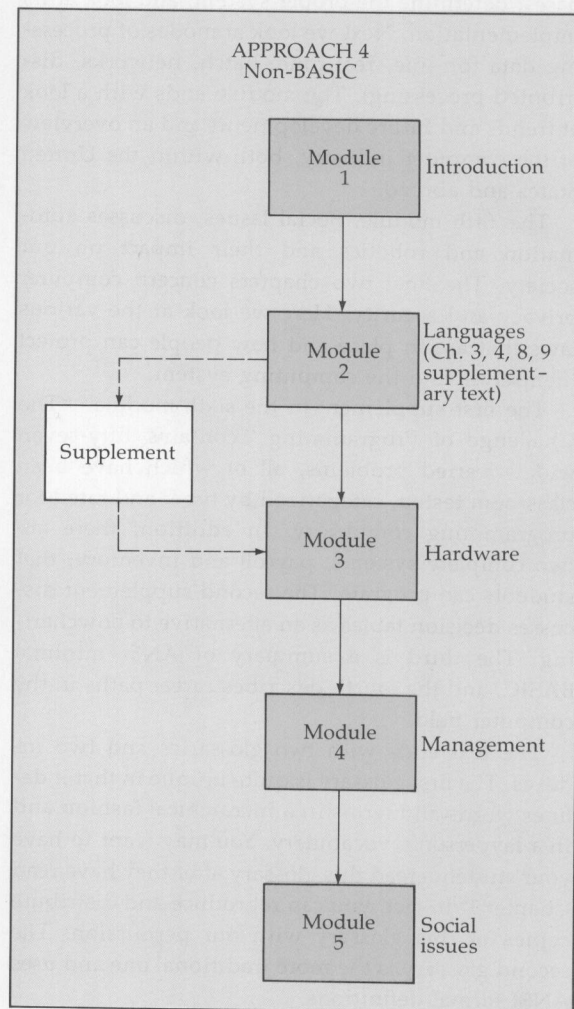
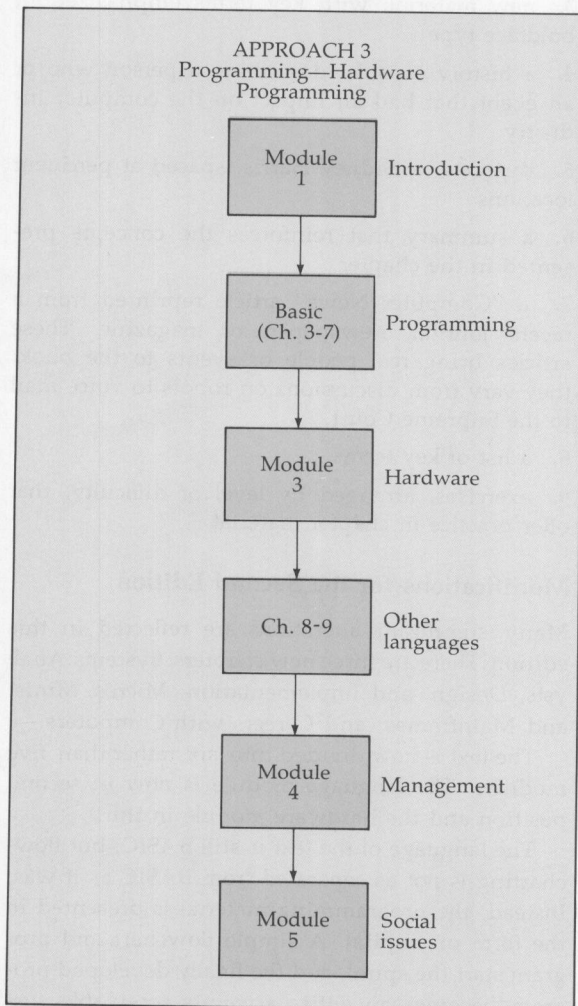
of the chapters to be used independently. Thus, you can “customize” our book to fit your favorite course structure and emphasis. If you believe that programming should be taught first, you might assign the chapters as shown in Approach 1, above left on this page. If you want to present hardware first and programming second, you might use the modules as shown in Approach 2. If you like to mix the two approaches (as we do), see the pathway through the text shown in Approach 3. Approach 4 shows you how you can use a language other than BASIC with our book. Other approaches are possible, and the

module concept gives you the flexibility to develop your own.

The first module, Introduction, establishes the essential terms, definitions, and concepts. It also discusses how computer systems retrieve and process data.

The second module, Language, covers flowcharting, Job Control Language (JCL), BASIC, and an overview of FORTRAN 77, COBOL 74, RPG-II, Pascal, and PL/1. We have programmed a single application in each language to show students how the languages differ. We use a VISA statement as the





common example because so many people use this credit card system.

We emphasize BASIC because of its wide availability and its popularity on time-sharing, small business, and personal computers. Also, students can learn to use BASIC easily and quickly, thus rapidly gaining a positive first-time computer experience. The modular organization of our book does not mandate BASIC as the language, however. If you want to substitute FORTRAN, COBOL, Pascal, or RPG-II for BASIC, simply choose a supplementary text and use it in place of the BASIC mate-

rial. The flowcharting chapter is designed to allow this substitution easily.

The third module, Hardware, concerns data processing equipment and functions. It explains how people enter data into the computer, how the computer stores, processes and outputs data, and how data are stored on external file devices. We also compare the various types of processors: micros, minis, and mainframes.

The fourth module, Management, begins with a study of a real system. We analyze the alternatives, design reports, calculate costs, study various data

bases, determine the proper system, and look at its implementation. Next we look at modes of processing data (on-line, real-time, batch, networks, distributed processing). The module ends with a look at trends and future developments and an overview of the computer industry, both within the United States and abroad.

The fifth module, Social Issues, discusses automation and robotics and their impact on our society. The final two chapters concern computer privacy and security. Here we look at the various laws that are in place and how people can protect themselves and the computing system.

The first supplement in the sixth module, "The Challenge of Programming," contains fifty-seven widely varied problems, all of which have been classroom tested, categorized by type, and rated for programming complexity. In addition, there are two complete systems, payroll and inventory, that students can program. The second supplement discusses decision tables as an alternative to flowcharting. The third is a summary of ANSI minimal BASIC, and the fourth describes career paths in the computer field.

The text ends with two glossaries and two indexes. The first glossary is quite unique in that it defines words and terms in a hierarchical fashion and in a layperson's vocabulary. You may want to have your students read this glossary after they have read Chapter 1. In fact, you can reproduce and distribute copies of this glossary with our permission. The second glossary is the more traditional one and uses ANSI formal definitions.

The Index of Business Applications lists the pages where a certain business term, for example, *payroll*, is discussed. The second index uses boldface page numbers to allow you to locate the definition of a term in context and to find it in the body of the text.

#### Features

Each chapter offers a rich assortment of teaching and learning devices:

1. a chapter outline, giving chapter content at a glance
2. a preview that introduces the topics to be discussed

3. new material, with key terms emphasized in boldface type
4. a history capsule, describing a person who or an event that had an impact on the computer industry
5. cartoons by Sidney Harris, spaced at pertinent locations
6. a summary that reinforces the concepts presented in the chapter
7. a "Computer News" article reprinted from a recent journal, newspaper, or magazine. These articles bring real people or events to the book; they vary from discussions on robots to voice mail to the Supreme Court.
8. a list of key terms
9. exercises, arranged by level of difficulty, that offer practice in chapter material

#### Modifications for the Second Edition

Many significant alterations are reflected in this edition. There are three new chapters: Systems: Analysis, Design, and Implementation; Micros, Minis, and Mainframes; and Careers with Computers.

The text is now divided into six rather than five modules. The language module is now in second position and the hardware module in third.

The language of the text is still BASIC, but flowcharting is not as separated from BASIC as it was. Instead, the programming material is presented in the form of a spiral. A simple flowchart and program start the spiral, and the finally developed program becomes an entire accounts receivable system. It starts with a data capture/validation program and ends with a master file update program that prints a statement almost identical to the real one used by VISA. Programming structure, style, and documentation are stressed throughout this section of the book.

General updating of all topics is a must in a new edition. You will find new material on Pascal, robotics, data communications, microprocessors, minicomputers, and structured programming.

Some material has been deleted, mostly in the areas of punched input/output devices, core storage, and internal memory codes (6 and 7 bit).

Some additional features have been developed for the second edition. There are twenty-two CAI programs you can use to reinforce the vocabulary of each chapter. The Challenge of Programming Supplement has two spirals, payroll and inventory control, which parallel the VISA accounts receivable spiral. You can have your students program in a spiral similar to the one in the text. Lastly, a computerized test bank of over one thousand multiple choice questions is available. As an adopter of the text you need to contact Wadsworth Publishing Company, 10 Davis Drive, Belmont, CA 94002 to make arrangements to use this system.

### Teaching and Learning Aids

To accompany the text we have an instructor's manual and a student study guide. For each chapter the instructor's manual includes:

1. Behavioral objectives
2. A summary
3. Teaching suggestions
4. Answers to end-of-chapter exercises
5. Multiple choice and true/false questions
6. Overhead transparency masters
7. CAI vocabulary testing programs

The student study guide is written by William L. Harrison (Oregon State University) and produced by P.S. Associates. For each chapter the study guide includes:

1. Chapter objectives
2. A synopsis
3. Self-evaluation questions and a review of terminology
4. A short-answer integrative problem
5. A self-test

### Acknowledgments

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Without support from our families we never would have made it. Many hours that could have been spent with them were sacrificed toward the creation of this book. Our acknowledgment of them should have come first, not last.

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## TO THE STUDENT

Among today's fastest changing fields are electronics and computers. To realize how fast they are changing, think back to the early 1970s when a handheld calculator was physically the size of this book, cost around \$100, and could only add, subtract, multiply, and divide. Today a four-function calculator is small enough to fit inside a wrist watch (and still have the watch, too) and may cost as little as \$3.50. In fact, the size of the calculator depends more on the size of the buttons we humans need to push than on the electronic needs of the calculator itself.

Change is a big part of our lives and computers are one reason why. We believe you should realize the capabilities and limitations of computers. We have tried here to give you knowledge on which to base a philosophy of the computer's role in business

and society. This same knowledge should also give you insight into the impact of the computer in helping to shape society's future.

This course will bring you some skills and techniques in problem solving that can be transferred to other disciplines and to your everyday life. You will see how simple and logical you must be when trying to get the computer to do something. You will be forced to consider every possible alternative the computer will encounter, and plan for it.

Most colleges offer computer courses more advanced than the one you are now taking. This book will prepare you for advanced courses in computer science or data processing if you choose to take them.

Besides a computer philosophy, some insight, and technical skills, you will also receive an historical perspective of the social and technological state of the art. Since the first commercial computer was installed in the early 1950s, the history is brief, but it is also very significant.

One final word before you turn to Chapter 1 and begin your study of an exciting and unique field. We believe you will learn the most by doing. We do not think you will fully grasp the concepts in this book unless you get involved with computers. That may mean solving a problem wrong sometimes, but you can learn from that experience, too. When you write a program you will inevitably make mistakes. Just remember that only you and the computer know of these mistakes, and the computer can't tell anyone.

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