

COMPUTING ESSENTIALS

Timothy J. O'Leary • Linda I. O'Leary

Annual Edition 1994–1995

To Richard D. Raymond—T.J.O. Kenneth L. Hoving—L.I.O.

McGraw-Hill Computing Essentials Annual Edition 1994-1995

Copyright © 1994, 1993, 1992, 1991, 1990, 1989 by McGraw-Hill, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without prior written permission of the publisher.

2 3 4 5 6 7 8 9 0 BAN BAN 9 0 9 8 7 6 5 4

ISBN 0-07-048984-X

See Illustration Credits on page 315. Copyrights included on these pages by reference.

Sponsoring editor: Roger Howell
Production director: Jane Somers
Production supervisor: Richard DeVitto
Project manager: Greg Hubit, Bookworks
Text and cover designer: Christy Butterfield

Illustrators: Erik Kroha, Caliber Design; GTS Graphics

Photo researcher: Darcy Wilding Compositor: GTS Graphics

Printer and binder: Banta Company

Information has been obtained by Mitchell McGraw-Hill from sources believed to be reliable. However, because of the possibility of human or mechanical error by our sources, Mitchell McGraw-Hill, or others, Mitchell McGraw-Hill does not guarantee the accuracy, adequacy, or completeness of any information and is not responsible for any errors or omissions or the results obtained from use of such information.

About the Authors

Timothy J. O'Leary has been a professional educator since 1975. He is a professor in the Department of Decision and Information Systems at Arizona State University. He has written several books and articles on computers and information systems.

Linda I. O'Leary is a professional trainer in the area of computers. She has developed computer training manuals for corporations and presented seminars on a wide variety of applications programs.



Preface to the Instructor

This book is designed for students in an introductory computer or microcomputer course. It assumes no prerequisites.

Our Purpose: To Create Computer Competency

This book is intended to give students competency in computer-related knowledge and skills to support their academic pursuits and be of immediate value to their employers. Our goal is to prepare students to be:

- Microcomputer-literate—able to employ microcomputers to increase their productivity and effectiveness.
- Familiar with commercial software—especially word processing, spreadsheet, and database management packages.
- Grounded in fundamental concepts—a basic working vocabulary and knowledge of computing and information concepts.

Distinguishing Features and Benefits

Key Feature #1: Flexibility The modular design provides instructors with many opportunities to meet their particular course objectives. There are four standard book formats:

- **Text Only.** *McGraw-Hill Computing Essentials: Annual Edition 1994–1995* in 14 brief chapters describes basic computer and information concepts.
- Labs Only. *McGraw-Hill Microcomputing Labs: Annual Edition* is available in three configurations of software application labs. Each is spiral-bound for convenient use in a lab setting. *Edition A* includes DOS 3.3 6.0, WordPerfect 5.1, Lotus 1-2-3 Release 2.3, and dBASE IV Version 1.1. *Edition B Revised* includes DOS 3.3 6.0, WordPerfect 5.1 Revised, Lotus 1-2-3 Release 2.2 Revised, and dBASE III PLUS Revised. *Edition C* includes DOS 3.3 6.0 WordPerfect 6.0 for DOS, Lotus 1-2-3 Release 2.4, and dBASE IV 1.1/2.0
- **Text Plus Labs.** McGraw-Hill Microcomputing: Annual Edition 1994–1995 is a spiral-bound combination of the Computing Essentials text and Labs Edition C.
- Custom-Bound Version (New!!). With this option, you can "mix and match." Mix any combination of modules to match your course needs. The modules listed below can be arranged in any order, and spiral-bound to form a "Custom-Bound Version" for your course.

DOS 5.0 Lotus 1-2-3 Release 2.4 Lotus 1-2-3 Release 2.3

Windows 3.1 Lotus 1-2-3 Release 2.2 Revised

WordPerfect 6.0 for Windows
WordPerfect 6.0 for DOS
WordPerfect 5.1 Revised
Paradox for Windows

WordPerfect (5.1/5.2) for Windows Paradox 4.0

WordPerfect 5.0 LAN

Excel 4.0 for Windows Works 3.0 for Windows Excel 5.0 for Windows Works 3.0 for DOS

Also available in separately bound modules are all of the above plus:

Windows 3.0 Lotus 1-2-3 Release 2.01

WordPerfect 5.0 Quattro*
WordPerfect 4.2* SuperCalc 4*
WordStar 4.0* Works 2.0 for DOS

*Educational versions of WordPerfect 4.2, Quattro Training Edition 1.01, Super-Calc 4, and dBASE III PLUS can be shrink-wrapped with these lab modules.

Consult with your McGraw-Hill sales representative to put together the best "customized" package for your course.

Key Feature #2: Revised Annually Being able to revise our materials every year allows us—and our readers—to keep pace in this dynamic field.

New to the 1994–1995 edition:

- **Update of Technology and Issues.** New coverage includes Windows NT, the Pentium chip, wireless modems, PIMs, more on ethics, and much more.
- New Review Questions. True—False, matching, fill in the blank, and discussion questions now appear at the end of each chapter in the *Essentials* volume.
- **Updated Graphics.** Over 50% of the illustrations are new, reflecting the rapid changes in technology and applications.
- **New Lab Modules.** Our lab offerings have been expanded to include the popular new software applications (see listing above).
- Revised Lab Modules. The most popular modules (WordPerfect 5.1, Lotus 1-2-3 Release 2.2, and dBASE III PLUS) have been completely revised. All new prob-

lems and exercises are included, and the tutorials have been rewritten to reflect use of hard-disk systems as well as floppy-disk systems. These modules when bound together form the new *Lab Edition B Revised*.

Key Feature #3: Visual Orientation We believe that our readers learn visually. Accordingly, Computing Essentials balances text with color graphics. Our Visual Summaries capture in a nutshell the key concepts covered in each chapter. The text also contains numerous color illustrations, photos, and charts. Adopters tell us that our visual orientation enhances their students' interest and comprehension.

Key Feature #4: "Learn-by-Doing" Approach Each chapter in Computing Essentials concludes with Review Questions and Discussion Questions and Projects. These pedagogical aids are designed to reinforce learning and encourage students to apply the concepts covered in each chapter to solve actual problems.

The lab modules also follow the "learn-by-doing" approach. An ongoing case study based on real-world use of the software leads the student step by step from problem to solution. Each lab module includes the following additional learning aids:

- Conceptual Overview
- Objectives
- Numerous Screen Displays
- Summary of Key Terms
- Lab Review (Matching and Fill-in Questions)
- Practice Exercises
- Glossary of Key Terms
- Summary of Commands
- Index

The Support Package

Teaching Materials sets are available to adopters. They are available separately for *Computing Essentials* as well as for each of the lab modules. Each set includes:

- Objectives
- Schedule
- Procedural Requirements
- Teaching Tips

- Answers to End-of-Chapter Problems
- Command Summary
- Answers to Practice Exercises
- Transparency Masters
- Printed Test Bank
- 3½-inch Student Data Disk and Test Questions

Note that RH Test, a test generation software, is also available to adopters and is needed to run the test questions on disk

Other support materials:

- Color Transparencies—New!!
- Multimedia—A CD-ROM Presentation Device—New!!
- Software Assistance Program—New!!
- Documentary-Style Videotape Series
- HyperCard Presentation Tool (Computer Resource Library)
- Computerized Glossary of Terms

If you would like information on how to obtain the last six supplements described above, please contact your McGraw-Hill sales representative.

Acknowledgments

We are grateful for the helpful comments from our reviewers: David Anderson, Fort Peck Community College; Bill Barth, Cayuga Community College; Janice Burke, South Suburban College; C. T. Cadenhead, Richland College; Earline Cocke, Northwest Mississippi Community College; Terry Cooper, Medicine Hat College; Jack Cundiff, Horry-Georgetown Tech; Jim Davies, DeAnza College; Paul Duchow, Pasadena City College; William Ferns, Baruch College; Tom Kane, Centennial College; Debbie Kramer, Rowan College; Albert Leary, St. Charles County Community College; Martha Long, North Essex County Community College; Curtis Meadow, University of Maine; Pam Milstead, Louisiana Tech University; Jeff Mock, Diablo Valley College; Owen Murphy, California State University—San Bernardino; Sonia Nayle, Los Angeles City College; Pamela Nelson, Panhandle State University; Brenda Nielson, Mesa Community College; Paul Northrup, University of Colorado; Carl Penzuil, Corning Community College; Lisa Rosner, Stockton State College; Marion Sackson, Pace University; Joe

Sallis, University of Mississippi, Judith Scheeren, Westmoreland Community College; Faye Simmons, SUNY Canton; Daniel Simon, Northhampton Community College; Elizabeth Swope, Louisiana State University; Barbara Wertz, Clackamas Community College; Mark Workman, Frank Phillips College; and James Worley, East Tennessee University.

In addition, we are very appreciative of all the efforts of the Mitchell McGraw-Hill staff and others who worked on this book: Roger Howell, Laurie Boudreau, Leslie Austin, and Steve Mitchell for their enthusiastic support of the 1994–1995 edition; Jane Somers and Richard DeVitto for production supervision; John Ambrose and Kris Johnson for their marketing support; Karen Jackson, Eric Munson, Erika Berg, and Seibert Adams for their past and present editorial and marketing support.

We are also grateful for the contributions of those outside Mitchell McGraw-Hill; Colleen Hayes for her hard work and continued dedication to the project; Greg Hubit for his excellent project management; Christy Butterfield for her innovative design work; Darcy Wilding for photo research; Peg Sallade for permission to use parts of her research on "Aquatic Fitness"; Marianne Virgili of Glenwood Springs Chamber of Commerce and Jim Price of the Sports Authority for their contributions toward the development of case materials; GTS Graphics for line illustrations and composition; Elaine Brett, Pat Rogondino, Susan Defosset, and Jane Granoff for their continued excellent editorial and production support.

Write to Us

We welcome your reactions to this book, for we would like it to be as useful to you as possible. Write to us in care of:

Microcomputer Applications Editor Mitchell McGraw-Hill Publishing 55 Francisco St, Suite 200 San Francisco, CA 94133

> Timothy J. O'Leary Linda I. O'Leary

Contents in Brief

Preface xvii

1	You and Computer Competency 2
2	Applications Software: Basic Tools 20
3	Systems Software 42
4	The Central Processing Unit 60
	Input and Output 86
6	Secondary Storage 110
7	Communications and Connectivity 128
8	Files and Databases 152
9	Information Systems 170
10	Systems Analysis and Design 188
11	Programming and Languages 208
12	Applications Software: Power Tools 232
13	Workplace Issues: Ergonomics, Ethics, Computer Crime, and Security 252
14	Your Future: Using Information Technology 270
	The Student Buyer's Guide: How to Buy Your Own Microcomputer System 283

Contents

Preface xvii

Fou	Users and Computer Competency 2 r Kinds of Computers 3
	Five Parts of an Information System 5
	Applications Software 6 Systems Software 7
	dware 8
	Input Devices 8
	The System Unit 8
	Secondary Storage 9
	Output Devices 10
	Communications Devices 11
Data	a 12
Con	nectivity 12
A Lo	ook at the Future: You and Computer Competency 13
	Powerful Software 13
	Powerful Hardware 13
	Connectivity 13
	Power Tools 14
	Workplace Issues: Ergonomics, Ethics, Computer Crime, and Security 1
Key	Terms 15
Revi	iew Questions 15
Disc	ussion Questions and Projects 17
Vicu	al Summary 18–19

Applications Software: Basic Tools 20

General-Purpose Applications Packages 20

Cursor 20
Menus 21
Format 22
WYSIWYG 22
Special-Purpose Keys 22
Macros 22
Import and Export 23
Word Processing 23
Word Wrap and the Enter Key 24
Search and Replace 24

Block and Move 24 Other Features 24

Spreadsheets Format 26 Formulas 27 Recalculation 27 Other Features 27 Database Managers 27 Retrieve and Display 29 Sort 29 Calculate and Format 29 Other Features 29 Graphics 30 Analytical Graphics 30 Presentation Graphics 31 Communications Data Banks 32 Message Exchanges 32 Financial Services 33 Share Resources 33 Integrated Packages 33 A Look at the Future Key Terms 36 Review Questions 36

Discussion Questions and Projects 38

Systems Software 42

Visual Summary 40-41

```
Why Learn About Systems Software?
                                       42
Four Kinds of Programs 44
DOS: The IBM Personal Computer Standard
    Advantages 46
    Disadvantages 47
Windows 48
    Advantages 48
    Disadvantages 49
OS/2
       49
    Advantages 50
    Disadvantages 50
Macintosh Operating Systems
   Advantages 51
    Disadvantages 52
UNIX: The "Portable" Operating System
   Advantages 53
   Disadvantages 53
A Look at the Future
Key Terms 55
Review Questions 56
Discussion Questions and Projects 57
Visual Summary 58–59
```

The Central Processing Unit 60

The Four Types of Computer Systems 60

Microcomputers 63 Minicomputers 63 Mainframes 64 Supercomputers 64

The CPU 66

The Control Unit 66 The Arithmetic-Logic Unit 66

Memory 67

Registers 67 The Processing Cycle 67

The Binary System 69

Units of Measure for Capacity 69 Binary Coding Schemes 70 The Parity Bit 70

The System Unit 71

System Board 71
Microprocessor Chips 72
RAM Chips 74
ROM Chips 76
System Clock 76
Expansion Slots and Boards 76
Bus Lines 77
Ports 78

A Look at the Future 79

Key Terms 80 Review Questions 81 Discussion Questions and Projects 82 Visual Summary 84–85

5 Input and Output 86

Input: Keyboard Versus Direct Entry 86 Keyboard Entry 87

Keyboards 87 Terminals 88

Direct Entry 88

Pointing Devices 89 Scanning Devices 90 Voice-Input Devices 93

Output: Monitors, Printers, Plotters, Voice 94 Types of Monitors 94

Monochrome Monitors 95 Color Monitors 96

Printers 97

Dot-Matrix Printer 97 Laser Printer 99 Ink-Jet Printer 100 Thermal Printers 100 Other Printers 101 Printer Features 101

Plotters 102

Pen Plotter 102 Ink-Jet Plotter 102 Electrostatic Plotter 102 Direct Imaging Plotter 102

Voice-Output Devices A Look at the Future 103

Key Terms 104 Review Questions 105 Discussion Questions and Projects 106 Visual Summary 108–109

Secondary Storage 110

Four Kinds of Secondary Storage Floppy Disks 111

The Disk Drive 111 How a Disk Drive Works 112 Drive A and Drive B 113 The Parts of a Floppy Disk 113 Taking Care of Floppy Disks 114

Hard Disks 115

Internal Hard Disk 115 Hard-Disk Cartridges 115 Hard-Disk Packs 116 Performance Enhancements 117

Optical Disks 118

CD-ROM 120 WORM 120 Erasable Optical Disks 120

Magnetic Tape 120

Magnetic Tape Streamers 121 Magnetic Tape Reels 121

A Look at the Future 122

Key Terms 122 Review Questions 123 Discussion Questions and Projects 124 Visual Summary 126-127

Communications and Connectivity 128

128 Communications and Connectivity

Fax Machines 130

Electronic Bulletin Boards 130

Electronic Mail 131

Voice-Messaging Systems 132

Sharing Resources 132

Databases 132

Commercial Services and Personal Services 132

Groupware 133

User Interface 134

Modems and Communication Speeds 134

Types of Modems 134

Communications Channels 135

Telephone Lines 136

Coaxial Cable 136

Fiber-Optic Cable 136

Microwave 136

Satellites 137

Data Transmission 137

Bandwidth 137

Serial and Parallel Transmission 138

Direction of Data Transmission 138

Modes of Transmitting Data 139

Protocols 139

Network Configurations 140

Star Network 140

Bus Network 141

Ring Network 142

Hierarchical Network 143

Network Types 143

Local Area Network 143

Metropolitan Area Network 144

Wide Area Network 145

A Look at the Future 145

Key Terms 146

Review Questions 147

Discussion Questions and Projects 148

Visual Summary 150–151

Files and Databases 152

Files 152

Data Organization 152

The Key Field 153

Batch Versus Real-Time Processing 153

Master Versus Transaction Files 154 File Organization 154

Database 156

The Need for Databases 156
Software for a Database Management System 157
The Data Dictionary 157
Query Language 157

DBMS Organization 157

The Hierarchical Database 158
The Network Database 158
The Relational Database 159

Types of Databases 160

The Individual Database 160
The Company, or Shared, Database 160
The Distributed Database 161
The Proprietary Database 161
Costs 162

Database Uses and Issues 162

Data for Strategic Uses 163 Importance of Security 163 The Database Administrator 164

A Look at the Future 164

Key Terms 164
Review Questions 165
Discussion Questions and Projects 166
Visual Summary 168–169

Information Systems 170

The Information Revolution 170 How Information Flows in an Organization 172

Functions 172 Management Levels 174 Information Flow 175

The Levels of Computer-Based Information Systems 176 Transaction Processing Systems 177 Management Information Systems 178 Decision Support Systems 180

The User 180 System Software 180 The Data 180 The Decision Models 181

Executive Information Systems 181 A Look at the Future 182

Key Terms 182 Review Questions 183 Discussion Questions and Projects 184 Visual Summary 186–187

10 Systems Analysis and Design 188

Systems Analysis and Design 189 Phase 1: Preliminary Investigation 190

Defining the Problem 191 Suggesting Alternative Systems 192 Preparing a Short Report 192

Phase 2: Analysis 192

Gathering Data 192
Analyzing the Data 194
Documenting the Systems Analysis Stage 196

Phase 3: Design 197

Designing Alternative Systems 197 Selecting the Best System 198 Writing the Systems Design Report 198

Phase 4: Development 198

Developing Software 198 Acquiring Hardware 199 Testing the New System 199

Phase 5: Implementation 199

Types of Conversion 199 Training 201

Phase 6: Maintenance 201
Prototyping 202
A Look at the Future 202

Key Terms 203 Review Questions 203 Discussion Questions and Projects 205 Visual Summary 206–207

Programming and Languages 208

Programs and Programming 208

What Is a Program? 208 What Is Programming? 209

Step 1: Program Specification 210

Determining Program Objectives 210
Determining the Desired Output 210
Determining the Input Data 210
Determining the Processing Requirements 211
Documenting the Program's Specifications 211

Step 2: Program Design 212

Top-Down Program Design 212 Pseudocode 212 Flowcharts 213 Logic Structures 215 Object-Oriented Programming 216 CASE Tools 217

Step 3: Program Code 218

The Good Program 218 Which Language? 218

Step 4: Program Test 219

Syntax Errors 219 Logic Errors 219 The Testing Process 219

Step 5: Program Finalized Documentation 220

Step 6: Program Maintenance 221

Operations 221 Changing Needs 221

Five Generations of Programming Languages 222

Machine Languages: The First Generation 222
Assembly Languages: The Second Generation 223
High-Level Procedural Languages: The Third Generation 223
Problem-Oriented Languages: The Fourth Generation 224
Natural Languages: The Fifth Generation 225

A Look at the Future 225

Key Terms 226 Review Questions 227 Discussion Questions and Projects 228 Visual Summary 230–231

Applications Software: Power Tools 232

Personal Information Managers 232 Project Management Software 233

Gantt Charts 235 PERT Charts 235

Desktop Publishing 235

New Media: Hypertext and Multimedia 237

Hypertext 237 Multimedia 239

CAD/CAM 241

Computer-Aided Design 241 Computer-Aided Manufacturing 242

Artificial Intelligence 242

Robotics 243 Knowledge-Based (Expert) Systems 244 Virtual Reality 245

A Look at the Future 247

Key Terms 247
Review Questions 248
Discussion Questions and Projects 249
Visual Summary 250–251