SEVENTH EDITION

Programming with Microsoft® Visual Basic® 2015

Diane Zak

PROGRAMMING WITH MICROSOFT® VISUAL BASIC® 2015

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DIANE ZAK

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Preface

Programming with Microsoft Visual Basic 2015, Seventh Edition uses Visual Basic 2015, an object-oriented language, to teach programming concepts. This book is designed for a beginning programming course. However, it assumes students are familiar with basic Windows skills and file management.

Organization and Coverage

Programming with Microsoft Visual Basic 2015, Seventh Edition contains an Overview and 14 chapters that present hands-on instruction; it also contains five appendices (A through E). An additional appendix (Appendix F) covering multiple-form applications and the FontDialog, ColorDialog, and TabControl tools is available online at CengageBrain.com.

In the chapters, students with no previous programming experience learn how to plan and create their own interactive Windows applications. GUI design skills, OOP concepts, and planning tools (such as TOE charts, pseudocode, and flowcharts) are emphasized throughout the book. The chapters show students how to work with objects and write Visual Basic statements such as If...Then...Else, Select Case, Do...Loop, For...Next, and For Each...Next. Students also learn how to create and manipulate variables, constants, strings, sequential access files, structures, classes, and arrays. Chapter 12 shows students how to create both static and dynamic Web applications. In Chapter 13, students learn how to connect an application to a Microsoft Access database, and then use Language-Integrated Query (LINQ) to query the database. Chapter 14 continues the coverage of databases, introducing the student to more advanced concepts and Structured Query Language (SQL).

Appendix A, which can be covered after Chapter 3, teaches students how to locate and correct errors in their code. The appendix shows students how to step through their code and also how to create breakpoints. Appendix B recaps the GUI design guidelines mentioned in the chapters, and Appendix C lists the Visual Basic conversion functions. The Visual Basic 2015 Cheat Sheet contained in Appendix D summarizes important concepts covered in the chapters, such as the syntax of statements, methods, and so on. The Cheat Sheet provides a convenient place for students to locate the information they need as they are creating and coding their applications. Appendix E contains Case Projects that can be assigned after completing specific chapters in the book.

Approach

Programming with Microsoft Visual Basic 2015, Seventh Edition teaches programming concepts using a task-driven rather than a command-driven approach. By working through the chapters, which are each motivated by a realistic case, students learn how to develop applications they are likely to encounter in the workplace. This is much more effective than memorizing a list of commands out of context. The book motivates students by demonstrating why they need to learn the concepts and skills covered in each chapter.

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Features

Programming with Microsoft Visual Basic 2015, Seventh Edition is an exceptional textbook because it also includes the following features:

READ THIS BEFORE YOU BEGIN This section is consistent with Cengage Learning's unequaled commitment to helping instructors introduce technology into the classroom. Technical considerations and assumptions about hardware, software, and default settings are listed in one place to help instructors save time and eliminate unnecessary aggravation.

YOU DO IT! BOXES These boxes provide simple applications that allow students to demonstrate their understanding of a concept before moving on to the next concept. The YOU DO IT! boxes are located almost exclusively in Lesson A of each chapter.

VISUAL STUDIO 2015 METHODS The book focuses on Visual Studio 2015 methods rather than on Visual Basic functions. Exceptions to this are the Val and Format functions, which are introduced in Chapter 2. These functions are covered in the book simply because it is likely that students will encounter them in existing Visual Basic programs. However, in Chapter 3, the student is taught to use the TryParse method and the Convert class methods rather than the Val function. Also in Chapter 3, the Format function is replaced with the ToString method.

OPTION STATEMENTS All programs include the Option Explicit, Option Strict, and Option Infer statements.

START HERE ARROWS These arrows indicate the beginning of a tutorial steps section in the book.

DATABASES, LINQ, AND SQL The book includes two chapters (Chapters 13 and 14) on databases. LINQ is covered in Chapter 13. SQL is covered in Chapter 14.

FIGURES Figures that introduce new statements, functions, or methods contain both the syntax and examples of using the syntax. Including the syntax in the figures makes the examples more meaningful, and vice versa.

CHAPTER CASES Each chapter begins with a programming-related problem that students could reasonably expect to encounter in business, followed by a demonstration of an application that could be used to solve the problem. Showing the students the completed application before they learn how to create it is motivational and instructionally sound. By allowing the students to see the type of application they will be able to create after completing the chapter, the students will be more motivated to learn because they can see how the programming concepts they are about to learn can be used and, therefore, why the concepts are important.

LESSONS Each chapter is divided into three lessons—A, B, and C. Lesson A introduces the programming concepts that will be used in the completed application. The concepts are illustrated with code examples and sample applications. The user interface for each sample application is provided to the student. Also provided are tutorial-style steps that guide the student on coding, running, and testing the application. Each sample application allows the student to observe how the current concept can be used before the next concept is introduced. In Lessons B and/or C, the student creates the application required to solve the problem specified in the Chapter Case.

APPENDICES Appendix A, which can be covered after Chapter 3, teaches students how to locate and correct errors (syntax, logic, and run time) in their code. The appendix shows students how to step through their code and also how to create breakpoints. Appendix B summarizes the GUI design guidelines taught in the chapters, making it easier for the student to follow the guidelines when designing an application's interface. Appendix C lists the Visual Basic

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conversion functions. Appendix D contains a Cheat Sheet that summarizes important concepts covered in the chapters, such as the syntax of statements, methods, and so on. The Cheat Sheet provides a convenient place for students to locate the information they need as they are creating and coding their applications. Appendix E contains Case Projects that can be assigned after completing specific chapters in the book. Appendix F, which is available online at CengageBrain.com, covers multiple-form applications and the FontDialog, ColorDialog, and TabControl tools.

GUI DESIGN TIP BOXES The GUI DESIGN TIP boxes contain guidelines and recommendations for designing applications that follow Windows standards. Appendix B provides a summary of the GUI design guidelines covered in the chapters.

TIP These notes provide additional information about the current concept. Examples include alternative ways of writing statements or performing tasks, as well as warnings about common mistakes made when using a particular command and reminders of related concepts learned in previous chapters.

SUMMARY Each lesson contains a Summary section that recaps the concepts covered in the lesson.

KEY TERMS Following the Summary section in each lesson is a listing of the key terms introduced throughout the lesson, along with their definitions.

REVIEW QUESTIONS Each lesson contains Review Questions designed to test a student's understanding of the lesson's concepts.

EXERCISES The Review Questions in each lesson are followed by Exercises, which provide students with additional practice of the skills and concepts they learned in the lesson. The Exercises are designated as INTRODUCTORY, INTERMEDIATE, ADVANCED, DISCOVERY, and SWAT THE BUGS. The DISCOVERY Exercises encourage students to challenge and independently develop their own programming skills while exploring the capabilities of Visual Basic 2015. The SWAT THE BUGS Exercises provide an opportunity for students to detect and correct errors in an application's code.

New to This Edition!

UPDATED VIDEOS These notes direct students to videos that accompany each chapter in the book. The videos explain and/or demonstrate one or more of the chapter's concepts. The videos have been revised from the previous edition and are available via the optional MindTap for this text.

NEW CHAPTER CASES, EXAMPLES, APPLICATIONS, REVIEW QUESTIONS, AND EXERCISES The chapters contain new Chapter Cases, code examples, sample applications, Review Questions, and Exercises.

CHAPTERS 2, 5, 6, AND 12 The Visible property is now introduced in Chapter 2 rather than in Chapter 5. Coverage of the priming and update reads was moved from Chapter 6's Lesson A to Chapter 6's Lesson B. The topics covered in Chapter 6's Lesson B are now covered in its Lesson C and vice versa. The Financial.Pmt function is covered in Chapter 6's Lesson B. Chapter 12, which covers Web applications, has been revamped.

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Steps and Figures

The tutorial-style steps in the book assume you are using Microsoft Visual Studio Ultimate 2015 and a system running Microsoft Windows 8. The figures in the book reflect how your screen will look if you are using a Microsoft Windows 8 system. Your screen may appear slightly different in some instances if you are using a different version of Microsoft Windows.

Instructor Resources

The following teaching tools are available for download at our Instructor Companion Site. Simply search for this text at sso.cengage.com. An instructor login is required.

INSTRUCTOR'S MANUAL The Instructor's Manual that accompanies this textbook includes additional instructional material to assist in class preparation, including items such as Sample Syllabi, Chapter Outlines, Technical Notes, Lecture Notes, Quick Quizzes, Teaching Tips, Discussion Topics, and Additional Case Projects.

TEST BANK Cengage Learning Testing Powered by Cognero is a flexible, online system that allows you to:

- author, edit, and manage test bank content from multiple Cengage Learning solutions
- create multiple test versions in an instant
- deliver tests from your LMS, your classroom or wherever you want

POWERPOINT PRESENTATIONS This book offers Microsoft PowerPoint slides for each chapter. These are included as a teaching aid for classroom presentation, to make available to students on the network for chapter review, or to be printed for classroom distribution. Instructors can add their own slides for additional topics they introduce to the class.

SOLUTION FILES Solutions to the Lesson applications and the end-of-lesson Review Questions and Exercises are provided.

DATA FILES Data Files are necessary for completing the computer activities in this book. Data Files can also be downloaded by students at CengageBrain.com.

MindTap

MindTap is a personalized teaching experience with relevant assignments that guide students to analyze, apply, and improve thinking, allowing you to measure skills and outcomes with ease.

- Personalized Teaching: Becomes yours with a Learning Path that is built with key student objectives. Control what students see and when they see it. Use it as-is or match to your syllabus exactly–hide, rearrange, add and create your own content.
- Guide Students: A unique learning path of relevant readings, multimedia and activities that move students up the learning taxonomy from basic knowledge and comprehension to analysis and application.
- Promote Better Outcomes: Empower instructors and motivate students with analytics and reports that provide a snapshot of class progress, time in course, engagement and completion rates.

The MindTap for *Programming with Microsoft Visual Basic 2015* includes videos, study tools, and interactive quizzing, all integrated into a full eReader that contains the full content from the printed text.

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Acknowledgments

Writing a book is a team effort rather than an individual one. I would like to take this opportunity to thank my team, especially Alyssa Pratt (Senior Content Developer), Heidi Aguiar (Full Service Project Manager), Serge Palladino and John Freitas (Quality Assurance), Jennifer Feltri-George (Senior Content Project Manager), and the compositors at GEX Publishing Services. Thank you for your support, enthusiasm, patience, and hard work. Last, but certainly not least, I want to thank the following reviewers for their invaluable ideas and comments: Cliff Brozo, Monroe College; Anthony Cameron, Fayetteville Technical Community College, and Tatyana Feofilaktova, ASA College. And a special thank you to Sally Douglas (College of Central Florida) for suggesting the YOU DO IT! boxes several editions ago.

Diane Zak

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Read This Before You Begin

Technical Information

Data Files

You will need data files to complete the computer activities in this book. Your instructor may provide the data files to you. You may obtain the files electronically at CengageBrain.com and then navigating to the page for this book.

Each chapter in this book has its own set of data files, which are stored in a separate folder within the VB2015 folder. The files for Chapter 1 are stored in the VB2015\Chap01 folder. Similarly, the files for Chapter 2 are stored in the VB2015\Chap02 folder. Throughout this book, you will be instructed to open files from or save files to these folders.

You can use a computer in your school lab or your own computer to complete the steps and Exercises in this book.

Using Your Own Computer

To use your own computer to complete the computer activities in this book, you will need the following:

- A Pentium® 4 processor, 1.6 GHz or higher, personal computer running Microsoft Windows. This book was written using Microsoft Windows 8, and Quality Assurance tested using Microsoft Windows 10.
- Either Microsoft Visual Studio Ultimate 2015 or Visual Studio Community Edition installed on your computer. This book was written and Quality Assurance tested using Microsoft Visual Studio Ultimate 2015. At the time of this writing, you can download a free copy of the Community Edition at *https://www.visualstudio.com/en-us/downloads/visual-studio-2015-downloads-vs.*

To control the display of filename extensions in Windows 8:

1. Press and hold down the Windows logo key on your keyboard as you tap the letter x. Click Control Panel, click Appearance and Personalization, click Folder Options, and then click the View tab.
2. Deselect the Hide extensions for known file types check box to show the extensions; or, select the check box to hide them. Click the OK button, and then close the Appearance and Personalization window.

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To always display the underlined letters (called access keys) in Windows 8:

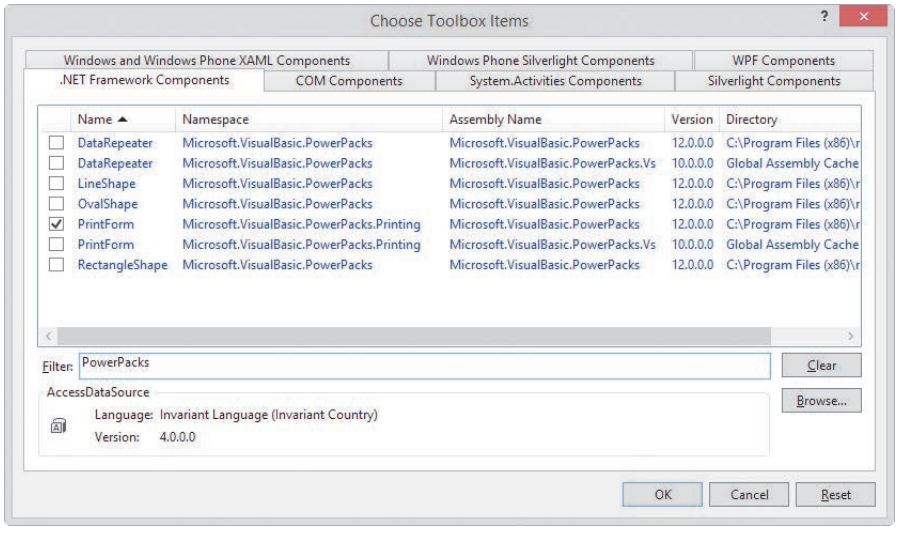
1. Press and hold down the Windows logo key on your keyboard as you tap the letter x. Click Control Panel, and then click Appearance and Personalization.
2. In the Ease of Access Center section, click Turn on easy access keys, and then select the Underline keyboard shortcuts and access keys check box. Click the OK button, and then close the Ease of Access Center window.

To start and configure Visual Studio to match the figures and tutorial steps in this book:

1. Use the steps on Page 11 to start Visual Studio.
2. Use the steps on Pages 12 and 13 to configure Visual Studio.

To install Microsoft Visual Basic PowerPacks 12.0:

1. Locate the vb_vbpowerpacks.exe file, which is contained in the VB2015\PowerPacks folder. Right-click the filename and then click Run as administrator. Click the Yes button.
2. Select the "I agree to the License Terms and Privacy Policy." check box. Either select or deselect the check box that asks if you want to join the Visual Studio Experience Improvement program. Click Install.
3. When the "Setup Successful!" message appears, click the Close button.
4. Start Visual Studio. Open the Toolbox window (if necessary) by clicking View on the menu bar and then clicking Toolbox. Right-click the Toolbox window and then click Add Tab. Type Visual Basic PowerPacks and press Enter.
5. Right-click the Visual Basic PowerPacks tab, and then click Choose Items. If necessary, click the .NET Framework Components tab in the Choose Toolbox Items dialog box.
6. In the Filter box, type PowerPacks. You may see one or more entries for the PrintForm control. Select Version 12's PrintForm control, as shown in Figure 1. (Although this book uses only the PrintForm control, you can also select Version 12's DataRepeater, LineShape, OvalShape, and RectangleShape controls.)



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7. Click the OK button to close the Choose Toolbox Items dialog box. If the message "The following controls were successfully added to the toolbox but are not enabled in the active designer:" appears, click the OK button. The PrintForm control (as well as any other PowerPacks controls you selected) will not appear in the Toolbox window until you either create a new Visual Basic application or open an existing one. You will learn how to perform both of those tasks in Chapter 1.

Figures

The figures in this book reflect how your screen will look if you are using Microsoft Visual Studio Ultimate 2015 and a Microsoft Windows 8 system. Your screen may appear slightly different in some instances if you are using another version of either Microsoft Visual Studio or Microsoft Windows.

Visit Our Web Site

Additional materials designed for this textbook might be available at CengageBrain.com. Search this site for more details.

To the Instructor

To complete the computer activities in this book, your students must use a set of data files. These files can be obtained on the Instructor Companion Site or at CengageBrain.com.

The material in this book was written using Microsoft Visual Studio Ultimate 2015 on a Microsoft Windows 8 system. It was Quality Assurance tested using Microsoft Visual Studio Ultimate 2015 on a Microsoft Windows 10 system.

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OVERVIEW

An Introduction to Programming

After studying the Overview, you should be able to:

- Define the terminology used in programming
- Explain the tasks performed by a programmer
- Understand the employment opportunities for programmers and software engineers
- Run a Visual Basic 2015 application
- Understand how to use the chapters effectively

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Programming a Computer

In essence, the word **programming** means *giving a mechanism the directions to accomplish a task*. If you are like most people, you have already programmed several mechanisms, such as your digital video recorder (DVR), cell phone, or coffee maker. Like these devices, a computer also is a mechanism that can be programmed.

The directions (typically called instructions) given to a computer are called **computer programs** or, more simply, **programs**. The people who write programs are called **programmers**. Programmers use a variety of special languages, called **programming languages**, to communicate with the computer. Some popular programming languages are Visual Basic, C#, C++, and Java. In this book, you will use the Visual Basic programming language.

The Programmer's Job

When a company has a problem that requires a computer solution, typically it is a programmer who comes to the rescue. The programmer might be an employee of the company; or he or she might be a freelance programmer, which is a programmer who works on temporary contracts rather than for a long-term employer.

First the programmer meets with the user, who is the person (or people) responsible for describing the problem. In many cases, this person will also eventually use the solution. Depending on the complexity of the problem, multiple programmers may be involved, and they may need to meet with the user several times. Programming teams often contain subject matter experts, who may or may not be programmers. For example, an accountant might be part of a team working on a program that requires accounting expertise. The purpose of the initial meetings with the user is to determine the exact problem and to agree on a solution.

Overview-Programmers

After the programmer and user agree on the solution, the programmer begins converting the solution into a computer program. During the conversion phase, the programmer meets periodically with the user to determine whether the program fulfills the user's needs and to refine any details of the solution. When the user is satisfied that the program does what he or she wants it to do, the programmer rigorously tests the program with sample data before releasing it to the user, who will test it further to verify that it correctly solves the problem. In many cases, the programmer also provides the user with a manual that explains how to use the program. As this process indicates, the creation of a good computer solution to a problem—in other words, the creation of a good program—requires a great deal of interaction between the programmer and the user.

Employment Opportunities

Overview-Programmer Qualities

When searching for a job in computer programming, you will encounter ads for "computer programmers" as well as for "computer software engineers." Although job titles and descriptions vary, computer software engineers typically are responsible for designing an appropriate solution to a user's problem, while computer programmers are responsible for translating the solution into a language that the computer can understand—a process called **coding**. Software engineering is a higher-level position that requires the ability to envision solutions. Using a construction analogy, software engineers are the architects, while programmers are the carpenters.

Keep in mind that depending on the employer as well as the size and complexity of the user's problem, the design and coding tasks may be performed by the same employee, no matter what his or her job title is. In other words, it is not unusual for a software engineer to code his or her solution or for a programmer to have designed the solution he or she is coding.

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Programmers and software engineers need to have strong problem-solving and analytical skills, as well as the ability to communicate effectively with team members, end users, and other nontechnical personnel. Typically, computer software engineers are expected to have at least a bachelor's degree in software engineering, computer science, or mathematics, along with practical work experience, especially in the industry in which they are employed. Computer programmers usually need at least an associate's degree in computer science, mathematics, or information systems, as well as proficiency in one or more programming languages.

Computer programmers and software engineers are employed by companies in almost every industry, such as telecommunications companies, software publishers, financial institutions, insurance carriers, educational institutions, and government agencies. The U.S. Bureau of Labor Statistics predicts that employment of computer software engineers will increase by 22% from 2012 to 2022. The employment of computer programmers, on the other hand, will increase by 8% over the same period. In addition, consulting opportunities for freelance programmers and software engineers are expected to increase as companies look for ways to reduce their payroll expenses.

There is a great deal of competition for programming and software engineering jobs, so jobseekers need to keep up to date with the latest programming languages and technologies. A competitive edge may be gained by obtaining vendor-specific or language-specific certifications, as well as knowledge of a prospective employer's business. More information about computer programmers and computer software engineers can be found on the U.S. Bureau of Labor Statistics Web site at *www.bls.gov*.

Visual Basic 2015

In this book, you will learn how to create programs, called **applications**, using the Visual Basic 2015 programming language. Visual Basic 2015 is one of the languages built into Microsoft's newest integrated development environment: Visual Studio 2015. An **integrated development environment (IDE)** is an environment that contains all of the tools and features you need to create, run, and test your programs.

Visual Basic 2015 is an **object-oriented programming language**, which is a language that allows the programmer to use objects to accomplish a program's goal. An **object** is anything that can be seen, touched, or used. In other words, an object is nearly any *thing*. The objects in an object-oriented program can take on many different forms. Programs written for the Windows environment typically use objects such as check boxes, list boxes, and buttons. A payroll program, on the other hand, might utilize objects found in the real world, such as a time card object, an employee object, and a check object.

Every object in an object-oriented program is created from a **class**, which is a pattern that the computer uses to create the object. The class contains the instructions that tell the computer how the object should look and behave. An object created from a class is called an **instance** of the class and is said to be **instantiated** from the class. An analogy involving a cookie cutter and cookies is often used to describe a class and its objects: The class is the cookie cutter, and the objects instantiated from the class are the cookies. You will learn more about classes and objects throughout this book.

You can use Visual Basic to create applications for the Windows environment or for the Web. A Windows application has a Windows user interface and runs on a personal computer. A **user interface** is what the user sees and interacts with while an application is running. Examples of Windows applications include graphics programs, data-entry systems, and games. A Web application, on the other hand, has a Web user interface and runs on a server. You access a Web

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application using your computer's browser. Examples of Web applications include e-commerce applications available on the Internet and employee handbook applications accessible on a company's intranet. You can also use Visual Basic to create applications for tablet PCs and mobile devices, such as cell phones.

A Visual Basic 2015 Demonstration

In the following set of steps, you will run a Visual Basic 2015 application that shows you some of the objects you will learn about in the chapters. For now, it is not important for you to understand how these objects were created or why the objects perform the way they do. Those questions will be answered in the chapters.

START HERE

To run the Visual Basic 2015 application:

You can also double-click the filename to run the application.

1. Use Windows to locate and then open the VB2015\Overview folder on your computer's hard disk or on the device designated by your instructor. Right-click **Monthly Payment Calculator (Monthly Payment Calculator.exe)** in the list of filenames and then click the **Open** button. (Depending on how Windows is set up on your computer, you may or may not see the .exe extension on the filename. Refer to the Overview's Summary section to learn how to show/hide filename extensions.)
2. After a few moments, the Monthly Payment Calculator application shown in Figure 1 appears on the screen. The interface contains a text box, a list box, buttons, radio buttons, and labels. You can use the application to calculate the monthly payment for a car loan.

Don't be concerned if some of the letters on your screen are not underlined. You can show/hide the underlined letters by pressing the Alt key.

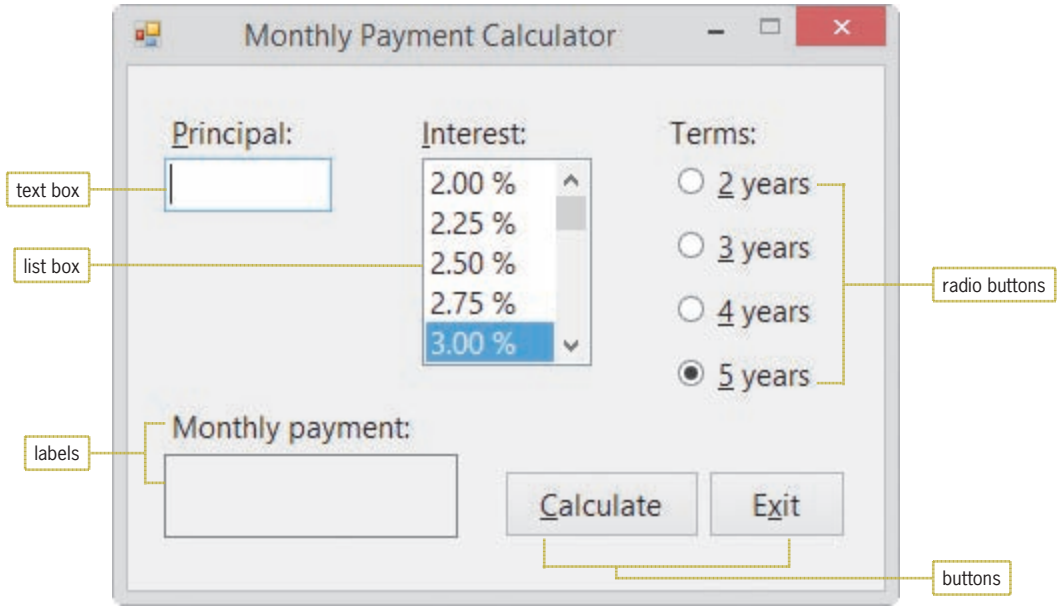

Figure 1 Monthly Payment Calculator application

3. Use the application to calculate the monthly payment for a $22,000 loan at 3.75% interest for five years. Type **22000** in the Principal text box. Scroll down the Interest list box and then click **3.75 %**. The radio button corresponding to the five-year term is already selected, so you just need to click the **Calculate** button to compute the monthly payment. The application indicates that your monthly payment would be $402.69. See Figure 2.

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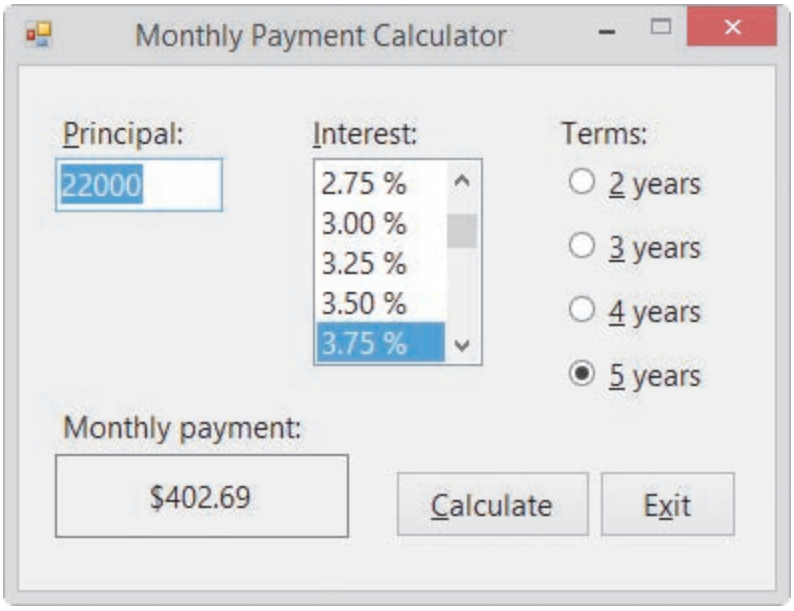

Figure 2 Computed monthly payment

4. Now determine what your monthly payment would be if you borrowed $5,000 at 4.5% interest for four years. Type **5000** in the Principal text box, click **4.50 %** in the Interest list box, click the **4 years** radio button, and then click the **Calculate** button. The Monthly payment box shows $114.02.
5. Click the **Exit** button to close the application.

Using the Chapters Effectively

This book is designed for a beginning programming course. However, it assumes students are familiar with basic Windows skills and file management. The chapters in this book will help you learn how to write programs using Microsoft Visual Basic 2015. The chapters are designed to be used at your computer. Begin by reading the text that explains the concepts. When you come to the numbered steps, follow the steps on your computer. Read each step carefully and completely before you try it. As you work, compare your screen with the figures to verify your results. The figures in this book reflect how your screen will look if you are using Visual Studio Ultimate 2015 and a Microsoft Windows 8 system. Your screen may vary in some instances if you are using a different edition of Visual Studio or if you are using another version of Microsoft Windows. Don't worry if your screen display differs slightly from the figures. The important parts of the screen display are labeled in each figure. Just be sure you have these parts on your screen.

Do not worry about making mistakes; that's part of the learning process. Tip notes identify common problems and explain how to get back on track. They also provide additional information about a procedure—for example, an alternative method of performing the procedure.

Tip notes are designated by the icon.

Each chapter is divided into three lessons. You might want to take a break between lessons. Following each lesson is a Summary section that lists the important elements of the lesson. After the Summary section is a list of the key terms (including definitions) covered in the lesson. Following the Key Terms section are questions and exercises designed to review and reinforce the lesson's concepts. You should complete all of the end-of-lesson questions and several exercises before continuing to the next lesson. It takes a great deal of practice to acquire the skills needed to create good programs, and future chapters assume that you have mastered the information found in the previous chapters.

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Some of the end-of-lesson exercises are Discovery exercises, which allow you to both "discover" the solutions to problems on your own and experiment with material that is not covered in the chapter. Some lessons also contain one or more Debugging exercises. In programming, the term **debugging** refers to the process of finding and fixing any errors, called bugs, in a program. Debugging exercises provide opportunities for you to find and correct the errors in existing applications. Appendix A, which can be covered after completing Chapter 3, guides you through the process of locating and correcting a program's errors (bugs).

Throughout the book, you will find GUI (graphical user interface) design tips. These tips contain guidelines and recommendations for designing applications. You should follow these guidelines and recommendations so that your applications conform to the Windows standards.

Summary

- Programs are the step-by-step instructions that tell a computer how to perform a task.
- Programmers use various programming languages to communicate with the computer.
- The creation of a good program requires a great deal of interaction between the programmer and the user.
- Programmers rigorously test a program with sample data before releasing the program to the user.
- It's not unusual for the same person to perform the duties of both a software engineer and a programmer.
- An object-oriented programming language, such as Visual Basic 2015, enables programmers to use objects to accomplish a program's goal. An object is anything that can be seen, touched, or used.
- Every object in an object-oriented program is instantiated (created) from a class, which is a pattern that tells the computer how the object should look and behave. An object is referred to as an instance of the class.
- The process of locating and correcting the errors (bugs) in a program is called debugging.

The Windows logo key looks like this .

- To control the display of filename extensions, press and hold down the Windows logo key on your keyboard as you tap the letter x. Click Control Panel, click Appearance and Personalization, click Folder Options, and then click the View tab. Deselect the Hide extensions for known file types check box to show the extensions; or, select the check box to hide them.

Key Terms

Applications—programs created for the Windows environment, the Web, or mobile devices

Class—a pattern that the computer uses to create (instantiate) an object

Coding—the process of translating a solution into a language that the computer can understand

Computer programs—the directions given to computers; also called programs

Debugging—the process of locating and correcting the errors (bugs) in a program

IDE—integrated development environment

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Instance—an object created (instantiated) from a class

Instantiated—the process of creating an object from a class

Integrated development environment—an environment that contains all of the tools and features you need to create, run, and test your programs; also called an IDE

Object—anything that can be seen, touched, or used

Object-oriented programming language—a programming language that allows the programmer to use objects to accomplish a program's goal

Programmers—the people who write computer programs

Programming—the process of giving a mechanism the directions to accomplish a task

Programming languages—languages used to communicate with a computer

Programs—the directions given to computers; also called computer programs

User interface—what the user sees and interacts with while an application is running

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CHAPTER 1

An Introduction to Visual Basic 2015

Creating a Splash Screen

In this chapter, you will use Visual Basic 2015, Microsoft's newest version of the Visual Basic language, to create a splash screen for the Crighton Zoo. A splash screen is the first image that appears when an application is started. It is used to introduce the application and to hold the user's attention while the application is being read into the computer's internal memory.

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