COMPLETE

VISUALIZING TECHNOLOGY

Fifth Edition

Debra Geoghan

COMPLETE

VISUALIZING TECHNOLOGY

Fifth Edition

Debra Geoghan

Bucks County Community College

PEARSON

Boston Columbus Indianapolis New York San Francisco Hoboken Amsterdam
Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto
Delhi Mexico City Sao Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Vice President of Career Skills: Andrew Gilfillan
Executive Editor: Jenifer Niles
Team Lead, Project Management: Laura Burgess
Project Manager: Laura Karahalis
Development Editor: Cheryl Slavik
Editorial Assistant: Michael Campbell
Vice President Digital Strategy Workforce Readiness: Jason Fournier
Product Strategy Manager: Eric Hakanson
Production Media Project Manager: John Cassar
Director of Product Marketing: Maggie Waples
Director of Field Marketing: Leigh Ann Sims
Product Marketing Manager: Kaylee Carlson
Field Marketing Managers: Molly Schmidt & Joanna Sabella
Program Manager: Emily Biberger
Efficacy Curriculum Manager: Jessica Sieminski
Senior Operations Specialist: Diane Peirano
Senior Art Director: Diane Ernsberger
Cover Art: Gray Wall Studio/Fotolia and Kletr/Fotolia
Cover Design: Lumina Datamatics, Inc.
Composition and Full-Service Project Management:
Lumina Datamatics, Inc.
Lumina Datamatics Project Manager: Sarah Vostok
Cover Printer: Lehigh-Phoenix Color/Hagerstown
Printer/Binder: Courier Companies, Inc./Kendallville
Text Font: 10/12 Helvetica Neue LT W1G Roman

Credits and acknowledgments borrowed from other sources and reproduced, with permission, in this textbook appear on the appropriate page within text.

Library of Congress Cataloging-in-Publication Data
Names: Geoghan, Debra, author.
Title: Visualizing technology. Complete / Debra Geoghan.
Other titles: Complete visualizing technology
Description: Fifth edition. | Boston, Massachusetts : Pearson, [2017]
Identifiers: LCCN 2015040281 | ISBN 9780134401072
Subjects: LCSH: Microcomputers—Popular works. | Computer science—Popular works.
Classification: LCC QA76.5 .G3766 2017 | DDC 004.16—dc23
LC record available at http://lccn.loc.gov/2015040281

PEARSON

ISBN 10: 0-13-440107-7
ISBN 13: 978-0-13-440107-2

Brief Contents

CHAPTER 1	What Is a Computer?	2
CHAPTER 2	Application Software	52
CHAPTER 3	File Management	112
CHAPTER 4	Hardware	162
CHAPTER 5	System Software	226
CHAPTER 6	Digital Devices and Multimedia	274
CHAPTER 7	The Internet	330
CHAPTER 8	Communicating and Sharing: The Social Web	380
CHAPTER 9	Networks and Communication	436
CHAPTER 10	Security and Privacy	484
CHAPTER 11	Databases	536
CHAPTER 12	Program Development	586
APPENDIX A	Microsoft® Office 2016 Applications Projects	634
APPENDIX B	Using Mind Maps	636

Contents

CHAPTER 1
What Is a Computer? 2

What Does a Computer Do? 4
Objective 1 Explain the Functions of a Computer 4
Necessity is the Mother of Invention 5

HOW TO Capture a Screenshot of Your Desktop 8

A Brief History of Computers 10
Objective 2 Describe the Evolution of Computer Hardware 10
History of Computers 11
Moore's Law 14

Bits and Bytes 16
Objective 3 Describe How Computers Represent Data Using Binary Code 16
Binary Code 17
Measuring Data 18

Let's Get Personal 20
Objective 4 List the Various Types and Characteristics of Personal Computers 20
Desktop Computers 21
Notebook Computers 22
MAC OR PC? 23
Ergonomics 24

HOW TO Ergonomics 26

Beyond the Desktop 28
Objective 5 Give Examples of Other Personal Computing Devices 28
Mobile Devices 29
Video Game Systems and Simulations 30

Multiuser Computers 32
Objective 6 List the Various Types and Characteristics of Multiuser Computers 32
Servers 33
Supercomputers 35
Distributed and Grid Computing 36

Computers are Everywhere 38
Objective 7 Explain Ubiquitous Computing and Convergence 38
Embedded Computers 39
Convergence 40

Objectives Recap 43
Key Terms 43
Summary 43
Application Projects 48

CHAPTER 2
Application Software 52

Making Business Work 54
Objective 1 Identify Types and Uses of Business Productivity Software 54
Office Suites 55
Other Types of Business Software 60

Making It Personal 64
Objective 2 Identify Types and Uses of Personal Software 64
Office Applications 65
Finance and Tax Preparation Software 66
Entertainment and Multimedia Software 67

Educational and Reference Software 69
Portable Apps 71

HOW TO Create a Document Using WordPad or TextEdit 72

Will It Run? 78

Objective 3 Assess a Computer System for Software Compatibility 78
Your System Specs 79
System Requirements 80

Where To Get It 82

Objective 4 Compare Various Ways of Obtaining Software 82
Licensing 83
Free or Fee 83
Sources of Software 84

Your Head in the Cloud 86

Objective 5 Discuss the Importance of Cloud Computing 86
Cloud Computing 87

HOW TO Create a Mobile App with Appy Pie 90

Managing Software on Your System 96

Objective 6 Install, Uninstall, and Update Software 96
Installing Software 97
Updating and Uninstalling Software 99

Objectives Recap 103
Key Terms 103
Summary 103
Application Projects 108

CHAPTER 3
File Management 112

A Place for Everything 114

Objective 1 Create Folders to Organize Files 114
Navigating Your Computer 115
Creating and Using Folders 119

HOW TO Organize Your Files 122

What's in a Name? 126

Objective 2 Explain the Importance of File Extensions 126
File Names and Extensions 127
File Properties 129

Back It Up 132

Objective 3 Explain the Importance of Backing Up Files 132
Windows Backup 133
OS X Time Machine 133
Other Backup Software 134
BACKUP to the Cloud 134
Cloud Storage 135

Shrink It 138

Objective 4 Demonstrate How to Compress Files 138
Types of File Compression 139
Working with File Compression 140

HOW TO Create a Compressed (Zipped) Folder 142

It's Always in the Last Place You Look 144

Objective 5 Use Advanced Search Options to Locate Files 144
Using Windows to Search for Files 145
Searching in OS X 146
Using Boolean Logic to Refine Searches 147

That's Not the Program I want to Open this File 148

Objective 6 Change the Default Program Associated with a File Type 148
Setting Program Defaults 149
Managing File Type Associations 150

Objectives Recap 153
Key Terms 153
Summary 153
Application Projects 158

CHAPTER 4
Hardware 162

The CPU: The brains of the operation 164
Objective 1 Explain the Functions of a CPU 164
Instruction Cycle 165
CPU Performance 166

Getting to Know Your System Unit and Motherboard 170
Objective 2 Identify the Parts of a System Unit and Motherboard 170
The Motherboard 171
Ports and Connectors 172
BIOS and MEMORY 174

A Place for Everything 176
Objective 3 Compare Storage Devices 176
Optical Discs 177
Flash Memory 178
Hard Drives 179
Disconnecting An External Drive 180

HOW TO Assess Your Computer Hardware 182

What Goes In . . . 184
Objective 4 List and Describe Common Input Devices 184
Keyboards 186
The Mouse and Other Pointing Devices 187
Digital Cameras and WEBCAMS 188
Scanners 188
Microphones and Game Controllers 191

. . . Must Come Out 192
Objective 5 List and Describe Essential Video and Audio Output Devices 192
Video Output Devices 193
Audio Output Devices 196

Pick a printer 198
Objective 6 Compare Various Types of Printers 198
Printers 199

HOW TO Reduce energy consumption using power settings 202

Adaptation: Making Technology Work for You 206
Objective 7 Explain and Provide Examples of Adaptive Technology 206
Adaptive Input Devices 207
Adaptive Output Devices 208

Communicate, Communicate, Communicate 210
Objective 8 Discuss Communication Devices 210
Network Adapters 211
Modems and Fax Devices 211

Objectives Recap 215
Key Terms 215
Summary 216
Application Projects 222

CHAPTER 5
System Software 226

Who's the Boss? 228
Objective 1 Explain What an Operating System Does 228
Provides User Interface 229
Manages Resources and Controls Hardware 230
Interacts With Software 231

HOW TO Keep Your Desktop OS Up to Date 232

Desktop Operating Systems 236
Objective 2 Compare Desktop Operating Systems 236
Windows 237
Mac OS X 238
Linux 240
Beta Software 241

Make Your OS Work for You 242

Objective 3 Configure a Desktop Operating System 242

Configuring Your OS 243

User Accounts 244

Something Special for You 246

Objective 4 Compare Specialized Operating Systems 246

Embedded Operating Systems 247

The NOS Knows 250

Objective 5 Compare the Most Common Network Operating Systems 250

What is An NOS? 251

Utilities You Should Use 254

Objective 6 List and Explain Important Utility Software 254

Why Use Disk Utilities? 255

Utilities For Disk Health 255

Security Software 259

HOW TO Back Up Important Files 260

Objectives Recap 265

Key Terms 265

Summary 265

Application Projects 270

CHAPTER 6

Digital Devices and Multimedia 274

Digital Camera Basics 276

Objective 1 Explain the Features of Digital Cameras 276

Key Features 277

Types of Digital Cameras 279

Bridging The Gap: Transferring Photos 282

Objective 2 Compare Methods for Transferring Images from a Digital Camera 282

Memory Cards 283

USB or Firewire Cable 284

Wireless and Cloud Transfer 284

A Picture is Worth a Thousand Words 286

Objective 3 Identify Several Ways to Edit and Print Photos 286

Editing Photos 287

Printing and Sharing Photos 288

HOW TO Edit a Photo Using the Windows Photos or OS X Photos App 292

Making Sense of Sound 298

Objective 4 Recognize Important Audio File Types 298

Audio File Types 299

Media Software 300

Speech Recognition 302

Lights, Camera, Action 304

Objective 5 Describe Several Ways to Create Videos 304

Videoconferencing, Webcasting, and Streaming Video 305

Video Cameras 306

Screen Capture 307

Sharing Video 307

HOW TO Create a Screen Capture Video Using Screencast-O-Matic 310

Technology on The Move 314

Objective 6 Compare Portable Media Players, Tablets, and Smartphones 314

Analog Vs. Digital 315

Portable Media Players 315

Smartphones 316

Tablets 316

Objectives Recap 321

Key Terms 321

Summary 321

Application Projects 326

CHAPTER 7

The Internet 330

Internet Timeline 332

Objective 1 Recognize the Importance of the Internet 332

How it All Got Started 333
World Wide Web 333
Internet2 334

Get Connected 336

Objective 2 Compare Types of Internet Connections 336

How Do You Get Connected? 337
Connecting Without a Computer 340

Surf's Up 342

Objective 3 Compare Popular Web Browsers 342

Browsers 343
Configuring Your Web Browser 346
Add-Ons, Plug-Ins, and Toolbars 347

HOW TO Use Google Drive 348

Navigating The Net 352

Objective 4 Demonstrate How to Navigate the Web 352

Web Addresses 353
Smart Searching 355

HOW TO Create a Website Using Wix 358

Would I Lie to You? 366

Objective 5 Discuss How to Evaluate the Credibility of Information Found on the Web 366

Who Wrote It? 367
What About The Design? 368

Objectives Recap 371
Key Terms 371
Summary 371
Application Projects 376

CHAPTER 8

Communicating and Sharing: The Social Web 380

Talk To Me 382

Objective 1 Compare Different Forms of Synchronous Online Communication 382

Chat and IM 383
VoIP 383

Leave A Message 386

Objective 2 Compare Different Forms of Asynchronous Online Communication 386

How do You Read and Send Email? 387
Parts of An Email Message 388
Text and Multimedia Messaging 390
Forums and Discussion Boards 391

There's A Place For Everyone . . . 392

Objective 3 Discuss the Impact of Social Media in Society 392

Social Network Sites 393
Social Video, Image, and Music Sites 396

HOW TO Create a LinkedIn Profile 400

Get Your Word Out 404

Objective 4 Locate User-Generated Content in the Form of a Blog or Podcast 404

Blogs 405
Podcasts 406
RSS 407
Crowdfunding 407

HOW TO Create a Blog with Blogger 408

The Wisdom of The Crowd 412

Objective 5 Discuss How Wikis and Other Social Media Sites Rely on the Wisdom of the Crowd 412

Wikis 413
Social Review Sites 414
Social Bookmarking and News Sites 414

E-Commerce 416

Objective 6 Explain the Influence of Social Media on E-commerce 416

Types of E-Commerce 417

How Safe is My Credit Card? 419

Build A Brand 420

Objective 7 Develop a Brand Marketing Strategy Using Social Media and Other Online Technologies 420

Facebook Pages 421

Twitter 423

Search Engines 424

Objectives Recap 427

Key Terms 427

Summary 427

Application Projects 432

CHAPTER 9

Networks and Communication 436

From Sneakernet to Hotspots 438

Objective 1 Discuss the Importance of Computer Networks 438

Peer-to-Peer Networks 439

Client–Server Networks 441

HOW TO **Examine Network and Sharing Settings 442**

LANs and WANs 446

Objective 2 Compare Different Types of LANs and WANs 446

Small Networks 447

Lan Topologies 448

Large Networks 449

Hardware 452

Objective 3 List and Describe the Hardware Used in Both Wired and Wireless Networks 452

Network Adapters 453

Network Connectivity Hardware 455

Software and Protocols 458

Objective 4 List and Describe Network Software and Protocols 458

Peer-to-Peer Network Software 459

Client–Server Network Software 461

Network Protocols 463

HOW TO **Check Your System Security Software 466**

Protecting Your Network 470

Objective 5 Explain How to Protect a Network 470

Layer 1: The Fence 471

Layer 2: Door Locks 471

Layer 3: Alarm Systems 472

Layer 4: Guard Dogs 472

Objective Recap 475

Key Terms 475

Summary 475

Application Projects 480

CHAPTER 10

Security and Privacy 484

Cybercrime: They Are Out to Get You 486

Objective 1 Recognize Different Types of Cybercrime 486

Personal Cybercrime 487

Cybercrime against Organizations 490

HOW TO **Configure Secure Browser Settings Using Google Chrome 492**

Malware: Pick Your Poison 496

Objective 2 Differentiate between Various Types of Malware 496

Spam and Cookies 497

Adware and Spyware 498

Viruses, Worms, Trojans, and Rootkits 499

Shields Up! 502

Objective 3 Explain How to Secure a Computer 502

Software 503
Hardware 505
Operating System 506

An Ounce of Prevention is Worth a Pound of Cure 508
Objective 4 Practice Safe Computing 508
User Accounts 509
Securing Accounts 510
Encryption 511
Safely Installing Software 512
Updating and Uninstalling Software 513
Acceptable Use Policies 514

HOW TO Secure a Microsoft Word Document 516

The Law is on Your Side 522
Objective 5 Discuss Laws Related to Computer Security and Privacy 522
The Enforcers 523
Current Laws 524

Objectives Recap 527
Key Terms 527
Summary 527
Application Projects 532

CHAPTER 11
Databases 536

Database Basics 538
Objective 1 Identify the Parts of a Database 538
Tables, Fields, and Records 539
Forms, Queries, and Reports 540

A Database For Every Purpose 544
Objective 2 Compare the Four Types of Databases 544
Flat Databases 545
Relational Databases 545
Object-Oriented Databases 546
Multidimensional Databases 546

HOW TO Create a Form Using Google Docs 548

The Tools of the Trade 552
Objective 3 Explain Database Management Systems 552
Creating a Database 553
Data Validation 553
SQL 554
Output 556

HOW TO Create a Customer Database 558

Data In . . . Information Out 564
Objective 4 Discuss Important Types of Information Systems 564
Office Support Systems 565
Transaction Processing 565
Management Information Systems 566
Decision Support Systems 566
Business Intelligence and Big Data 567
Expert Systems and Artificial Intelligence 567

Real-World Databases 570
Objective 5 List Examples of Databases Used in Law Enforcement and Research 570
Law Enforcement 571
Science 572

Objectives Recap 577
Key Terms 577
Summary 577
Application Projects 582

CHAPTER 12
Program Development 586

Getting from Idea to Product 588
Objective 1 Describe the System Development Life Cycle 588
System Development Life Cycle (SDLC) 589
Other Development Models 593

Coding the System 596

Objective 2 Describe the Program Development Cycle 596

Program Development Cycle 597

HOW TO **Create a Flowchart 602**

Tools of the Trade 606

Objective 3 Compare Various Programming Languages 606

Programming Languages 607
Programming Tools 608
Web Programming 609
Mobile App Development 610

HOW TO **Automate a Task by Using a Macro in Word 612**

Artificial Intelligence 620

Objective 4 Explain the Term *Artificial Intelligence* 620

Applications 621
Expert Systems 621
Neural Networks 622

Objectives Recap 625

Key Terms 625

Summary 625

Application Projects 630

Appendix A Microsoft® Office 2016 Applications Projects 634

Appendix B Using Mind Maps 636

Glossary 638

Index 655

What's New in This Edition?

Visualizing Technology is a highly visual, engaging computer concepts textbook. Filled with all the important topics you need to cover, but unlike other textbooks, you won't find pages full of long paragraphs. Instead, you'll find a text written the way students are hardwired to think: it has smaller sections of text that use images creatively for easier understanding, and chapters are organized as articles with catchy headlines. For the fifth edition, we have completely updated the design, so that students encounter content in a more linear, yet engaging way—just as they see on their favorite websites.

Visualizing Technology provides a hands-on approach to learning computer concepts in which students learn a little and then apply what they are learning in a project, simulation, or watch a Viz Clip video to dive deeper. Each chapter has two *How-To* projects focused on *Digital Literacy* and (*Essential Job Skills*) Job Skills so that students are gaining the skills needed for professional and personal success. They learn about the important topics of ethics, green computing, and careers in every chapter. And, the content is all up to date with the latest in technology, including Windows 10 and Mac OS X El Capitan.

The optimal way to experience *Visualizing Technology* is with MyITLab. All of the instruction, practice, review, and assessment resources are in one place, allowing you to arrange your course from an instructional perspective that gives students a consistent, measurable learning experience from chapter to chapter.

INSTRUCTION

Prepare visual and kinesthetic learners with a variety of instructional resources

- **Integrated Etext** provides an environment in which students can interact with the learning resources directly
- **Viz Intro Videos** provide an overview of the objectives covered in the chapter
- **Viz Clip Videos** dig deeper into key topics in the chapter in an engaging, YouTube-like approach
- **PowerPoint Presentation** – can be used in class for lecture, or assigned to students, particularly online students for instruction and review
- **Audio PowerPoint Presentation** deliver audio versions of the PowerPoint presentation - an excellent lecture-replacement option for online students
- **TechBytes Weekly** provides a timesaving news site that allows instructors to add pre-curated, interesting, timely, and relevant news items to their weekly lectures without having to search themselves. TIA Weekly also features valuable links and other resources, including discussion questions and course activities.

PRACTICE

Engage students with hands-on activities and simulations that demonstrate understanding

- **NEW How-To Projects these** active-learning projects are now delivered in two versions per chapter a *Digital Literacy* Project and an *Essential Job Skill* Project. Each project focuses on the skills students need for personal and professional success. Topics include, basic website creation, mobile application creation, video creation, and using social media for brand marketing.
  - **How-To Videos accompany each project to** *show* student how to complete the hands-on projects
- **IT Simulations** provide 12 newly revised and redesigned, individual scenarios that students work through in an active learning environment.
- **Windows 10 high-fidelity training simulations** allow students to explore Windows in a safe, guided environment that provides feedback and Learning Aids (Watch and Practice) to assist them if they need help.

REVIEW

Self-check and review resources keep learning on track

- **Viz Check Quiz Parts 1 & 2** provide a self-check of 3-4 objectives, so that students can see how well they are learning the content. (Feeds *grade* to MIL gradebook)
- **Viz Intro videos can also be used for review, as they provide an overview of what is covered in the chapter.**
- **Adaptive Dynamic Study Modules** are adaptive flashcards that provide students with personalized review based on their strengths and weaknesses
- **Jeopardy! Game** and **Crossword Puzzles** are a fun, engaging way for students to challenge knowledge

Other in-book, end-of-chapter projects and resources: Mind-map visual review; Objective recaps; Key Terms; Summary; Review Exercises—Multiple Choice, True or False, and Fill in the Blank.

ASSESSMENT

Measure performance with ready-to-use resources

- **End-of-Chapter Quiz** this is a comprehensive chapter quiz that covers all of the objectives from the chapter.
- **Application Projects** *(MyITLab Grader project)* and solution files. Projects are written to Windows 10 and Office 2016, but Grader projects are compatible with Office 2013 and 2016.
- **Testbank exam** customizable prebuilt, autograded, objective-based questions covering the chapter objectives
- **Other In-Book, End-of-Chapter projects:** Running Project; Critical Thinking; Do It Yourself; Ethical Dilemma; On The Web; Collaboration

CHANGES BY CHAPTER

Chapter 1 What Is a Computer?

Added coverage of:

- Ergonomics How To actively
- Drones, Apple Watch

Chapter 2 Application Software

- Updated all software versions
- Mobile app How to activity

Chapter 3 File Management

- Updated to Windows 10 and OS X El Capitan

Chapter 4 Hardware

- Added coverage of USB-C and DisplayPort
- Power settings How to activity

Chapter 5 System Software

- Updated all content and figures to Windows 10 and OS X El CApitan
- Back up How To activity

Chapter 6 Multimedia and Digital Devices

- Screen capture How To activity

Chapter 7 The Internet and World Wide Web

- Added coverage of Microsoft Edge
- Build a website How to activity

Chapter 8 Communicating and Sharing

- Added new objective - Develop a Brand Marketing Strategy

Chapter 9 Networks and Communication

- Security software How to activity

Chapter 10 Security and Privacy

- Updated browser security How to activity to use Chrome

Chapter 11 Databases

- Updated to Access 2016
- Customer Service database How to activity

Chapter 12 Program Development

- Updated to Office 2016

Appendix A Microsoft® Office 2016 Applications Projects

Appendix B Using Mind Maps

Visual Walkthrough

VISUALIZING TECHNOLOGY HALLMARKS

- **Addresses visual and kinesthetic learners**—images help students to learn and retain content while hands-on projects allow students to practice and apply what they learned.
- **Easy to read**—it has the same amount of text as other concepts books but broken down into smaller chunks of text to aid in comprehension and retention.
- **Clear, easy-to-follow organization**—each chapter is broken into a series of articles that correspond to chapter objectives.
- **Highly visual**—students will want to read!

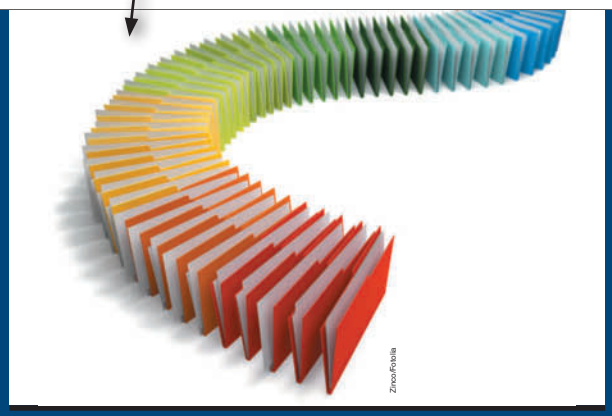
Learning Objectives clearly outlined in chapter opener and restated at the beginning of each article

Learning Outcomes are clearly defined at the beginning of each chapter.

Chapter Intro Video introduces the main concepts of the chapter

Explanation of the **Running Project** for that chapter

Catchy headlines begin each article



A Place for Everything

Objective 1

Create Folders to Organize Files

One of the most important things that you need to do when working with computers is called **file management**: opening, closing, saving, naming, deleting, and organizing digital files. In this article, we discuss organizing your digital files, creating new folders, and navigating through the folder structure of your computer.

SIMULATION File Management

The second part of the file name is the **file extension**. In this example, .docx is the extension. The extension is assigned by the program that's used to create the file. Microsoft Word files have the extension .docx. Windows maintains an association between a file extension and a program, so double-clicking on a .docx file opens Microsoft Word. The extension helps the operating system determine the type of file. If you change the file extension of a file, you may no longer be able to open it. **Table 3.4** lists some common file types and the programs associated with them.

TABLE 3.4 Common File Extensions and Default Program Associations

Extension	Type of File	Default Program Association (Windows)	Default Program Association (OS X)
.docx	Word document	Microsoft Word	Microsoft Word
.rtf	Rich text format document	WordPad or Word	TextEdit
.pages	Pages document	—	Pages
.xlsx	Excel workbook	Excel	Excel
.pptx	PowerPoint presentation	PowerPoint	PowerPoint
.bmp	Bitmap image	Paint	Preview
.jpeg/.jpg	Image file (Joint Photographic Experts Group)	Photos	Preview
.mp3	Audio file (Moving Picture Experts Group Audio Layer III)	Windows Media Player	iTunes
.aac	Audio file (Advanced Audio Coding)	iTunes	iTunes
.mov	Video file (QuickTime)	QuickTime	QuickTime
.wmv	Video file (Windows Media Video)	Windows Media Player	—
.pdf	Portable document format	Adobe Acrobat and Reader	Preview

Geoghan, Debra, Visualizing Technology Complete, 4/e. Pearson Education, 2014.

FIND OUT MORE

The characters \ / ? : * " > < | can't be used in a file name because they each have a special meaning in Windows. For example, the colon (:) is used to indicate the letter of a drive (such as C: for your hard drive). Use the Internet to research the remaining illegal characters. What does each symbol represent?

IT Simulations—take students through a hands-on activity covering a key topic in the chapter

Find Out More—prompts for additional research on a given topic

Images are used to represent concepts that help students learn and retain ideas

Green Computing provides eco-friendly tips for using technology

Moore's Law

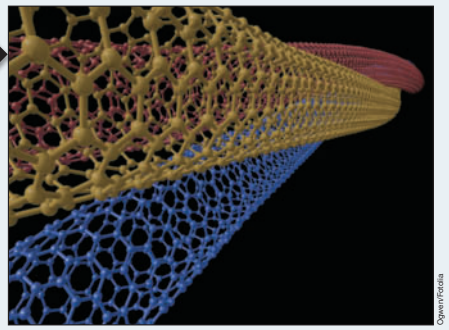
In 1965, Intel cofounder Gordon Moore observed that the number of transistors that could be placed on an integrated circuit had doubled roughly every two years. This observation, known as **Moore's Law**, predicted this exponential growth would continue. The current trend is closer to doubling every 18 months. As a result of new technologies, such as building 3D silicon processors or using carbon nanotubes in place of silicon (Figure 1.7), this pace will likely continue for another 10 to 20 years. The increase in the capabilities of integrated circuits directly affects the processing speed and storage capacity of modern electronic devices.

Moore stated in a 1996 article: "More than anything, once something like this gets established, it becomes more or less a self-fulfilling prophecy. The Semiconductor Industry Association puts out a technology road map, which continues this [generational improvement] every three years. Everyone in the industry recognizes that if you don't stay on essentially that curve they will fall behind. So it sort of drives itself."* Thus, Moore's Law became a technology plan that guides the industry. Over the past several decades, the end of Moore's Law has been predicted. Each time, new technological advances have kept it going. Moore himself admits that exponential growth can't continue forever.

In less than a century, computers have gone from being massive, unreliable, and costly machines to being an integral part of almost everything we do. As technology has improved, the size and costs have dropped as the speed, power, and reliability have grown. Today, the chip inside your cell phone has more processing power than that first microprocessor developed in 1971. Technology that was science fiction just a few decades ago is now commonplace.

*Moore, Gordon E. 1996. "Some Personal Perspectives on Research in the Semiconductor Industry," in Rosenbloom, Richard S. and William J. Spencer (Eds.). Engines of Innovation: U.S. Industrial Research at the End of an Era. Harvard College

FIGURE 1.7 Carbon nanotubes may someday replace silicon in integrated circuits.



Ogwen/Fotolia

GREEN COMPUTING

Smart Homes

The efficient and eco-friendly use of computers and other electronics is called **green computing**. Smart homes and smart appliances help save energy and, as a result, are good for both the environment and your pocketbook.

Smart homes use home automation to control lighting, heating and cooling, security, entertainment, and appliances. Such a system can be programmed to turn various components on and off at set times to maximize energy efficiency. If you're away on vacation or have to work late, you can remotely activate a smart home by phone or over the Internet. Some utility companies offer lower rates during off-peak hours, so programming your dishwasher and other appliances to run during those times can save you money and help energy utility companies manage the power grid, potentially reducing the need for new power plants.

Smart appliances plug into the **smart grid**—a network for delivering electricity to consumers that includes communication technology to manage electricity distribution efficiently. Smart appliances monitor signals from the power company, and when the electric grid system is stressed, can react by cutting back on their power consumption.

Adrian Sherratt/Alamy

Running Project

Use the Internet to look up current microprocessors. What companies produce them? Visit **computer.howstuffworks.com/microprocessor.htm** and read the article. How many transistors were found on the first home computer processor? What was the name of the processor, and when was it introduced?

5 Things You Need To Know

- First-generation computers used vacuum tubes.
- Second-generation computers used transistors.
- Third-generation computers used integrated circuits (chips).
- Fourth-generation computers use microprocessors.
- Moore's Law states that the number of transistors that can be placed on an integrated circuit doubles roughly every two years—although today it is closer to every 18 months.

Key Terms

central processing unit (CPU)

ENIAC (Electronic Numerical Integrator and Computer)

integrated circuit

microprocessor

Moore's Law

transistor

vacuum tube

Subtopics have same color background as main topics—makes it easy to follow each piece

Ethics boxes provide thought-provoking questions about the use of technology

Social Review Sites

Social review sites such as TripAdvisor and epinions let users review hotels, movies, games, books, and other products and services. Yelp allows users to review local businesses and places with physical addresses such as parks. Figure 8.23 shows a Yelp map of Times Square restaurants on the iPad app. The reviews are from regular people, not expert food critics, and can help you decide where to eat. You can use the Yelp app on a mobile device to get information when you are right in the area.

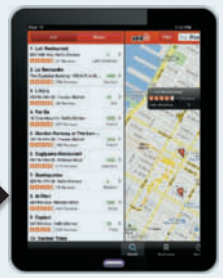


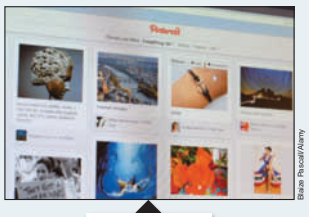
FIGURE 8.23 Searching for a Place to Eat in Times Square Using the Yelp App on an iPad

Social Bookmarking and News Sites

Social bookmarking sites allow you to save and share your bookmarks or favorites online. Delicious allows you to not only save and share your bookmarks online but also search the bookmarks of others. It's a great way to quickly find out what other people find interesting and important right now. The links are organized into topics, or tags, to make it easier for you to find links. You can click the *Follow* button if you have a Delicious account, but you don't need an account to browse Delicious.

Pinterest allows you to create virtual cork boards around topics of interest and pin webpages to them (Figure 8.24). You can share your boards with others, and you can follow other people to see what they have pinned. StumbleUpon discovers websites based on your interests. When you sign up, you indicate topics that interest you. Then, as you visit websites, you can click the *StumbleUpon* button to be taken to a similar site. You can click *I like this* to improve the selection of pages you stumble onto.

Social news sites are different from traditional mass media news sites in that at least some of the content is submitted by users. Social news is interactive in a way that traditional media isn't. It's like having millions of friends sharing their finds with you. Content that's submitted more frequently or gets the most votes is promoted to the front page.



Blaze Pascal/Alamy

FIGURE 8.24 Pinterest

Three of the most popular social news sites are reddit, Digg, and Slashdot. Digg doesn't publish content but allows the community to submit content they discover on the web and puts it in one place for everyone to see and to discuss. reddit (Figure 8.25) allows community members to submit content and to vote that content up or down, as well as discuss it. reddit is organized into categories called subreddits. Celebrities often participate in AMA—ask me anything—interviews on reddit. Slashdot, which focuses primarily on technology topics, produces some content but also accepts submissions from its readers. Whatever your interests, there's probably a social news site for you.

Ian Dagnall Computing/Alamy

FIGURE 8.25 reddit

ETHICS

Some people create multiple accounts on social bookmarking and news sites so they can promote their own content. For example, a blogger might create several accounts on Digg and use each one to Digg a blog post, artificially raising its popularity on Digg and driving more traffic to it. This violates the Digg terms of use. But what if the blogger had all his friends and family members create accounts and Digg his post? Is it ethical? Does it violate the terms of use? Is it fair to other bloggers?

Running Project

Go to the Wikipedia article "Reliability of Wikipedia" at wikipedia.org/wiki/Reliability_of_Wikipedia. How does Wikipedia ensure that the content is correct? What procedures are in place to remove or correct mistakes? How does Wikipedia compare to other online sources of information?

3 Things You Need To Know	Key Terms
• Social media relies on the wisdom of the crowd rather than that of an expert. • Anybody can edit a wiki. • Social bookmarking and news sites help users find content that others recommend.	crowdsourcing social bookmarking site social news site social review site wiki

Running Project—Specific instructions are provided for compiling information for the Running Project

Things You Need to Know—Key takeaway points are provided for each article

Key Terms—Students are reminded of the key terms they should understand after reading each article

Digital Literacy Skill

Capture a Screenshot of Your Desktop

HOW TO VIDEO

Throughout this book, you will be directed to provide screenshots of the work you have done. This is quite easy to do and is useful in other situations. For example, it's helpful for providing directions on how to do something or for keeping a record of an error message that appears on your screen. Windows includes a program called the Snipping Tool that you can use to capture a screenshot. Macs include the Grab tool.

The Windows Snipping Tool can capture four types of snips:

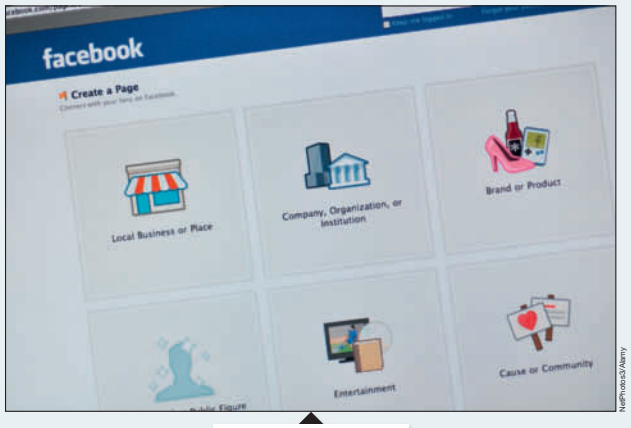
- **Free-form Snip:** Allows you to draw boundaries around an object for a snip
- **Rectangular Snip:** Allows you to draw a rectangle around an object for a snip
- **Window Snip:** Captures a selected window for a snip
- **Full-screen Snip:** Captures the whole screen for a snip

You can save your screenshots, email them, paste them into documents, and annotate and highlight them by using the buttons on the Snipping Tool toolbar. If necessary, download the student data files from **pearsonhighered.com/viztech**. From your student data files, open the *vt_ch01_howto1_answersheet* file and save the file as **lastname_firstname_ch01_howto1_answersheet**

Students get prepared for professional and personal success with these **Digital Literacy** and **Essential Job Skills** How-To projects.

Career Spotlight—Each chapter provides an interesting career option based on chapter content

To create a Facebook Page, you need a personal Facebook account. Facebook's Terms of Service permit you to have only one personal Facebook account, but you can create multiple Facebook Pages. So, for example, a college representative might create a page for each department, club, or office. Once you are logged in to your personal account, the option *Create Page* can be found in the menu options. You can choose from several page categories (Figure 8.30). A page for a business or an organization will have different features than a page for a person or cause. When you create a page, read the Facebook Pages terms carefully. Customize your page with a profile picture and header image that represents your brand.



NetPhotos/Alamy

FIGURE 8.30 Create a Page Categories

CAREER SPOTLIGHT

JOBS

BLOGGER—Although many blogs are personal in nature and earn the writer no compensation, some lucky folks are professional bloggers. These bloggers may be paid by a company to blog about a product or provide news or reviews, and their blogs are usually part of a bigger website. Some professional bloggers use their blogs to drive customers to their other products. Successful bloggers monetize the content on their sites in several ways, including placing ads and links to other sites. A professional blog may earn money by using Google AdSense to place ads and links on it. It takes a lot of time and work to write a good blog and even more to make money doing it.

Stuart Miles/Fotolia

Running Project

Select a local business that you regularly patronize or are interested in learning about, and search the web for evidence of online brand marketing. Does this business have a social media presence on Facebook, Google, Yahoo!, Twitter? How easy is it for a potential customer to locate information about the business? What advice would you give to this business to improve its online presence?

2 Things You Need To Know	Key Terms
• Organizations should maintain an online presence that includes both a traditional website and social media. • Successful search engine optimization (SEO) makes a website easier to find.	hashtag search engine optimization (SEO)

Viz Check—In MyITLab, take a quick quiz covering Objectives 4–7.

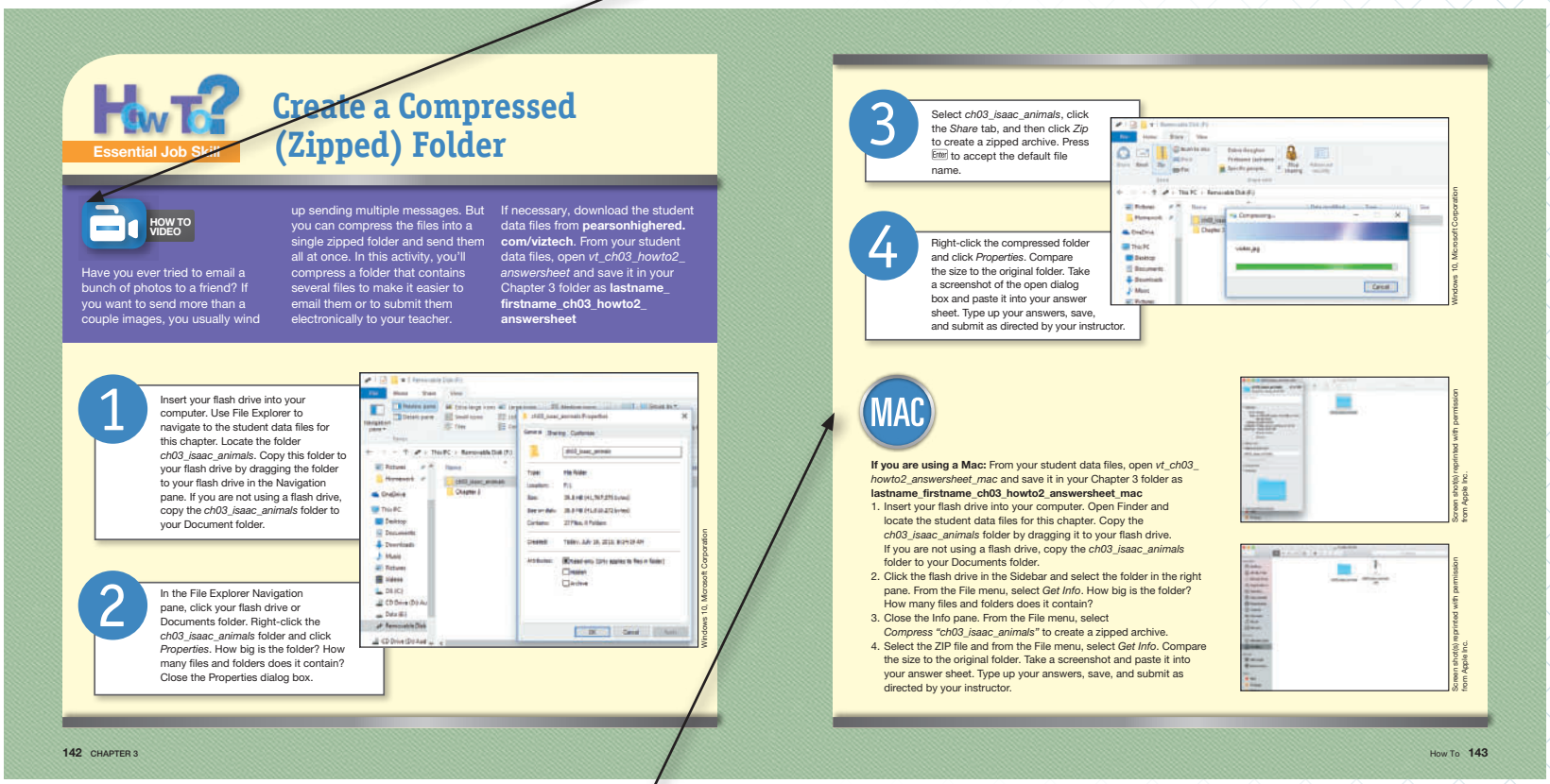
Viz Check quizzes—Each chapter includes two short online quizzes covering 3–5 objectives

422 CHAPTER 8

Objective 7 425

How to Projects—Each chapter provides two step-by-step projects, complete with visual instructions, to complete interesting and useful items

How to Videos—Each How to Project has a corresponding video walk-through of the project



How To?

Essential Job Skill

Create a Compressed (Zipped) Folder

HOW TO VIDEO

Have you ever tried to email a bunch of photos to a friend? If you want to send more than a couple images, you usually wind up sending multiple messages. But you can compress the files into a single zipped folder and send them all at once. In this activity, you'll compress a folder that contains several files to make it easier to email them or to submit them electronically to your teacher.

If necessary, download the student data files from **pearsonhighered.com/viztech**. From your student data files, open *vt_ch03_howto2_answersheet* and save it in your Chapter 3 folder as **lastname_firstname_ch03_howto2_answersheet**

1 Insert your flash drive into your computer. Use File Explorer to navigate to the student data files for this chapter. Locate the folder *ch03_isaac_animals*. Copy this folder to your flash drive by dragging the folder to your flash drive in the Navigation pane. If you are not using a flash drive, copy the *ch03_isaac_animals* folder to your Document folder.

2 In the File Explorer Navigation pane, click your flash drive or Documents folder. Right-click the *ch03_isaac_animals* folder and click *Properties*. How big is the folder? How many files and folders does it contain? Close the Properties dialog box.

Windows 10, Microsoft Corporation

3 Select *ch03_isaac_animals*, click the *Share* tab, and then click *Zip* to create a zipped archive. Press Enter to accept the default file name.

4 Right-click the compressed folder and click *Properties*. Compare the size to the original folder. Take a screenshot of the open dialog box and paste it into your answer sheet. Type up your answers, save, and submit as directed by your instructor.

Windows 10, Microsoft Corporation

MAC

If you are using a Mac: From your student data files, open *vt_ch03_howto2_answersheet_mac* and save it in your Chapter 3 folder as **lastname_firstname_ch03_howto2_answersheet_mac**

1. Insert your flash drive into your computer. Open Finder and locate the student data files for this chapter. Copy the *ch03_isaac_animals* folder by dragging it to your flash drive. If you are not using a flash drive, copy the *ch03_isaac_animals* folder to your Documents folder.
2. Click the flash drive in the Sidebar and select the folder in the right pane. From the File menu, select *Get Info*. How big is the folder? How many files and folders does it contain?
3. Close the Info pane. From the File menu, select *Compress "ch03_isaac_animals"* to create a zipped archive.
4. Select the ZIP file and from the File menu, select *Get Info*. Compare the size to the original folder. Take a screenshot and paste it into your answer sheet. Type up your answers, save, and submit as directed by your instructor.

Screen shot(s) reprinted with permission from Apple Inc.

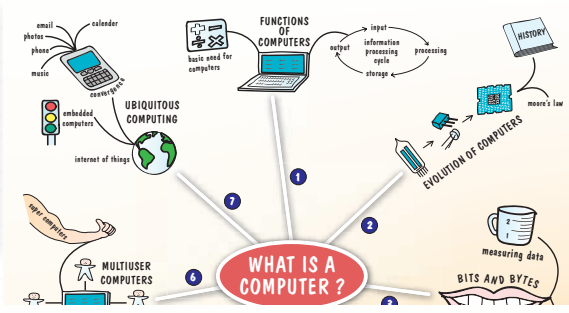
Screen shot(s) reprinted with permission from Apple Inc.

142 CHAPTER 3

How To 143

Mac coverage—Where appropriate, instructions and solutions are included so Mac users can complete the exercises

The **End-of-Chapter content** ranges from traditional review exercises to application and hands-on projects that have students working independently, collaboratively, and online



Learn It Online

- Visit **pearsonhighered.com/viztech** for student data files
- Find simulations, VizClips, Viz Check Quizzes, and additional study materials in **MyITLab**
- Be sure to check out the **Tech Bytes** weekly news feed for current topics to review and discuss

Objectives Recap

1. Explain the Functions of a Computer
2. Describe the Evolution of Computer Hardware
3. Describe How Computers Represent Data Using Binary Codes
4. List the Various Types and Characteristics of Personal Computers
5. Give Examples of Other Personal Computing Devices
6. List the Various Types and Characteristics of Multiuser Computers
7. Explain Ubiquitous Computing and Convergence

microprocessor **13**
midrange server **33**
minicomputer **33**
mobile application (mobile app) **22**
mobile device **29**
Moore's Law **14**
multiuser computer **32**
netbook **22**
notebook **22**
operating system (OS) **23**
personal computer (PC) **20**
punch card **5**
server **33**
smart appliance **15**
smart grid **15**
smart home **15**
stylus **22**
subnotebook **22**
supercomputer **35**
tablet **22**
transistor **11**
Turing machine **5**
Turing test **5**
ubiquitous computing (ubicomp) **38**
Unicode **17**
Universal design **25**
unmanned aircraft system (UAS) **37**
vacuum tube **11**
video game system **30**
volunteer computing **36**
wearable **29**
workstation **21**

Summary

1. Explain the Functions of a Computer

A computer is a device that converts raw data into information using the information processing cycle. The four steps of the IPC are: input, processing, storage, and output. Computers can be programmed to perform different tasks.

2. Describe the Evolution of Computer Hardware

The earliest computers used vacuum tubes, which are inefficient, large, and prone to failure. Second-generation computers used transistors, which are small electric switches. Third-generation computers used integrated circuits, which are silicon chips that contain multiple tiny transistors. Fourth-generation computers use microprocessors, which are complex integrated circuits that contain the central processing unit (CPU) of a computer.

Moore's Law states that the number of transistors that can be placed on an integrated circuit has doubled roughly every two years. The increase in the capabilities of integrated circuits directly affects the processing speed and storage capacity of modern electronic devices.

3. Describe How Computers Represent Data Using Binary Codes

A single bit (or switch) has two possible states—on or off—and can be used for situations with two possibilities such as yes/no or true/false. Digital data is represented by 8-bit binary code on most modern computers. The 8-bit ASCII system originally had binary codes for 256 characters. Unicode is an extended ASCII set that has codes for more than 100,000 characters.

Summary continues on the next page

Summary *continued*

4. List the Various Types and Characteristics of Personal Computers

Personal computers include desktop computers, which offer the most speed, power, and upgradability for the lowest cost; workstations, which are high-end desktop computers; and all-in-ones, which are compact desktop computers with the computer case integrated into the monitor. Portable personal computers include notebooks and tablets.

5. Give Examples of Other Personal Computing Devices

Other computing devices include smartphones, wearables, GPS, video game systems, and simulators.

6. List the Various Types and Characteristics of Multiuser Computers

Multiuser computers allow multiple simultaneous users to connect to the system. They include servers, minicomputers and midrange servers, and mainframe computers and enterprise servers. Supercomputers perform complex mathematical calculations. They perform a limited number of tasks as quickly as possible. Distributed computing uses the processing of multiple computers to perform complex tasks.

7. Explain Ubiquitous Computing and Convergence

Ubiquitous computing means the technology recedes into the background so you no longer notice it as you interact with it. The Internet of Things is the connection of the physical world to the Internet. Convergence is the integration of multiple technologies, such as cell phones, cameras, and MP3 players, on a single device.

Multiple Choice

Answer the multiple-choice
key terms and concepts fr

1. The _____ is a me
intelligent behavior.
a. Analytical Engine
b. Artificial intelligence
c. Bernoulli numbers
d. Turing test
2. First-generation compu
a. integrated circuits
b. microprocessors
c. transistors
d. vacuum tubes
3. A _____ is a comp
central processing unit
a. microprocessor
b. silicon
c. transistor
d. vacuum tube
4. What is the binary cod
language characters ar
a. ASCII
b. Base 2
c. International standar
d. Unicode

9. _____ is a field of study in which information technology is applied to the field of biology.
a. Bioinformatics
b. Distributed computing
c. Ergonomics
d. Ubicomp

10. A(n) _____ is an example of convergence.
a. smart grid
b. smartphone
c. traffic light
d. ubicomp

True or False

Answer the following questions with *T* for true or *F* for false for more practice with key terms and concepts from this chapter.

_____ 1. Computers convert data into information using the Information Processing Cycle.

_____ 2. Third-generation computers used vacuum tubes.

_____ 3. Today's computers use transistors and integrated circuits.

_____ 4. Moore's Law states that the number of transistors

_____ 5. Unicode contains codes for most of the languages in use today.

_____ 6. Bioinformatics allows you to design a workspace for your comfort and health.

_____ 7. All-in-one is another name for a tablet computer.

_____ 8. Users connect to servers via clients.

_____ 9. Volunteer computing projects harness the idle processing power of hundreds or thousands of

Application Project

Office 2016 Application Projects

Word 2016: Intern Report

Project Description: In the following Microsoft Word project, you will create a letter telling your new boss about the things you have learned in this class. In the project you will enter and edit text, format text, insert graphics, check spelling and grammar, and create document footers. *If necessary, download the student data files from* ***pearsonhighered.com/viztech****.*

Step	Instructions
1	Start Word. From your student data files, open the file named *vt_ch01_word* Save the document as **lastname_firstname_ch01_word**
2	On the last line of the document, type **Anna Sanchez, Intern** to complete the letter.
3	Select the first four lines of the document containing the name and street address. Apply the No Spacing style.
4	Format the entire document as Times New Roman, 12 pt.
5	In the first body paragraph, format *Jones Consulting* as italic.

Running Project . . .

. . . The Finish Line

Use your answers from the previous sections of the chapter project to discuss the evolution of computers in the past few centuries. Write a report responding to the questions raised throughout the chapter project. Save your file as **lastname_firstname_ch01_project** and submit it to your instructor as directed.

Do It Yourself 1

Consider the features available on the personal computing device that you use the most. From your student data files, open the file *vt_ch01_DIY1_answersheet* and save the file as **lastname_firstname_ch01_DIY1_answersheet**

What device did you choose? Is it a desktop, notebook, tablet, or some other type of system? Where is it located? How long have you had it? Did you research the computer before you made your purchase? What made you purchase it?

What do you use the computer for the most? What are five features you use most frequently? Why? What are three you use the least? Why? How could this device be improved to make your life more convenient? Describe one way life would be easier and one way your life would be more difficult without this device. Save your answers and submit it as directed by your instructor.

Do It Yourself 2

Use an online mind mapper tool such as Mindomo (**mindomo.com**), Mindmeister (**mindmeister.com**) or Coggle (**coggle.it**) to create a mind map to compare desktop, notebook, and mobile devices. A mind map is a visual outline. More information about using mind maps can be found in Appendix B. From your student data files, open the file *vt_ch1_DIY2_answersheet* and save the file as **lastname_firstname_ch1_DIY2_answersheet**

Your map should have three main branches: desktop, notebook, and mobile devices. Each branch should have at least three leaves: characteristics, advantages, and disadvantages.

When you have finished your map, take a screenshot of this window and paste it into your answer sheet, or, if available, export your mind map as a PNG or JPG file.

Critical Thinking

Convergence has led to smaller devices that cost less and do more. From your student data files, open the file *vt_ch01_CT_answersheet* and save the file as **lastname_firstname_ch01_CT_answersheet**

Research three of the newest smartphones or tablets on the market—one from each mobile platform: iOS, Android, and Windows. Complete the following table, comparing the features of each device. Use this research to decide which device would best meet your personal needs. Which device should you buy and why? What other accessories will you need to purchase? Do you need to purchase a service plan to take advantage of all the device's features? Save your file and submit both your table and essay as directed by your instructor.

	Device 1 - iOS	Device 2 - Android	Device 3 - Windows
Website or store			
Brand			
Model			
Price			
Phone			
Calendar			
Camera/video			
GPS			
Games			
Video player			
MP3 player			
Internet			
Downloadable apps			
Additional features			
Additional purchases required			

Ethical Dilemma

The term *digital divide* refers to the gap in technology access and literacy. There have been many types of programs designed to close this gap. One current trend is to put tablets in the hands of every student. From your student data files, open the file *vt_ch01_ethics_answersheet* and save the file as **lastname_firstname_ch01_ethics_answersheet**

Use the Internet to find a school program that supplies all students with tablets or notebooks. What are the goals of the program? How was it funded? Has it been successful? How has its success or failure been measured? Do you think programs like this one can really solve the digital divide? Why or why not? Type up your answers; be sure to cite your sources. Save the file and submit your work as directed by your instructor.

On the Web

There are many important people and events that led to our modern computers. In this exercise, you will create a timeline that illustrates the ones you feel are most significant. From your student data files, open the file *vt_ch01_web_answersheet* and save the file as **lastname_firstname_ch01_web_answersheet**

Visit **computerhope.com/history** and under *Timeline* click the link to open the time period that includes the year you were born. Create a timeline showing five to seven important milestones in the development of computers that occurred in this decade. Use a free online timeline generator, such as Dipity (**dipity.com**) or TimeGlider (**timeglider.com**), or online presentation tool (such as Prezi or PowerPoint) to create your timeline. Share the URL and present your findings to the class. Prepare a summary of your timeline and include the URL where it can be viewed. Save the file, and submit your work as directed by your instructor.

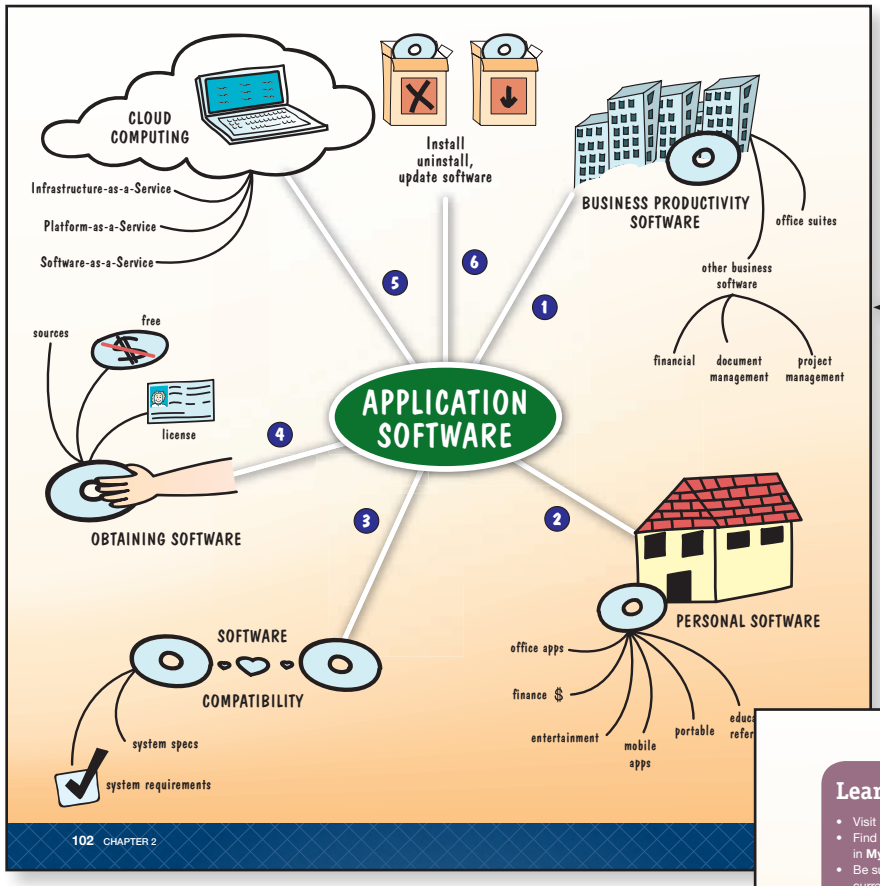
Collaboration

With a group of three to five students, research a famous computer pioneer. Write and perform a news interview of this person. If possible, video record the interview. Present your newscast to the class.

Instructors: Divide the class into groups of three to four students, and assign each group a famous computing pioneer from the list **computerhope.com/people**.

The Project: As a team, prepare a dialog depicting a news reporter interviewing this person. Use at least three references. Use Google Drive or Microsoft Office to prepare the presentation and provide documentation that all team members have contributed to the project.

Outcome: Perform the interview in a newscast format using the dialog you have written. The interview should be 3 to 5 minutes long. If possible, record the interview, and share the newscast with the rest of the class. Save this video as **teamname_ch01_video** Turn in a final text version of your presentation named **teamname_ch01_interview** Be sure to include the name of your presentation and a list of all team members. Submit your presentation to your instructor as directed.



102 CHAPTER 2

Mind maps are visual outlines of the chapter content, organized by objectives. They help students organize and remember the information they learned

Learn It Online

- Visit **pearsonhighered.com/viztech** for student data files
- Find simulations, VizClips, and additional study materials in **MyITLab**
- Be sure to check out the **Tech Bytes** weekly news feed for current topics to review and discuss

Objectives Recap

1. Identify Types and Uses of Business Productivity Software
2. Identify Types and Uses of Personal Software
3. Assess a Computer System for Software Compatibility
4. Compare Various Ways of Obtaining Software
5. Discuss the Importance of Cloud Computing
6. Install, Uninstall, and Update Software

Key Terms

application software **53**
bug **99**
cell **57**
cloud **86**
cloud computing **86**
cloud service provider (CSP) **87**
database **59**
document management system (DMS) **61**
donationware **83**
EULA (end-user license agreement) **83**
field **59**
form **59**
freeware **83**
Gantt chart **62**
hotfix **99**
Infrastructure-as-a-Service (IaaS) **87**
office application suite **55**
open source **65**
patch **99**
personal information manager (PIM) **60**
Platform-as-a-Service (PaaS) **87**
platform neutral **95**
portable apps **71**
project management software **62**
query **59**
record **59**
report **59**
retail software **83**
service pack **99**
shareware **83**
Software-as-a-Service (SaaS) **88**
spreadsheet **57**
system requirements **80**
table **59**
word processor **55**

Summary

1. Identify Types and Uses of Business Productivity Software
The most common business software is an office application suite—which may include a word processor, spreadsheet, presentation program, database, and personal information manager. Other business applications include financial software, document management, and project management software.

2. Identify Types and Uses of Personal Software
Personal software includes office applications, especially word processors, spreadsheets, and presentation programs. Other personal applications include entertainment and multimedia software such as media managers, video and photo editing software, and video games. Financial and tax preparation software as well as educational and reference software are also popular. You can run portable apps from a flash drive and take them with you.

3. Assess a Computer System for Software Compatibility
Before purchasing and installing software, you should research the system requirements needed to run the program and compare them to your system specifications using the System Control Panel.

4. Compare Various Ways of Obtaining Software
You can obtain software from brick-and-mortar and online stores, publisher websites, and download websites. Download mobile apps only from trusted markets. It's important to read the EULA to understand the software license restrictions.

5. Discuss the Importance of Cloud Computing
Cloud computing moves hardware and software into the cloud, or Internet. Cloud computing allows you to access applications and data from any web-connected computer. Some benefits include lower cost, easier maintenance, security, and collaboration.

6. Install, Uninstall, and Update Software
Managing the programs on your computer includes installing, uninstalling, and updating the software. You can install programs through an app store, by using media, or by downloading it from a website. Updating software fixes bugs, adds features, or improves compatibility. You should uninstall software using the program's uninstaller.

End of Chapter 103

About the Author

Debra is a professor of computer and information science at Bucks County Community College, teaching computer classes ranging from basic computer literacy to cybercrime, computer forensics, and networking. She has certifications from Microsoft, CompTIA, Apple, and others. Deb has taught at the college level since 1996 and also spent 11 years in the high school classroom. She holds a B.S. in Secondary Science Education from Temple University and an M.A. in Computer Science Education from Arcadia University.

Throughout her teaching career Deb has worked with educators to integrate technology across the curriculum. At BCCC she serves on many technology committees, presents technology workshops for BCCC faculty, and serves as the computer science coordinator. Deb is an avid user of technology, which has earned her the nickname “gadget lady.”

Dedication

This project would not have been possible without the help and support of many people. I cannot express how grateful I am to all of you. Thank you.

My team at Pearson—Jenifer, Cheryl, Emily, Laura, and everyone else: you have been amazing, helping to bring my vision to reality and teaching me so much along the way.

My colleagues and students at Bucks County Community College: for your suggestions and encouragement throughout this process. You inspire me every day.

And most importantly—my family. My husband and sons for your patience, help, and love—even when it meant taking a photo "right this minute," or reading a chapter when you wanted to be doing something else, or missing me while I was away. And the rest of my family and friends who agreed to let me use their photos throughout the book. I couldn't have done this without your love and support.

And finally my dad—who taught me to love technology and not be afraid to try new things. I miss you and love you, daddy.

Reviewers of All Editions

Phil Valvalides Guilford Technical Community College
Svetlana Marzelli Atlantic Cape Community College
Pat Lyon Tomball College
Arta Szathmary Bucks County Community College
June Lane Bucks County Community College
Ralph Hunsberger Bucks County Community College
Sue McCrory Missouri State
Laura White University of West Florida
Karen Allen Communtiy College of RI
Ralph Argiento Guilford Technical Community College
Kuan Chen Purdue University Calumet
Carin Chuang Purdue University North Central
Christie Jahn Hovey Lincoln Land Community College
Dr. Seth Powless University of Toledo
Amiya K. Samantray Marygrove College

Special thanks to Lisa Hawkins, Frederick Community College

Mimi Spain Southern Maine Community College
Kathie O'Brien North Idaho College
Pat Franco Los Angeles Valley College
Claire Amorde Florida Institute Of Technology
Michael Haugrud Minnesota State University Moorhead
Anjay Adhikari Miami Dade College
Lynne Lyon Durham College
Kate Le Grand Broward College
Carolyn Barren Macomb Community College
Bob Benavedis Collins College
Theresa Hayes Broward College
Mary Fleming Ivy Tech Community College
Penny Cypert Tarrant County College
Bernice Eng Brookdale Community College
Deb Fells Mesa Community College
Karen Allen Bunker Hill Community College
Beverly Amer Northern Arizona University
Michael Beddoes Salt Lake Community College
Leilani Benoit New Mexico State University
Gina Bowers Harrisburg Area Community College
Linda Collins Mesa Community College
Fred D'Angelo Pima Community College
Robert Devoe Peterson Fresno City College
Hedy Fossenkemper Paradise Valley Community College
Rachelle Hall Glendale Community College
Terri Helfand Chaffey College
Ilga Higbee Black Hawk College
Kay Johnson Community College of Rhode Island
Darrel Karbginsky Chemeketa Community College
Susan Katz University of Bridgeport
Sherry Kersey Hillsborough Community College
Ellen Kessler Harrisburg Area Community College
Kate Legrand Broward Community College
Mike Lehrfeld Brevard Community College
Jian Lin Eastern Connecticut State University
Nicole Lytle California State University, San Bernadino
Peggy Menna Community College of Rhode Island
Deborah Meyer Saint Louis Community College, Forest Park
Pam Silvers Asheville-Buncombe Technical Community College
Will Smith Tulsa Community College
Lynne Stuhr Trident Technical College
Ann Taff Tulsa Community College
Jim Taggart Atlantic Cape Community College
Michelle Vlaich Lee Greenville Technical College

VISUALIZING TECHNOLOGY

Blackday/Fotolia

CHAPTER

1

What Is a Computer?

In This Chapter

VIZ INTRO

If you've gone grocery shopping, put gas in your car, watched a weather report on TV, or used a microwave oven today, then you've interacted with a computer. Most of us use computers every day, often without even realizing it. Computers have become so commonplace that we don't even consider them computers. In this chapter, we discuss what a computer is and look at the development of computers in the past few centuries. After reading this chapter, you will recognize the different types of computing devices and their impact on everyday life.

Objectives

1. Explain the Functions of a Computer
2. Describe the Evolution of Computer Hardware
3. Describe How Computers Represent Data Using Binary Code
4. List the Various Types and Characteristics of Personal Computers
5. Give Examples of Other Personal Computing Devices
6. List the Various Types and Characteristics of Multiuser Computers
7. Explain Ubiquitous Computing and Convergence

Running Project

In this project, you'll explore computers used in everyday life. Look for instructions as you complete each article. For most articles, there is a series of questions for you to research. At the conclusion of the chapter, you'll submit your responses to the questions raised.

Sergey Nivens/Fotolia

What Does a Computer Do?

Objective 1

Explain the Functions of a Computer

A **computer** is a programmable machine that converts raw **data** into useful **information**. Raw data includes numbers, words, pictures, or sounds that represent facts about people, events, things, or ideas. A toaster can never be anything more than a toaster—it has one function—but a computer can be a calculator, a media center, a communications center, a classroom, and much more. The ability to change its programming distinguishes a computer from any other machine.

Necessity is the Mother of Invention

The original computers were people, not machines, and the mathematical tables they computed tended to be full of errors. The technical and scientific advancements of the Industrial Revolution at the end of the 19th century led to a growing need for this type of hand-calculated information and to the development of the first mechanical computers. Computers automated the tedious work of computing such things as tide charts and navigation tables.

In the early 19th century, mathematician Charles Babbage designed a mechanical computer called an **Analytical Engine**, which could be programmed using punch cards. **Punch cards** are stiff pieces of paper that convey information by the presence or absence of holes. Punch cards were developed by Joseph Marie Jacquard, as part of the Jacquard loom, to manufacture textiles with complex patterns (Figure 1.1). The Analytical Engine would have been the first mechanical computer, but the technology didn't exist at the time to build it. In his 1864 book *Passages from the Life of a Philosopher*, Babbage wrote, "The whole of the development and operations of analysis are now capable of being executed by machinery. As soon as an Analytical Engine exists, it will necessarily guide the future course of science*." In 2011, a group of researchers at London's Science Museum began a project to build Babbage's computer. The project will take at least 10 years and cost millions of dollars.

Mathematician Ada Lovelace, a contemporary of Babbage, wrote a program for the Analytical Engine to calculate a series of Bernoulli numbers—a sequence of rational numbers used in number theory. Because of her efforts, many consider her the first computer programmer. Lovelace never tested the program because there were no machines capable of running it; however, when run on a computer today, her program yields the correct mathematical results. In 1979, the Ada computer language was named in her honor.

In 1936, mathematician Alan Turing wrote a paper titled *On Computable Numbers*, in which he introduced the concept of machines that could perform mathematical computations—later called **Turing machines**. In 1950, he developed the **Turing test**, which tests a machine's ability to display intelligent behavior. It took 64 years for the first computers to pass the Turing test, but it happened in 2014. Many consider Alan Turing to be the father of computer science and **artificial intelligence**—the branch of science concerned with making computers behave like humans. In 2014, the film *The Imitation Game* chronicled Alan Turing and other mathematicians' attempts during World War II to crack the Enigma code used by the Germans to encrypt communications.

Mark Scheuern/Alamy

FIGURE 1.1 Punch cards used to create textile patterns in a Jacquard loom.

*Babbage, Charles. Passages from the Life of a Philosopher. Longman, Green, Longman, Roberts, & Green. London. 1864.

Creativa Images/Fotolia

Photo 5000/Fotolia

STORAGE: The raw data is stored temporarily until it can be processed. The processed information is stored for later retrieval.

INPUT: Data is collected from a customer order form.

PROCESSING: The data is manipulated, or processed, so it can be used to evaluate the customer's order.

OUTPUT: The processed data–now information–is output to the store employee to fulfill the order.

FIGURE 1.2 The information processing cycle converts data collected from a customer order form into information used to fulfill the order.

Geoghan, Debra. Visualizing Technology Complete, 4e. Pearson Education, 2014.

THE INFORMATION PROCESSING CYCLE

Computers convert data into information by using the **information processing cycle (IPC)**. The four steps of the IPC are input, processing, storage, and output. Raw data entered into the system during the input stage is processed, or manipulated, to create useful information. The information is stored for later retrieval and then returned to the user in the output stage. Figure 1.2 shows an example of how this works.

It was nearly a century after Babbage designed his Analytical Engine before the first working mechanical computers were built. From that point, it took only about 40 years to go from those first-generation machines to the current fourth-generation systems.

Running Project

Many developments of the Industrial Revolution helped pave the way for modern computers, such as the Jacquard loom. Use the Internet to find out how the following people also contributed: George Boole, Vannevar Bush, Nikola Tesla, and Gottfried Wilhelm Leibniz.

4 Things You Need to Know

- Computers are programmable machines.
- The four steps of the information processing cycle are input, processing, storage, and output.
- The IPC converts raw data into useful information.
- Artificial intelligence is the science of making computers behave like humans.

Key Terms

Analytical Engine

artificial intelligence

computer

data

information

information processing cycle (IPC)

punch card

Turing machine

Turing test

Digital Literacy Skill

Capture a Screenshot of Your Desktop

HOW TO VIDEO

Throughout this book, you will be directed to provide screenshots of the work you have done. This is quite easy to do and is useful in other situations. For example, it's helpful for providing directions on how to do something or for keeping a record of an error message that appears on your screen. Windows includes a program called the Snipping Tool that you can use to capture a screenshot. Macs include the Grab tool.

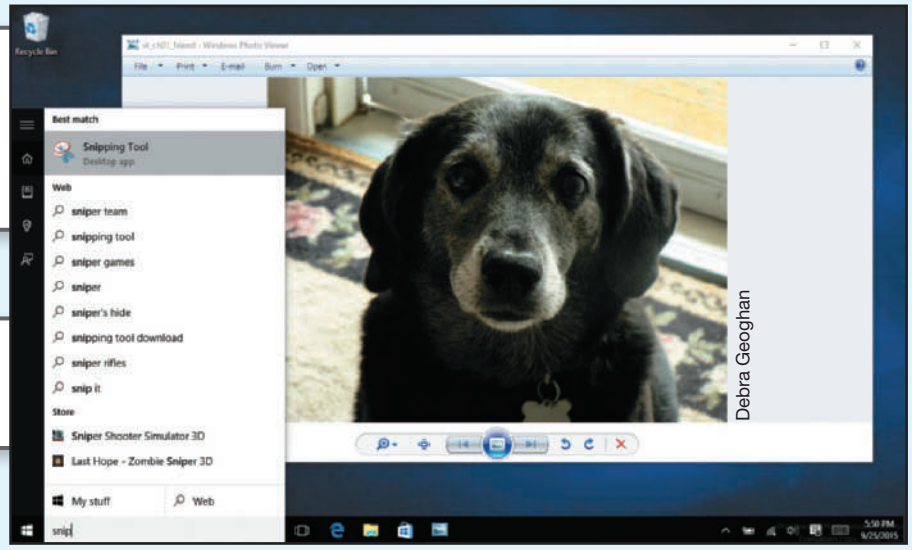
The Windows Snipping Tool can capture four types of snips:

- **Free-form Snip:** Allows you to draw boundaries around an object for a snip
- **Rectangular Snip:** Allows you to draw a rectangle around an object for a snip
- **Window Snip:** Captures a selected window for a snip
- **Full-screen Snip:** Captures the whole screen for a snip

You can save your screenshots, email them, paste them into documents, and annotate and highlight them by using the buttons on the Snipping Tool toolbar. If necessary, download the student data files from **pearsonhighered.com/viztech**. From your student data files, open the *vt_ch01_howto1_answersheet* file and save the file as **lastname_firstname_ch01_howto1_answersheet**

1. From your student data files, right-click the file *vt_ch01_friend*, point to *Open with*, and then click *Windows Photo Viewer* or *Photo Gallery*.

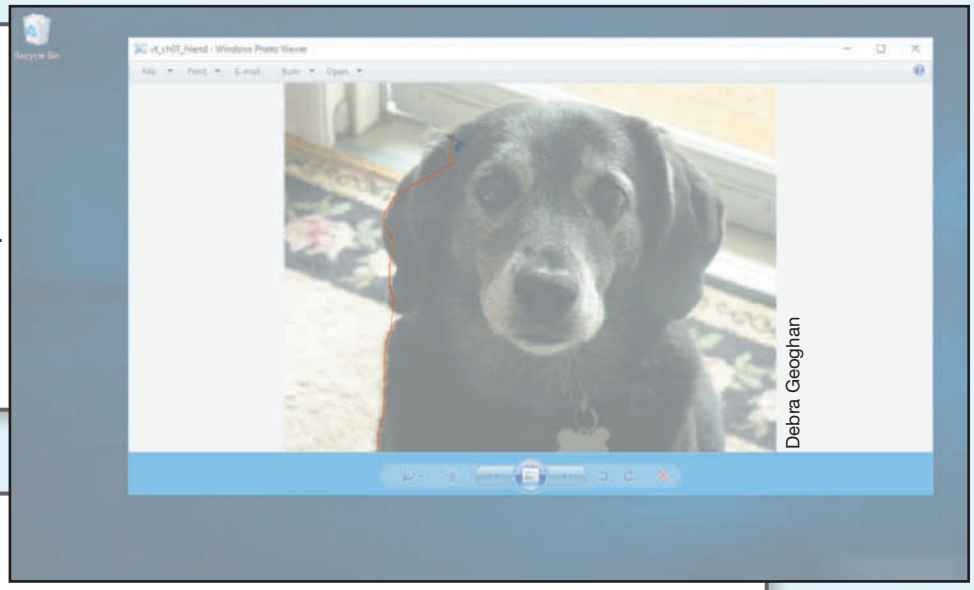
2. In the Windows search box, type **snip** and then, in the search results, click *Snipping Tool*.



Windows Photo Viewer, Windows 10, Microsoft Corporation

3

In the Snipping Tool window, click the drop-down arrow next to *New* and click *Free-form Snip*. Drag the mouse to draw a line around the dog's head with the Snipping Tool scissors. Switch to your answer sheet and paste the snip under **Free-form Snip**. You can resize the image to fit your answer sheet.



Windows Photo Viewer, Windows 10, Microsoft Corporation

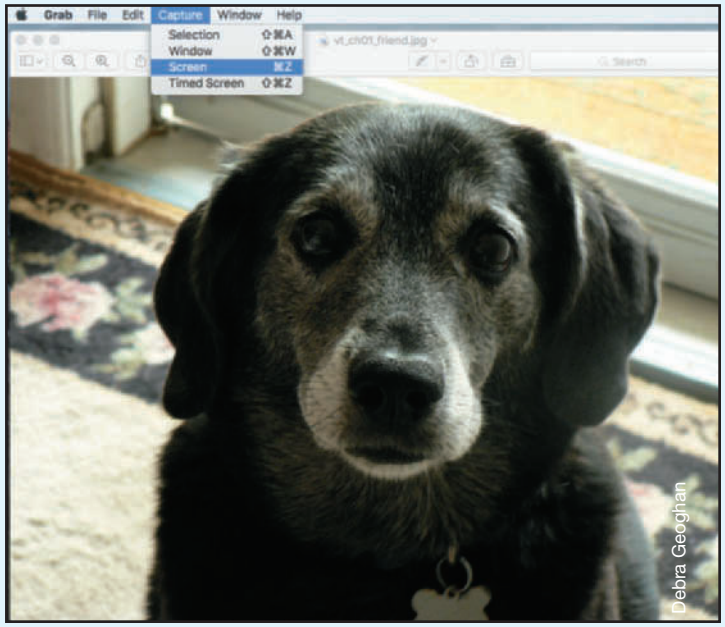
4

In the Snipping Tool window, click the drop-down arrow next to *New* and click *Rectangular Snip.* Drag the box around the dog's head and release the mouse button. Paste the rectangular snip into your document under **Rectangular Snip**. Use the Snipping Tool to capture a Window Snip and a Full-screen Snip of the dog and paste both in your document. In a paragraph, describe the difference between the snips you took. Save the file and submit your file as directed by your instructor.

MAC

If you are using a Mac:

1. From your student data files, double-click the file *vt_ch01_friend* to open it in Preview. (Note: If the image opens in another program, it is still okay.)
2. Use Launchpad to open Grab, located in the *Other* folder.
3. From the *Capture* menu, click *Selection*, *Window*, or *Screen*, as appropriate. Follow the onscreen directions to take each capture. Once you have captured each image, use the *Edit* menu to copy the capture and paste it into your answer sheet. In a paragraph, describe the difference between the grabs you took. Save the file and submit your file as directed by your instructor.



Screen shot(s) reprinted with permission from Apple Inc.