

# Microsoft Visual C# Step by Step

Tenth Edition



 Professional

John Sharp

# Microsoft Visual C# Step by Step

Tenth Edition

John Sharp

# Microsoft Visual C# Step by Step

## Table of Contents

Cover

Title Page

Copyright Page

Contents at a Glance

Contents

Acknowledgments

About the author

Introduction

## PART I: INTRODUCING MICROSOFT VISUAL C# AND MICROSOFT VISUAL STUDIO

### Chapter 1 Welcome to C#

Writing your first C# program

Beginning programming with the Visual Studio 2022 environment

Writing your first program using Visual Studio 2022

Using namespaces

Namespaces and assemblies

Commenting code

Creating a graphical application

Examining the Universal Windows Platform app

Adding code to the graphical application

Summary

Quick Reference

### Chapter 2 Working with variables, operators, and expressions

# Table of Contents

Understanding statements

Using identifiers

Identifying keywords

Using variables

- Naming variables

- Declaring variables

- Specifying numeric values

Working with primitive data types

- Unassigned local variables

- Displaying primitive data type values

Using arithmetic operators

- Operators and types

- Examining arithmetic operators

- Controlling precedence

- Using associativity to evaluate expressions

- Associativity and the assignment operator

Incrementing and decrementing variables

- Prefix and postfix

Declaring implicitly typed local variables

Summary

Quick Reference

## Chapter 3 Writing methods and applying scope

Creating methods

Declaring a method

Returning data from a method

Using expression-bodied methods

Calling methods

- Specifying the method call syntax

- Returning multiple values from a method

Applying scope

- Defining local scope

# Table of Contents

Defining class scope

Overloading methods

Writing methods

Using the Visual Studio Debugger to step through methods

Refactoring code

Nesting methods

Using optional parameters and named arguments

Defining optional parameters

Passing named arguments

Resolving ambiguities with optional parameters and named arguments

Summary

Quick reference

## Chapter 4 Using decision statements

Declaring Boolean variables

Using Boolean operators

Understanding equality and relational operators

Understanding conditional logical operators

Short-circuiting

Summarizing operator precedence and associativity

Pattern matching

Using if statements to make decisions

Understanding if statement syntax

Using blocks to group statements

Cascading if statements

Using switch statements

Understanding switch statement syntax

Following the switch statement rules

Using switch expressions with pattern matching

Summary

Quick reference

## Chapter 5 Using compound assignment and iteration statements

# **Table of Contents**

Using compound assignment operators

Writing while statements

Writing for statements

Writing do statements

Summary

Quick reference

## **Chapter 6 Managing errors and exceptions**

Trying code and catching exceptions

Unhandled exceptions

Using multiple catch handlers

Catching multiple exceptions

Filtering exceptions

Propagating exceptions

Using checked and unchecked integer arithmetic

Writing checked statements

Writing checked expressions

Throwing exceptions

Using throw expressions

Using a finally block

Summary

Quick reference

## **PART II: UNDERSTANDING THE C# OBJECT MODEL Chapter**

### **7 Creating and managing classes and objects**

Understanding classification

The purpose of encapsulation

Defining and using a class

Controlling accessibility

Working with constructors

Overloading constructors

Deconstructing an object

Understanding static methods and data

# Table of Contents

Creating a shared field

Creating a static field by using the const keyword

Understanding static classes

Static using statements

Anonymous classes

Summary

Quick reference

## Chapter 8 Understanding values and references

Copying value type variables and classes

Understanding null values and nullable types

The null-conditional and null-coalescing operators

Using nullable types

Understanding the properties of nullable types

Using ref and out parameters

Creating ref parameters

Creating out parameters

How computer memory is organized

Using the stack and the heap

The System.Object class

Boxing

Unboxing

Casting data safely

The is operator

The as operator

The switch statement revisited

Summary

Quick reference

## Chapter 9 Creating value types with enumerations and structures

Working with enumerations

Declaring an enumeration

Using an enumeration

Choosing enumeration literal values

# Table of Contents

Choosing an enumerations underlying type

## Working with structures

Declaring a structure

Understanding differences between structures and classes

Declaring structure variables

Understanding structure initialization

Copying structure variables

Summary

Quick reference

## Chapter 10 Using arrays

Declaring array variables

Creating an array instance

Populating and using an array

Creating an implicitly typed array

Accessing an individual array element

Accessing a series of array elements

Iterating through an array

Passing arrays as parameters or return values for a method

Copying arrays

Using multidimensional arrays

Creating jagged arrays

Accessing arrays that contain value types

Summary

Quick reference

## Chapter 11 Understanding parameter arrays

Overloading: a recap

Using array arguments

Declaring a params array

Using params object[ ]

Using a params array

Comparing parameter arrays and optional parameters



# Table of Contents

Summary

Quick reference

## Chapter 12 Working with inheritance

What is inheritance?

Using inheritance

- The System.Object class revisited

- Calling base-class constructors

- Assigning classes

- Declaring new methods

- Declaring virtual methods

- Declaring override methods

- Understanding protected access

Creating extension methods

Summary

Quick reference

## Chapter 13 Creating interfaces and defining abstract classes

Understanding interfaces

- Defining an interface

- Implementing an interface

- Referencing a class through its interface

- Working with multiple interfaces

- Explicitly implementing an interface

- Handling versioning with interfaces

- Interface restrictions

- Defining and using interfaces

Abstract classes

- Abstract methods

Sealed classes

- Sealed methods

- Implementing and using an abstract class

Summary

Quick reference

# **Table of Contents**

## **Chapter 14 Using garbage collection and resource management**

### **The life and times of an object**

Writing finalizers

Why use the garbage collector?

How does the garbage collector work?

Recommendations

### **Resource management**

Disposal methods

Exception-safe disposal

The using statement and the IDisposable interface

Calling the Dispose method from a finalizer

### **Implementing exception-safe disposal**

### **Handling asynchronous disposal**

### **Summary**

### **Quick reference**

## **PART III: UNDERSTANDING THE C# OBJECT MODEL Chapter**

### **15 Implementing properties to access fields**

#### **Implementing encapsulation by using methods**

#### **What are properties?**

Using properties

Read-only properties

Write-only properties

Property accessibility

#### **Understanding property restrictions**

#### **Declaring interface properties**

Replacing methods with properties

Pattern-matching with properties

#### **Generating automatic properties**

#### **Initializing objects by using properties**

Automatic properties and immutability

#### **Using records with properties to implement lightweight structures**

# Table of Contents

Summary

Quick reference

## Chapter 16 Handling binary data and using indexers

What is an indexer?

- Storing binary values

- Displaying binary values

- Manipulating binary values

- Solving the same problems using indexers

Understanding indexer accessors

Comparing indexers and arrays

Indexers in interfaces

Using indexers in a Windows application

Summary

Quick reference

## Chapter 17 Introducing generics

The problem: Issues with the object type

The generics solution

- Generics vs. generalized classes

- Generics and constraints

Creating a generic class

- The theory of binary trees

- Building a binary tree class by using generics

Creating a generic method

- Defining a generic method to build a binary tree

Variance and generic interfaces

- Covariant interfaces

- Contravariant interfaces

Summary

Quick reference

## Chapter 18 Using collections

# Table of Contents

## What are collection classes?

- The List<T> collection class
- The LinkedList<T> collection class
- The Queue<T> collection class
- The PriorityQueue<TElement, TPriority> collection class
- The Stack<T> collection class
- The Dictionary<TKey, TValue> collection class
- The SortedList<TKey, TValue> collection class
- The HashSet<T> collection class

## Using collection initializers

## Find methods, predicates, and lambda expressions

- The forms of lambda expressions
- Lambda expressions and anonymous methods

## Comparing arrays and collections

## Summary

## Quick reference

## Chapter 19 Enumerating collections

### Enumerating the elements in a collection

- Manually implementing an enumerator
- Implementing the IEnumerable interface

### Implementing an enumerator by using an iterator

- A simple iterator
- Defining an enumerator for the Tree<TItem> class by using an iterator

## Summary

## Quick reference

## Chapter 20 Decoupling application logic and handling events

### Understanding delegates

### Examples of delegates in the .NET class library

- The automated factory scenario
- Declaring and using delegates

### Lambda expressions and delegates

# **Table of Contents**

## Enabling notifications by using events

- Declaring an event

- Subscribing to an event

- Unsubscribing from an event

- Raising an event

## Understanding user-interface events

- Using events

- Summary

- Quick reference

## Chapter 21 Querying in-memory data by using query expressions

- What is LINQ?

- Using LINQ in a C# application

  - Selecting data

  - Filtering data

  - Ordering, grouping, and aggregating data

  - Joining data

  - Using query operators

  - Querying data in `Tree<TItem>` objects

- LINQ and deferred evaluation

- Summary

- Quick reference

## Chapter 22 Operator overloading

- Understanding operators

  - Operator constraints

  - Overloaded operators

  - Creating symmetric operators

  - Understanding compound assignment evaluation

- Declaring increment and decrement operators

- Comparing operators in structures and classes

- Defining operator pairs

- Implementing operators

# Table of Contents

Overriding the equality operators

Understanding conversion operators

    Providing built-in conversions

    Implementing user-defined conversion operators

    Creating symmetric operators, revisited

    Writing conversion operators

Summary

Quick reference

## PART IV: BUILDING UNIVERSAL WINDOWS PLATFORM APPLICATIONS WITH C#

### Chapter 23 Improving throughput by using tasks

    Why perform multitasking by using parallel processing?

    The rise of the multicore processor

    Implementing multitasking by using Microsoft .NET

        Tasks, threads, and the ThreadPool

        Creating, running, and controlling tasks

        Using the Task class to implement parallelism

        Abstracting tasks by using the Parallel class

        When not to use the Parallel class

    Canceling tasks and handling exceptions

        The mechanics of cooperative cancellation

        Handling task exceptions by using the AggregateException class

        Using continuations with canceled and faulted tasks

Summary

Quick reference

### Chapter 24 Improving response time by performing asynchronous operations

    Implementing asynchronous methods

        Defining asynchronous methods: the problem

        Defining asynchronous methods: the solution

        Defining asynchronous methods that return values

# Table of Contents

Asynchronous method pitfalls

Asynchronous methods and the Windows Runtime APIs

Tasks, memory allocation, and efficiency

## Using PLINQ to parallelize declarative data access

Using PLINQ to improve performance while iterating through a collection

Canceling a PLINQ query

## Synchronizing concurrent access to data

Locking data

Synchronization primitives for coordinating tasks

Canceling synchronization

The concurrent collection classes

Using a concurrent collection and a lock to implement thread-safe data access

Summary

Quick reference

## Chapter 25 Implementing the user interface for a Universal Windows Platform app

Features of a Universal Windows Platform app

Using the Blank App template to build a Universal Windows Platform app

Implementing a scalable user interface

Implementing a tabular layout by using a Grid control

Adapting the layout by using the Visual State Manager

Applying styles to a UI

Summary

Quick reference

## Chapter 26 Displaying and searching for data in a Universal Windows Platform app

Implementing the Model-View-ViewModel pattern

Displaying data by using data binding

Modifying data by using data binding

Using data binding with a ComboBox control

Creating a ViewModel

# **Table of Contents**

Adding commands to a ViewModel

Summary

Quick reference

## **Chapter 27 Accessing a remote database from a Universal Windows Platform app**

Retrieving data from a database

Creating an entity model

Updating the UWP application to use the web service

Creating and using a REST web service

Searching for data in the Customers app

Inserting, updating, and deleting data through a REST web service

Summary

Quick reference

**Index**