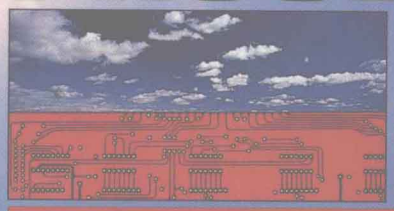
COMPUTERS AND DATA PROCESSING TODAY



with BASIC Second Edition

Steven L. Mandell

COMPUTERS AND DATA PROCESSING TODAY

with BASIC Second Edition

Steven L. Mandell
Bowling Green State University

West Publishing Company
St. Paul ■ New York ■ Los Angeles ■ San Francisco

COPY EDITOR: Elaine Linden
ILLUSTRATIONS: John Foster, Dave Pauly, Barbara Barnett
COMPOSITION: Parkwood Composition, Inc.
COVER PHOTOS: Background photo of sky, Four By Five, Inc.; upper right photo, Michel Tcherevkoff, The Image Bank; lower left photo, Rob Atkins, The Image Bank.

Photo credits appear following the index

A study guide has been developed to assist you in mastering concepts presented in this text. The study guide reinforces concepts by presenting them in condensed, concise form. Additional illustrations and examples are also included. The study guide is available from your local bookstore under the title *Study Guide to Accompany Computers and Data Processing Today* **Second Edition**, prepared by Steven L. Mandell.

COPYRIGHT © 1983 WEST PUBLISHING COMPANY
COPYRIGHT © 1986 By WEST PUBLISHING COMPANY
50 West Kellogg Boulevard
P.O. Box 64526
St. Paul, MN 55164-1003

All rights reserved
Printed in the United States of America

Library of Congress Cataloging-in-Publication Data
Mandell, Steven L.
Computers and data processing today with BASIC.

Includes index.
1. Electronic data processing. 2. Electronic digital computers. 3. BASIC (Computer program language) I. Title.
QA76.M27475 1986 004 85-17769
ISBN 0-314-96079-1

THIS BOOK IS DEDICATED TO
ALL OF THE PEOPLE AT
WEST PUBLISHING COMPANY

COMPUTERS AND DATA PROCESSING TODAY

此为试读,需要完整PDF请访问: www.ertongbook.com

PREFACE

The revision work associated with this edition has been one of my most enjoyable and rewarding efforts. Feedback from instructors using the text has provided an excellent source of ideas for improvement. Nothing can replace the actual classroom testing of material when attempting to create a new edition. The final result is a new, second edition of a textbook vastly improved in structure and substance.

NEW FEATURES

Readers familiar with the first edition of the text will notice several changes incorporated into the second edition. These changes include the following:

- Three new chapters: Data Structures and File Design; Microcomputers; Application Software.
- New appendix on Numbering Systems
- Computers in Our Lives—short, high-interest, student-oriented applications which open each chapter
- Marginal Definitions
- Concept Summaries
- Computers Illustrated—thematic photo essays dealing with creativity, entertainment, research and technology, human performance and the quality of life
- Restructuring of chapters to provide greater flexibility
- Newly developed software support
- Updated and revised "Highlights"
- Updated and revised "Focus on Microcomputers"

In the last few years, there has been an explosion in the number of students taking beginning courses in computers and data processing. This explosion has resulted in the need for a wide variety of books and teaching materials. The goal of this book is to provide an introductory text that is concise while maintaining clarity and teachable style. I believe that this book continues my philosophy of presenting the educational material in a logical, uncluttered manner while including relevant real-world examples. Additionally, by virtue of its full-color format and extensive use of graphics, I believe this book is one of the most visually appealing introductory computer books yet published. The book remains modular and flexible so that an instructor may reorder the topics according to his or her approach.

The basic pedagogical format found in this book is designed to aid in the clear, straightforward presentation of the material, while including motivational real-world examples. Each chapter begins with "Computers in Our Lives" which describes how computers are used in areas familiar or fascinating to students. Next is a brief introductory section that provides a logical link with the previous material. The chapter outline that follows permits the student to develop a frame of reference for the text material. This outline also provides a useful guide when preparing for exams. At the conclusion of the chapter material, there is a point-by-point summary in sentence form followed by approximately ten review questions.

Two additional features in the pedagogical design warrant special attention, and are also related to the title of this book, *Computers and Data Processing Today*. Several Highlight boxes are included in each chapter that present material of current interest. They are designed to be motivational and entertaining, while at the same time providing current perspectives that enrich the book's content.

Secondly, because of the tremendous proliferation of microcomputers today, it became apparent that adequate attention had to be devoted to their special requirements. This arose both from my own teaching experience as well as from comments received from instructors all around the country. The decision was made to include separate chapters on microcomputers and application software as well as to integrate microcomputer information throughout the book in the "Focus on Microcomputers" section at the end of each chapter. This section integrates microcomputer concepts and applications into the material discussed in that particular chapter. This combination should prove to be valuable for students entering a "micro world."

In addition to the new appendix, "Numbering Systems," we have again included "Career Opportunities," to give students a practical insight into computer-related careers. The importance of good flowcharting techniques can never be underestimated. This was also made clear to me in reviews of the text. Therefore, the flowcharting material presented in the text and in the BASIC/Pascal supplements is augmented through the use of a separate appendix entitled "Program Logic Flowcharts and Decision Logic Tables." Individuals with courses utilizing a computer language laboratory will find this addition provides significant flexibility in teaching program design. Finally, at the end of the text is a comprehensive glossary and a separate index.

In order to provide appropriate materials for the widest variety of teaching situations, there are three versions of this book available—first, a version with a very complete BASIC language supplement with microcomputer implementation; second, a version with a standard Pascal supplement; and finally a language-free version.

SUPPLEMENTARY EDUCATIONAL MATERIAL

The *Study Guide* to accompany this text includes numerous materials for student reinforcement. Each chapter in the *Study Guide* contains the following: Key Terms; a narrative Summary of the chapter; a Structured Learning section; and an extensive set of questions and answers (True/False, Matching, Short

Answers). The format for the student materials supporting the language supplements is slightly different. For each section in the language supplement the *Study Guide* includes Structured Learning, a Worksheet, and Programming Problems.

A complete instructor's resource package has been designed to reduce administrative efforts. In the *Instructor's Manual,* the classroom support includes: Learning Objectives, detailed Outlines, Answers to Review and Discussion Questions, Additional Review and Discussion Questions and an Answer Key to the *Study Guide.* Extensive materials have been included for language versions of this text. For each section in the language supplement, there is an average of four programming problems; each problem in the BASIC supplement is accompanied by a flowchart and a list of any differences for microcomputers.

A Test Bank of over 1,000 multiple choice questions is also included in the *Instructor's Manual.* In addition, the WESTEST or MICROTEST computerized testing service is available from West Publishing Company with these questions in machine-readable form.

There are 100 Transparencies (25 in color) available to qualified adopters. Most of these visuals are unique, and not mere reproductions of artwork found in the text. Additionally, a narrative script of a tour of a modern computer facility augments a set of color slides available to adopters from West Publishing Company.

In keeping with the extraordinary growth of microcomputers and application software, two software packages are available to qualified adopters of this text. The first package consists of an educational version of a word processor, electronic spread sheet, data manager, and graphics package. This software is available for a number of microcomputers providing hands-on experience and guidance with these four popular types of application packages. These instructional packages will acquaint students with the basic concepts of commercial software packages in a simple, easy-to-follow format. The second software package includes five hands-on projects to get the students involved with using simulated home banking, an information network, computerized ticket purchasing, a psychological traits analysis package, and a dental office data base. A *Users Guide and Laboratory Workbook* accompanies both software packages and includes numerous exercises for the four application programs and the five user oriented programs.

Also available is WestTutor™, a computer-assisted instruction package developed from the BASIC Supplement of the textbook. Instructions are provided at the bottom of each screen to direct the student through the tutorial. Instructions are also provided for the instructor.

ACKNOWLEDGMENTS

I wish to thank the people who helped shape the first edition of this text through their comments, criticisms and suggestions: Don Cartlidge, New Mexico State University; James W. Cox, Lane Community College, Oregon; Richard H. Harms, Santa Ana College, California; Fred L. Head, Cypress College, California; Kathleen Ott, New Mexico Junior College; Curtis G. Rawson, Kirkwood Community College, Iowa; Al Stehling, San Antonio College; Rein Turn, California State University, Northridge; Kenneth W. Veatch, San Antonio College; Louis A. Wolff, Moorpark College, California.

In preparation of this second edition, the following people provided invaluable comments based on their experience using COMPUTERS AND DATA PROCESSING TODAY:

Professor Beverly Blaylock
Grossmont College, California
Bruce A. Boraas
Mankato State University, Minnesota
Marvin L. Daugherty
Indiana Vocational Technical College
Robert M. Denmark
Seaton Hill University, New Jersey
Orlynn R. Evans
Stephen F. Austin State University, Texas
Lorinda Hite
Owens Technical College, Ohio
Kaila Katz
Montclair State College, New Jersey
Raymond C. Marves
Florida Junior College
Thomas A. Parkinson
Oakland Community College, Michigan
Leesa Pohl
Park College, Missouri
R. B. Purse
University of Regina/Canada
Richard G. Schenck
Antelope Valley, California

Many individuals and companies have been involved in the development of the material for this book. Numerous corporations and government agencies provided the color pictures found in this book in addition to applications material. Many professionals provided the assistance required for completing a text of this magnitude: Sarah Basinger, Laura Bores, Susan Moran, and Robert Szymanski on student material; Allan Johnson on instructor material; Sue Bauman with Pascal and Karen McKee with BASIC; Russell Thompson on software development; Meredith Flynn and Norma Morris on manuscript development; and Shannan Benschoter, Ann Bressler, Linda Cupp, Melissa Landon, and Sally Oates on manuscript preparation. The design of the book is a tribute to the many talents of William Stryker. One final acknowledgment goes to my publisher and valued friend, Clyde Perlee, Jr., for his encouragement and ideas.

Steven L. Mandell

CONTENTS

COMPUTERS IN OUR LIVES: Stevie's Wondrous Computers 2

Chapter Outline 3

Introduction 3

Computers in Business 3
HIGHLIGHT: Help for Managers 4
Banking 4
Manufacturing 5
Office Electronics 7
CONCEPT SUMMARY 1–1: Computers in Business 9

Computers in Government 10
HIGHLIGHT: Computers and Recreational Aesthetics 12
HIGHLIGHT: Monitoring Chemical Spills 14

Computers in Medicine 14

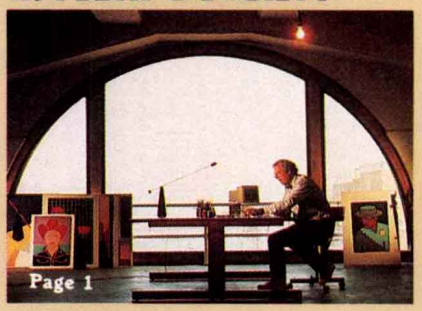
Education 16
HIGHLIGHT: Encendiendo Una Llama! 17
CONCEPT SUMMARY 1–2: Privacy Legislation 18
HIGHLIGHT: Bring on the Band, Switch on the Synthesizer 19

Behavioral Aspects of Computer Use 19
Privacy 19
Computer Crime 22
FOCUS ON MICROCOMPUTERS: A Chicken in Every Pot and a Microcomputer on Every Desk 24

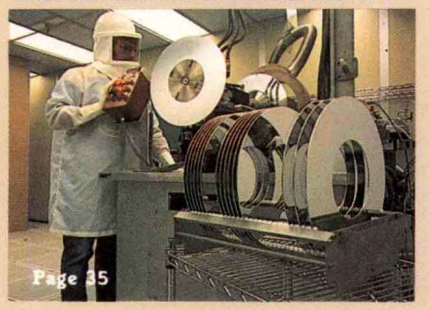
Summary Points 26
Review and Discussion Questions 27

COMPUTERS ILLUSTRATED: Enhancing Creativity and Entertainment 29

CHAPTER 1
THE ROLE OF COMPUTERS IN TODAY'S SOCIETY



CHAPTER 2
COMPUTER EVOLUTION



COMPUTERS IN OUR LIVES: Going for the Gold with Computers 36

Chapter Outline 37

Introduction 37

Early Mechanical Devices 38
The Pascaline 38
The Punched Card Concept 39
HIGHLIGHT: Augusta Ada Bryon, Countess of Lovelace 41

Early Developments in Electronic Processing 42
HIGHLIGHT: Alan Turing and the Enigma 45

The Fifties: Pioneers in the Industry 46
CONCEPT SUMMARY 2–1: Motivations for Data Processing Developments and the Machines that Resulted 47
HIGHLIGHT: Old Computers Don't Die; They Just Sto(re) Away! 48

The Early Sixties: Innovators 51

The Late Sixties: Technology Trend Setters 54

The Seventies and Eighties: Entrepreneurs 56
CONCEPT SUMMARY 2–2: Characteristics of Each Computer Generation 58
HIGHLIGHT: This Is a Personal Computer? 59
HIGHLIGHT: The Hackers 60
CONCEPT SUMMARY 2–3: People and Computer Development—Pioneers, Innovators, Trend Setters, Entrepreneurs 62
FOCUS ON MICROCOMPUTERS: Innovators in the Micro World 63

Summary Points 65
Review and Discussion Questions 67

此为试读，需要完整PDF请访问：www.ertongbook.com

COMPUTERS IN OUR LIVES: Superforecasts 70

Chapter Outline 71

Introduction 71

Digital and Analog Computers 71

Computer Functions 72
HIGHLIGHT: Intrigue and the Superchip 73

Data Processing 74
CONCEPT SUMMARY 3–1: Processing Functions 77

The Role of Computers in Processing Data 78
HIGHLIGHT: Static Can Zap a Microprocessor! 82
Input and Input Devices 82
Central Processing Unit 83
HIGHLIGHT: The British Chip 86
Output and Output Devices 88

Types of Primary Storage 88

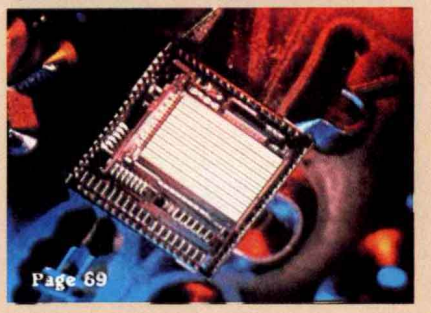
Data Representation 92
CONCEPT SUMMARY 3–2: RAM and ROM 93
Binary Representation 93
HIGHLIGHT: The Clean Room 94
Octal Number System 95
HIGHLIGHT: Easy-to-Do Conversion 96
Hexadecimal Number System 97
Computer Codes 99
Code Checking 100
FOCUS ON MICROCOMPUTERS: How Much Power Does a Micro Need? 101

Summary Points 103
Review and Discussion Questions 105

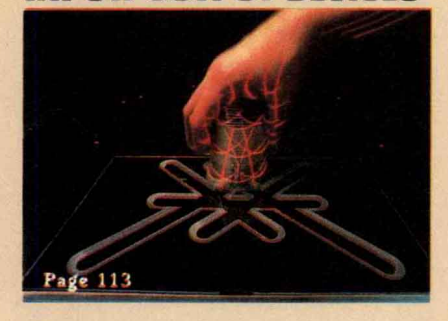
COMPUTERS ILLUSTRATED: Enhancing Research and Technology 107

CHAPTER 3

DATA PROCESSING AND COMPUTER HARDWARE



CHAPTER 4
INPUT/OUTPUT DEVICES



COMPUTERS IN OUR LIVES: Technology Talks 114

Chapter Outline 115

Introduction 115

Punched Cards 115

Key-to-Magnetic Media 117

Source-Data Automation 118
HIGHLIGHT: The Songwriter's Helper 119
Magnetic-Ink Character Recognition 119
Optical Recognition 120
Remote Input 122
HIGHLIGHT: Jeans and Beams 123
HIGHLIGHT: Psychiatric Programming 124
CONCEPT SUMMARY 4–1: Types of Input 124

Printers 125
Impact Printers 126
Nonimpact Printers 128
HIGHLIGHT: Computers and Sports 130

Special-Purpose Input and Output 131
Visual Display Terminals 131
CONCEPT SUMMARY 4–2: Impact and Nonimpact Printers 131
Plotters 132
HIGHLIGHT: Liquid Crystal Display 133
Computer Output Microfilm 134
Voice Input and Output 135
Graphics Tablets 135
Spatial Digitizer 135
CONCEPT SUMMARY 4–3: Special Purpose Input and Output 136
Touch Screen 136
Mouse 136
FOCUS ON MICROCOMPUTERS: Input and Output 137

Summary Points 139
Review and Discussion Questions 139

COMPUTERS IN OUR LIVES: Interactive Multi-Media Graphics 142

Chapter Outline 143

Introduction 143

Classification of Media 143

Sequential-Access Media 143
Magnetic Tape 143
CONCEPT SUMMARY 5–1: Magnetic Tape 148
Cassette Tape 148
HIGHLIGHT: Computer Decorating 149

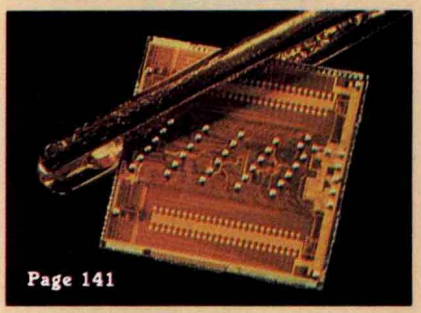
Direct-Access Media 150
Magnetic Disks 150
HIGHLIGHT: Computers Blend the Old and the New 153
Floppy Disks 154
CONCEPT SUMMARY 5–2: Magnetic Disks 154
HIGHLIGHT: Nutrition on a Disk 156

Mass Storage 156

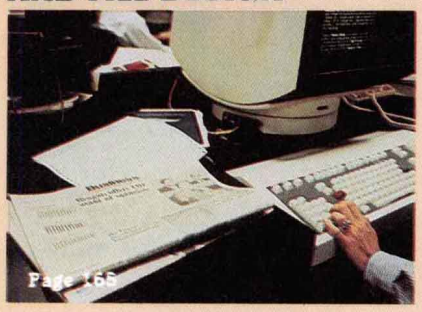
Trends in Data Storage 157
Charge-Coupled Devices 157
Laser Technology 157
HIGHLIGHT: A New Job for an Old Disk 158
RAM Disks 159
HIGHLIGHT: Powerful Duo 160
Josephson Junction 160
FOCUS ON MICROCOMPUTERS: Data Storage 162

Summary Points 163
Review and Discussion Questions 164

CHAPTER 5
STORAGE DEVICES



CHAPTER 6
DATA STRUCTURES AND FILE DESIGN



COMPUTERS IN OUR LIVES: Data Base to the Rescue 166

Chapter Outline 167

Introduction 167

Data Structures 167
- Hierarchical Data Structures 167
- Network Data Structures 168
- Relational Data Structures 170
- Logical Organization of Data 170

CONCEPT SUMMARY 6–1: A Comparison of Data Structures 171

File Design 173
- Logical Records 173

HIGHLIGHT: Caltrans, Intelligent Traffic 175
- Methods of File Access 175
- Logical File Designs 176

HIGHLIGHT: A Dating Service for Horses 186
CONCEPT SUMMARY 6–2: Comparison of File Designs 187
HIGHLIGHT: Data Base Corrals Rustlers 189
HIGHLIGHT: Data Bases Create Security Problems 191
FOCUS ON MICROCOMPUTERS: Data Security for Microcomputers 192

Summary Points 194
Review and Discussion Questions 195

COMPUTERS IN OUR LIVES: Commuting by Computing 198

Chapter Outline 199

Introduction 199

Communication Channels 199

Message Transmission 200
Modes of Transmission 201
Speeds of Transmission 201
HIGHLIGHT: Is Faster Better? 203
Software for Transmission 203
HIGHLIGHT: In the Movies 204
Grades of Transmission 205
CONCEPT SUMMARY 7–1: Message Transmission 205

Multiplexers and Concentrators 205

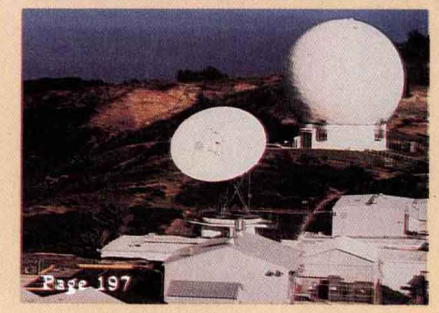
Programmable Communications Processors 206

Networks 206
HIGHLIGHT: Legal Beagles Use Electronic Mail 208
Architecture 209
HIGHLIGHT: Electronic Copyrights 211
Distributed Computing 212

Satellite Communication Systems 215
HIGHLIGHT: Home Banking 216
Current Satellite Usage 216
CONCEPT SUMMARY 7–2: Network Architecture 217
FOCUS ON MICROCOMPUTERS: Communication Networks 218

Summary Points 219
Review and Discussion Questions 220

CHAPTER 7
DATA COMMUNICATION



CHAPTER 8
COMPUTER SYSTEMS

COMPUTERS IN OUR LIVES: Supercomputers and Super Chess Players 224

Chapter Outline 225

Introduction 225

Minicomputers 225
Characteristics 225
Applications 226
Vendor Support 227
HIGHLIGHT: Micros Outshine Minis 229
HIGHLIGHT: Infoshare Networks Micros and Minis 230

Mainframe Computers 230
Characteristics 230
HIGHLIGHT: Parke-Davis and Easytrac Data-Base Access 232
HIGHLIGHT: Schwinn Modernizes with Mainframes 233
Applications 233
Vendor Support 234

Supercomputers 234
Characteristics 234
Applications 235
CONCEPT SUMMARY 8–1: Comparison of Computer Systems 235
HIGHLIGHT: Supercomputer Market Growth Predicted 237

Software 237
Vendor Support 237
Market Trends 238
CONCEPT SUMMARY 8–2: Needs Met by Time-Sharing Services and Service Bureaus 238

Service Bureaus and Time-Sharing Companies 239

Management Perspectives on Computer Systems 239
FOCUS ON MICROCOMPUTERS: Micro to Mainframe—New Problems 241

Summary Points 243
Review and Discussion Questions 244

此为试读，需要完整PDF请访问：www.ertongbook.com