Ciprian Adrian Rusen

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IC³® Internet and Computing Core Certification Computing Fundamentals

Study Guide

Ciprian Adrian Rusen

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About the Author

Ciprian Adrian Rusen is a recognized Windows Consumer Expert – Microsoft Most Valuable Professional (MVP). He has published several books about Windows and Microsoft Office, and he's also a very active tech blogger at **http://www.7tutorials.com**.

On his website you can find many tutorials about Windows 7, Windows 8.1, and Windows 10. He and his team of editors also publish how-to guides about other Microsoft products like Windows Phone and Xbox One. If you would like to keep up to date with the latest Microsoft consumer products, you should subscribe to his blog.

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Introduction

Welcome to the *IC3 Internet and Computing Core Certification Computing Fundamentals Study Guide* for the IC3 Digital Literacy Certification. The purpose of this book is to help you prepare for the Computing Fundamentals certification exam, which covers subjects needed for a good basic understanding of computing, including knowledge and use of computer hardware, software, and operating systems.

The book contains all of the information you need to pass the Computing Fundamentals exam. It also includes notes and warnings from the author to help reduce issues you may be experiencing in your own environment. By studying for and passing this exam, you will gain insight that will make you more valuable in your current position and will make you more likely to be recognized.

In the remainder of this introduction, we will look at some of the facts about the exam, give some commonsense tips for taking the exam, and review the process for registering for the exam.

Exam Facts

Individuals seeking IC3 certification are required to take and pass all three IC3 exams: Computing Fundamentals, Key Applications, and Living Online. Here are some facts about them:

- The IC3 exams are administered by Certiport and are taken at Certiport Authorized Testing Centers.
- The exams are based on Microsoft Windows 7 and Microsoft Office 2010.
- There are 45 multiple-choice questions for each exam.
- There is a time limit of 50 minutes for each exam.
- Each exam has a maximum score of 1000.
- The minimum passing score could range from 620 in difficult tests to 720 on easier tests.
- There is a short survey before the exam begins (taking the survey does not use any of the available 50 minutes).
- If you do not pass the exam, you can retake it as many times as you want, but you must wait 24 hours before taking the exam a second time. If you do not pass the exam again, a two-day waiting period will be imposed for each subsequent exam retake.

Tips for Taking the IC3 GS4 Exams

Here are some general tips for improving the odds of passing your certification exam:

- Read each question carefully. Although the test is not written to be confusing, there are times when the obvious choice is not the correct choice.
- Make sure you answer each question. Any unanswered questions are considered wrong, so you are better off making an educated guess than leaving a question unanswered.

- For any questions where you are unsure of the correct answer, use a process of elimination to remove any obviously incorrect answers first. Once you have eliminated the obviously incorrect answers, make an educated guess from the remaining answers.

- If you are unsure about a question, select the answer you think is most likely to be correct, mark it for review, and come back to it at a later time.

- Get a good night's sleep the night before the exam. This will help you to be more alert and think clearly during the exam.

Exam Registration

Take the following steps to register for the IC3 exams:

1. Using a browser, navigate to the Certiport website: http://www.certiport.com.

2. To register with Certiport, click the Register link in the top-right corner and provide all the required personal information.

3. Once the registration process is complete, select that you would like to take an exam or prepare for an exam and click Next.

4. Register for the IC3 certification.

5. Locate a Certiport Authorized Testing Center (CATC) near you.

6. Once you have found a CATC, you should then contact the Testing Center directly to confirm that they offer the exam(s) you wish to take, determine their prices and fees, set up a date and time to take the exam, and find out what exam preparation resources/courses they offer.

You can find the exam policies that you must abide by at this webpage: http://www.certiport.com/PORTAL/desktopdefault.aspx?page=common/pagelibrary/LiveApp.htm.

IC3 requires certification candidates to accept the terms of a nondisclosure agreement before taking certification exams.

Who Should Read This Book?

This book is intended for individuals who want to prepare for the Computing Fundamentals exam as part of earning their IC3 GS4 certification. For both the student and the job-seeker, IC3 provides the foundation of knowledge needed for success, and it is a well-respected and internationally recognized credential that reflects the most relevant skills needed in today's academic and business environments.

What's Inside?

Here is a glance at what's in each chapter:

Chapter 1: Understanding Operating Systems This chapter introduces basic concepts like hardware, software, and operating systems and explains how they work together. It also explains the basics of managing files on a computer and customizing an operating system.

Chapter 2: Understanding Hardware This chapter goes into more detail about hardware and provides more information about different types of hardware, what they are used for, and how to measure their performance.

Chapter 3: Understanding Software This chapter demonstrates how to install, uninstall, and reinstall various software. It explains the different licensing models and the basics of using several types of software.

Chapter 4: Troubleshooting Problems with Your Computer This chapter describes the most common types of problems you may encounter when dealing with both software and hardware and how to deal with them.

What's Included with the Book

This book includes many helpful items intended to prepare you for the Computing Fundamentals exam that's part of the IC3 GS4 certification.

Assessment Test The assessment test at the conclusion of the book's introduction can be used to quickly evaluate where you are with your general computing knowledge and skills that prove your competency in digital literacy. This test should be taken prior to beginning your work in this book, and it should help you identify areas in which you are either strong or weak. Note that these questions are purposely simpler than the types of questions you may see on the exams.

Objective Map and Opening List of Objectives At the start of this book is a detailed exam objective map showing you where each of the exam objectives is covered in this book. In addition, each chapter opens with a list of the exam objectives it covers. Use these to see exactly where each of the exam topics is covered.

Exam Essentials The end of each chapter provides a brief overview of the concepts covered in the chapter. We recommend reading through these sections carefully to check your recollection of each topic and returning to any sections of the chapter you're not confident about having mastered.

Chapter Review Questions Each chapter includes review questions. The material for these questions is pulled directly from information that was provided in the chapter. These questions are based on the exam objectives, and they are similar in difficulty to items you might actually encounter on the IC3 GS4 exams.

Interactive Online Learning Environment and Test Bank

The interactive online learning environment that accompanies this book provides a test bank with study tools to help you prepare for the certification exams—and increase your chances of passing it the first time! The test bank includes the following:

Sample Tests All of the questions in this book are provided: the assessment test, which you'll find at the end of this introduction, and the chapter tests that include the review questions at the end of each chapter. In addition, there are two practice exams. Use these questions to test your knowledge of the study guide material. The online test bank runs on multiple devices.

Flashcards Questions are provided in digital flashcard format (a question followed by a single correct answer). You can use the flashcards to reinforce your learning and provide last-minute test prep before the exam.

Practice Files Many exercises in this book use practice files that were created specifically for this book. You can find them online, in the Other Study Tools section of the interactive learning environment that was created for this book. Before going through all the exercises that are offered, please register and download all the practice files.

Other Study Tools A glossary of key terms from this book is available as a fully searchable PDF.

How to Use This Book

If you want a solid foundation for preparing for the Computing Fundamentals exam, then look no further. We've spent a lot of time putting this book together with the sole intention of helping you to pass the exam!

This book is loaded with valuable information. You'll get the most out of your study time if you follow this approach:

1. Take the assessment test immediately following this introduction. (The answers are at the end of the test, but no peeking!) It's okay if you don't know any of the answers—that's what this book is for. Carefully read over the explanations for any question you get wrong, and make note of the chapters where that material is covered.

2. Study each chapter carefully, making sure you fully understand the information and the exam objectives listed at the beginning of each one. Again, pay extra-close attention to any chapter that includes material covered in questions you missed on the assessment test.

3. Answer all the review questions related to each chapter. Specifically note any questions that confuse you, and study the corresponding sections of the book again. And don't just skim these questions—make sure you understand each answer completely.

4. Test yourself using all the electronic flashcards. This is a brand-new and updated flashcard program to help you prepare for the Computing Fundamentals exam, and it is a really great study tool.

Learning every bit of the material in this book is going to require applying yourself with a good measure of discipline. So try to set aside the same time period every day to study, and select a comfortable and quiet place to do so. If you work hard, you will be surprised at how quickly you learn this material. If you follow the steps listed here and study with the review questions, practice exams, and electronic flashcards, you will increase your chances of passing the exam.

How to Contact Sybex

Sybex strives to keep you supplied with the latest tools and information that you need for your work. Please check the website at <u>http://sybextestbanks.wiley.com</u>.

IC3 GS4 Exam Objectives

IC3—Module 1: Computing Fundamentals

Objective Number	Objectives and Skill Sets	Chapter
1.0	Operating System Basics	1
1.1	What is an OS and what does it do?	
1.1.1	Explain the differences between software applications and operating systems and demonstrate their uses.	
1.1.2	Common OS features, explain each of their uses: Power On/Power Off Log on/log off/switch user Lock/Unlock Differences between common OSs	
1.1.3	Explain how hardware can influence the Operating System and software and vice versa.	
1.1.4	Software updates, security fixes, bugs, adaption to new hardware. Demonstrate how to update software, using manual and automatic settings.	
1.2	Manage computer files and folders.	1
1.2.1	Directory and folder hierarchy and structure: Menu, Toolbar, and Window Navigation Expand and Collapse Folder views	
1.2.2	File/Folder management: Keyboard shortcuts Copy Paste Delete Move Rename Create shortcuts Search	
1.2.3	Identify file extensions and their associations such as .docx, .xlsx, .pdf, .mp3, etc.	
1.3	Manage computer configuration, Control Panel, OS, and drivers.	
1.3.1	Basic Desktop Customization Visual options Languages Date and Time Accessibility options	

1.3.2	Describe the various states of operation available in a typical consumer-level OS. Include Shutdown, hibernation, standby, fully awake, etc.	
1.3.3	User accounts and rights: Group policy (specifically mobile) Read/Write Administrative vs. standard user rights File and Directory Permissions	
2.0	Computer hardware and concepts	2
2.1	Common computer terminology	
2.1.1	Define the terms and explain the differences between input/output devices and hardware and peripherals. Processing: Gigahertz, Hertz, CPU Input/Output: Monitor and Projector, Mice, Keyboards, Stylus, Microphone, Speakers, Touchpad Printers	2
2.1.2	Explain the different types of memory (Volatile, Nonvolatile). Volatile – RAM Nonvolatile - SSD drive, Magnetic hard drive, ROM, Flash drives (USB, Jump, Thumb, etc.) Units of measurement: Mega, giga, tera, peta Explain the difference between Bit vs. Byte.	
2.2	Types of devices	
2.2.1	Explain these different types of computers. Compare and contrast uses and capabilities. Server Desktop Laptop Tablet Smartphone	
2.3	Computer performance	
2.3.1	Specify criteria that could be used to evaluate the pros and cons of various computing devices and peripherals, Focus on performance issues.	
2.3.2	Processing vs. memory vs. storage: Describe the concepts of Processing capacity, Processing speed, Memory capacity, Memory speed, Storage capacity, and Storage speed including how each interacts with the other to determine overall computing capacity, speed and power.	
3.0	Computer software and concepts	3
3.1	Software management	
		3

3.1.1	Describe how to install, uninstall and reinstall various kinds of software, including application software, drivers and system software, upgrades and patches, on various types of personal computers and configure the environment for use.	
3.2	Licensing	
3.2.1	Understand the various licensing models used for computer software such as operating systems, application programs, system software, databases, browsers, etc. Freeware, shareware, open-source, premium applications.	
3.2.2	Demonstrate an understanding of the legal and ethical obligations associated with EULAs and the user's responsibilities, commitments, and benefits that can be derived by entering into a typical computer industry EULA.	
3.2.3	Demonstrate an understanding of the concept of a single seat and site License options, how each party benefits, restrictions, obligations, etc.	
3.3	Software Usage	
3.3.1	Describe the dependencies and constraints that exist between hardware and software operation.	
3.3.2	Demonstrate an understanding of the similarities and differences between a basic, consumer-level relational database management system and a typical spreadsheet program, including an understanding of which situations would be better suited to which product.	
3.3.3	Describe what desktop publishing is, how and when desktop publishing software should be used, and the general feature set included in a representative desktop publishing program.	
3.3.4	Describe what a Presentation program is, its purpose, how it is used, and the general feature set included in a typical consumer-level presentation program.	
3.3.5	Demonstrate how to use templates, default settings, and quick start aids to rapidly generate usable application user data.	
3.3.6	Describe the purpose and use of a personal computer-based entertainment program. List the features that could be expected to be found in such a program and explain how they work.	
3.4	Software tools Explain what file compression is and how it works with various file types. Explain how files are stored on a Hard Disk. Demonstrate how to organize, compress, defragment, and otherwise optimize a computer's hard disk performance. Explain the danger posed by viruses and malware and how virus and	3

	malware scanning software work. List several common/popular brands and types of virus and malware scanning software.	
1.3.4	Install/uninstall applications	
4.0	Troubleshooting	4
4.1	Software	
4.1.1	Explain the concepts associated with version control of Operating System (OS) software. Further explain how the OS version can affect the compatibility of other software on the PC.	
4.1.2	Demonstrate how to identify and remove a virus or other malware from an infected PC.	
4.1.3	Explain what 'safe mode' is in popular PC operating systems (OSs), and how and when it should be used when troubleshooting problems on a personal computer system.	
4.1.4	Explain where and how to find information beyond that stored on the PC to help troubleshoot problems on a PC. List popular Knowledge base, forums, and self-help web sites and explain how to use them for troubleshooting.	
4.1.5	Demonstrate how to invoke and interpret the information available in a PC's Task, Process, or Application Manager. Further demonstrate how to use this tool when troubleshooting a problem on the affected PC.	
4.2	Hardware	
4.2.1	Explain how different versions of firmware affect performance of hardware subsystems on a PC and how that information may be used in troubleshooting a problem on a PC.	
4.2.2	Explain the role of Cables and other connectors that connect the various parts of a computer together and what can happen when one or more cable or connector does not make the proper connection.	4
4.3	Devices and Peripherals	
4.3.1	Explain how different versions of firmware can affect performance of peripheral devices and hardware attached to a PC and how that information may be used in troubleshooting a problem on a PC.	
4.3.2	Explain what a device driver is, how it fits into the operating system architecture, and how incompatibilities may lead to problems. Further explain how this information may be used in troubleshooting a problem on a PC.	
4.4	Backup / Restore	
4.4.1	Demonstrate how to backup and then restore software and data to: Safe offsite location. External drive Cloud	

| 4.4.2 | Explain the implications of versioning and re-cycling of backups in an incremental backup system. Explain how to properly restore from an incremental backup system. | |

Assessment Test

IC3—Module 1: Computing Fundamentals

1. What is the keyboard shortcut for the Copy command?

   A. Ctrl+V

   B. Ctrl+Z

   C. Alt+F4

   D. Ctrl+C

2. Which of the following is an operating system?

   A. Bing

   B. Facebook

   C. Android

   D. Skype

3. Which of the following are characteristics of modern operating systems? (Choose all that apply.)

   A. They are real-time.

   B. They are multitasking.

   C. They are impossible to learn.

   D. They can be used for a limited time.

4. For how long does an operating system holds the information from the Clipboard?

   A. Until you update the operating system

   B. Until you press Alt+F4 on your keyboard

   C. Until you use a search engine to copy that information

   D. Until you use the Paste command

5. What is Windows Update?

   A. A tool that keeps Android up to date

   B. A Windows virus

   C. A tool that keeps Windows up to date

   D. A data-recovery tool for Windows

6. What does the processor of a computer do?

   A. Stores your data in the form of files and folders

   B. Carries out the instructions sent by the software you run

   C. Processes and generates the image that is displayed by your computer

   D. Connects a computer to a network

7. What are peripherals?

   A. The internal hardware components of a computer

   B. A type of software

   C. A type of search engine

   D. External hardware components that can be connected to a computer

8. What is a laptop?

   A. A mobile phone with advanced computing capabilities

   B. A portable computer that is suitable for mobile use

   C. A specialized business computer that is intended to be used at a single controlled location

   D. A type of software

9. Which of the following units of measure do you use for measuring the storage space available on a hard disk?

   A. GHz

   B. GB

   C. Number of cores

   D. SSD

10. What is open source?

    A. A commercial license for software

    B. A type of hardware

    C. A type of software license

    D. A web browser

11. Which of the following is a presentation program?

    A. Microsoft Word

    B. Mozilla Firefox

    C. Google

    D. Microsoft PowerPoint

12. Which of the following activities can be performed with a personal entertainment application? (Choose all that apply.)

    A. Write documents

    B. Listen to music

    C. Create databases

    D. Watch movies

13. Which of the following programs can you use to view the applications that are running on your Windows computer?

    A. Windows Update

    B. Windows Media Player

    C. Task Manager

    D. Control Panel

14. What is firmware?

    A. A driver

    B. An operating system

    C. The first software to run on a hardware device when it is powered on

    D. A web browser

15. What is Safe Mode?

    A. A networking protocol

    B. A Windows error message

    C. The process of updating the firmware on a hardware device

    D. A different way of starting Windows that loads only the barest essentials that are required for Windows to function

Answers to Assessment Test

IC3—Module 1: Computing Fundamentals

1. D. The keyboard shortcut for Copy is Ctrl+C.

2. C. Android is the only operating system in the list.

3. A, B. Modern operating systems execute applications and commands in real time, and they allow multiple applications to run at the same time (multitasking).

4. D. The Clipboard holds information temporarily until you opt to paste it somewhere else.

5. C. Windows Update is a tool that keeps Windows up to date.

6. C. The processor is the "brains" of a computer. The CPU is what carries out the instructions sent by the software you run.

7. D. Peripherals are external hardware components that can be connected to a computer.

8. B. A laptop is a portable computer that is suitable for mobile use.

9. B. The amount of storage space is measured in bytes and its multiples. Modern computers tend to have large hard drives with lots of storage space. It is very common to have a hard disk in your computer with 500 GB of storage space or even 1 TB.

10. C. Open source is a type of software license.

11. D. The most popular examples of presentation programs are Microsoft PowerPoint (included in Microsoft Office) and Impress (included in LibreOffice).

12. B, D. Personal entertainment applications allow you to do fun things on your computer, like listening to music or watching movies.

13. C. Task Manager shows a list of all the applications that are running on your computer.

14. C. Firmware is a very basic piece of software that contains only the instructions that are required for the hardware to work as intended. It is the first software to run on a device when it is powered on.

15. D. Safe Mode is a different way of starting Windows that loads only the barest essentials that are required for Windows to function.

Chapter 1
Understanding Operating Systems

THE FOLLOWING IC3 GS4: COMPUTER FUNDAMENTALS EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **What Is An OS And What Does It Do?**

- Explain the differences between software applications and operating systems and demonstrate their uses.

- Common OS features, explain each of their uses:

  - Power On/Power Off

  - Log on/log off/switch user

  - Lock/Unlock

  - Differences between common OSs

- Explain how hardware can influence the Operating System and software and vice versa.

- Software updates, security fixes, bugs, adaptation to new hardware. Demonstrate how to update software, using manual and automatic settings.

✓ **Manage Computer Files and Folders**

- Directory and folder hierarchy and structure

  - Menu, Toolbar, and Window Navigation

  - Expand and Collapse

  - Folder views

- File/Folder management

  - Keyboard shortcuts

  - Copy

  - Paste

  - Delete

  - Move

  - Rename

  - Create shortcuts

  - Search

- Identify file extensions and their associations such as .docx, .xlsx, .pdf, .mp3, etc.

✓ **Manage Computer Configuration, Control Panel, OS, and Drivers**

- Basic Desktop Customization

- Visual options
- Languages
- Date and Time
- Accessibility options
- Describe the various states of operation available in a typical consumer-level OS. Include Shutdown, hibernation, standby, fully awake, etc.
- User accounts and rights
  - Group policy (specifically mobile)
  - Read/Write
  - Administrative vs. standard user rights
- File and Directory Permissions

Modern computers and devices like smartphones and tablets consist of numerous components, even though some devices are really small. First, there are plenty of specialized hardware components like video cards or sound cards, each of which has its own role to play. Then there are the operating system (e.g., Windows) and the programs (e.g., Microsoft Office) that make the device useful to users. Without them, any piece of hardware, no matter how powerful, cannot be used. That's why, in this chapter, we will start by discussing the role each component plays in a modern computer and the basics of how they work together. Then we will focus on the operating system, what it does, how it works, and how to personalize it.

Operating Systems and Their Roles When Using Computers and Devices

We will start by defining hardware, software, and operating systems so that you have a good understanding on what they are and what their role is. As you will see, the relationship between them is quite delicate and very important. Any computer or device cannot function and cannot be used productively without these three elements working well together. That's why we will start by discussing them and by explaining all the key concepts that are involved.

What Is Hardware?

Any computer or device is composed, at a physical level, of *hardware*. For example, a computer almost always has a monitor, a mouse and keyboard, a hard disk or flash memory, a graphics card, a sound card, some memory, a motherboard, a network card, a case, and a power supply.

If you look inside a smartphone and a tablet, you will find similar components. The most important difference is their size, since they need to fit into a person's hand. Also, the display is touch sensitive, and mobile devices have a battery built in.

Each hardware component is specialized to perform a set of specific tasks. For example, the sound card is in charge of providing sound to the user, the graphics card takes care of processing the image and sending it to display, the network card is in charge of connecting to the network and the Internet, and so on.

What Is Software?

Software is a set of machine-readable instructions that direct a computer or device to perform specific operations. Software is not physical like hardware is. It is ephemeral, in the sense that it is anything that can be stored electronically on the hardware of a computer or device.

There are many types of software, the most important being these two:

System Software This software is designed to directly operate the hardware of a computer or device. Such software provides all the basic functions that allow users and other software to control the device's hardware. The most common types of system software are the operating system, drivers (which control a specific hardware component), and system utilities (which assist users in the maintenance of their computers).

Application Software This is specialized software the users can employ to perform certain tasks. For example, Microsoft PowerPoint lets users create presentations. Antivirus software like Norton Antivirus or Kaspersky Antivirus keeps your computer safe from threats and so on. This type of software is also referred to as applications, programs, or apps (when working with mobile devices). In order to function, application software needs to run on top of both the system software and hardware. Applications are either provided by the operating system (for example, Paint is an application offered by Windows) or installed by users on top of the operating system.

To help you understand these concepts better, let's take a look at each of these two types of software in more detail.

What Is an Operating System?

An *operating system* is a special type of software that manages all the communications between the user, the software applications, and the hardware in a computer or device. It is the most important piece of software that runs on a device because without it interactions with that device would be impossible. Operating systems perform important tasks like recognizing the hardware components of a device, controlling them, taking input from devices such as the keyboard or the touch screen (in the case of tablets and smartphones), managing the file system on that device, taking input from the user or from other software applications, and sending it to the hardware.

The most popular operating systems are Windows, Linux, Mac OS X, Android, iOS, and Windows Phone. Some are designed to work on computers and laptops (Windows, Linux, or Mac OS X), while others are designed to work on mobile devices like smartphones and tablets (Android, iOS, Windows Phone).

Operating systems have many characteristics that allow them to be classified in multiple ways. The most important characteristics are these:

- Modern operating systems are real-time.

  They execute applications and commands in real time. The benefit of being real-time is that the operating system delivers a quick and predictable response to the commands issued by the user or by the applications they are using.

- Modern operating systems are multitasking.

  They allow multiple applications to run at the same time. Hardware resources are allocated and managed automatically by the operating system and shared among all the programs and services that are running.

- Operating systems can be multiuser or single-user.

  For example, Windows and other operating systems that are designed to run on computers are multiuser. This means that you can create multiple user accounts on the same computer and have them share that computer's hardware and software resources. Single-user operating systems allow only one user account. Generally, these operating systems are found on mobile devices like smartphones and tablets. However, even these types of devices will have multiuser operating systems in the future.

- Some operating systems can be embedded.

  This means that they are designed to be used in small devices like cash registers, ATMs, and so on. These devices are very compact and have limited resources. Embedded operating systems are optimized to run on limited hardware resources, and they generally provide a small and specialized set of services and interactions.

How Do They All Work Together?

When you start a computer or a device like your smartphone, the operating system loads

first. Once that is loaded, you will interact with both the application software that is installed on it and the operating system. For example, when you use an application like Microsoft Word to write a document, the application sends your input and commands to the operating system. The operating system then communicates with the hardware, and it automatically manages the resources used by Microsoft Word in order to deliver the desired results.

Users can also work directly with the operating system. For example, in Windows, you can access the files and folders that are stored on your computer and open them. You can also browse the storage on your computer, using the operating system and its features, without needing to install other applications.

Figure 1.1, which shows how the operating system and system software are layered on a typical computer, should help you understand this more clearly. The arrows indicate how the information flows.
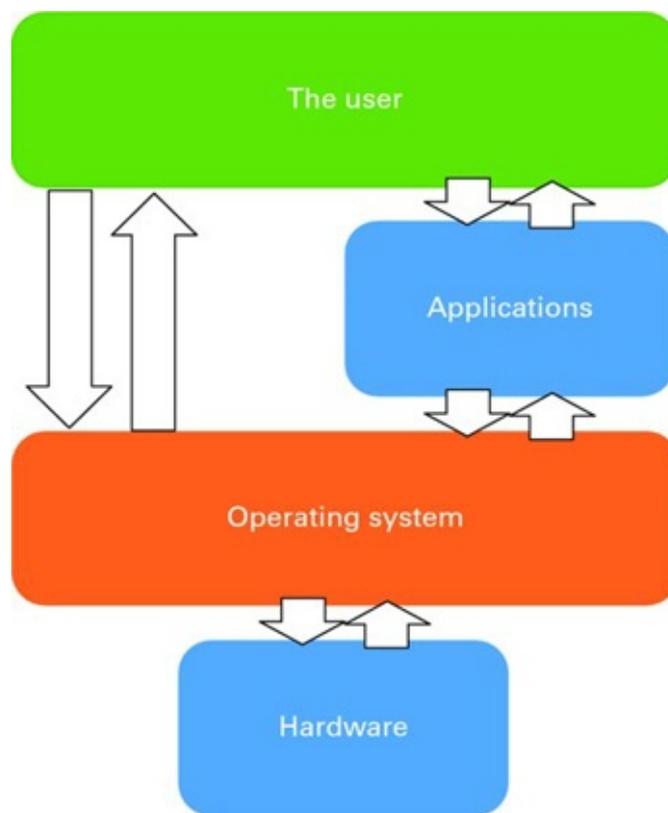
Figure 1.1 The flow of information among the user, software applications, the operating system, and the hardware

Which Computer Operating System Is Best?

There is a never-ending debate about which is the best operating system for your computer. Is it Windows? Is it Mac OS X? Is it Linux? The truth is that modern operating systems are not that different anymore, at least not when it comes to what you can do with them. You can use any of them to write a document, deliver a presentation, play games, watch movies, surf the Internet, and so on. Very few features are unique to one operating system. The differences between them are mostly in the way the user interface works.

Choosing one operating system versus another is mostly a matter of personal preference. If you like how a Mac looks and feels, you might purchase a Mac and use Mac OS X. If you are a great believer in free software, then you might prefer to use Linux on your computer. If you want to have access to the greatest number of applications, devices, and learning resources, then you will go for Windows.

Accessing and Locking the Operating System

When you press the power button on a computer or other device, the operating system is loaded, and you're asked to sign in if you've set up a password or *personal identification number (PIN)*. Regardless of the device, the basic idea is the same: you need to power up your computer or device, wait for the operating system to load, and then authenticate yourself in order to use it.

> If you have only one user account on your computer and no password set for it, it is enough to press the power button on your computer and wait for Windows 7 to start and automatically sign you in. However, not having a password makes your computer a lot less secure, and we recommend that you always set a password for your user account.

Let's do an exercise together in which you'll learn how to power on your computer and sign into Windows 7 (Exercise 1.1).

EXERCISE 1.1

Signing into Windows 7

1. Press the power button on your computer.

2. Wait for the operating system to start.

   When that process is finished, you are shown the sign-in screen (Figure 1.2), where you can see the user accounts that exist on your computer.

Figure 1.2 The Windows log-in screen showing the user accounts that exist on your computer

3. Select your user account and then type your password.

   If you have only one user account on your Windows 7 computer, you are directly prompted for your password, without having to go through this step. Also, if you have no password set for your account, then you won't be asked to type one.

4. Click the sign-in button, which is an arrow pointing to the right (Figure 1.3).
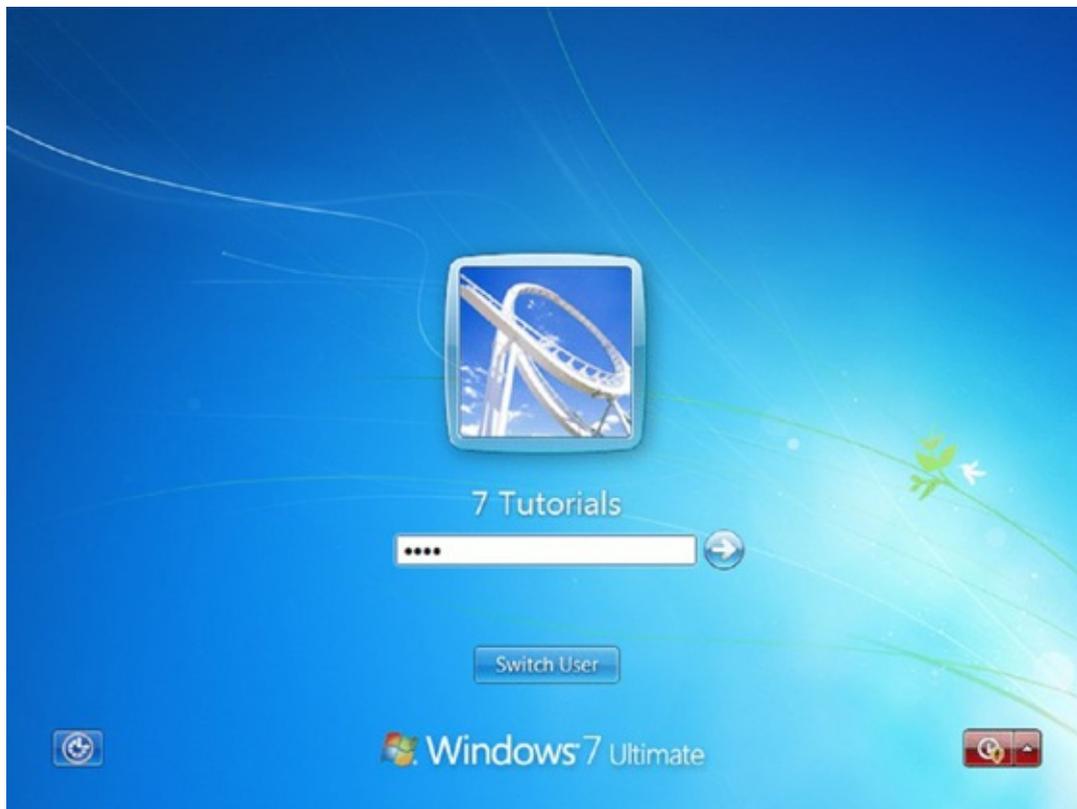
Figure 1.3 The sign-in screen for your user account

Once you log into Windows 7, you can start using the software applications that are installed on it and do your work. When you have finished working on the computer, you can do the following:

Switch User You can switch to another user account that exists on your computer so that someone else can use it. When you do this, your account remains active in the background and so do all your running applications. They will be available to you in the state in which you left them when you switch back to your user account. Be aware that other users can turn off the computer, and your unsaved work will be lost if that happens.

Log Off All your applications and files are closed. The computer and the operating system remain turned on, and other users can log in with their accounts and continue using the computer.

Lock Your user account remains active in the background as well all your running applications. Windows 7 displays the sign-in screen and requests your user account password. You can unlock your account by typing your password, and you will be able to resume your work exactly where you left off. No one else can use your account and your running applications unless they type your password and unlock your account.

Restart All your applications and files are closed. The operating system is shut down and then your computer and the operating system are restarted. When the restarting procedure is over, you are back to the sign-in screen, where you can log back into Windows.

Sleep Sleep is a low-power mode that saves significantly on power consumption. Your user account gets locked, Windows stores your work in memory, and then it places itself into stand-by mode. When you press the power button, Windows resumes from sleep and allows you to sign in and resume your work, exactly where you left off. Resuming from

sleep is generally faster than powering on your computer.

Shut Down First, all your applications and files are closed. Then the operating system turns itself off as well as the computer. When shut down, the computer does not use electrical power because it is no longer running.

To access all these options, click the Start button to open the Start menu. On the right side you will see the Shut Down button and a small arrow near it. Clicking the Shut Down button will obviously power off your computer, as mentioned earlier. Clicking the small arrow near it will give you access to the additional options that were mentioned earlier, as shown in Figure 1.4.
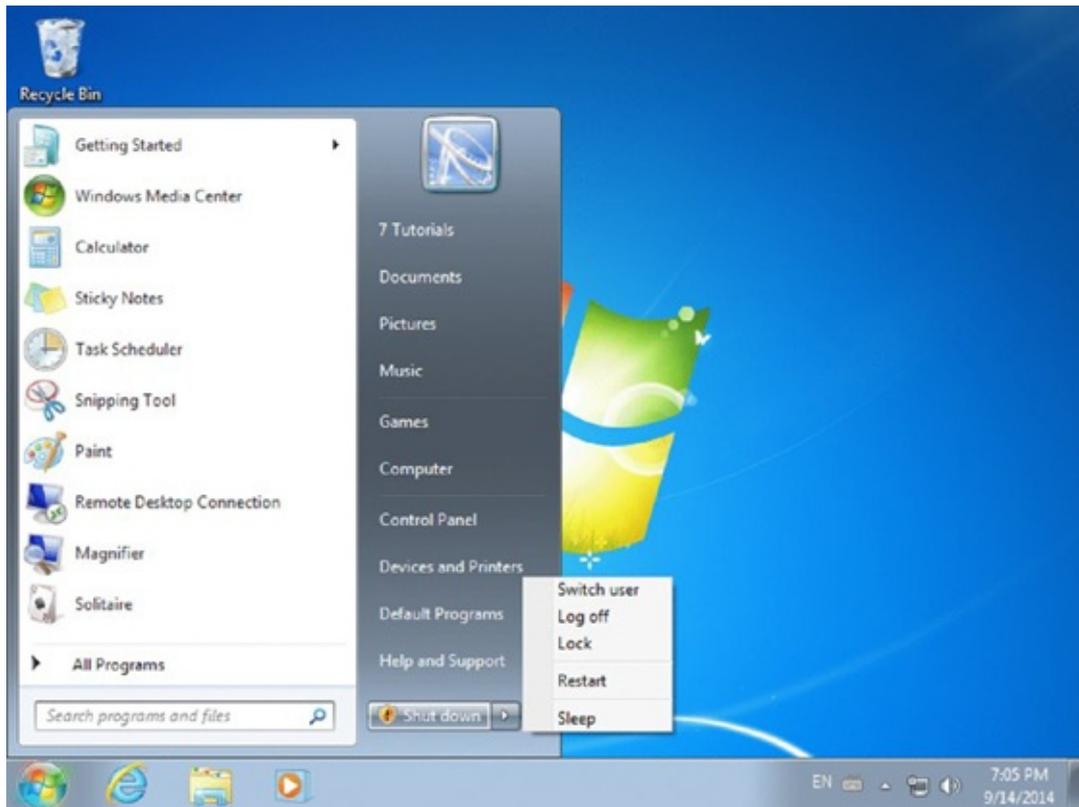
Figure 1.4 Options for switching the user, logging off, locking the computer, restarting it, or putting it to sleep

To learn more, let's do this small exercise, which teaches you how to put Windows 7 to sleep and then resume from sleep (Exercise 1.2).

EXERCISE 1.2

Putting Your Computer to Sleep and Then Resuming Your Work

1. Click the Start button in Windows 7, on the bottom-left corner of the screen.

2. Click the small arrow near the Shut Down button to reveal other options ([Figure 1.5](#)).
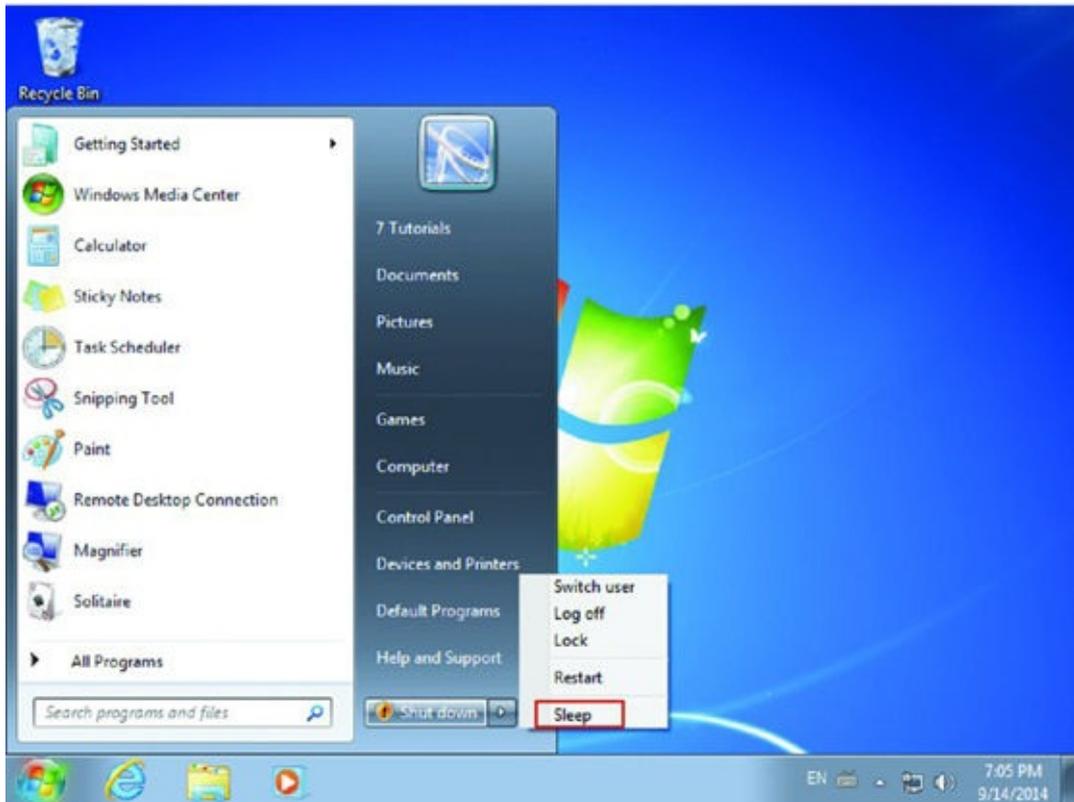
[**Figure 1.5**](#) The Sleep button

3. Click Sleep and wait for Windows 7 to turn off the screen and put itself into sleep mode.

4. Wait a couple of seconds, press the power button, and then wait for Windows 7 to resume from sleep.

5. At the sign-in screen, type your user account password and click the Sign In button.

Software and System Updates

Most applications and operating systems receive updates on a regular basis. Windows receives updates through the Windows Update service, whereas software applications receive updates through their own update services, if their manufacturer provides them. For example, Internet browsers made by companies other than Microsoft (e.g., Google Chrome, Mozilla Firefox, Opera) have their own update service. They are updated on a monthly basis because they require continuous improvement in order to keep up with the needs of their users and the evolution of the Internet. Other applications may not have their own update service, so users need to manually download and install newer versions

when they become available. Most applications are like this, including popular ones like the 7-Zip file archiver or the GOM multimedia player.

Luckily, Microsoft also offers updates to popular software like Microsoft Office or Windows Essentials through the Windows Update service, if you set it to deliver them.

Software updates are created for many reasons:

- To fix problems of any kind, ranging from security issues to bugs that don't allow the software run as it was intended.

- To add new features and characteristics that make the product more useful to its users.

- Some operating system updates also provide new driver versions that allow the operating system to better use and manage the hardware components of your computer.

By default, Windows is set to automatically check for updates and install them when they are available. However, you can also install them manually. Exercise 1.3 details how to check for updates and install those that are available.

EXERCISE 1.3

Manually Installing Windows Updates

1. Click Start and then Control Panel.

2. Click System And Security and then Windows Update (Figure 1.6).
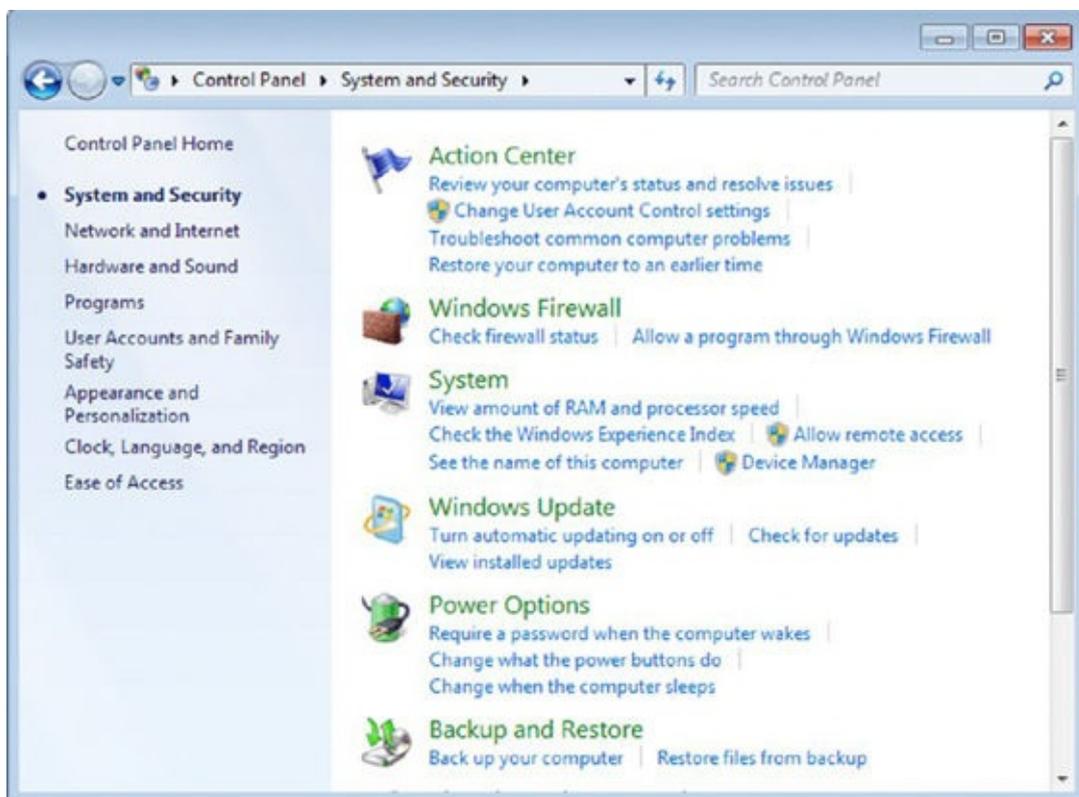
Figure 1.6 The System And Security section in Control Panel

3. In the column on the left, click Check For Updates (Figure 1.7).
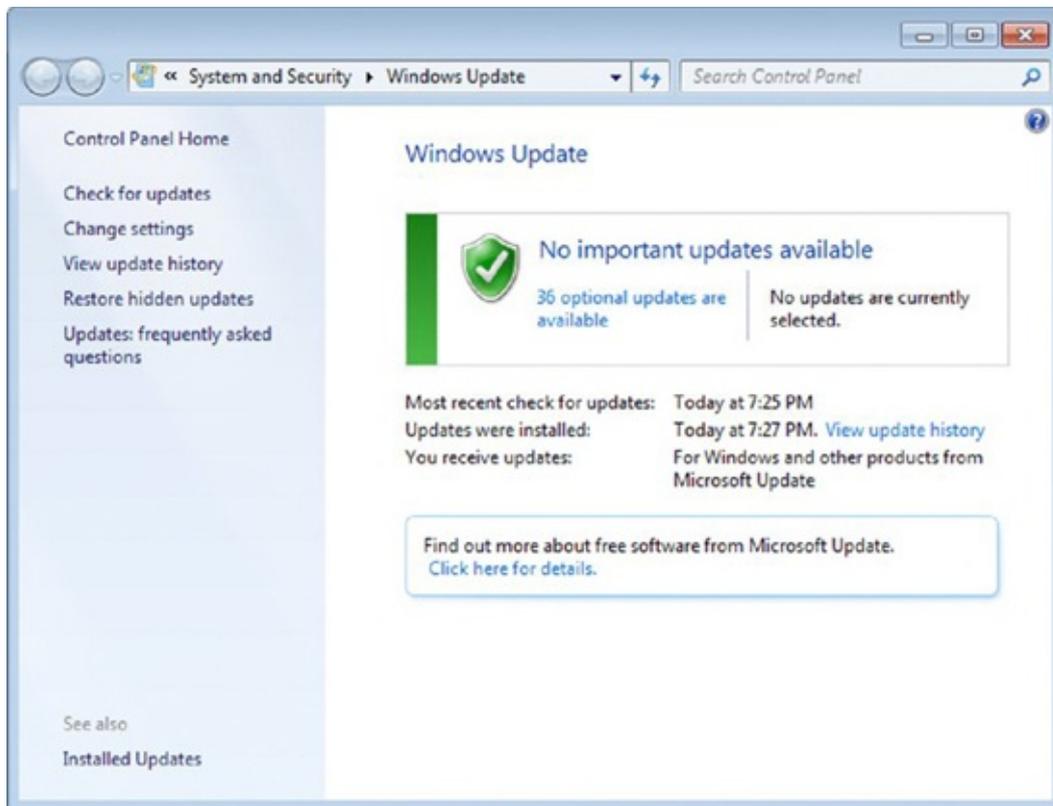
Figure 1.7 The Windows Update window

4. Wait for Windows to check for updates and let you know whether there are any updates available to be installed.

5. If updates are available, click Install Updates (Figure 1.8) and wait for them to be installed.

Figure 1.8 Windows Update informing you how many updates are available

When the process is finished, you are informed that the updates were successfully

installed.

6. It is possible that Windows will recommend that you restart your computer in order to install those updates. If that is the case, click Restart Now (Figure 1.9). Otherwise, close the Windows Update window.
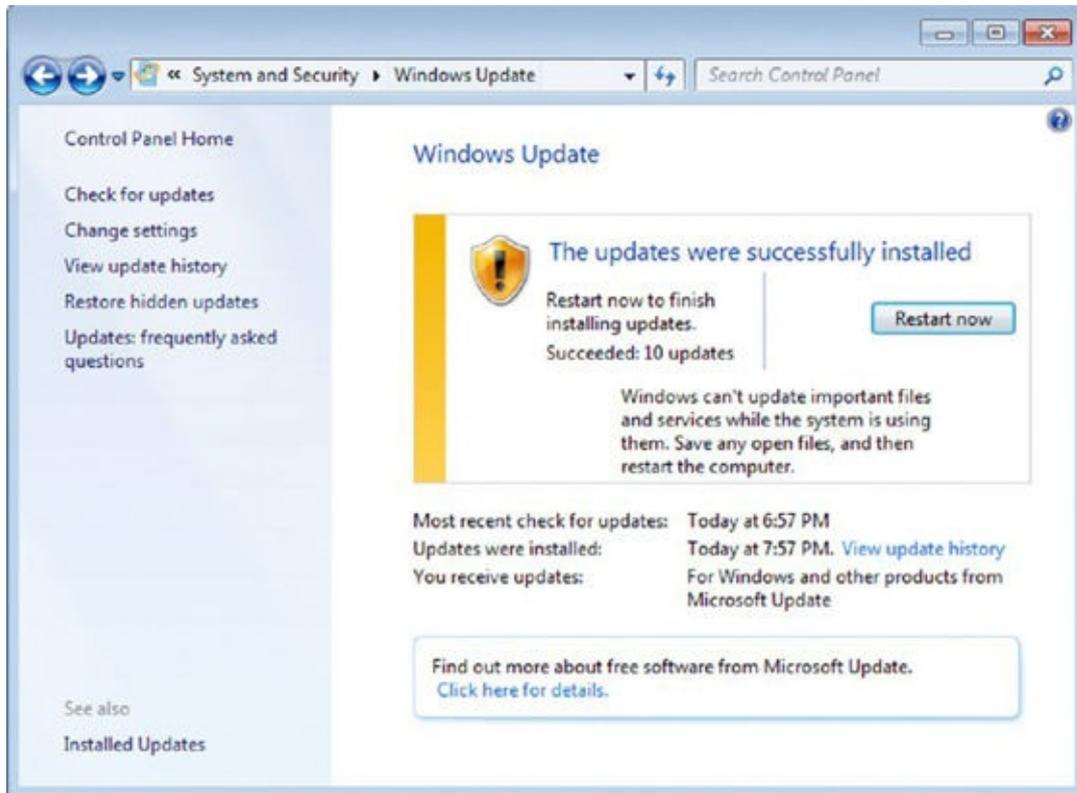
Figure 1.9 Windows Update informing you that updates were successfully installed

 Real World Scenario

Always Keep Windows Update Turned On

On some technical forums or blogs you may encounter a recommendation to disable Windows Update. Some recommend this because they think that it improves general system performance. Others recommend this because using Windows Update on pirated copies of Windows will install updates that figure out whether users are using an illegal copy of Windows and try to inform them about this problem and educate them on how to purchase a legal copy of Windows.

Disabling Windows Update is a very bad practice that only creates problems for users. For starters, your Windows installation will not benefit from the many security updates provided by Microsoft. Therefore, it will be vulnerable to all kinds of security threats. Also, you won't benefit from bug fixes and performance improvements. Also, some updates add new features to Windows that may be useful to you. That's why you should always check and confirm that Windows Update is enabled on your computer and that it installs updates automatically.

Windows Update can be set to work in four different ways:

- Install Updates Automatically (Recommended)

  Every day, Windows automatically checks for updates and installs them in the background when they are available. If a computer restart is required in order to finalize their installation, it will request it from the user. This is the default setting for Windows Update.

- Download Updates, But Let Me Choose Whether to Install Them

  Windows Update automatically checks for updates and downloads them in the background when they are available. The user is prompted to install them, when appropriate.

- Check For Updates, But Let Me Choose Whether to Download and Install Them

  Windows Update automatically checks for updates in the background, and it informs the user when they available for download and installation. It doesn't download any updates without the user's prior consent.

- Never Check For Updates (Not Recommended)

  This means that Windows Update is turned off and not working. Windows is not kept up to date, and it becomes vulnerable to all kinds of problems.

When setting up your Windows computer for the first time, it is a good idea to double-check that Windows Update is turned on and working well. Exercise 1.4 shares how to do this.

EXERCISE 1.4

Confirming That Windows Update Is Turned On

1. Click Start and then Control Panel.

2. Click System And Security and then Windows Update.

3. In the column on the left, click Change Settings.

4. In the Important Updates section, select Install Updates Automatically (Recommended) (Figure 1.10).
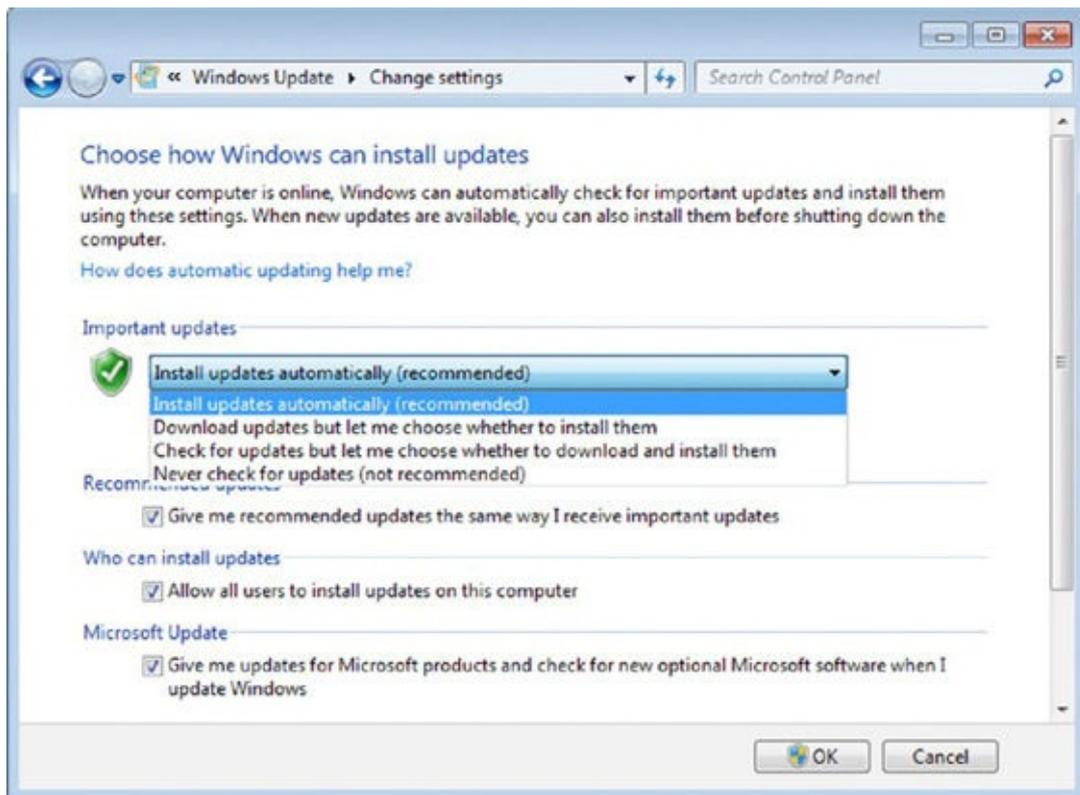
Figure 1.10 Where you change the Windows Update settings

5. Click OK.

6. Close the Windows Update window.

Working with Files, Folders, and Libraries

When you work on a computer, you will create files and folders to store your work and use it later on. A file is a resource for storing information that can then be opened and used with the help of a computer program. To make it simpler, imagine the file to be the digital counterpart of a paper document. Similarly, a folder is the digital equivalent of the file folder used in offices. *Libraries* are a new concept that was introduced in Windows 7 and used in all subsequent versions of Windows. A library is a virtual collection of folders on your computer.

Files *Files* can store any kind of data. For example, Word files will store documents created with Microsoft Word. Documents can include text, graphics, tables, and so on. Images are also files—the digital counterpart of pictures. Images can be opened with programs that are designed to deal with images and render them on the screen. Videos and movies are also stored as files, and they can be viewed with specialized programs that render them on the screen.

Files can be created by the user, by the applications they are using, and by the operating system. They are generally stored in folders with different names and sizes.

Folders *Folders* are a way of organizing files and other folders on your computer. You can think of a folder as a collection of references to other files and folders that are inside it. Some people also refer to them as directories. Folders always have a hierarchical tree-like structure. One folder contains several files and other folders (also named subfolders). Its subfolders have their own files and subfolders, and so on (Figure 1.11).
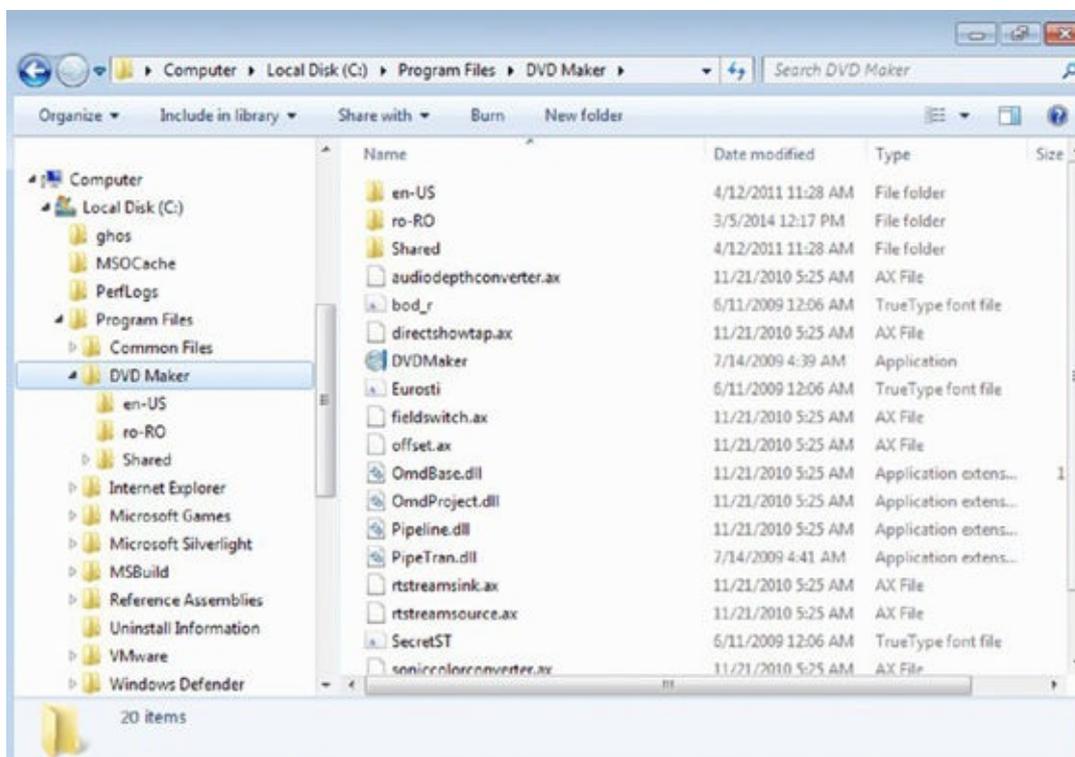
Figure 1.11 A folder and its contents displayed by Windows Explorer

Libraries Libraries do not exist as actual folders on the computer but only as references to one or more folders and the files stored inside them. Libraries are named using the type of files and folders they tend to store: Documents, Pictures, Music, and Videos. The

Documents library will link to the folders where you store your documents, the Pictures library will link to the folders where you store your pictures, and so on.

Libraries are useful because they have direct shortcuts throughout the operating system, and you can easily access them. Also, their content is automatically indexed by Windows so that you can quickly search for the files you are looking for. Searching for files that are not part of a library generally takes longer than when searching for files that are part of a library.

Accessing Your Files and Folders

All operating systems provide an easy way for you to access your files and folders. In Windows 7, you can use Windows Explorer. To open this program, click the folder icon on the taskbar—the transparent bar that runs across the bottom of the screen. You can see the folder icon in Figure 1.12.

Figure 1.12 The shortcuts on the Windows taskbar, including the one for Windows Explorer

The left side of Windows Explorer is named the Navigation pane. There you will see several sections and shortcuts to different locations on your computer. Whatever is selected in the Navigation pane determines what is shown on the right pane (Figure 1.13).
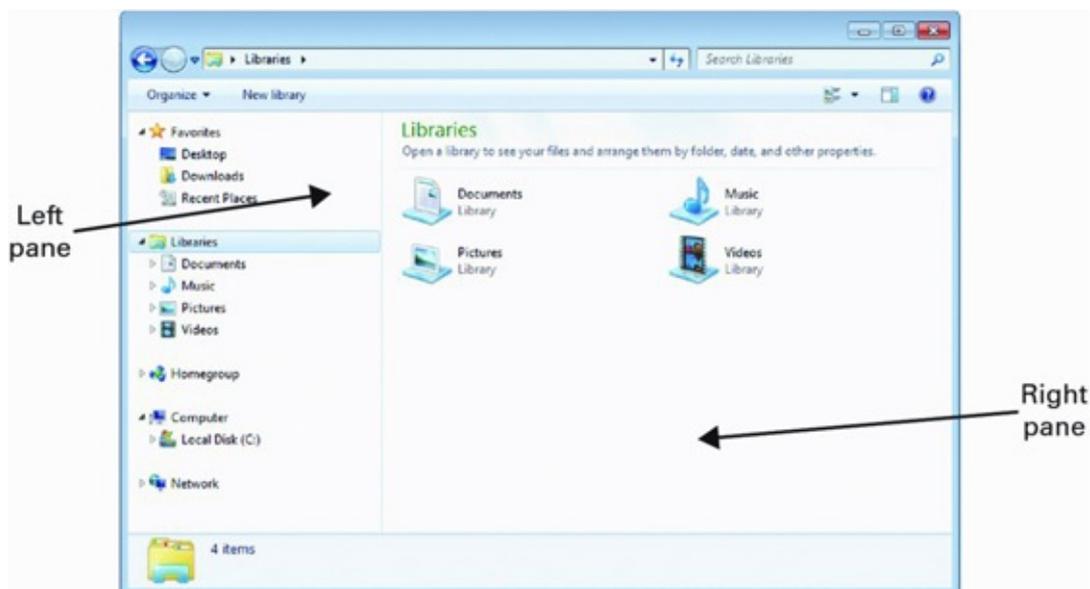
Figure 1.13 The Windows Explorer window

By default, Libraries is selected. There you will see the four default libraries that exist in Windows 7: Documents, Music, Pictures, and Videos. To make things easy for you, it is best to save your documents in the Documents library, your pictures in the Pictures library, and so on.

In order to successfully navigate through your computer's files and folders, you have to learn how Windows Explorer works. First, let's take a look at its window and each of its elements, as they are highlighted in Figure 1.14.
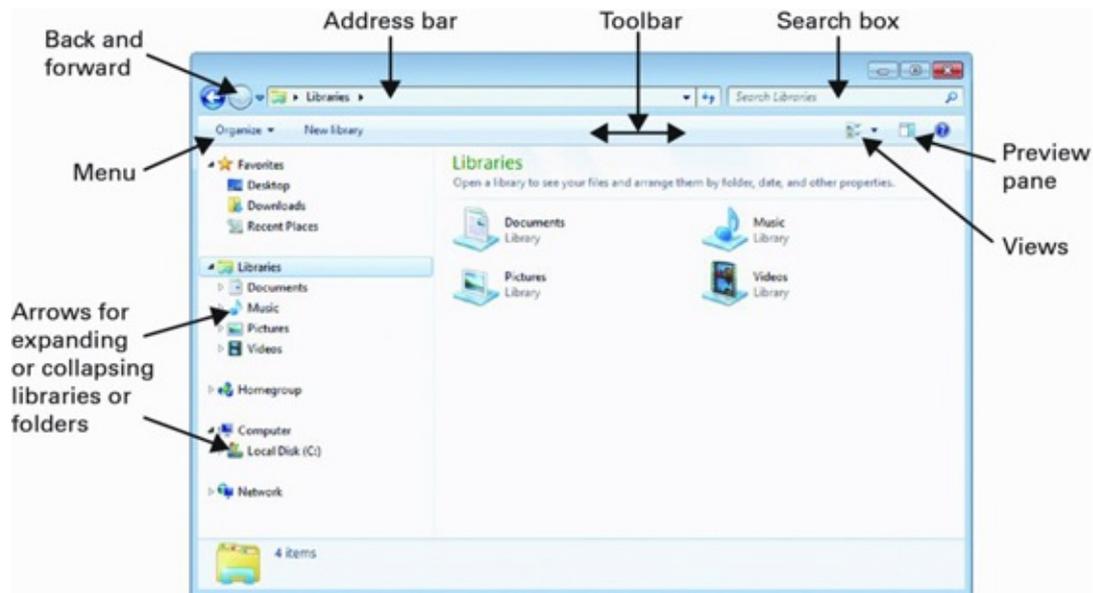
Figure 1.14 The different navigation elements of the Windows Explorer window

Now let's discuss them one by one:

Address Bar On the very top of the Windows Explorer window you will see a bar that initially says Libraries. As you navigate through your computer, this bar will always tell you where you are on your computer.

Back and Forward On the left side of the address bar you have two buttons pointing left and right. The left button is for going back, and the right is for going forward through the folder structure in your computer.

Search Box On the right side of the address bar is a box that you can use to quickly search for a file or folder. If you enter the name of a file and press Enter on your keyboard, Windows will start searching for files and folders that correspond to the search term you are using.

Toolbar The toolbar is displayed just beneath the address bar. This bar includes contextual buttons depending on where you are on your computer. You will notice that as you browse your files and folders, the number of buttons available changes. The toolbar tries to adapt and present you with options that help you be more productive depending on what you are doing.

Menus On the left side of the toolbar you will find the Organize menu. As you can see, this menu has an arrow pointing downward. Each time you see that arrow for an item on the toolbar, it means that it is a menu that can be opened.

Views On the right side of the toolbar you will notice another button with an arrow pointing downward, signaling that it is actually a menu. If you click it, you will be able to change the way you view the files and folders displayed in the right pane. Your files and folders remain the same; only the way they are presented here changes, depending on which view you select. We will discuss views in more detail shortly.

Preview Pane On the right side of the toolbar, near the Views menu, you will find the button for enabling or disabling the Preview pane. When it's enabled, a third pane is displayed on the right side of the Windows Explorer window. When you select a file in the middle pane, you can see a preview of its content in this Preview pane. If you have a

larger screen that can accommodate this pane, it is a good idea to enable it because it can be useful when navigating the files on your computer.

Arrows In the Navigation pane on the left side of the Windows Explorer window you will notice that many elements have a small arrow to the left of their name. You can use these arrows to expand or collapse the element. For example, if you click the arrow for Libraries, it will collapse them. Click it again and it will expand them.

Your computer stores not just your data but also lots of files and folders that are installed by the operating system and the applications that you are using. All this data is always stored in the Local Disk (C:) drive on your computer. You will always find this drive in the Navigation pane. Please note that the C: drive may have a different name because it can be easily customized, but on most computers it is named Local Disk.

When navigating this drive, you will see plenty of folders with names like Windows (this is where Windows is installed), Program Files (this is where applications are installed), or Users (this is where your user files and folders are stored as well as those of other users on the same computer). You can double-click any of these folders and explore their content. However, you should refrain from deleting or changing anything. Most of your work should be done in the Users folder. If you open it, you will see a subfolder for each user that has been created on your computer, and one of them will be yours. If you open your subfolder, then you will see your Documents, Pictures, and Music folders, and so on.

We mentioned earlier the concept of views. They are just different ways of viewing your files and folders. The views you can use in Windows Explorer are the following, as shown in Figure 1.15:
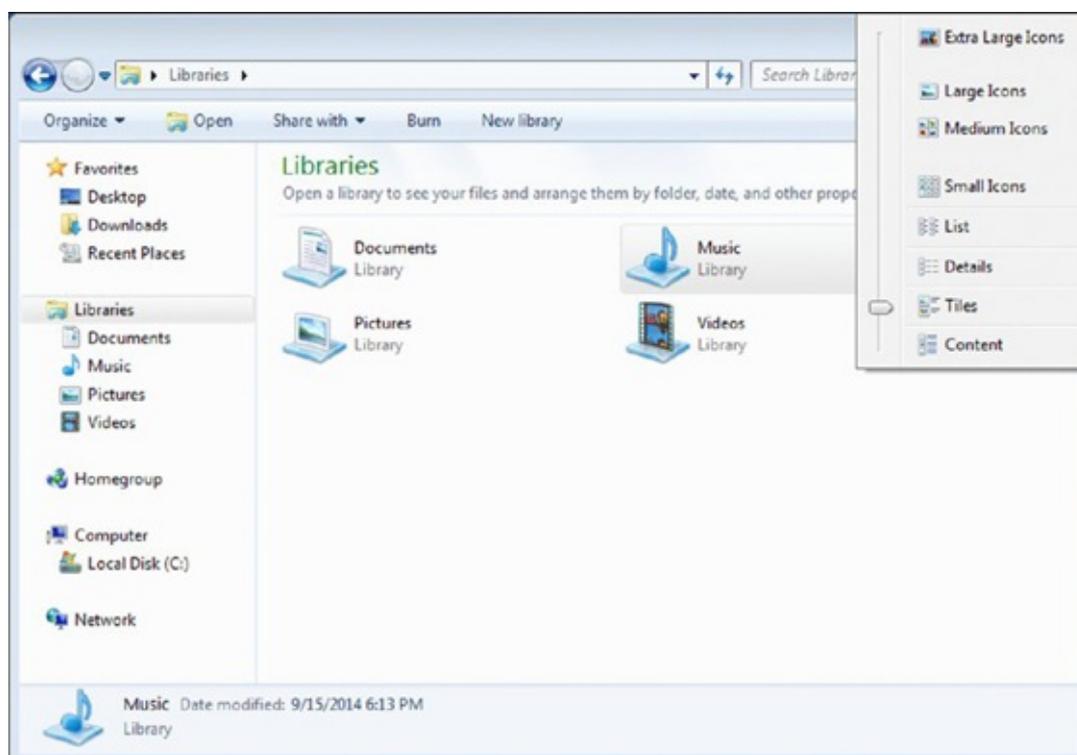
Figure 1.15 The views that are available in Windows Explorer

Extra Large Icons Displays the contents of your libraries and folders using very large icons. This view is generally useful for people with vision disabilities.

Large Icons Displays the contents of your libraries and folders using large icons. This view is useful when you want to see the pictures found on your computer and you want to see a preview of them instead of a small icon.

Medium Icons Displays the contents of your libraries and folders using medium icons.

Small Icons Displays the contents of your libraries and folders using small icons.

List Displays the contents of your libraries and folders in a list that contains only the name of each file and its respective icon.

Details Displays the contents of your libraries and folders by providing detailed information about each item, including its name, the date when it was last modified, its type, its size, and so on. This view is very useful when you want to learn more about each file and folder before opening it.

Tiles This view displays medium-sized icons for each file and folder, as well as information about their type and size.

Content When using this view, each file and folder are placed on a separate row. Each row has detailed information about each file and folder: the date when it was last modified, its size, its author, and so on.

You should definitely experiment with each view and learn how they work (Exercise 1.5) so that you can use them effectively depending on what you want to do.

EXERCISE 1.5

Using Views and the Preview Pane in Windows Explorer

1. On the taskbar, click the Folder icon.

2. In the Navigation pane, click Pictures in the Libraries section.

3. In the right pane, double-click Sample Pictures.

4. Click the Views menu and click Extra Large Icons.

   Notice how the pictures are now displayed.

5. Click the Views menu again and then Details.

   Notice how the way pictures are displayed has changed.

6. Click the Preview pane button. Note that a new pane appears on the right.

7. Click any picture in the middle pane to see a preview of it in the Preview pane.

8. Click the Preview pane button again to hide this pane.

9. Click the Views menu and choose Large Icons.

10. Click the X in the top-right corner of the Windows Explorer window to close it.

Understanding File Types

When working on your computer, you will create many types of files: documents,

spreadsheets, presentations, music files, and so on. When you save a file, you are prompted to give a name to the file and choose a file type. If you get the file from somewhere else, it has already been assigned a file type.

When browsing your files in Windows Explorer, you can see the file type of each file when you are using the Content, Tiles, and Details views. The file type is generally denoted by a three- or four-letter extension that follows the filename and also by the icon used by Windows Explorer to display that file. For example, document.docx means a file named document with the extension .docx. The dot separates the name of the file from its extension. The file extension is hidden by default in Windows when viewing files, but it is added automatically when saving them.

You can opt to change the file type when multiple options are available and change from the default file extension to something else. In Figure 1.16 you can see Paint open and the options that are available for saving a file. To save a file, click the Save As option, choose a file type, and then type the name of the file. If you make changes to the same file later, you need only click Save.
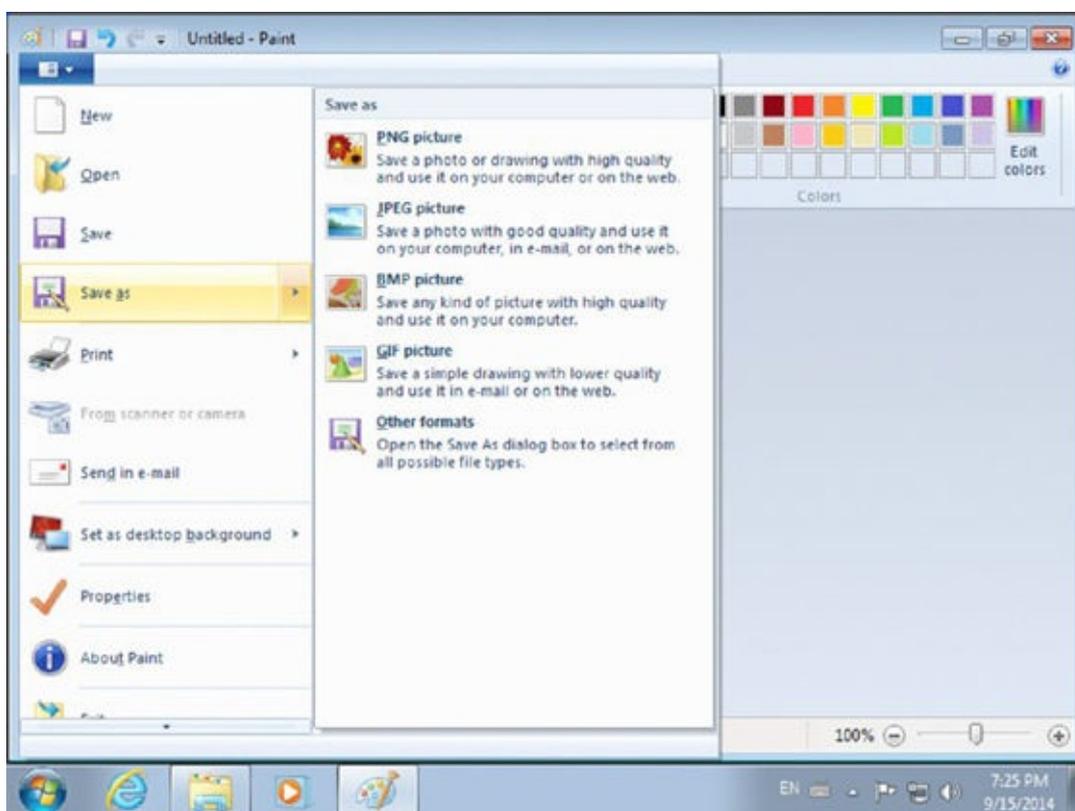
Figure 1.16 The Save As options that are available in Paint

Some of the most common types of files are the following:

- Microsoft Office files
  - Microsoft Word (.doc and .docx)
  - Microsoft PowerPoint (.ppt and .pptx)
  - Microsoft Excel (.xls and .xlsx)
  - Microsoft Publisher (.pub and .pubx)
  - Microsoft OneNote (.one)

- Picture files
  - JPEG files
  - GIF files (`.gif`)
  - Bitmap files (`.bmp`)
  - PNG files (`.png`)
  - TIFF files (`.tif` and `.tiff`)
  - RAW files (`.raw`)
- Music files
  - Windows audio files (`.wav`)
  - MP3 audio files (`.mp3` and `.m3u`)
  - Windows Media audio files (`.asx`, `.wm`, `.wma`, and `.wmx`)
  - Free Lossless Audio Codec files (`.flac`)
  - AAC files (`.aac`)
- Video files
  - Audio Video Interleaved files (`.avi`)
  - Motion JPEG files (`.avi` and `.mov`)
  - Windows Media files (`.wm`, `.wmv`, and `.asf`)
  - Matroska multimedia files (`.mkv`)
  - Apple QuickTime files (`.mov` and `.qt`)
  - MPEG Movie files (`.mp4`, `.mov`, `.m4v`, `.mpeg`, `.mpg`, `.mpe`, `.m1v`, `.mp2`, `.mpv2`, `.mod`, `.vob`, and `.m1v`)

Other types of popular files are the following:

Executable Files (.exe) Executable files can be run with a double-click.

Text Files (.txt) Simple text documents without any kind of formatting.

Portable Document Format Files (.pdf) A very popular type of files that is generally used for sharing non-editable documents that need to look the same on all the devices on which they are used, no matter what operating system is used.

OpenOffice and LibreOffice Documents (.odt,.ott,.oth, and.odm) Documents created using free open-source office applications like OpenOffice and LibreOffice.

Managing Your Files and Folders

While working on your computer, it is better that you organize your work so that you will have an easier time finding the files you need later on. For starters, use the libraries provided by Windows 7 to store your files depending on their type. Save your pictures in the Pictures library, your documents in the Documents library, and so on.

Once things get too crowded, you will want to create your own folders and subfolders, move files around, and delete those that you do not need. Let's take each file and folder management activity and see how it is done:

Create a File You can create files from applications like Microsoft Office, but you can also create empty files directly from Windows Explorer. To do so, follow these steps:

1. Open the folder where you want to store the file.

2. Right-click anywhere in the available empty space and select New and then one of the available file types, as shown in Figure 1.17.
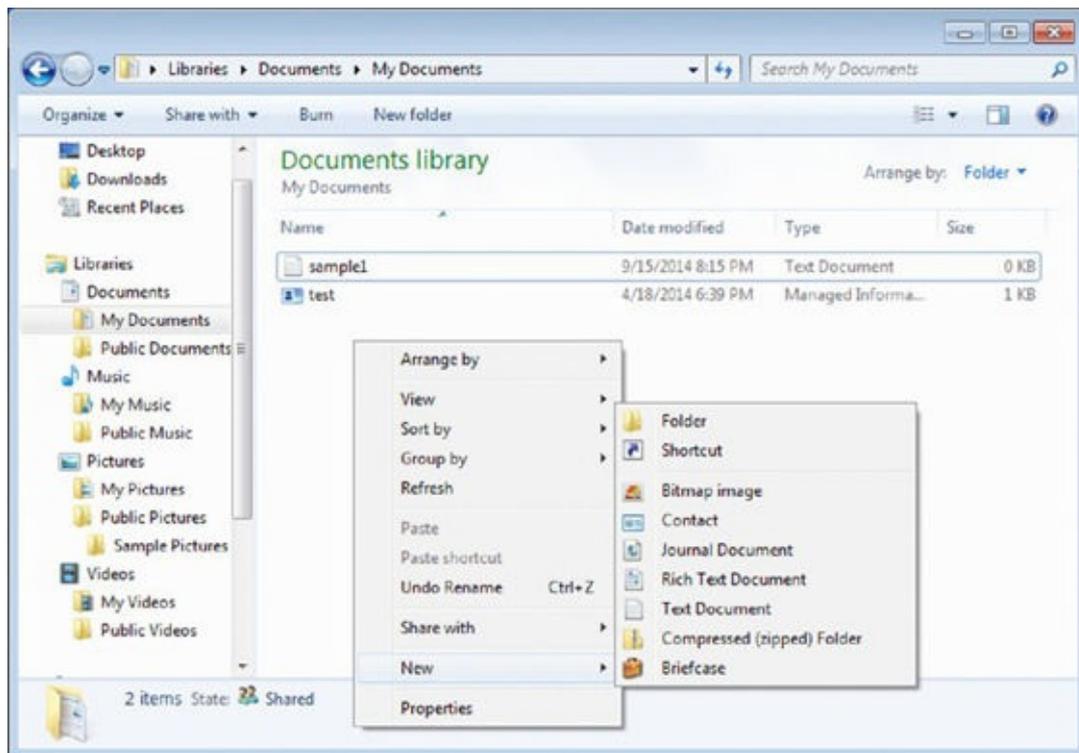
Figure 1.17 The types of files that can be created using the context menu in Windows Explorer

3. Type the name of the file and press Enter on your keyboard.

A new file is created, with the name and type you have provided. However, the file is empty because it has no contents. If you double-click it, you can open it and edit it in the appropriate application for files of that type. Don't forget to save your edits so that they are stored inside the file.

Create a Subfolder Subfolders are helpful when you want to better organize your files. You can create subfolders with different names and then move files into them, according to your way of organizing things. To create a subfolder, do the following:

1. Navigate to the desired parent folder and click New Folder on the Windows Explorer toolbar.

2. Type a name for the folder and press Enter on your keyboard.

   Alternatively, you can use the keyboard shortcut Ctrl+Shift+N or right-click somewhere in the available empty space and select New and then Folder.

Copy You may want to copy a file or folder to another location. Here's how it is done:

1. Select the file or folder that you want to copy somewhere else.

2. Use the Copy command to copy it to a part of memory called the Clipboard.

> **NOTE** The Clipboard holds this information temporarily so that you can paste it somewhere else. You'll want to use the Paste command immediately after you use the Copy command. This is because the Clipboard can hold only one thing at a time. If you copy another item, the previous one is removed from the Clipboard. When you use the Copy command, the original file or folder stays where it is and is not moved. When you use Paste after the Copy command, a copy of that item is created in the desired location.

There are several options for accessing the Copy command:

- Click the file or folder you want to copy and use the keyboard shortcut Ctrl+C.

- Click the file or folder you want to copy and from the Organize menu in Windows Explorer click Copy.

- Right-click the file or folder to copy and click Copy (Figure 1.18).
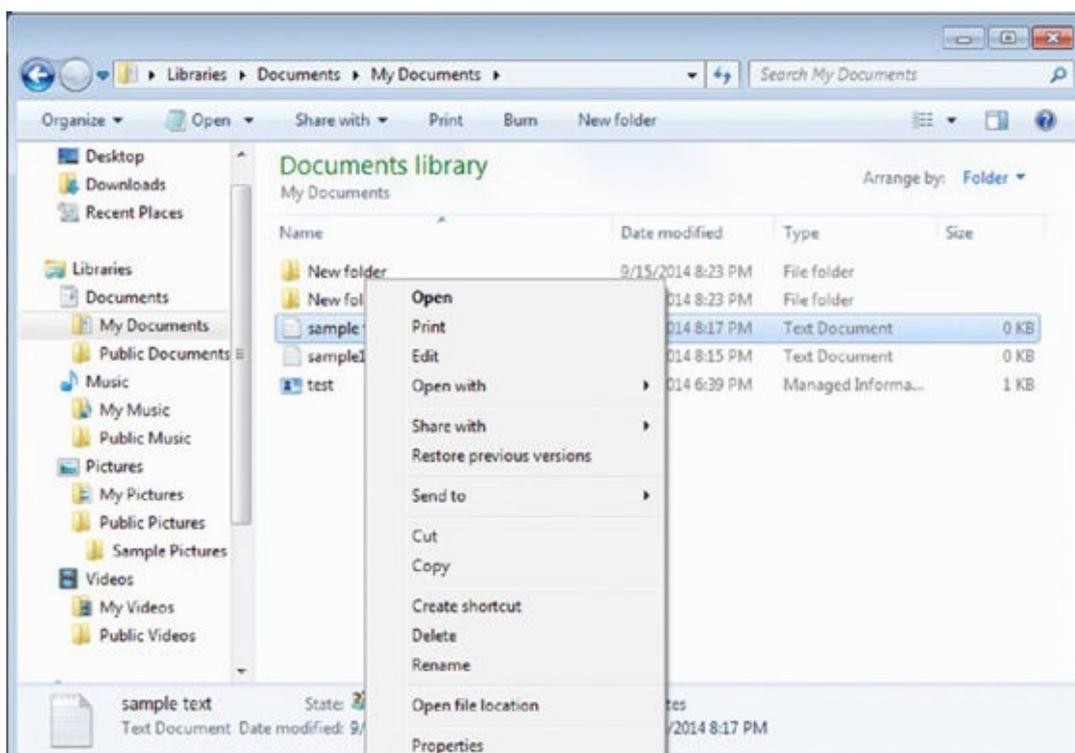
Figure 1.18 The options available in the context menu when right-clicking a file

Paste Once you've copied something to the Clipboard, using one of the methods shared earlier, you can use the Paste command to perform the actual task of copying the item to its new location.

1. Navigate to the location where you'd like to paste the file or folder.

    This might be a new subfolder you created, a library, or even the Desktop.

2. Then use one of the following options:

- Use the keyboard shortcut Ctrl+V.

- Click the Organize menu in Windows Explorer and then click Paste.

- Right-click the empty area inside the folder or on the Desktop and click Paste ([Figure 1.19](#)).
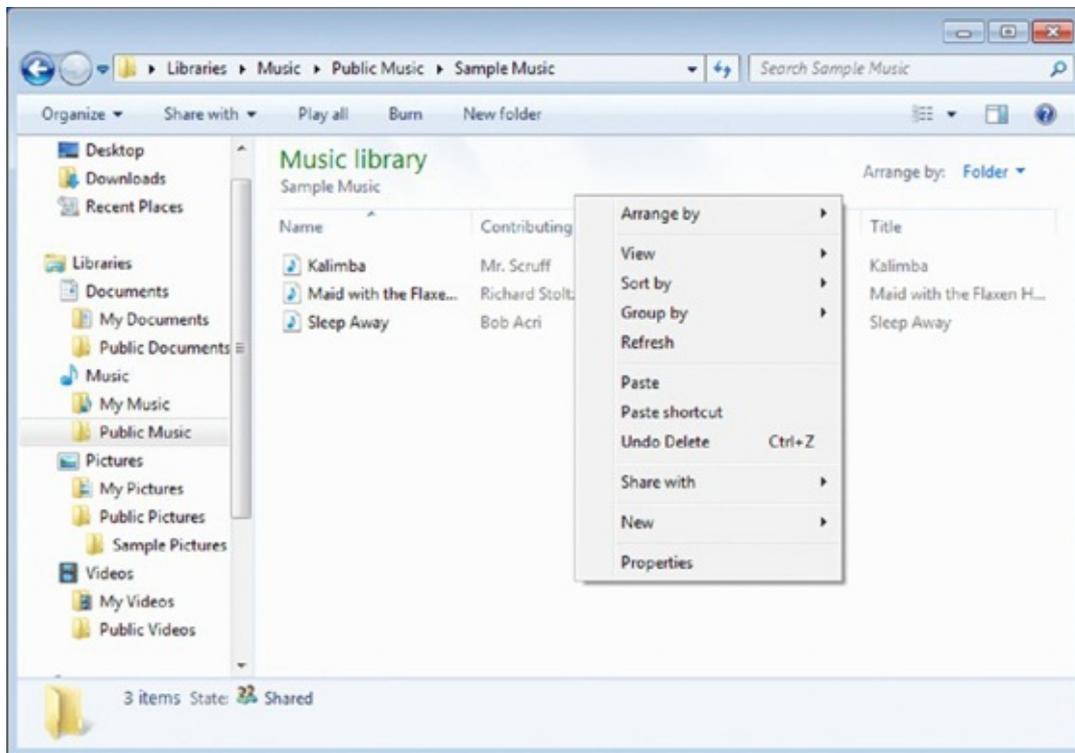
[Figure 1.19](#) The Paste option in the context menu

Cut This command works like the Copy command, except that the selected file or folder is removed from its original location and can be moved to the new one. Be careful when using Cut and make sure that you use Paste immediately after. The problem with using Cut is that if anything fails during the moving process (after you use Paste), then you will lose the selected file or folder. That's why it is better to use the Copy command instead and then delete the selected file or folder from the original location once its copy has been made in the new location. There are several options for accessing the Cut command:

- Click the file or folder to cut and use the keyboard shortcut Ctrl+X.

- Click the file or folder to cut and from the Organize menu in Windows Explorer click Cut.

- Right-click the file or folder to cut and click Cut.

Move Here You can use the Move Here command to move a file or folder. It works like Cut and Paste; the item will be moved, and the original item will no longer appear in its original location. To use this command, follow these steps:

1. Right-click the file or folder to move, and hold down the right mouse button while you drag the file on top of its new location, in the Navigation pane.

2. Let go of the right mouse button and click Move Here ([Figure 1.20](#)).
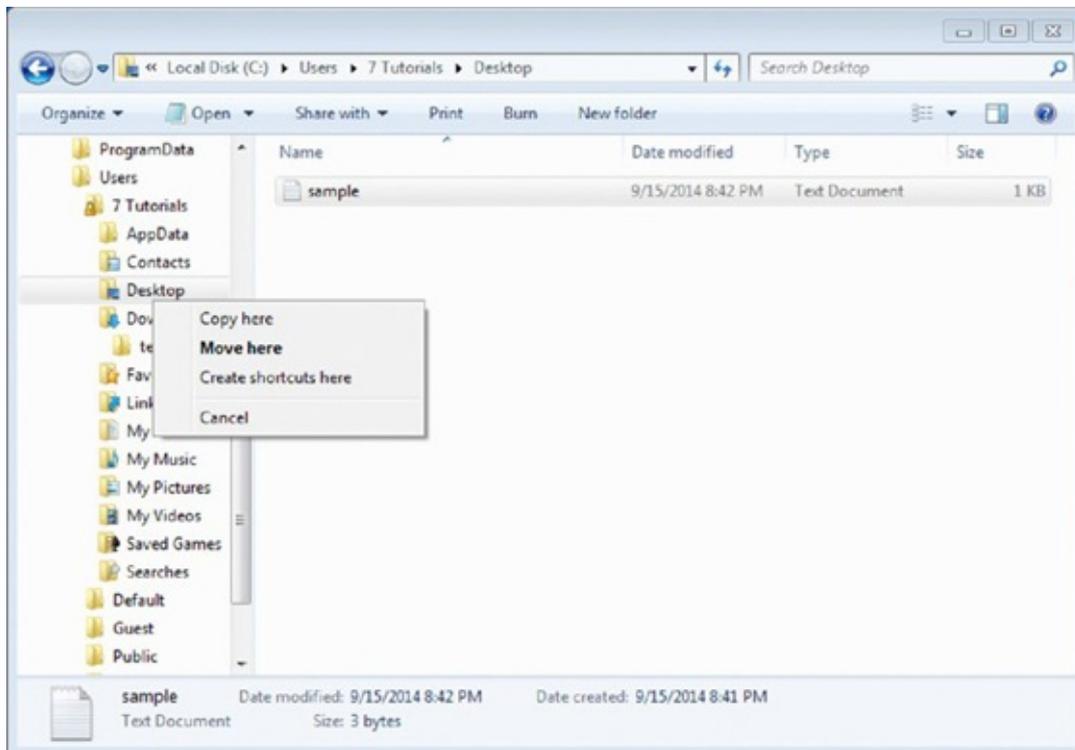
Figure 1.20 The Move Here option

Alternatively, you can use the Cut and Paste commands for the same effect.

Rename You can rename both files and folders. This can be done in several ways:

- Select the item by clicking it. Press the F2 key on the keyboard. Type the new name.
- Click the item one time, wait a second or two, and then click it again. Type the new name.
- Right-click the item to rename and click Rename. Type the new name.

Delete You can remove both files and folders from your computer. This can be done in several ways. Here's one method:

1. Select the item by clicking it.
2. Press the Delete key on the keyboard and confirm that you want to delete that item.

   The item is moved to the Recycle Bin and can be recovered in case you decide that you need it again.

You can also do the following:

1. Right-click the item to delete.
2. Click Delete and confirm that you want to delete that item.

Alternatively, you can drag the item to the Recycle Bin using the mouse.

To delete an item without moving it to the Recycle Bin, follow these steps:

1. Select the item by clicking it.
2. Then, hold down the Shift key and the Delete key.

But be aware that this way the item cannot be recovered if you need it again.

Create a Shortcut If you need to access a file or folder from another location but you do not want to copy or move it, you can create a shortcut. You can tell which files are shortcuts because they have an arrow in their icon and Shortcut included in the filename. Shortcuts are only references to other files and folders and do not hold any data except for what's required to point their target location. The option to create a shortcut is available from the options that appear when you right-click the item. There are several ways of creating a shortcut. Here's the first way:

1. Right-click the item you want to create a shortcut for.

2. Click Create Shortcut.

   The shortcut is created in the same location.

3. You can now cut and paste that shortcut to another location like the Desktop.

> The original file should be kept in its initial location; otherwise the shortcut won't work.

You can also do the following:

1. Right-click the file or folder.

2. Click Send To and then click Desktop (Create Shortcut), as shown in Figure 1.21.
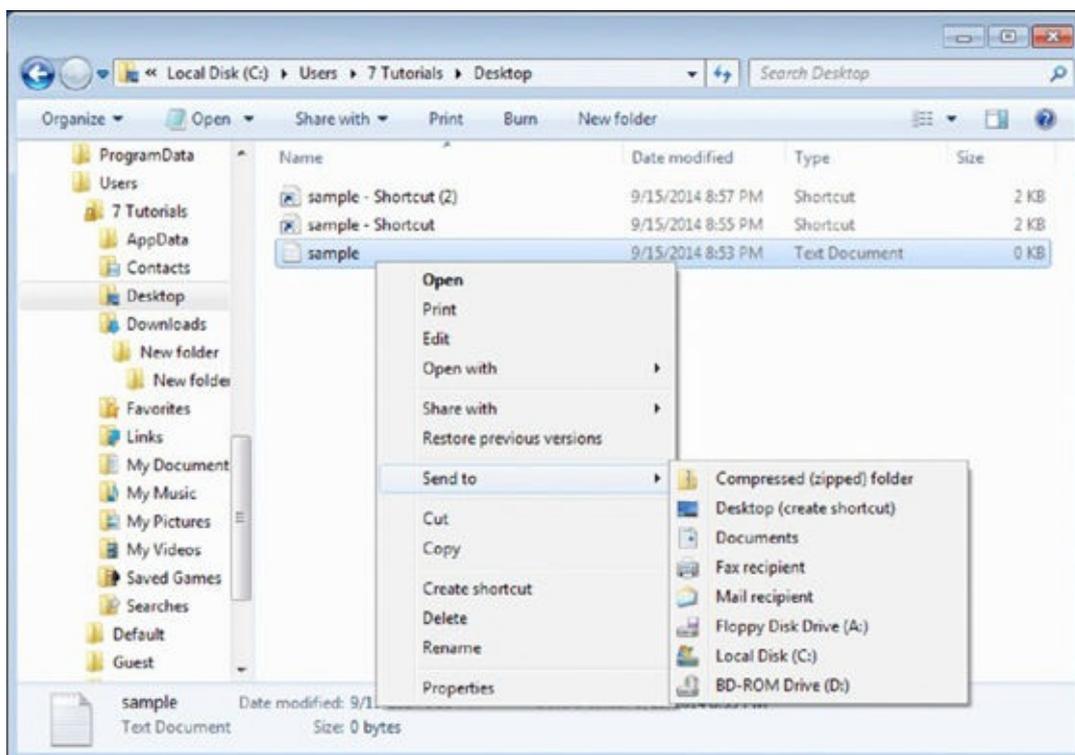
Figure 1.21 The Send To menu in Windows Explorer

A shortcut is created for that item on the Desktop.

And finally, you can use this method:

1. Press and hold down Ctrl+Shift while you drag that item to the location you want to create a shortcut to.

2. Release the item in the location where you want to create a shortcut for it.

Search for a File There are many ways to search for a specific file, provided you know something about it. One way is to use the Search box on the top-right of the Windows Explorer window:

1. Select the library or folder where you want to perform the search.
2. Click inside the Search box (Figure 1.22) and type the name of the file you are looking for.

Figure 1.22 The Search box in Windows Explorer

If you want to search for a file on the whole computer, do this:

1. Select Local Disk (C:) in the Computer section of the Navigation pane.
2. Then use the Search box.

Here's another way:

1. Close Windows Explorer and press the F3 key on the keyboard.
2. This brings up a Search window where you can type the name of the file (Figure 1.23).
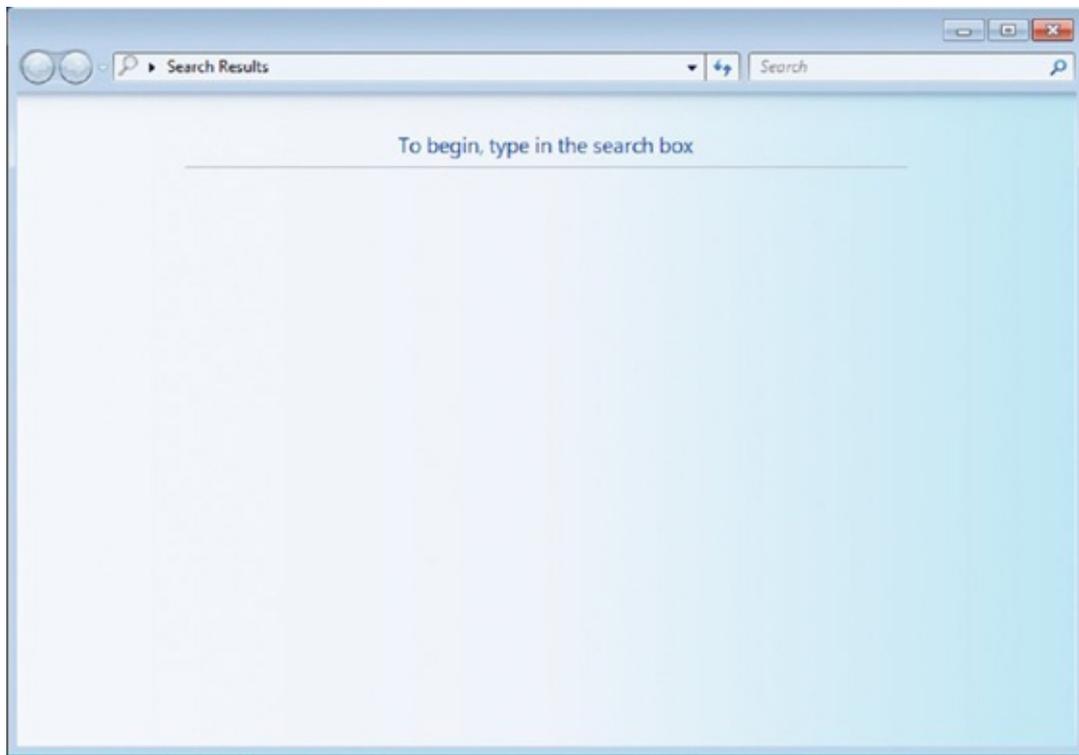
Figure 1.23 The Search window that is accessed by pressing F3

If you don't know the filename, you can search based on the date you believe it was created, by the kind of file it is, by the type, and other criteria. Your search will be made across your whole computer.

You can also click the Start button on the Desktop and start typing the name of the file (Figure 1.24). Searches are performed automatically as you type but only in locations that are indexed by Windows, like your libraries. To access a file or folder, click it in the list of results. If you want to perform a computer-wide search, the previous methods work better.
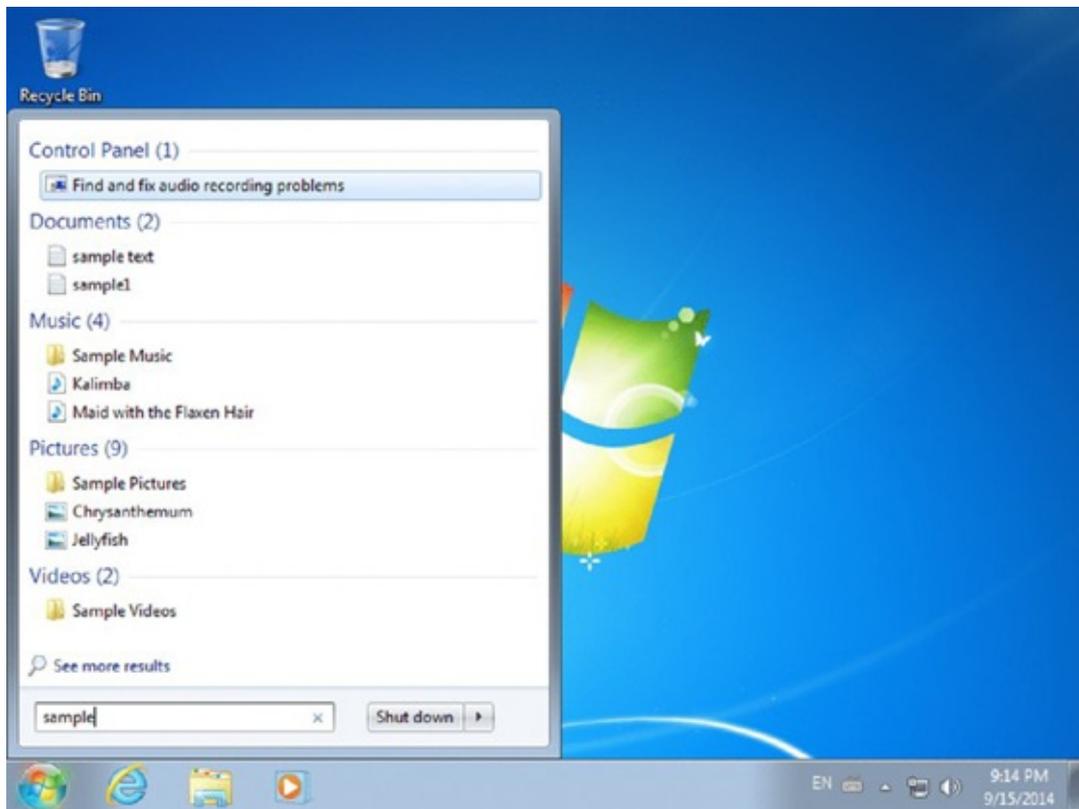
Figure 1.24 The Start menu search

> ![NOTE] Although we provided the necessary keyboard shortcuts that you can use while working with files and folders in Windows, there are many more keyboard shortcuts for you to discover. You can find a complete list of keyboard shortcuts on Microsoft's Knowledge Base, here: `http://support.microsoft.com/kb/126449`. Don't hesitate to consult it and learn how each keyboard shortcut works. They will surely make you more productive when using Windows.

Customizing Your Computer

All modern operating systems give you plenty of options for configuring the way they look and how you use them. The most basic customizations are about changing the way the operating system looks. For example, in Windows 7, you can change the resolution of the screen, the Desktop background, the theme, and so on. Obviously, you can go into a lot of detail and customize more advanced settings, but there's no need to, unless you have very specific needs.

When you first use a computer, most probably you will want to change the way Windows looks, the language used for typing, the time and the date, and how accessible the computer is, in case you have a disability.

Another aspect that you might want to customize is how many user accounts there are on your computer and who is allowed to use it and who the administrator is.

Let's look at the most common types of customizations that are performed on a computer and see how they are done.

Customizing the Desktop

All the visual customization options that are available in Windows are found in the Control Panel. To access them, click Start ➤ Control Panel ➤ Appearance And Personalization, as shown in Figure 1.25.
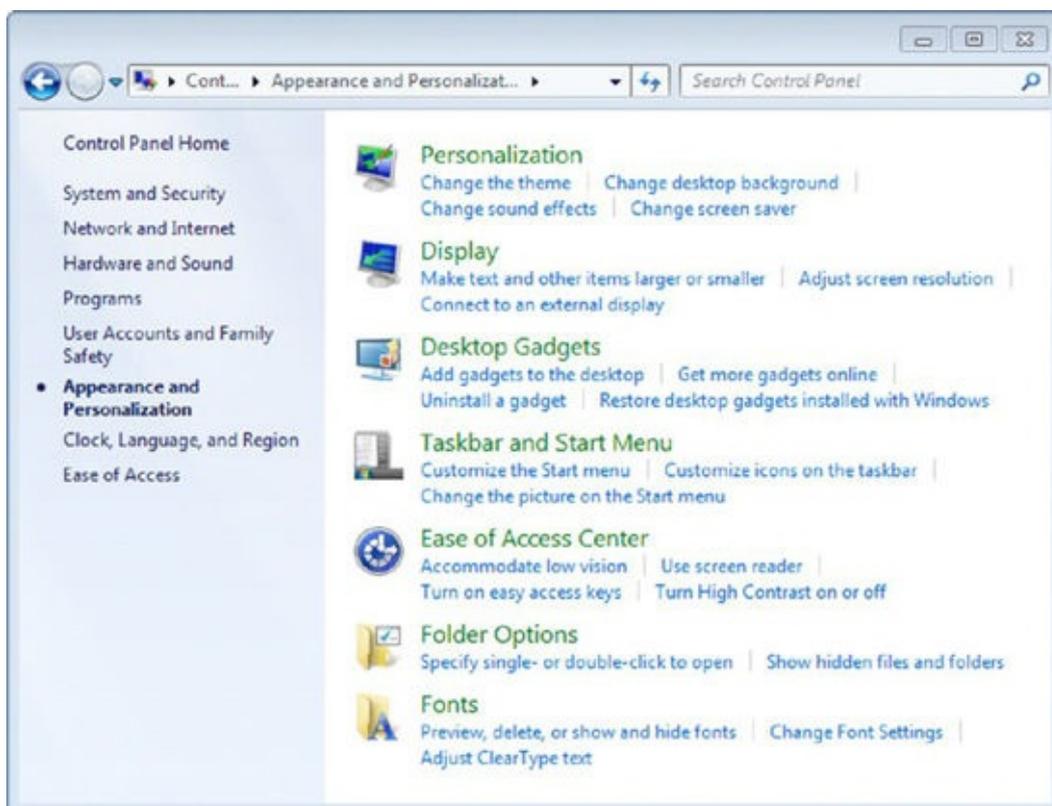
Figure 1.25 The Appearance And Personalization section in the Control Panel

In this panel you will find that Windows offers lots of visual customizations:

- You can change the theme used by Windows, the Desktop background, sound effects, and the screensaver.

- You can change the resolution of the screen and make text and other items larger or smaller.

- You can add gadgets to the Desktop, which provide additional information like weather data or the calendar. Please note that this feature of Windows has been discontinued, and Microsoft doesn't provide any new gadgets except those already found in Windows 7.

- You can customize the icons on the taskbar and the items that are displayed by the Start menu.

- You can improve the level of accessibility and turn on features like High Contrast or a screen reader, in case you have disabilities that do not allow you to use your computer without help.

- You can install new fonts, view those that are installed, and adjust their settings.

- You can also set how files and folders are displayed when using Windows Explorer.

Customizing the Screen Resolution

The display of any computer or device has a specific size that is measured in inches (for example, 9″, 24″, and so on). This number tells you the diagonal measurement of the screen, measured from the bottom-left corner to the top-right corner.

All displays are split into really small squares that are used to display color. Think of the image on your display like a puzzle with really small pieces. Pixels are the smallest squares that could be manufactured and used to display color. How many pixels are on the screen depends on the size of the screen. The total number of pixels is communicated using the screen resolution. It is usually quoted as width × height, with the units in pixels; for example, 1366×768 means the width is 1366 pixels and the height is 768 pixels.

The bigger the resolution, the clearer the image is because there's more room for displaying small details on the screen. When you increase the resolution, items on the screen appear smaller. The opposite happens when you lower the screen resolution. Computer displays have a maximum resolution that can be set, depending on their size and the actual number of pixels available. However, their resolution can be lowered if needed. Exercise 1.6 demonstrates how to change the screen resolution so that items on the screen appear bigger, if you need them to.

EXERCISE 1.6

Changing the Resolution of Your Screen

1. Click the Start button and then click Control Panel.

2. Click Appearance And Personalization and then Adjust Screen Resolution, under Display.

3. Click the drop-down list next to Resolution and use the slider to set a lower resolution like 1024×768, if it is available, as shown in Figure 1.26.
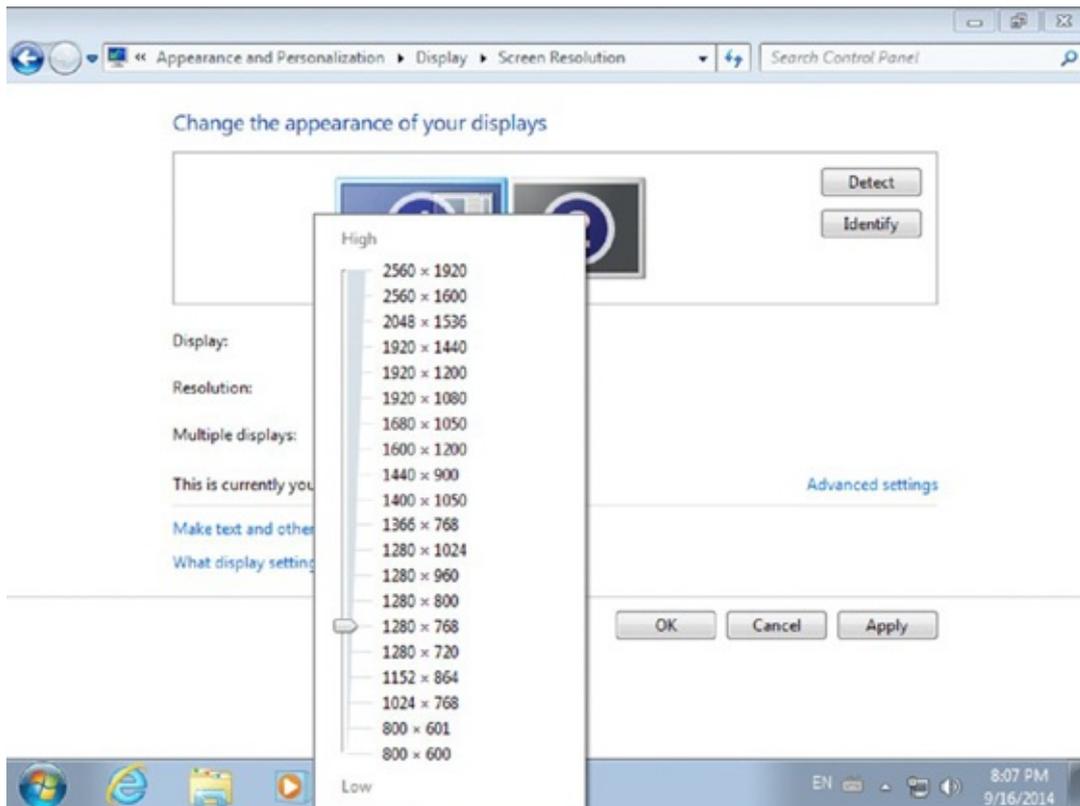
Figure 1.26 The Resolution slider from the Screen Resolution window

4. Click Apply.

5. If you like the new resolution, click Keep Changes. Otherwise, click Revert and repeat steps 3 and 4.

6. Click OK.

If you want to make the text and other items larger than they are and you do not want to change the resolution, you can do that. Exercise 1.7 shows you how.

Changing the Size of the Items on Your Screen

1. Click the Start button and then click Control Panel.

2. Click Appearance And Personalization and then Display.

3. Change the size you want for the text and other items. You can choose Smaller, Medium, or Larger (Figure 1.27).
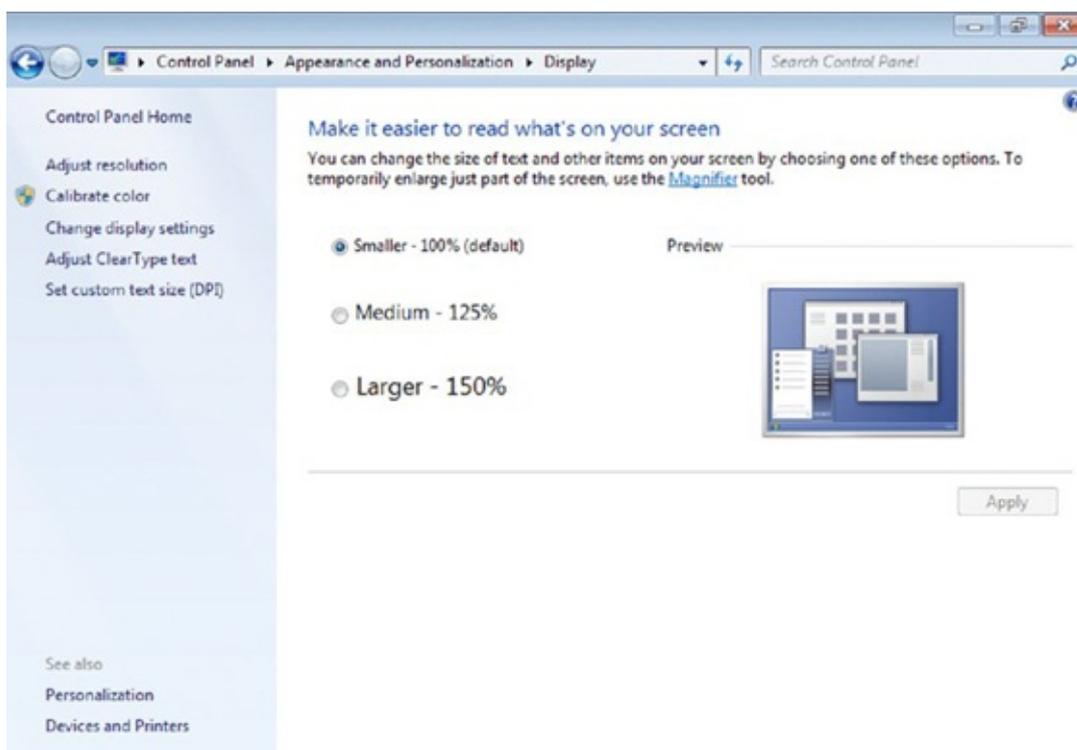
Figure 1.27 The Display window

4. Click Apply.

5. You are asked to log off your computer to apply these changes. Make sure that you do not have any unsaved work and then click Log Off Now.

6. Log back into Windows.

Customizing the Desktop Appearance

Windows allows you to change the background image that is displayed on the screen as well as the general visuals and the sounds that are used through the operating system. To make things simpler and easier to manage, Microsoft uses the concept of themes in its Windows operating system. A *theme* is the collection of all the visual settings and sounds that are used by Windows: the Desktop background, the color used to display the user interface, the sounds that are played when messages are displayed, and the screensaver that is displayed when you have kept your computer turned on but you are not using it.

For starters let's see how to change the Desktop background in Windows. Exercise 1.8 demonstrates everything you need to know.

Changing the Desktop Background

1. Click the Start button and then click Control Panel.

2. Click Appearance And Personalization and then Personalization (Figure 1.28).
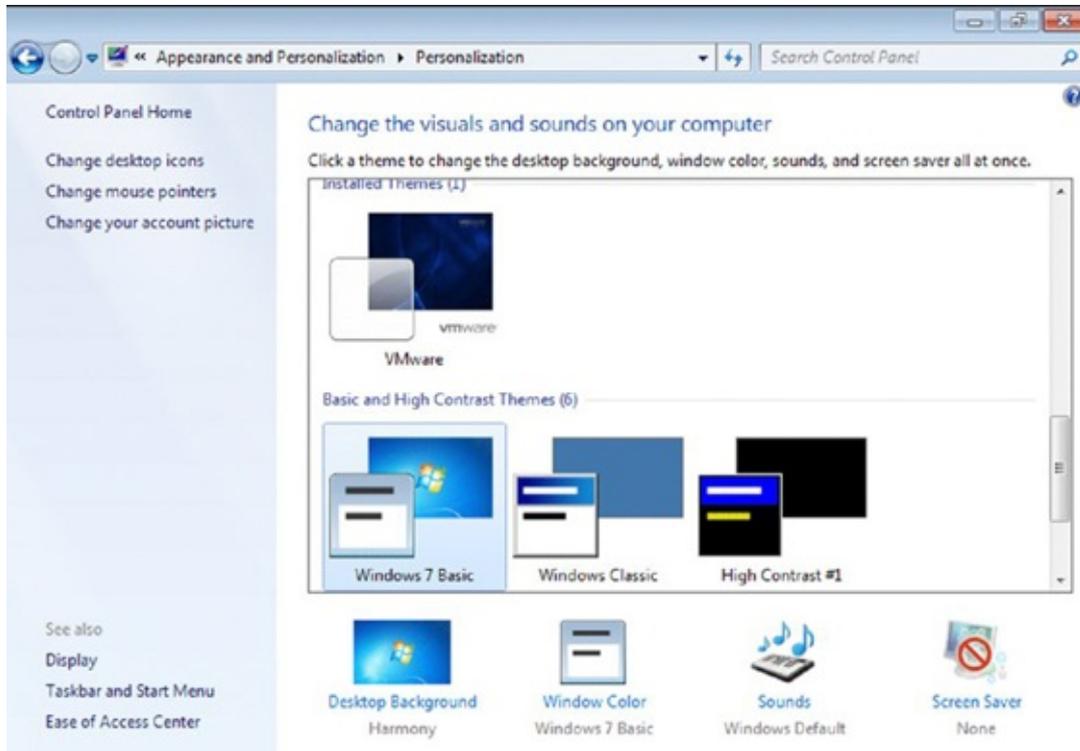
Figure 1.28 The Personalization window

3. Click Desktop Background and choose one of the available images (Figure 1.29).
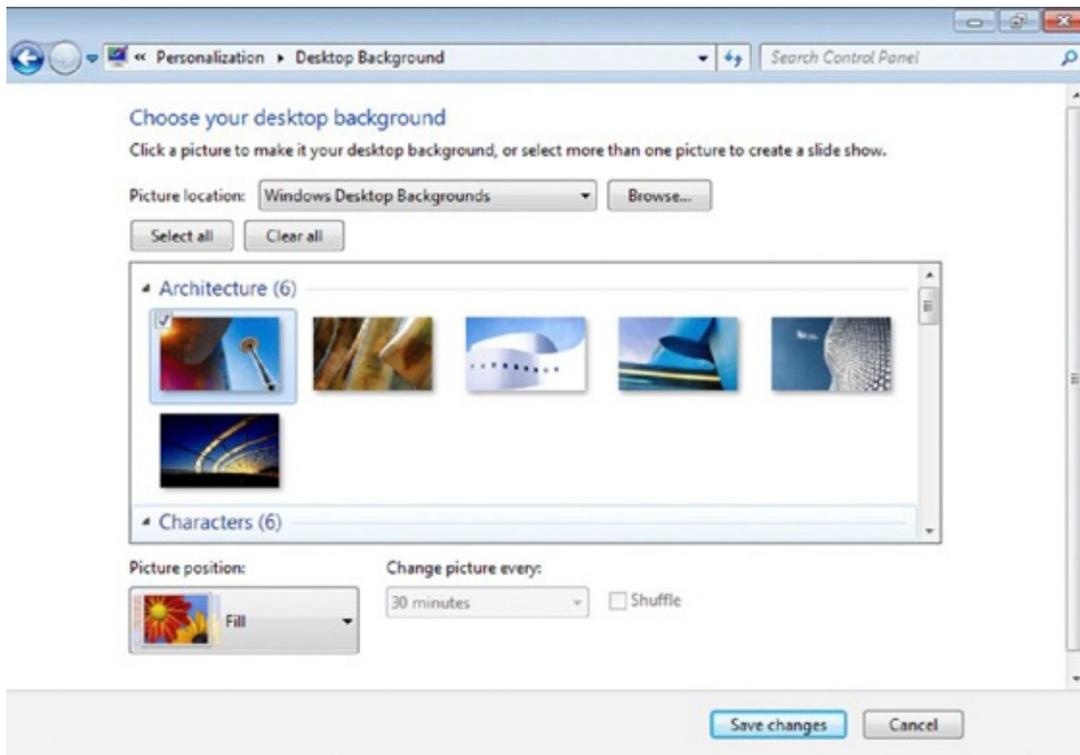
The Desktop Background window

4. Set the picture position and then click Save Changes.

5. Close the Personalization window in order to see the new Desktop background.

Themes can also be changed from the Personalization window. They are displayed in the center of the window and are split into categories like My Themes, Aero Themes, and Basic And High Contrast Themes. Browse through the available themes and select the one that you want to apply. You will notice that each theme uses a different Desktop background, different visuals, and so on. When you have found a theme that you are happy with, close the Personalization window.

Customizing the Language You Are Using

Windows 7 offers you the ability to change both the language that you use for typing (the keyboard input language) as well as the language used to display everything on the screen (the display language). Changing the keyboard input language can be done in all versions of Windows 7. Unfortunately, changing the display language is possible only in the more expensive versions of Windows 7: Windows 7 Ultimate and Windows 7 Enterprise. Affordable versions like Windows 7 Home and Windows 7 Professional do not include this useful feature.

First, you'll learn how to change the language used for typing, using the instructions shared in Exercise 1.9.

EXERCISE 1.9

Adding a New Keyboard Input Language

1. Click the Start button and then click Control Panel.

2. Click Clock, Language, And Region and then Region And Language.
3. Select the Keyboards And Languages tab ([Figure 1.30](#)).
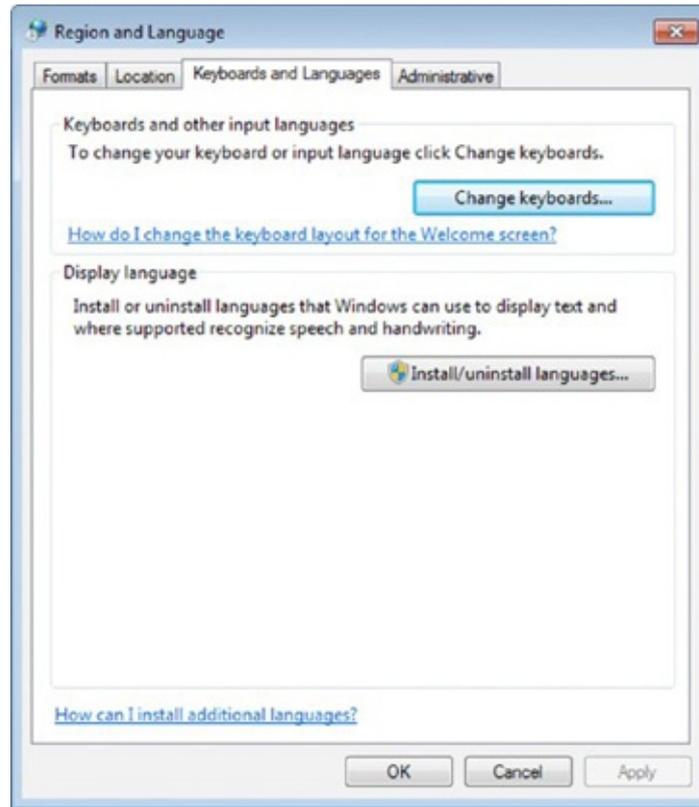
Figure 1.30 The Keyboard And Languages tab in the Region And Language window

4. Click the Change Keyboards button.
5. In the new Text Services And Input Languages window, click Add.
6. Double-click the keyboard input language that you want to add, to expand it ([Figure 1.31](#)).
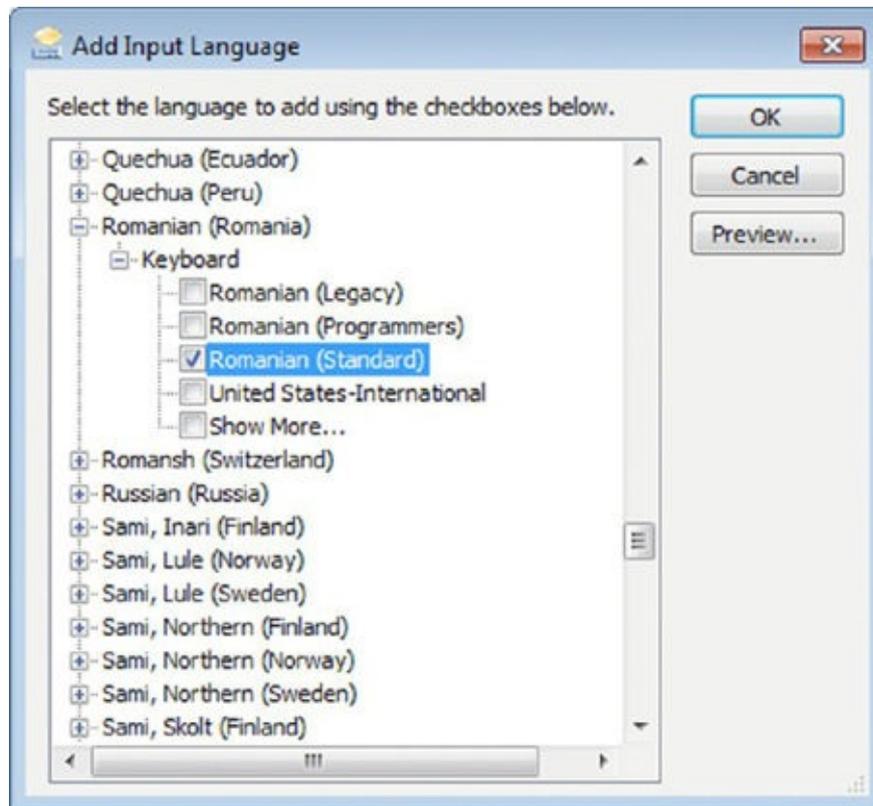
Figure 1.31 The Add Input Language window where you can add a new input language

7. Then double-click Keyboard and select the type you want to add.

8. Click OK and then click OK again in the windows that remain open.

You can add as many keyboard input languages as you wish and then switch between them. This is very helpful if you are a multilingual person who works using more than one language.

You can switch between languages for typing at any time during your work. All you have to do is to click the two-letter language code near the keyboard icon that is shown on the taskbar (the bar on the bottom of the screen) and select the language that you want to use (Figure 1.32). You can also use the keyboard shortcut Alt+Shift for the same effect.
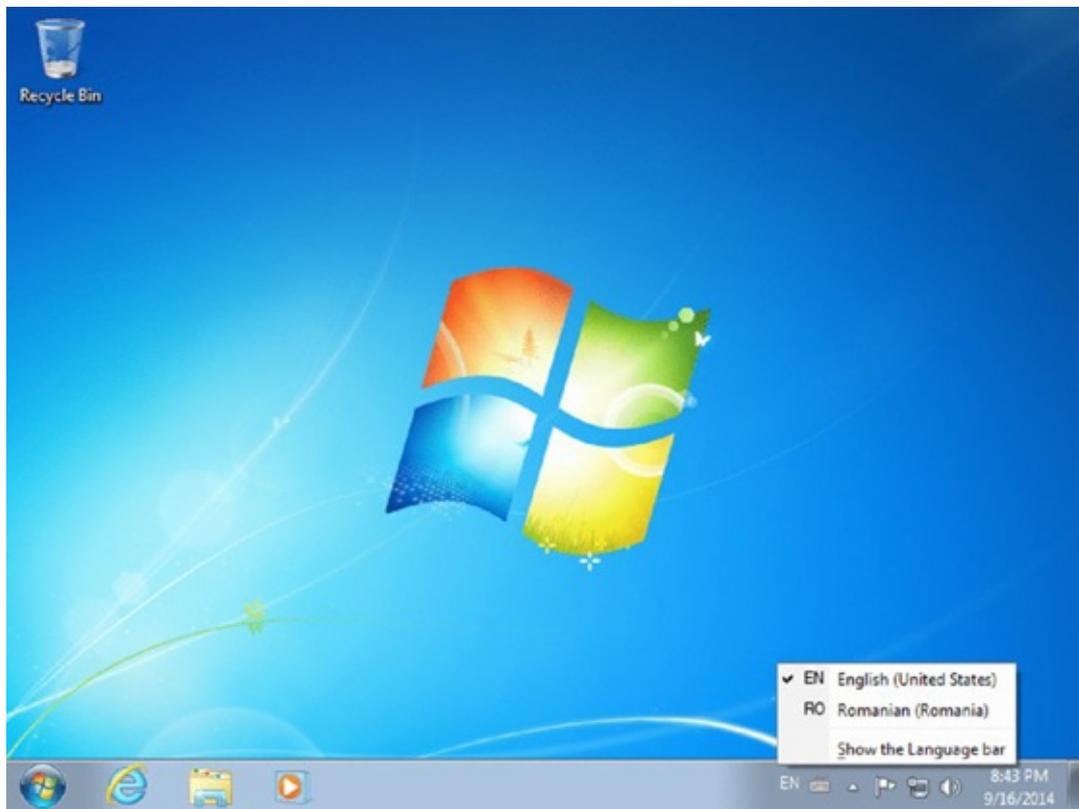
Figure 1.32 The keyboard input language switcher

If you have Windows 7 Ultimate or Windows 7 Enterprise, you can also change the display language that is used. Exercise 1.10 shows how.

EXERCISE 1.10

Adding a New Display Language

1. Click the Start button and then click Control Panel.

2. Click Clock, Language, And Region and then Region And Language.

3. Select the Keyboard And Languages tab.

4. Click the Install/Uninstall Languages button.

5. In the new Install Or Uninstall Display Languages window, click Install Display Languages (Figure 1.33) and then Launch Windows Update.
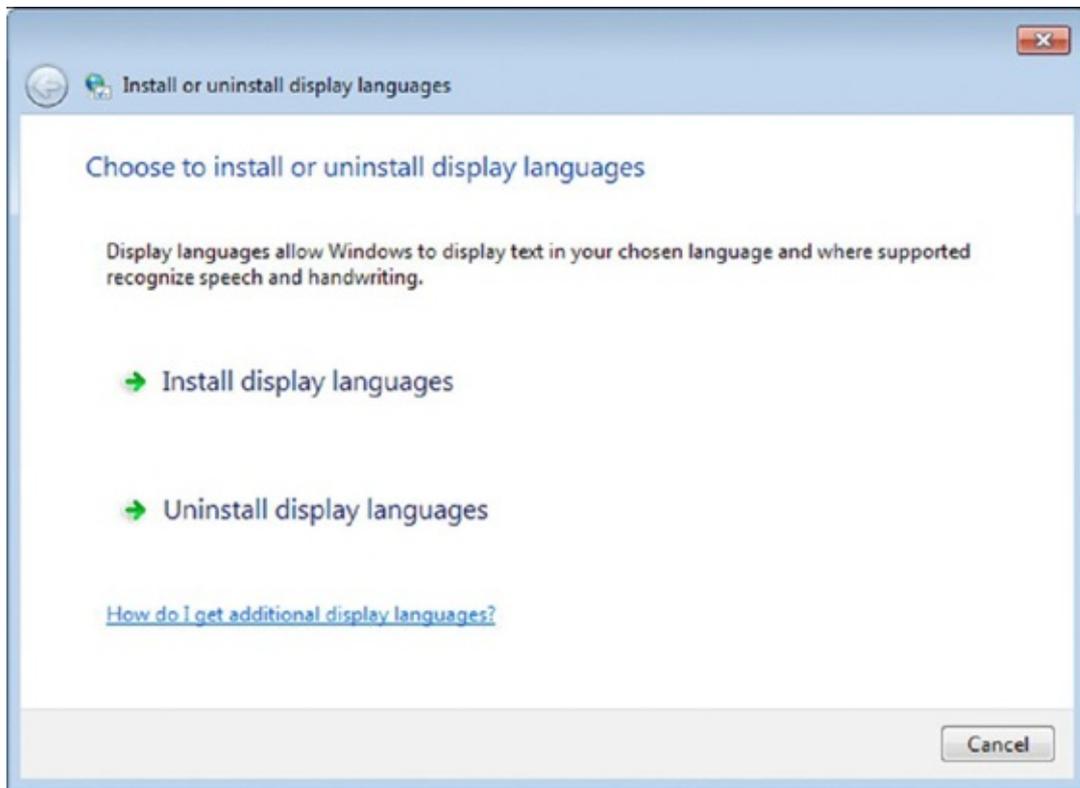
Figure 1.33 The Install Or Uninstall Display Languages Wizard

6. In the Windows Update window, click the link that says how many optional updates are available (Figure 1.34).
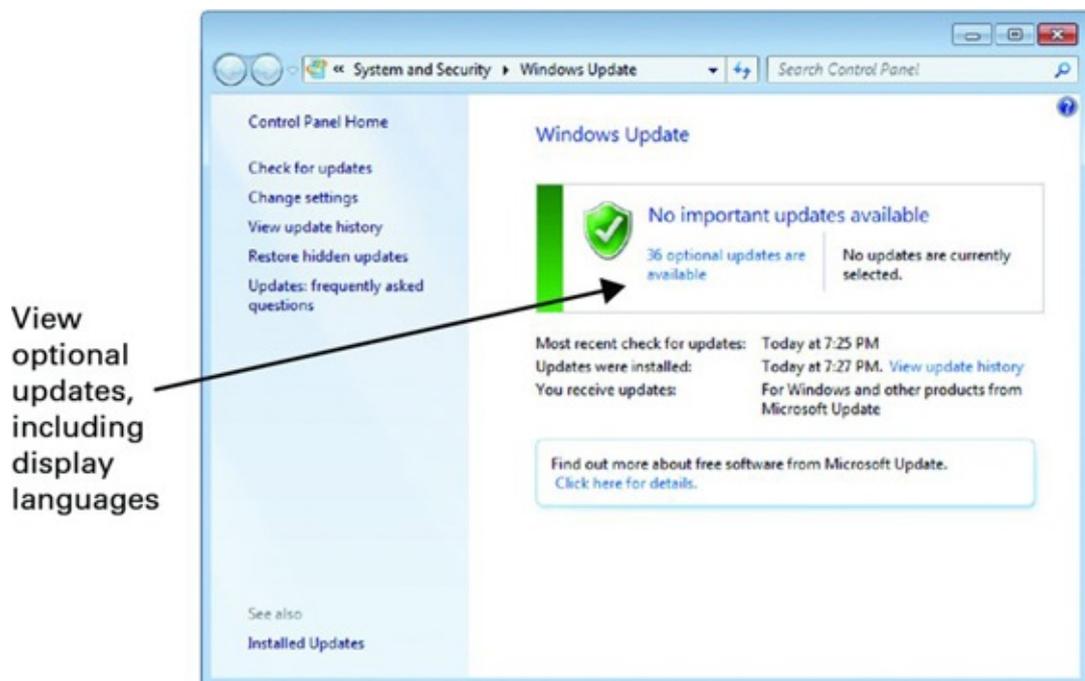
Figure 1.34 Windows Update displaying the number of optional updates available

7. Scroll down to Windows 7 Language Packs and select the display language that you want to install (Figure 1.35).
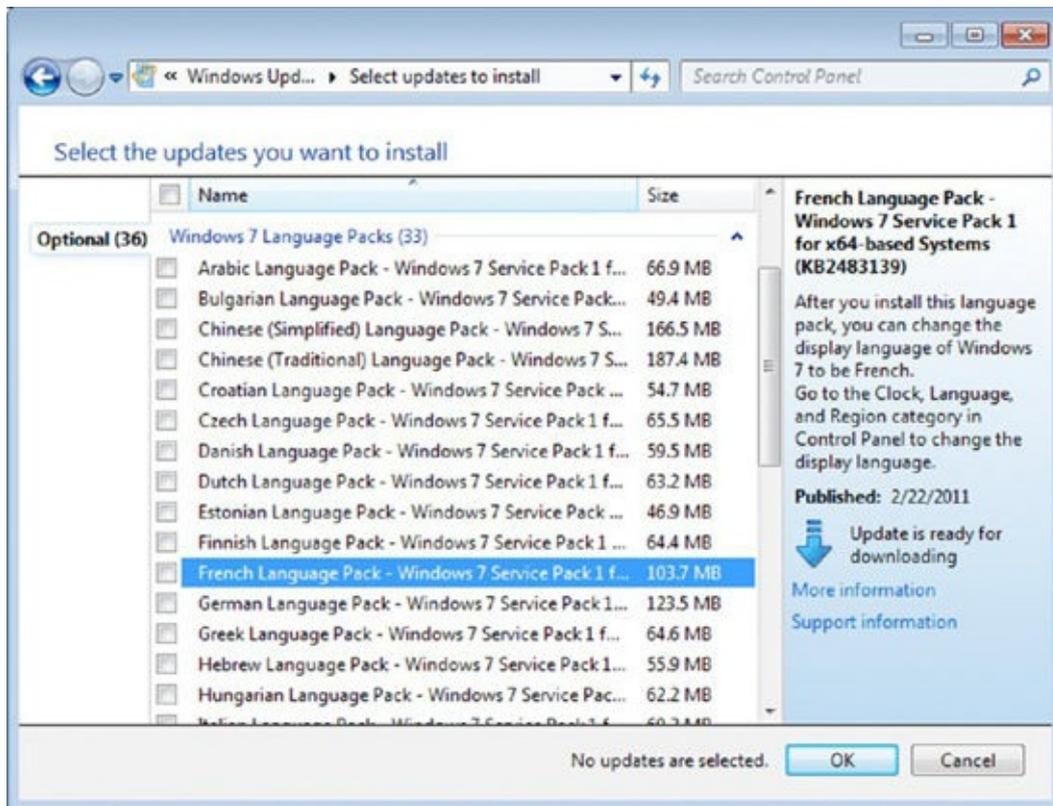
Figure 1.35 A list of the optional updates that are available

8. Click OK and then Install Updates.

9. Wait for the display language to be installed.

Changing the display language used by Windows 7 is relatively easy, but it does take more steps than changing the keyboard input language. Also, there's no keyboard shortcut available for this switch. Exercise 1.11 demonstrates the steps involved in changing the display language.

EXERCISE 1.11

Changing the Display Language

1. Click the Start button and then click Control Panel.

2. Click Clock, Language, And Region and then Region And Language.

3. Choose the Keyboard And Languages tab.

4. In the Display Language section, click the Choose A Display Language drop-down list and select the language that you want to use.

5. Click OK, and you will be notified that you need to log off. Close any files that you have open and then click Log Off Now.

6. Log back into Windows 7 and you will see the selected display language used.

Changing the Date and Time

When you set up a new computer or when you have just installed Windows 7, the date and

the time might be incorrect. Fortunately, changing them is very easy, and it takes only a few clicks. Exercise 1.12 shows how it is done.

EXERCISE 1.12

Changing the Date and the Time

1. Click the Start button and then click Control Panel.

2. Click Clock, Language, And Region and then Date And Time.

3. Click the Change Date And Time button.

4. Change the date using your mouse and the calendar that is shown on the left in Figure 1.36.
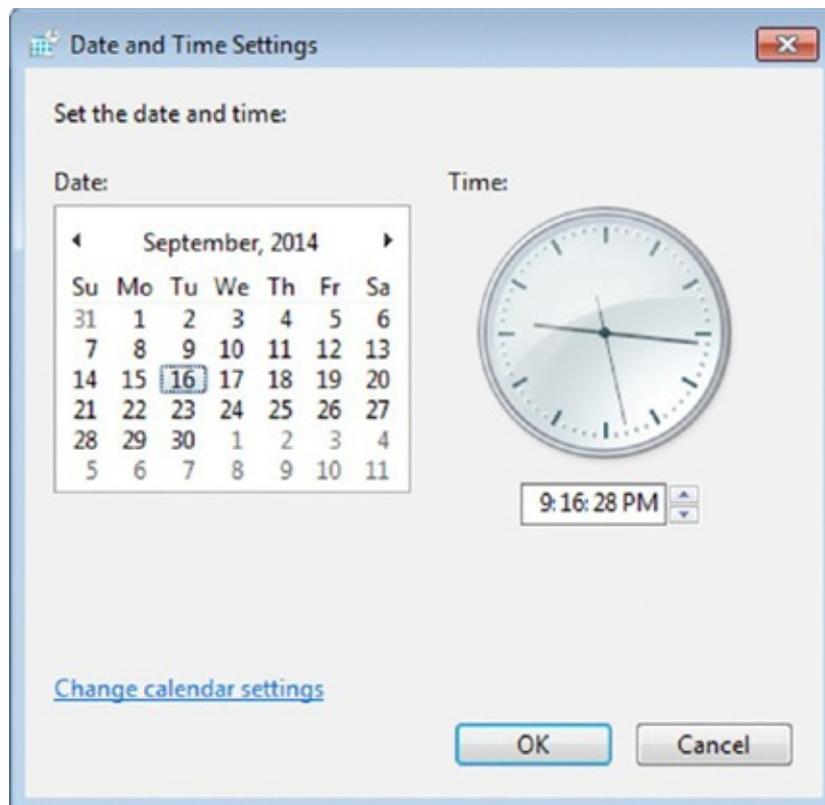
Figure 1.36 The Date And Time Settings window

5. Change the time by selecting the hour or the minute and then typing the correct values.

6. When finished, click OK and then click OK again.

Making the Computer More Accessible

If you have a disability that makes it difficult to hear, see, or physically use the computer, there are options and features available that you can configure to make things easier for you. These options are found in the Control Panel by selecting Appearance And Personalization and then Ease Of Access Center, as shown in Figure 1.37.
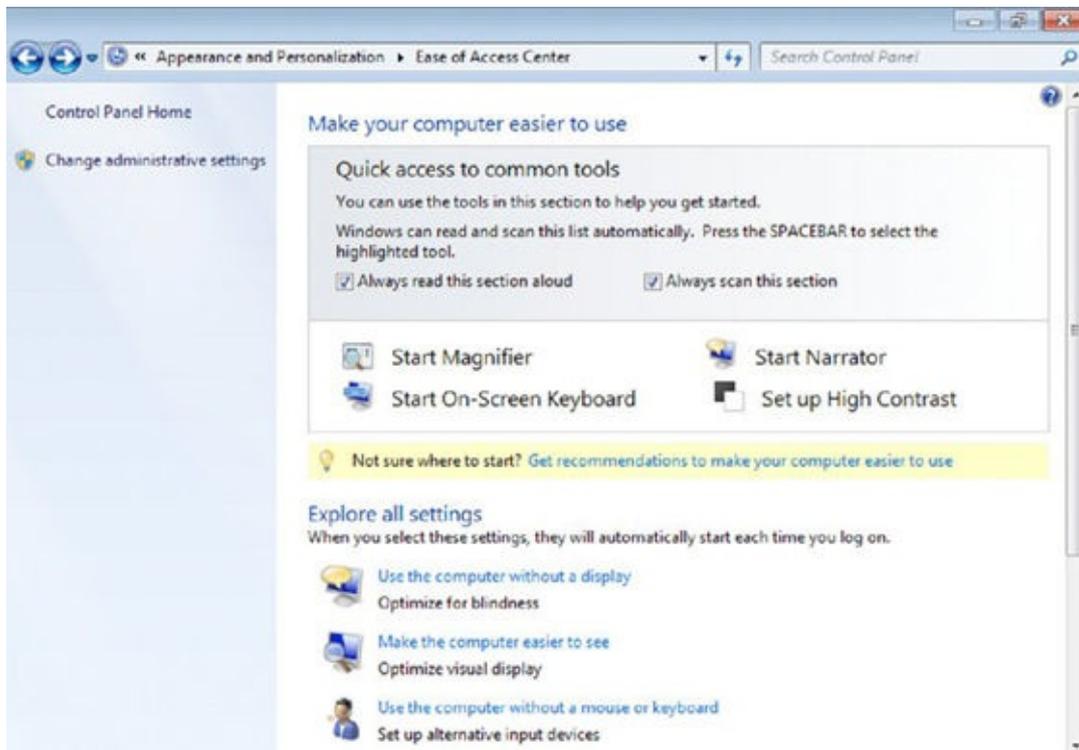
Figure 1.37 The Ease Of Access Center in the Control Panel

The easiest way to understand what features you should enable is to work through the wizard that is available by clicking the link "Get recommendations to make your computer easier to use." Work through it on your own and select the statements that apply to you. Upon completion, you'll see options to enable features that Windows 7 deems appropriate, based on your answers (Figure 1.38).
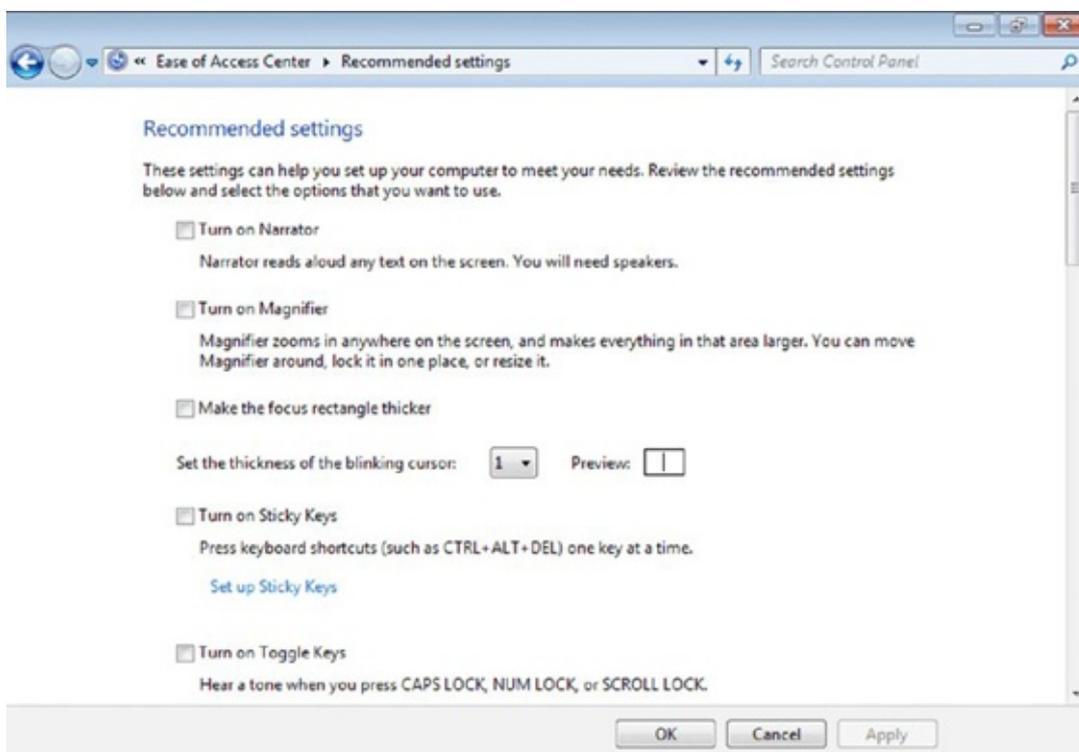
Figure 1.38 The settings recommended by the Ease Of Access Center

Here are some of the items that you might be prompted to enable based on the answers you give:

High Contrast When this option is turned on, you change how the computer displays information on the screen. The colors used to display everything will have a very high contrast so that you have an easier time figuring out the different elements that are displayed.

Narrator Reads aloud the text that appears on the screen.

Speech Recognition Once you set it up, you can use speech commands like "Open Control Panel" to control the computer, if you have a microphone available. You can also use it to dictate text.

Magnifier Zooms in on areas of the screen that you select. In its default form, you use it like a magnifying glass.

On-Screen Keyboard Lets you type words using a keyboard that appears on the screen. You can type on the keyboard using the mouse or another pointing device.

Understanding User Accounts

In order to use Windows, you need a user account and a password set for it. A *user account* is a collection of settings that Windows uses for understanding your preferences and for controlling the files and folders you access, the tasks you are allowed to perform, the devices and resources you are allowed to use, and so on. User accounts are also used to separate the people that use the same computer and make sure that they can keep their personal files private (like the ones stored in their libraries) and that they do not change each other's settings.

In the Windows 7 operating system there are three types of user accounts that you can choose from (Figure 1.39).
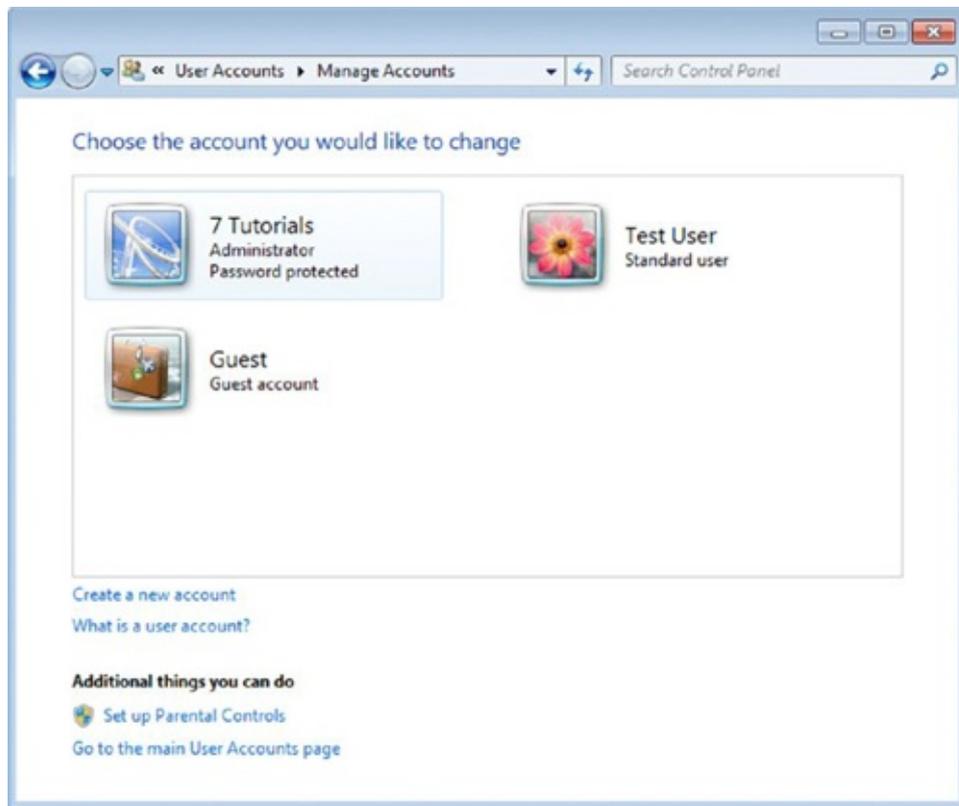
Figure 1.39 The Manage Accounts window where you can see the user accounts existing on your computer

Administrator User accounts of this type have complete control over the operating system, its applications, and its settings. It is the only type of user account that can install or uninstall applications in Windows. Administrators can also manage other user accounts and create new user accounts.

Standard A limited type of user account that can use only existing software applications and cannot install or uninstall applications. Also, this user account cannot modify system settings that affect other users. Standard user accounts can change only their own settings.

Guest A limited type of user account. There is only one Guest user account on a Windows device, and it has no password. It is meant only for temporary access to the PC, and it can be used only for running existing applications. This user account type cannot modify any system settings.

In Windows 7, the first person to create a user account is the administrator. When you create other user accounts, you can choose their type. Also, the Guest account exists by default in Windows 7. It only needs to be enabled in order for it to be used. But first, you'll learn how to create a user account using the instructions in Exercise 1.13.

EXERCISE 1.13

Creating a Standard User Account

1. Click Start and click Control Panel.

2. Under User Accounts And Family Safety, click Add Or Remove User Accounts.

3. Click Create A New Account.

4. Type a name for the account, leave Standard User selected, and click Create Account, as shown in Figure 1.40.
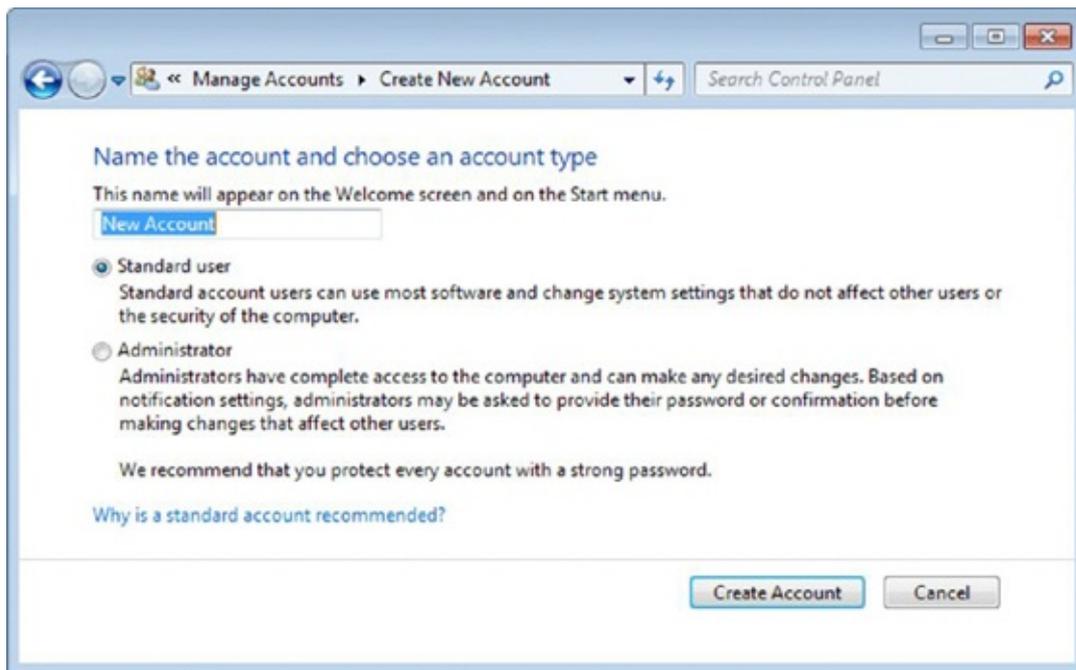
Figure 1.40 The Create New Account window

Sharing Folders with Other Users

User accounts are also important when you want to share your work with others. For example, you might share the same computer with another person, and you may want to give the other person access to one of your folders. Or, your computer is connected to a network, and you may want to share a folder with others on the network. Before you do that, you will need to understand one more concept: permissions.

If you want to share a folder with another person (on the same computer or on the same network), you need to set the level of permissions assigned to that person for that folder. The permissions you can give another person are as follows:

Read The other person can only read the files and subfolders that are found in the folder you are sharing. They cannot modify them or delete them.

Read/Write The other person can read the files and folders that are found in the folder you are sharing. They can also modify them and delete them.

You will see these two options in Windows each time you try to share anything with

someone else.

To simplify sharing on small networks like the one in your home or in a small company, Microsoft has introduced the concept of Homegroup. The Homegroup is a group of Windows computers and devices that share content and devices with each other, in the same network. What is shared with the Homegroup is not available to other computers that are on the same network but are not part of the Homegroup. The Homegroup can be joined by Windows 7 and Windows 8 computers and devices.

By design, there's no limit to the number of computers that can join a Homegroup. The Homegroup is protected by a password that you share with the users who want to participate in it. This password is requested only when a new computer joins the Homegroup. You create or join a Homegroup from Control Panel under Network And Internet.

In Windows Explorer, you can easily share a folder by first opening it and then clicking the Share With menu on the toolbar. There you will see several options, including Homegroup (Read) and Homegroup (Read/Write), as shown in Figure 1.41. Read and Read/Write are the permissions you want to assign to the Homegroup for that shared folder.
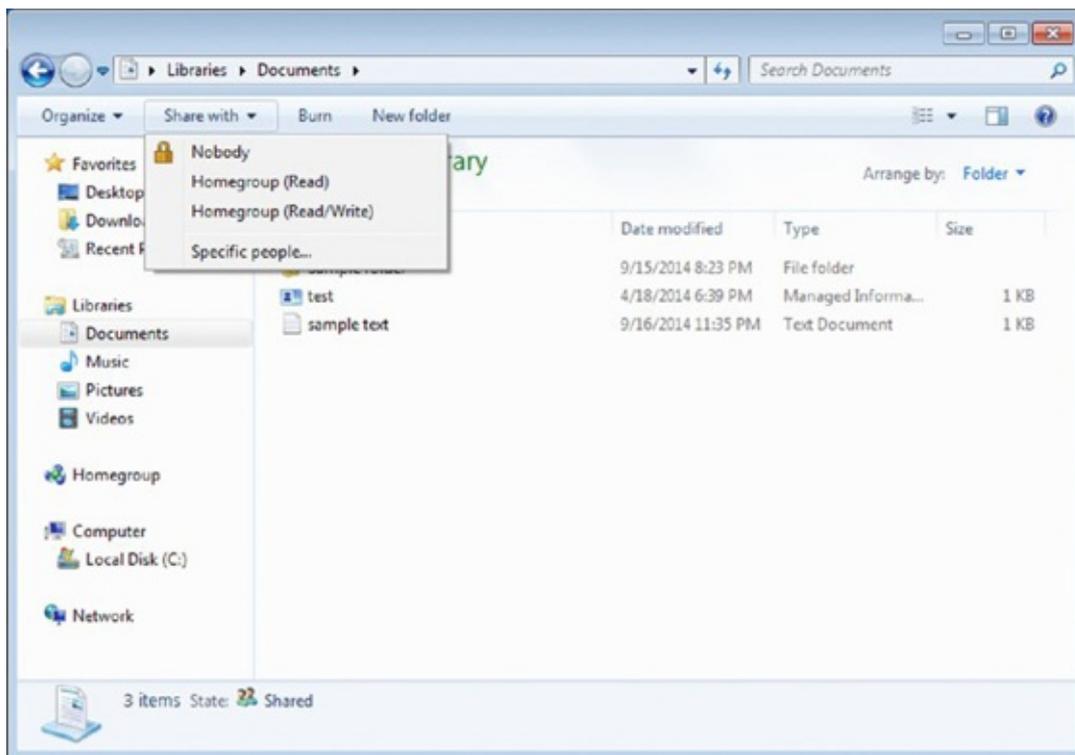
Figure 1.41 The Share With menu in Windows Explorer

You can also share a folder with another person who has a user account on the same computer. Exercise 1.14 shows you how it is done.

Sharing a Folder with Another User Account

1. Open Windows Explorer and select your Documents library.

2. Click the Share With menu on the toolbar and then select Specific People.

3. Click the arrow pointing downward and select the user with whom you want to share your documents (Figure 1.42).
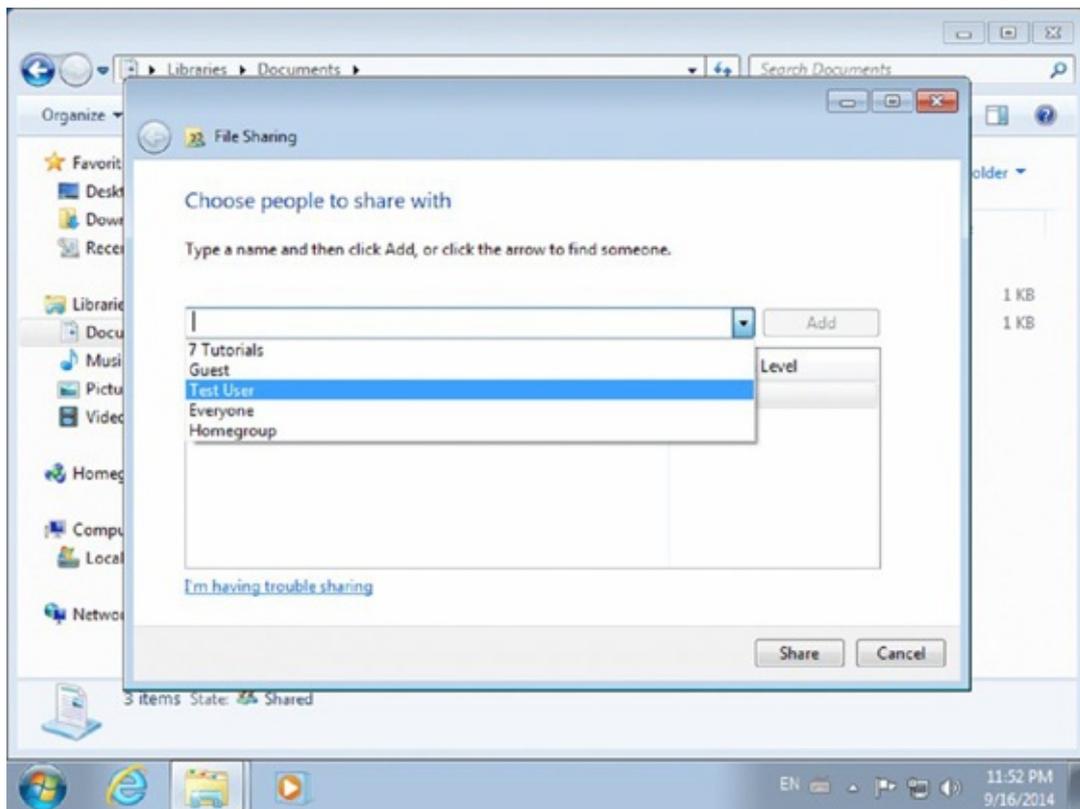
Figure 1.42 Choosing with whom to share in the File Sharing Wizard

4. Click Add.

5. Click the arrow beside Read, on the line for the new user.

6. If desired, click Read/Write. If not, leave Read selected.

7. Click Share.

The person with whom you are sharing that folder can access it by opening Windows Explorer and double-clicking Local Disk (C:), Users, and then the name of your user account.

To stop sharing that folder with the user you initially shared it with, repeat steps 1 and 2 from Exercise 1.14, click the name of the user to remove, and then click Remove. Lastly, click Share to update with whom you are sharing that folder.

Managing Permissions in Large Businesses

So far, with regard to creating user accounts and sharing data, we've been focused on

small networks like the one in your home or in a small business. In large enterprises, user accounts and permissions are managed differently. Consider what would happen if there were thousands of users who each had their own computer. Think about how hard it would be and how long it would take to create all those user accounts and share data among them, using the aforementioned methods, on every one of those computers and for every one of those users. It just isn't manageable.

To make things more manageable, enterprises create a network domain, and they hire network administrators who create all the network users on a computer called a server. Users' data is saved to this server or others. Because users and their data are centralized, one network administrator can manage all users and all data sharing and assign all permissions to the data and resources that are shared, from a single location.

The set of permissions that the network administrator applies is created and managed through the Group Policy. Just as it sounds, permissions are created for entire groups of users, and those permissions make up a policy that those users are restricted by. So, a network administrator can create a Group Policy that restricts all users in a specific group (say Accountants, Guests, or Marketing), to efficiently place limits on what members of that group can access on the network and what they can do on their own computers.

How Organizations Assign Permissions Using Group Policy

In some colleges, users are placed into groups that represent the job they do. There are groups for adjunct faculty, full-time faculty, administrators, human resources, marketing, and so on. There are groups for mobile users too, namely those people who access data remotely from home or on the road. Permissions are assigned to these groups and thus are also applied to the users who are in those groups. This makes it easy to manage access to resources while limiting what users can do once they're connected to that organization's network.

As an example, users in the adjunct faculty group are allowed to access the student database for the purpose of finding a student's phone number or address or to look up a grade for a specific class, but they cannot change this information. Users in the faculty group can do all of these things too, but they also have the ability to change a student's grade in a course. They do not have the ability to change a student's phone number or address. Users in the human resources group have permission to access and alter a student's phone number or address but not their grade. Mobile users might be assigned specific permissions that apply only to them, perhaps to protect access to sensitive data over an unprotected network such as the Internet. These permissions are easy to manage because they have to be applied only to the group and not the individual users.

Additionally, when new employees are hired, it is easy for the network administrator to add a new user account to the group in which that employee belongs. That user is automatically assigned the permissions for that group. When an employee is laid off or retires, it is equally easy to remove that person from a group. Because the user is no longer a member of the group, they cannot access the group's resources.

Often, users are assigned to more than one group. For the most part, users' permissions are cumulative. So if a user has permission to read one resource in one group and also write to it in a second, the user can both read and write to the resource. Users can also be denied access to specific resources should they be found to abuse them. For example, if a user is overusing the printer, they may be blocked from accessing it.

Summary

Before you can use a computer effectively, you must know a little about what makes it work. A computer must have an operating system and applications. Without those essential elements no work can be done. These two types of software are updated by their manufacturers on a regular basis so that they are kept safe from security problems, their problems are fixed, and new features are introduced.

Once your computer is powered on, you can log on and start using all the applications that are available to create and save data. This data is stored in files, each with its own type and file extension. In order to keep track of your files, the operating system has a file system that allows you to view your files, use them, and manage them as you see fit. In this chapter you learned all the basic commands for working with files in Windows.

In order for users to be truly productive, operating systems on modern computers allow multiple users to use the same computer. Each user should have an individual user account so that each person's data, applications, and settings are kept separate. Obviously, this data can be shared at any time with other users on the same computer or with other users on the network. In this chapter you also learned how to share your folders with others.

Finally, it is important to be able to customize your computer so that it better meets your needs. In this chapter we showed how to customize the way the operating system looks, how to change the language you are using, how to modify the date and time (in case the operating system has the wrong information), and how to improve its accessibility if you have a disability that makes using the computer difficult.

In the next chapter will talk in more detail about hardware and the different hardware components of a typical computer. We will also talk about different types of computers and how to measure and compare their relative performance.

Exam Essentials

Understand the difference between the operating system and software applications. An operating system is the most important software that runs on a device, because without it, interactions with that device would be impossible. The operating system is what makes communication between the user, software applications, and the internal hardware possible. Applications are either included with the operating system or installed on top of the operating system. Applications allow you to create data and use your computer more productively. You should know the differences between the operating system and software applications.

Understand how to power on and power off your computer. In order to use a computer, you should understand how to log into Windows with your account, switch users, log off, and shut down the computer. You should also know that logging off closes all applications and windows, while switching users, locking the computer, or putting the computer to sleep only pauses those things so that you can get to work more quickly when you return.

Know how to browse your computer's files and folders. You cannot be a productive user unless you know what Windows Explorer is and how to use it to browse the files and folders that are found on your computer. Learn how to work with the views that are available and understand the differences between them.

Know how to manage your files and folders. Understand how to organize your files and folders, depending on their type. Use the libraries that are available in Windows to keep things organized, and know how to move your data around. Also, you should learn the keyboard shortcuts for useful commands like Copy, Cut, Paste, Rename, and so on. They will make things easier when working with your files.

Know how to customize Windows 7. There are too many customization options available to discuss them all here. Thus, you'll need to work through all of the options on your own. Know how to change the theme and the Desktop background and how to update the date and the time if your computer is using the wrong data. Knowing this will allow you to personalize your computer and have it look and work the way you want it to. Also, you should understand the basic Accessibility options that are available and how they can help people with disabilities.

Key Terms

Before you take the exam, be certain you are familiar with the following terms:

files	operating system
folders	personal identification number
hardware	software
libraries	

Review Questions

1. What does an operating system such as Windows do?

   A. Manages the files and folders on my computer

   B. Displays the image on the screen of my computer

   C. Allows communication between the user, software applications, and the internal hardware of my computer

   D. Powers on the computer when I need to use it and powers it off when I'm finished working

2. Which of these are operating systems? (Choose all that apply.)

   A. Windows

   B. Hardware

   C. Microsoft Office

   D. Android

3. You need to leave your computer unattended for a couple of minutes, and you want to secure it. You do not want to have to close all of your applications or save your work because on your return you want to get back to work quickly, right where you left off. Which of the following options will enable you to do this? (Choose all that apply.)

   A. Log off

   B. Lock the computer

   C. Use the Switch User command

   D. Shut down

4. You want to move a folder to another location. Which two commands do you use to perform this task? (Choose all that apply.)

   A. Copy

   B. Cut

   C. Move

   D. Paste

5. Which views in Windows Explorer allow you to learn the type of each file? (Choose all that apply.)

   A. Content

   B. List

   C. Tiles

   D. Details

6. What two keyboard shortcuts can you use to copy and paste a file to another location?

A. Ctrl+C and Ctrl+V

B. Ctrl+X and Ctrl+P

C. Ctrl+X and Ctrl+V

D. Ctrl+C and Ctrl+X

7. If everything on the screen is too small to see, what can you do? (Choose all that apply.)

A. Use the Magnifier.

B. Decrease the screen resolution.

C. Increase the screen resolution.

D. Opt to make text and other items larger from the Display window.

8. Where do you go in Windows 7 in order to change the Desktop background or the theme?

A. Start ➤ Control Panel ➤ Appearance And Personalization ➤ Display

B. Start ➤ Control Panel ➤ Clock ➤ Language ➤ Region

C. Start ➤ Control Panel ➤ Appearance And Personalization ➤ Personalization

D. Start ➤ Control Panel ➤ Appearance And Personalization ➤ Desktop Gadgets

9. Which of these user accounts has the permission to manage other users?

A. Homegroup users

B. Standard users

C. Homegroup members

D. Administrators

10. Which sharing permission allows a user to access and view a file but not make any changes to it?

A. View

B. Read/Write

C. Delete

D. Read

Chapter 2
Understanding Hardware

THE FOLLOWING IC3 GS4: COMPUTER FUNDAMENTALS EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

- ✓ **Common Computer Terminology**

  - Define the terms and explain the differences between input/output devices and hardware and peripherals.

    - Processing

      - Gigahertz

      - Hertz

      - CPU

    - Input / Output

      - Monitor and Projector

      - Mice

      - Keyboards

      - Stylus

      - Microphone

      - Speakers

      - Touchpad

      - Printers

  - Explain the different types of memory.

    - Volatile

      - RAM

    - Nonvolatile]

      - SSD drive

      - Magnetic hard drive

      - ROM

      - Flash drives (USB, Jump, Thumb, etc.)

    - Units of measurement

      - Mega, giga, tera, peta. Explain the difference between Bit vs. Byte

- ✓ **Types of Devices**

  - Explain these different types of computers. Compare and contrast uses and

capabilities:

- Server
- Desktop
- Laptop
- Tablet
- Smart Phone

✓ **Computer Performance**

- This objective may include, but is not limited to, the following topics:
  - Specify criteria that could be used to evaluate the pros and cons of various computing devices and peripherals, Focus on performance issues.
  - Processing vs. memory vs. storage:
    - Describe the concepts of Processing capacity, Processing speed, Memory capacity, Memory speed, Storage capacity, and Storage speed including how each interacts with the other to determine overall computing capacity, speed and power.

 In Chapter 1, "Understanding Operating Systems," we mentioned that computers generally have software components and a hardware component. Now that we have explained important concepts like software, operating systems, and applications, it is time to take a look at the physical components of a computer: the hardware.

We will start by talking about the components that make up a computer and what they do. Then we will talk about external components that can be connected to a computer in order to increase its capabilities and usefulness.

Since computers are just as diverse as the components they are made of, we will also discuss the most common types of computers and devices that are used today and their properties.

Then we will talk about how information is sent inside your computer and how it is represented. Knowing that will also help you understand the characteristics of a computer and its components, as well as how to evaluate its performance. There's a lot of ground to cover and lots of interesting things to share, so let's get started.

The Internal Hardware Components of a Computer

Hardware is the term that is used to describe the physical components of a computer or device. While software and operating systems are ephemeral and nontangible, hardware is always physical and tangible. You may never see or touch the hardware inside your computer, but that doesn't mean the components don't exist. Hardware is generally protected by a case, to keep it safe from damage, from dust, and from other things that might stop it from working.

Hardware components are specialized for the jobs they do. For example, one component handles the sound that is played by the computer, another handles the image displayed on the screen, another handles the connection to the network, and so on. Generally, inside the case of a computer you will find the following hardware components:

Processor

Also known as the *CPU* (central processing unit), it is the "brains" of a computer. The CPU is what carries out the instructions sent by the software you run. It's the most important hardware component in a computer. You cannot have a running device without a processor.

RAM RAM means random access memory, and it is a volatile and very fast form of memory that allows data to be read and written in roughly the same amount of time. Software uses RAM to carry out calculations and operations as quickly as possible. When an application is closed, it no longer uses a portion of the available RAM, and it frees it up for other applications. RAM can't be used for long-term storage, however, because all data in RAM disappears when a computer is restarted or shut down.

Disk Storage There are two types of disk storage solutions that are commonly used in computers:

> **Hard Disk** This is the data storage device in your computer that is used for storing and retrieving information. Unlike RAM, a hard disk stores data permanently, and it can hold large amounts of information. Also, it is slower at writing and reading data. On a hard disk, data is usually read faster than it is written. In many modern computers, traditional hard disks are replaced with devices named SSDs.

> **SSD** Solid-state disks (SSD) are also data storage devices, but they use different circuitry and methods for storing your data as well as fewer moving parts. They are much faster than traditional hard disks and consume less power when running. Generally, SSDs are at least five times faster than traditional hard disks. Due to their benefits and continuously lowering prices, they will ultimately replace hard disks.

Graphics Card This is the hardware that processes and generates the image that is displayed by your computer. It is also known as a video card, video adapter, or graphics adapter. A graphics card is always directly connected to the monitor; otherwise, the image would not get displayed. Due to the advances in technology, graphics cards can also be small chips that are built into the motherboard.

Sound Card This is the hardware that processes and generates sound. Without a sound card you would not be able to listen to music and hear the sounds played by the operating

system and the applications that you are running. With the help of a microphone, sound cards can also take sound input from outside the computer and turn it into audio recordings. Just like graphics cards, sound cards can also be small chips that are built into the motherboard.

Network Card Also known as a network interface controller (NIC) or network adapter, it is the hardware that connects a computer to a network and manages the data transfers between the network and the computer. Network cards can use either network cables or wireless signals to connect to the network but never both at the same time. You will need two separate network cards for that: one for network cables and one for wireless signals. Due to the advances in technology, network cards can also be small chips that are built into the motherboard.

DVD Drive This device can read and write to a digital video disc (DVD) that is used to store all kinds of data, from movies to games and all types of files.

Blu-ray Drive This is a device that can read Blu-ray discs. Blu-ray is the modern alternative to the DVD and is slowly replacing it. Blu-ray discs are similar in shape and size to DVDs, but they store a lot more data. Typically, Blu-ray discs store six times more data than DVDs. Blu-ray drives can also read DVDs, so you won't need both a Blu-ray drive and a DVD-ROM drive in your computer.

Motherboard This is the main board in a computer. It holds all the crucial hardware components of the computer, like the processor and the RAM. All the internal hardware components of a computer are connected to it in some way. This is because the motherboard acts as the hub that manages all the communication between hardware components. Without a motherboard, the hardware components of a computer would not be able to interact and cooperate with each other. Many modern motherboards integrate chips that replace other hardware components like a sound card, network card, or graphics card.

Power Supply Unit This manages the alternating current from the wall socket and transforms it into direct current, which is necessary for your computer to run. It is one of the most important components of a computer since it provides the necessary electrical power for all other components.

Computer Cooling All the hardware components of a computer generate heat. If any component gets overheated, it will malfunction and stop working. All computers and devices, no matter how big or small, have some form of cooling built in. In a typical computer, cooling is provided through the use of small fans to reduce temperature by actively exhausting hot air.

All these components make up all computers, including laptops and mobile devices like smartphones and tablets. Because mobile devices are smaller so that they can be easily carried, their hardware components are much smaller than on traditional computers. Also, they are optimized to consume as little energy as possible and release as little heat as possible. Desktop computers are bigger because their components are more powerful. They deliver more performance while consuming more power and requiring more cooling and ventilation.

Volatile vs. Nonvolatile Memory

We mentioned that RAM is volatile memory. *Volatile* means that it can store data only while powered on. When it's powered off, data stored in RAM is lost. This is why this type of memory is used only for making real-time calculations in a computer and not for storing files and other data that needs to be used on a long-term basis.

Nonvolatile memory can store data even when powered off. Obviously, you cannot use the data from nonvolatile memory if it is powered off, but the data will never be lost unless the memory is physically damaged. Nonvolatile memory can come in many forms and shapes. The most common types of nonvolatile memory are hard disks, SSDs, DVDs, Blu-ray discs, external hard disks, and USB flash drives.

Peripheral Devices That Can Be Connected to a Computer

Previously we listed the internal hardware components of a computer. There are also external hardware components that can be connected to the computer; see Figure 2.1. These are called *peripherals*. Here are the types of peripherals you can connect to a computer.
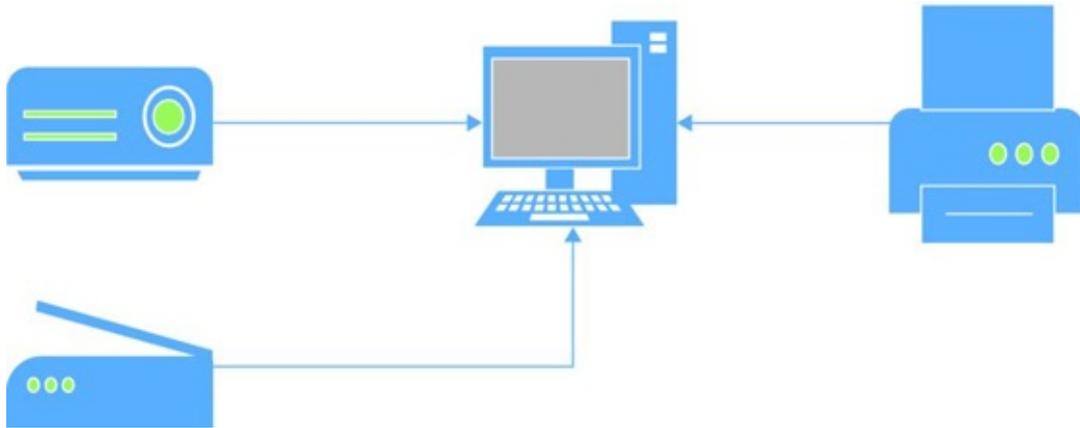
Figure 2.1 A desktop computer and several peripherals that are connected to it: printer, scanner, and projector

Monitor This is the visual display for the computer. It takes the data sent by the graphics card and displays it to the user. On small devices like laptops, tablets, and smartphones, the monitor is built into the device, and therefore it is not considered a peripheral but an internal hardware component of that device. Modern devices like tablets and smartphones have more evolved displays that include sensors for touch gestures. They are called touchscreens. Users can use the touchscreen to react to what is displayed and control how it is displayed. Touchscreens generally replace mice and keyboards.

Mouse A mouse is a pointing device that detects motion relative to the surface you place it on. This motion is translated into a pointer that is shown on the display of your computer. The pointer can be used to control what is displayed and how it is displayed.

Keyboard This device is similar to a typewriter. It has characters engraved or printed on its keys, and each press of a key corresponds to the single written symbol on top of it. It is the most commonly used device for providing data input to computers.

Speakers Speakers produce the sound in response to the data sent by the sound card of a computer.

Microphone This device converts the sound in air into an electrical signal that can be sent to the sound card and later on processed and used by the computer.

Webcam A webcam is a video camera that takes the image in real time and sends it to the computer that it is connected to. The resulting video can be viewed, saved, streamed, or sent to others. Webcams generally include a microphone so that they can record both the sound and the image from their area.

Printer This is a device that prints graphics or text on paper and other similar media.

Scanner This device optically scans images, printed text, and handwriting and converts it to a digital image. It is the opposite of a printer: whereas the printer takes digital input and turns it into physical output like text on paper, the scanner takes the physical input (the text on paper) and turns it into a digital image.

Flash Drives These devices use nonvolatile flash memory (a type of memory that can be erased and reprogrammed with electrical signals) for storing data. They are similar to SSDs when it comes to the types of memory used for storage, but they have less advanced circuitry, chips, and so on. The most common examples of flash drives are the USB flash drive and the Secure Digital (SD) cards. USB flash drives are plugged into a computer via USB ports, and they are used to easily store and carry data between computers. They are used for the same purposes as a DVD or Blu-ray disc. SD cards are used in the same ways as USB flash drives. However, they are smaller in size and are optimized for use in portable devices like smartphones, digital cameras, and tablets.

Stylus This device is used to assist in navigating or providing more precision when using touchscreens. A stylus generally looks like a pen. They are especially useful with smaller screens or touchscreens that have less precision and sensitivity. You can use a stylus to accurately navigate through menus and windows, send messages, and write on your touch screen.

Projector This optical device projects the images it receives from your computer onto a surface like walls or projection screens.

Peripherals complement the internal hardware of a computer. For example, you can do more with a sound card if you have a microphone connected to it. Some peripherals are also mandatory in order to use a computer. For example, if you have a desktop computer, you must have a monitor attached to it in order to view the image. The mouse and keyboard are also mandatory on a desktop computer because without them you cannot control the computer.

On the other hand, laptops have a monitor built in and do not need an external monitor in order to be used successfully. Also, mobile devices like tablets and smartphones don't need a mouse and keyboard because they have touchscreens that use touch input from the user to control those devices.

Peripherals vs. Internal Hardware Components

With each new generation of mobile devices, more and more hardware components get included in each device. For example, in classic desktop computers, the monitor is a peripheral because it is not inside the computer case. In a smartphone, the monitor is included in the device itself and is no longer a peripheral. It is a core part of the device. Also, the display of a smartphone includes touch sensors that allow you to control it with your fingers. As a result, you don't need a mouse and keyboard like you do to control a desktop computer. Speakers and microphones are also an internal part of more computers and devices. This trend will only continue with time. You will see even more devices that move from being an external peripheral to an integral hardware component of a computer or device.

Peripherals are generally split in two types:

Input Devices These peripherals are used to provide data and control commands to the computer they are connected to. For example, the keyboard is an input device because you use it to enter text and send commands to the computer. The mouse is an input device because you use it to control what is displayed on the screen. The scanner is another input device that takes images, printed text, and handwriting and converts it to a digital image. Other examples of input devices are the webcam, the stylus, and the microphone.

Output Devices These peripherals are used to communicate the outcome of the data processing that was carried out by the computer to the user. The monitor is an output device because it displays the image on the screen, based on the commands sent by the user. Other examples of output devices are the speakers, the printer, and the projector.

Some peripherals can be both input and output devices. For example, there are multifunctional printers that are both a printer and a scanner, and you can use them for inputting data to the computer through the use of the scanner and outputting data from it through the use of the printer. Let's go through Exercise 2.1 and help you identify input and output devices, based on the definitions that were shared earlier.

EXERCISE 2.1

Separating Output Devices from Input Devices

Beside each entry write either "Input" or "Output" to denote the type of device:

1. Printer

2. Scanners

3. Speakers

4. Mouse

5. Multifunctional printer

The answers to Exercises 2.1, 2.2, and 2.3 are found at the end of this chapter before the summary.

The Most Common Types of Computers and Devices

Computers and devices now have increasingly different forms and properties; see Figure 2.2. Some are big, powerful, less mobile, and less power efficient. Others are more power efficient and mobile while being less powerful in terms of performance. In general, we use the following types of devices:

Figure 2.2 A desktop computer on the left and a laptop on the right

Desktop Computers A desktop computer is a personal computer that it is intended to be used at a single location, usually on a desk or a table. Desktop computers generally require many peripherals like a monitor, a keyboard and mouse, speakers, and more. Also, they need an external power source in order to function. Their components are generally placed in a case that is an upright tower or horizontal desktop. Performance-wise, desktop computers tend to be more powerful than laptops and other mobile devices, but they have higher energy requirements.

Servers A server is a specialized business computer that is intended to be used at a single controlled location. Servers generally have powerful hardware (like faster processors, increased storage capacity, and so on), and they require more energy than other types of computers. They are run using special software that provides services to other computers on a network.

A server can be used to store data from a company's network, manage users, manage printers, and so on. There are print servers, data servers, email servers, and more. An enterprise generally uses one or more servers to manage a domain, which allows network administrators to manage hundreds or thousands of users and their data effectively.

Laptops A laptop is a portable computer that is suitable for mobile use. Laptops, sometimes called *notebook* computers, include a display, speakers, a keyboard, and a pointing device combined into a single unit. Most modern laptops also come with an integrated webcam and microphone. Laptops can be powered by using a built-in rechargeable battery as well as an external power supply. They are easy to carry around and can be used in many locations and on different surfaces.

Tablets A tablet is a mobile computer with the display, its battery, and all its other components in a single unit. They may include physical buttons (like On/Off and/or volume switches), but they do not always include an external keyboard, although a virtual keyboard is included in the operating system. You control them by using your fingers or a stylus to touch their display. Tablets are highly mobile devices due to their small size, energy efficiency, and long battery life.

Hybrid Devices These are newer types of devices that combine the properties of two different devices. They are growing both in the number of devices available and in popularity. One example of hybrid devices is all-in-ones: desktop computers that integrate all their hardware components in the same case as the display. Also, the screen can include touch sensors, making it easy to control with your fingers. Such devices are more mobile than traditional desktop computers, and they require less space.

Another example of hybrid devices is convertibles. They are mobile devices that generally mix the properties of a tablet with those of a laptop. For example, Microsoft Surface devices are tablets to which you can magnetically attach a keyboard. They also have a kickstand, which allows you to place them on your desk and use them as laptops. However, when you are on the go, you can detach the keyboard and use the device as a tablet.

Smartphones Smartphones are mobile phones with advanced computing capabilities. They combine the features of a computer with those of a mobile phone. Just like a computer, they have an operating system installed, and you can install applications (which are called apps). You can use them to browse the Internet, take pictures, view documents, and so on. You can also use them to call other people or send them text messages. Some smartphones are nearly large enough to double as a tablet, such as Apple's iPhone 6 Plus.

An average person may own and use a reasonably large number of devices. You may have a smartphone to keep in touch with others while on the go, a desktop computer at home with a large monitor so that you can have fun with your family, and a laptop at work that you also take with you on business trips.

In Exercise 2.2 we will ask you to distinguish between examples of operating systems, applications, and types of computers.

EXERCISE 2.2

Distinguishing among the Operating System, Applications, and Types of Computers

Specify the category of each of the following items. Choose from Operating System, Application, or Type of Computer:

1. Windows 7

2. Laptop

3. Microsoft Office

4. Android

5. Server

When purchasing a new computer or device, you should take into consideration its price, its performance, and how well it meets your needs. But before you do that, you need to know how information flows inside a computer and how you can evaluate the performance of the devices that you are considering.

How Information Is Transmitted inside a Computer

Computers are electronic devices, and they can interpret and produce only two kinds of input: on or off. Like electricity traveling through a light switch, which is either a complete circuit (light is on) or a broken circuit (light is off), data and instructions are transmitted in the same manner through a computer, via electrical circuits found on the computer's motherboard. Because of that, data must be offered to the computer with only two types of symbols to represent it. Those symbols are 1 and 0: 1 is on; 0 is off. These are called *bits*.

Each 1 and each 0 is a single bit. A bit is the smallest unit of storage. A bit isn't anything on its own, but when you combine 8 bits, you get a *byte*, and a byte is something much more important. In fact, 1 byte can represent a letter, such as A, B, C, or D. If you think about spelling out a single word, then you can imagine that several bytes are created to represent that word.

So, moving on from a single byte, note the following:

- A kilobyte (KB) is 1,024 bytes (2^{10}).
- A megabyte (MB) is 1,024 kilobytes.
- A gigabyte (GB) is 1,024 megabytes.
- A terabyte (TB) is 1,024 gigabytes.
- A petabyte (PB) is 1,024 terabytes.

To get an idea of how much data these entries represent, consider that a CD holds about 700 MB of data, which is around 80 minutes of music or 60 minutes of video. Seven minutes of high-definition television (HDTV) video is about 1 GB of data; 100,000 digital pictures taken with a 6-megapixel camera comes to about 500 GB.

To help you remember all these units of measure and the differences between them, let's go through Exercise 2.3.

EXERCISE 2.3

Converting Bits and Bytes

Fill in the blanks:

1. A byte = _____ bits.
2. A kilobyte = _____ bytes.
3. A terabyte = _____ gigabytes.

How to Evaluate the Performance of a Computer or Device

In order to evaluate the performance of any computer or device, you first need to know its most important characteristics and understand what they mean. For example, when buying a new computer or laptop, you will encounter terms like *number of cores*, *processor speed*, *storage space*, and so on. If you don't know what these terms mean, you won't have an idea of how well the device will perform and whether it will meet your needs.

Let's take the most important components of a computer and discuss their most important properties:

The Processor (CPU) Most computer manufacturers mention the speed of the processor using a unit of measure named *hertz* (Hz). A hertz is one computing cycle per second. A cycle is described as one computer instruction; 100 Hz means 100 cycles per second or 100 computer instructions. Modern computers have really fast processors, and they can run millions of cycles per second. To make it easier to express their speed, multiples are used: KHz (kilohertz, 10^3 Hz), MHz (megahertz, 10^6 Hz), and GHz (gigahertz, 10^9 Hz). The most common multiplier used when expressing a processor's speed is GHz; 1 GHz means one billion hertz. The bigger the number of gigahertzes, the faster the processor is.

Early processors had one physical computing component named core. Since the early 2000s, processors started including more than one core. Because of the improvements in the technology used to build processors, manufacturers can now add more cores into a processor without making it bigger in size. Therefore, we have dual-core, quad-core, hexa-core, and eight-core processors and so on. Each core has the same speed as the others (measured in hertz), and each core can process its own computer instructions in parallel with the other cores. Therefore, the more cores available, the higher the performance of that processor.

RAM When referring to the random-access memory of a computer, one of the most important properties is how much is physically installed. The more RAM you have, the greater the amount of data that can be stored in it. You will often see RAM described using GBs; a computer might have 2 GB, 4 GB, 8 GB, or more of installed RAM. When a computer has 8 GB of RAM, it means that it can fill up to 8 GB of data in the RAM to perform calculations. The more RAM you have, the better your computer will perform.

Hard Drive The amount of storage space is also measured in bytes. Modern computers tend to have large hard drives with lots of storage space. It is very common to have a hard disk in your computer with 500 GB of storage space or even 1 TB. However, if you are using an SSD inside a computer, it will most probably have a smaller amount of storage space, due to the fact that SSDs are more expensive to manufacture than traditional hard disks. That's why you will often see SSDs having only 64 GB or 128 GB of storage space.

Display Size One of the most important properties of a monitor is its size. This is described by the length of its diagonal, which is the distance between opposite corners. This distance is measured in inches. The size of the display differs from device to device. For example, a tablet may be 9 or 10 inches in diagonal, a laptop may have a screen with a

diagonal from 11 inches to 17 inches, while a desktop computer may have a screen with a 24-inch diagonal.

Obviously these are not the only properties of a computer; there many other characteristics that you can use to get an idea of what it has to offer. For example, weight is an important factor when choosing a mobile device like a laptop or a tablet. If you buy a desktop computer, you may want one with a powerful graphics card and so on.

You can get a better view of the performance delivered by a computer by using the operating system and the information shared by tools like Task Manager or the Windows Experience Index. For example, you can use Task Manager to see how your computer's resources are currently being used and if there are any bottlenecks, as explained in Exercise 2.4.

Determining the Available Hardware Resources Using Task Manager

1. In Windows 7, open Task Manager by pressing Ctrl+Alt+Esc on your keyboard.

2. Click the Performance tab and wait for a couple of seconds ([Figure 2.3]).
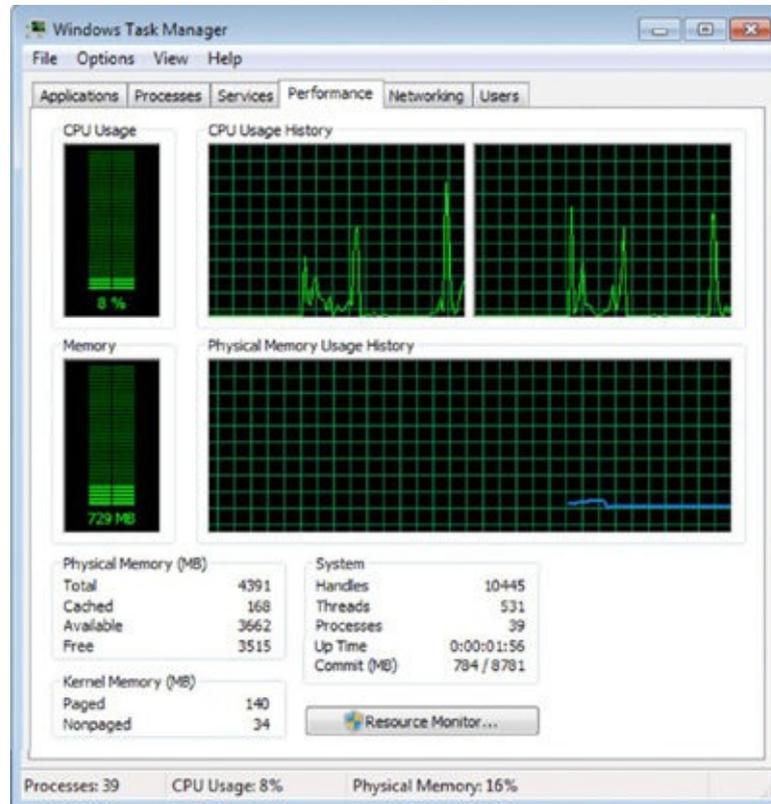
Figure 2.3 The Performance tab in Task Manager

3. Look at the CPU Usage graph to learn how much of the CPU processing power is currently being used.

4. Look at the CPU Usage History graph to learn how much of your CPU's processing power was used in the last couple of minutes. If you are using a computer that has a CPU with multiple cores, you will see an individual graph for each core.

5. Look at the Memory graph to learn how much RAM is in use.

6. Look at the Physical Memory Usage History graph to learn how much RAM was used in the last couple of minutes.

7. Close Task Manager by clicking the X in the top-right corner of the window.

Another tool that you can use to interpret the performance that is delivered by a Windows computer or device is the Windows Experience Index, as explained in Exercise 2.5. This is Microsoft's measurement of how well a computer can run Windows. A computer with a base score of 2.0 has the ability to run general computing tasks, but it would not be powerful enough to run advanced multimedia features in Windows 7 or Windows 8. A computer with a base score of 3.0 can run many Windows features at a basic level, but it

might have issues running higher-level functions, such as playing high-definition content. Most computers running Windows 7 should have a score of at least 4. A score of 7 and above generally means a higher-end computer with powerful hardware.

To calculate a computer's Windows Experience Index score, Windows rates certain components and gives them a subscore. Those components are defined by the following areas:

Processor Calculations per second

Memory (RAM) Memory operations per second

Graphics Desktop graphics performance for Windows features

Gaming Graphics The performance delivered when running games that are demanding from a visual perspective or when running image-editing applications

Primary Hard Disk Disk data transfer rate for the hard disk where the operating system is installed

The base performance score of your computer is the lowest subscore in any of the areas just mentioned. For example, if your computer has a processor subscore of 7 and a graphics subscore of 3, the base performance score will be 3 and not the average of all the individual subscores. These subscores will help you identify which hardware component is the weakest part of your computer. You may use this information when deciding which component is worth replacing with a better one. For example, there's no point in changing the processor if the primary hard disk is the component receiving a very low subscore.

EXERCISE 2.5

Determining the Windows Experience Index of Your Computer

1. Click Start and then Control Panel.
2. Click System And Security and then System (Figure 2.4).
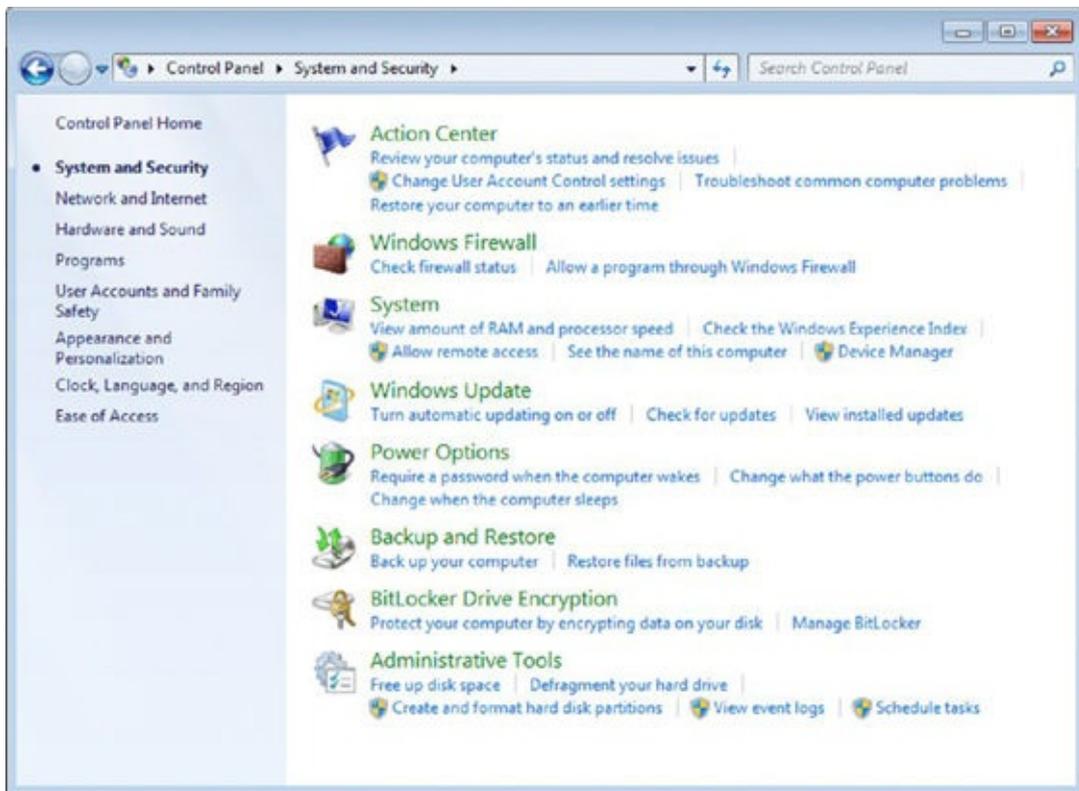
Figure 2.4 The System And Security section in Control Panel

3. In the System window, look for the Rating line in the System section. There you will see the base score for your computer (Figure 2.5).
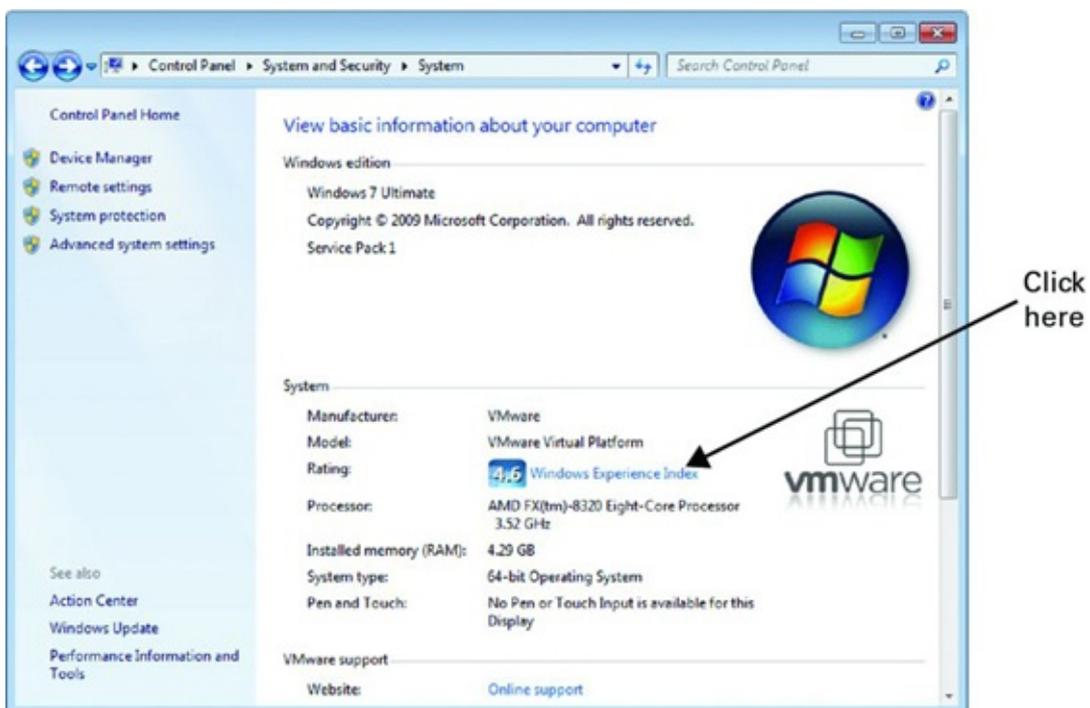
Figure 2.5 The System panel

4. Click the Windows Experience Index link to see a list with all the individual subscores for each component.

5. Note the component with the highest subscore and the one with the lowest (Figure 2.6).
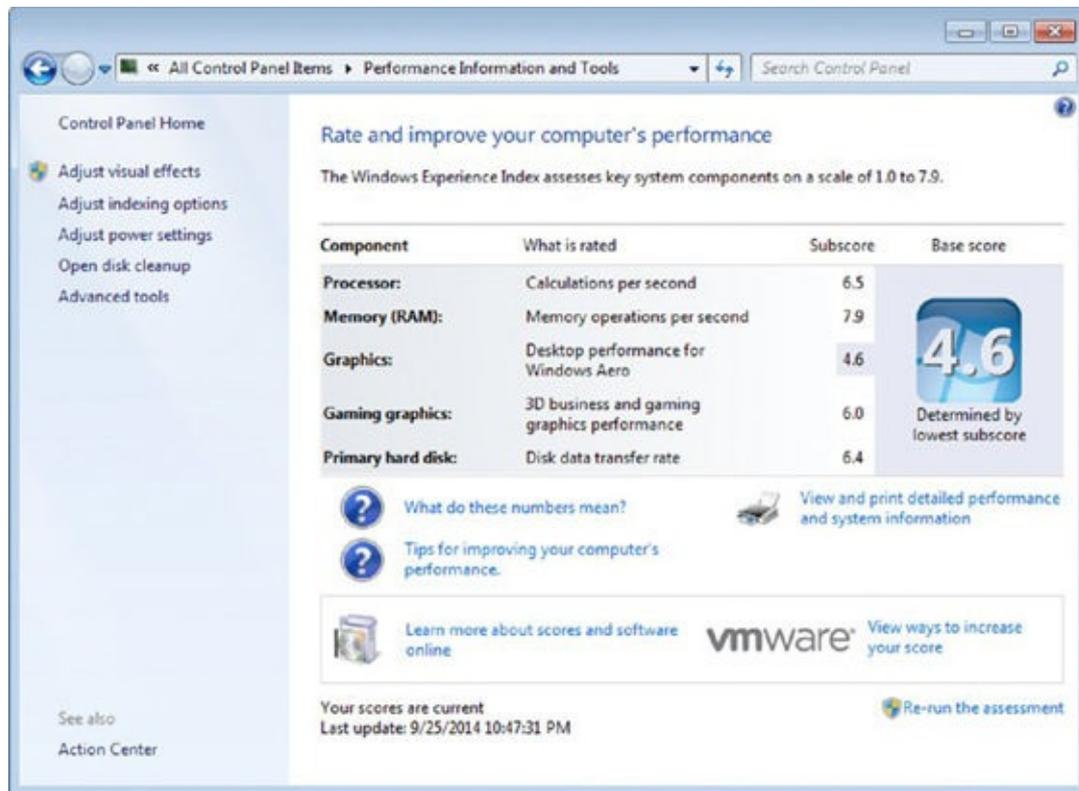
Figure 2.6 The Performance Information And Tools window

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Answers to Exercises 2.1–2.3

Answers to Exercise 2.1

1. Output
2. Input
3. Output
4. Input
5. Input and output

Answers to Exercise 2.2

1. Operating system
2. Type of computer
3. Application
4. Operating system
5. Type of computer

Answers to Exercise 2.3

1. 8
2. 1024
3. 1024

Summary

There are many different types of computers (servers, laptops, tablets, and so on), and each has several internal hardware components that allow it to work. You can't have a computer without a motherboard, a processor, RAM, a hard disk, and so on. Also, external hardware devices can be connected to a computer to allow you to do more with it. For example, connecting a printer to your computer allows you to print your work on a piece of paper, which wouldn't be possible otherwise.

Every piece of hardware has its own unique properties, and some hardware is faster than other hardware, or can store more data, and so on. The sum of the properties of each hardware device that makes up a computer determines its overall performance and what you can do with it. That's why, before purchasing a new computer or device, it is recommended that you look at its most important properties in order to understand if it offers what you need.

Now that you understand the basics about software and hardware in a computer, in the next chapter we will start to go more in depth about software, how to install and uninstall various kinds of software, the licensing models used for software, and the most important types of software applications that you can use to do your work.

Exam Essentials

Understand the role of each hardware component. Make sure you know what hardware is used for what type of task so that you have a good understanding of how computers work. Know that the CPU is for processing computer instructions, RAM is for storing data temporarily, and the hard disk is for storing data in the long term.

Understand the difference between peripherals and internal hardware. Know what kinds of devices are considered peripherals, what they do, and how they expand what a computer can do. You should also know the difference between input and output devices and be able to distinguish the type of each commonly used peripheral device.

Know the units of measurement used with hardware. Learn what a bit is, what a byte is, and the various extensions of these (MB, GB, and so on). Be able to convert, or at least state, how many bits are in a byte and perform similar conversions.

Understand the most important properties for the most important components that make up a device. Learn how processor speed is measured and how the number of cores available impacts performance. Know how storage space is measured as well as the amount of available RAM. Also, you should know how the display size is measured.

Know how to evaluate performance. Task Manager can help you understand how your computer's hardware resources are used and how many resources are available. The Windows Experience Index will help you evaluate the overall performance of your system and identify the components that have lower performance than others.

Key Terms

Before you take the exam, be certain you are familiar with the following terms:

Blu-ray drive	Mouse
Computer cooling	Network card
CPU	Power supply unit
Desktop computers	Printer
Disk storage	Processor
DVD drive	RAM
Flash drives	Scanner
Graphics card	Servers
Hybrid devices	Smartphones
Keyboard	Sound card
Laptops	Speakers
Microphone	Stylus
Monitor	Tablets
Motherboard	Webcam

Review Questions

1. Which of these are considered internal hardware? (Choose all that apply.)

   A. RAM

   B. Mouse

   C. CPU

   D. Printer

2. Which of these types of memory are nonvolatile? (Choose all that apply.)

   A. SSD

   B. RAM

   C. DVD

   D. USB flash drive

3. Which of these hardware components are peripherals for a desktop computer? (Choose all that apply.)

   A. SSD

   B. Speakers

   C. Webcam

   D. Sound card

4. Which of these devices are considered output devices? (Choose all that apply.)

   A. Monitor

   B. Speakers

   C. Microphone

   D. Keyboard

5. Which type of computer has very powerful hardware and is used to provide specialized services to other computers on the network?

   A. Laptop

   B. Tablet

   C. Smartphone

   D. Server

6. How are bits related to bytes?

   A. 1 bit = 8 bytes

   B. 1 byte = 8 bits

   C. 1 bit = 2 bytes

D. 1 bit = 24 bytes

7. What can you represent with a single byte?

    A. A letter like A or Z

    B. A single picture

    C. A single video

    D. You can't represent anything with a single byte. You have to group 8 bytes together to represent something.

8. What unit of measurement is generally used to denote the amount of RAM installed in a computer?

    A. GHz

    B. MB

    C. GB

    D. MHz

9. You want to use Task Manager to view RAM usage and usage history. What tab in Task Manager offers a graph that details this?

    A. Processes

    B. Services

    C. Resource Monitor

    D. Performance

10. What does 1 hertz stand for when measuring a processor's speed?

    A. One bit per second

    B. One computer instruction per second

    C. One computer instruction per minute

    D. One computing cycle per minute

Chapter 3
Understanding Software

THE FOLLOWING IC3 GS4: COMPUTER FUNDAMENTALS EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **Software Management**

- Describe how to install, uninstall and reinstall various kinds of software, including application software, drivers and system software, upgrades and patches, on various types of personal computers and configure the environment for use.

✓ **Licensing**

- Understand the various licensing models used for computer software such as operating systems, application programs, system software, databases, browsers, etc. Freeware, shareware, open-source, premium applications.

- Demonstrate an understanding of the legal and ethical obligations associated with EULAs and the user's responsibilities, commitments, and benefits that can be derived by entering into a typical computer industry EULA.

- Demonstrate an understanding of the concept of a single seat and site License options, how each party benefits, restrictions, obligations, etc.

✓ **Software Usage**

- Describe the dependencies and constraints that exist between hardware and software operation.

- Demonstrate an understanding of the similarities and differences between a basic, consumer-level relational database management system and a typical spreadsheet program, including an understanding of which situations would be better suited to which product.

- Describe what desktop publishing is, how and when desktop publishing software should be used, and the general feature set included in a representative desktop publishing program.

- **Describe what a Presentation program is, its purpose, how it is used, and the general feature set included in a typical consumer-level presentation program.**

- Demonstrate how to use templates, default settings, and quick start aids to rapidly generate usable application user data.

- Describe the purpose and use of a personal computer-based entertainment program. List the features that could be expected to be found in such a program and explain how they work.

✓ **Software Tools**

- Explain what file compression is and how it works with various file types.

- Explain how files are stored on a Hard Disk. Demonstrate how to organize,

compress, defragment, and otherwise optimize a computer's hard disk performance.

- Explain the danger posed by viruses and malware and how virus and malware scanning software work. List several common/popular brands and types of virus and malware scanning software.

In order to use a computer or device as productively as possible, you shouldn't stick to using only the operating system and the tools and applications that are built into the system. You should consider installing other kinds of software applications that allow you to do many things ranging from creating documents and presentations to doing your work and to having fun.

When dealing with software applications, you should first understand what requirements they have and how to install them and remove them when you no longer need them. We will start this chapter by explaining the concept of system requirements and demonstrating how to install and remove applications in Windows 7.

When installing software applications, you will often encounter a step where you have to accept the license agreement, which is the contract between you as the user and the publisher of the software that you are installing. There are many types of software license agreements, and each has its rights and limitations for the user. We will discuss the most important types of licenses and how they affect your use of the software that you are installing.

Then we will move on and discuss the most common types of software applications that you are likely to install on your computer and share what you can do with them.

Finally, we will discuss common software tools like file-compression applications, tools that can optimize your computer's performance, and applications that can help you keep it safe from digital threats like computer viruses.

The Dependencies between Hardware and Software

In order to be used efficiently, software needs certain hardware components or other software resources to be present on the computer or device where you want to use it, prerequisites that are called system requirements. They are often shared by the publisher of the software you are using and serve as a guideline. Some software, especially computer games, has two sets of system requirements: minimum and recommended. The minimum system requirements are the minimum hardware and software components you should have in order to run that software, even though its performance and responsiveness might not be great. The recommended software requirements are what you need in order to run that software with optimal performance and responsiveness.

The most important system requirements are those of the operating system that you want to use. Any operating system needs to be installed on a computer or device with a minimum hardware configuration that allows it to run correctly. For example, Microsoft says that Windows 7 needs at least the following:

- A computer with a processor running at 1 GHz

- 1 GB of RAM

- 16 GB of free space on its hard disk

Obviously, if your computer has a faster processor, more RAM, or more free space on its hard disk, Windows 7 will run faster and better.

Applications also have system requirements that must be met in order to run. For example, Microsoft Office 2010 has the following hardware requirements:

- A processor running at 500 MHz, with 256 MB of RAM

- 3 GB of free space on your hard disk

- A computer display with a minimum resolution of 1024 × 768 pixels

Applications might have software requirements as well. For example, Microsoft Office 2010 works only when using the following operating systems:

- Windows Vista

- Windows 7

- Windows 8

- Windows 8.1

> **NOTE** Microsoft Office 2010 doesn't work on older Windows versions like Windows XP, which was discontinued by Microsoft.

The same goes for mobile apps. For example, if you have an Android smartphone, some apps will work only with the latest version of Android and not with older versions. Other apps may require your device to have at least 512 MB of RAM, while others (especially mobile games) may require several gigabytes of free space in order for you to download,

install, and use them.

Before purchasing and installing any software, it is best to check its system requirements and consider whether your computer or other device meets them. If it meets the minimum hardware and software configuration that's requested by the publisher, then it is OK to use that software. If it doesn't, then you should reconsider.

Installing, Removing, or Reinstalling Software

In order to take full advantage of your computer and use it for as many things as possible, you will need to install many kinds of software on it:

Applications Software that you install in order to perform specialized tasks. For example, if you want to create documents or presentations, you will want to install Microsoft Office or LibreOffice. If you are a graphic designer, you may need to install advanced photo-editing applications like Adobe Photoshop.

Drivers Software that operates and controls particular hardware devices connected to your computer. Drivers ensure that your operating system takes full advantage of your hardware. Operating systems come with generic drivers, but for full access, you often need specific drivers.

For example, if you install the driver for your computer's video card, Windows will be able to identify it correctly and fully use all its features. Either drivers are installed automatically by Windows for the hardware components it identifies and knows or you need to install them separately, just like any other program. Generally, many components bundle a disc with drivers that you can use when installing them on your computer.

Installing any Windows application is generally a quick and simple process. The steps involved are similar from application to application, and their flow is generally the same:

1. You start the setup program and confirm that you want to install the application.

2. You select whether you want a quick installation or a slower custom installation.

   It is better to go for the lengthier, custom installation process because you can control where the application is installed, which shortcuts are installed, and what features are enabled, and you can prevent unwanted things from being installed or activated on your computer.

3. Commercial applications that cost money generally ask you to enter an activation code or serial number that proves that you have purchased them from a legitimate source.

4. You select the folder where you want to install the application and which features and modules you want installed.

5. The installation is performed. The process takes longer for larger applications with lots of files. A smaller application like a web browser generally installs itself in seconds.

6. Once the setup program finishes the installation, you close it, and you can then use the application.

The way the setup program looks is different from application to application, and the steps involved may not always be in the same order as mentioned here. However, the basic principles are the same when installing all applications.

Installing drivers for your hardware components is very similar to installing applications. The only difference is that the setup program includes fewer steps and offers fewer customization options. Also, you may be asked to restart your computer so that the operating system can load the driver and use it to manage the hardware component it was

made for. When downloading a driver, you need to pay attention and make sure that you download the driver that's appropriate for your specific hardware component. You must download and install the driver that was created by the manufacturer of the hardware component you are using and for its exact model name and number.

🌐 Real World Scenario

Things to Pay Attention to When Installing Free Software Applications

When installing a free software application, it is very important that you go for a lengthier custom installation process in which you pay attention to all the details that are displayed. That's because it is very likely that the developers of that free application will try to take advantage of your installation to make some money. There are two common methods that they could use for monetizing their free applications:

- They display ads that run during the installation, encouraging you to download other applications. In Figure 3.1, you can see an example of an ad that is displayed when installing a popular application named KMPlayer. If you click the link for PandoraTV, you will be taken to a web page from which you can download and install the application recommended by that ad.

Figure 3.1 The installation for the popular KMPlayer application

- They recommend that you install software applications made by other companies, which you may not need or want. For example, the popular avast! free antivirus software recommends that you install both Google Chrome and the Google Toolbar, as shown in Figure 3.2. If you do not pay attention and you do not

uncheck the two boxes that allow the installation of these two additional applications, you will end up installing three software applications instead of just one.
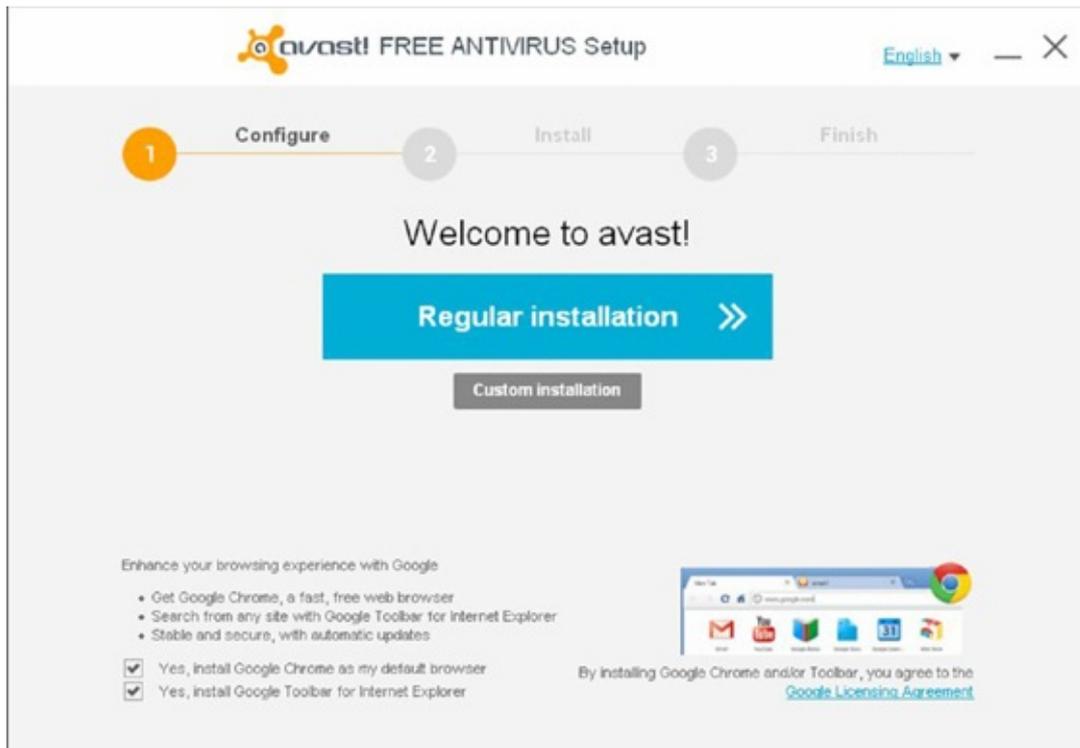
The installation for avast! free antivirus

- Such practices are so widespread that if you automatically choose the quick installations, you will end up with all kinds of applications you don't want or need. These additional programs lower your computer's responsiveness and performance. Some of these additional programs may also expose your computer to security risks.

To help you get a better understanding of the steps involved when installing an application, work through Exercise 3.1 and install a popular free Internet browser, Mozilla Firefox.

EXERCISE 3.1

Installing an Application Like Mozilla Firefox

1. Download Mozilla Firefox from `https://www.mozilla.org/`.

   You will download an executable setup file that includes the words *Firefox Setup* in its name.

2. Open Windows Explorer and navigate to where you have downloaded the Firefox Setup file and double-click it. Generally you will find it in the Downloads folder.

3. In order to do a custom installation, click Options, as shown in .

Figure 3.3 The Mozilla Firefox installation program

You can now choose the shortcuts that are created for Firefox, select the destination folder where Firefox is installed, and configure the settings that control how it works.

4. Customize the installation as you prefer and click Install, as shown in Figure 3.4.
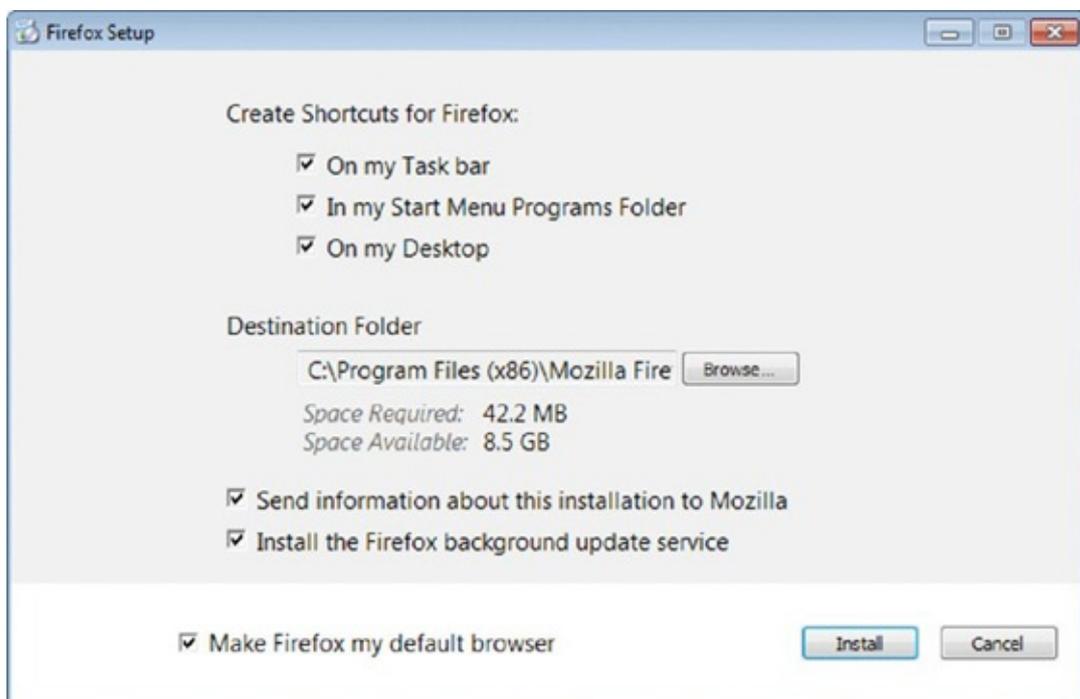
Figure 3.4 Customizing the Mozilla Firefox installation

5. Wait for the Firefox Setup to download and install the necessary files.

6. When the installation is complete, you are asked whether you want to import settings and data from other installed browsers. Select Don't Import Anything and click Next (Figure 3.5).
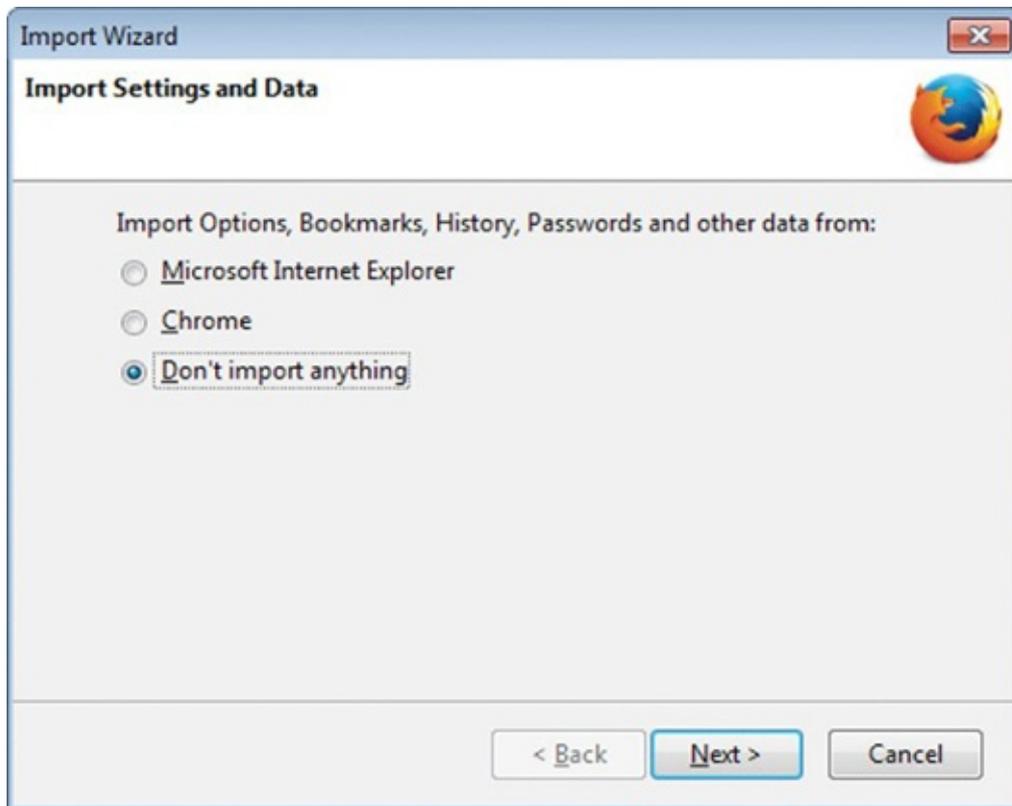
Figure 3.5 The Mozilla Firefox Import Wizard

Firefox is now started, and you can start using it. Most probably you will also be asked whether you want Firefox to be set as your default browser (Figure 3.6).
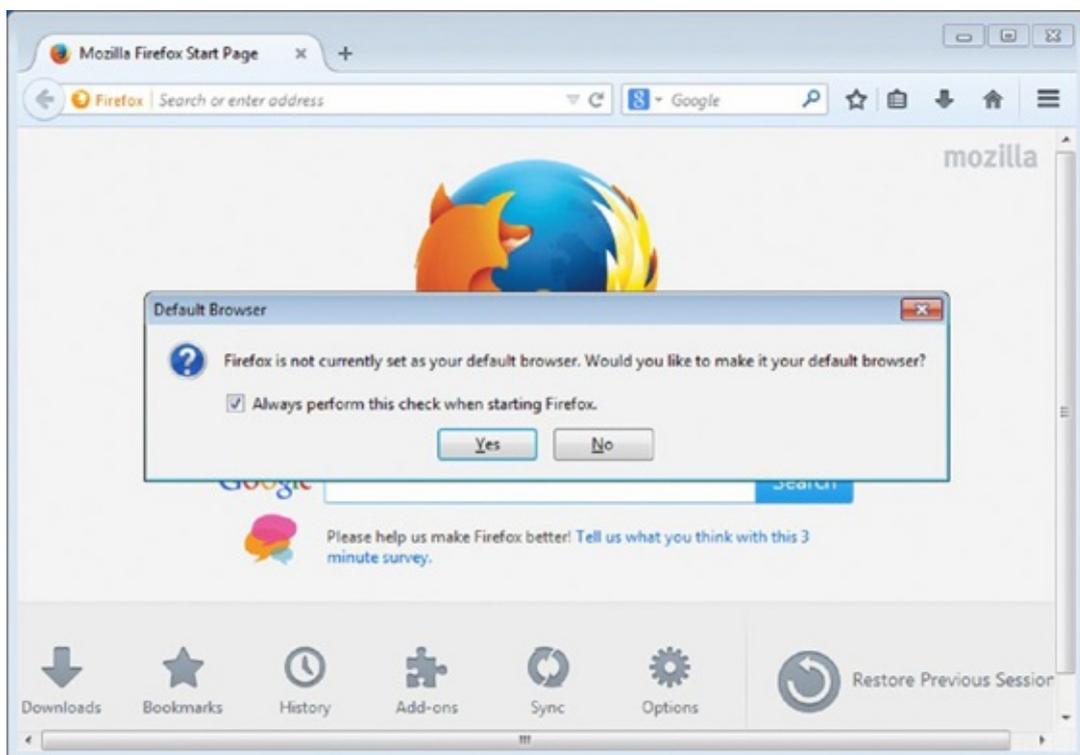
Figure 3.6 The Mozilla Firefox browser

7. Answer whether you would like to make it your default browser and then close the Mozilla Firefox window.

Removing an application from your computer is somewhat similar to installing it. The

steps involved are almost the same, but some options will be different from application to application. Also, the uninstall program will look different from application to application. To make sure that the uninstall works without issues, you should first close the application that you want to remove from your computer.

You start the uninstallation process from Control Panel. You click the Uninstall A Program link under Programs, and then you'll see a list with all the programs that are installed on your computer (Figure 3.7).
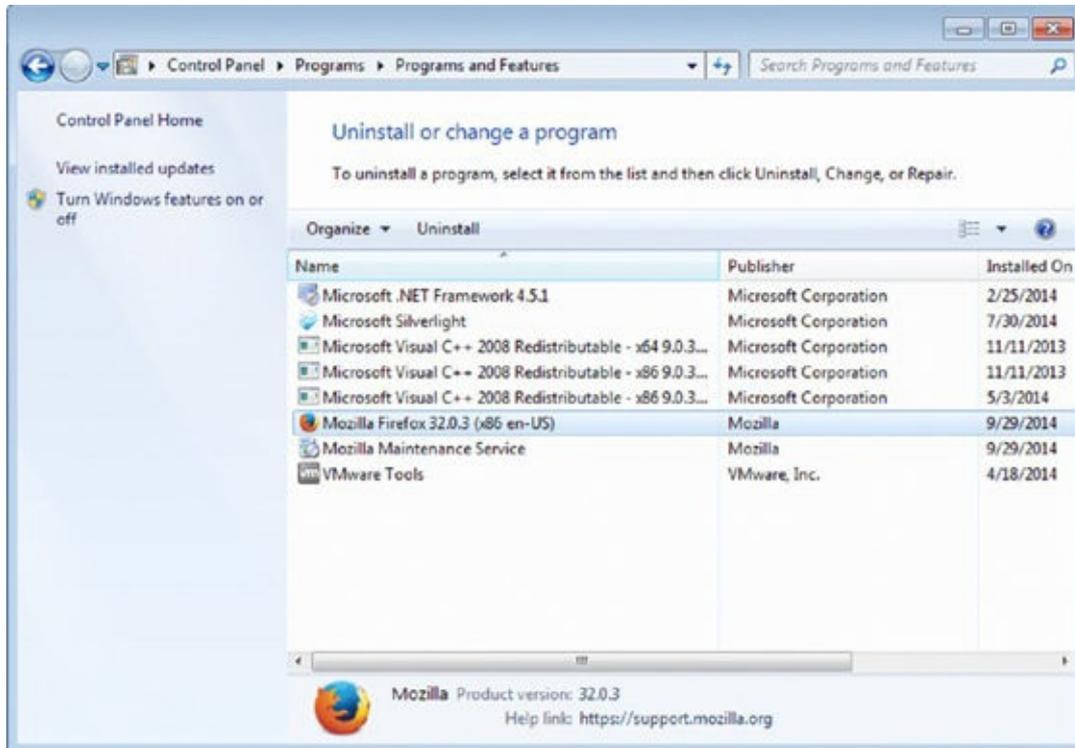
Figure 3.7 The Programs And Features panel in Windows

If you select each installed program one by one, you will notice that the toolbar at the top of the list displays different buttons for each application:

Uninstall Triggers the uninstall program for the application that you have selected.

Change Triggers the setup program that allows you to change how the selected application is installed on your computer (Figure 3.8).
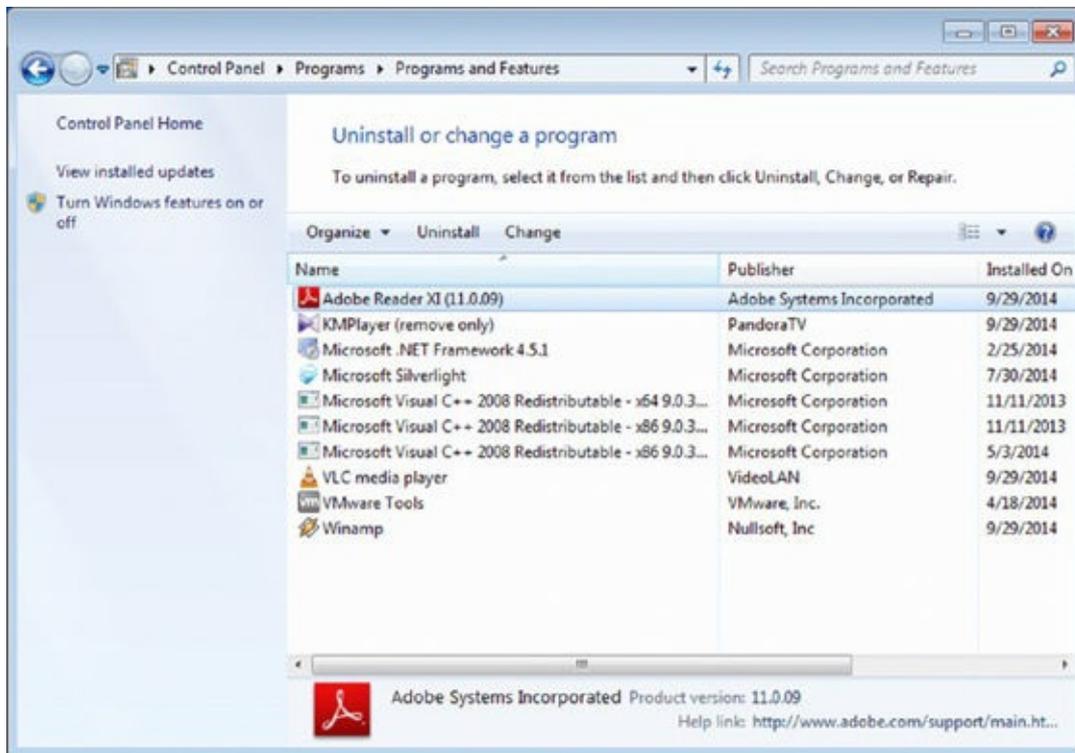
Figure 3.8 The Change button in the Programs And Features panel

Repair Triggers the setup program that allows you to repair the selected application. A typical repair reinstalls the application and all its files and settings (Figure 3.9).
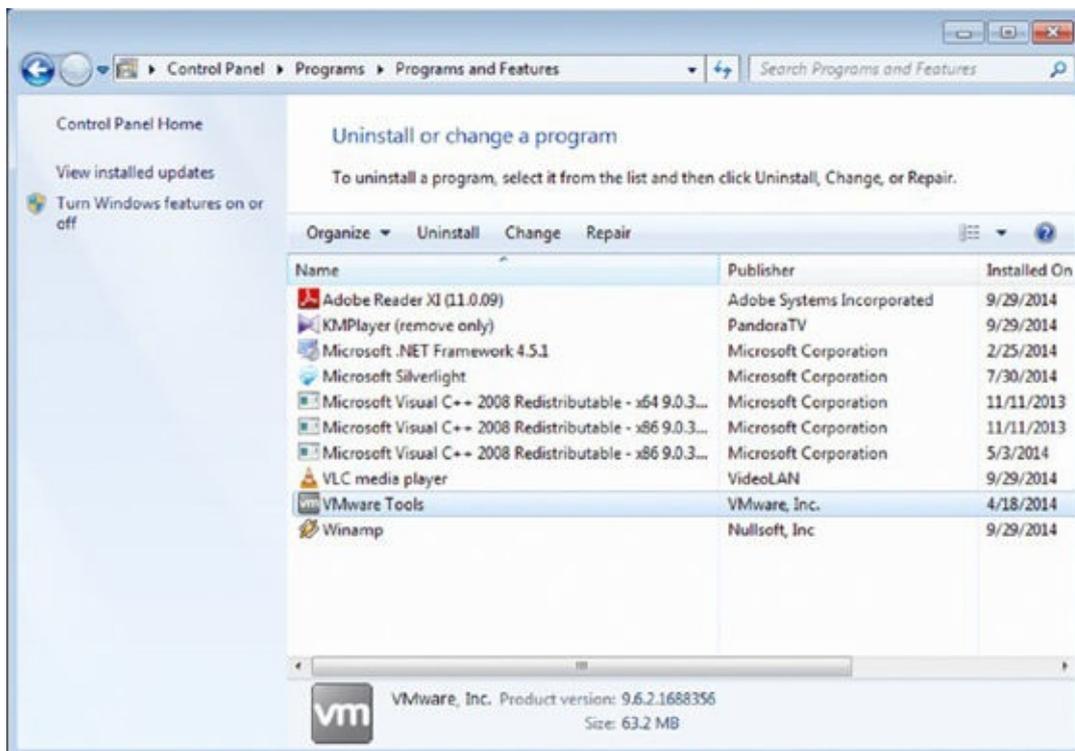
Figure 3.9 The Repair button in the Programs And Features panel

Uninstall/Change Triggers the uninstall program for the application that you have selected, which allows you to remove it or change the way it is installed on your computer (Figure 3.10).
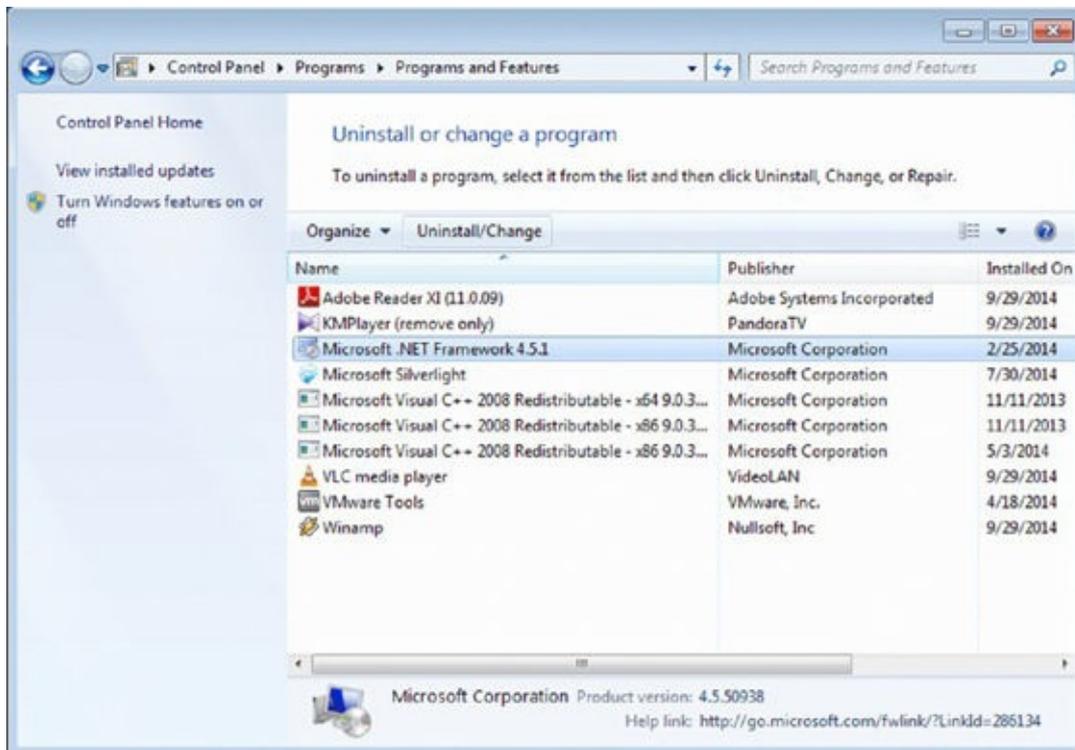
Figure 3.10 The Uninstall/Change button in the Programs And Features panel

For most applications you will see only the Uninstall button. For some applications you will see the Uninstall/Change button, while for others you will see two or three buttons: Uninstall, Change, and/or Repair. This varies from application to application, depending on how it was created by its developer.

To help you get a better understanding of the steps involved when uninstalling an application, work through Exercise 3.2 and uninstall Mozilla Firefox.

EXERCISE 3.2

Uninstalling an Application Like Mozilla Firefox

1. Make sure that Mozilla Firefox is not running. Close it if it is running.

2. Click Start and then Control Panel.

3. Under Programs, click the Uninstall A Program link (Figure 3.11).
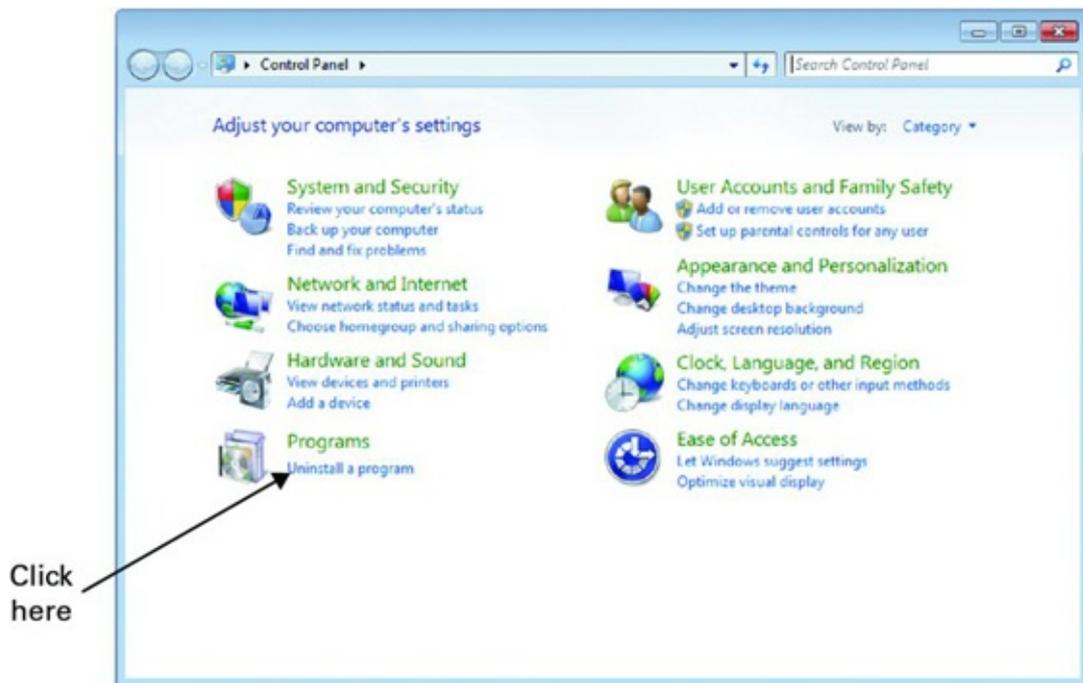
Figure 3.11 Control Panel

4. In the Programs And Features window, select Mozilla Firefox ([Figure 3.12](#)).
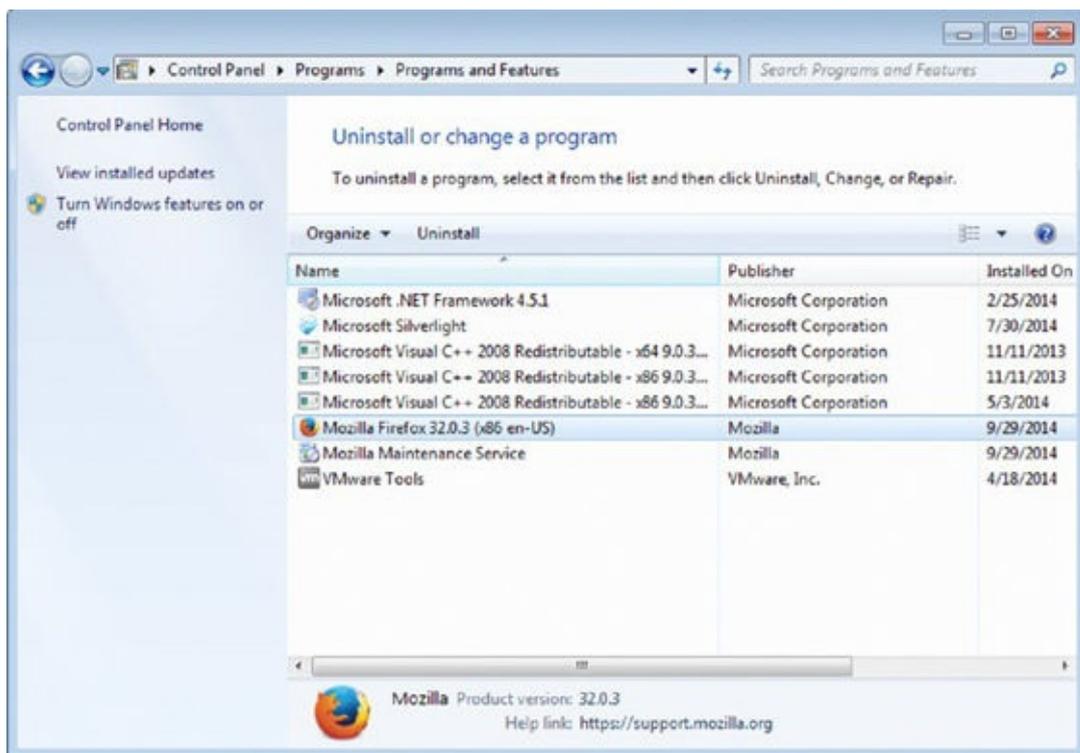
Figure 3.12 The Programs And Features panel

5. Click Uninstall. The Mozilla Firefox Uninstall Wizard is now started ([Figure 3.13](#)).

Figure 3.13 The Mozilla Firefox Uninstall Wizard

6. Click Next.

7. You are informed that Firefox will be uninstalled from the location where it is currently installed. Click Uninstall ([Figure 3.14](#)).
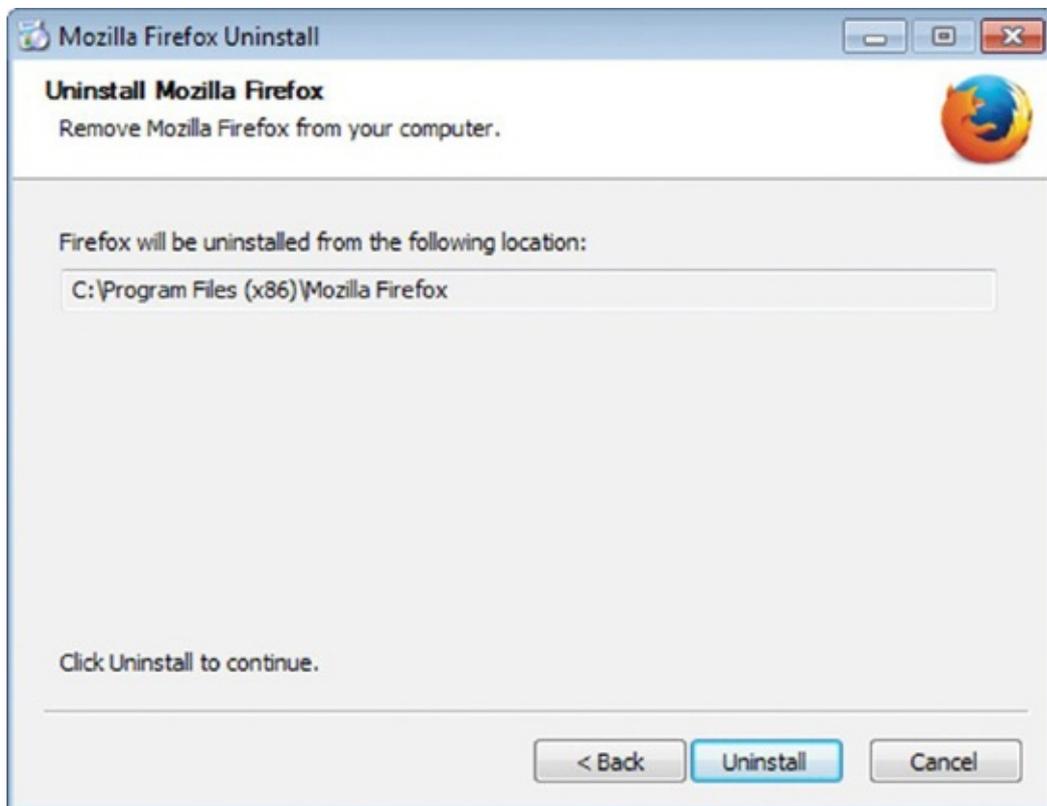
Figure 3.14 The Mozilla Firefox uninstall location

8. When you are informed that Mozilla Firefox has been uninstalled from your

computer, click Finish (Figure 3.15).
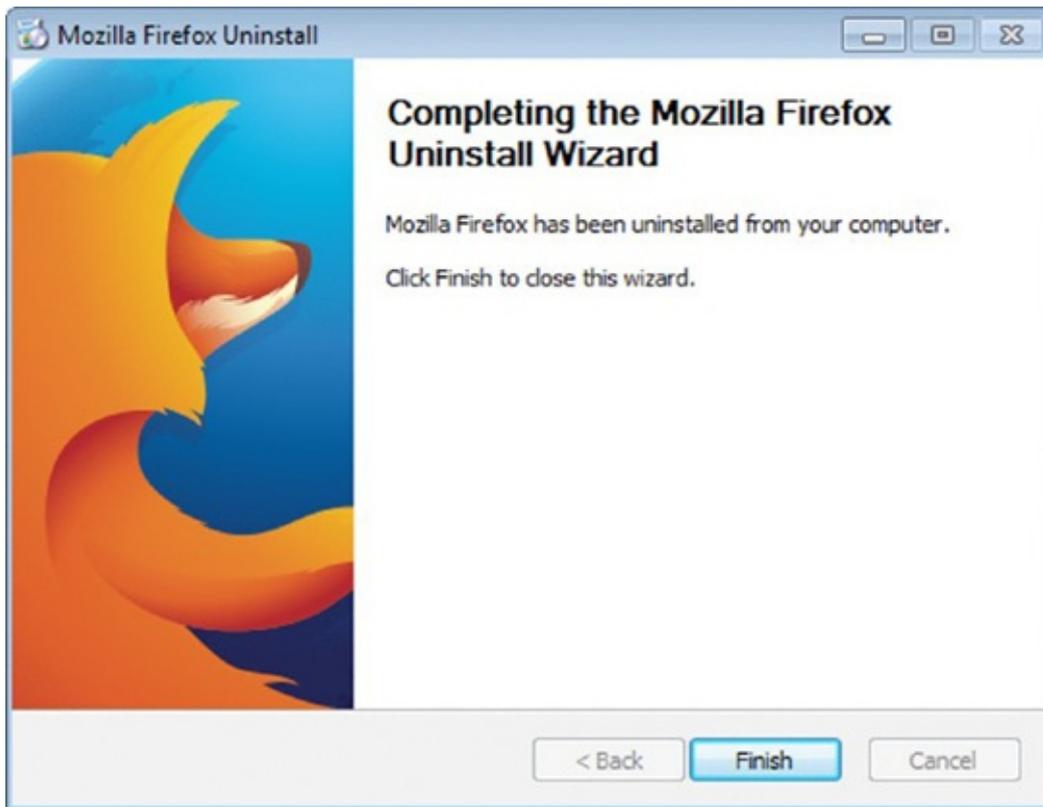
Figure 3.15 Finalizing the Mozilla Firefox uninstall process

One thing you may notice when installing drivers for your computer's hardware components is that they tend not to be listed in the Programs And Features window from which you uninstall software applications. This is because once a driver is installed, it is best to leave it installed so that the operating system can use it. If a new version of a driver is available for a hardware component, you can simply install it and the old driver version will be automatically replaced by the newer version.

Software Licensing and Its Implications

Each time you install a software application or driver, you will go through a step that requires you to read and accept the end-user license agreement (EULA) or software license agreement. This step is mandatory when dealing with software installations because the *EULA* is the contract between the company that published the software you want to use and you, the user. The EULA communicates the license used by the application you are installing. It gives you the right to use the application in some manner while also stating the restrictions that are imposed by the software publisher. In the screen capture shown in Figure 3.16, you can see a portion of the EULA for the popular Winamp music player.

Figure 3.16 The Winamp license agreement

EULAs are not legally binding contracts. The software publisher seeks the user's agreement to its requirements prior to installing and using the software. When the user agrees to the specified terms, they are purchasing or renting a license from the software publisher. Without accepting the EULA, the user cannot install and use the software.

Does Anyone Read EULAs?

One of the most criticized aspects of end-user license agreements is the fact that they are often too long and users don't take time to read them. Sometimes they are also filled with legal jargon that may be hard to understand for a person without any legal background or studies. That's why most users blindly accept the EULA for the software they want to install and use, and they do not know their rights and limitations when using it.

An important caveat of EULAs is that they tend not to protect the user, only the software publisher that owns the copyright. Also, EULAs are not designed to be any kind of warranty. Most software sold at retail disclaims any warranty on the performance of the software and limits liability for any damages to the purchase price of the software.

When dealing with software license agreements, you will encounter three major types of licenses:

Proprietary Licenses The software publisher grants the use of one or more copies of its software under the end-user license agreement, but the ownership of those copies remains with the software publisher. The user can use the software only under certain conditions and is restricted from modifying, sharing, or redistributing the software. Here are some of the most common restrictions that are imposed by proprietary licenses:

- Only a specific number of installations may be allowed per user. For example, the software may be licensed for use on only one computer, and the user may install it as many times they want on that computer. However, installing it on a second or third computer requires the purchase of another license. Retail versions of Microsoft Office generally have such restrictions.

- Only a specific number of users are allowed to use the software. Licenses that involve this type of restriction are called *per-seat licenses*. This type of licensing and restrictions is common for products used by specialized professionals in industrial settings: designers, chemists, biologists, researchers, and the like. For example, an institution may purchase a 10-seat license for a specialized software application, which means that a maximum of 10 users can use it. A user may be a person, another application, or a device accessing that application.

- Only a specific group of users can use the software. This type of licensing is typically applied to business, government, and educational institutions. An organization purchases a volume license or a site license of a software application. The organization is allowed to install the software in its sites or facilities, and the license restricts the use of that application to only the users who are part of that organization. The Windows operating system is generally licensed this way to organizations.

- The user can use the software for free for a limited time, and in order to continue using it, they must pay the license fee. This type of software is called *shareware*, and its purpose is to give potential users the opportunity to try out the application on a limited basis, for a limited time, and to judge its usefulness before purchasing a license for the full version. Once the free trial period has passed, the application may stop running until a license is purchased or may continue to run with limitations (for example, the inability to save your work) until a license is purchased. The most popular example of shareware is computer games. Many games have a shareware version that's available for free so that users can try it and see if they enjoy playing it before purchasing the full version.

- The user can use the software only after paying a subscription fee. It is sometimes referred to as software as a service (SaaS) or on-demand software. Many business applications are licensed this way as well as an increasing number of consumer applications. This type of licensing involves a monthly or annual subscription fee.

When the subscription expires, the user has to renew it and pay another fee in order to continue using the software. The best known example of such software is Office 365, from Microsoft. Most proprietary licenses are perpetual, meaning that there is no time limitation involved when using the software. The advantage of subscription-based licensing is that the monthly or annual fee is a lot more affordable than traditional perpetual licenses. Users have to pay for software only for as long as they need to use it.

Proprietary licenses can combine multiple types of restrictions. For example, some software licensing may involve restrictions for both time and number of users. Other licensing may involve restrictions for both number of users and number of installations.

Freeware This type of license doesn't involve any monetary cost for the user but restricts the usage rights in ways that are similar to proprietary licenses. For example, some freeware software is fully functional for an unlimited time but doesn't allow the user to modify it or redistribute it. Other freeware has only basic functions enabled, but fully functional versions are available commercially, under typical proprietary licenses. The software publisher may also restrict the user from copying, distributing, modifying, or making derivative works of that software. One of the most popular examples of freeware is the Google Chrome web browser.

Open-Source Licenses Either these types of licenses have minimal requirements that affect how the software can be redistributed to other users or they don't involve monetary costs for their users or they preserve the freedoms that are given to the users. The most popular free software licenses are the following:

GPL (GNU General Public License) This free software licensing guarantees end users the freedoms to use, study, share, and modify the software they are using. The most popular example of GPL software is the Linux operating system. Many distributions like Ubuntu Linux and Linux Mint are distributed using a GPL.

MIT License This license originated at the Massachusetts Institute of Technology (MIT), and it permits reuse within proprietary software provided all copies of the licensed software include a copy of the MIT license terms and the copyright notice. Many software development tools are licensed using an MIT license.

Free Software vs. Commercial Software

There is a never-ending debate about whether people should use free and open-source software instead of commercial software with proprietary licenses. Unfortunately there is no clear-cut answer, and choosing the software that you want to use depends on a mix of factors like financial costs, the level of support you receive, the alternatives that you have, and so on.

Free and open-source software has the advantage that it doesn't require a direct monetary cost for the user in order to use it. Also, it tends to protect the user's rights a lot more than proprietary software, at least from a licensing perspective. Open-source software tends to adopt new trends and technologies faster than commercial software with proprietary licenses. Because open-source software is free, it means that it is developed by a community that's not interested in making money from the software but rather in developing the product as much as possible, as fast as possible. This is the reason why you will encounter many great open-source applications like the Mozilla Firefox web browser, many different versions and distributions of the Linux operating systems, or office applications like LibreOffice.

There are also disadvantages to using open-source products instead of proprietary software. For example, some open-source applications are of lower quality than proprietary alternatives because they are developed and maintained by a small number of people, with limited time and resources available. Large companies may develop higher-quality software because they can involve more people and resources in their software development process.

When using open-source software, there's no company responsible for the product that you are using. This means that if you encounter problems and issues, there's no company to go to and ask for help. You are dependent on the community that is developing that software, and it may or may not help you. This is generally a problem for business environments, and many companies prefer proprietary software for this reason.

Another argument against using open-source software, especially in business environments, is that while it doesn't incur monetary costs to install and use it, that doesn't mean that it is free. Because open-source software is not so widely used as proprietary software and it is generally developed by small communities of software developers, you may not have access to complete product documentation, training materials, or support services. Having all of these elements in place involves costs for the company, which sometimes may be higher than when using proprietary software.

As you can see, there is no right answer to which type of software you should use. Before making a decision, you must balance your needs as a user with the alternatives that are available and the costs involved when choosing one type of software versus another.

The Most Common Types of Office Applications

Whether you are at home or at work, in order to use your computer productively, you will need to install and use a suite of office applications. The most popular suite is Microsoft Office, and it includes a diverse number of applications, depending on the exact version you are using. Most office suites will include the following types of applications:

Word Processing Program These applications allow users to compose, edit, format, and print written documents. Modern word processors permit the use of specific fonts, can perform spell checking and grammar checking, and include automatic text correction and other advanced features. The most popular examples of word processors for Windows are Microsoft Word (included in Microsoft Office) and Writer (included in LibreOffice).

Presentation Program These applications allow users to display information in the form of a slide show. They permit users to insert formatted text, images, videos, and sound and arrange everything into a slide-show system to display this content. The most popular examples of presentation programs are Microsoft PowerPoint (included in Microsoft Office) and Impress (included in LibreOffice).

Desktop Publishing Application These applications generate layouts and produce typographic-quality text and images that are comparable to traditional typography and printing. This type of application allows users to produce a wide variety of materials ranging from magazines to books to promotional posters. Some of the most popular desktop publishing applications are Adobe InDesign, CorelDraw, and Microsoft Publisher (included in some versions of Microsoft Office).

Spreadsheet Program These applications can be used to organize, analyze, and store data in tabular form, using rows and columns. They are computerized simulations of paper accounting worksheets. Modern spreadsheet programs can have multiple interacting sheets filled with data and can display the data as text, numerals, or graphics. When using spreadsheet programs, it is very easy to perform mathematical, statistical, or financial operations. The most popular examples of spreadsheet programs are Microsoft Excel (included in Microsoft Office) and Calc (included in LibreOffice).

Database Management System Any company will use one or more databases to collect and store data about its operations. Databases are organized collections of data. They are created to collect large quantities of information; in order to use the data in a meaningful way, a database management system is required. This system provides an interface between the users and the database. There are many types of databases and database management systems. Two examples of database management systems are Microsoft Access (included in most versions of Microsoft Office) and Base (included in LibreOffice).

Personal Information Manager These are applications that function as a personal organizer. They allow users to store, organize, and share different types of personal information: documents, address books, significant calendar dates (birthdays, meetings, and appointments), reminders, email messages, fax communications, and more. The most popular application of this type is Microsoft Outlook (included in some versions of Microsoft Office).

Other suites of office applications may include applications for making diagrams and flowcharts (for example, Microsoft Visio, LibreOffice Draw) or for managing projects (for example, Microsoft Project).

Databases vs. Spreadsheets—Which Is Best at What?

Although the tables in a database look similar to spreadsheets in the way they are organized, they are not the same, and they should be used for different purposes.

First of all, databases are used to store raw data, while spreadsheets are used to store formatted data. There is no need to format the information in a database table. In order to view the information from a database, you must create reports, which then display the data in a human-readable format. Spreadsheets are formatted during the data-entry process so that users can understand and use them as soon as they are created.

Databases are optimized for entering, storing, and managing large amounts of data. Doing the same with spreadsheets is unmanageable. Spreadsheets are best used when working with limited data sets that one person can easily manage.

Another important difference is that databases make it easy to maintain data, but doing the same with spreadsheets is difficult and requires lots of manual intervention.

One advantage of spreadsheets over databases is that spreadsheets allow quick analysis and the creation of what-if scenarios that simulate what will happen in different situations based on existing data. Such analysis can be done when working with databases, but it generally requires custom tools and reports that are built specifically for that database. Spreadsheets are created and optimized for performing quick analysis and calculations for all kinds of data sets.

Finally, databases allow multiple users to work with them at the same time and perform different tasks ranging from data entry to data maintenance and reporting. Although it is possible to work collaboratively on spreadsheets, it is a lot more difficult for concurrent users to use the same spreadsheet.

Using Templates to Get Started with an Application

Many applications offer a variety of predefined templates that allow you to be more productive and create needed documents, spreadsheets, or presentations faster than if you had started from scratch.

For example, Microsoft Excel has plenty of templates for creating things like budgets, inventories, invoices, reports, time sheets, and so on. You browse through the available choices, select the predefined template that you want to use, wait for it to download, and then start creating your spreadsheet. The great thing about templates is that they are preformatted and populated with standard fields of data. You just enter your own data, make some minor adjustments, and you are finished. You don't have to create everything from scratch.

The same goes for Microsoft Word, PowerPoint, and other applications in the Microsoft Office suite. To give you one last example, Microsoft Word has templates for things like agendas, cards, certificates, contracts, letters, job descriptions, memos, resumes, and so on.

To help you get a better understanding of templates and how they work, go through Exercise 3.3 and use a resume template in Microsoft Word to help you create your resume faster.

EXERCISE 3.3

Using a Template in Microsoft Word

1. Click Start and then All Programs.

2. Click Microsoft Office and then Microsoft Word 2010 (Figure 3.17).
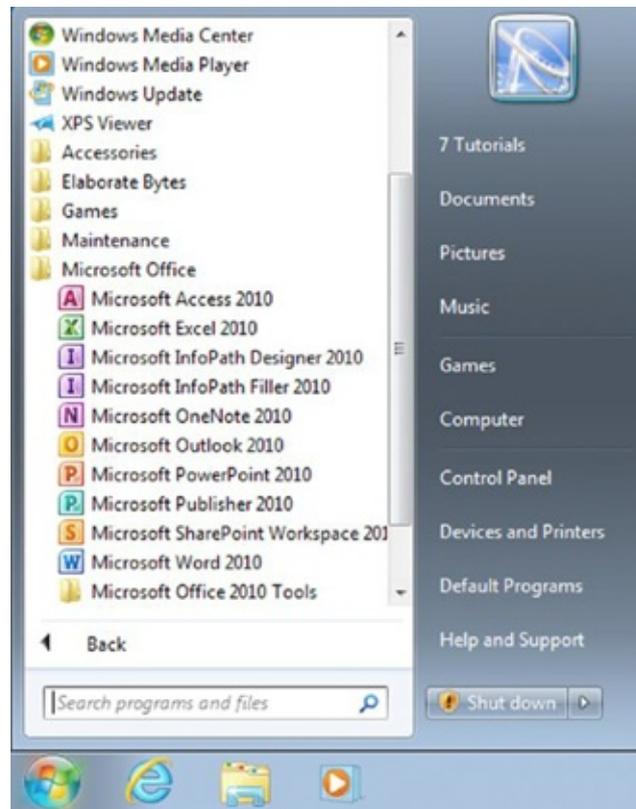
Figure 3.17 The Start menu

3. In the Microsoft Word window, click File and then New. A list of all the available templates is now loaded.

4. Scroll down until you find Resumes And CVs and click it (Figure 3.18).
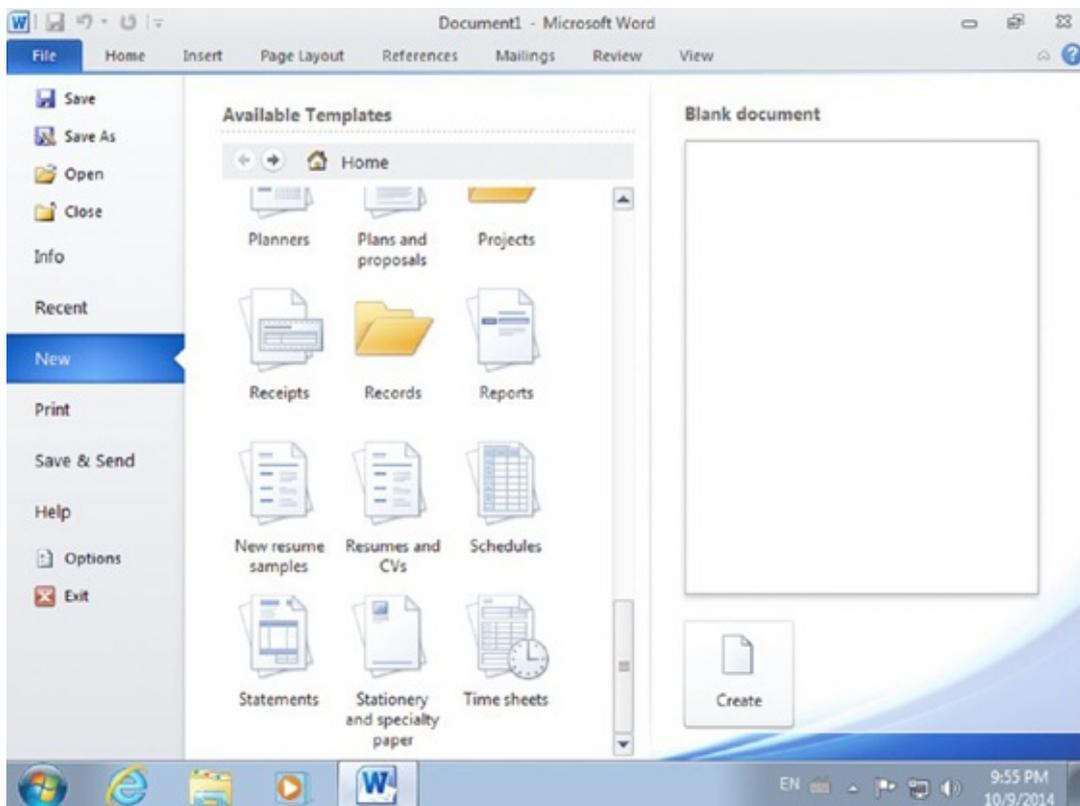
Figure 3.18 Creating new documents in Microsoft Word

5. Click Basic Resumes and then double-click Chronological Resume (Traditional

Design). The selected template is downloaded into Microsoft Word (Figure 3.19).
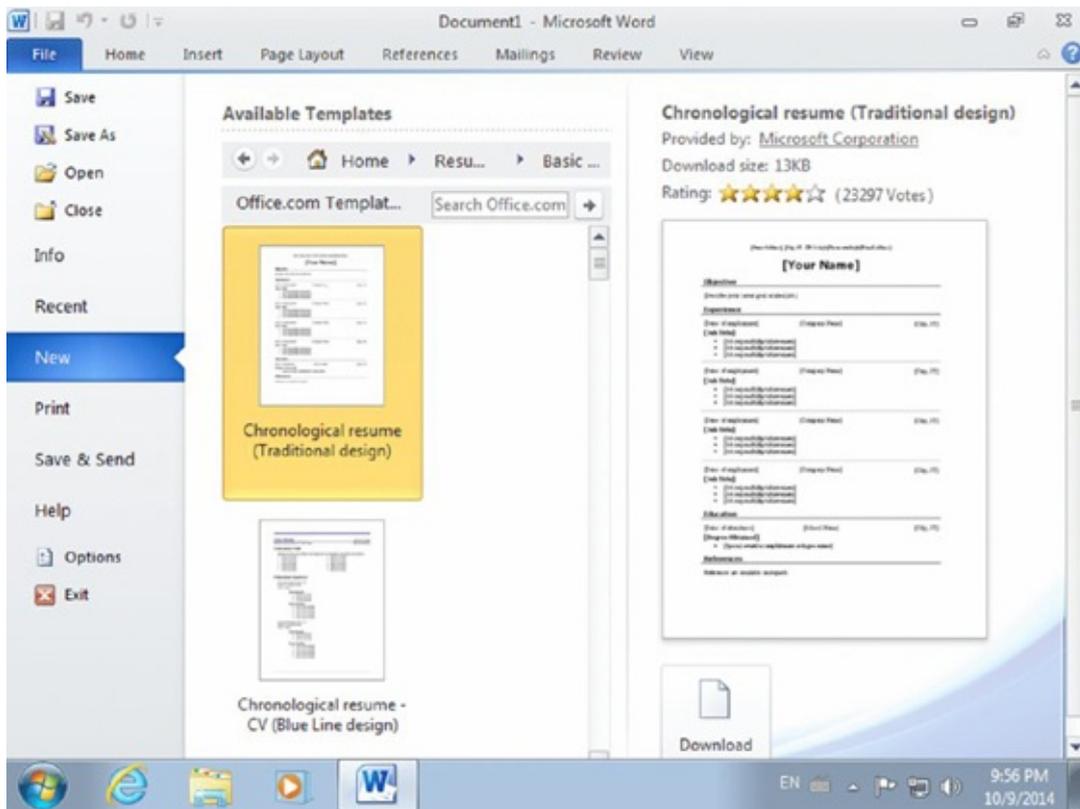
Figure 3.19 Choosing a template in Microsoft Word

6. Scroll down the document, and notice how this template includes the necessary sections and fields for completing your resume.

7. Enter your personal data into the appropriate fields.

   The resume is organized and formatted for you (Figure 3.20).
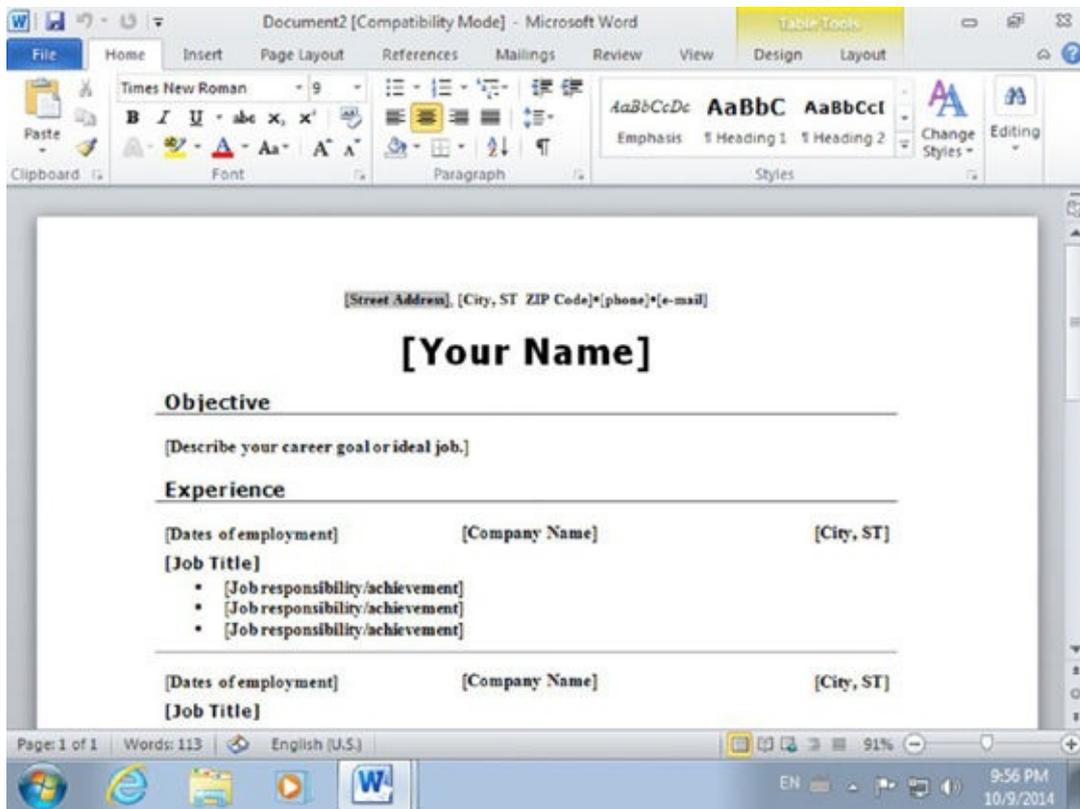
Figure 3.20 A new document in Microsoft Word

8. Close Microsoft Word by clicking the small X on the top-right side of the window.

Personal Entertainment Applications

We use computers and devices not only to work but also to have fun. And having fun means different things to different people. That's why you will encounter lots of entertainment software of all kinds.

For example, if you want to listen to music or watch movies, you may want to use a media player like Winamp, Windows Media Player, or VLC Media Player. You may want to use your computer to view and record live television. You can do so by using programs like Windows Media Center.

Many people have fun playing games on their computers. That's why there are thousands of games developed each year. Yes, Windows does include some casual games like Solitaire, Chess, or Minesweeper, but you may want to play different games, including some with very advanced graphics. You can purchase and install all kinds of games as long as your computer meets their minimum system requirements.

Compressing Files to Save Space

When dealing with large files that take up a lot of disk space, it is a good idea to compress or archive those files so that they take fewer bits than in their original representation. Compression is useful because it helps reduce the space occupied on the hard disk as well as reduce the time it takes to transfer the file from a source to another.

There are two types of compression:

Lossless Some data compression algorithms allow you to compress data without losing information, so you can easily return a file to its uncompressed state. There are many formats and file types for storing compressed data in a lossless way. For example, the PNG and BMP file formats are used for storing images in a compressed, lossless manner. When compressing files of diverse types, they are usually compressed into archives with formats like ZIP or RAR. However, compressing them into these formats requires specialized applications like 7-Zip, WinZip, or WinRAR.

Lossy Such compression algorithms generally drop nonessential data from the source in order to save storage space. This type of compression reduces the file size using approximations of data, and the files are not reversible. However, the compressed file is close enough to the original to make this type of compression worth using. Lossy compression is generally used when working with multimedia files like pictures, videos, and music. For example, JPEG is the most popular lossy compression type for images that allows you to save a lot of space while still having an image that's close enough to the original that your eye won't notice the differences without analyzing it in detail. When working with audio files, MP3 is the most popular type of lossy compression, and when working with video, MPEG is the most popular.

When storing and transferring documents of all kinds, if you want to save space and make file transfers faster, it is a good idea to compress them into one or more archives with a popular format like ZIP. While creating such archives requires you to install specialized software like the popular 7-Zip, extracting their contents is easily done by Windows, without having to install any file-compression application. Exercise 3.4 shares how to extract the contents of any archive in Windows 7. In order to complete this exercise, please download the documents.zip practice file to your computer.

EXERCISE 3.4

Extracting the Contents of a ZIP File Archive

1. Navigate to the location of the documents.zip file that you want to extract.

2. Right-click that file and then click Extract All (Figure 3.21). The Extract Compressed (Zipped) Folders Wizard appears.
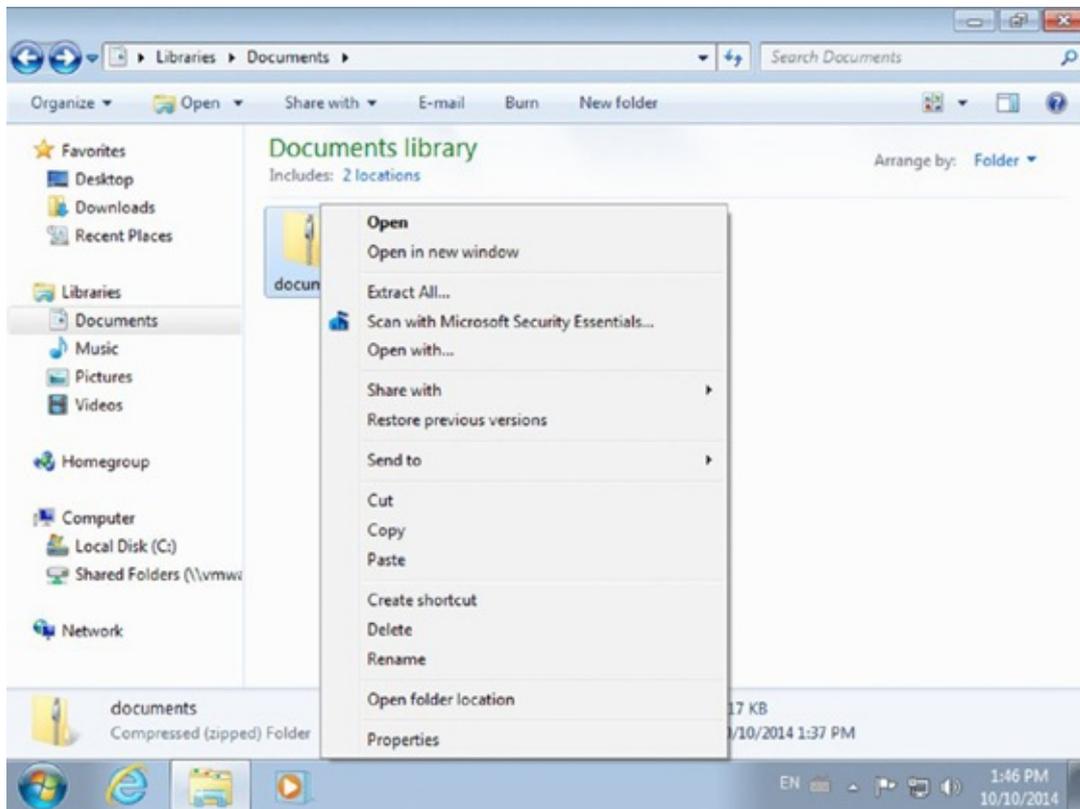
Figure 3.21 The context menu in Windows Explorer

3. Click Extract (Figure 3.22).
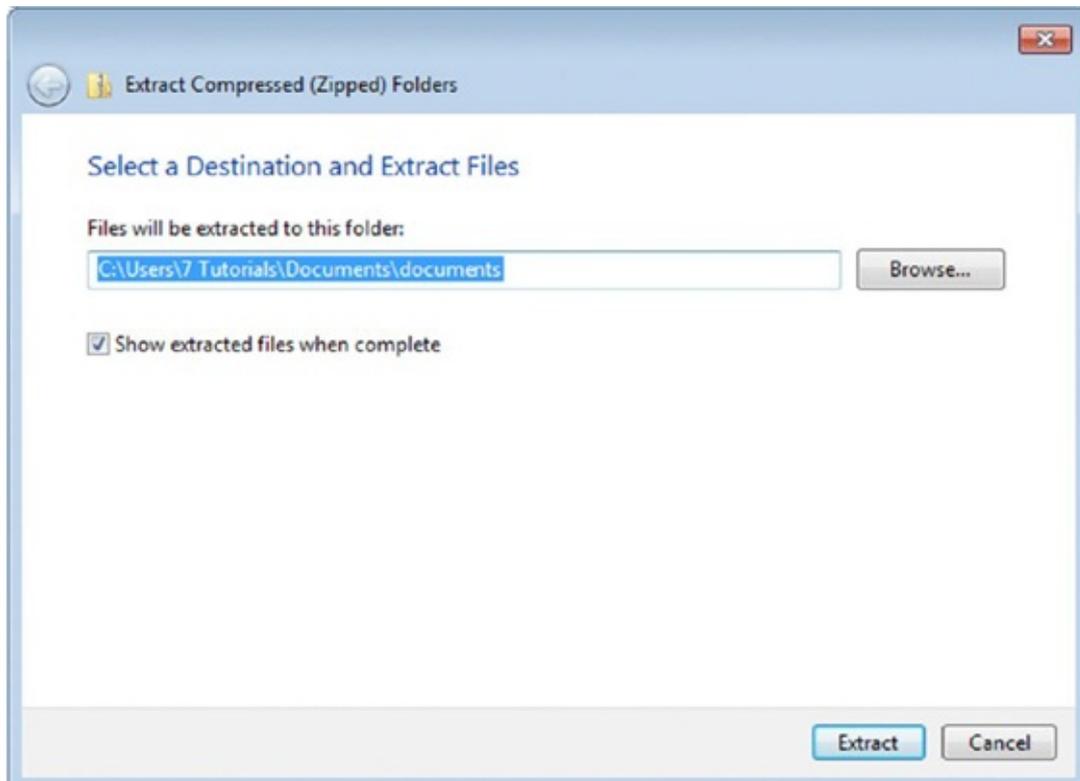
Figure 3.22 The Extract Compressed (Zipped) Folders Wizard

The contents of the archive are extracted and shown. You can now use the files that were inside the archive and modify them as you wish.

Optimizing Your Computer's Hard Disk Performance

When you use your computer, the operating system and your applications generate all kinds of temporary files that are stored in special folders designated for this task. For example, if you browse the Internet and visit several websites, your browser will copy temporary files like images and all kinds of data from those websites. If you work on a document in Microsoft Word, temporary copies of it are stored on the disk so that they can be used in case something goes wrong and you are in danger of losing your data. When installing Windows Updates or new applications, log files are created. You get the idea: when doing any kind of work on your computer, chances are that many temporary files and folders are created, for all kinds of purposes both by Windows and by your applications.

The trouble with these files is that some of them are never deleted from your computer so, as time goes by, you will have less disk space available. In order to help with this problem, Windows 7 includes an application named *Disk Cleanup*. With it, you can remove unnecessary files from your computer: temporary Internet files, deleted files from the Recycle Bin, setup log files, error reports, user file history, and so on. In Exercise 3.5 you will learn how to use it to clean up unnecessary files and save space on your hard disk.

EXERCISE 3.5

Freeing Up Disk Space with Disk Cleanup

1. Click Start and then All Programs.

2. Click Accessories ➢ System Tools ➢ Disk Cleanup ([Figure 3.23](#)).
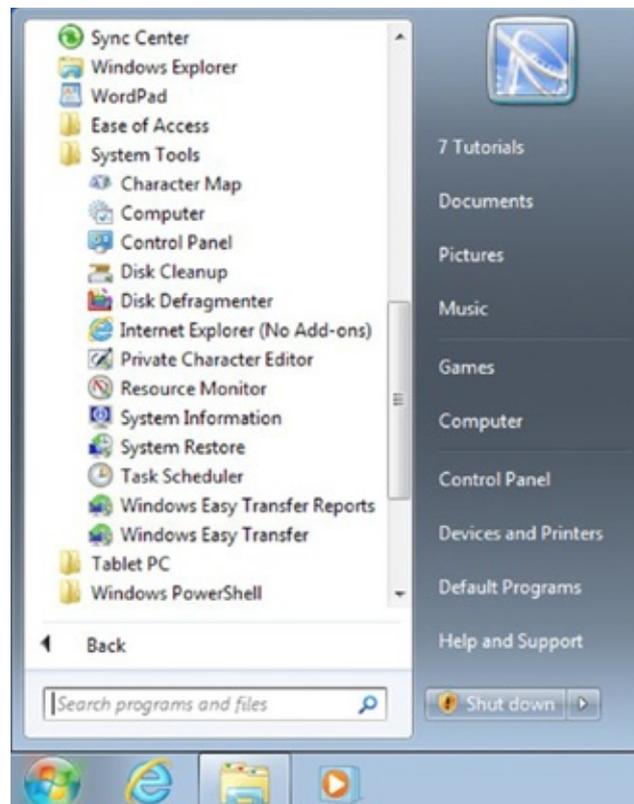
[Figure 3.23](#) The Start menu

Disk Cleanup automatically scans your computer for files that can be deleted. When finished, it displays what it finds.

3. Select the types of files that you want to delete and click OK ([Figure 3.24](#)).
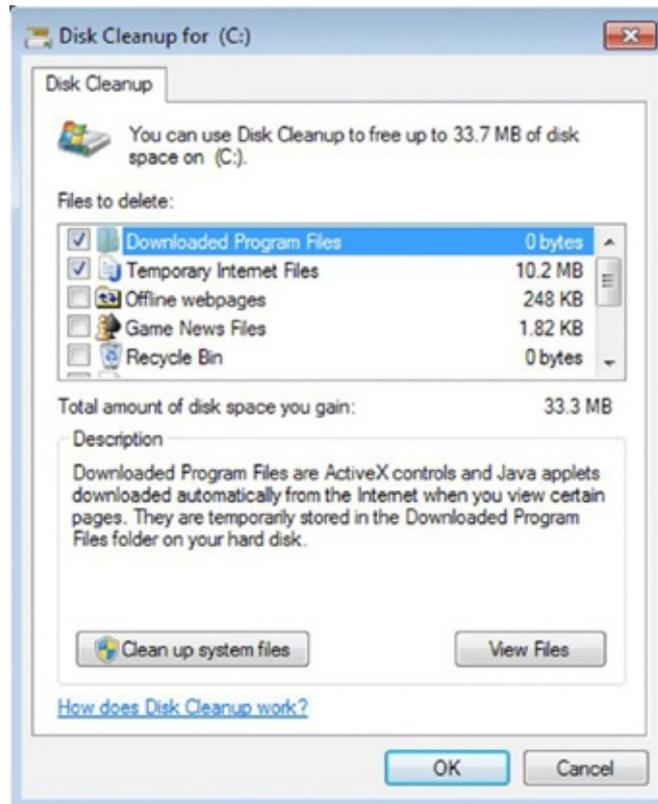
Figure 3.24 Disk Cleanup

You are asked to confirm that you are sure you want to permanently delete those files.

4. Click Delete Files and wait for Disk Cleanup to remove them ([Figure 3.25](#)).
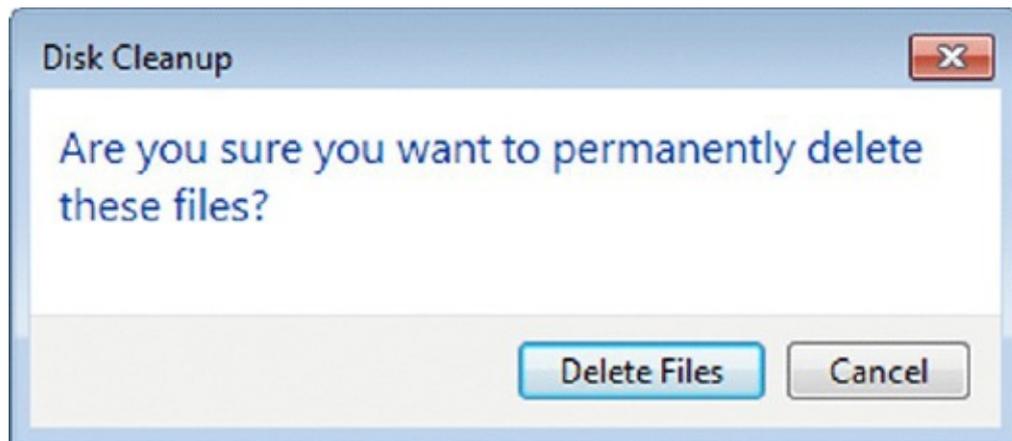
Figure 3.25 Confirmation dialog for Disk Cleanup

When finished, the Disk Cleanup application will close itself automatically.

Another common issue with computers is in the way files are stored on traditional hard disks. Because of the way hard disks work, when you save a file on your computer, it is stored in a specific location on the hard disk. When you make changes to it, those changes

end up being saved in a different physical place on the hard disk. This doesn't change where the file appears in Windows, only where the bits of information that make up the file are stored on the hard disk. As you work with more and more files, they get more and more fragmented. This fragmentation may degrade the performance of your computer. In order to help with this problem, Windows 7 includes an application named *Disk Defragmenter*. With it, you can consolidate all fragmented data on your hard disk. It rearranges the data on your hard disk and reunites the fragmented data so that your computer can run more efficiently.

> Depending on how Windows is set up, this tool may run automatically, once every few days. On other computers it may not. That's why it is best to run it manually at least one time and see whether the disk is fragmented or not.

Exercise 3.6 shows how to use Disk Defragmenter in Windows 7 to improve your computer's performance.

EXERCISE 3.6

Using Disk Defragmenter

1. Click Start and then All Programs.

2. Click Accessories ➢ System Tools ➢ Disk Defragmenter ([Figure 3.26](#)).

   The application opens, and you can see the status of the disks that are found inside your computer.

3. Select the disk that you want to defragment and click Defragment Disk ([Figure 3.27](#)).

   The disk is analyzed and then defragmented, if necessary. When finished, Disk Defragmenter will show you the percentage of fragmentation that's left at the end of its work.

4. Close Disk Defragmenter.
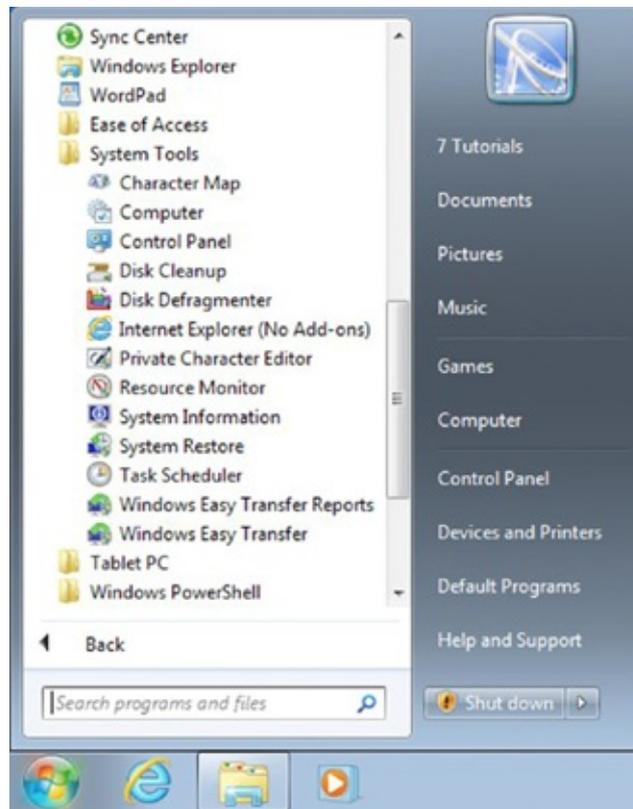
Figure 3.26 The Start menu
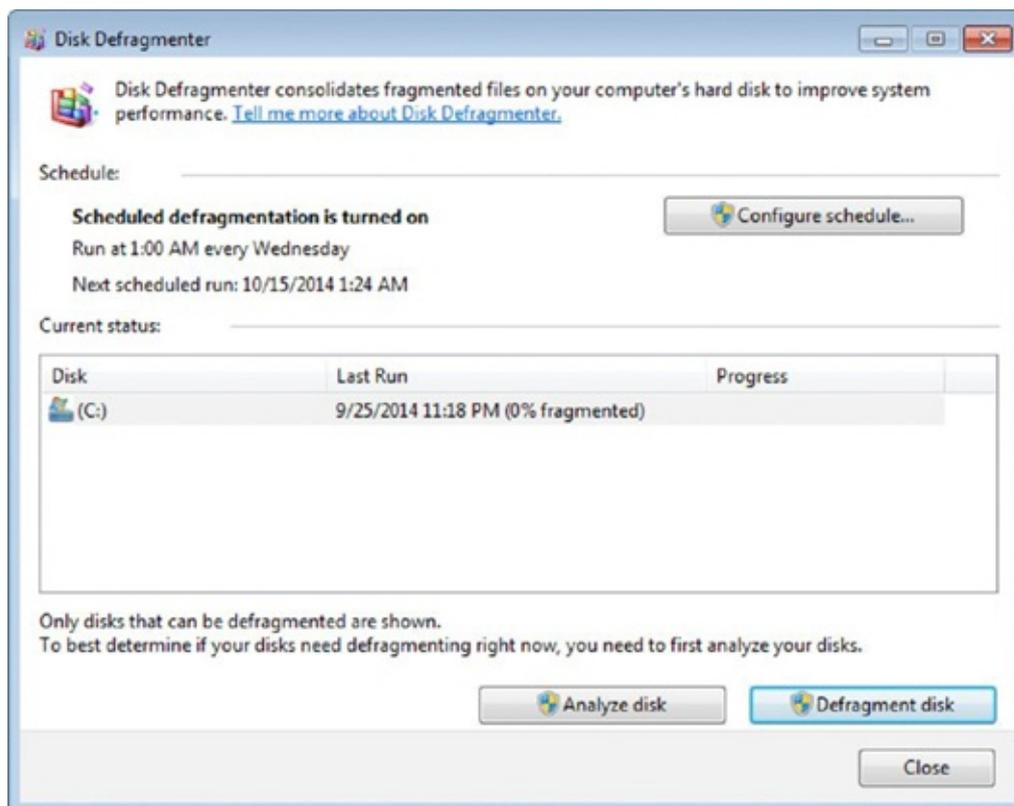
Figure 3.27 Disk Defragmenter

WARNING It is very important to note that fragmentation affects only traditional hard disks because of the way they store data. Modern SSD drives are not affected by fragmentation because they have a different way of storing data. This is why Disk Defragmenter doesn't work on computers and devices with SSD drives. If you force the defragmentation process on an SSD drive, you will lower its life expectancy.

Now that you know the basics of optimizing your computer's performance, let's talk a bit about protecting it from security threats.

Protecting Yourself from Malware

When you use any computer or device and connect it to the Internet, you will expose yourself to all kinds of security threats. Those threats are referred to using all kinds of names, the most popular being *malware* and *viruses*.

Malware is the broadest term when referring to security threats, and it includes any software that is used to disrupt the operation of your computer, to gather sensitive information, or to gain access to private computers. Malware can appear in all kinds of forms and in all kinds of places. It evolves at a very fast pace, and new forms are invented each year. However, when referring to different types of malware, you will most probably encounter terms like the following:

Viruses Viruses are malware applications that, when executed, replicate themselves. They often do harmful things like stealing private information, corrupting data, sabotaging other computers, displaying humorous messages on your screen, or logging your keystrokes. The defining characteristic of viruses is that they self-replicate without the user's consent.

Spyware Spyware is software that aids in gathering information about a person or organization without their knowledge. This software will send the information it collects to another entity without the user's consent.

Keyloggers These are software that records the keystrokes on your keyboard. Generally this type of software is installed without the user's consent, and its purpose is to actively monitor what the user does.

Rootkits This is a stealthy type of malicious software that hides its existence from normal methods of detection in order to run with privileged access to a computer. Rootkits are hard to detect, and they generally gain full control over the infected computer. They are used for all kinds of malicious purposes, from corporate espionage to attacking other computers and systems.

Trojans These are a non-self-replicating type of malware that, when executed, carries the actions that were determined by its creator. Trojans generally mask themselves as legitimate software applications. Once installed, they can be used for all kinds of purposes, including corrupting data, stealing personal information, watching the user's screen and/or webcam, controlling the system remotely, and so on.

To protect yourself from malware, you need to install specialized security software that's used to prevent, detect, and remove malicious software. This type of software is called antivirus, and it provides protection from all kinds of malware.

An antivirus program actively monitors what is going on with a computer, and if it detects any unusual activity, it blocks it or informs the user. Antivirus software also regularly scans your computer for malware, and if it finds any infected files, it removes them.

Antivirus software can be either free or cost money. Generally, free antivirus software offers only the basics in terms of malware protection, things like real-time scanning of your system, manual scans, and malware detection and removal. Commercial antivirus software tends to be more advanced and, alongside the features offered by free antivirus software, includes things like advanced behavioral analysis and rootkit protection.

To keep your computer as safe as possible, you should install at least a free antivirus product. Some of the most popular free antivirus applications are Microsoft Security Essentials, avast! antivirus, and AVG Antivirus Free. If you are willing to purchase a commercial antivirus product, you will have plenty of options to choose from. You should consider products like Kaspersky Anti-Virus, Bitdefender Antivirus, Norton AntiVirus, ESET NOD32 Antivirus, or Webroot SecureAnywhere Antivirus.

Summary

In order to be productive when using a computer, you will need to install all kinds of software applications. The most common type of applications that are installed on computers worldwide is office suites, like Microsoft Office. It is important to learn what each application from this suite does and what it is good at.

When you install software, you first need to make sure that your computer meets its system requirements. If it doesn't have the necessary minimum in terms of hardware and software, it won't run correctly. Then, during the installation process, you will encounter the end-user license agreement. If you don't agree with its terms and conditions, then you won't be able to install and use that software. That's why you should have a good understanding of those terms before purchasing and installing any kind of software.

Obviously, you will also want to use your computer to have fun. You should consider installing a multimedia player on your computer if you want to listen to music and watch videos. Games are also another way you can have fun on your computer, but before installing them, you should make sure that your computer meets the minimum system requirements. Games tend to be more demanding than other types of software, and paying attention to their system requirements is very important for a good experience.

While you work on your computer, both your applications and the operating system will generate all kinds of temporary files that are not always cleaned up automatically. Also, files will become more and more fragmented. That's why you will end up having less disk space available on your computer, and its general performance may decrease in time. With the help of tools like Disk Cleanup and Disk Defragmenter, you can increase the space available on your disk and improve your computer's performance.

Finally, it is very important to understand the risks that you expose your computer to when connecting it to the Internet. There are all kinds of security threats and malware that can infect it and do harm in one way or another. It is important to install an antivirus application on your computer so that you keep it as safe and secure as possible.

Now that you understands the basics of installing and using software, we will discuss ways to troubleshoot and fix problems with your computer. In the next chapter you will learn how to remove malware from your computer, how to figure out what's causing problems on your computer, and how to create your own backup system in Windows.

Exam Essentials

Understand the dependencies between hardware and software. Know what system requirements are and their role in your decision of whether to purchase and install software on your computer.

Know how to install or remove applications. You will need to install plenty of applications on your computer in order to use it more productively. You should know how to install an application and how to remove it when you no longer need it.

Understand the basics of software licensing. Software licensing is a bit tricky, and it is important to know the basics on this subject. You should understand the differences between open-source software and proprietary software as well as the advantages offered by the most important types of licenses.

Know the most important types of office applications. In order to use your computer productively, it is very likely that you will need to install and use an office suite of applications like Microsoft Office. You should know the types of applications that are generally included in such suites and what they are used for.

Know how to save space on your computer and maintain its performance. Over time, you will have less space available on your computer's hard disk. Knowing how to save space using file compression or tools like Disk Cleanup will be very useful. Also, disk fragmentation may lower your computer's performance levels, especially after you have used it for a long time. Knowing how to defragment your files will help you keep its performance at normal levels for a longer time.

Key Terms

Before you take the exam, be certain you are familiar with the following terms:

Applications	MIT license
Database management system	Open-source licenses
Desktop publishing application	Per-seat licenses
Disk Cleanup	Personal information manager
Disk Defragmenter	Presentation program
Drivers	Proprietary licenses
EULA	Shareware
Freeware	Spreadsheet program
GPL (GNU General Public License)	Viruses
Malware	Word processing

Review Questions

1. What do system requirements tell you?

   A. The hardware configuration your computer should have in order to run an application with maximum performance

   B. The minimum hardware configuration and other software resources your computer should have in order to run an application

   C. The best configuration your computer should have in order to run an application

   D. The minimum software configuration your computer should have in order to run an application

2. What are the things you can generally customize when installing an application? (Choose all that apply.)

   A. The installation folder

   B. The EULA

   C. When to remove the application

   D. Which shortcuts are installed

3. Where do you remove installed applications from?

   A. Start ➢ Control Panel ➢ System And Security

   B. Start ➢ Default Programs

   C. Start ➢ Control Panel ➢ Uninstall A Program

   D. Start ➢ Control Panel ➢ Programs

4. What is a EULA? (Choose all that apply.)

   A. The end-user license agreement

   B. The end-user legal advisor

   C. The contract between the company that has published the software that you want to use and you, the user

   D. The contract between the developers of the software that you want to use and you, the user

5. Which of the following is an open-source license? (Choose all that apply.)

   A. Freeware

   B. GPL

   C. Shareware

   D. MIT License

6. Which are the characteristics of spreadsheet programs? (Choose all that apply.)

   A. It is easy for multiple users to work on the same data set at the same time,

performing different types of operations.

B. They are used to store raw data.

C. They make it easy to perform mathematical, statistical, or financial operations.

D. They are computerized simulations of paper accounting worksheets.

7. What are the differences between a desktop publishing program and a word processing program?

A. Word processing programs allow you to compose written documents, whereas desktop publishing programs allow you to produce typographical-quality text and images.

B. Word processing programs allow you to produce books, and desktop publishing programs allow you to create promotional posters.

C. Word processing programs cannot work with images, whereas desktop publishing programs can work with images.

D. Word processing programs allow you to edit words, whereas desktop publishing programs allow you to edit images.

8. Which is an example of a presentation program? (Choose all that apply.)

A. Microsoft Publisher

B. Microsoft PowerPoint

C. LibreOffice Impress

D. Microsoft Word

9. How you can increase the amount of free space available on your computer's hard disk? (Choose all that apply.)

A. Compress large files

B. Delete the files you no longer need

C. Install an antivirus program

D. Run Disk Cleanup

10. What is the main characteristic of a virus?

A. It can corrupt data on your computer.

B. It can log your keystrokes.

C. It can monitor your webcam.

D. It self-replicates without the user's consent.

Chapter 4
Troubleshooting Problems with Your Computer

THE FOLLOWING IC3 GS4: COMPUTER FUNDAMENTALS EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:

✓ **Software**

- Explain the concepts associated with version control of Operating System (OS) software. Further explain how the OS version can affect the compatibility of other software on the PC.

- Demonstrate how to identify and remove a virus or other malware from an infected PC.

- Explain what 'safe mode' is in popular PC operating systems (OSs), and how and when it should be used when troubleshooting problems on a personal computer system.

- Explain where and how to find information beyond that stored on the PC to help troubleshoot problems on a PC. List popular Knowledge base, forums, and self-help web sites and explain how to use them for troubleshooting.

- Demonstrate how to invoke and interpret the information available in a PC's Task, Process, or Application Manager. Further demonstrate how to use this tool when troubleshooting a problem on the affected PC.

✓ **Hardware**

- Explain how different versions of firmware affect performance of hardware subsystems on a PC and how that information may be used in troubleshooting a problem on a PC.

- Explain the role of Cables and other connectors that connect the various parts of a computer together and what can happen when one or more cable or connector does not make the proper connection.

✓ **Devices and Peripherals**

- Explain how different versions of firmware can affect performance of peripheral devices and hardware attached to a PC and how that information may be used in troubleshooting a problem on a PC.

- Explain what a device driver is, how it fits into the operating system architecture, and how incompatibilities may lead to problems. Further explain how this information may be used in troubleshooting a problem on a PC.

✓ **Backup/Restore**

- Demonstrate how to backup and then restore software and data to: Safe offsite location, External drive, Cloud.

- Explain the implications of versioning and re-cycling of backups in an incremental backup system. Explain how to properly restore from an incremental backup

system.

When you use computers on a regular basis, you will encounter problems of all kinds. Some applications might stop working correctly, while others may use way too many resources. Your computer may get infected with malware, putting your data in danger. Windows might suddenly stop working and you won't know what to do to fix it. Hardware components might start to fail or perhaps have bugs that can be fixed only by installing new firmware or drivers. Let's face it: you can encounter problems with computers just as you can with any other tool.

In this chapter we will cover all the basic things you need to know in order to troubleshoot problems at both a software level and a hardware level. Finally, you will learn about several methods that you can use to keep your data safe so that no matter what happens with your computer, you never lose your data. Let's get started.

Dealing with Problems Caused by Software

When you use a computer, you get to install lots of software applications that can be used for all kinds of tasks. Since software is so diverse, chances are that some things might not work as you expect them to. For example, you may want to use an old application that is not compatible with your operating system, or you may use another application that consumes too many of your computer's resources, making it slow down dramatically. Or, while browsing the Internet or checking your email, you may get your computer infected with some harmful virus. The kinds of problems you may encounter are as diverse as the number and types of applications you are installing on your computer.

To give you a hand and help you understand what is going on and how to deal with software-related problems, we will cover several common scenarios that most users deal with at some point when using computers. First, we'll explain how to deal with incompatibilities between the operating system and the applications that a user may attempt to install.

Dealing with Incompatibilities between the Operating System Version and Your Applications

Each new version of any operating system introduces all kinds of changes and advancements. Sometimes, newer versions also introduce problems that did not exist in the previous versions, as well as incompatibilities with older applications. This is why it is very important to keep both your operating system and your installed applications up to date. Both the operating system and the applications you are using need to improve and evolve over time so that you have access to the latest features, bug fixes, and productivity and security improvements.

When you install a new version of Windows on your computer, most of your applications will keep working as they did in the past. However, some of your older software might stop working. These applications just might be too old and outdated, and the new version of Windows introduces enough changes that the old version doesn't work anymore. If this happens, then you need to check for newer versions of those applications that work with your new version of Windows.

While this is OK for home users who install mostly free or affordable software that's easily upgradable on their computers, businesses might have some issues. Applications that are designed for business tend to be more expensive, and upgrading them on a regular basis may incur very high costs for the company. That's why, before upgrading to a new version of Windows, each company must evaluate the compatibility of its applications with that version. To help you with this evaluation, Microsoft has created a website named *Windows Compatibility Center*. You can find it at this address: http://www.microsoft.com/en-us/windows/compatibility/CompatCenter/Home.

If you prefer a shorter address that is easier to type, use this address: http://bit.ly/19fq1xr.

When you visit this website, follow these steps:

 1. Type the name of the application for which you want to check the compatibility with a

certain version of Windows.

2. 2. Press Enter on your keyboard.

3. Select it from the list of results.

4. Select the version of Windows you are interested in.

The Windows Compatibility Center will tell you whether this application is compatible with the version of Windows you selected and whether you need to take any kind of action (see Figure 4.1).

Figure 4.1 The Windows Compatibility Center

If you cannot upgrade a specific application to a newer version that works on your new version of Windows, there's another solution that might help: the *Compatibility Mode* feature that's included in every version of Windows. It allows you to edit the properties of the application that is causing you trouble and set Windows to run it in compatibility mode with an older version of Windows. When you do that, Windows tries to adjust its settings and simulate an environment that is similar to the older version of Windows you selected. In certain scenarios this helps you run older applications that otherwise would refuse to run correctly.

In Exercise 4.1 you will learn how to set the compatibility mode for any application that is installed on your Windows computer.

EXERCISE 4.1

Setting the Compatibility Mode for Any Windows Application

1. Click Start and then Computer.

2. Browse your computer's C: drive and find the executable (.exe) file of the application that is not working.

   Applications are generally installed in the Program Files folder.

3. Right-click the executable file of that application and select Properties ([Figure 4.2](#)).
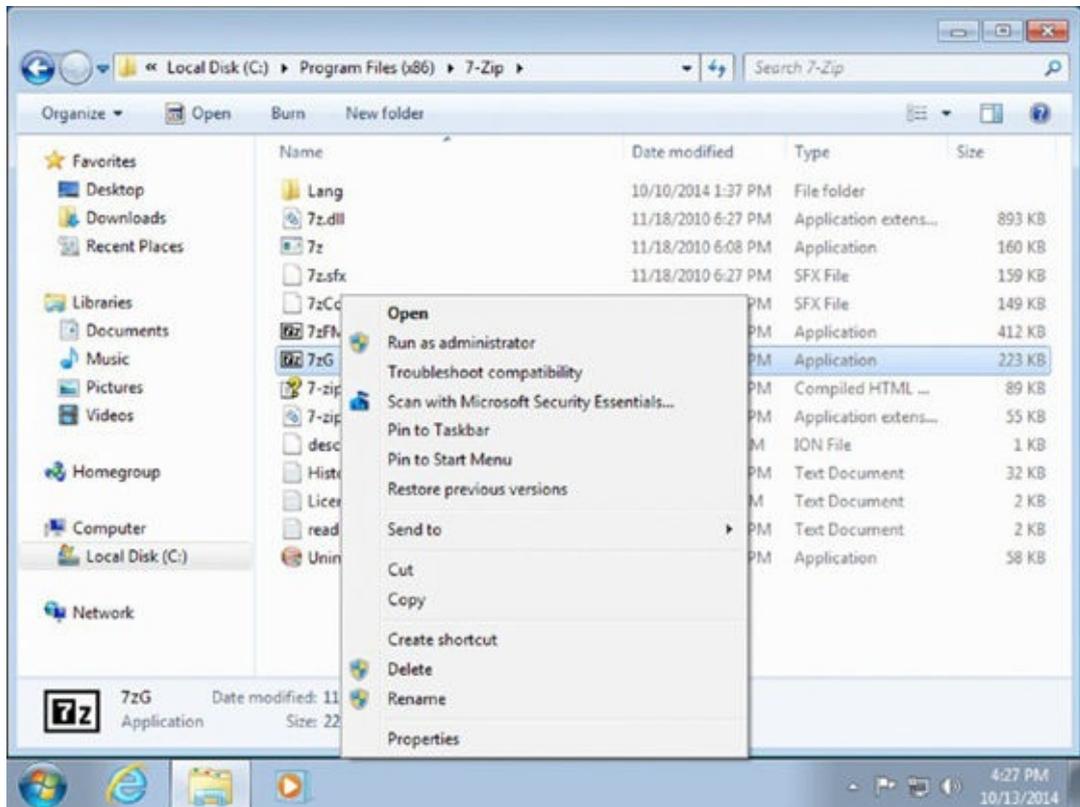

Figure 4.2 The context menu for an executable file

4. In the Properties window of that file, click the Compatibility tab.

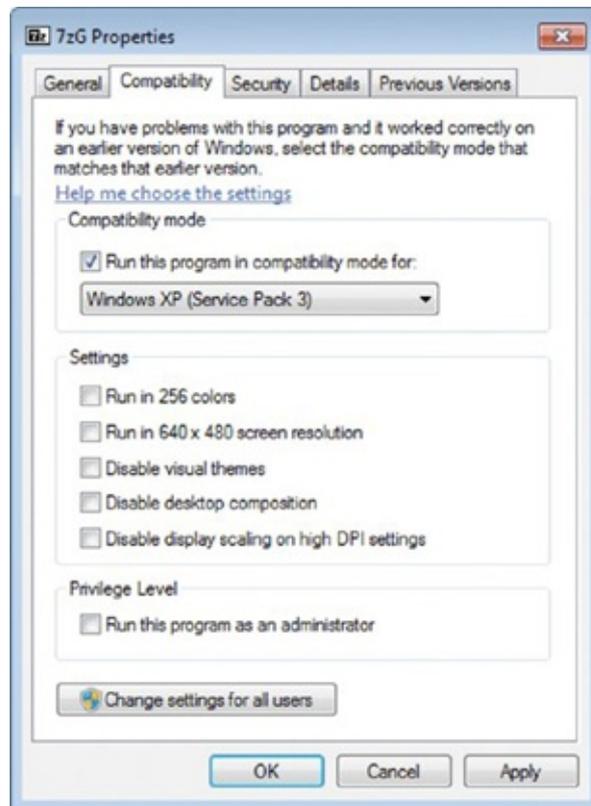5. Check the box that says "Run this program in compatibility mode for" ([Figure 4.3](#)).

Figure 4.3 The Compatibility tab in the Properties window

6. Select the older Windows version on which this application used to work (Figure 4.4).
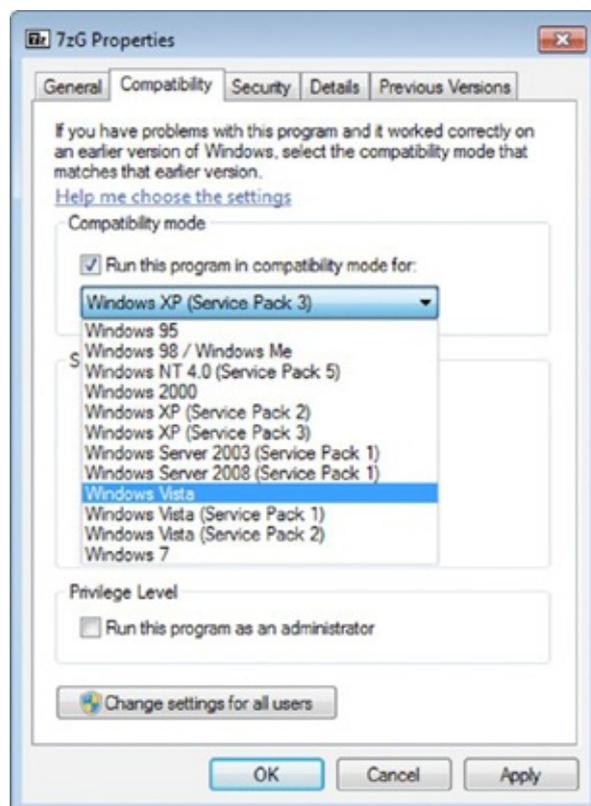

Figure 4.4 Selecting the compatibility mode for a file

7. Click OK.

The next time you run the selected application, it will run in an environment that

Dealing with Unresponsive Applications

While you are using applications on your computer, some may become unresponsive at some point, for all kinds of reasons. For example, the antivirus might scan a file you have opened with another application and the file gets locked out and unusable for a while by that application, causing it to stop working. Or, you may be using an application that requires an Internet connection and the Internet connection drops, causing the application to stop working. This lack of response may last only a few seconds, or it may be permanent. That's why if you notice that an application is no longer responding to your commands, it is best to first wait for a couple of seconds. If nothing changes, then you need to take action.

The reasons why an application may stop working vary. What's common to most unresponsive applications is that they tend to slow your computer down until you force them to close. With the help of the Task Manager, you can force any application to stop and close.

When you open the *Task Manager* and select the Applications tab (Figure 4.5), you will see all the applications that you have started.

Figure 4.5 The Task Manager in Windows 7
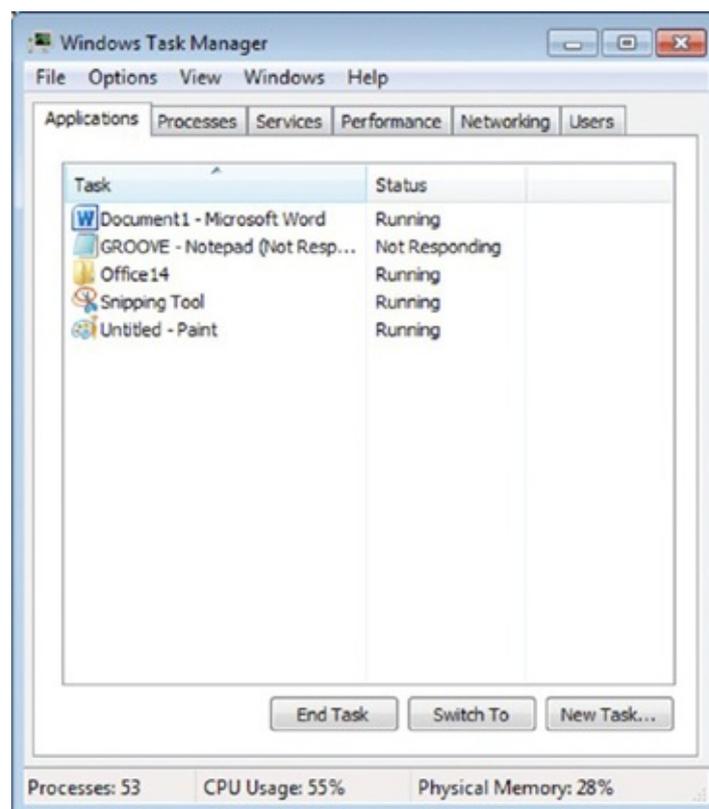
The Task column lists the name of each application, while the Status column shows whether each application is running or not responding. If an application is marked as Not Responding, you won't be able to continue using it, and in order to fix this problem, you need to use the Task Manager to stop it.

In Exercise 4.2 you will learn how to use the Task Manager in Windows to identify

applications that are not responding and how to make them stop and close.

EXERCISE 4.2

Identifying Nonresponsive Applications and Ending Their Functioning

1. When you are using an application that is no longer responding, press Ctrl+Shift+Esc on your keyboard to open the Task Manager.

2. Click the Applications tab and identify the application that is no longer responding.

3. Select it and then click End Task ([Figure 4.6](#)).
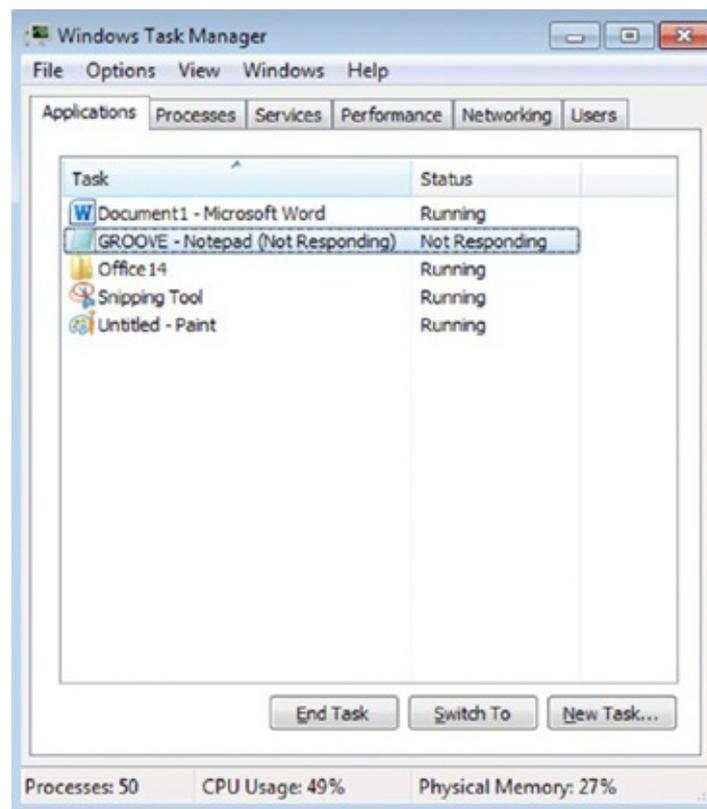

Figure 4.6 Closing an application with the Task Manager

4. Windows 7 will tell you that the selected application is not responding, and you can select what you want to do. Select Close The Program ([Figure 4.7](#)).
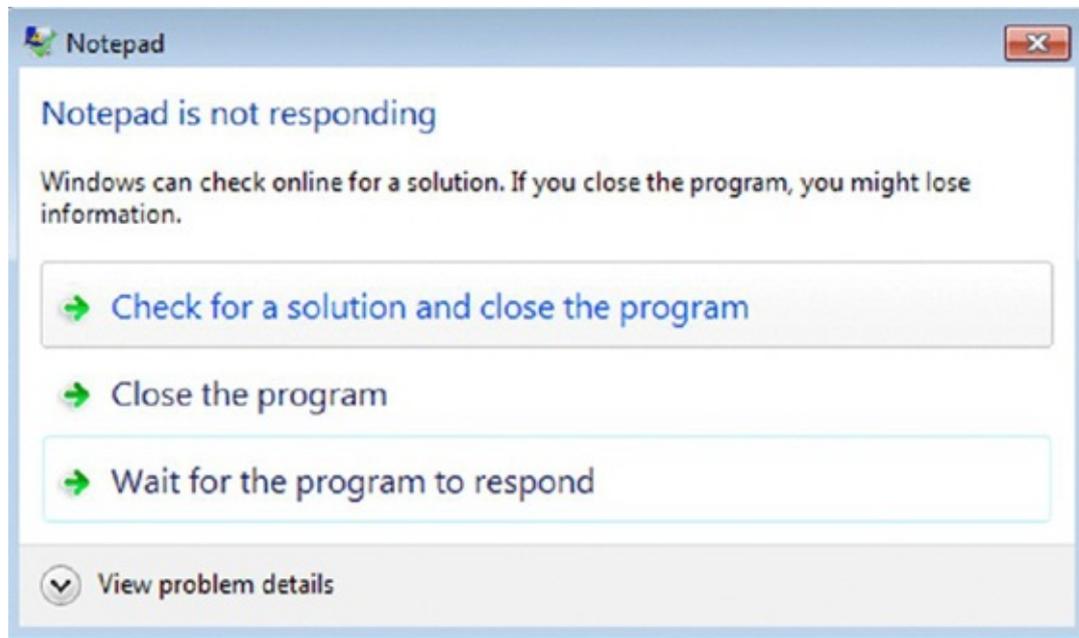
Figure 4.7 The warning shown when a program is not responding

Now that you know how to deal with unresponsive applications, let's discuss another scenario that's likely to happen when you use a computer on a regular basis.

Dealing with Applications That Consume Too Many Resources

Some applications may consume a big percentage of your computer's resources. They won't become unresponsive, but if you want to run other applications at the same time, those other applications will have limited hardware resources at their disposal, and they will work slower than usual. If you open several applications at the same time, your computer will become slow to respond, and all your commands will take a long time to work.

If you are dealing with this scenario, Task Manager is again the tool that can help you. If you open it and select the Processes tab, you will see all the processes that are running. They include both applications that you have started and processes that are run automatically by Windows. In this tab there are several columns with information:

Image Name The name of the process that is running. The process is always named using the name of the file that it is running. When you run an application, you will not see its name but the name of that application's executable file (with .exe at the end of its name).

User Name The name of the user account that started the process.

CPU The percentage of your computer's processor power used by the process.

Memory The amount of RAM used by that process. This is generally measured in kilobytes.

Description A description of the process. In the case of applications, you will see the name of the application that started the process.

By default, Task Manager displays only the processes that you have started or that Windows has started automatically for your user account. If you want to see all the

processes that are running on your computer, including those started by other users, click the Show Processes From All Users button (see Figure 4.8). Task Manager will now display all running processes, from all user accounts.
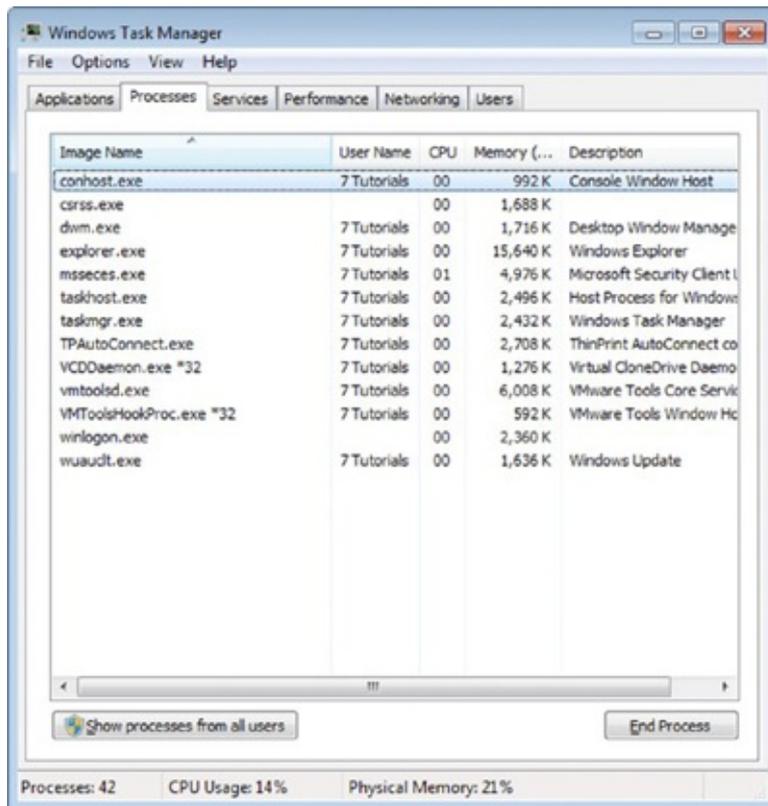

Figure 4.8 The Task Manager showing running processes

If you want to identify the process that is using the biggest share of your computer's processor power, follow these steps:

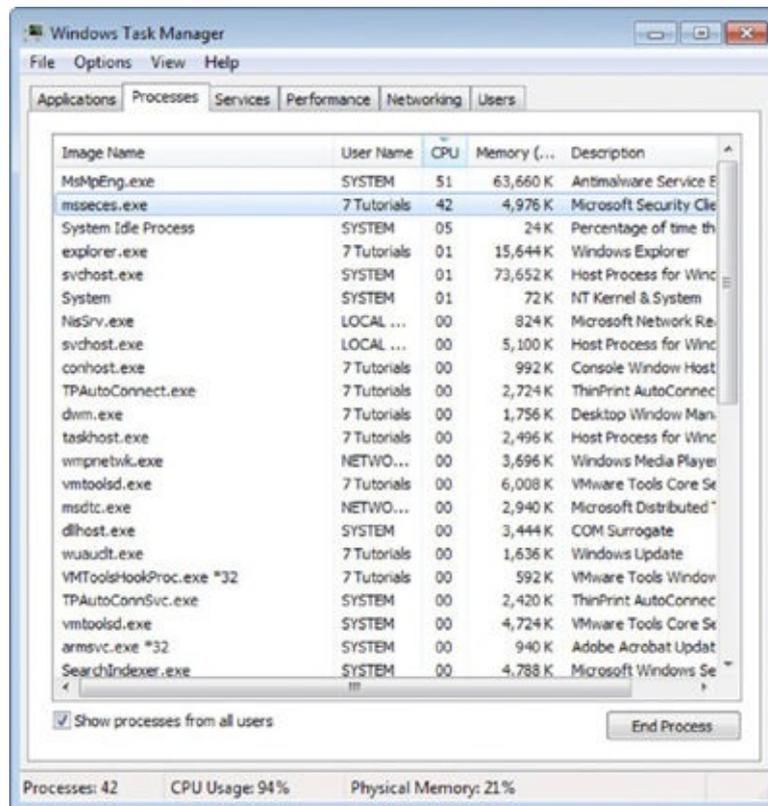1. Click the CPU column to sort it in descending order (see Figure 4.9).

Figure 4.9 The Processes tab in the Task Manager, sorted by CPU use

You will first see the processes that are using the most of your computer's processor.

2. Click this column again, and you will sort it in ascending order with the processes that use the fewest resources listed first.

3. If you want to identify the applications that are using the most RAM, click the Memory column once to sort it in descending order.

4. Look at the Description column to learn the name of the application that is consuming the most memory.

5. Close that application and notice how your computer's resources are freed and other applications become more responsive.

Dealing with Malware Infections

Another problem you may encounter when using your computer is malware infections. You may try to download an infected file from the Internet, from an untrusted source. You may have received a malicious email with an infected attachment, or you may have plugged in a USB memory stick that was used on another computer, which was infected with some form of malware.

If you have an antivirus program installed, its real-time protection engine should be able to identify the threat and block it before it gets the chance to infect your computer and cause harm. For example, when you download a new file to your computer, it should be automatically scanned by the antivirus. If you plug in a USB memory stick, the antivirus should automatically scan it. If it doesn't, you should scan it yourself to make sure that you are not exposing yourself to security problems.

If a security problem is detected, the antivirus program will inform you about it and

should be able to automatically deal with it. For example, in Figure 4.10, *Microsoft Security Essentials* (the free antivirus provided by Microsoft for Windows 7 users) informs the user that detected threats are being cleaned and that no action is needed from the user after a malicious file was downloaded from the Internet.
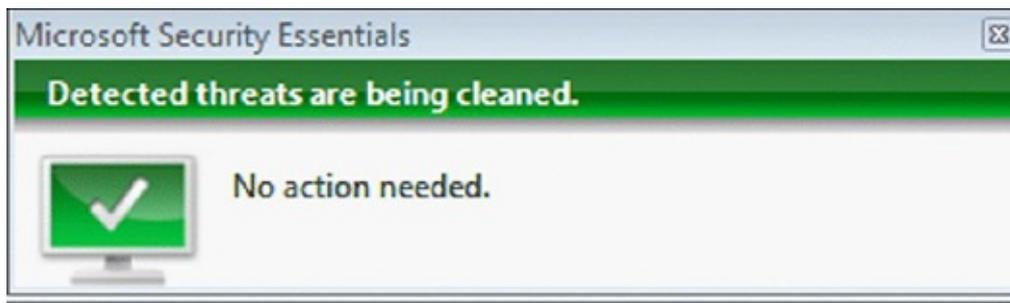

Figure 4.10 A Microsoft Security Essentials prompt

While other antivirus software will look different and display different prompts with more or less information being revealed, its real-time protection engine should work in a similar way.

We recommend that you regularly scan your computer for malware at least once a month. You can perform the scan manually or you can set your antivirus to do that for you, automatically. However, some free antivirus products like Microsoft Security Essentials don't include any scheduling features, and you will have to perform the scans yourself. In Exercise 4.3 we will demonstrate how to perform a full-system scan on your computer with Microsoft Security Essentials and how to deal with the infected files that it detects.

EXERCISE 4.3

Scanning Your Computer for Malware with Microsoft Security Essentials and Removing Infected Files

1. Click Start and then All Programs to see a list with shortcuts to your programs (Figure 4.11).
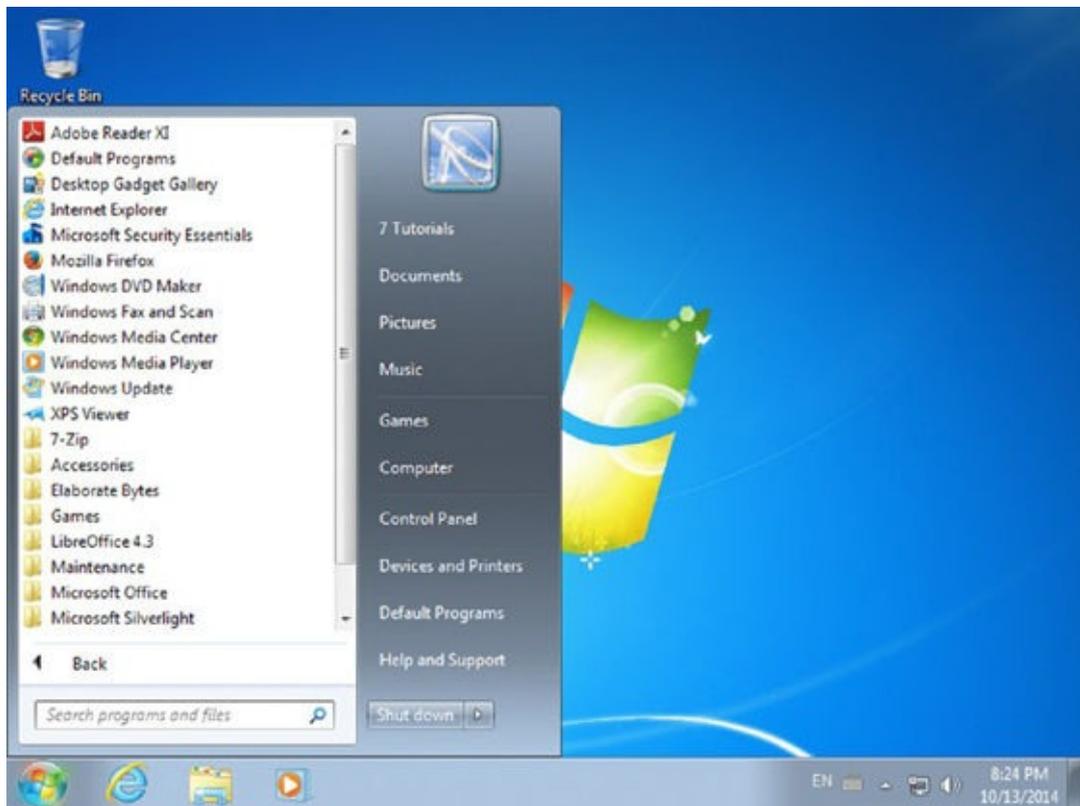
Figure 4.11 The Start menu in Windows 7

2. Click Microsoft Security Essentials to start this antivirus program.

3. In the Home tab, select Full as the scan option and then click Scan Now (Figure 4.12).
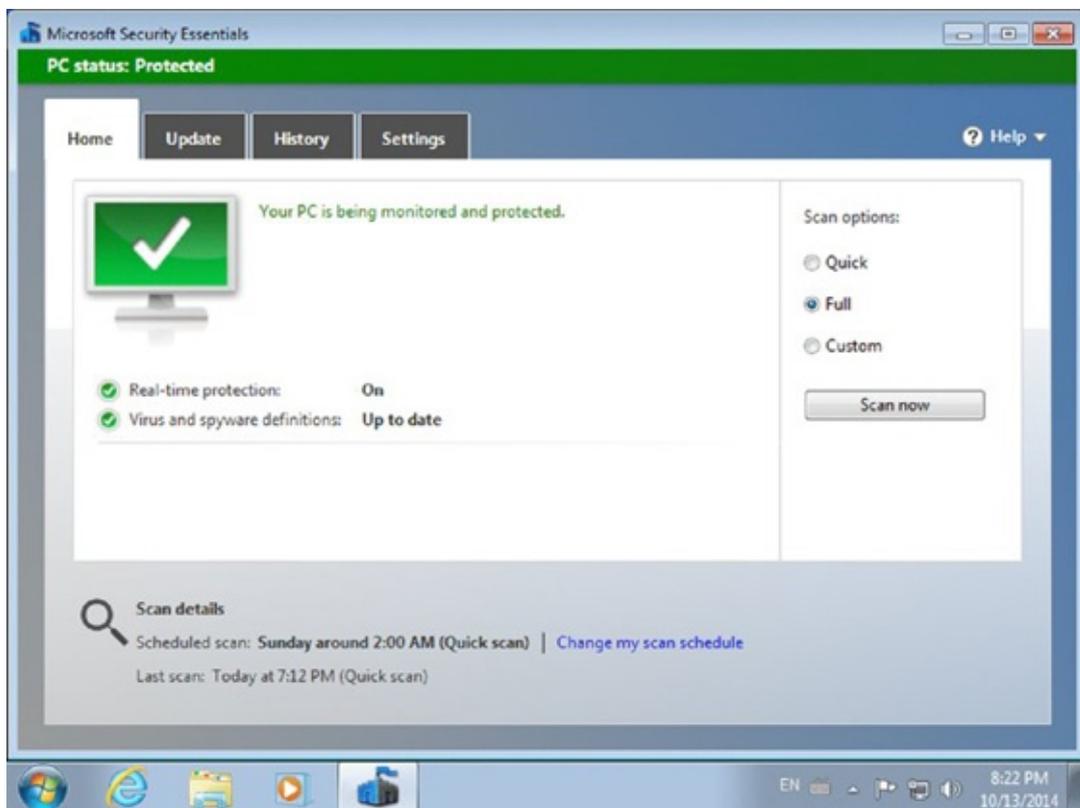
Figure 4.12 Microsoft Security Essentials

4. Wait for the scan to end and then look at the results displayed.

5. If threats are detected, click Clean PC (Figure 4.13).

Figure 4.13 Potential threats detected by Microsoft Security Essentials

6. Wait for Microsoft Security Essentials to deal with them. When it has finished, click Close (Figure 4.14).

Figure 4.14 Threats removed by Microsoft Security Essentials

Using Safe Mode to Fix Problems with Windows

If you have problems with the way Windows works, then one quick way to fix it is to start it using the Safe Mode feature. *Safe Mode* is a different way of starting Windows that 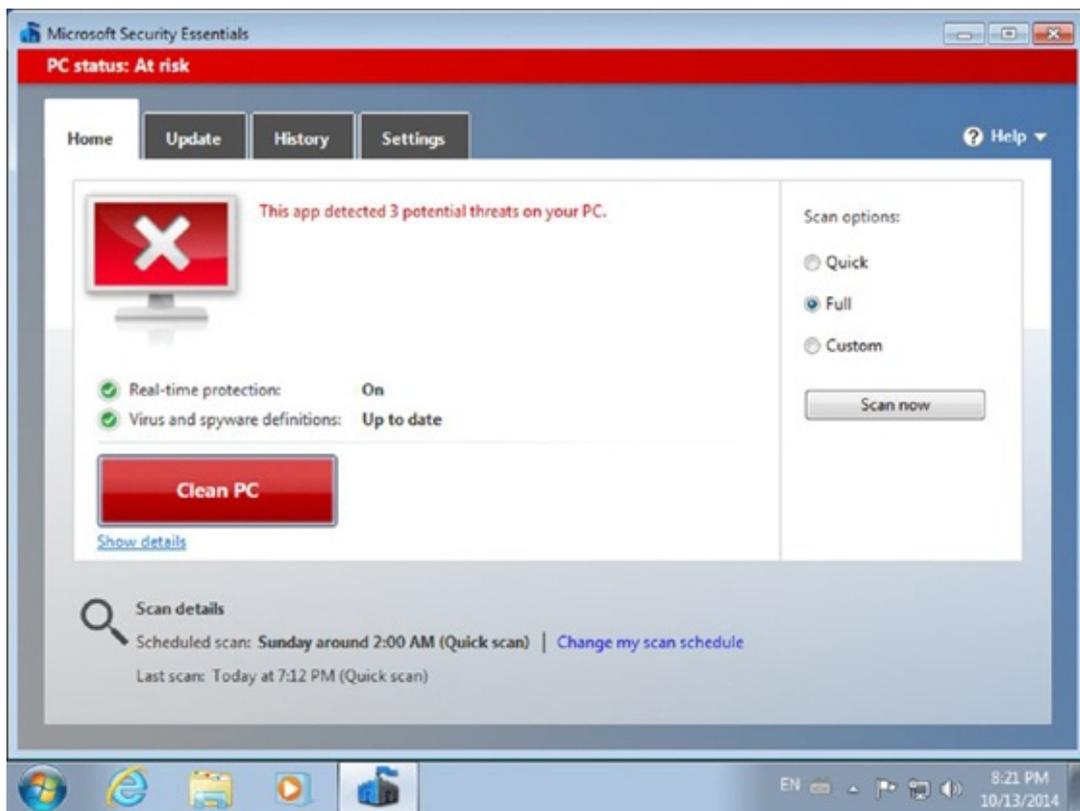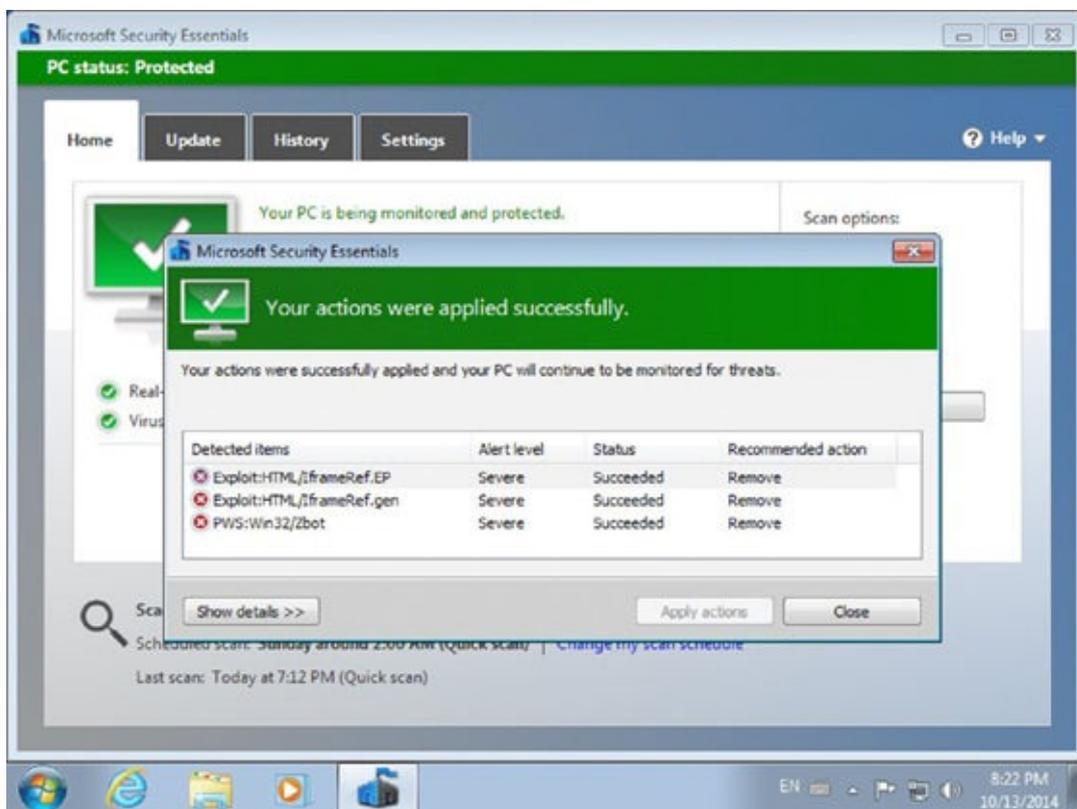loads only the barest essentials that are required for Windows to function. For example, most drivers are not loaded, and most Windows services are not started. Also, the applications that are normally set to run at startup are not loaded. When in Safe Mode, Windows will run using the lowest possible graphics and the minimum resolution that is supported—800 × 600 pixels (see Figure 4.15).
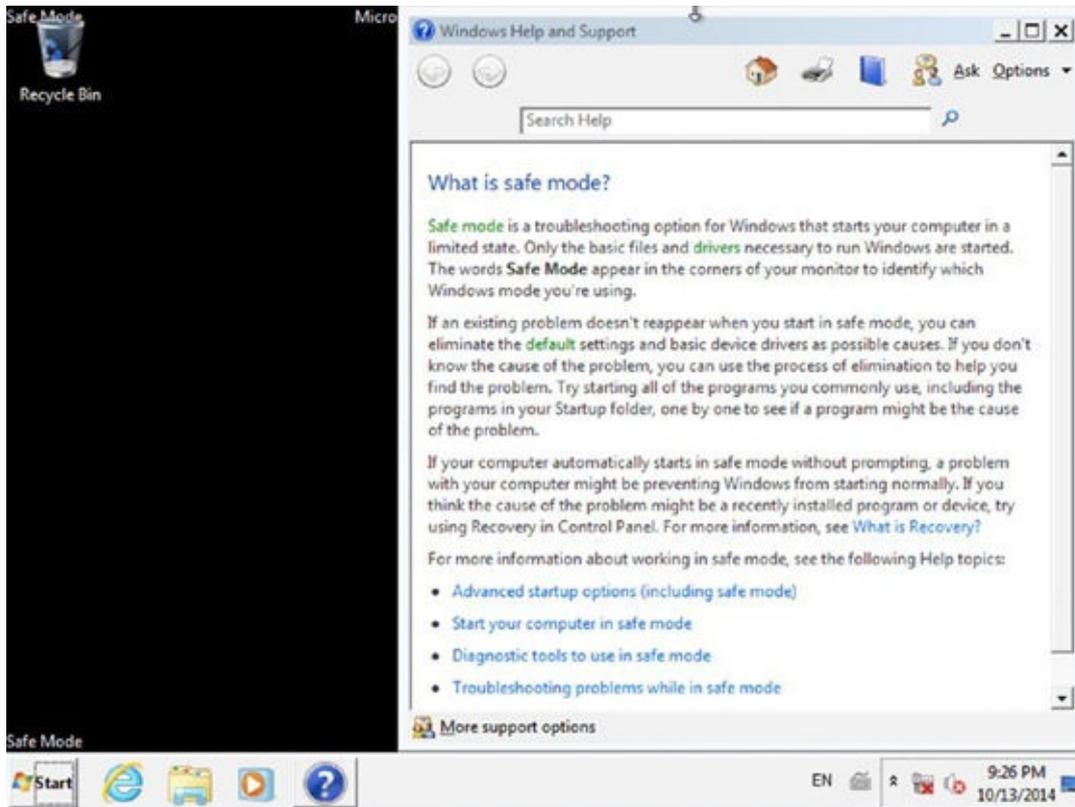
Figure 4.15 Safe Mode

Because Safe Mode is a minimal way of running Windows, it should be used only for diagnosing computer problems and for fixing them.

Safe Mode can start in one of three ways:

Safe Mode Normal Safe Mode loads only the bare essentials that are required for Windows to function.

Safe Mode with Networking This way also loads the drivers for your computer's network card so that you can access the network or the Internet.

Safe Mode with Command Prompt When you start Windows using this mode, it automatically launches the command prompt without displaying other elements of the user interface, such as the Start button. This mode is useful only to IT professionals who know how to use command-line utilities to administer Windows.

You can use Safe Mode to solve all kinds of problems, including but not limited to the following:

- Disk corruption problems that do not allow Windows to start or run normally

- Instability caused by malfunctioning drivers that need to be removed
- Incompatible applications that cause Windows to malfunction
- Malware infections that are hard to remove

In Exercise 4.4 you will learn how to start Windows 7 in Safe Mode.

EXERCISE 4.4

Starting Windows 7 in Safe Mode

1. Shut down your Windows 7 computer.

2. Press the power button to start your computer and then press the F8 key on your keyboard.

3. Keep the F8 key pressed until you see the Advanced Boot Options screen shown in Figure 4.16.

```
                        Advanced Boot Options

Choose Advanced Options for: Windows 7
(Use the arrow keys to highlight your choice.)

    Repair Your Computer

    Safe Mode
    Safe Mode with Networking
    Safe Mode with Command Prompt

    Enable Boot Logging
    Enable low-resolution video (640x480)
    Last Known Good Configuration (advanced)
    Directory Services Restore Mode
    Debugging Mode
    Disable automatic restart on system failure
    Disable Driver Signature Enforcement

    Start Windows Normally

Description: Start Windows with only the core drivers and services. Use
            when you cannot boot after installing a new device or driver.

ENTER=Choose                                           ESC=Cancel
```
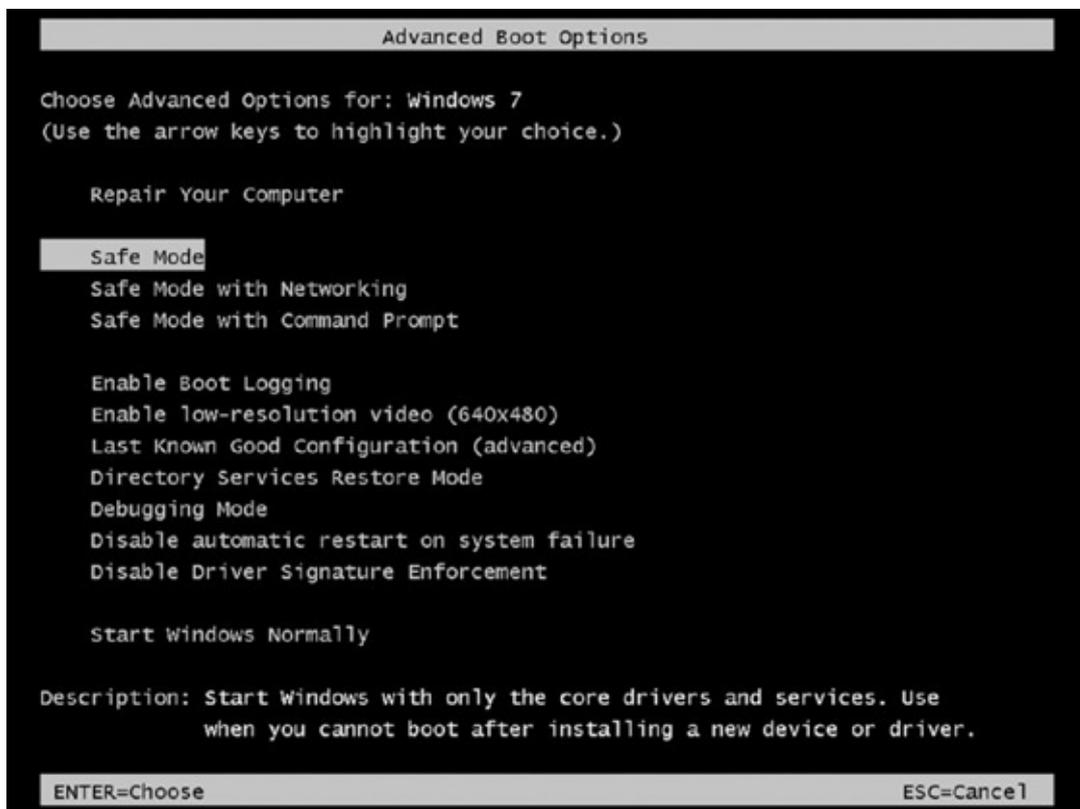
Figure 4.16 Advanced Boot Options

4. Using the arrow keys on your keyboard, move the cursor to one of the Safe Mode boot options and then press Enter.

5. Wait for Windows 7 to start in Safe Mode and then log in with your user account, if required.

   Windows 7 is now started using Safe Mode.

Finding Help Online

If you have a computer problem that you can't fix using any of the methods shared earlier in this chapter, then your best choice is to search for help online. On the Internet you will find plenty of websites, knowledge bases, forums, and technical communities where you can find solutions to your problems or ask for help from others.

One of the best places to get started is Microsoft's *Fix It Solution Center*. It is a portal where you can find information to help you fix all kinds of problems. When you visit it, you are asked to select the problem area and what you were trying to do. Then you are given a list of documented problems and their solutions. For some problems you can download and run a specially crafted file that will help you fix the problem that you have. You can access the Fix It Solution Center by entering in your browser either of the following two addresses:

http://support.microsoft.com/fixit/

http://bit.ly/1cjQQlU

You can also try online communities like *Microsoft Answers*, where you can get help from Microsoft's employees, technical experts who are active in that community, or other users like yourself. When visiting this community, select the product you are having trouble with, and then you will see all the available discussion threads or wikis with documentation. You can access Microsoft Answers by entering in your browser either of the two following addresses:

http://answers.microsoft.com

http://bit.ly/1peZGaz

There are many other communities where you can ask for help from others, even though they are not managed by Microsoft. An example of a great technical community is superuser.com. Also, you can find plenty of websites with lots of how-to articles and guides that show you how to best use Windows and its applications and how to fix problems. Two such great websites are 7tutorials.com and howtogeek.com. Don't hesitate to visit them and read their articles. You will definitely learn more about using your computer, and you will find plenty of help for fixing your technical problems.

Dealing with Problems Caused by Hardware

Hardware can also cause problems from time to time. You may have to deal with simple issues like your monitor not powering on or more complex issues like never-ending crashes and continuous restart loops. Since hardware components are very diverse, the problems that they may cause are just as diverse.

To help you understand how to deal with hardware-related problems, we will cover several common scenarios that most users deal with at some point. We will start with the simplest of issues, which are caused by cables and connectors not being plugged in correctly.

Dealing with Problems Caused by Cables and Connectors

When you use a computer, you may encounter small incidents that will stop it from working correctly. These are most often caused by minor issues like cables and connectors not being plugged in correctly.

For example, if you try to type something and the computer seems to ignore your key presses, then the first thing you should do is to check the cable that connects the keyboard to the computer. Take a look at it and see whether it is still plugged into the back of your computer. Maybe the keyboard is no longer plugged correctly into the USB or PS/2 port. The same goes for the mouse—if all of a sudden it stops registering your commands, then most probably the cause for this issue is that its cable is no longer plugged in correctly. If you have wireless mice and keyboards that run using batteries and they don't work, you should also check whether their batteries are empty or whether they are correctly inserted into the appropriate slots.

The same principle applies each time your computer suddenly ignores your input or when it no longer provides the expected output. For example, if you press the power button on your computer and the computer doesn't start, then maybe it no longer is receiving power. Check that the power cable is correctly plugged into your computer, that the power is on, and that the power supply unit is turned on. Most power supplies generally have an On/Off switch on their back, and it might be set to Off.

Another issue that may happen is for your monitor to stop displaying the image on the screen. It just stays black, no matter what you do. In this case, there are three things that you can check:

- Check whether the monitor is plugged correctly into the power socket.
- Check whether the monitor is correctly connected to the computer.
- Check whether the monitor is turned on.

Chances are that one of these situations is the cause of your problem and you can fix it quickly.

The same principles apply also when dealing with peripherals like printers or webcams. If a printer no longer prints anything, check that it is turned on, that it is receiving power, and that it is connected correctly to your computer.

Obviously, it may happen that all cables and connectors are plugged in correctly and your

computer still doesn't work because some hardware component is broken and needs to be fixed or replaced. But in most cases, simple things like these are the cause of your issues.

Upgrading the Firmware for Your Computer's Components and Peripherals

In order to function, every piece of hardware has some small permanent software that is programmed into its memory. Because it is not really software in the classic sense and it exists at the boundary between hardware and software, it is named *firmware*.

Generally, firmware is a very basic piece of software that contains only the instructions that are required for the hardware to work as intended. It is the first software to run on a device when it is powered on. Without it, the hardware would be impossible to use. Even though it is not evident, you will find firmware in all kinds of products, from washing machines to the individual components that make up a computer to peripherals like printers, portable music players, scanners, and so on.

Changing the firmware of a device may rarely or never be done during its lifetime; some firmware memory devices are permanently installed and cannot be changed after they are produced. Examples of such devices are USB memory sticks, CPUs, and network cards. However, for some hardware components, updating the firmware is possible and advisable because it can help fix annoying bugs or add new features. The most common component in a computer for which it is advisable to upgrade the firmware is the motherboard. Also, many mobile devices like tablets and smartphones get regular firmware updates that fix problems or add new features.

In the motherboard of a computer or device, the firmware is named *BIOS*, meaning Basic Input/Output System. The term was coined in 1975, and it has been used ever since when referring to the firmware of a motherboard or a computer. It has a different name from other firmware because motherboards are more complex hardware that manages the interaction among all kinds of hardware that make up a computer.

The BIOS is one of the most advanced forms of firmware. It is in charge of initializing and testing all the hardware components of a computer, providing the necessary power for other hardware, including the cooling devices found inside a computer, and it is also responsible for loading the operating system. From the BIOS you can configure the way your computer's motherboard works.

The BIOS is the only form of firmware that has a visual interface, which you can access by pressing a key on your keyboard immediately after starting your computer. The key that you have to press varies from computer to computer. In Figure 4.17 you can see the user interface for a typical BIOS. Please keep in mind that the number of configuration options displayed varies from computer to computer, and on your computer things will be different than in this figure.
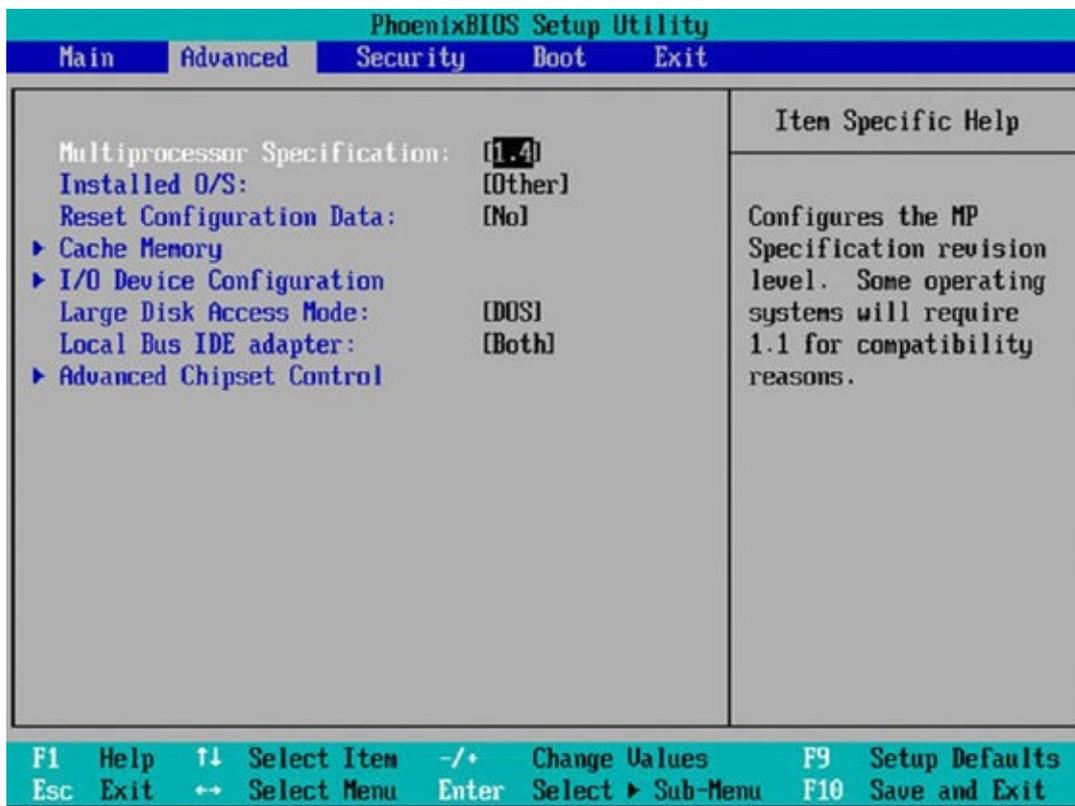
Figure 4.17 The BIOS

The upgrade process for the firmware is called *flashing,* and it involves overwriting the existing firmware and data on that device. Flashing the firmware of any computer or device is done using specialized software for this task. This software works differently and looks different for each component and manufacturer. In Figure 4.18 you can see the HP System BIOS Update Utility that is used to update the BIOS on HP computers.
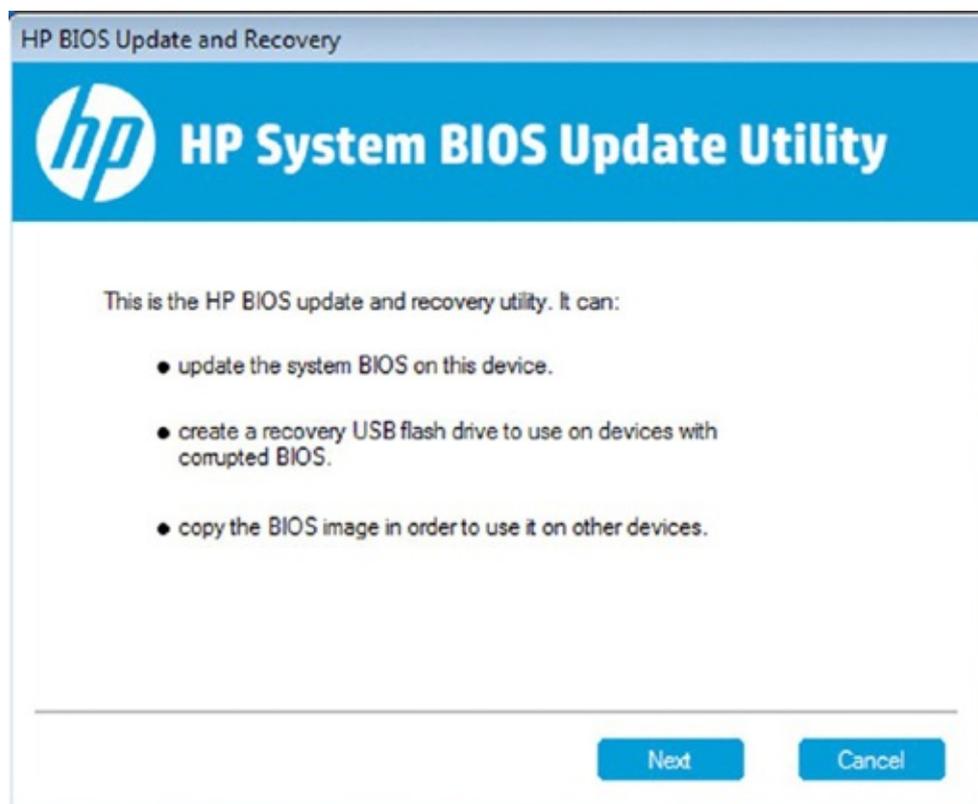

Figure 4.18 The HP System BIOS Update Utility

WARNING It is very important that this process runs without problems and that the device remains powered on through the duration of its flashing. If the process is interrupted in any way, the device becomes unusable because it no longer has the firmware necessary to function. It has only a partial copy of the firmware that's not able to work on its own.

The firmware for any hardware device is always found on its manufacturer's website. You have to be careful and look for the firmware that's created specifically for your hardware component's name and model number. If you try to install the firmware that was created for another model number or another component, you will damage that component, and it will stop working, possibly for good.

Dealing with Drivers for Your Computer's Hardware

We first introduced the concept of *drivers* in Chapter 3, "Understanding Software," and we said that they are software that operates and controls particular hardware devices attached to your computer. They ensure that your operating system takes full advantage of your hardware. Operating systems come with some generic drivers, but for full access you often need specific drivers. Drivers can be a problem, and they can cause performance and stability issues if they are not handled correctly.

Windows has a large database of hardware components and drivers for them. If your computer has commonly used hardware, chances are that Windows automatically detects it and installs the appropriate drivers through the Windows Update service. When that happens in Windows 7, you will see a notification like the one shown in Figure 4.19, stating that Windows is installing device driver software. Wait for the installation to finish prior to using that device. This prompt is most often encountered when you connect peripherals to your computer like USB memory sticks, external hard disks, webcams, or printers.
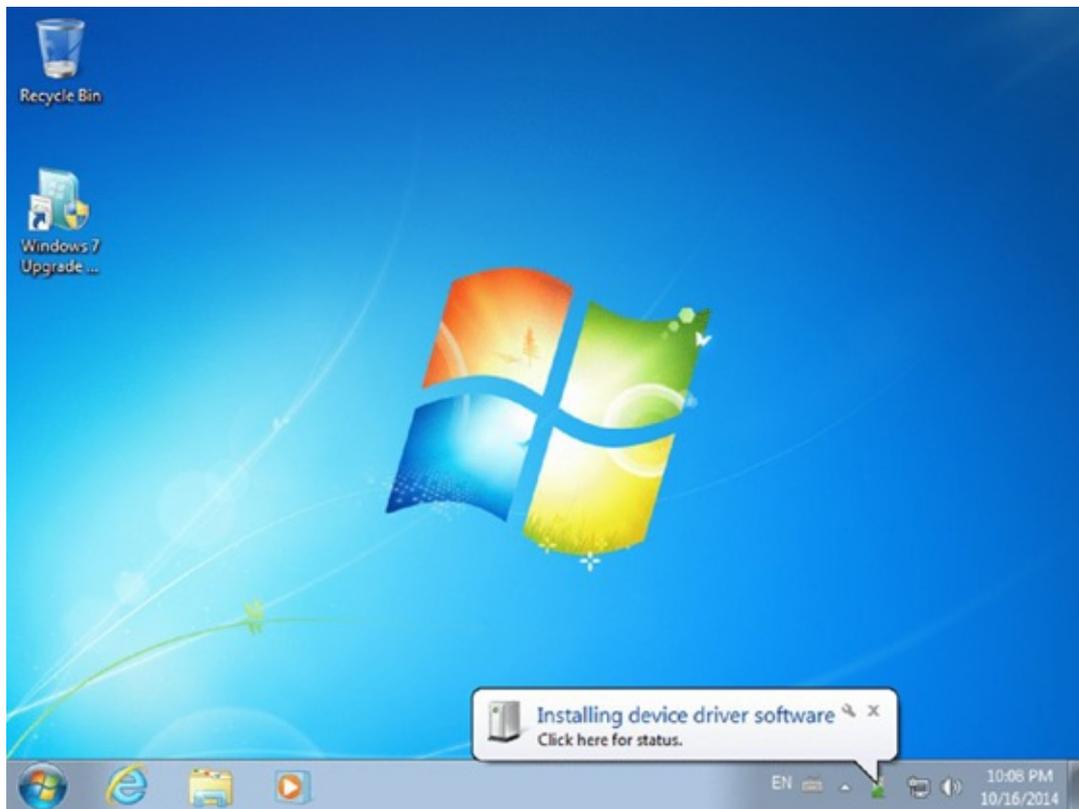
Figure 4.19 Windows 7 installing device driver software

Drivers are also required for peripherals. For example, if you want to use a printer or a scanner, you have to install the drivers that are found on its installation disk or on the manufacturer's website. Again, download the drivers for your exact printer or scanner, and make sure that they are compatible with the operating system version you are using.

Before installing a driver you need to double-check the following:

That it is made for the exact hardware component you are using. You need to make sure that it was made for the exact model and model number of that component and not for another one. This is especially true when dealing with drivers for more complex hardware like the graphics card or the sound card. If you don't install the appropriate driver, your component will not work, and you will almost certainly cause instability or performance issues.

That the driver is compatible with the exact version of the operating system you are using. This is a big problem when you want to upgrade an older computer or laptop to a newer version of Windows. Even though the latest version of Windows theoretically works on your computer's hardware configuration, some of your computer's components might not have drivers available for this version of Windows. That's why you should always check before upgrading to a newer version of Windows whether your computer's hardware components have drivers for it.

If, by mistake, you install drivers that were made to work on another version of Windows, chances are that your computer will crash and stop working normally. In the section "Dealing with Incompatibilities between the Operating System Version and Your Applications" earlier in this chapter, we mentioned the Windows Compatibility Center website, which can help you evaluate whether the software that you want to use is compatible with your version of Windows. Luckily this website also includes many

hardware components in its database, so you can use it to check whether your computer's components are compatible with the latest version of Windows before upgrading to it (Figure 4.20).
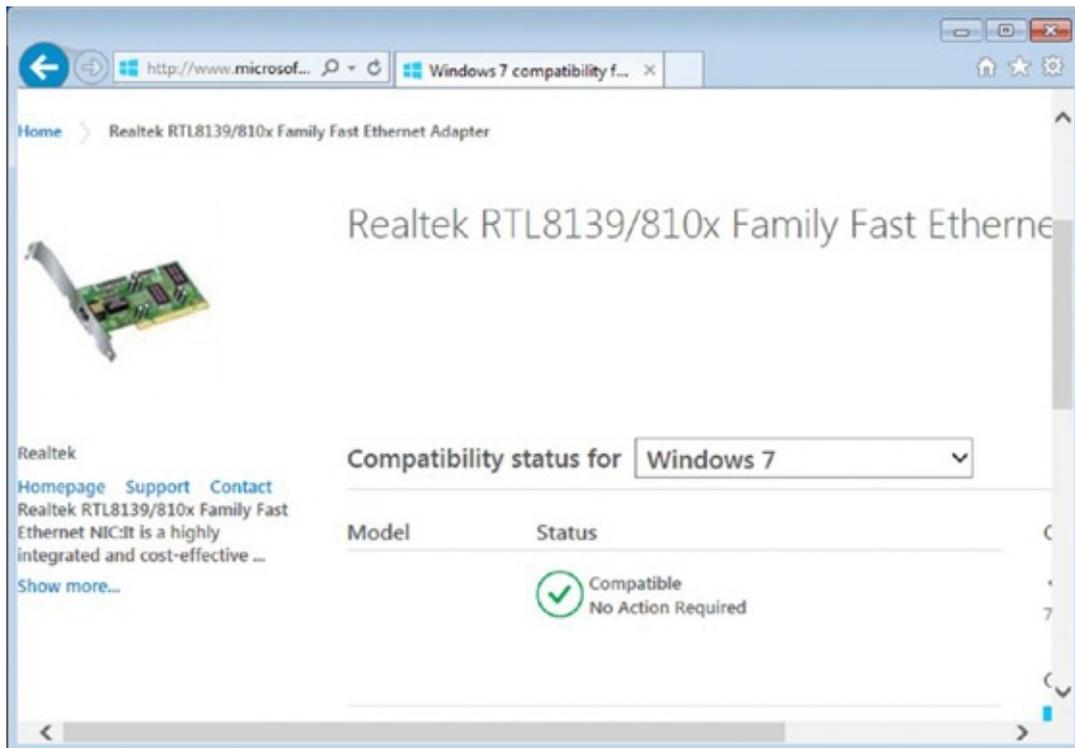

Figure 4.20 The Windows Compatibility Center

Type the name of the hardware component that you want to check, click Search, and look through the results that are returned. You can find the Windows Compatibility Center at either of these two addresses:

http://www.microsoft.com/en-us/windows/compatibility/CompatCenter/Home

http://bit.ly/19fq1xr

After installing Windows on a computer and adding the appropriate drivers for its hardware, you should double-check that you have installed all the necessary drivers and that you did not forget anything. This check can be quickly performed using a tool named Device Manager that's found in Windows. Exercise 4.5 demonstrates how to use it to check whether there are any hardware components for which you are missing drivers.

EXERCISE 4.5

Checking Whether There Are Any Missing Drivers in Windows

1. Click Start and then type the word device in the search box.

2. Click the Device Manager search result (Figure 4.21), and the tool will open.

Figure 4.21 The Device Manager shortcut

Here you can see all the hardware components that are inside your computer as well as the peripherals that are connected to it.

3. In the Device Manager window, look for a section named Other Devices (Figure 4.22).
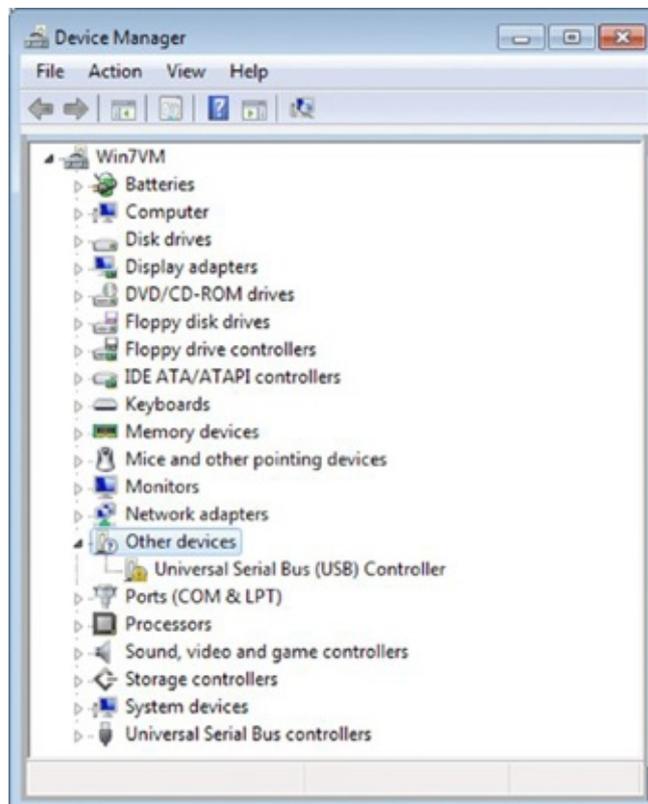

Figure 4.22 The Device Manager window

If you find it, there you will see at least one device for which Windows does not have the appropriate drivers.

4. Write down the information that is displayed by the Device Manager for each device in the Other Devices category, and use it to find the missing drivers that need to be installed on your computer.

If you find at least one device listed in the Other Devices section of the Device Manager, it means that you have not installed all the necessary drivers for your computer. If this category does not exist in Device Manager, it means that all the necessary drivers have been installed and there's no need to worry.

With this information in hand, you should look on the website of your computer's manufacturer for any devices that you may have missed in your search for drivers. You will surely find a driver that's available for download that you did not install.

Creating Your Own Backup System

In order to have a safe computing experience, it is very important to have some sort of backup system in place so that you won't lose your data if your computer has problems or gets stolen. Backups can be done in many ways, using different kinds of tools and storage media. First of all, you can use tools that are included in Windows 7, like Backup and Restore, or you can use third-party software that is designed for this task.

In terms of the media where you can back up your data, you have the following options:

External Drive You can use an external hard drive that is connected to your computer, multiple DVDs, or one or more Blu-ray discs, if you have a drive that can burn this type of disk with data.

Network Location You can store your backup on a shared folder on another computer in your network or on a network server that's used by your company for backing up user data. Generally companies tend to have their own automated backup systems that users don't control. In business environments, the network administrator handles the data backup, the backup server, and when and how the data is backed up for each user.

Cloud Storage The cloud is a model of data storage where your data is stored on multiple physical servers that are owned and managed by a company that specializes in storing and securing user data. Users buy or lease storage capacity from the providers of this type of service. There are many cloud storage services. The most popular are Dropbox, OneDrive from Microsoft, Google Drive, and Box. While all of them are commercial services that require a paid subscription, they all have a free plan with limited storage included.

In terms of data safety, the safest storage solution is the cloud because your data is stored in specialized data centers that are actively maintained and administered by specialized companies. Also, your data has copies so that it doesn't get lost if a specific server crashes. Your data won't be lost even if your computers are lost or a natural disaster takes place in your area.

In this section we will discuss how to back up your data on all three kinds of media. We will also share how to restore your data when required.

Backing Up Your Data with Backup and Restore

While there are many software applications that you can use to make backups of your computer and your data, many prefer to use the *Backup and Restore* tool that's included in Windows 7. That's because it is free and it is relatively easy to use.

With it, you can back up your entire operating system, its settings, and all your data. You can allow Windows 7 to choose what to back up, or you can select individual folders, libraries, and the disk drives that you want backed up. When you use this tool for the first time, you can set it to run on an automatic schedule and make sure that it backs up your data regularly, without you having to do it manually. Backup and Restore is able to keep track of your files and folders automatically, and it adds only your new or modified files to your recurring backups so that it doesn't waste space.

With this tool you can back up your data on all kinds of media: an external hard drive

that's connected to your computer, on DVDs or Blu-Ray discs, or on network locations like shared folders on other computers. During the backup procedure, all you have to do is select the desired location for your backup, and Backup and Restore will take care of the necessary transfers for you. When you store your backup in a network location, you have to provide the network location and the necessary credentials if you need to authenticate yourself in order to access that location, as shown in Figure 4.23.
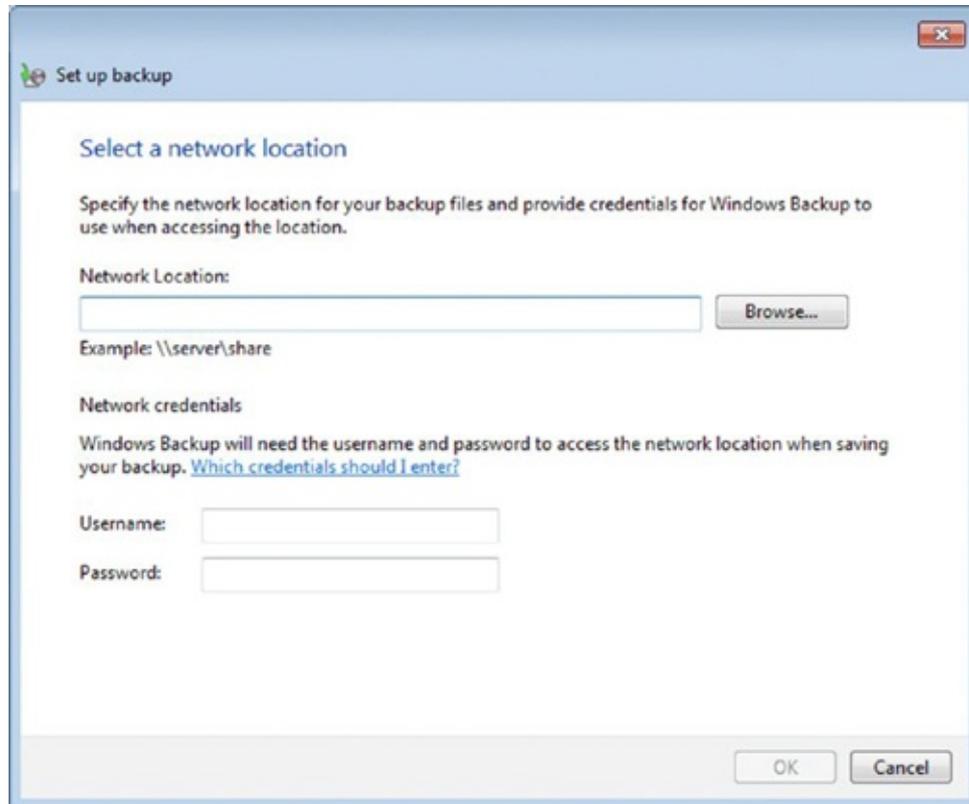

Figure 4.23 The Set Up Backup Wizard

In Exercise 4.6 you will learn how to back up your computer with Backup and Restore on an external hard disk. Before you start this exercise, make sure that you plug an external hard disk into your computer and wait for it to be detected and installed by Windows.

EXERCISE 4.6

Backing Up Your Data with Backup and Restore

1. Click Start and then Control Panel.

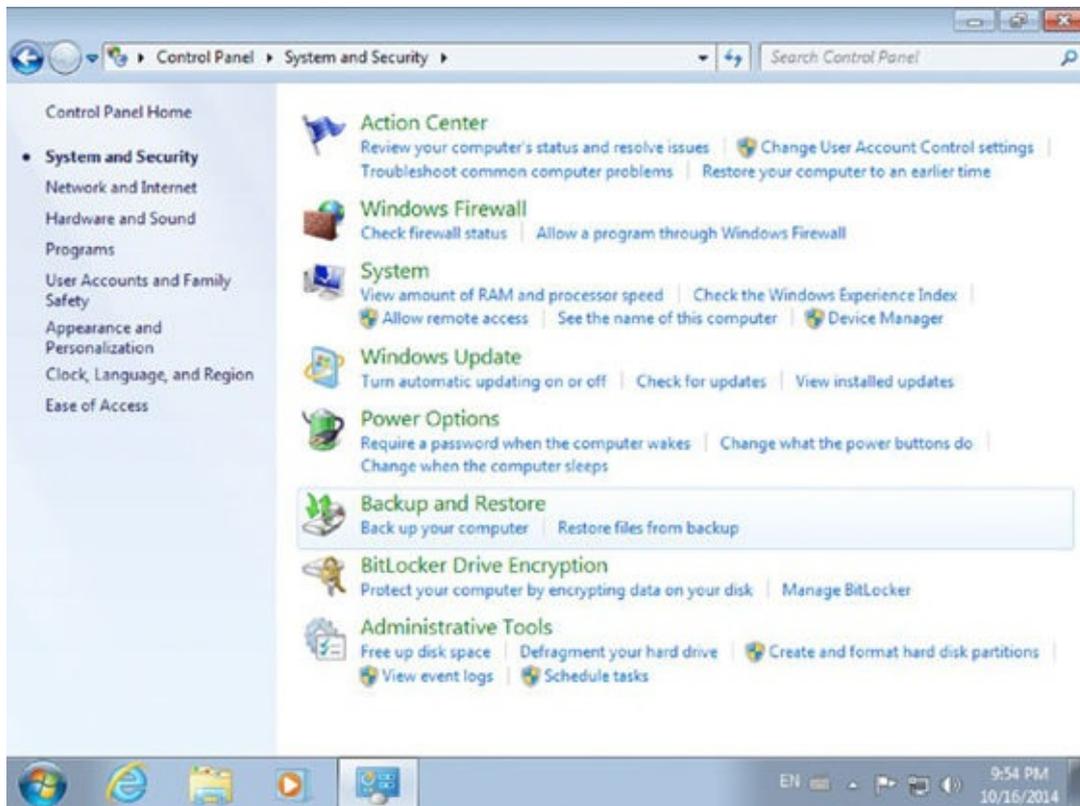2. Click System And Security and then Backup And Restore (Figure 4.24).

Figure 4.24 The Backup And Restore entry in the Control Panel

3. In the Backup And Restore window, click the Set Up Backup link in the top right (Figure 4.25).
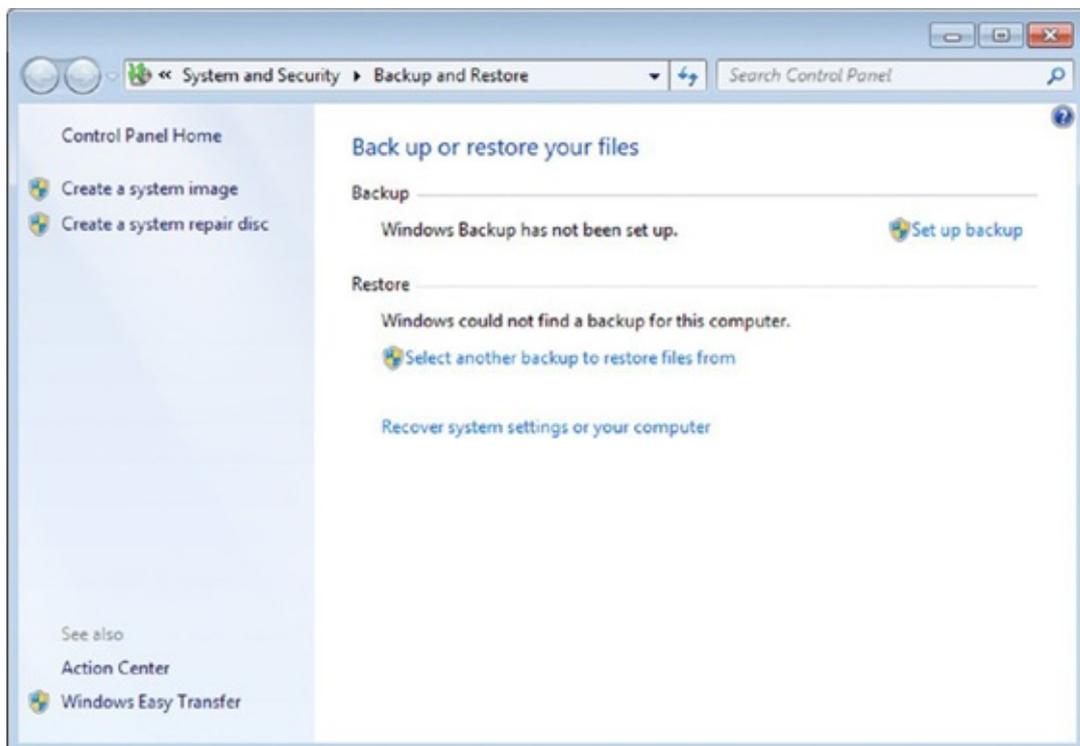

Figure 4.25 The Backup And Restore window

Windows takes a while to start the Set Up Backup Wizard.

You are asked to select where the backup is to be saved.

4. Select the external hard disk that is connected to your computer and click Next
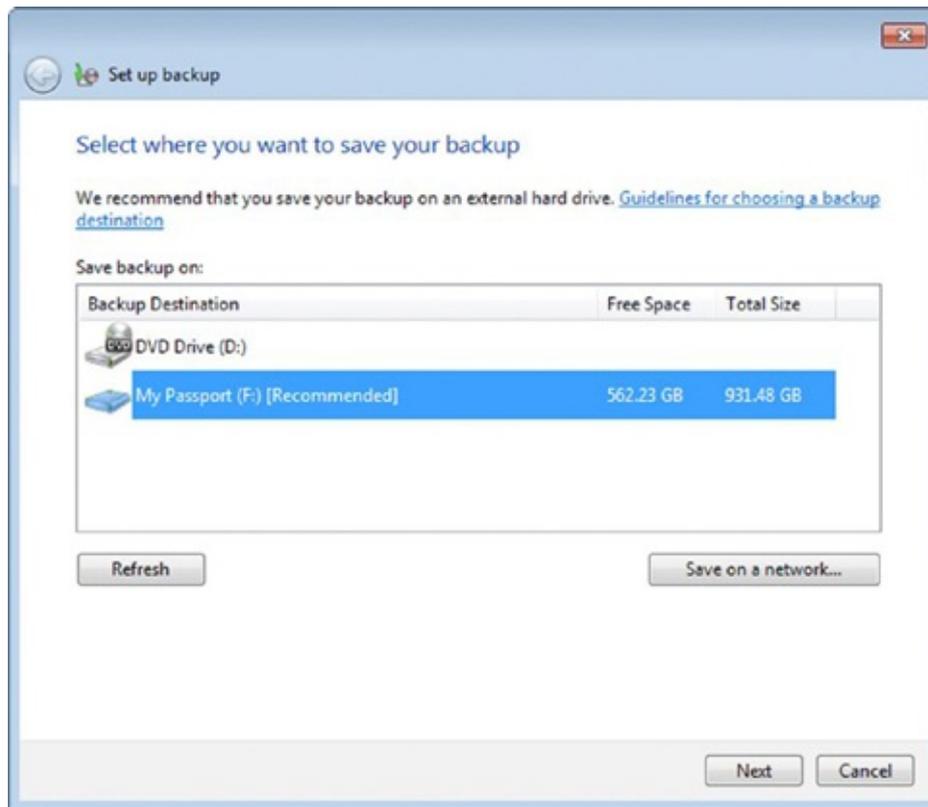
(Figure 4.26).

Figure 4.26 Selecting where to save your backup

5. You are asked what to back up. Select Let Windows Choose (Recommended) and click Next (Figure 4.27).
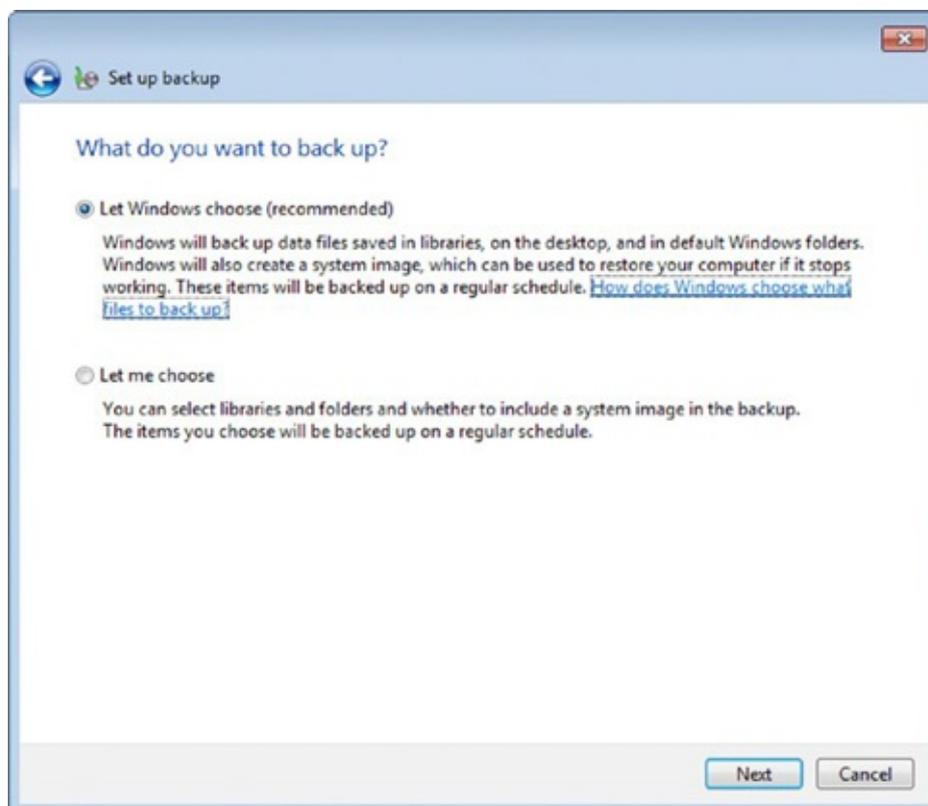

Figure 4.27 Selecting what you want to back up

The Set Up Backup Wizard shares its settings and what it will back up.

6. Read the information displayed and click Save Settings And Run Backup ([Figure 4.28](#)).
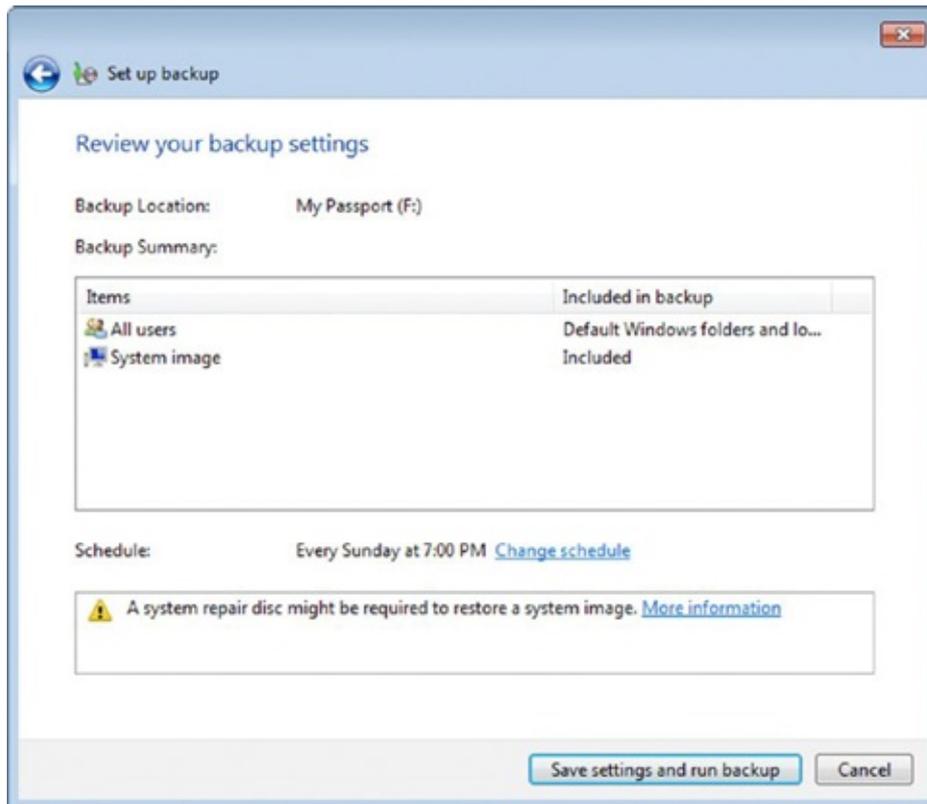

Figure 4.28 Reviewing your backup settings

You return to the Backup And Restore window, where you can see the progress of the backup process ([Figure 4.29](#)). Wait for it to finish.
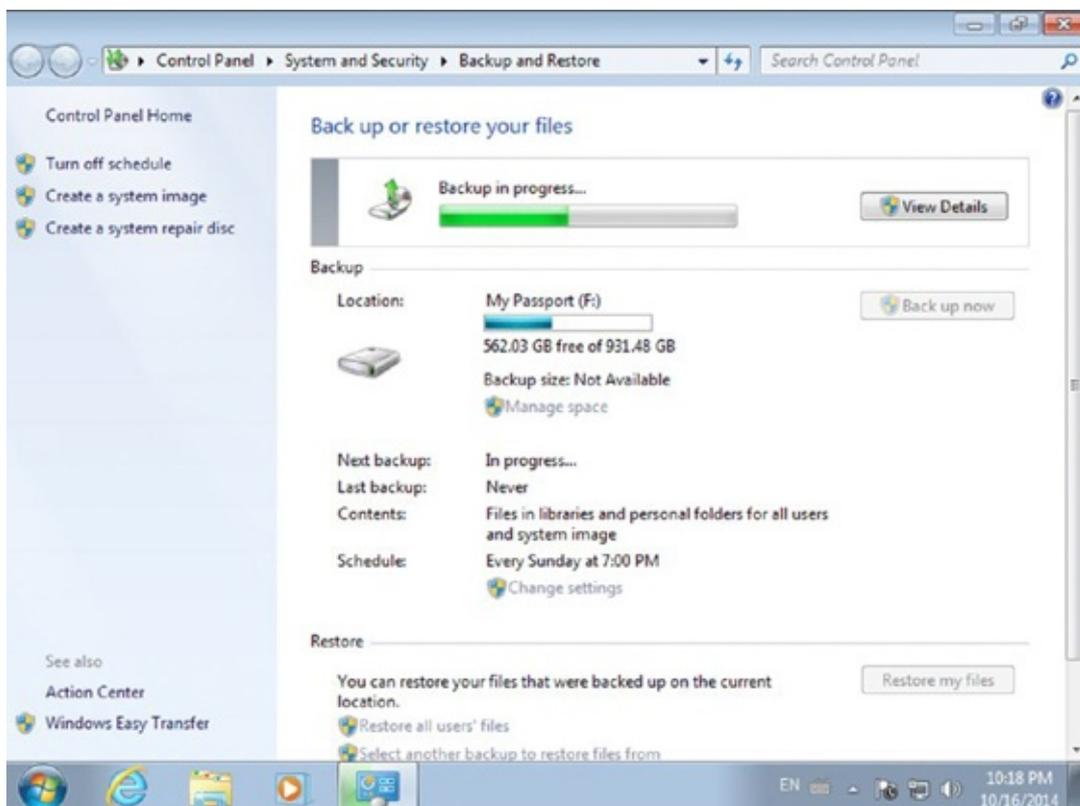

Figure 4.29 The backup in progress

When the backup is finished, you are shown the date and time when it was done as well as the schedule of the next automatic backup.

7. Close the Backup And Restore window.

Restoring Your Data with Backup and Restore

You can also use the Backup and Restore tool from Windows to restore your backups. You can restore all the files of all the user accounts that are on your computer, or you can restore only your own files from the latest backup.

If you choose to restore your own files, the easiest way to restore them is to select Browse For Folders (Figure 4.30) and select the folders that you want to restore.
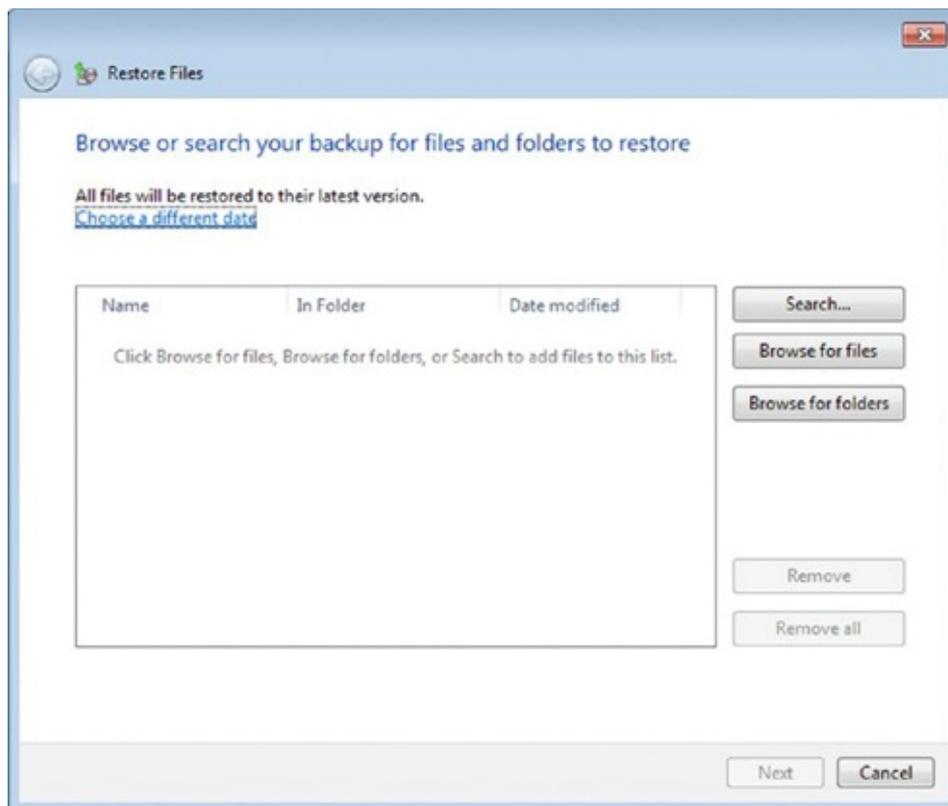

Figure 4.30 The Restore Files Wizard

During the restore process you are also asked where you want to restore your files. You can restore them to their original location, in which case you will have to overwrite the ones that currently exist there, or you can choose to restore them to another location like another folder or an external hard disk.

In Exercise 4.7 you will learn how to use Backup and Restore in Windows 7 to restore some of your files from the latest backup.

EXERCISE 4.7

Restoring Your Backed-Up Data with Backup and Restore

1. Click Start and then Control Panel.

2. Click System And Security and then Backup And Restore.

3. Click the Restore My Files button found at the bottom of the Backup And Restore window (Figure 4.31).
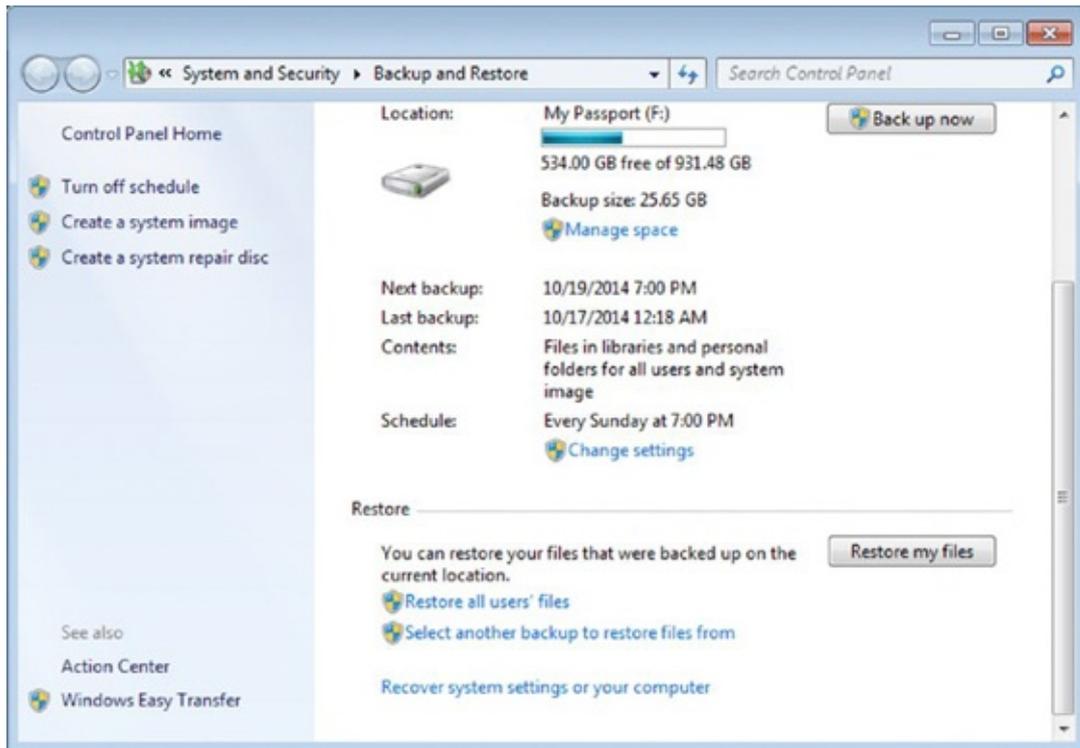

Figure 4.31 The Backup And Restore window

4. You need to select which files will be restored to their latest version. Click Browse For Folders (Figure 4.32).
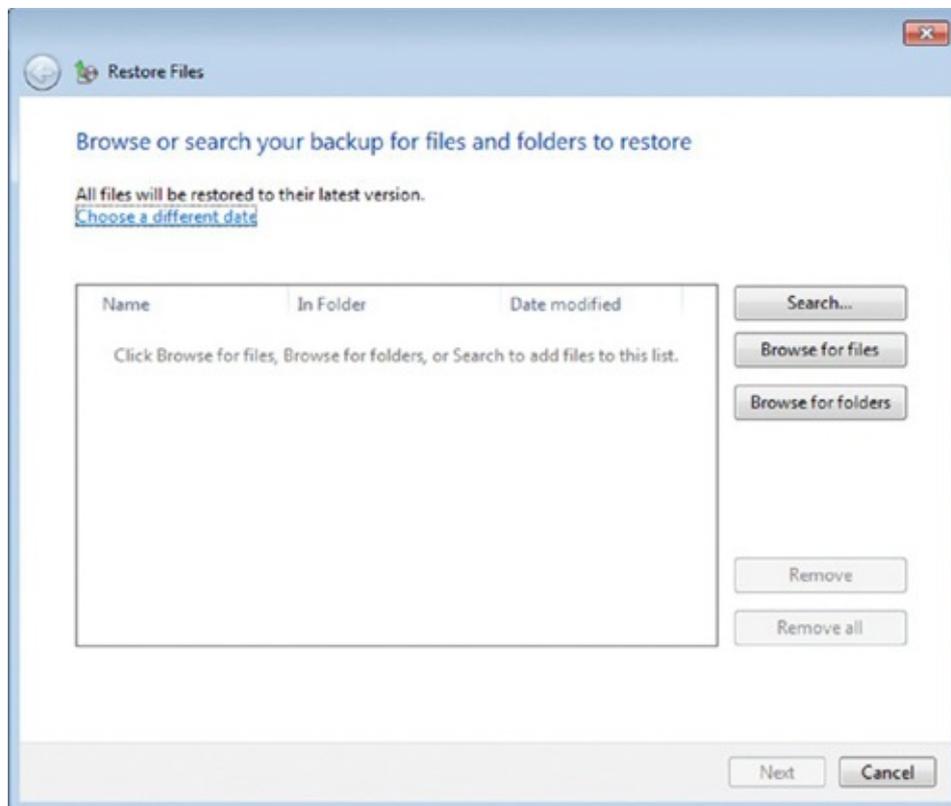
Figure 4.32 The Restore Files Wizard

5. Browse the folders found inside your latest backup and select the folder that you

want to restore. Click Add Folder ([Figure 4.33](#)).
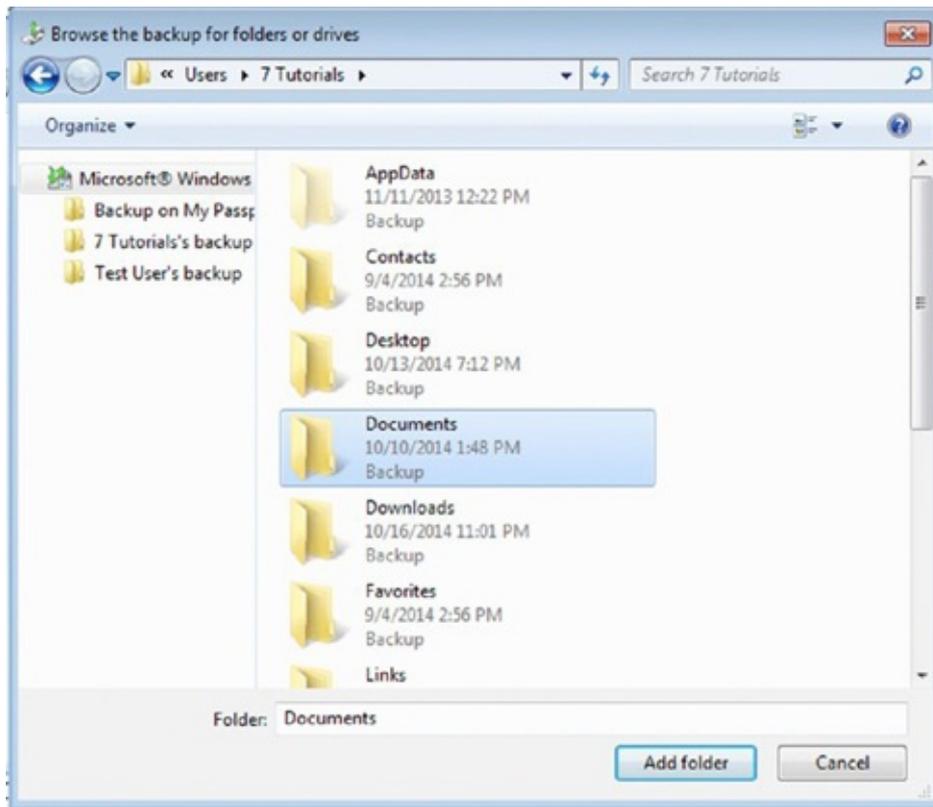
Figure 4.33 The Browse The Backup For Folders Or Drives dialog

6. In the Restore Files Wizard, click Next ([Figure 4.34](#)).
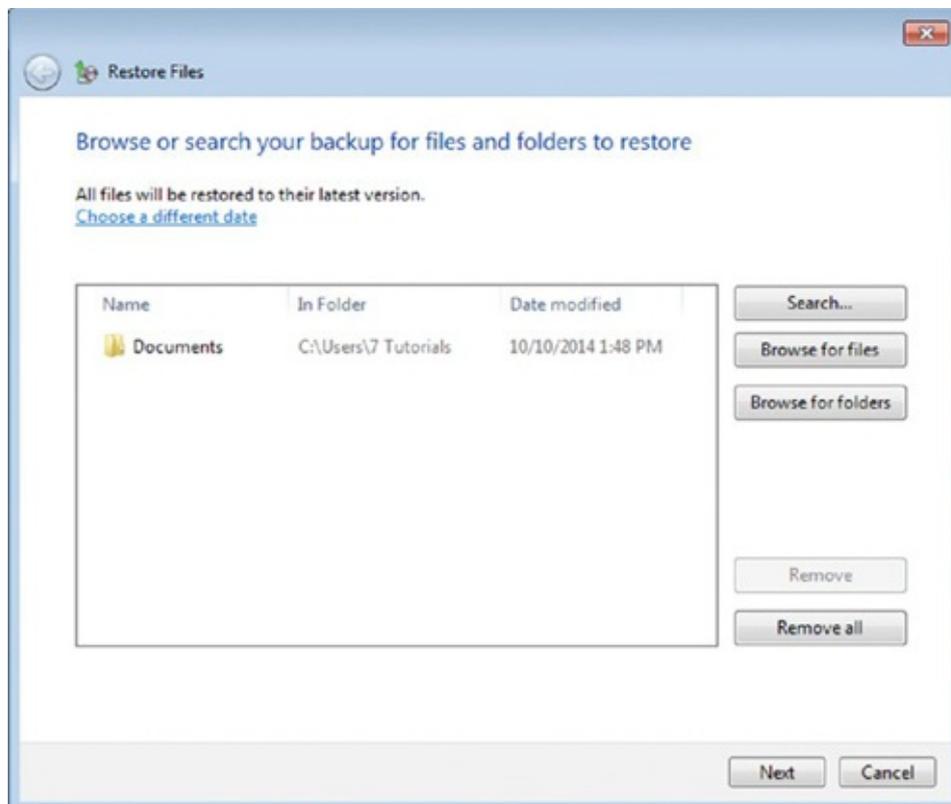
Figure 4.34 The folders that will be restored

7. You are asked where you want to restore your files. Choose In The Original Location and click Restore ([Figure 4.35](#)).

Figure 4.35 Selecting where to restore your files

Your files are copied from the backup to their original location. During this process you are asked whether you want the files from the backup to replace the files found currently in that location.

8. Check the box that says Do This For All Conflicts as shown in Figure 4.36, and then click Copy And Replace.

Figure 4.36 The Copy File dialog

When the backup files from the selected folder are copied to their original location, you are informed that your files have been restored.
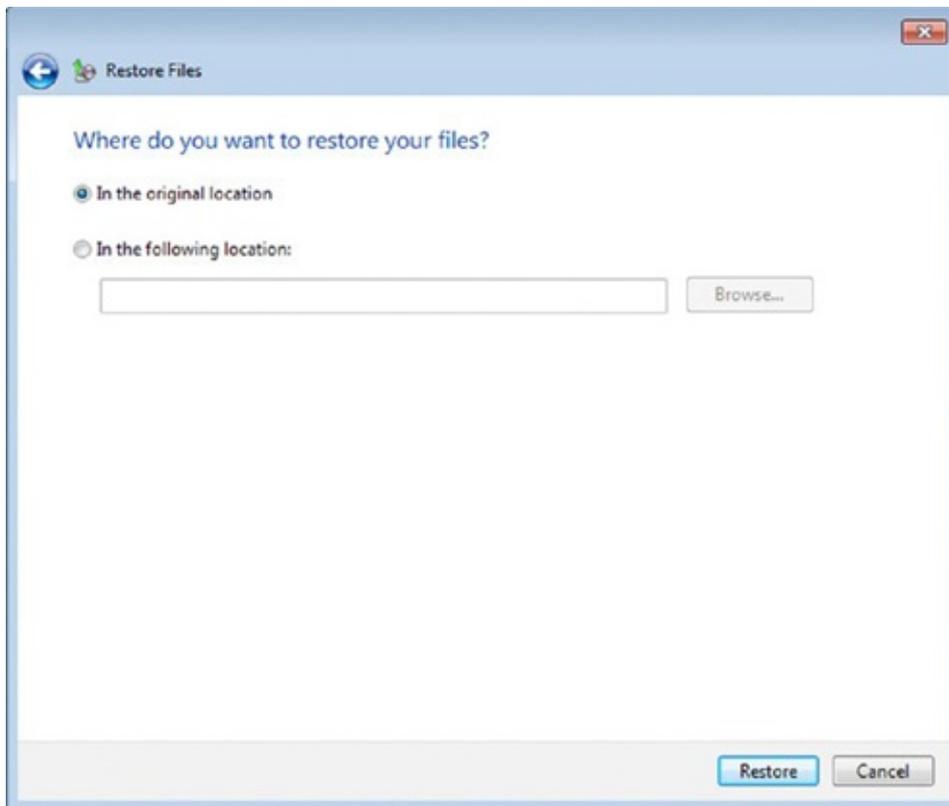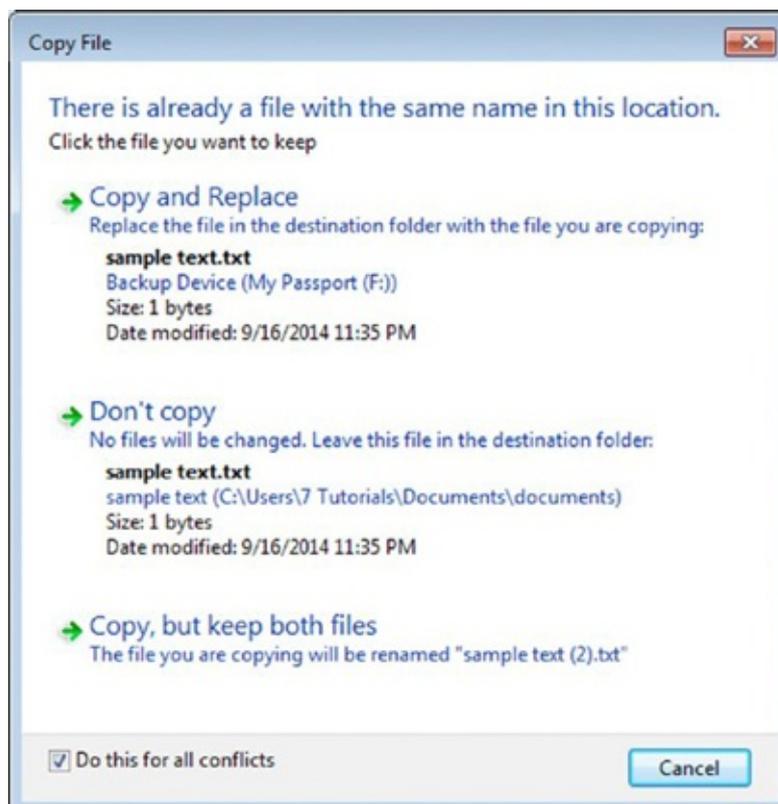
9. Click Finish.

Backing Up Your Data to the Cloud with OneDrive

There are many cloud storage solutions that you can use to back up your data, and while they look and work differently, the basic principle is the same: they are services that allow you to back up and access your data from any device with an Internet connection. Even if your computer crashes and no longer works, your data is safe and can easily be accessed and recovered from anywhere. The only condition is that you know the necessary credentials to authenticate yourself as a user of that service.

Another advantage of cloud storage solutions is that they are more reliable in the sense that they always update your latest files automatically, as long as the backup and synchronization application runs in the background. Windows tools like Backup and Restore run once every couple of days, so you may lose a few days' worth of files or at least a few hours' worth if something bad happens. Cloud storage solutions diminish the risk of losing your work. Also, storing your files on several physical servers of a specialized company makes your data harder to lose than with traditional backup systems.

One of the most popular cloud storage services is *OneDrive* from Microsoft. With it, you can back up your data on any of your computers and devices, including smartphones and tablets. You can also have it synchronized across all of them and be able to also access it by using the OneDrive website.

In order to use OneDrive, you need to have a Microsoft account, meaning an account that's registered with Microsoft, with an email address and password. You can create your own Microsoft account by going to `https://signup.live.com/` and following the instructions displayed on the screen.

> Some people prefer to enable two-step verification, meaning that in order to log in, they need to provide not only their email and password but also a temporary code that's shared with them via email, SMS, phone, or an app for their smartphone. This helps protect their accounts from unauthorized people who might learn their password through various methods and then try to access their accounts without their approval.

If you are using Windows 7, you need to download the OneDrive application and install it on your computer. This application is found by going to `https://onedrive.live.com`.

Once you download it, you need to install and configure OneDrive. Exercise 4.8 demonstrates how this is done.

EXERCISE 4.8

Installing and Setting Up OneDrive on Your Windows 7 Computer

1. Open File Explorer and navigate to the location where you downloaded the OneDriveSetup.exe file. Then double-click it.

   The OneDrive setup process starts.

2. Click the Get Started button shown in Figure 4.37.

Figure 4.37 The Microsoft OneDrive setup program

   You are asked to sign in with your Microsoft account.

3. Type your username and password and click Sign In (Figure 4.38).
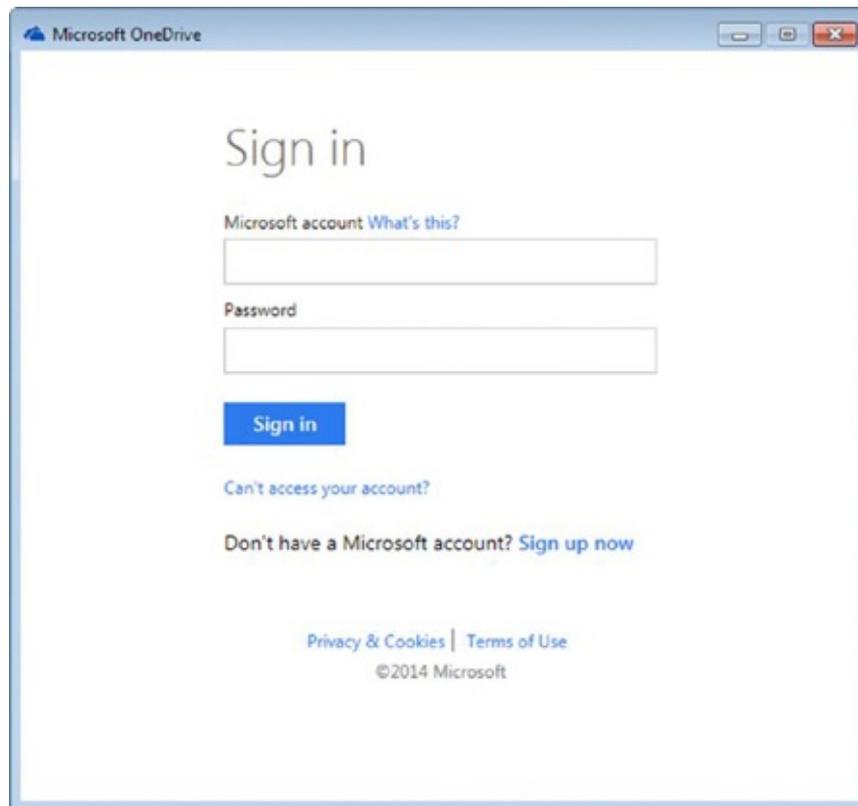
Figure 4.38 Signing in to OneDrive

Depending on how you have set up your Microsoft account, you may be asked to enter a code to verify your identity. If that happens, the code will be generated by a special Authenticator app on your smartphone.

4. Enter that code and click Submit (Figure 4.39). If you are not asked for this code, skip to the next step.
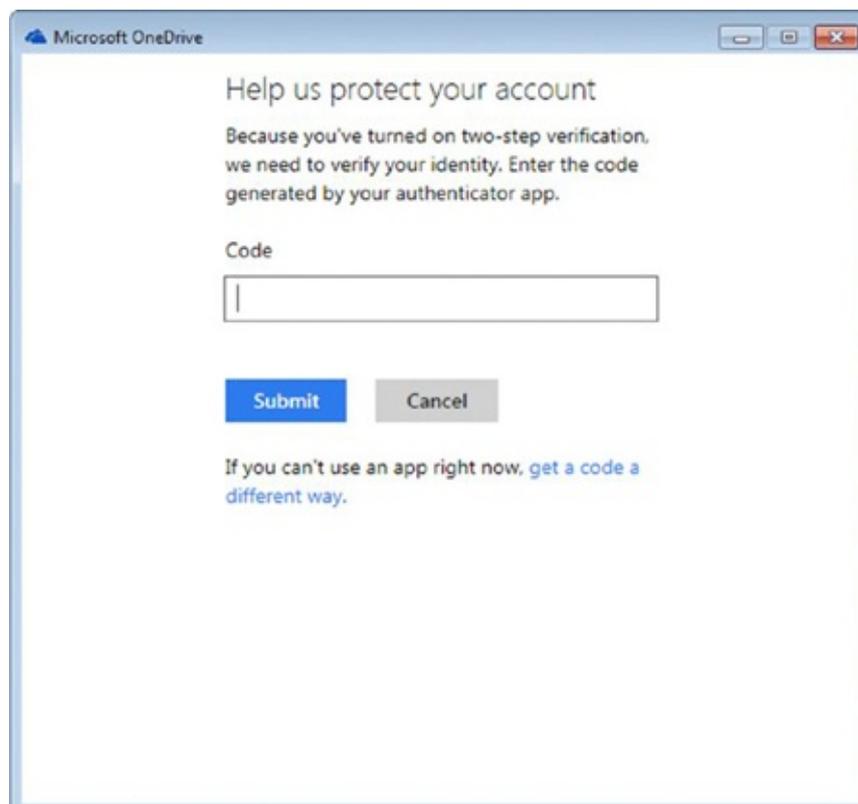
Figure 4.39 Entering your two-step verification code

You are informed that the OneDrive folder will be created in your user account.

5. Click the Next button shown in Figure 4.40.
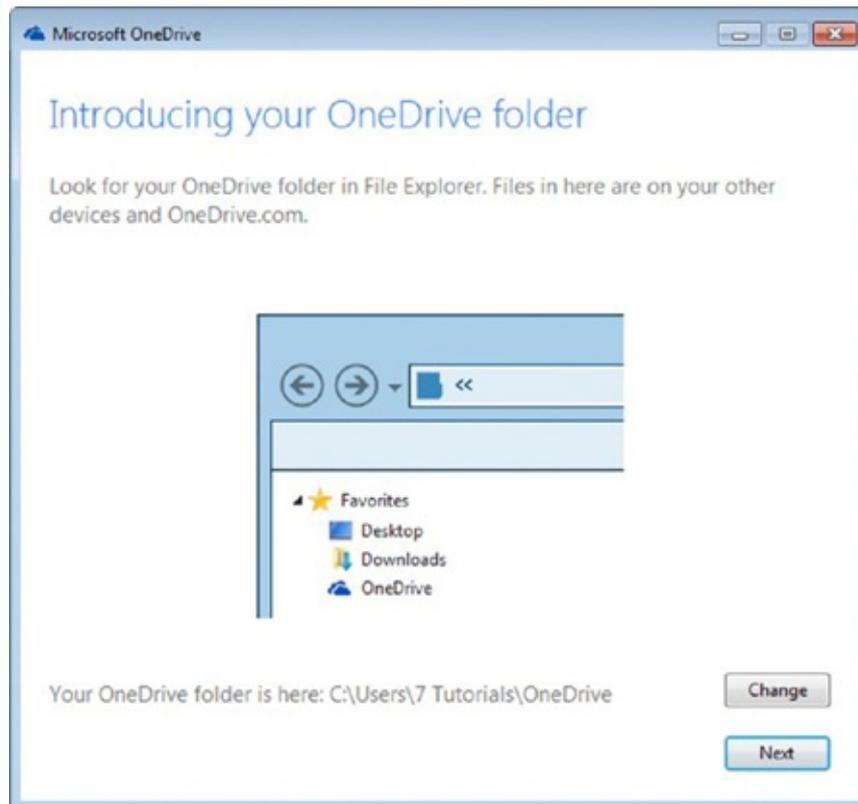
Figure 4.40 The location of your OneDrive folder

You are asked what you want to synchronize.

6. Select All Files And Folders On My OneDrive (Figure 4.41) and click Next.
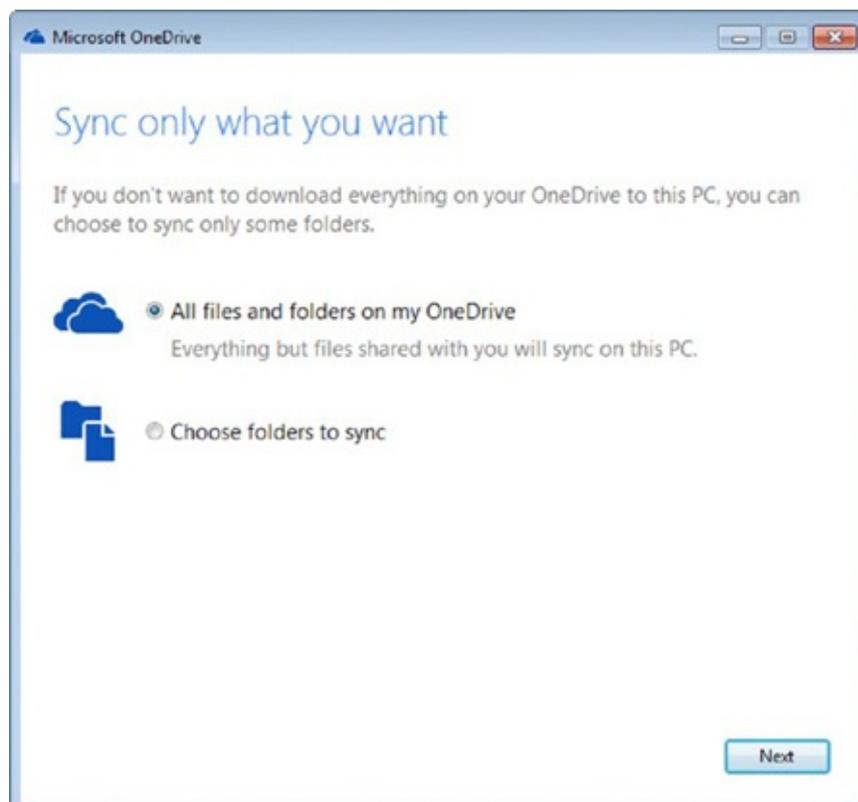
Figure 4.41 Selecting what you want to sync

You can then select whether you want OneDrive to allow you to fetch any of your files from this PC from anywhere on the Internet.

7. Leave the box checked and click Done (Figure 4.42).
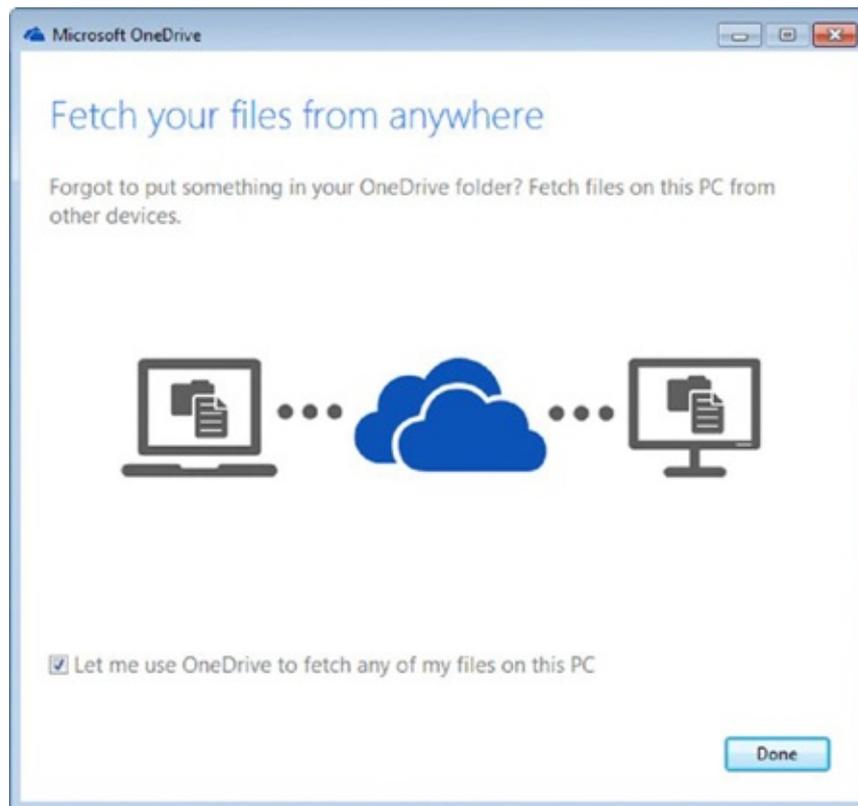
Figure 4.42 Setting the fetch feature in OneDrive

OneDrive is now installed, and Windows Explorer is opened directly to your OneDrive folder (Figure 4.43).
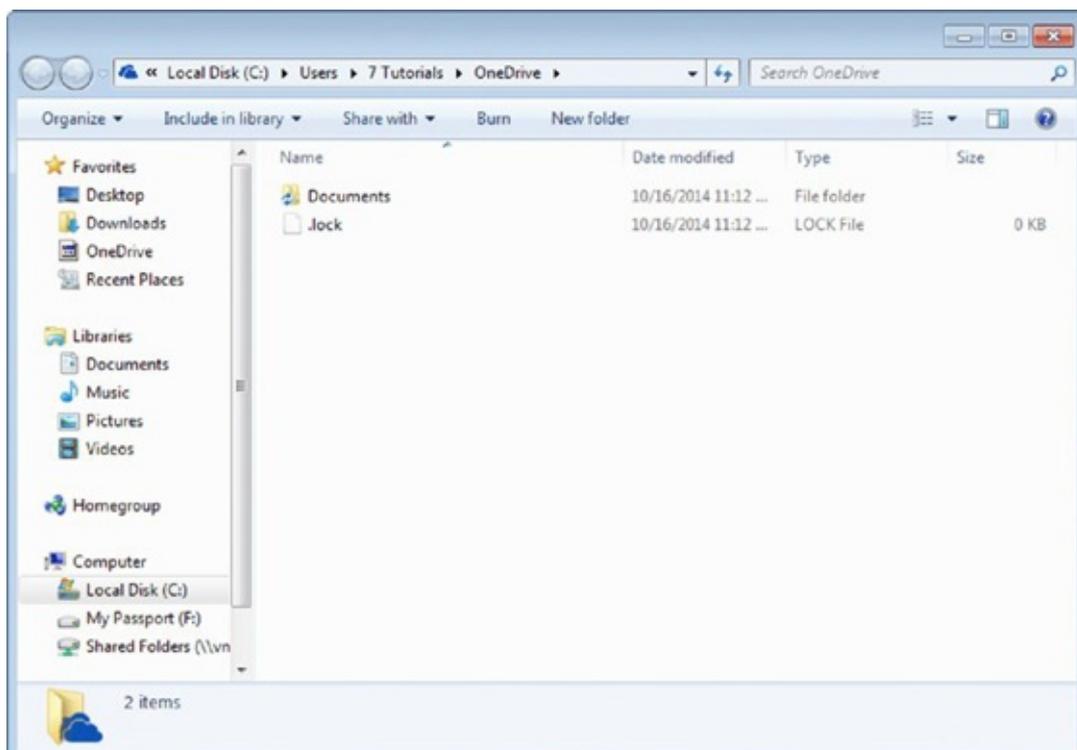
Figure 4.43 The OneDrive folder

8. Copy the files and folders that you want to back up in the cloud to this folder.

9. When finished, close Windows Explorer.

Once OneDrive is installed on your Windows 7 computer, you can access it using the shortcuts from Windows Explorer. OneDrive works just like any other folder. You can cut, copy, paste, and delete any file or folder just as you would normally do. Anything that's found inside the OneDrive folder is automatically synchronized to the cloud and with other devices and computers where you are using OneDrive with the same Microsoft account.

If Windows crashes and you need to reinstall it, your data is safely stored in the cloud. After reinstalling Windows, all you have to do is to reinstall OneDrive, and all of your backedup files will be automatically downloaded to your computer. You can also access those files at any time from the OneDrive website by using the OneDrive apps for tablets and smartphones. Once a file is synchronized with this server, it is never lost, no matter what happens, unless you delete it from OneDrive.

Summary

As you have seen in this chapter, there are plenty of computer issues you may have to deal with, and the list doesn't stop at what we managed to cover in this chapter. We discussed only the most common types of issues that are caused by hardware and software components, not all of the issues that you may encounter.

Knowing how to troubleshoot common computing problems is very useful in your everyday work, and not having to call tech support for every simple problem will save you some frustration, time, and sometimes even money.

Finally, building your own backup system is a great way to ensure that your data is always safe, no matter what happens. Computers and devices are perishable, and at some point they will stop working for various reasons, including old age. Having a backup system in place ensures that you won't lose your precious data when your computer stops working. While you may be able to afford to replace a hardware component or buy a new computer, you may not be able to afford to lose your work and your personal files. A backup will always help you recover your files when you need them and restore them on other computers, if your own is no longer working.

Exam Essentials

Learn how to identify applications that are not compatible with your operating system and learn how to deal with them. When upgrading to a newer version of Windows, you may encounter old applications that don't work with that version. It is important to know how to identify incompatible applications and what you can do in order to use them.

Know how to end unresponsive applications. While using a computer, some applications may stop working, causing your computer to slow down. It is good to know how to end those applications that have stopped working and find those applications that are consuming a big percentage of your computer's hardware resources.

Know how to remove malware from your computer. If your computer is connected to the Internet, then you will encounter all kinds of malware that may or may not infect your computer, depending on the effectiveness of your antivirus application. Knowing how to remove viruses and other malware from your computer is crucial for having a secure computing experience.

Know how to deal with simple hardware-related problems. While using a computer, you may have to deal with simple issues that are caused by cables and connectors not being plugged in correctly. Your keyboard may stop working suddenly, your computer may not start when you press the power button, and so on. It is very good to know how to deal with these kinds of issues and fix them quickly.

Understand the role of firmware and drivers when dealing with hardware. In order for a computer to run well, its components must have up-to-date firmware and drivers installed. These types of software have a big impact on your computer's performance and on the way you are using the computer. That's why you should have a good understanding of these concepts and the role they play when using a computer.

Know how to set up your own backup system. Your work and your data are even more important than your computer, and you should always have a system to keep it safe. Setting up your own backup system is vital to a good computing experience, and having a way to recover your data when something goes wrong will save you lots of frustration, time, and money.

Key Terms

Before you take the exam, be certain you are familiar with the following terms:

Backup and Restore	Microsoft Answers
BIOS	Microsoft Security Essentials
Compatibility Mode	OneDrive
Drivers	Safe Mode
Firmware	Task Manager
Fix It Solution Center	Windows Compatibility Center
Flashing	

Review Questions

1. What tool you can use to check whether an application is compatible with your Windows version?

    A. Microsoft Fix It Solution Center

    B. Compatibility Mode

    C. Safe Mode

    D. Windows Compatibility Center

2. What tool you can use to close applications that are not responding?

    A. Windows Defender

    B. Microsoft Security Essentials

    C. Task Manager

    D. Microsoft Word

3. Which of the following are ways of preventing malware infections? (Choose all that apply.)

    A. When downloading a new file on your computer, you scan it with an antivirus.

    B. When plugging a USB memory stick into your computer, you scan it with an antivirus.

    C. Boot into Safe Mode.

    D. You use your antivirus to scan your computer for malware regularly, at least once a month.

4. What is Safe Mode? (Choose all that apply.)

    A. Windows loading only the barest essentials that are required for it to run

    B. Windows loading without a user interface

    C. A way of loading Windows that allows you to troubleshoot and fix problems with the operating system

    D. Windows loading without a desktop background

5. Which of the following are resources where you can get help from Microsoft? (Choose all that apply.)

    A. Microsoft Word

    B. Microsoft Answers

    C. Yahoo! Answers

    D. Fix It Solution Center

6. When your computer's monitor remains black after turning on the computer, what should you do to fix this problem? (Choose all that apply.)

A. Check whether the monitor is turned on.

B. Check whether the monitor is correctly connected to the computer.

C. Check whether the monitor is full of dust.

D. Check whether the monitor is plugged correctly into the power socket.

7. What should you check before installing a driver for a hardware component? (Choose all that apply.)

A. That it was released in the last 30 days

B. That it is compatible with the exact version of the operating system you are using

C. That it is made for the exact hardware component that you are using

D. That it was created by the manufacturer of your hardware's component

8. What is the BIOS? (Choose all that apply.)

A. Firmware with a user interface

B. Software that runs when the operating system is started

C. The firmware that is in charge of initializing and testing all the hardware components of a computer

D. Basic Input/Output System

9. Why should you back up your data? (Choose all that apply.)

A. To lose it when your computer crashes

B. To be able to recover it when your computer crashes

C. To be able to recover it when your computer gets stolen

D. To have it in the cloud

10. Which of the following are characteristics of cloud storage? (Choose all that apply.)

A. Your data is stored on multiple physical servers.

B. Your data can be accessed from different computers and devices with an Internet connection as long as you have the correct credentials to access it.

C. Your data can be recovered from anywhere at any time.

D. Your data can be recovered only for a limited time.

Appendix A
Answers to Review Questions

Chapter 1: Understanding Operating Systems

1. C. Operating systems are the middleman between the hardware of the computer, the user, and the software applications that are installed. The operating system always takes the input from the user, translates it into commands for the hardware, and returns the result.

2. A, D. Windows and Android are operating systems. Microsoft Office is an application that must be installed on top of the operating system. Hardware is the collection of the physical elements that constitute a computer.

3. B, C. When you lock your computer or switch users, the computing session is paused, and your applications and files remain open. You do not have to save your work because you are not ending the session. If you opt to log off the computer, your session is ended. Also, if you shut down the computer, the computer is turned off, and your session has ended.

4. B, D. When you cut something and then paste it, the item is moved. If you were to copy it instead, the item would not be moved, but a copy of it would be created. There is no specific Move command, but if you right-click and drag a folder from one area of the hard drive to another, Move Here is an option after you drop the item.

5. A, C, D. When using Windows Explorer, you can learn the file type of each file when you are using the Content, Tiles, and Details views. The List view displays a list with all your files, without any additional information.

6. A. Ctrl+C is the shortcut for Copy; Ctrl+X is the shortcut for Cut; Ctrl+V is the shortcut for Paste; Ctrl+P is the shortcut for printing a document.

7. A, B, D. The Magnifier is a tool available from the Accessibility Center that enables you to zoom in on what is showing on the screen. You can decrease the screen resolution to make everything larger, while increasing it would make everything smaller. You can also opt to make text and other items larger from the Display window.

8. C. The only place where you can go to customize both the Desktop background and the theme used by Windows is Start ➢ Control Panel ➢ Appearance And Personalization ➢ Personalization. The other options take you to panels where you can customize other items.

9. D. Only administrators are allowed to make changes that affect all users of the computer and create other users.

10. D. Read is the permission that offers access to a file but does not allow any alteration to it. Read/Write allows access and editing. View and Delete are not valid permissions.

Chapter 2: Understanding Hardware

1. A, C. RAM and the CPU are housed inside the computer and are thus internal hardware. A mouse and a printer are connected externally so they are external hardware or peripherals.

2. A, C, D. RAM is the only type of volatile memory in this list. It loses all its stored data when powered off. SSDs, DVDs, and USB flash drives do not lose their data when powered off.

3. B, C. The speakers and the webcam are generally connected to a desktop computer and are not found inside the case of the computer. They are peripherals.

4. A, B. A monitor shows the visual output of the computer. Speakers output sound. A microphone accepts data, so it's an input device. A keyboard accepts keystrokes, so it is also an input device.

5. D. Servers tend to have very powerful hardware, which requires more energy than other computers. They are used to provide all kinds of specialized services to other computers.

6. B. One byte contains 8 bits (or 8 bits make up 1 byte).

7. A. A byte represents a single letter. It would take many bytes to represent a picture or a video. You do not have to group 8 bytes together to represent something; 1 byte will suffice.

8. C. RAM is denoted in GBs. GHz and MHz are used with the CPU; MB is too small a measure. Note that in the past MB was used as a unit of measure for RAM, but now it comes in GBs.

9. D. The Performance tab offers graphs to represent usage history. The Processes and Services tabs do not offer graphs. Resource Monitor is a button on the Performance tab and is also an application.

10. B. One hertz is one computing cycle per second or one computer instruction per second. The only correct answer is B. The other answers are incorrect.

Chapter 3: Understanding Software

1. B. System requirements describe the hardware components or other software resources that need to be present on the computer where you want to use an application.

2. A, D. Typical application installations allow users to change the installation folder and specify which shortcuts they want installed.

3. C. You can start the removal process for any of your installed applications by clicking Start ➤ Control Panel ➤ Uninstall A Program. There you will see a list of all your installed applications, and you can remove any of them.

4. A, C. EULA stands for end-user license agreement, and it is the contract between the company that published the software that you want to use and you, the user.

5. B, D. GPL (GNU General Public License) and MIT are the most commonly used open-source licenses. Freeware and shareware are proprietary licenses.

6. C, D. A and B are characteristics of databases, whereas C and D are characteristics of spreadsheets and spreadsheet programs like Microsoft Excel.

7. A. While both word processing programs and desktop publishing programs can work with text and images, word processing programs specialize in creating written documents, whereas desktop publishing programs specialize in creating materials that are comparable to traditional typography and printing.

8. B, C. Microsoft PowerPoint and LibreOffice Impress are similar programs that can be used to create presentations.

9. A, B, D. Installing an antivirus program is the only action listed that you can take that does not increase the amount of free space available on your computer's hard disk.

10. D. A, B, and C are harmful activities that can be performed by all kinds of malware. What separates a virus from other types of malware is its capacity to replicate itself.

Chapter 4: Troubleshooting Problems with Your Computer

1. D. Windows Compatibility Center is a website where you can check whether an application is compatible with your version of Windows.

2. C. Task Manager is the tool that you can use to learn the status of your running applications and close those that are no longer responding to your commands.

3. A, B, D. Booting into Safe Mode is the only thing that doesn't prevent malware infections.

4. A, C. Safe Mode is a way of loading Windows with only the barest essentials that are required for it to run, which allows users to troubleshoot and fix problems that cannot be solved when loading Windows normally.

5. B, D. Microsoft Answers is an online community where you can get help from Microsoft employees, technical experts, and other users. Fix It Solution Center is a portal created by Microsoft where you can find solutions to many Windows-related problems.

6. A, B, D. Dust doesn't cause monitors to stop displaying the image on the screen. All the other possible causes do.

7. B, C. You should install a driver on your computer only if it was made for the exact hardware component that you are using and only if it is compatible with the version of the operating system you are using.

8. A, C, D. B is the only answer that doesn't describe a characteristic of the BIOS.

9. B, C. If you have a backup system in place, you can easily recover your data when your computer crashes or gets stolen.

10. A, B, C. Cloud storage solutions do not impose a time limit for recovering your data. All other options are characteristics of cloud storage solutions.

Appendix B
Using the Practice Files

This appendix lists the practice files that accompany the book. The information is organized by chapter for easy reference. You can find all practice files online, in the "Other Study Tools" section of the interactive learning environment that was created for this book. Before going through all the exercises that are offered, please register and download all the practice files.

IC3—Module 1: Computing Fundamentals

Part I	
Chapter	**Practice Files**
Chapter 1: Understanding Operating Systems	None
Chapter 2: Understanding Hardware	None
Chapter 3: Understanding Software	documents.zip
Chapter 4: Troubleshooting Problems with Your Computer	None

Free Online Learning Environment

Register on Sybex.com to gain access to the free online interactive learning environment and test bank to help you study for your IC3 Internet and Computing Core Certification Global Standard 4 exam.

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- Practice Exams to test your knowledge of the material
- Electronic Flashcards to reinforce your learning and provide last-minute test prep before the exam
- Searchable Glossary to give you instant access to the key terms you'll need to know for the exam
- Practice Files for you to use in chapter exercises and activities

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