## Contents

**Introduction**  
xxv

### Part I: C# Fundamentals

**Chapter 1: The .NET Framework**  
3

- What’s the .NET Framework?  
  - Common Language Runtime  
  - .NET Framework Class Library  
4

- Assemblies and the Microsoft Intermediate Language (MSIL)  
6

- Versions of the .NET Framework and Visual Studio  
8

- Summary  
9

**Chapter 2: Getting Started with Visual Studio 2008**  
11

- Visual Studio 2008 Overview  
  - Choosing the Development Settings  
  - Resetting the Development Settings  
  - Creating a New Project  
  - Components of the IDE  
11

- Code and Text Editor  
  - Code Snippets  
  - IntelliSense  
  - Refactoring Support  
34

- Debugging  
  - Setting Breakpoints  
  - Stepping through the Code  
  - Watching  
  - Autos and Immediate Windows  
49

- Unit Testing  
  - Creating the Test  
  - Running the Test  
  - Testing with Floating Point Numbers  
  - Adding Additional Test Methods  
53

- Summary  
59
Chapter 3: C# Language Foundations

Using Visual Studio 2008 61
Using the C# Compiler (csc.exe) 64
Dissecting the Program 66
  Passing Arguments to Main() 68
Language Syntax 68
  Keywords 68
  Variables 69
  Scope of Variables 71
  Constants 74
  Comments 74
  XML Documentation 74
Data Types 78
  Value Types 79
  Reference Types 84
  Enumerations 85
  Arrays 87
  Implicit Typing 88
  Type Conversion 89
Flow Control 92
  if-else Statement 92
  switch Statement 94
Looping 96
  for Loop 96
  Nested for Loop 97
  foreach 98
  while and do-while Loops 99
  Exiting from a Loop 99
  Skipping an Iteration 102
Operators 102
  Assignment Operators 103
  Relational Operators 105
  Logical Operators 106
  Mathematical Operators 108
  Operator Precedence 109
Preprocessor Directives 110
  #define and #undef 111
  #if, #else, #elif, and #endif 115
  #warning and #error 117
  #line 118
Chapter 4: Classes and Objects

Classes
Defining a Class
Using Partial Classes
Creating an Instance of a Class (Object Instantiation)
Anonymous Types (C# 3.0)
Class Members
Function Members
Static Classes

System.Object Class
Testing for Equality
Implementing Equals
ToString() Method
Attributes

Structures

Summary

Chapter 5: Interfaces

Defining an Interface
Implementing an Interface
Implementing Multiple Interfaces
Extending Interfaces
Interface Casting
The is and as Operators
Overriding Interface Implementations
Summary

Chapter 6: Inheritance

Understanding Inheritance in C#
Implementation Inheritance
Abstract Class
Abstract Methods
Virtual Methods
Sealed Classes and Methods
Overloading Methods
## Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overloading Operators</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Extension Methods (C# 3.0)</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>Access Modifiers</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Inheritance and Constructors</td>
<td>202</td>
</tr>
<tr>
<td></td>
<td>Calling Base Class Constructors</td>
<td>203</td>
</tr>
<tr>
<td></td>
<td>Interface Inheritance</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>Explicit Interface Members Implementation</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>211</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 7: Delegates and Events</strong></td>
<td>213</td>
</tr>
<tr>
<td></td>
<td>Delegates</td>
<td>213</td>
</tr>
<tr>
<td></td>
<td>Creating a Delegate</td>
<td>214</td>
</tr>
<tr>
<td></td>
<td>Delegates Chaining (Multicast Delegates)</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Implementing Callbacks Using Delegates</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>Asynchronous Callbacks</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>Anonymous Methods and Lambda Expressions</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Events</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>Handling Events</td>
<td>229</td>
</tr>
<tr>
<td></td>
<td>Implementing Events</td>
<td>232</td>
</tr>
<tr>
<td></td>
<td>Difference between Events and Delegates</td>
<td>235</td>
</tr>
<tr>
<td></td>
<td>Passing State Information to an Event Handler</td>
<td>237</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 8: Strings and Regular Expressions</strong></td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>The System.String Class</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>Escape Characters</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>String Manipulations</td>
<td>247</td>
</tr>
<tr>
<td></td>
<td>String Formatting</td>
<td>254</td>
</tr>
<tr>
<td></td>
<td>The StringBuilder Class</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>Regular Expressions</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>Searching for a Match</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>More Complex Pattern Matching</td>
<td>261</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>263</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 9: Generics</strong></td>
<td>265</td>
</tr>
<tr>
<td></td>
<td>Understanding Generics</td>
<td>265</td>
</tr>
<tr>
<td></td>
<td>Generic Classes</td>
<td>268</td>
</tr>
<tr>
<td></td>
<td>Using the default Keyword in Generics</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>Advantages of Generics</td>
<td>271</td>
</tr>
<tr>
<td>Contents</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Using Constraints in a Generic Type</td>
<td>271</td>
<td></td>
</tr>
<tr>
<td>Generic Interfaces</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>Generic Structs</td>
<td>276</td>
<td></td>
</tr>
<tr>
<td>Generic Methods</td>
<td>276</td>
<td></td>
</tr>
<tr>
<td>Generic Operators</td>
<td>278</td>
<td></td>
</tr>
<tr>
<td>Generic Delegates</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td>Generics and the .NET Framework Class Library</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td>Using the LinkedList&lt;T&gt; Generic Class</td>
<td>284</td>
<td></td>
</tr>
<tr>
<td>System.Collections.ObjectModel</td>
<td>288</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>291</td>
<td></td>
</tr>
<tr>
<td>Chapter 10: Threading</td>
<td>293</td>
<td></td>
</tr>
<tr>
<td>The Need for Multithreading</td>
<td>293</td>
<td></td>
</tr>
<tr>
<td>Starting a Thread</td>
<td>295</td>
<td></td>
</tr>
<tr>
<td>Aborting a Thread</td>
<td>297</td>
<td></td>
</tr>
<tr>
<td>Passing Parameters to Threads</td>
<td>301</td>
<td></td>
</tr>
<tr>
<td>Thread Synchronization</td>
<td>303</td>
<td></td>
</tr>
<tr>
<td>Using Interlocked Class</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>Using C# Lock</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>Monitor Class</td>
<td>307</td>
<td></td>
</tr>
<tr>
<td>Thread Safety in Windows Forms</td>
<td>312</td>
<td></td>
</tr>
<tr>
<td>Using the BackgroundWorker Control</td>
<td>315</td>
<td></td>
</tr>
<tr>
<td>Testing the Application</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>Chapter 11: Files and Streams</td>
<td>321</td>
<td></td>
</tr>
<tr>
<td>Working with Files and Directories</td>
<td>321</td>
<td></td>
</tr>
<tr>
<td>Working with Directories</td>
<td>322</td>
<td></td>
</tr>
<tr>
<td>Working with Files Using the File and FileInfo Classes</td>
<td>326</td>
<td></td>
</tr>
<tr>
<td>Creating a FileExplorer</td>
<td>329</td>
<td></td>
</tr>
<tr>
<td>The Stream Class</td>
<td>331</td>
<td></td>
</tr>
<tr>
<td>BufferedStream</td>
<td>333</td>
<td></td>
</tr>
<tr>
<td>The FileStream Class</td>
<td>334</td>
<td></td>
</tr>
<tr>
<td>MemoryStream</td>
<td>337</td>
<td></td>
</tr>
<tr>
<td>NetworkStream Class</td>
<td>338</td>
<td></td>
</tr>
<tr>
<td>Cryptography</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Hashing</td>
<td>344</td>
<td></td>
</tr>
<tr>
<td>Salted Hash</td>
<td>346</td>
<td></td>
</tr>
<tr>
<td>Encryption and Decryption</td>
<td>347</td>
<td></td>
</tr>
</tbody>
</table>
Contents

Compressions for Stream Objects 353
  Compression 353
  Decompression 354
Serialization 359
  Binary Serialization 359
  XML Serialization 365
Summary 375

Chapter 12: Exception Handling 377

Handling Exceptions 377
  Handling Exceptions Using the try-catch Statement 378
  Handling Multiple Exceptions 381
  Throwing Exceptions Using the throw Statement 383
  Rethrowing Exceptions 386
  Exception Chaining 387
  Using Exception Objects 389
  The finally Statement 391
Creating Custom Exceptions 393
Summary 395

Chapter 13: Arrays and Collections 397

Arrays 397
  Accessing Array Elements 400
  Multidimensional Arrays 400
  Arrays of Arrays: Jagged Arrays 402
  Parameter Arrays 403
  Copying Arrays 404
Collections Interfaces 404
  Dynamic Arrays Using the ArrayList Class 405
  Indexers and Iterators 407
  Implementing IEnumerable<T> and IEnumerator<T> 410
  Implementing Comparison Using IComparer<T> and IComparable<T> 413
  Dictionary 420
  Stacks 422
  Queues 423
Summary 424
Chapter 14: Language Integrated Query (LINQ) 425

LINQ Architecture 425
LINQ to Objects 426
   Query Syntax versus Method Syntax and Lambda Expressions 429
   LINQ and Extension Methods 430
   LINQ and Anonymous Types 436
LINQ to DataSet 438
   Reshaping Data 441
   Aggregate Functions 442
   Joining Tables 443
   Typed DataSet 446
   Detecting Null Fields 449
   Saving the Result of a Query to a DataTable 449
LINQ to XML 450
   Creating XML Trees 450
   Querying Elements 452
   An Example Using RSS 453
LINQ to SQL 458
   Using the Object Relational Designer 458
   Querying 460
   Inserting New Rows 461
   Updating Rows 463
   Deleting Rows 463
Summary 465

Chapter 15: Assemblies and Versioning 467

Assemblies 467
   Structure of an Assembly 467
   Examining the Content of an Assembly 468
   Single and Multi-File Assemblies 469
   Understanding Namespaces and Assemblies 480
Private versus Shared Assemblies 486
   Creating a Shared Assembly 488
   The Global Assembly Cache 492
   Putting the Shared Assembly into GAC 493
   Making the Shared Assembly Visible in Visual Studio 495
   Using the Shared Assembly 496
Summary 499
## Part II: Application Development Using C#  
### Chapter 16: Developing Windows Applications

- **The Project**  
  - Configuring the FTP Server  
  - Creating the Application  
  - Using Application Settings  
  - Coding the Application  
  - Building the Directory Tree and Displaying Images  
  - Creating a New Directory  
  - Removing a Directory  
  - Uploading Photos  
  - Deleting a Photo  
  - Testing the Application  

- **Adding Print Capability**  
  - Basics of Printing in .NET  
  - Adding Print Support to the Project  

- **Deploying the Application**  
  - Publishing the Application Using ClickOnce  
  - Updating the Application  
  - Programatically Updating the Application  
  - Rolling Back  
  - Under the Hood: Application and Deployment Manifests  

### Summary

### Chapter 17: Developing ASP.NET Web Applications

- **About ASP.NET**  
  - How ASP.NET Works  
  - What Do You Need to Run ASP.NET?  

- **Data Binding**  
  - Modeling Databases Using LINQ to SQL  
  - Data Binding Using the GridView Control  
  - Displaying Publisher’s Name  
  - Displaying Titles from a Selected Publisher  
  - Making the Publisher Field Editable  

- **Building Responsive Applications Using AJAX**  
  - AJAX Control Toolkit  
  - AJAX-Enabling a Page Using the ScriptManager Control  
  - Using the UpdatePanel Control  
  - Using Triggers to Cause an Update  

---

xxii
Chapter 18: Developing Windows Mobile Applications 573

The Windows Mobile Platform 574
Developing Windows Mobile Applications Using the .NET Compact Framework 576
Obtaining the Appropriate SDKs and Tools 578
Building the RSS Reader Application 580
Building the User Interface 581
Creating the Helper Methods 583
Wiring All the Event Handlers 589
Testing Using Emulators 596
Testing Using Real Devices 597
Deploying the Application 598
Creating a CAB File 598
Creating a Setup Application 603
Summary 616

Chapter 19: Developing Silverlight Applications 617

The State of Silverlight 617
Obtaining the Tools 619
Architecture of Silverlight 620
Building a Silverlight UI Using XAML 621
Creating a Bare-Bones Silverlight Application 621
Understanding XAML 623
Crafting XAML Using Expression Blend 2 635
Silverlight 1.0 645
Animation — Part 1 645
Animations — Part 2 650
Playing Media 654
Creating Your Own Media Player 663
Silverlight 2.0 675
Creating the Project Using Visual Studio 2008 676
Summary 694
## Contents

**Chapter 20: Windows Communication Foundation**  695

- **What Is WCF?**  695  
  - Comparing WCF with ASMX Web Services  700  
  - Your First WCF Service  700  
  - Consuming the WCF Service  708  

- **Understanding How WCF Works**  710  
  - WCF Communication Protocols  710  
  - The ABCs of WCF  710  
  - Messaging Patterns  713  
  - Hosting Web Services  713  

- **Building WCF Services**  714  
  - Exposing Multiple Endpoints  714  
  - Creating Self-Hosted WCF Service  720  
  - Implementing WCF Callbacks  728  
  - Calling WCF Services from an AJAX Page  741  

- **Summary**  745  

**Part III: Appendixes**  747

- **Appendix A: C# Keywords**  749  

- **Appendix B: Examining the .Net Class Libraries Using the Object Browser**  757  

- **Appendix C: Generating Documentation for Your C# Applications**  765  

- **Index**  781