JAMES S. QUASNEY / JOHN MANIOTES / JOHN REPEDE

QBasic

FUNDAMENTALS AND STYLE

QBasic Fundamentals and Style

with an Introduction to Microsoft Visual Basic for Windows

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QBasic Fundamentals and Style

with an Introduction to Microsoft Visual Basic for Windows

Preface

OBJECTIVES OF THIS BOOK

This book was developed specifically for an introductory computer programming course that utilizes MS-DOS QBasic on an IBM PC, IBM PS/1, IBM PS/2, or compatible system. The objectives of this book are as follows:

- To acquaint the reader with the proper and correct way to design and write high-quality programs.
- To emphasize the top-down approach, structured programming, and modern programming practices early and consistently throughout the book.
- To teach the fundamentals of the QBasic programming language.
- To teach good problem-solving techniques that can be used in advanced computing and information-processing courses.
- To emphasize interactive applications and menu-driven programs, the most popular type of programming in today's world.
- To develop an exercise-oriented approach that allows the reader to learn by example.
- To use practical problems to illustrate the applications of computers.
- To encourage independent study, and help those who are working alone on their own personal computer systems.

WHY USE QBasic RATHER THAN BASICA?

QBasic (or MS-DOS QBasic) offers a superb environment in which to learn programming. It has several important advantages over BASICA that make it indispensable for instructors who want to teach their students the correct, structured programming practices right from the start. The major advantages of QBasic over BASICA are as follows:

- QBasic offers subprograms and functions as an alternative to subroutines for modularizing programs.
- The block `IF` statement allows for multiple lines of coding in the `THEN` and `ELSE` clauses.
- The `SELECT CASE` statement can be used to implement the Case structure without the use of the `ON GOSUB` statement or complex, nested `IF` statements.
- The `DO WHILE. . .LOOP` and `DO. . .LOOP UNTIL` statements allow students to implement cleanly the Do-While and Do-Until structures.
- The QBasic editor is powerful, and yet easy to use. The operating environment, which includes windows, pull-down command menus, and the use of a mouse, helps simplify the tasks of entering, modifying, and executing programs. The QBasic interpreter checks each line entered for correct syntax, formats the line, and changes the line to executable form if the syntax is correct.
- The full-screen editor allows the user to insert lines, delete lines, and change lines at the desired location on the screen, thus eliminating the need for line numbers.
- Complete mouse capabilities allow the student to easily navigate through the QBasic operating environment without having to remember keystroke sequences.
- QBasic uses dialog boxes with buttons whenever it needs additional information from the programmer. These dialog boxes make it easier for students to respond to requests made by QBasic.
- Improved on-line debugging tools, that go far beyond the `TRON` and `TROFF` statements, are available to the student confronted with baffling logic errors.
- The QB Survival Guide offers a complete on-line help facility. The Survival Guide is a context-sensitive, electronic help system with instant cross-referencing that answers students' questions as fast as they can click the mouse or press the F1 Key. The Survival Guide also provides programming examples that can be copied into the current program.

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CHAPTER ON MICROSOFT VISUAL BASIC

This text includes a chapter (Chapter 12) on Microsoft Visual Basic for Windows, which introduces the student to event-driven programming. Topics include starting Visual Basic; designing a form and adding labels, text boxes, and command buttons; changing the properties of controls; specifying an event procedure; running and saving applications; and accessing information about Visual Basic through the Help facility.

Students are introduced to the three-step process of building Windows applications:

1. Create the user interface
2. Set properties
3. Write code

Microsoft Visual Basic uses the same programming statements and functions as QBasic. Thus, once the student is able to write programs in QBasic, he or she has the experience to accomplish the third step in creating a Windows application.

TEXTBOOK WITH OR WITHOUT PRIMER EDITION OF MICROSOFT VISUAL BASIC 2.0 FOR WINDOWS

This textbook is available with or without the Primer Edition of Microsoft Visual Basic 2.0 for Windows. If you do not have a version of Microsoft Visual Basic for Windows available for student use and intend to cover Chapter 12, then you should order the textbook software package (ISBN 0-7895-0021-3).

LEVEL OF INSTRUCTION

No previous experience with a computer is assumed, and no mathematics beyond the high school freshman level is required. The book is written specifically for the student with average ability, for whom continuity, simplicity, and practicality are characteristics we consider essential. Numerous insights, based on the authors' sixty cumulative years of experience in teaching and consulting in the field of computer information systems, are implicit throughout the book. For the past twenty years, one of us has taught introductory programming courses using a dialect of BASIC, the latest being QBasic.

FUNDAMENTAL TOPICS ARE PRESENTED IN DETAIL

Besides introducing students to the correct way to design and write programs by means of structured and top-down techniques, the book presents fundamental topics concerning computers and programming that should be covered in any introductory programming class. These include the stored program concept; getting acquainted with the computer; editing programs; input/output operations; variables and constants; simple and complex computations; the use of functions, subroutines, and subprograms; decision making; the use of counters and running totals; rounding and truncation; looping and end-of-file tests; counter-controlled loops; the use of relational and logical operators; string manipulation; and graphics and sound. Other essential topics include data validation; control breaks; paging reports; table processing; sequence checking; selection; searching; matching; merging; sorting; file processing; and the differences between batch and interactive applications; and an introduction to event-driven programming through the use of Microsoft Visual Basic for Windows. Every one of these topics is covered in detail in this book.

DISTINGUISHING FEATURES

The distinguishing features of this book include the following:

A Proven Book

This book has evolved over the past twenty years and is based on the authors' eight prior books on BASIC programming. Many instructors and students who have used our books have shared with us their comments and suggestions for improvement as new programming techniques have been developed. They have done much to shape the contents of this book, which reflects modern programming practices.

Early Presentation of the Top-Down (Modular) Approach and the Structured Programming Approach

Students are introduced to the top-down approach early, before they learn about looping and decision making. By the time they get to the larger and more complex programs, they are solving problems top-down by habit.

Although the authors discuss subprograms via the `CALL` statement, the `GOSUB` and `RETURN` statements are primarily used to implement top-down designs. Hence, the student is not burdened with constructing separate subprograms and passing variables.

Particular attention is given to designing proper programs by means of the three logic structures of structured programming: Sequence; Selection (If-Then-Else and Case); and Repetition (Do-While and Do-Until). A disciplined method for implementing the structured design is adhered to throughout the book.

Early and Complete Coverage of File Processing

Complete coverage of sequential, random, and simulated-indexed files provides the reader with knowledge that is central to a real programming environment. Topics include creating all three types of files; file maintenance (matching and merging operations); and an information retrieval system that features simulated-indexed files. Sequential file processing is covered immediately following the presentation of the top-down approach and structured programming.

Student Diskette

The *Student Diskette* that accompanies this book includes all the executable programs and data files presented in the text. Students can use the program and data files on this diskette for the following:

- To step through the **PC Hands-On Exercises** at the end of each chapter
- To select a program similar to their solution for a programming assignment (this will save keying time)
- To experiment on their own with developing alternative solutions to the programming case studies presented in the text
- To access data files required in the programming assignments
- To store their solutions to programming assignments

Program names on the diskette are in the form of PRGc-n, where c represents the chapter number and n represents the program number. For example, PRG2-8 refers to the eighth program presented in Chapter 2. Data file names correspond to the names used in the text.

QBasic Programming Problems with Sample Input and Output

Over 60 challenging, field-tested QBasic Programming Problems are included at the end of the chapters. Each of the problems includes a statement of purpose, a problem statement, sample input data, and the corresponding output results. Solutions to these problems are given in the *Instructor's Manual* and on the *Instructor's Resource Disk.*

Interactive Applications (Menu-Driven Programs)

Although examples of batch processing are presented, the primary emphasis is on interactive processing. The reader is introduced to the `INPUT`, `PRINT`, and `CLS` (Clear Screen) statements early in Chapter 2. The `LOCATE` statement is presented in Chapter 4 and thereafter is used extensively to build screens. Several menu-driven programs are illustrated to familiarize the reader with the type of programming that is proliferating today.

Emphasis on the Program Development Life Cycle

The program development life cycle is presented early in Chapter 1 and is used throughout the book. Good design habits are reinforced, and special attention is given to testing the design before attempting to implement the logic in a program.

Emphasis on Fundamentals and Style

Heavy emphasis is placed on the fundamentals of producing well-written and readable programs. A disciplined style is consistently used in all program examples. Thorough documentation and indention standards illustrate the implementation of the Selection and Repetition logic structures. The programming and style tips recommended throughout the book are summarized in Appendix C.

Summary of the QBasic Language on a Reference Card

A summary of the statements, functions, special keys, operators, and reserved words can be found on a reference card at the back of the book. This summary is invaluable to the beginning student as a quick reference piece.

Presentation of Programming Case Studies

This book contains 25 completely solved and annotated case studies, illuminating the use of QBasic and computer programming in the real world. Emphasis is placed on problem analysis, program design, and an in-depth discussion of the program solution. The program solutions to these programming case studies, as well as all other programs found throughout the book, are on the accompanying *Student Diskette.*

Program Design Aids

The authors recognize top-down charts and flowcharting as excellent pedagogical aids and as the tools of an analyst or programmer. Hence, many of the programming case studies include both top-down charts and program flowcharts to demonstrate programming style, design, and documentation.

Debugging Techniques and Programming Tips

A characteristic of a good programmer is that he or she has confidence that a program will work the first time it is executed. This confidence implies that careful attention has been given to the design and that the design has been fully tested. Still, errors do occur; and when they do, they must be corrected. Throughout this book, especially in Appendix C, efficient methods for locating and correcting errors are introduced using the QBasic debugger. Tracing, as well as

other debugging techniques, is discussed in detail. The sections in Appendix C that deal with programming tips and style tips serve as excellent references, facilitating the writing of efficient, readable code.

Applications-Oriented Approach

More than 150 QBasic programs, illustrating a wide range of practical applications, along with many partial programs, are used to introduce specific statements and the proper and correct way to write programs.

Emphasis on Data Validation

The reliability of a thoroughly tested program cannot be guaranteed once it is turned over to a user. Most abnormal terminations in a production environment are due to user errors rather than programmer errors. This is especially true for programs that interact with the user or are executed on personal computers. Good programmers will attempt to trap as many user errors as possible. This book pays particular attention to the illustration of various data validation methods for ensuring that incoming data is reasonable or within limits.

What You Should Know

Each chapter contains a succinct, list-formatted review entitled What You Should Know, which reinforces key concepts and computer information system terminology.

Test Your Basic Skills

A set of short-answer exercises identified as Test Your Basic Skills appears at the end of each chapter. More than 200 problems, many of which are complete programs, are included for practice. Through the use of these exercises, the student can master the concepts presented, and instructors are afforded a valuable diagnostic tool. Answers for the even-numbered Test Your Basic Skills exercises are available to the students in Appendix E. Answers to the odd-numbered exercises can be found in the *Instructor's Manual.*

Graphics and Sound

Chapter 10 covers all the graphics statements and functions in QBasic that are central to understanding what can be done with graphics on the PC. The topics provide the student with knowledge of how to create, change, display, and store graphic designs and animation sequences. Furthermore, the necessary sound and music statements are discussed and are applied to various applications.

Additional PC Information

Besides a general introduction to personal computers in Chapter 1, Appendix D includes diskette formatting and operating instructions for the PC, and a list of popular magazines, newspapers, and manuals to help keep the student abreast of the new developments in the computer field.

ANCILLARY MATERIALS

A comprehensive instructor's support package accompanies *QBasic Fundamentals and Style.* These ancillaries are available upon request from the publisher.

Instructor's Manual

The *Instructor's Manual* includes the following:

- Lecture outlines for each chapter
- Transparency masters from each chapter of the text
- Chapter-by-chapter objectives, teaching suggestions, and vocabulary lists
- Answers to the odd-numbered Test Your Basic Skills exercises
- Program solutions to the more than 60 programming assignments in the book
- Test bank, including true/false, short-answer, fill-in, and multiple-choice questions for quizzes and tests

An *Instructor's Resource Disk* is also available that includes the solutions to the more than 60 programming assignments found at the end of Chapters 2 through 11.

Programming Application Logic Simulator (PALS)

The Programming Application Logic Simulator (PALS) is an interactive program developed especially for students taking their first programming course. PALS offers computer-assisted instruction in developing logic to solve problems. Students complete a series of exercises on the computer covering the three logic structures: Sequence, Selection, and Repetition. PALS is available on disk to adopting instructors and can be duplicated for student distribution.

MicroExam IV

MicroExam IV, a computerized test-generating system, is available free to adopters of this textbook. It includes all of the questions from the *Instructor's Manual.* MicroExam IV is an easy-to-use, menu-driven package that provides instructors with testing flexibility and allows customizing of testing documents. For example, a user of MicroExam IV can enter his or her own questions and can generate review sheets and answer keys. MicroExam IV will run on any IBM-compatible system.

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Hammond, Indiana
January 1995

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Notes to the Student

A few things to help you get going:

1. The first occurrence of a computer or programming term in this book is printed in **bold.** Its definition can be found in the same or next sentence.

2. The line numbers that appear to the left of program lines throughout this book are not part of the programs. QBasic does not require line numbers. Their appearance is strictly for reference purposes during the discussion of the program. Beginning in Chapter 4, these line numbers also appear near symbols in top-down charts and program flowcharts in order to show their relationship to the corresponding program.

3. Each chapter ends with an important, useful review section called What You Should Know.

4. The answers to all the even-numbered Test Your Basic Skills questions are in Appendix E.

5. A convenient, fully detailed language reference for QBasic is never farther away than your Shift + F1 key or right Mouse button. Use these context-sensitive help keys whenever you have a question or want to learn more about the item nearest your cursor. This works for BASIC keywords, menu commands, error messages, dialog boxes, and just about anything else you can point to.

6. All the executable programs in the text are on the *Student Diskette* that accompanies this book. The programs on the *Student Diskette* which correspond to those in the text begin with the prefix PRG, followed by the chapter and program numbers. For example, PRG2-8 refers to the eighth executable program in Chapter 2.

   Each chapter-ending Test Your Basic Skills section includes several PC Hands-On Exercises that utilize the programs on the *Student Diskette.* Follow the directions and load, modify, and execute the programs. These short exercises will help you understand the significance of various QBasic statements and how slight modifications to a program can affect the results.

   You will also find the programs on the *Student Diskette* helpful when you are solving assigned programming problems. These programs can be retrieved from the diskette, and statements can be added, modified, or deleted to arrive at a solution. Most of the programming exercises in this book suggest which program should be loaded from the *Student Diskette* and modified to develop a solution.

7. An easy-to-use reference card at the back of this book contains a summary of the QBasic statements, functions, special keys, operators, limits, and reserved words.

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