

CONTENTS IN DETAIL

FOREWORD by Vijaye Raji	xvii
--------------------------------	-------------

ACKNOWLEDGMENTS	xix
------------------------	------------

INTRODUCTION	xxi
---------------------	------------

Who Should Read This Book?	xxii
What's in This Book?	xxii
Online Resources	xxiii
A Note to the Reader	xxiv

1	
INTRODUCING SMALL BASIC	1

What Is a Computer?	1
What Is a Computer Program?	2
What Is Small Basic?	2
The Vision of Small Basic	3
The Basics of Small Basic	3
The Small Basic Language	3
The Small Basic Library	4
The Small Basic Development Environment	4
Installing Small Basic	4
The Small Basic IDE	4
Opening and Saving Your Work	5
Sharing Your Work and Importing Games	5
Copy and Paste; Undo and Redo	6
Running Your Program and Graduating	6
Writing and Running Your First Program	6
Objects and Methods	7
Naming Your Programs	8
Files Generated by Small Basic	8
Helping Hands: IntelliSense and Syntax Coloring	9
Drawing with Small Basic	9
<i>Try It Out 1-1</i>	10
Programming Challenges	11

2	
GETTING STARTED	13

The Parts of a Program	14
Comments and Statements	14
Characters and Strings	15
Arguments and Methods	15
<i>Try It Out 2-1</i>	16

Exploring Other Features	16
Case Sensitivity	16
Sequential Execution	17
Displaying Numbers and Doing Math	17
Joining Strings	18
<i>Try It Out 2-2</i>	19
Object Properties	19
Setting and Changing Property Values	19
Working with Properties	20
<i>Try It Out 2-3</i>	22
Arithmetic Operators	22
<i>Try It Out 2-4</i>	23
Programming Errors	24
Syntax Errors	24
Logic Errors	25
Runtime Errors	25
Programming Challenges	25

3 DRAWING BASICS 27

The Graphics Coordinate System	27
Drawing Lines	28
Drawing Shapes	30
Triangles	30
<i>Try It Out 3-1</i>	30
Rectangles and Squares	31
<i>Try It Out 3-2</i>	32
Ellipses and Circles	32
Pen Size and Color	34
Pen Width and Shape Size	34
<i>Try It Out 3-3</i>	35
Drawing Text	35
Inserting Images	38
Programming Challenges	39

4 USING VARIABLES 43

What's a Variable?	44
The Basics of Using Variables	44
Assigning Expressions to Variables	45
Passing Variables to Methods	45
Changing the Value of a Variable	46
Using Spaces for Readability	47
<i>Try It Out 4-1</i>	47
Rules for Naming Variables	47
Say What You Mean	48
Find the Right Length	48

Stick with Your Style	48
Let IntelliSense Work for You	48
Avoid Naming Variables After Methods and Objects	49
<i>Try It Out 4-2</i>	49
Simplifying Expressions	50
<i>Try It Out 4-3</i>	51
Using Variables to Solve Problems	51
<i>Try It Out 4-4</i>	52
Two Kinds of Data	53
Global Variables	53
<i>Try It Out 4-5</i>	54
Programming Challenges	54

5

DRAWING SHAPES WITH TURTLE GRAPHICS 55

Meet the Turtle	55
Moving the Turtle	56
Absolute Motion	57
Relative Motion	59
Coloring Your Steps	60
Controlling Your Speed	61
<i>Try It Out 5-1</i>	61
Introducing the For Loop	62
<i>Try It Out 5-2</i>	64
Drawing Regular Polygons	64
A Star Is Born	65
<i>Try It Out 5-3</i>	66
Creating Polygon Art Using Nested Loops	67
<i>Try It Out 5-4</i>	68
Endless Graphics	69
<i>Try It Out 5-5</i>	70
Programming Challenges	70

6

GETTING USER INPUT 73

Talking to the Computer	74
Your Number, Please?	74
Introducing Yourself to Your Computer	75
Writing Prompts for Input	75
A Moment of Silence, Please (Pause)	76
Working with User Input	77
Converting Fahrenheit to Celsius	77
<i>Try It Out 6-1</i>	78
Averaging Numbers	78
Reading Text	79
<i>Try It Out 6-2</i>	80
Programming Challenges	81

7

EMPOWERING PROGRAMS WITH MATH 83

Exponent Methods	84
SquareRoot() and Good Old Pythagoras	84
Powerful Powers	85
<i>Try It Out 7-1</i>	86
Rounding Methods	86
Traditional Rounding	87
Rounding to the Nearest Hundredth	88
<i>Try It Out 7-2</i>	88
Abs(), Min(), and Max() Methods	88
<i>Try It Out 7-3</i>	90
The Remainder() Method	90
<i>Try It Out 7-4</i>	91
Random Numbers	92
<i>Try It Out 7-5</i>	92
Trigonometric Methods	93
<i>Try It Out 7-6</i>	94
Programming Challenges	95

8

MAKING DECISIONS WITH IF STATEMENTS 97

The If Statement	98
Relational Operators	100
<i>Try It Out 8-1</i>	101
Complex If Conditions	101
<i>Try It Out 8-2</i>	102
Comparing Strings	102
The If/Else Statement	103
<i>Try It Out 8-3</i>	104
Nested If and If/Else Statements	104
<i>Try It Out 8-4</i>	106
The Goto Statement	107
<i>Try It Out 8-5</i>	108
Programming Challenges	108

9

USING DECISIONS TO MAKE GAMES 111

The If/Elseif Ladder	112
Letter Grades	113
The Bug on the Ladder	114
<i>Try It Out 9-1</i>	115
Let's Get Logical	115
Logical Operators in the Zoo	116
The And Operator	117
The Or Operator	118
The Cosmic Order of Evaluation	119
<i>Try It Out 9-2</i>	120
The Shapes Object	120
<i>Try It Out 9-3</i>	122

Create a Game: Guess My Coordinates	122
Step 1: Open the Startup File	123
Step 2: Set Up the Game	123
Step 3: Hide the Star	124
Step 4: Let the User Guess	126
<i>Try It Out 9-4</i>	127
Programming Challenges	127

10

SOLVING PROBLEMS WITH SUBROUTINES **129**

Why Use Subroutines?	130
Writing Subroutines	130
<i>Try It Out 10-1</i>	133
Subroutine Input and Output	133
<i>Try It Out 10-2</i>	135
Nesting Subroutines	135
<i>Try It Out 10-3</i>	138
Create a Dragon Game	138
Step 1: Open the Startup File	139
Step 2: Write the Setup() Subroutine	140
Step 3: Add a Bit of Chance	141
Step 4: Let the Player Know What's Going On	142
Step 5: Get the Player in the Game with GetChoice()	142
Step 6: Process the Player's Choice	143
Step 7: Add Motion with MoveKnight()	143
Step 8: Shoot Arrows with ShootArrow()	145
Step 9: Swing the Sword with StabDragon()	146
Step 10: Breathe Fire	146
<i>Try It Out 10-4</i>	147
Programming Challenges	147

11

EVENT-DRIVEN PROGRAMMING **149**

GraphicsWindow Events	151
Create Patterns with the MouseDown Event	151
<i>Try It Out 11-1</i>	152
Fire Missiles with the KeyDown Event	152
<i>Try It Out 11-2</i>	154
Make a Typewriter Using the TextInput Event	154
<i>Try It Out 11-3</i>	155
Draw Pictures with the MouseMove Event	155
<i>Try It Out 11-4</i>	156
Useful Tips	157
Create a Gold Rush Game	157
Step 1: Open the Startup File	158
Step 2: Move the Turtle	159
Step 3: Move the Bag of Gold	160
Step 4: Update the User's Score	162
<i>Try It Out 11-5</i>	162
Programming Challenges	163

12

BUILDING GRAPHICAL USER INTERFACES

165

Design a User Interface with the Controls Object	166
Step 1: The Design Phase.	166
Step 2: Program Interactivity.	168
<i>Try It Out 12-1</i>	169
Make a Colorful Drawing Program.	169
<i>Try It Out 12-2</i>	171
Explore Circuits with Code	171
Step 1: Open the Startup File	172
Step 2: Add the Main Code	173
Step 3: Toggle the Switch.	174
Step 4: Respond to Changes	175
Step 5: Update the Program's Interface	175
<i>Try It Out 12-3</i>	176
Program Your Own Image Viewer	176
<i>Try It Out 12-4</i>	178
Programming Challenges	178

13

REPEATING FOR LOOPS

181

The For Loop	182
<i>Try It Out 13-1</i>	183
Magical Moving Text.	183
<i>Try It Out 13-2</i>	184
Adding 'em Up.	184
<i>Try It Out 13-3</i>	185
Formatting Your Output	185
<i>Try It Out 13-4</i>	186
Drawing All Kinds of Lines	186
<i>Try It Out 13-5</i>	187
Changing the Step Size	187
Counting Down by Twos	187
Making a Fractional Step.	188
<i>Try It Out 13-6</i>	188
Nested Loops	189
Tessellating for Fun	190
<i>Try It Out 13-7</i>	191
Multiple Nesting Levels	191
<i>Try It Out 13-8</i>	192
Programming Challenges	192

14

CREATING CONDITIONAL WHILE LOOPS

195

When to Use While Loops.	196
Writing a While Loop.	196
<i>Try It Out 14-1</i>	198
Validating Your Inputs	198
<i>Try It Out 14-2</i>	199

Infinite Loops	199
<i>Try It Out 14-3</i>	200
Create a Rock-Paper-Scissors Game	200
Step 1: Open the Startup File	201
Step 2: Add the MouseDown Handler	202
Step 3: Switch the Images	203
Step 4: Announce the Winner	204
<i>Try It Out 14-4</i>	204
Programming Challenges	204

15

GROUPING DATA IN ONE-DIMENSIONAL ARRAYS 207

Getting Started with Indexed Arrays	208
Array Basics	209
Initializing Arrays	210
<i>Try It Out 15-1</i>	211
Filling Arrays with a For Loop	211
Constant Initialization	212
Random Initialization	212
Formula Initialization	212
User Initialization	212
<i>Try It Out 15-2</i>	213
Displaying Arrays	213
<i>Try It Out 15-3</i>	214
Processing Arrays	214
Finding the Sum	214
Finding the Maximum Element	215
Using String Values in Arrays	215
<i>Try It Out 15-4</i>	216
Saving Records	216
Using Indexed Arrays	216
Random Selection	216
A Magic 8 Ball	217
<i>Try It Out 15-5</i>	218
Create the Catch Apples Game	218
Step 1: Open the Startup File	219
Step 2: Add the Apples	220
Step 3: Position the Apples	221
Step 4: Move the Apples	221
Step 5: Catch or Miss	222
<i>Try It Out 15-6</i>	223
Programming Challenges	223

16

STORING DATA WITH ASSOCIATIVE ARRAYS 227

Associative Arrays	228
Putting Associative Arrays to Use	230
Days in French	230
<i>Try It Out 16-1</i>	231

Storing Records	231
<i>Try It Out 16-2</i>	232
The Array Object	232
Is It an Array?	232
How Big Is an Array?	233
Does It Have a Particular Index?	233
Does It Have a Particular Value?	234
Give Me All the Indices	234
<i>Try It Out 16-3</i>	235
Your Computer the Poet	235
Step 1: Open the Startup File	236
Step 2: Set Up the Graphical User Interface	237
Step 3: Respond to Button Clicks	237
Step 4: Write the Poem’s First Line	238
Step 5: Write the Poem’s Second and Third Lines	238
<i>Try It Out 16-4</i>	239
Programming Challenges	239

17

EXPANDING TO HIGHER-DIMENSION ARRAYS 241

Two-Dimensional Arrays	242
A Random Matrix	242
<i>Try It Out 17-1</i>	244
A Matrix with User Input	244
Animated Squares	245
<i>Try It Out 17-2</i>	246
Using String Indices	246
<i>Try It Out 17-3</i>	247
Going Interactive	248
<i>Try It Out 17-4</i>	249
Common Operations on Numerical 2D Arrays	249
Step 1: Add All Elements	250
Step 2: Find the Sum of Each Column	251
<i>Try It Out 17-5</i>	252
Arrays of Three or More Dimensions	252
<i>Try It Out 17-6</i>	253
Create a Treasure Map Game	253
Step 1: Open the Startup File	254
Step 2: Create the GUI Elements	255
Step 3: Start a New Game	255
Step 4: Create a New Treasure Map	256
Step 5: Draw Objects on the Map	257
Step 6: Show the Player’s Location	258
Step 7: Handle Button Clicks	258
<i>Try It Out 17-7</i>	260
Programming Challenges	260

18

ADVANCED TEXT MAGIC

263

The Text Object	263
Appending Strings and Getting Their Length.	264
<i>Try It Out 18-1</i>	265
Taking Strings Apart: Substrings	266
<i>Try It Out 18-2</i>	268
Changing Case	268
<i>Try It Out 18-3</i>	270
Character Coding with Unicode	270
<i>Try It Out 18-4</i>	273
Practical Examples with Strings	273
Counting Special Characters	273
<i>Try It Out 18-5</i>	274
Palindrome Number Checker	274
<i>Try It Out 18-6</i>	275
Igpay Atinlay	276
<i>Try It Out 18-7</i>	277
Fix My Spelling	277
<i>Try It Out 18-8</i>	278
Unscramble	278
<i>Try It Out 18-9</i>	280
Rhyme Time: The House That Jack Built	280
<i>Try It Out 18-10</i>	284
Programming Challenges	284

19

RECEIVING FILE INPUT AND OUTPUT

287

The Case for Files.	288
Naming Files	288
File Organization	289
The File Object	291
File I/O Methods	291
<i>Try It Out 19-1</i>	294
<i>Try It Out 19-2</i>	298
File Management	298
Practical Programs	301
The Poet.	301
Math Wizard	302
<i>Try It Out 19-3</i>	305
Programming Challenges	305

WHERE TO GO FROM HERE

307

INDEX

309