



Contents

Chapters 16–27 and Appendix F are PDF documents posted online at the book’s Companion Website (located at www.pearsonhighered.com/deitel/).

Preface **xix**

Before You Begin **xxix**

I Introduction to Computers, the Internet and Visual Basic **I**

- 1.1 Introduction 2
- 1.2 Computer Organization 3
- 1.3 Personal Computing, Distributed Computing and Client/Server Computing 4
- 1.4 Hardware Trends 4
- 1.5 Microsoft’s Windows® Operating System 5
- 1.6 Machine Languages, Assembly Languages and High-Level Languages 5
- 1.7 Visual Basic 6
- 1.8 Some Other Key Programming Languages 7
- 1.9 The Internet and the World Wide Web 7
- 1.10 Extensible Markup Language (XML) 8
- 1.11 Introduction to Microsoft .NET 9
- 1.12 The .NET Framework and the Common Language Runtime 9
- 1.13 Test-Driving the Visual Basic **Advanced Painter** Application 10
- 1.14 Introduction to Object Technology 13
- 1.15 Wrap-Up 15
- 1.16 Web Resources 15

2 Dive Into® Visual Basic 2010 Express **24**

- 2.1 Introduction 25
- 2.2 Overview of the Visual Studio 2010 IDE 25
- 2.3 Menu Bar and Toolbar 30
- 2.4 Navigating the Visual Studio IDE 33
 - 2.4.1 **Solution Explorer** 35
 - 2.4.2 **Toolbox** 36
 - 2.4.3 **Properties Window** 37
- 2.5 Using Help 38

2.6	Using Visual Programming to Create a Simple Program that Displays Text and an Image	40
2.7	Wrap-Up	51
2.8	Web Resources	52

3 Introduction to Visual Basic Programming 60

3.1	Introduction	61
3.2	Programmatically Displaying Text in a Label	62
3.2.1	Analyzing the Program	63
3.2.2	Modifying ASimpleProgram to Programmatically Change the Label's Text Property	66
3.3	Addition Program	70
3.4	Building the Addition Program	73
3.5	Memory Concepts	79
3.6	Arithmetic	81
3.7	Decision Making: Equality and Relational Operators	85
3.8	Wrap-Up	90

4 Introduction to Problem Solving and Control Statements 103

4.1	Introduction	104
4.2	Algorithms	104
4.3	Pseudocode	105
4.4	Control Structures	105
4.5	If...Then Selection Statement	108
4.6	If...Then...Else Selection Statement	109
4.7	Nested If...Then...Else Statements	110
4.8	Repetition Statements	111
4.9	Compound Assignment Operators	113
4.10	Formulating Algorithms: Counter-Controlled Repetition	115
4.11	Formulating Algorithms: Nested Control Statements	121
4.12	Using the Debugger: Locating a Logic Error	127
4.12.1	Breakpoints and Running the Program	129
4.12.2	<i>Quick Info</i> Box	130
4.12.3	Locals Window	131
4.12.4	Using the Step Over Command to Execute Statements	131
4.13	Wrap-Up	133

5 Problem Solving and Control Statements: Part 2 149

5.1	Introduction	150
5.2	For...Next Repetition Statement	150
5.2.1	For...Next Statement Header Components	152
5.2.2	General Form of a For...Next Statement	152

5.2.3	Declaring the Control Variable Before a For...Next Statement	153
5.2.4	Using Expressions in the For...Next Statement's Header	153
5.2.5	For...Next Statement UML Activity Diagram	153
5.2.6	Local Type Inference	153
5.3	Examples Using the For...Next Statement	155
5.4	Application: Interest Calculator	155
5.5	Formulating Algorithms: Nested Repetition Statements	159
5.6	Select...Case Multiple-Selection Statement	162
5.7	Do...Loop While and Do...Loop Until Repetition Statements	166
5.8	Using Exit to Terminate Repetition Statements	168
5.9	Using Continue in Repetition Statements	168
5.10	Logical Operators	169
5.11	Application: Dental Payment Calculator	172
5.12	Wrap-Up	175
6	Methods	191
6.1	Introduction	192
6.2	Classes and Methods	192
6.3	Subroutines: Methods That Do Not Return a Value	194
6.4	Functions: Methods That Return a Value	198
6.5	Implicit Argument Conversions	200
6.6	Option Strict and Data-Type Conversions	201
6.7	Passing Arguments: Pass-by-Value vs. Pass-by-Reference	203
6.8	Scope of Declarations	206
6.9	Case Study: Random-Number Generation	209
6.9.1	Scaling and Shifting of Random Numbers	211
6.9.2	Randomly Selecting Images	212
6.9.3	Rolling Dice Repeatedly and Displaying Statistics	214
6.10	Case Study: A Game of Chance	216
6.11	Method Overloading	221
6.12	Optional Parameters	223
6.13	Using the Debugger: Debugging Commands	225
6.14	Wrap-Up	227
7	Arrays	241
7.1	Introduction	242
7.2	Arrays	242
7.3	Declaring and Allocating Arrays	243
7.4	Initializing the Values in an Array	244
7.5	Summing the Elements of an Array	245
7.6	Using Arrays to Analyze Survey Results	246
7.7	Die-Rolling Program with an Array of Counters	249
7.8	Case Study: Flag Quiz	251
7.9	Passing an Array to a Method	255
7.10	For Each...Next Repetition Statement	258

7.11	Sorting an Array with Method <code>Sort</code> of Class <code>Array</code>	260
7.12	Searching an Array with Linear Search	262
7.13	Searching a Sorted Array with Array Method <code>BinarySearch</code>	264
7.14	Rectangular Arrays	265
7.15	Case Study: Maintaining Grades Using a Rectangular Array	267
7.16	Resizing an Array with the <code>ReDim</code> Statement	277
7.17	Wrap-Up	278

8 Files **289**

8.1	Introduction	290
8.2	Data Hierarchy	290
8.3	Files and Streams	292
8.4	Test-Driving the Credit Inquiry Application	293
8.5	Writing Data Sequentially to a Text File	295
8.5.1	Class <code>CreateAccounts</code>	298
8.5.2	Opening the File	299
8.5.3	Managing Resources with the <code>Using</code> Statement	300
8.5.4	Adding an Account to the File	301
8.5.5	Closing the File and Terminating the Application	302
8.6	Building Menus with the Windows Forms Designer	303
8.7	Credit Inquiry Application: Reading Data Sequentially from a Text File	305
8.7.1	Implementing the Credit Inquiry Application	305
8.7.2	Selecting the File to Process	305
8.7.3	Specifying the Type of Records to Display	306
8.7.4	Displaying the Records	307
8.8	Wrap-Up	310

9 Object-Oriented Programming: Classes and Objects **315**

9.1	Introduction	316
9.2	Classes, Objects, Methods and Instance Variables	316
9.3	<code>Account</code> Class	317
9.4	Value Types and Reference Types	323
9.5	Case Study: Card Shuffling and Dealing Simulation	324
9.6	Case Study: <code>Time</code> Class	330
9.7	Class Scope	337
9.8	Object Initializers	338
9.9	Auto-Implemented Properties	338
9.10	Using <code>Me</code> to Access the Current Object	339
9.11	Garbage Collection	339
9.12	Shared Class Members	340
9.13	<code>Const</code> and <code>ReadOnly</code> Fields	343
9.14	Shared Methods and Class <code>Math</code>	344
9.15	Object Browser	345
9.16	Wrap-Up	345

10	Object-Oriented Programming: Inheritance and Polymorphism	355
10.1	Introduction	356
10.2	Base Classes and Derived Classes	356
10.3	Business Case Study: Commission Employees Class Hierarchy	358
10.3.1	Creating Base Class <code>CommissionEmployee</code>	358
10.3.2	Creating Derived Class <code>BasePlusCommissionEmployee</code>	361
10.3.3	Testing Class <code>BasePlusCommissionEmployee</code>	364
10.4	Constructors in Derived Classes	366
10.5	Protected Members	366
10.6	Introduction to Polymorphism: Polymorphic Video Game	367
10.7	Abstract Classes and Methods	368
10.8	Case Study: Payroll System Class Hierarchy Using Polymorphism	369
10.8.1	Abstract Base Class <code>Employee</code>	370
10.8.2	Concrete Derived Class <code>SalariesEmployee</code>	372
10.8.3	Concrete Derived Class <code>CommissionEmployee</code>	373
10.8.4	Indirect Concrete Derived Class <code>BasePlusCommissionEmployee</code>	375
10.8.5	Demonstrating Polymorphic Processing	376
10.9	Online Case Study: Interfaces	378
10.10	Wrap-Up	379
11	Introduction to LINQ	386
11.1	Introduction	387
11.2	Querying an Array of Primitive-Type Elements Using LINQ	388
11.3	Querying an Array of Reference-Type Elements Using LINQ	391
11.4	Deferred Execution and Transforming Query Results	397
11.5	LINQ Resource Center	398
11.6	Wrap-Up	399
12	Databases and LINQ	403
12.1	Introduction	404
12.2	Relational Databases	405
12.3	A Books Database	406
12.4	LINQ to SQL	409
12.5	Querying a Database with LINQ	410
12.5.1	Creating LINQ to SQL Classes	411
12.5.2	Data Bindings Between Controls and the LINQ to SQL Classes	414
12.6	Dynamically Binding Query Results	418
12.6.1	Creating the Display Query Results GUI	418
12.6.2	Coding the Display Query Results Application	419
12.7	Retrieving Data from Multiple Tables	421
12.8	Creating a Master/Detail View Application	425
12.8.1	Creating the Master/Detail GUI	427
12.8.2	Coding the Master/Detail Application	428

12.9	Address Book Case Study	431
12.9.1	Creating the Address Book Application's GUI	432
12.9.2	Coding the Address Book Application	434
12.10	Tools and Web Resources	436
12.11	Wrap-Up	436

13 Web App Development with ASP.NET **443**

13.1	Introduction	444
13.2	Web Basics	445
13.3	Multitier Application Architecture	446
13.4	Your First Web Application	448
13.4.1	Building the WebTime Application	450
13.4.2	Examining WebTime.aspx 's Code-Behind File	459
13.5	Standard Web Controls: Designing a Form	460
13.6	Validation Controls	465
13.7	Session Tracking	471
13.7.1	Cookies	472
13.7.2	Session Tracking with HttpSessionState	473
13.7.3	Options.aspx : Selecting a Programming Language	475
13.7.4	Recommendations.aspx : Displaying Recommendations Based on Session Values	479
13.8	Case Study: Database-Driven ASP.NET Guestbook	481
13.8.1	Building a Web Form that Displays Data from a Database	483
13.8.2	Modifying the Code-Behind File for the Guestbook Application	487
13.9	Online Case Study: ASP.NET AJAX	488
13.10	Online Case Study: Password Protected Books Database Application	488
13.11	Wrap-Up	488

14 Windows Forms GUI: A Deeper Look **495**

14.1	Introduction	496
14.2	Controls and Components	496
14.3	Creating Event Handlers	498
14.4	Control Properties and Layout	500
14.5	GroupBoxes and Panels	504
14.6	ToolTip s	505
14.7	Mouse-Event Handling	507
14.8	Keyboard-Event Handling	510
14.9	Menus	513
14.10	MonthCalendar Control	522
14.11	DateTimePicker Control	523
14.12	LinkLabel Control	526
14.13	ListBox and CheckedListBox Controls	528
14.14	Multiple Document Interface (MDI) Windows	532
14.15	Visual Inheritance	540

14.16	Animation with the Timer Component	543
14.17	Wrap-Up	544
15	Graphics and Multimedia	551
15.1	Introduction	552
15.2	Drawing Classes and the Coordinate System	552
15.3	Graphics Contexts and Graphics Objects	553
15.4	Colors	554
15.5	Fonts	561
15.6	Drawing Lines, Rectangles and Ovals	565
15.7	Drawing Arcs	568
15.8	Drawing Polygons and Polylines	571
15.9	Additional Brush Types	572
15.10	Loading, Displaying and Scaling Images	577
15.11	Windows Media Player	579
15.12	Printing	580
15.13	Wrap-Up	586
A	Operator Precedence Chart	595
B	Primitive Types	597
C	Number Systems	598
C.1	Introduction	599
C.2	Abbreviating Binary Numbers as Octal and Hexadecimal Numbers	602
C.3	Converting Octal and Hexadecimal Numbers to Binary Numbers	603
C.4	Converting from Binary, Octal or Hexadecimal to Decimal	603
C.5	Converting from Decimal to Binary, Octal or Hexadecimal	604
C.6	Negative Binary Numbers: Two's-Complement Notation	606
D	ASCII Character Set	611
E	Unicode[®]	612
E.1	Introduction	613
E.2	Unicode Transformation Formats	614
E.3	Characters and Glyphs	615
E.4	Advantages/Disadvantages of Unicode	616
E.5	Using Unicode	616
E.6	Character Ranges	618
	Index	623

Companion Website Online Content

Chapters 16–27 and Appendix F are PDF documents posted online at the book’s Companion Website (located at www.pearsonhighered.com/deitel).

- 16 Exception Handling: A Deeper Look**
- 17 Strings and Characters: A Deeper Look**
- 18 Files and Streams: A Deeper Look**
- 19 GUI with Windows Presentation Foundation (WPF)**
- 20 WPF Graphics and Multimedia**
- 21 XML and LINQ to XML**
- 22 Web App Development with ASP.NET:
A Deeper Look**
- 23 Web Services**
- 24 Silverlight and Rich Internet Applications**
- 25 Collections and Generics**
- 26 ATM Case Study, Part 1:
Object-Oriented Design with the UML**
- 27 ATM Case Study, Part 2:
Implementing an Object-Oriented Design**
- F Creating Console Applications**