

# Table of Contents

---

<b>Preface</b> .....	<b>17</b>
About the Authors.....	19
How This Book is Organized .....	20
Who Should Buy This Book? .....	20
Where to Find Answers to Review Questions and Exercises .....	20
How to Report Errata .....	20
Conventions Used in This Book .....	21
<b>Section 1 Introductory Knowledge</b> .....	<b>23</b>
<b>Chapter 1 How a Computer Works</b> .....	<b>25</b>
1.1 Introduction.....	25
1.2 What is Hardware? .....	25
1.3 What is Software? .....	26
1.4 How a Computer Executes (Runs) a Program .....	26
1.5 Compilers and Interpreters .....	26
1.6 What is Source Code? .....	27
1.7 Review Questions: True/False .....	27
1.8 Review Questions: Multiple Choice.....	28
<b>Chapter 2 Visual C#</b> .....	<b>31</b>
2.1 What is Visual C#? .....	31
2.2 What is the Difference Between a Script and a Program? .....	31
2.3 Why You Should Learn C#.....	31
2.4 How C# Works.....	31
<b>Chapter 3 Software Packages to Install</b> .....	<b>33</b>
3.1 Visual Studio.....	33
3.2 How to Set Up Visual Studio Community .....	33
<b>Review Questions in “Introductory Knowledge”</b> .....	<b>39</b>
<b>Section 2 Getting Started with C#</b> .....	<b>41</b>
<b>Chapter 4 Introduction to Basic Algorithmic Concepts</b> .....	<b>43</b>
4.1 What is an Algorithm?.....	43
4.2 The Algorithm for Making a Cup of Tea .....	43
4.3 Properties of an Algorithm .....	43
4.4 Okay About Algorithms. But What is a Computer Program Anyway? .....	44
4.5 The Party of Three!.....	44
4.6 The Three Main Stages Involved in Creating an Algorithm.....	44
4.7 Flowcharts.....	45
Exercise 4.7-1 Finding the Average Value of Three Numbers.....	46
4.8 What are “Reserved Words”?.....	47
4.9 What is the Difference Between a Statement and a Command? .....	48
4.10 What is Structured Programming?.....	48
4.11 The Three Fundamental Control Structures .....	48

Exercise 4.11-1 Understanding Control Structures Using Flowcharts .....	48
4.12 Your First C# Program .....	49
4.13 What is the Difference Between Syntax Errors and Logic Errors? .....	50
4.14 Commenting Your Code .....	50
4.15 User-Friendly Programs .....	51
4.16 Review Questions: True/False .....	52
4.17 Review Questions: Multiple Choice .....	53
<b>Chapter 5 Variables and Constants.....</b>	<b>55</b>
5.1 What is a Variable?.....	55
5.2 What is a Constant? .....	57
5.3 How Many Types of Variables and Constants Exist in C#? .....	59
5.4 Rules for Naming Variables in C#.....	60
5.5 Rules for Naming Constants in C# .....	60
5.6 What Does the Phrase “Declare a Variable” Mean? .....	60
5.7 How to Declare Variables in C#.....	61
5.8 How to Declare Constants in C#.....	62
5.9 Review Questions: True/False .....	62
5.10 Review Questions: Multiple Choice .....	63
5.11 Review Exercises .....	64
<b>Chapter 6 Handling Input and Output .....</b>	<b>65</b>
6.1 Which Statement Outputs Messages and Results on a User’s Screen? .....	65
6.2 How to Output Special Characters .....	66
6.3 Which Statement Lets the User Enter Data?.....	68
6.4 Review Questions: True/False .....	70
6.5 Review Questions: Multiple Choice .....	70
<b>Chapter 7 Operators.....</b>	<b>71</b>
7.1 The Value Assignment Operator .....	71
7.2 Arithmetic Operators.....	73
7.3 What is the Precedence of Arithmetic Operators?.....	74
7.4 Compound Assignment Operators.....	75
Exercise 7.4-1 Which C# Statements are Syntactically Correct?.....	75
Exercise 7.4-2 Finding Variable Types .....	76
7.5 Incrementing/Decrementing Operators .....	76
7.6 String Operators.....	78
Exercise 7.6-1 Concatenating Names .....	78
7.7 Review Questions: True/False .....	79
7.8 Review Questions: Multiple Choice .....	79
7.9 Review Exercises .....	81
<b>Chapter 8 Trace Tables .....</b>	<b>83</b>
8.1 What is a Trace Table? .....	83
Exercise 8.1-1 Creating a Trace Table.....	84
Exercise 8.1-2 Swapping Values of Variables .....	84
Exercise 8.1-3 Swapping Values of Variables – A Second Approach.....	87
Exercise 8.1-4 Creating a Trace Table.....	87
Exercise 8.1-5 Creating a Trace Table.....	88

8.2	Review Questions: True/False .....	89
8.3	Review Exercises .....	89
<b>Chapter 9 Using Visual Studio .....</b>		<b>91</b>
9.1	Creating a New C# Project .....	91
9.2	Writing and Executing a C# Program .....	92
9.3	What “Debugging” Means .....	96
9.4	Debugging C# Programs with Visual Studio .....	96
9.5	Review Exercises .....	101
<b>Review Questions in “Getting Started with C#” .....</b>		<b>103</b>
<b>Section 3 Sequence Control Structures .....</b>		<b>105</b>
<b>Chapter 10 Introduction to Sequence Control Structures .....</b>		<b>107</b>
10.1	What is the Sequence Control Structure? .....	107
	Exercise 10.1-1 Calculating the Area of a Parallelogram .....	107
	Exercise 10.1-2 Calculating the Area of a Circle .....	108
	Exercise 10.1-3 Calculating Fuel Economy .....	108
	Exercise 10.1-4 Where is the Car? Calculating Distance Traveled .....	109
	Exercise 10.1-5 Kelvin to Fahrenheit .....	110
	Exercise 10.1-6 Calculating Sales Tax .....	111
	Exercise 10.1-7 Calculating a Sales Discount .....	111
	Exercise 10.1-8 Calculating the Sales Tax Rate and Discount .....	112
10.2	Review Exercises .....	112
<b>Chapter 11 Manipulating Numbers .....</b>		<b>115</b>
11.1	Introduction .....	115
11.2	Useful Mathematical Methods (Functions) .....	116
	Exercise 11.2-1 Calculating the Distance Between Two Points .....	120
	Exercise 11.2-2 How Far Did the Car Travel? .....	121
11.3	Review Questions: True/False .....	122
11.4	Review Questions: Multiple Choice .....	123
11.5	Review Exercises .....	123
<b>Chapter 12 Complex Mathematical Expressions .....</b>		<b>125</b>
12.1	Writing Complex Mathematical Expressions .....	125
	Exercise 12.1-1 Representing Mathematical Expressions in C# .....	125
	Exercise 12.1-2 Writing a Mathematical Expression in C# .....	126
	Exercise 12.1-3 Writing a Complex Mathematical Expression in C# .....	126
12.2	Review Exercises .....	128
<b>Chapter 13 Exercises With a Quotient and a Remainder .....</b>		<b>131</b>
13.1	Introduction .....	131
	Exercise 13.1-1 Calculating the Quotient and Remainder of Integer Division .....	131
	Exercise 13.1-2 Finding the Sum of Digits .....	132
	Exercise 13.1-3 Displaying an Elapsed Time .....	136
	Exercise 13.1-4 Reversing a Number .....	138
13.2	Review Exercises .....	138
<b>Chapter 14 Manipulating Strings .....</b>		<b>141</b>
14.1	Introduction .....	141

14.2	The Position of a Character in a String.....	141
14.3	Retrieving an Individual Character From a String.....	142
	Exercise 14.3-1 Displaying a String Backwards.....	142
14.4	Useful String Methods (Functions).....	143
	Exercise 14.4-1 Switching the Order of Names.....	148
	Exercise 14.4-2 Creating a Login ID.....	149
	Exercise 14.4-3 Creating a Random Word.....	150
14.5	Review Questions: True/False .....	150
14.6	Review Questions: Multiple Choice .....	151
14.7	Review Exercises .....	153
	<b>Review Questions in "Sequence Control Structures".....</b>	<b>155</b>
<b>Section 4</b>	<b>Decision Control Structures .....</b>	<b>157</b>
	<b>Chapter 15 Introduction to Decision Control Structures.....</b>	<b>159</b>
15.1	What is a Decision Control Structure? .....	159
15.2	What is a Boolean Expression?.....	159
15.3	How to Write Boolean Expressions.....	159
	Exercise 15.3-1 Filling in the Table.....	160
15.4	Logical Operators and Complex Boolean Expressions.....	161
15.5	What is the Order of Precedence of Logical Operators?.....	162
15.6	What is the Order of Precedence of Arithmetic, Comparison, and Logical Operators? .....	162
	Exercise 15.6-1 Filling in the Truth Table.....	163
	Exercise 15.6-2 Calculating the Results of Complex Boolean Expressions.....	164
	Exercise 15.6-3 Converting English Sentences to Boolean Expressions.....	164
15.7	How to Negate Boolean Expressions .....	166
	Exercise 15.7-1 Negating Boolean Expressions.....	167
15.8	Review Questions: True/False .....	168
15.9	Review Questions: Multiple Choice .....	169
15.10	Review Exercises .....	170
	<b>Chapter 16 The Single-Alternative Decision Structure.....</b>	<b>173</b>
16.1	The Single-Alternative Decision Structure .....	173
	Exercise 16.1-1 Trace Tables and Single-Alternative Decision Structures.....	174
	Exercise 16.1-2 The Absolute Value of a Number .....	175
16.2	Review Questions: True/False .....	176
16.3	Review Questions: Multiple Choice .....	177
16.4	Review Exercises .....	178
	<b>Chapter 17 The Dual-Alternative Decision Structure.....</b>	<b>181</b>
17.1	The Dual-Alternative Decision Structure.....	181
	Exercise 17.1-1 Finding the Output Message .....	181
	Exercise 17.1-2 Trace Tables and Dual-Alternative Decision Structures.....	182
	Exercise 17.1-3 Who is the Greatest?.....	183
	Exercise 17.1-4 Finding Odd and Even Numbers.....	185
	Exercise 17.1-5 Weekly Wages.....	186
17.2	Review Questions: True/False .....	187
17.3	Review Questions: Multiple Choice .....	188

---

17.4	Review Exercises.....	189
<b>Chapter 18 The Multiple-Alternative Decision Structure.....</b>		<b>193</b>
18.1	The Multiple-Alternative Decision Structure.....	193
	Exercise 18.1-1 Trace Tables and Multiple-Alternative Decision Structures.....	194
	Exercise 18.1-2 Counting the Digits.....	196
18.2	Review Questions: True/False .....	197
18.3	Review Exercises.....	197
<b>Chapter 19 The Case Decision Structure.....</b>		<b>201</b>
19.1	The Case Decision Structure.....	201
	Exercise 19.1-1 The Days of the Week.....	203
19.2	Review Questions: True/False .....	205
19.3	Review Exercises.....	205
<b>Chapter 20 Nested Decision Control Structures.....</b>		<b>209</b>
20.1	What are Nested Decision Control Structures? .....	209
	Exercise 20.1-1 Trace Tables and Nested Decision Control Structures .....	210
	Exercise 20.1-2 Positive, Negative or Zero?.....	212
20.2	A Mistake That You Will Probably Make! .....	213
20.3	Review Questions: True/False .....	217
20.4	Review Exercises.....	217
<b>Chapter 21 Tips and Tricks with Decision Control Structures .....</b>		<b>221</b>
21.1	Introduction.....	221
21.2	Choosing a Decision Control Structure.....	221
21.3	Streamlining the Decision Control Structure.....	221
	Exercise 21.3-1 "Shrinking" the Algorithm .....	223
	Exercise 21.3-2 "Shrinking" the C# Program .....	223
	Exercise 21.3-3 "Shrinking" the Algorithm .....	224
21.4	Merging Two or More Single-Alternative Decision Structures.....	227
	Exercise 21.4-1 Merging the Decision Control Structures.....	228
	Exercise 21.4-2 Merging the Decision Control Structures.....	228
21.5	Replacing Two Single-Alternative Decision Structures with a Dual-Alternative One ..	230
	Exercise 21.5-1 "Merging" the Decision Control Structures .....	230
21.6	What is Code Indentation and Why is it so Important? .....	232
21.7	Using the "From Inner to Outer" Method in Decision Control Structures .....	233
21.8	Review Questions: True/False .....	234
21.9	Review Questions: Multiple Choice.....	235
21.10	Review Exercises.....	237
<b>Chapter 22 Flowcharts with Decision Control Structures.....</b>		<b>241</b>
22.1	Introduction.....	241
22.2	Converting C# Programs to Flowcharts.....	241
	Exercise 22.2-1 Designing the Flowchart.....	242
	Exercise 22.2-2 Designing the Flowchart.....	243
	Exercise 22.2-3 Designing the Flowchart.....	244
	Exercise 22.2-4 Designing the Flowchart.....	245
22.3	Converting Flowcharts to C# Programs.....	246
	Exercise 22.3-1 Writing the C# Program .....	247

Exercise 22.3-2	Writing the C# Program.....	248
Exercise 22.3-3	Writing the C# Program.....	249
Exercise 22.3-4	Writing the C# Program.....	251
Exercise 22.3-5	Writing the C# Program.....	253
22.4	Review Exercises .....	254
<b>Chapter 23 More Exercises with Decision Control Structures .....</b>		<b>261</b>
23.1	Simple Exercises with Decision Control Structures .....	261
Exercise 23.1-1	Both Odds or Both Evens? .....	261
Exercise 23.1-2	Validating Data Input and Finding if a Number is Exactly Divisible by both 5 and 8.....	261
Exercise 23.1-3	Is it an Integer?.....	264
Exercise 23.1-4	Converting Gallons to Liters, and Vice Versa.....	265
Exercise 23.1-5	Converting Gallons to Liters, and Vice Versa (with Data Validation) .....	266
Exercise 23.1-6	Where is the Tollkeeper? .....	267
Exercise 23.1-7	The Most Scientific Calculator Ever!.....	268
23.2	Finding Minimum and Maximum Values with Decision Control Structures.....	269
Exercise 23.2-1	Finding the Name of the Heaviest Person .....	270
23.3	Exercises with Series of Consecutive Ranges of Values.....	272
Exercise 23.3-1	Calculating the Discount.....	272
Exercise 23.3-2	Validating Data Input and Calculating the Discount .....	274
Exercise 23.3-3	Sending a Parcel.....	275
Exercise 23.3-4	Progressive Rates and Electricity Consumption .....	277
Exercise 23.3-5	Progressive Rates and Text Messaging Services.....	278
23.4	Exercises of a General Nature with Decision Control Structures .....	279
Exercise 23.4-1	Finding a Leap Year.....	279
Exercise 23.4-2	Displaying the Days of the Month .....	280
Exercise 23.4-3	Is the Number a Palindrome?.....	282
Exercise 23.4-4	Checking for Proper Capitalization and Punctuation .....	283
23.5	Review Exercises .....	284
<b>Review Questions in "Decision Control Structures" .....</b>		<b>289</b>
<b>Section 5 Loop Control Structures.....</b>		<b>291</b>
<b>Chapter 24 Introduction to Loop Control Structures.....</b>		<b>293</b>
24.1	What is a Loop Control Structure?.....	293
24.2	From Sequence Control to Loop Control Structures.....	293
24.3	Review Questions: True/False .....	295
<b>Chapter 25 The Pre-Test Loop Structure .....</b>		<b>297</b>
25.1	The Pre-Test Loop Structure .....	297
Exercise 25.1-1	Designing the Flowchart and Counting the Total Number of Iterations .....	298
Exercise 25.1-2	Counting the Total Number of Iterations .....	299
Exercise 25.1-3	Designing the Flowchart and Counting the Total Number of Iterations .....	299
Exercise 25.1-4	Counting the Total Number of Iterations .....	301
Exercise 25.1-5	Finding the Sum of 4 Numbers.....	301
Exercise 25.1-6	Finding the Product of 20 Numbers.....	302
Exercise 25.1-7	Finding the Product of N Numbers.....	303
Exercise 25.1-8	Finding the Sum of Odd Numbers.....	304
Exercise 25.1-9	Finding the Sum of an Unknown Quantity of Numbers.....	305
25.2	Review Questions: True/False .....	306

25.3	Review Questions: Multiple Choice.....	307
25.4	Review Exercises.....	309
<b>Chapter 26 The Post-Test Loop Structure .....</b>		<b>313</b>
26.1	The Post-Test Loop Structure.....	313
	Exercise 26.1-1 Designing the Flowchart and Counting the Total Number of Iterations.....	314
	Exercise 26.1-2 Counting the Total Number of Iterations.....	315
	Exercise 26.1-3 Designing the Flowchart and Counting the Total Number of Iterations.....	316
	Exercise 26.1-4 Counting the Total Number of Iterations.....	317
	Exercise 26.1-5 Finding the Product of N Numbers.....	318
	Exercise 26.1-6 Finding the Product of an Unknown Quantity of Numbers.....	319
26.2	Review Questions: True/False.....	320
26.3	Review Questions: Multiple Choice.....	321
26.4	Review Exercises.....	322
<b>Chapter 27 Counted Loop Structures.....</b>		<b>325</b>
27.1	Counted Loop Structures.....	325
	Exercise 27.1-1 Designing the Flowchart and Creating the Trace Table.....	328
	Exercise 27.1-2 Creating the Trace Table.....	329
	Exercise 27.1-3 Counting the Total Number of Iterations.....	330
	Exercise 27.1-4 Finding the Sum of 10 Numbers.....	331
	Exercise 27.1-5 Finding the Square Roots from 0 to N.....	332
27.2	Rules that Apply to Counted Loop Structures.....	333
	Exercise 27.2-1 Counting the Total Number of Iterations.....	333
	Exercise 27.2-2 Counting the Total Number of Iterations.....	334
	Exercise 27.2-3 Counting the Total Number of Iterations.....	334
	Exercise 27.2-4 Counting the Total Number of Iterations.....	335
	Exercise 27.2-5 Finding the Average Value of N Numbers.....	336
27.3	Review Questions: True/False.....	336
27.4	Review Questions: Multiple Choice.....	337
27.5	Review Exercises.....	340
<b>Chapter 28 Nested Loop Control Structures .....</b>		<b>343</b>
28.1	What is a Nested Loop?.....	343
	Exercise 28.1-1 Say “Hello Zeus”. Designing the Flowchart and Counting the Total Number of Iterations.....	344
	Exercise 28.1-2 Creating the Trace Table.....	345
28.2	Rules that Apply to Nested Loops.....	347
	Exercise 28.2-1 Breaking the First Rule.....	347
	Exercise 28.2-2 Counting the Total Number of Iterations.....	348
28.3	Review Questions: True/False.....	348
28.4	Review Questions: Multiple Choice.....	349
28.5	Review Exercises.....	351
<b>Chapter 29 Tips and Tricks with Loop Control Structures.....</b>		<b>355</b>
29.1	Introduction.....	355
29.2	Choosing a Loop Control Structure.....	355
29.3	The “Ultimate” Rule.....	355
29.4	Breaking Out of a Loop.....	359
29.5	Cleaning Out Your Loops.....	361

	Exercise 29.5-1	Cleaning Out the Loop.....	362
	Exercise 29.5-2	Cleaning Out the Loop.....	363
29.6		Endless Loops and How to Avoid Them .....	364
29.7		Using the “From Inner to Outer” Method in Loop Control Structures .....	365
29.8		Review Questions: True/False .....	366
29.9		Review Questions: Multiple Choice .....	367
29.10		Review Exercises .....	368
<b>Chapter 30 Flowcharts with Loop Control Structures.....</b>			<b>371</b>
30.1		Introduction.....	371
30.2		Converting C# Programs to Flowcharts .....	371
	Exercise 30.2-1	Designing the Flowchart.....	372
	Exercise 30.2-2	Designing the Flowchart.....	373
	Exercise 30.2-3	Designing the Flowchart.....	374
	Exercise 30.2-4	Designing the Flowchart.....	375
	Exercise 30.2-5	Designing the Flowchart.....	376
	Exercise 30.2-6	Designing the Flowchart.....	378
	Exercise 30.2-7	Designing the Flowchart.....	378
30.3		Converting Flowcharts to C# Programs .....	379
	Exercise 30.3-1	Writing the C# Program.....	380
	Exercise 30.3-2	Writing the C# Program.....	381
	Exercise 30.3-3	Writing the C# Program.....	382
	Exercise 30.3-4	Writing the C# Program.....	384
30.4		Review Exercises .....	387
<b>Chapter 31 More Exercises with Loop Control Structures .....</b>			<b>393</b>
31.1		Simple Exercises with Loop Control Structures .....	393
	Exercise 31.1-1	Finding the Sum of $1 + 2 + 3 + \dots + 100$ .....	393
	Exercise 31.1-2	Finding the Product of $2 \times 4 \times 6 \times 8 \times 10$ .....	394
	Exercise 31.1-3	Finding the Sum of $2^2 + 4^2 + 6^2 + \dots (2N)^2$ .....	395
	Exercise 31.1-4	Finding the Sum of $3^3 + 6^6 + 9^9 + \dots (3N)^{3N}$ .....	396
	Exercise 31.1-5	Finding the Average Value of Positive Numbers .....	396
	Exercise 31.1-6	Counting the Numbers According to Which is Greater.....	397
	Exercise 31.1-7	Counting the Numbers According to Their Digits .....	398
	Exercise 31.1-8	How Many Numbers Fit in a Sum.....	398
	Exercise 31.1-9	Finding the Total Number of Positive Integers .....	399
	Exercise 31.1-10	Iterating as Many Times as the User Wishes .....	400
	Exercise 31.1-11	Finding the Sum of the Digits.....	401
	Exercise 31.1-12	Counting the Digits.....	403
31.2		Exercises with Nested Loop Control Structures .....	404
	Exercise 31.2-1	Displaying all Three-Digit Integers that Contain a Given Digit.....	404
	Exercise 31.2-2	Displaying all Instances of a Specified Condition .....	405
31.3		Data Validation with Loop Control Structures .....	407
	Exercise 31.3-1	Finding the Square Root - Validation Without Error Messages.....	408
	Exercise 31.3-2	Finding the Square Root - Validation with One Error Message.....	409
	Exercise 31.3-3	Finding the Square Root - Validation with Individual Error Messages .....	410
	Exercise 31.3-4	Finding the Sum of 10 Numbers .....	411
31.4		Finding Minimum and Maximum Values with Loop Control Structures .....	412
	Exercise 31.4-1	Validating and Finding the Maximum Value.....	414
	Exercise 31.4-2	Validating and Finding the Maximum Temperature.....	415

	Exercise 31.4-3 "Making the Grade" .....	417
31.5	Exercises of a General Nature with Loop Control Structures .....	418
	Exercise 31.5-1 Fahrenheit to Kelvin, from 0 to 100 .....	418
	Exercise 31.5-2 Wheat on a Chessboard .....	419
	Exercise 31.5-3 Just a Poll.....	420
	Exercise 31.5-4 Is the Message a Palindrome? .....	421
31.6	Review Questions: True/False .....	424
31.7	Review Exercises .....	424
	<b>Review Questions in "Loop Control Structures" .....</b>	<b>431</b>
<b>Section 6</b>	<b>Arrays .....</b>	<b>433</b>
	<b>Chapter 32 Introduction to Arrays .....</b>	<b>435</b>
32.1	Introduction.....	435
32.2	What is an Array? .....	436
	Exercise 32.2-1 Designing an Array.....	438
	Exercise 32.2-2 Designing Arrays.....	439
	Exercise 32.2-3 Designing Arrays.....	440
32.3	Review Questions: True/False .....	440
32.4	Review Exercises .....	441
	<b>Chapter 33 One-Dimensional Arrays .....</b>	<b>443</b>
33.1	Creating One-Dimensional Arrays in C# .....	443
33.2	How to Get Values from One-Dimensional Arrays .....	444
	Exercise 33.2-1 Creating the Trace Table .....	444
	Exercise 33.2-2 Using a Non-Existing Index .....	445
33.3	How to Add Values Entered by the User to a One-Dimensional Array.....	445
33.4	How to Iterate Through a One-Dimensional Array .....	445
	Exercise 33.4-1 Displaying Words in Reverse Order .....	446
	Exercise 33.4-2 Displaying Positive Numbers in Reverse Order.....	447
	Exercise 33.4-3 Displaying Even Numbers in Odd-Numbered Index Positions.....	448
	Exercise 33.4-4 Finding the Sum.....	449
33.5	Review Questions: True/False .....	450
33.6	Review Questions: Multiple Choice.....	452
33.7	Review Exercises.....	453
	<b>Chapter 34 Two-Dimensional Arrays .....</b>	<b>457</b>
34.1	Creating Two-Dimensional Arrays in C# .....	457
34.2	How to Get Values from Two-Dimensional Arrays .....	458
	Exercise 34.2-1 Creating the Trace Table .....	459
34.3	How to Add Values Entered by the User to a Two-Dimensional Array.....	460
34.4	How to Iterate Through a Two-Dimensional Array .....	460
	Exercise 34.4-1 Displaying Reals Only .....	463
	Exercise 34.4-2 Displaying Odd Columns Only .....	464
34.5	What's the Story on Variables <i>i</i> and <i>j</i> ? .....	465
34.6	Square Arrays .....	465
	Exercise 34.6-1 Finding the Sum of the Elements of the Main Diagonal.....	465
	Exercise 34.6-2 Finding the Sum of the Elements of the Antidiagonal .....	467
	Exercise 34.6-3 Filling in the Array.....	468
34.7	Review Questions: True/False .....	470



	Exercise 36.4-7 The Five Best Scorers.....	538
36.5	Searching Elements in Arrays.....	540
	Exercise 36.5-1 The Linear Search Algorithm – Searching in a One-Dimensional Array that may Contain the Same Value Multiple Times .....	540
	Exercise 36.5-2 Display the Last Names of All Those People Who Have the Same First Name .....	541
	Exercise 36.5-3 Searching in a One-Dimensional Array that Contains Unique Values .....	542
	Exercise 36.5-4 Searching for a Given Social Security Number .....	544
	Exercise 36.5-5 Searching in a Two-Dimensional Array that may Contain the Same Value Multiple Times.....	545
	Exercise 36.5-6 Searching in a Two-Dimensional Array that Contains Unique Values .....	546
	Exercise 36.5-7 Checking if a Value Exists in all Columns .....	548
	Exercise 36.5-8 The Binary Search Algorithm – Searching in a Sorted One-Dimensional Array .....	551
	Exercise 36.5-9 Display all the Historical Events for a Country.....	553
	Exercise 36.5-10 Searching in Each Column of a Two-Dimensional Array.....	555
36.6	Exercises of a General Nature with Arrays .....	558
	Exercise 36.6-1 On Which Days was There a Possibility of Snow?.....	558
	Exercise 36.6-2 Was There Any Possibility of Snow? .....	558
	Exercise 36.6-3 In Which Cities was There a Possibility of Snow?.....	560
	Exercise 36.6-4 Display from Highest to Lowest Grades by Student, and in Alphabetical Order.....	563
	Exercise 36.6-5 Archery at the Summer Olympics .....	565
36.7	Review Questions: True/False .....	567
36.8	Review Exercises.....	568
	<b>Review Questions in “Arrays” .....</b>	<b>581</b>
<b>Section 7</b>	<b>Subprograms.....</b>	<b>583</b>
	<b>Chapter 37 Introduction to Subprograms.....</b>	<b>585</b>
37.1	What is Procedural Programming? .....	585
37.2	What is Modular Programming? .....	585
37.3	What Exactly is a Subprogram? .....	586
37.4	Review Questions: True/False .....	586
	<b>Chapter 38 User-Defined Methods (Functions) .....</b>	<b>589</b>
38.1	Writing your Own Methods (Functions) in C#.....	589
38.2	How Do You Call a Method?.....	590
38.3	Formal and Actual Arguments.....	592
38.4	How Does a Method Execute?.....	593
	Exercise 38.4-1 Back to Basics – Calculating the Sum of Two Numbers.....	594
	Exercise 38.4-2 Calculating the Sum of Two Numbers Using Fewer Lines of Code! .....	595
38.5	Review Questions: True/False .....	596
38.6	Review Exercises.....	597
	<b>Chapter 39 User-Defined void Methods (Procedures).....</b>	<b>601</b>
39.1	Writing your Own void Methods (Procedures) in C# .....	601
39.2	How Do You Call a void Method? .....	602
39.3	Formal and Actual Arguments.....	603
39.4	How Does a void Method Execute?.....	603

Exercise 39.4-1	Back to Basics – Displaying the Absolute Value of a Number.....	605
Exercise 39.4-2	A Simple Currency Converter.....	606
39.5	Review Questions: True/False .....	607
39.6	Review Exercises .....	608
<b>Chapter 40 Tips and Tricks with Subprograms .....</b>		<b>611</b>
40.1	Can Two Subprograms use Variables of the Same Name? .....	611
40.2	Can a Subprogram Call Another Subprogram?.....	612
Exercise 40.2-1	A Currency Converter – Using Methods with void Methods.....	613
40.3	Passing Arguments by Value and by Reference .....	615
Exercise 40.3-1	Finding the Logic Error .....	617
40.4	Passing and/or Returning an Array .....	618
40.5	Default Argument Values (Optional Arguments) .....	621
40.6	The Scope of a Variable .....	621
40.7	Converting Parts of Code into Subprograms .....	623
40.8	Overloading Methods.....	628
40.9	Review Questions: True/False .....	631
40.10	Review Exercises .....	632
<b>Chapter 41 More Exercises with Subprograms .....</b>		<b>639</b>
41.1	Simple Exercises with Subprograms .....	639
Exercise 41.1-1	Finding the Average Values of Positive Integers .....	639
Exercise 41.1-2	Finding the Sum of Odd Positive Integers.....	640
Exercise 41.1-3	Roll, Roll, Roll the... Dice! .....	641
Exercise 41.1-4	How Many Times Does Each Number of the Dice Appear? .....	642
41.2	Exercises of a General Nature with Subprograms .....	644
Exercise 41.2-1	Validating Data Input .....	644
Exercise 41.2-2	Sorting an Array.....	646
Exercise 41.2-3	Progressive Rates and Electricity Consumption.....	647
41.3	Review Exercises .....	649
<b>Review Questions in “Subprograms” .....</b>		<b>661</b>
<b>Index.....</b>		<b>663</b>
<b>Some Final Words from the Authors.....</b>		<b>669</b>
<b>More of our Books.....</b>		<b>671</b>