

 **AUTODESK**  
Official Press

**George Omura**  
**Brian C. Benton**

# Mastering AutoCAD® and AutoCAD LT®

 **SYBEX**  
A Wiley Brand





# **Mastering AutoCAD® 2018 and AutoCAD LT® 2018**

**George Omura**  
**with Brian C. Benton**

 **SYBEX**  
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 **AUTODESK**  
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To my friend and colleague David Fawcett, who is  
retiring soon: fair winds and following seas...

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# Introduction

Welcome to *Mastering AutoCAD 2018 and AutoCAD LT 2018*. As many readers have already discovered, this book is a unique blend of tutorial and reference, which includes everything that you need to get started and stay ahead with Autodesk® AutoCAD® software. With this edition, you get coverage of the latest features of both AutoCAD 2018 and AutoCAD LT® 2018 software along with detailed information on existing features.

## How to Use This Book

Rather than just showing you how each command works, this book shows you AutoCAD 2018 in the context of a meaningful activity. You'll learn how to use commands while working on an actual project and progressing toward a goal. This book also provides a foundation on which you can build your own methods for using AutoCAD and become an AutoCAD expert. For this reason, we haven't covered every single command or every permutation of a command response. You should think of this book as a way to get a detailed look at AutoCAD as it's used on a real project. As you follow the exercises, we also encourage you to explore AutoCAD on your own, applying the techniques that you learn to your own work.

Both experienced and beginning AutoCAD users will find this book useful. If you aren't an experienced user, the way to get the most out of this book is to approach it as a tutorial—chapter by chapter—at least for the first two parts of the book. You'll find that each chapter builds on the skills and information that you learned in the previous one. To help you navigate, the exercises are shown in numbered steps. To address the needs of all readers worldwide, the exercises provide both Imperial (feet/inches) and metric measurements. Some exercises use generic units of measurement, and if the focus of the exercise is not dependent on the measurement system, Imperial is used.

After you've mastered the material in Part 1 and Part 2, you can follow your interests and explore other parts of the book in whatever order you choose. Part 3 takes you to a more advanced skill level. There you'll learn more about storing and sharing drawing data and how to create more complex drawings. If you're interested in 3D, check out Part 4. If you want to start customizing right away, go to Part 5. You can check out Chapter 25 at any time because it gives you general information about sharing AutoCAD files with your co-workers and consultants. You can also use this book as a ready reference for your day-to-day problems and questions about commands. "The Bottom Line" section at the end of each chapter will help you review and look at different ways to apply the information that you've learned. Experienced users will also find this book a handy reference tool.

Finally, you can learn more about AutoCAD through the author-supplied bonus chapters found at [www.omura.com/chapters](http://www.omura.com/chapters). For example, if you run into problems using AutoCAD, see the section "When Things Go Wrong" in Bonus Chapter 3, "Hardware and Software Tips." To delve into the details of printers and plotting, check out Bonus Chapter 5, "Understanding Plot Styles."

## AutoCAD and AutoCAD LT 2018

Autodesk has released AutoCAD 2018 and AutoCAD LT 2018 simultaneously. Not surprisingly, they're nearly identical in the way they look and work. You can share files between the two programs with complete confidence that you won't lose data or corrupt files. The main differences are that AutoCAD LT doesn't support all of the 3D functions of AutoCAD 2018, nor does it support the customization tools of AutoLISP® or the .NET Framework. But AutoCAD LT still has plenty to offer in both the productivity and customization areas. Because they're so similar, we can present material for both programs with only minor adjustments.



When a feature is discussed that is available only in AutoCAD 2018, you'll see the AutoCAD Only icon. For the purposes of this publication, the "ACAD only" icon means that the relevant (or adjacent) content applies only to AutoCAD software and not to AutoCAD LT software.

You'll also see warning messages when tutorials vary between AutoCAD 2018 and AutoCAD LT. If only minor differences occur, you'll see either a warning message or directions embedded in the exercise indicating the differences between the two programs.

We've also provided workaround instructions wherever possible when AutoCAD LT doesn't offer a feature found in AutoCAD 2018.

## Getting Information Fast

In each chapter, you'll find extensive tips and discussions in the form of sidebars set off from the main text. These provide a wealth of information that we have gathered over years of using AutoCAD on a variety of projects in different office environments. You may want to browse through the book and read these boxes just to get an idea of how they might be useful to you.

Another available quick reference is Bonus Chapter 4, "System Variables and Dimension Styles." It contains descriptions of all the dimension settings with comments on their uses. If you experience any problems, you can consult the section "When Things Go Wrong" in Bonus Chapter 3, "Hardware and Software Tips."

## The Mastering Series

The *Mastering* series from Sybex provides outstanding instruction for readers with intermediate and advanced skills in the form of top-notch training and development for those already working in their field, and clear, serious education for those aspiring to become pros. Every *Mastering* book includes the following:

- ◆ Skill-based instruction with chapters organized around real tasks rather than abstract concepts or subjects
- ◆ Self-review test questions so that you can be certain you're equipped to do the job right

## What to Expect

*Mastering AutoCAD 2018 and AutoCAD LT 2018* is divided into five parts, each representing a milestone in your progress toward becoming an expert AutoCAD user. Here is a description of those parts and what they will show you.

## **Part 1: The Basics**

As with any major endeavor, you must begin by tackling small, manageable tasks. In this first part, you'll become familiar with the way that AutoCAD looks and feels.

- ◆ Chapter 1, "Exploring the Interface," shows you how to get around in AutoCAD.
- ◆ Chapter 2, "Creating Your First Drawing," details how to start and exit the program and how to respond to AutoCAD commands.
- ◆ Chapter 3, "Setting Up and Using the Drafting Tools," tells you how to set up a work area, edit objects, and lay out a drawing.
- ◆ Chapter 4, "Organizing Objects with Blocks and Groups," explores some tools unique to CAD: symbols, blocks, and layers. As you're introduced to AutoCAD, you'll also get a chance to make some drawings that you can use later in the book and perhaps even in your future projects.
- ◆ Chapter 5, "Keeping Track of Layers and Blocks," shows you how to use layers to keep similar information together and object properties such as linetypes to organize things visually.

## **Part 2: Mastering Intermediate Skills**

After you have the basics down, you'll begin to explore some of the subtler qualities of AutoCAD.

- ◆ Chapter 6, "Editing and Reusing Data to Work Efficiently," tells you how to reuse drawing setup information and parts of an existing drawing.
- ◆ Chapter 7, "Mastering Viewing Tools, Hatches, and External References," details how to use viewing tools and hatches and how to assemble and edit a large drawing file.
- ◆ Chapter 8, "Introducing Printing, Plotting, and Layouts," shows you how to get your drawing onto hard copy.
- ◆ Chapter 9, "Adding Text to Drawings," tells you how to annotate your drawing and edit your notes.
- ◆ Chapter 10, "Using Fields and Tables," shows you how to add spreadsheet functionality to your drawings.
- ◆ Chapter 11, "Using Dimensions," gives you practice in using automatic dimensioning (another unique CAD capability).

## **Part 3: Mastering Advanced Skills**

At this point, you'll be on the verge of becoming a real AutoCAD expert. Part 3 is designed to help you polish your existing skills and give you a few new ones.

- ◆ Chapter 12, "Using Attributes," tells you how to attach information to drawing objects and how to export that information to database and spreadsheet files.
- ◆ Chapter 13, "Copying Existing Drawings from Other Sources," details techniques for transferring paper drawings to AutoCAD. You'll also learn how to include aerial and map views in your drawings.

- ◆ Chapter 14, “Advanced Editing and Organizing,” is where you’ll complete the apartment building tutorial. During this process, you’ll learn how to integrate what you’ve learned so far and gain some tips on working in groups.
- ◆ Chapter 15, “Laying Out Your Printer Output,” shows you the tools that let you display your drawing in an organized fashion.
- ◆ Chapter 16, “Making ‘Smart’ Drawings with Parametric Tools,” introduces you to parametric drawing. This feature lets you quickly modify a drawing by changing a few parameters.
- ◆ Chapter 17, “Using Dynamic Blocks,” shows you how you can create blocks that can be edited with grips without having to redefine them.
- ◆ Chapter 18, “Drawing Curves,” gives you an in-depth look at some special drawing objects, such as splines and fitted curves.
- ◆ Chapter 19, “Getting and Exchanging Data from Drawings,” is where you’ll practice getting information about a drawing and learn how AutoCAD can interact with other applications, such as spreadsheets and page layout programs. You’ll also learn how to copy and paste data.

## **Part 4: 3D Modeling and Imaging**

Although 2D drafting is the workhorse application in AutoCAD, its 3D capabilities give you a chance to expand your ideas and look at them in a new light.

- ◆ Chapter 20, “Creating 3D Drawings,” covers basic features for creating three-dimensional drawings.
- ◆ Chapter 21, “Using Advanced 3D Features,” introduces you to some of the program’s more powerful 3D capabilities.
- ◆ Chapter 22, “Editing and Visualizing 3D Solids,” takes a closer look at 3D solids and how they can be created, edited, and displayed in AutoCAD 2018.
- ◆ Chapter 23, “Exploring 3D Mesh and Surface Modeling,” introduces you to free-form 3D modeling using mesh and surface objects. With the latest additions to the 3D feature set in AutoCAD, there isn’t anything you can’t model in 3D.

## **Part 5: Customization and Integration**

One of the greatest strengths of AutoCAD is its openness to customization, which you’ll explore in this section.

- ◆ Chapter 24, “Customizing Toolbars, Menus, Linetypes, and Hatch Patterns,” shows you how to use workspaces, customize the user interface, and create custom linetypes and hatch patterns. You’ll also be introduced to the DIESEL macro language.
- ◆ Chapter 25, “Managing and Sharing Your Drawings,” shows you how to adapt AutoCAD to your own work style. You’ll learn about the tools that help you exchange drawings with others and how to secure your drawings to prevent tampering.



## Part 6: Appendixes

Finally, this book has several appendixes.

- ◆ Appendix A, “The Bottom Line,” contains the solutions to the book’s “Master It” review questions.
- ◆ Appendix B, “Installing and Setting Up AutoCAD,” contains an installation and configuration tutorial. If AutoCAD isn’t already installed on your system, follow the steps in this tutorial before starting Chapter 1.
- ◆ Appendix C, “The Autodesk AutoCAD 2018 Certification,” shows you where in the book the learning objectives are covered for the Certified User and Certified Professional Exams. If you want to get certified, this information will be very useful.



## Where to Get the Exercise Files and Bonus Chapters

Many of the exercises in this book make use of sample files that you can download from the following website: [www.sybex.com/go/masteringautocad2018](http://www.sybex.com/go/masteringautocad2018). With these files, you can pick up an exercise anywhere you like without having to work through the book from front to back. You can also use these sample files to repeat exercises or to just explore how files are organized and put together. You can also download additional bonus chapters that cover other AutoCAD features from [www.omura.com/chapters](http://www.omura.com/chapters). The bonus chapters are as follows:

- ◆ Bonus Chapter 1, “Using the Express Tools,” gives you a gentle introduction to the world of AutoCAD customization. You’ll learn how to load and use existing Express tools that expand the software’s functionality, and you’ll be introduced to AutoLISP as a tool to create macros.
- ◆ Bonus Chapter 2, “Exploring AutoLISP,” is a primer to this popular macro language found in AutoCAD. You’ll learn how you can create custom commands built on existing ones and how you can retrieve and store locations and other data.
- ◆ Bonus Chapter 3, “Hardware and Software Tips,” provides information about hardware related to AutoCAD. It also offers tips on improving the performance of AutoCAD and troubleshooting and provides more detailed information on setting up the plotting feature.
- ◆ Bonus Chapter 4, “System Variables and Dimension Styles,” provides a reference to dimension style settings.
- ◆ Bonus Chapter 5, “Understanding Plot Styles,” discusses methods for controlling line-weights and shading in your printer output.
- ◆ Bonus Chapter 6, “Rendering 3D Drawings,” shows how you can use AutoCAD to produce lifelike views of your 3D drawings.
- ◆ Bonus Chapter 7, “Keeping a Project Organized with Sheet Sets,” shows you how to use the Sheet Set Manager to simplify your file management. By using the Sheet Set Manager, you can automate some of the tedious drawing coordination tasks.

**THE AUTOCAD FREE TRIAL**

If you don't have AutoCAD, you can download and install a trial version from the Autodesk website ([www.autodesk.com](http://www.autodesk.com)). Be aware that the trial is good for only 30 days and cannot be reinstalled to add time to the trial period—don't start to use it until you're certain you'll have plenty of free time to practice using AutoCAD.

**FREE AUTODESK SOFTWARE FOR STUDENTS AND EDUCATORS**

The Autodesk Education Community is an online resource with more than five million members that enables educators and students to download—for free (see the website for terms and conditions)—the same software used by professionals worldwide. You can also access additional tools and materials to help you design, visualize, and simulate ideas. Connect with other learners to stay current with the latest industry trends and get the most out of your designs. Get started today at [www.autodesk.com/joinedu](http://www.autodesk.com/joinedu).

## The Minimum System Requirements

This book assumes that you have a Windows-based PC with at least a dual-core processor or equivalent CPU. Your computer should have at least one DVD drive and a hard disk with 4 GB or more of free space for the AutoCAD program files and about 200 MB of additional space for sample files and the workspace. In addition to these requirements, you should have enough free disk space to allow for a Windows virtual memory page file that is about 1.5 times the amount of installed RAM. Consult your Windows manual or Bonus Chapter 3, “Hardware and Software Tips,” available at [www.omura.com/chapters](http://www.omura.com/chapters), for more on virtual memory.

AutoCAD 2018 runs best on systems with at least 4 GB or more of RAM. Your computer should also have a high-resolution monitor and an up-to-date display card. An HD/VGA display with a resolution of 1366×768 or greater will work fine with AutoCAD, but if you want to take full advantage of the 3D features, you should have a 128 MB or greater, OpenGL-capable, workstation-class graphics card. We also assume that you're using a mouse and have the use of a printer or a plotter. Finally, you'll need an Internet connection to take full advantage of the support offerings from Autodesk.

If you want a more detailed explanation of hardware options with AutoCAD, see Bonus Chapter 3. You'll find a general description of the available hardware options and their significance to AutoCAD.

## Doing Things in Style

Much care has been taken to see that the stylistic conventions in this book—the use of uppercase or lowercase letters, italic or boldface type, and so on—are the ones most likely to help you learn AutoCAD. On the whole, their effect should be subliminal. However, you may find it useful to be conscious of the following rules:

- ◆ Menu selections are shown by a series of options separated by the ➤ symbol (for example, choose File ➤ New). These are typically used to show selections from a context menu or the Application menu, which you will learn about in Chapter 1.

- ◆ Keyboard entries are shown in boldface (for example, enter **Rotate**↵).
- ◆ Command-line prompts are shown in a monospaced font (for example, `Select objects:`).

For most functions, this book describes how to select options from Ribbon panels and the Application menu. In addition, where applicable, we include related keyboard shortcuts and command names in parentheses. These command names provide continuity for readers who are accustomed to working at the Command prompt.

## **New Features of AutoCAD 2018**

AutoCAD 2018 has a long list of new features, many of which are aimed at making your work easier and faster. Some features, like Autodesk 360<sup>®</sup> and Autodesk Exchange, are web tools that help you share your work, keep up with the latest on AutoCAD, and discuss issues you may be having. Here are some of the new features that we cover in this book:

- ◆ Resizable dialog boxes
- ◆ Improved 2D and 3D display quality and performance
- ◆ Improved Move and Copy tools
- ◆ PDF vector import
- ◆ Center mark dimensioning tool
- ◆ 3D printing support

## **Contact the Authors**

We hope that *Mastering AutoCAD 2018* and *AutoCAD LT 2018* will be of benefit to you and that, after you've completed the exercises, you'll continue to use the book as a reference. If you have comments, criticism, or ideas about how the book can be improved, you can email us at the following addresses:

George Omura: [george.omura@gmail.com](mailto:george.omura@gmail.com)

Brian C. Benton: [bbenton@cad-a-blog.com](mailto:bbenton@cad-a-blog.com)

If you find errors, please let our publisher know. Visit the book's web page, [www.sybex.com/go/masteringautocad2018](http://www.sybex.com/go/masteringautocad2018), and click the Errata link to find a form to use to identify the problem.

And thanks for choosing *Mastering AutoCAD 2018* and *AutoCAD LT 2018*.





# Part 1

## The Basics

- ◆ **Chapter 1: Exploring the Interface**
- ◆ **Chapter 2: Creating Your First Drawing**
- ◆ **Chapter 3: Setting Up and Using the Drafting Tools**
- ◆ **Chapter 4: Organizing Objects with Blocks and Groups**
- ◆ **Chapter 5: Keeping Track of Layers and Blocks**







## Chapter 1

# Exploring the Interface

Before you can start to use the new capabilities of the AutoCAD® 2018 software, you must become familiar with the basics. If you're completely new to AutoCAD, you'll want to read this first chapter carefully. It introduces you to many basic operations of AutoCAD, such as opening and closing files, getting a close-up look at part of a drawing, and changing a drawing. If you're familiar with earlier versions of AutoCAD, you should review this chapter anyway to get acquainted with the features that you haven't already used.

Autodesk releases new versions of AutoCAD every year. Part of this strategy is to introduce improvements that focus on a particular category of features. AutoCAD 2018 offers updates that cover a wide range of features. The user interface is easier to customize. There are more ways to access drafting and layer settings. External references have been revamped to allow easy modification to file paths. Font recognition in PDFs has been improved, and display performance has been enhanced. Finally, a new 2018 file format has been updated to accommodate these new features. Before you begin the exercises in this chapter, make sure that you have loaded the sample files from this book's web page at [www.sybex.com/go/masteringautocad2018](http://www.sybex.com/go/masteringautocad2018). See the introduction for details. If you have purchased the e-book version, please see the introduction for instructions on how to download the sample files.

In this chapter, you will learn to

- ◆ Use the AutoCAD window
- ◆ Get a closer look with the Zoom command
- ◆ Save a file as you work
- ◆ Make changes and open multiple files

## Taking a Guided Tour

First, you'll get a chance to familiarize yourself with the AutoCAD screen and how you communicate with AutoCAD. As you do the exercises in this chapter, you'll also get a feel for how to work with this book. Don't worry about understanding or remembering everything you see in this chapter. You'll get plenty of opportunities to probe the finer details of the program as you work through the later chapters. To help you remember the material, we have included a brief set of questions at the end of each chapter. For now, just enjoy your first excursion into AutoCAD.



## AUTOCAD REFERENCES IN THIS BOOK

In this chapter and throughout the rest of the book, when we say AutoCAD, we mean both AutoCAD and AutoCAD LT®. Some topics apply only to AutoCAD. In those situations, you'll see an icon indicating that the topic applies only to AutoCAD and not to AutoCAD LT. If you're using AutoCAD LT 2018, these icons can help you focus on the topics that are more relevant to your work by letting you skim over items that do not apply.

AutoCAD 2018 is designed to run on Windows 7, Windows 8, Windows 8.1, and Windows 10. This book was written using AutoCAD 2018 running on Windows 7 Professional.

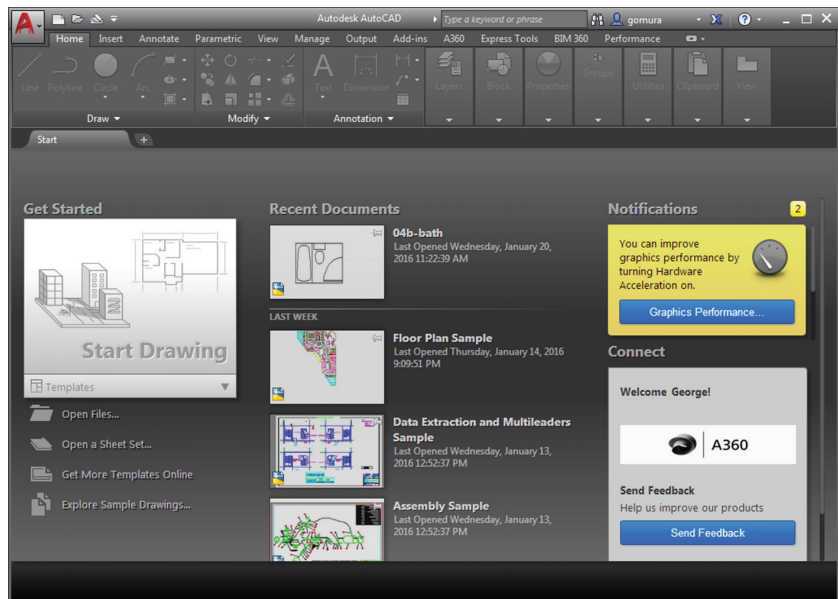
## Launching AutoCAD

If you've already installed AutoCAD (see Appendix B, "Installing and Setting Up AutoCAD") and are ready to jump in and take a look, proceed with the following steps to launch the program:

1. Choose Start > All Programs > Autodesk > AutoCAD 2018 > AutoCAD 2018. You can also double-click the AutoCAD 2018 icon on your Windows Desktop. AutoCAD LT users will use AutoCAD LT 2018 in place of AutoCAD 2018.
2. The AutoCAD Start tab appears, offering options to open existing drawings or to create a new drawing. You may also see the Design Feed panel, which allows you to use a cloud-based collaboration feature. Click the Start Drawing thumbnail in the left side of the view under "Get Started" (see Figure 1.1).

**FIGURE 1.1**

The Start tab offers easy access to previous work.



3. The AutoCAD window displays a blank default document named `Drawing1.dwg`. Users may see the Sheet Set Manager palette to the left of the AutoCAD window. In brand-new installations, you will see the Design Feed panel. Close the Design Feed panel for now. AutoCAD LT users may see the Info palette to the left of the AutoCAD window.

If you're using the trial version, you'll see the Product License Activation window before step 2. This window shows you the number of days you have left in the trial version. You can also activate the product here if you purchase a license. Click the Try button to continue opening the program. Now let's look at the AutoCAD window in detail. Don't worry if it seems like a lot of information. You don't have to memorize it, but by looking at all of the parts, you'll be aware of what is available in a general way.

## The AutoCAD Window

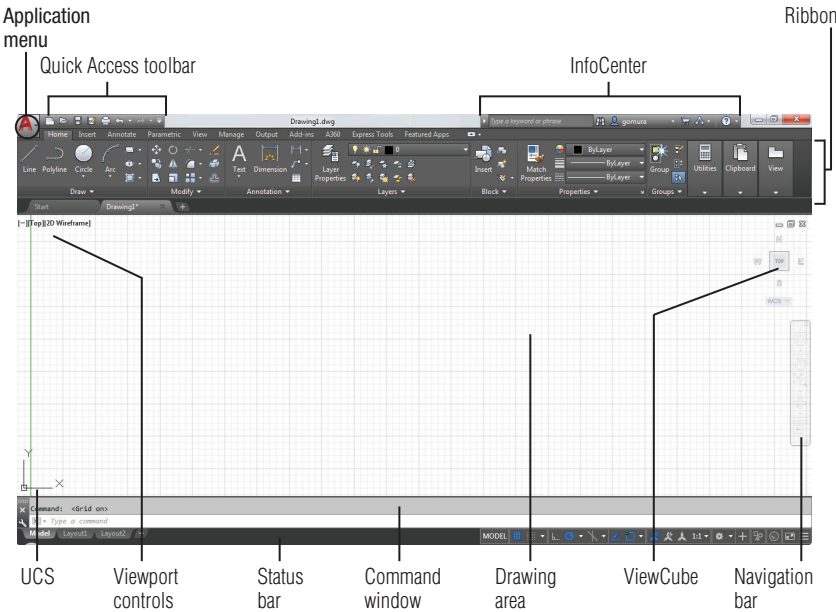


The AutoCAD program window is divided into several parts:

- ◆ Application menu
- ◆ Quick Access toolbar
- ◆ InfoCenter
- ◆ Ribbon
- ◆ Drawing tabs
- ◆ Drawing area
- ◆ UCS icon (User Coordinate System icon)
- ◆ Viewport controls
- ◆ ViewCube®
- ◆ Navigation bar
- ◆ Command window
- ◆ Status bar

Figure 1.2 shows a typical layout of the AutoCAD program window. You can organize the AutoCAD window into any arrangement you want and save it as a *workspace*. You can save and recall a workspace at any time using the Workspace Switching tool in the Quick Access toolbar. (You'll learn more about this tool in the next chapter.) The default workspace in Figure 1.2 is called the Drafting & Annotation workspace, and it is one of several workspaces built into AutoCAD.

**FIGURE 1.2**  
A typical arrangement of the elements in the AutoCAD window

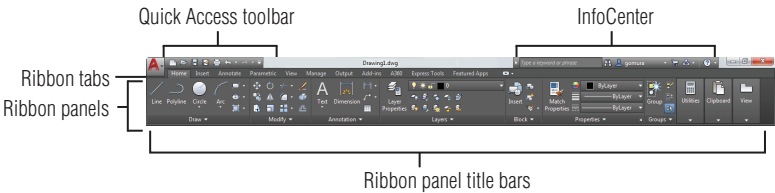


### AUTOCAD FOR 3D

For 3D modeling work, AutoCAD offers the 3D Modeling workspace and 3D drawing templates. The combination of these two features can make AutoCAD look like a very different program, but beneath the different appearance, the underlying program is the same. You'll learn more about workspaces and templates later in this chapter and in Chapter 24, "Customizing Toolbars, Menus, Linetypes, and Hatch Patterns." Part 4 of this book shows you the 3D features and tools of AutoCAD in more detail.

In the upper-left corner of the AutoCAD program window, the red AutoCAD icon displays the Application menu, which offers a set of options not directly related to drawing; we'll elaborate on this menu in the next section. The Quick Access toolbar at the top of the drawing area (shown in Figure 1.3) includes the basic file-handling functions, which you find in nearly all Windows programs. The InfoCenter is the AutoCAD online help facility; you'll learn more about it in Chapter 2, "Creating Your First Drawing." The Ribbon uses icons to provide nearly all of the commands that you'll need; you'll learn more about it in the section "Using the Ribbon" later in this chapter.

**FIGURE 1.3**  
The Quick Access toolbar, featuring basic Windows file-handling functions, appears above the Ribbon.



The drawing area occupies most of the screen. Everything you draw appears in this area. As you move your mouse around, crosshairs appear to move within the drawing area. This is the drawing cursor that lets you point to locations in the drawing area. You'll get your first chance to work with the drawing area later in the section "Picking Points in the Drawing Area."

Just above the drawing area are the Drawing tabs that let you create new drawings or switch between open drawings in a way similar to popular web browsers. Notice the X in the current tab, which lets you close the current drawing, and the plus icon just to the right of the tab, which lets you create a new drawing or open an existing one. When you click the plus icon, a new drawing tab appears that you can save as a new file. Right-click the plus icon and a context menu opens that offers you the option to open an existing drawing or to create a new one in the form of an additional tab by using a template.

If you hover over the Drawing tab, you'll see preview images of the model and layouts of the drawing. You'll learn more about model and layout spaces later in this chapter.

Within the drawing area, you see several items along the side and in the corners. The UCS icon appears in the lower-left corner. You'll learn more about the UCS icon in a moment. In the upper-right corner, you see the ViewCube. The ViewCube is primarily for 3D modeling, and we look at those techniques in Chapter 20, "Creating 3D Drawings." You'll also see a Navigation bar along the right edge of the AutoCAD window. This bar offers tools that you can use to get around in your drawing. Basic tools like Zoom and Pan can be found here as well as some advanced tools for viewing 3D models.

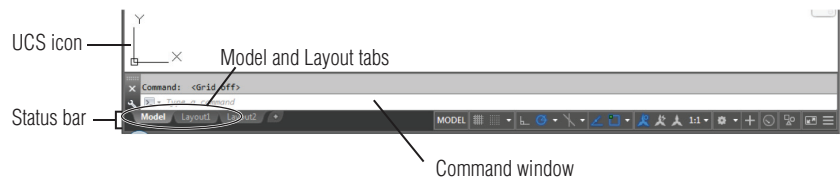
The Viewport controls in the upper-left corner of the drawing area offer menu options to control 3D and 2D views and visual styles, and they duplicate some of the functions of the ViewCube. You'll explore the Viewport controls when you delve into 3D modeling in Chapter 23, "Exploring 3D Mesh and Surface Modeling."

Just below the drawing area in the lower-left corner are the Model and Layout tabs. These tabs enable you to switch quickly between different types of views called the *model* and *layout* views. You'll get to see firsthand how these views work in a section called "Working with AutoCAD" later in this chapter.

The Command window, located just below the drawing area, gives you feedback about the AutoCAD commands as you use them. You can move and resize this window just as you move and resize other display components. The Command window can be placed in a docked position as shown in Figure 1.4 by dragging it into the status bar. We'll elaborate on the Command window in the section "Working in the Command Window" later in this chapter.

**FIGURE 1.4**

The Command window and the status bar



Below the Command window is the status bar (also shown in Figure 1.4). The status bar gives you information at a glance about the state of the drawing. The tools in the status bar offer aids to the drafting process.



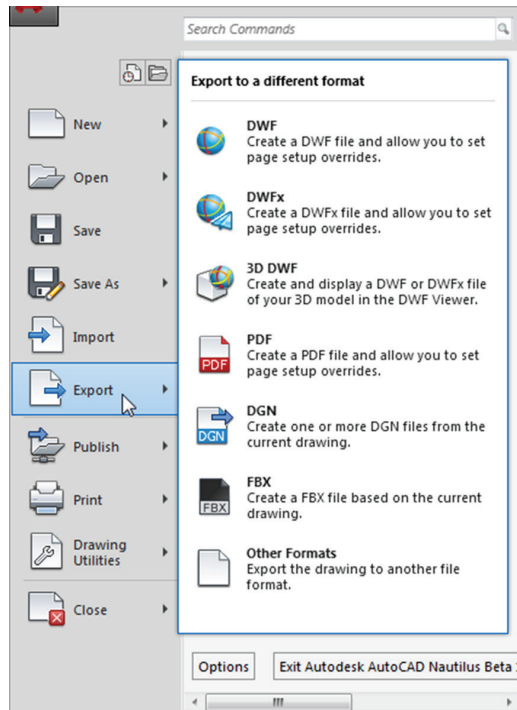
## Using the Application Menu

The Application menu offers tools to help you manage your AutoCAD files. It is basically the File pull-down menu from earlier versions of AutoCAD. Try it out to see how it works:

1. Click the Application menu icon in the upper-left corner of the AutoCAD window. A list of options appears.
2. Move the cursor slowly down the list of options in the left column. As you highlight the options, additional options appear in a column to the right.
3. Highlight the Export option to see the various formats available for export (see Figure 1.5).

**FIGURE 1.5**

The Export option in the Application menu showing the list of export options

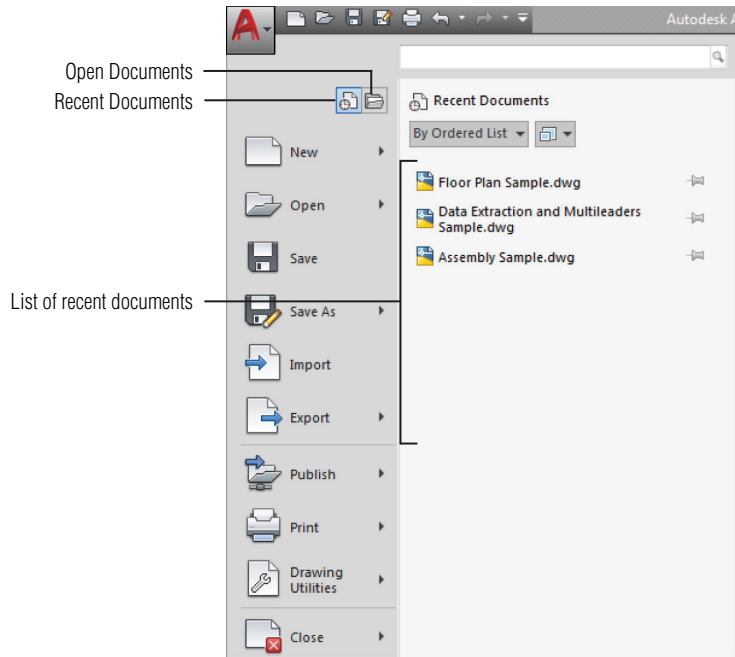


The Application menu also gives you a convenient way to find recently used files or to get to a file you already have open. If you move your cursor away from the list of options to the left in the Application menu, you'll see Recent Documents in the upper-left portion of the menu. You'll also see two icon tools, named Open Documents and Recent Documents (see Figure 1.6).

The Open Documents option lets you quickly change from one open file to another when you are viewing your files full-screen. The Recent Documents option displays a list of documents on which you've recently worked.

**FIGURE 1.6**

The Open Documents and Recent Documents tools



You can use the View tool in the upper-right portion of the Application menu to select the way the list of files is displayed in a manner similar to the way you would use the Windows Explorer View option. You can click this icon and select Small Images to have the list display the files with thumbnail images of their content. Hover over a filename and you will see a tool tip that displays a larger thumbnail of the drawing.

## Using the Ribbon

Certification  
Objective

The most prominent feature in the AutoCAD window, besides the drawing area, is the Ribbon (see Figure 1.7). This is where you'll be selecting tools to draw, edit, or perform other functions. The Ribbon contains a set of panels representing groups of tools and features. The name of each Ribbon panel is found in its title bar at the bottom of the panel. Tabs that appear above the Ribbon panels further organize them. Each tool in the Ribbon offers a tool tip and cue card that provides a short description to help you understand what the tool icon represents.



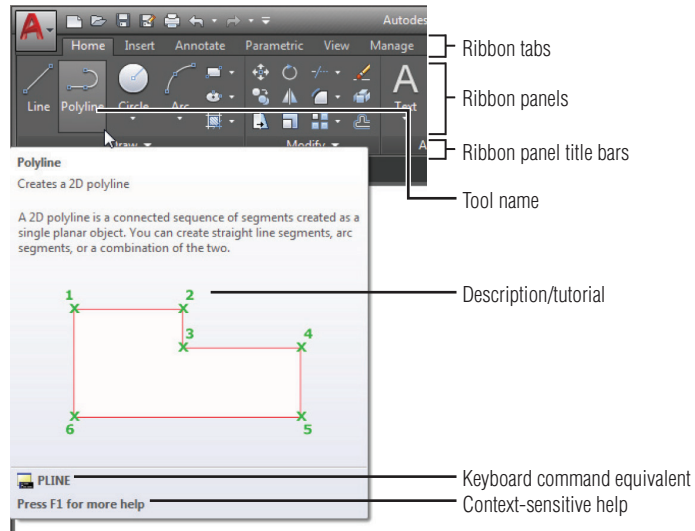
If you see only the Ribbon tabs, click the arrowhead button in the Ribbon Control tool. If you don't even see the tabs, type **Ribbon**.↵

Move the arrow cursor onto one of the Ribbon panel tools and leave it there for a moment; you'll see a tool tip appear just below the cursor. Hold the cursor there a bit longer and the tool tip changes to give you even more information about the tool.



**FIGURE 1.7**

A typical cue card from a Ribbon panel tool



In most cases, you'll be able to guess what each tool does by looking at its icon. The icon with an arc in the Draw Ribbon panel, for instance, indicates that the tool draws arcs; the one with the circle shows that the tool draws circles; and so on. For further clarification, the tool tip gives you the name of the tool.

### COMMUNICATING WITH THE COMMAND WINDOW AND DYNAMIC INPUT DISPLAY

AutoCAD is the perfect servant: It does everything you tell it to do and no more. You communicate with AutoCAD by using tools and menu options, which invoke AutoCAD commands. A *command* is a single-word instruction you give to AutoCAD telling it to do something, such as draw a line (the Line tool in the Draw Ribbon panel) or erase an object (the Erase tool in the Modify Ribbon panel). Whenever you invoke a command, either by typing it or by selecting an option or tool, AutoCAD responds by presenting messages to you in the Command window and the Dynamic Input display or by displaying a dialog box. The Dynamic Input display is the display of information that appears at the cursor and consists of messages, dimensions, and coordinates.

The messages in the Command window, or in the Dynamic Input display, often tell you what to do next, or they may display a list of available options. A single command often presents a series of messages that you answer to complete the command. These messages serve as an aid to new users who need a little help. If you ever get lost while using a command or forget what you're supposed to do, look at the Command window for clues. As you become more comfortable with AutoCAD, you'll find that you won't need to refer to these messages as frequently.

You can also right-click to display a set of options that relate directly to your current activity. For example, if you right-click before picking the first point for the Rectangle command, a set of options appears displaying the same options that are listed in the Command prompt along with some additional options.



Finally, the Dynamic Input display allows you to enter dimensional data of objects as you draw them. Besides echoing the command-line messages, the Dynamic Input display shows temporary dimensions, coordinates, and angles of objects that you're drawing and editing. As you enter coordinate or angle values through the keyboard, they appear in the Dynamic Input display. You can easily turn the Dynamic Input display on or off by clicking the Dynamic Input tool when it is visible in the status bar or by setting the Dynmode command to 0 for off or 3 for on. When the Dynamic Input display is turned off, your keyboard input appears only in the Command window.

As a new user, you'll find these tool tips helpful because they show you the name of the tool and a brief description of how to use it. Typically, when we ask you to select a tool, we'll use the name shown in the tool tip to help you identify the tool. In the case of a tool with flyouts, the tool name changes under different conditions. For those tools, we'll use a general description to identify the tool. You'll learn more about flyouts a bit later in this chapter (see the section "Understanding Flyouts").

As you work through this book, we'll ask you to select tools from the Ribbon panels. You'll often be asked to switch between different tabs to select tools from other sets of panels. To make the process simpler to read, we'll use a somewhat abbreviated description of a tool's location. For example, for the Line tool we'll say, "Click the Line tool in the Home tab's Draw panel." For the Move tool, we'll say, "Click the Move tool in the Home tab's Modify panel."

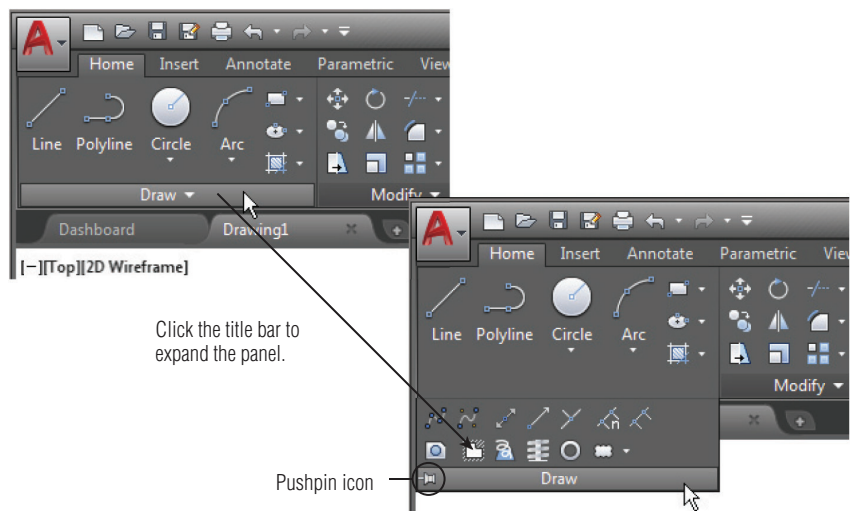
## EXPANDING HIDDEN PANELS

Certification  
Objective

In addition to the visible tools, some buttons are hidden from view. You can expand many of the Ribbon panels to select more of them. If you see an arrowhead to the right of a panel's title bar, you can click the title bar to expand the panel (see Figure 1.8). The panel expands to reveal additional tools. If you move the cursor to the drawing area, the expanded panel shrinks to its original size. You can also click the pushpin icon in the expanded panel title bar to lock the panel in its open position.

**FIGURE 1.8**

The arrowhead in the panel title bar tells you that additional tools are available.

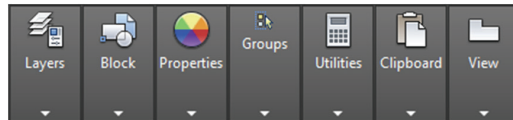


From now on, we'll refer to the location of additional tools as the expanded panel. For example, we'll say, "Click the Ray tool in the expanded Draw panel" when we want you to select the Ray tool.

If you are working on a smaller screen with low resolution, some of the Ribbon panels to the far right may look different from what you are shown in this book. On a low-resolution screen, AutoCAD will automatically reduce the size of the panels to the right of the Ribbon so that they show only their title (see Figure 1.9).

**FIGURE 1.9**

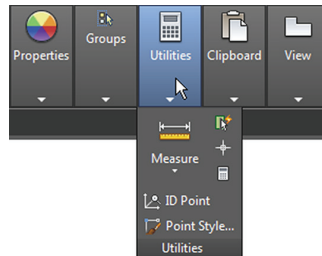
The Layers, Block, Properties, Groups, Utilities, and View panels are reduced to single icons with a smaller AutoCAD window.



To see the tools, hover over the panel (see Figure 1.10).

**FIGURE 1.10**

Hover over the panel to see the tools.

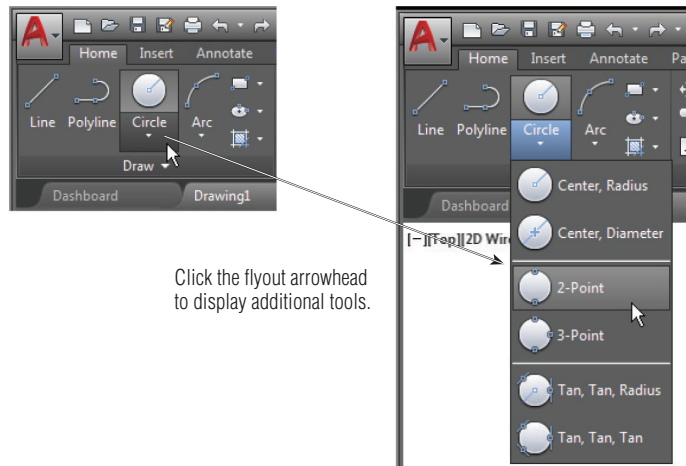


Finally, the Workspace drop-down menu in the Quick Access toolbar may be hidden from view in a low-resolution display. If you don't see these options in your AutoCAD window, click the double arrowhead icon to the far right of the Quick Access toolbar to reveal it. If you still don't see the Workspace menu, click the downward-pointing arrow icon at the far-right end of the Quick Access toolbar and select Workspace. See "Can't Find the Tool or Panel We're Discussing?" later in this chapter for more on "missing" interface items.

## UNDERSTANDING FLYOUTS

The *flyouts* are one more feature that you'll want to know about. Flyouts are similar to expanded panels because you can click an arrowhead to gain access to additional tools. Unlike a whole panel, however, flyouts give you access to different methods for using a particular tool. For example, AutoCAD lets you draw circles in several ways, so it offers a flyout for the Circle tool in the Home tab's Draw panel. If you click the arrowhead below the Circle icon in the Draw panel, you'll see additional tools for drawing circles (see Figure 1.11).

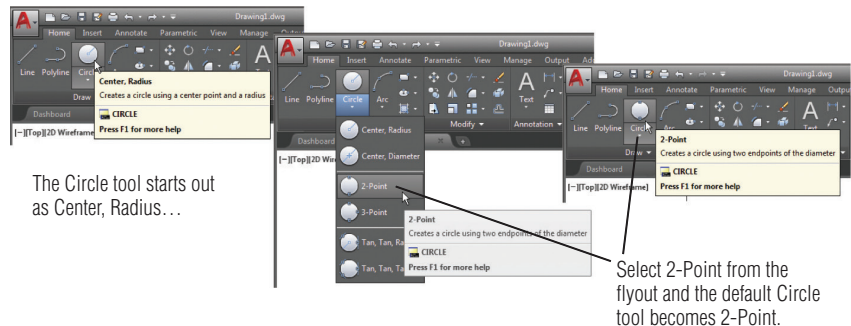
**FIGURE 1.11**  
Flyouts



Click the flyout arrowhead to display additional tools.

If you select a tool option from a flyout, that option becomes the default tool for the icon you chose. For example, when you hover your cursor over the Circle icon in the Draw panel, the tool tip shows “Center, Radius” for the tool’s name. If you click the arrowhead below the Center, Radius tool and select 2-Point, then 2-Point becomes the default tool and you’ll see “2-Point” for the name of the tool in the tool tip (see Figure 1.12).

**FIGURE 1.12**  
The tool with a flyout will change to the last tool used.



The Circle tool starts out as Center, Radius...

Select 2-Point from the flyout and the default Circle tool becomes 2-Point.

### GENERAL TOOL NAMES VS. TOOL TIP NAMES

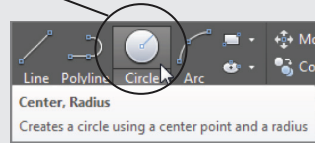
Because the tool tip for tools with flyouts can change, describing them by name can be a bit problematic. The name may have changed based on the last tool you used from a flyout. For this reason, if a tool has a flyout, we’ll refer to it by a general name that is related to the set of tools contained

*continues*

continued

within it rather than by the tool tip name. For example, we'll call the circle icon tool the Circle tool rather than the Center, Radius tool.

Circle tool



## TOOLS VS. THE KEYBOARD

Throughout this book, you'll be told to select tools from the Ribbon panels to invoke commands. For new and experienced users alike, the Ribbon panels offer an easy-to-remember method for accessing commands. If you're an experienced AutoCAD user, you can type commands directly from the keyboard. Most of the keyboard commands you know and love still work as they did before.

Many tools and commands have *aliases*. Aliases are one-, two-, or three-letter abbreviations of a command name. As you become more proficient with AutoCAD, you may find these aliases helpful. As you work through this book, the shortcuts will be identified for your reference.

Finally, if you're feeling adventurous, you can create your own aliases and keyboard shortcuts for executing commands by adding them to the AutoCAD support files. Chapter 24 discusses how to customize menus, Ribbon panels, toolbars, and keyboard shortcuts.

## Picking Points in the Drawing Area

Now that you've seen the general layout of AutoCAD, take a look at the coordinate readout and the drawing cursor to get a sense of how the parts of the AutoCAD screen work together:

1. Move the cursor around in the drawing area. As you move it, notice how the coordinate readout changes to tell you the cursor's location. It shows the coordinates in an X, Y, Z format. If the coordinates are not shown on the status bar, click the customization tool at the bottom-right corner of the AutoCAD window and click the Coordinates option check mark. The coordinate readout will then be visible. The Customization tool looks like three horizontal bars. See "Can't Find the Tool or Panel We're Discussing?" later in this chapter for more information.
2. Place the cursor in the middle of the drawing area and click the left mouse button. Move the cursor and a rectangle follows. This is a *window selection*; you'll learn more about this window in Chapter 2. You also see a coordinate readout following the cursor and the message Specify opposite corner or. This display at the cursor is called the *Dynamic Input display*. You'll learn more about it a little later in this chapter (see Figure 1.13).

**FIGURE 1.13**

The Dynamic Input display cursor



3. Move the cursor a bit in any direction, and then click the left mouse button again. Notice that the window selection disappears, as does the Dynamic Input display.
4. Try picking several more points in the drawing area. Notice that, as you click, you alternately start and end a window selection. If you happen to click and drag, you will see a lasso selection (see “Click and Drag to Lasso Objects” in Chapter 2 for more on the lasso selection method).

If you happen to click the right mouse button, a context menu appears. A right-click frequently opens a menu containing options that are *context sensitive*. This means the contents of the menu depend on the location where you right-click as well as the command that is active at the time. If there are no appropriate options at the time of the right-click, AutoCAD treats the right-click as an Enter (↵) keystroke. You’ll learn more about these options as you progress through the book. For now, if you happen to open this menu by accident, press the Esc key to close it.

## Using the UCS Icon

In the lower-left corner of the drawing area, you see an L-shaped line. This is the *User Coordinate System (UCS)* icon, which tells you your orientation in the drawing. This icon becomes helpful as you start to work with complex 2D drawings and 3D models. The X and Y indicate the x- and y-axes of your drawing. Chapter 21, “Using Advanced 3D Features,” discusses this icon in detail. For now, you can use it as a reference to tell you the direction of the axes.

### IF YOU CAN’T FIND THE UCS ICON

The UCS icon can be turned on and off, so if you’re on someone else’s system and you don’t see the icon or it doesn’t look like it does in this chapter, don’t panic. See Chapter 21 for more information.



## Working in the Command Window

As mentioned earlier, at the bottom of the screen, just above the status bar, is a small horizontal window called the *Command window*. Here AutoCAD displays responses to your input while you’re using a command. By default, it shows one line of text. This line shows the current responses to your command input as well as command options. As you work through a command, you’ll see more responses, with earlier responses scrolling upward in faded text. You can view text that has scrolled out of sight by clicking the up-pointing arrowhead at the far right of the Command window. Right now, the command line displays the words “Type a command” in a box (see Figure 1.4, earlier in this chapter). This tells you that AutoCAD is waiting for a command. When you click a point in the drawing area, you see the message *Specify opposite corner or [Fence/WPolygon/CPolygon]:*. At the same time, the cursor starts to draw a window selection that disappears when you click another point. The same message appears in the Dynamic Input display at the cursor.

As a new user, pay special attention to messages displayed in the Command window and the Dynamic Input display because this is how AutoCAD communicates with you. Besides giving you messages, the Command window records your activity within AutoCAD. You can use the scroll bar to the right of the Command window to review previous messages. You can also enlarge the window for a better view. (Chapter 2 discusses these components in more detail.)

Now let's look at the AutoCAD window components in detail.

### THE COMMAND WINDOW AND DYNAMIC INPUT DISPLAY

The Command window and the Dynamic Input display allow AutoCAD to provide text feedback on your actions. You can think of these features as a chat window for communicating with AutoCAD—as you enter commands, AutoCAD responds with messages. As you become more familiar with AutoCAD, you may find that you don't need to rely on the Command window and Dynamic Input display as much. For new and casual users, however, the Command window and Dynamic Input display can be helpful in understanding what steps to take as you work.

## Working with AutoCAD

Now that you've been introduced to the AutoCAD window, you're ready to try using a few AutoCAD commands. First you'll open a sample file and make a few modifications to it. In the process, you'll become familiar with common methods of operation in AutoCAD.

### Opening an Existing File

In this exercise, you'll get a chance to see and use a typical Select File dialog box.

Before you start, make sure that you have installed the sample files for this book from the book's web page. See the introduction for instructions on how to find the sample files.

To start, you'll open an existing file:



1. In the Drawing tab at the top left of the drawing area, click the Close icon to the far right of the tab.

A message appears, asking whether you want to save the changes you've made to the current drawing. Click No.



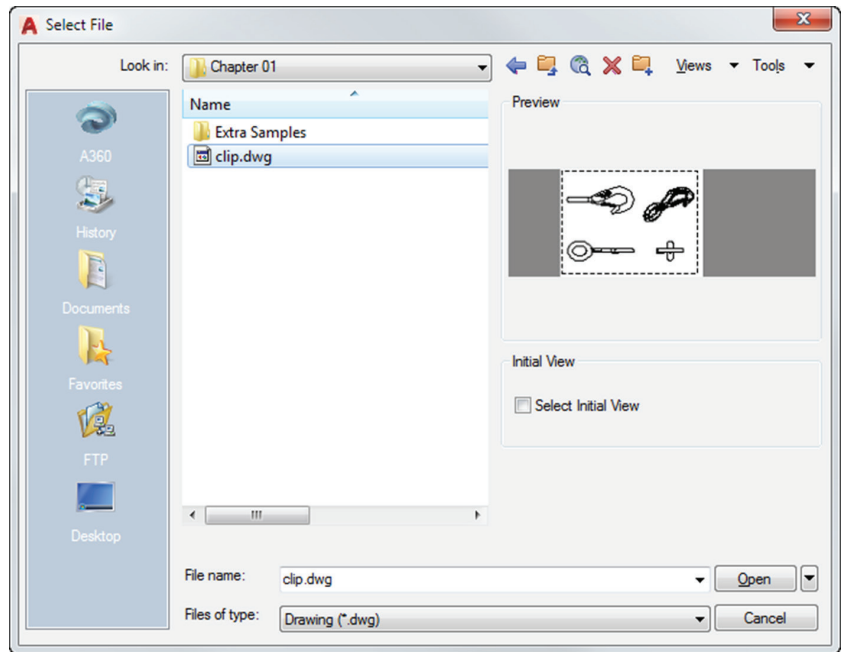
2. In the Start tab, click the Open Files option just below the Start Drawing icon in the left column. The Select File dialog box opens. This is a typical Windows file dialog box with an added twist: In the large Preview box on the right, you can preview a drawing before you open it, thereby saving time while searching for files. To the left is a panel known as the Places list, in which you can find frequently used locations on your computer or the Internet (see Figure 1.14).

If you don't see a Preview box in the Select File dialog box, click the word *Views* in the upper-right corner and select Preview from the list that appears. Note that the Select File dialog box can be resized if you need to view more of your drawing list.

3. In the Select File dialog box, open the Look In drop-down list and locate the Chapter 1 folder of the Mastering AutoCAD 2018 sample files. (You may need to scroll through the list to find it.)

**FIGURE 1.14**

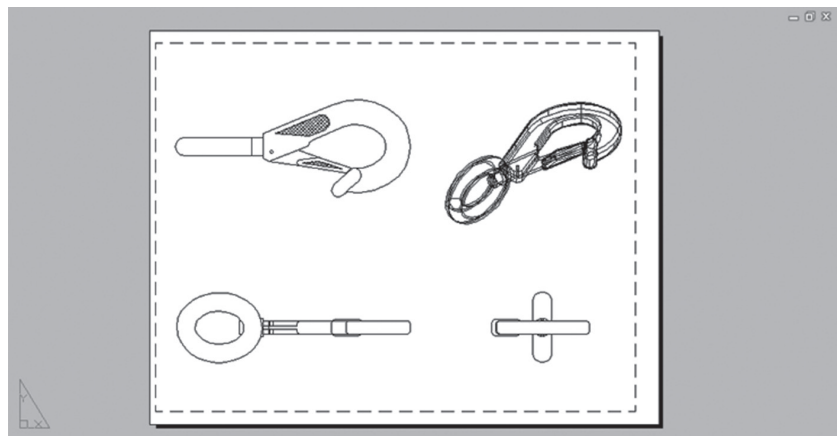
The Select File dialog box



4. Move the arrow cursor to the `clip.dwg` file and click it. Notice that the `clip.dwg` file-name now appears in the File Name text box below the file list. The Preview box also now shows a thumbnail image of the file. Be aware that a thumbnail may not show for files from older versions of AutoCAD.
5. Click the Open button at the bottom of the Select File dialog box. AutoCAD opens the `clip.dwg` file, as shown in Figure 1.15.

**FIGURE 1.15**

The Layout1 view of the `clip.dwg` file



The `clip.dwg` file opens to display a *layout* view of the drawing. A layout is a type of view in which you lay out different views of your drawing in preparation for printing. You can tell you are in a layout view by the white area over the gray background. This white area represents your drawing on a printed page. This view is like a print preview.

Also note that the AutoCAD window's title bar displays the name of the drawing. The name is also displayed in the Drawing tab. This offers easy identification of the file.

This particular file contains both 2D drawings and a 3D model of a typical locking clip. The layout view shows top, front, and right-side views as well as an isometric view.

## Getting a Closer Look

One of the most frequently used commands is Zoom, which gives you a closer look at part of your drawing. This command offers a variety of ways to control your view. In this section, you'll enlarge a portion of the clip drawing to get a more detailed look. You use a *zoom window* to tell AutoCAD which area you want to enlarge.

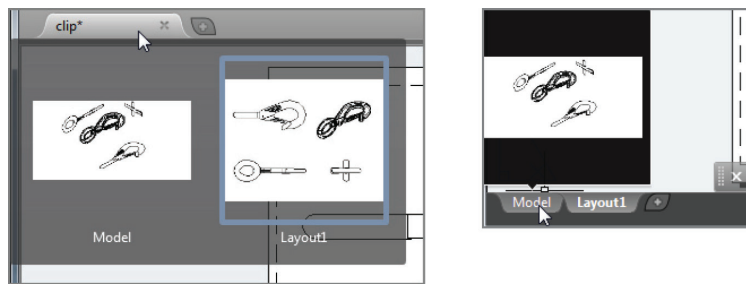
Certification  
Objective

You'll start by switching to a Model Space view of the drawing. The Model Space view places you in a workspace where you do most of your drawing creation and editing. Follow these steps:

1. Hover over the Clip tab at the top left of the drawing area (see the left panel in Figure 1.16). You'll see two preview icons showing the Model Space on the left and the layout on the right. If you hover over the Model Space image, the drawing area will temporarily change to show you the full view of the Model Space.
2. Click the image on the left showing the Model Space (see Figure 1.16).

**FIGURE 1.16**

Hover over the Drawing tab, and click the Model Space image (left) or click the Model tab in the lower-left corner of the drawing area (right).

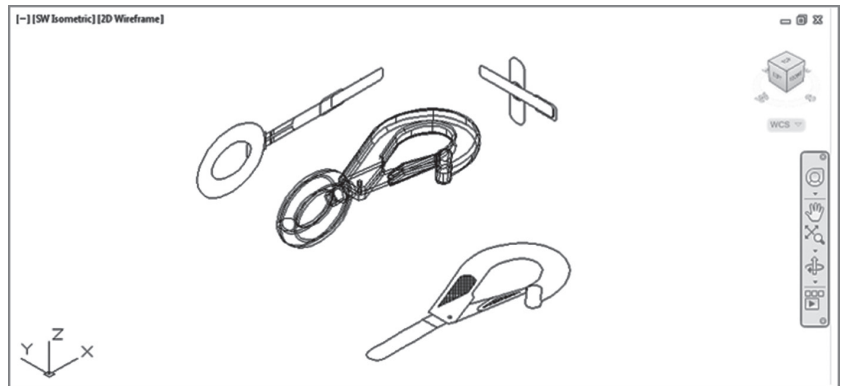


Your view changes to show the full 3D model with the 2D representations of the model (see Figure 1.17). You can also click the Model tab below the drawing area (see the right panel in Figure 1.16) to accomplish the same change from the layout to Model Space.

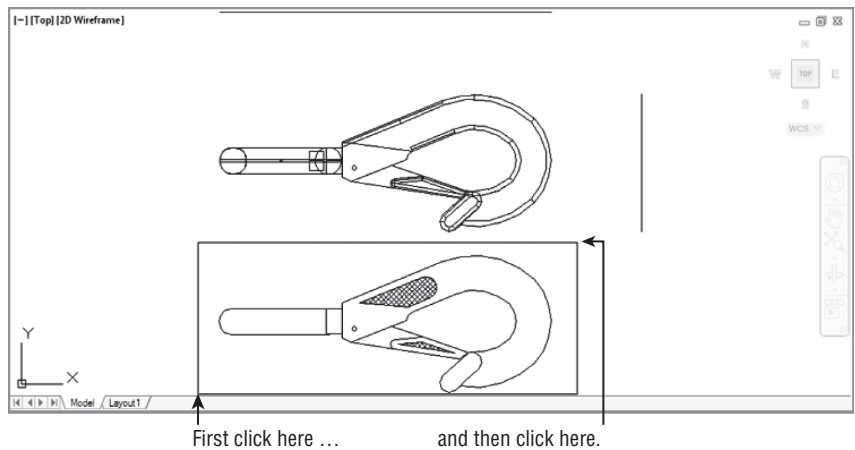
3. Type **PLAN**↵. Your display changes to a two-dimensional view looking down on the drawing, as shown in Figure 1.18.



**FIGURE 1.17**  
3D model with 2D  
representations of  
the model

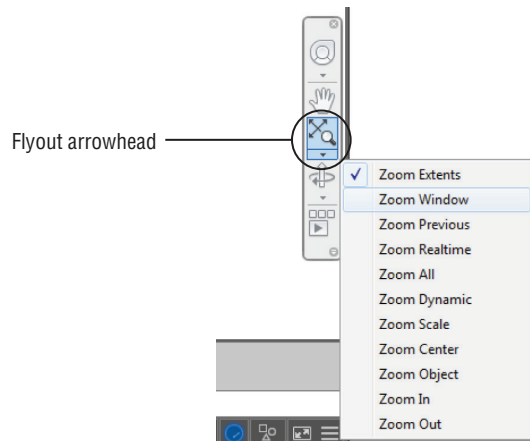


**FIGURE 1.18**  
Placing the zoom  
window around the  
clip



4. Click the Zoom Window tool from the Zoom flyout in the Navigation bar (see Figure 1.19). Remember that to open the flyout, you need to click the arrowhead next to or below the tool.

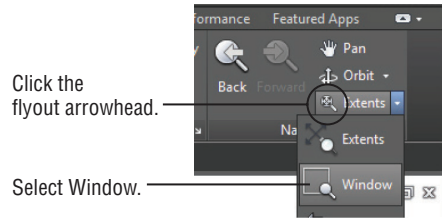
**FIGURE 1.19**  
Choosing the Zoom  
Window tool from the  
Zoom flyout in the  
Navigation bar



You can also click the Window tool from the Zoom flyout in the View tab's Navigate panel (see Figure 1.20) or type the command **Z-W-J**. If you don't see the Navigate panel, right-click in the Ribbon and choose Show Panels > Navigate.

**FIGURE 1.20**

The Zoom flyout and Window tool in the View tab's Navigate panel



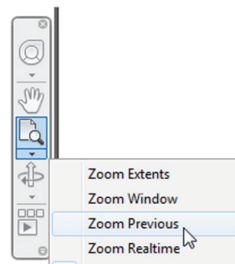
5. The Dynamic Input display shows the Specify first corner: prompt. Look at the image in Figure 1.18. Move the crosshair cursor to a location similar to the one shown in the figure labeled "First click here," and then left-click. Move the cursor, and the rectangle appears with one corner fixed on the point you just picked; the other corner follows the cursor.
6. The Dynamic Input display now shows the Specify opposite corner: prompt. Position the other corner of the zoom window so that it encloses the lower image of the clip, as shown in Figure 1.18, and left-click the mouse again. The clip enlarges to fill the screen.

In this exercise, you used the Window option of the Zoom command to define an area to enlarge for your close-up view. You saw how AutoCAD prompts you to indicate first one corner of the window selection and then the other. These messages are helpful for first-time users of AutoCAD. You'll use the Window option frequently—not just to define views but also to select objects for editing.

Getting a close-up view of your drawing is crucial to working accurately, but you'll often want to return to a previous view to get the overall picture. To do so, choose Zoom Previous from the Zoom flyout in the Navigation bar (see Figure 1.21). You may also type **Z-P-J**.

**FIGURE 1.21**

The Zoom Previous option



Do this now and the previous view appears. Click Zoom Previous again, and the view showing the entire clip returns to the screen.

You can quickly enlarge or reduce your view by using the Zoom Realtime option of the Zoom command. Follow these steps to change your view with Zoom Realtime:

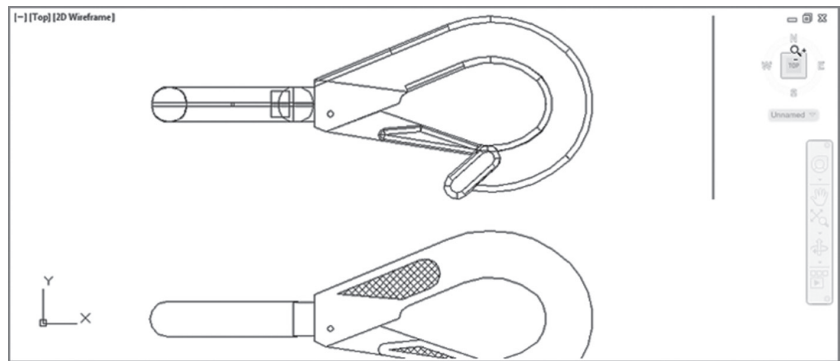
#### Zoom Realtime



1. Click the Zoom Realtime option from the Navigation bar's Zoom flyout. You can also type **Z**.
2. Place the Zoom Realtime cursor slightly above the center of the drawing area, and then click and drag downward. Your view zooms out to show more of the drawing.
3. While still holding the left mouse button, move the cursor upward. Your view zooms in and enlarges. When you have a view similar to the one shown in Figure 1.22, release the mouse button. (Don't worry if you don't get *exactly* the same view as the figure. This is just for practice.)

**FIGURE 1.22**

The final view you want to achieve in step 3 of the exercise



4. You're still in Zoom Realtime mode. Click and drag the mouse again to see how you can further adjust your view. To exit, you can select another command besides Zoom or Pan, or press the Esc key twice.

If you prefer, you can use the wheel on your mouse to zoom and pan over your view. Roll the wheel to zoom in and out, or click and drag the wheel to pan. Be aware that Zoom Realtime offers finer control over the amount of magnification than does the mouse wheel.

As you can see from this exercise, you have a wide range of options for viewing your drawings just by using a few tools. These tools are all you need to control the display of 2D drawings.

## Saving a File as You Work

It's a good idea to save your file periodically as you work on it. As with any Windows program, you can save it under its original name (click the Save tool on the Quick Access toolbar) or under a different name (choose Save As from the Application menu or the Quick Access toolbar), thereby creating a new file.

By default, AutoCAD automatically saves your work at 10-minute intervals under a name that is a combination of the current filename plus a number and that ends with the **.sv\$** filename extension. This is known as the *Automatic Save* feature. Using settings in the Options dialog box or system variables, you can change the name of the autosaved file and control the time between autosaves. See "The Open and Save Tab" in Appendix B for details.

### “I CAN’T FIND MY AUTOMATIC SAVES!”

As an IT manager at ELS Architecture and Urban Planning, this author (George) is often asked, “Where does AutoCAD put the Automatic Save files?” By default, in Windows 7, Windows 8, and Windows 10 the Automatic Save file is stored in `C:\Users\User Name\appdata\local\temp\`. You can find the exact location for your system by typing **Savefilepath** at the Command prompt. This file location is often set as a hidden folder, so you may need to set up File Explorer to display hidden folders before you can get to the Automatic Save file. You can also specify a different location for the Automatic Save files. See Appendix B for information on how to locate hidden files and specify a location for your files.

## Making Changes

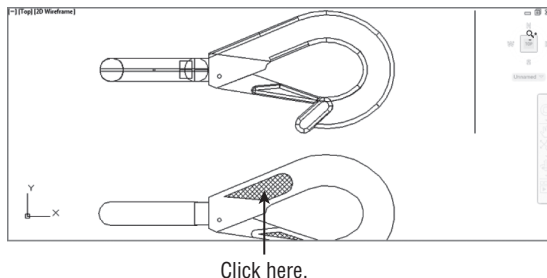
You’ll frequently make changes to your drawings. One of the primary advantages of AutoCAD is the ease with which you can make modifications. The following exercise shows you a typical sequence of operations involved in changing a drawing:

1. Use the Save As option in the Application menu to save the current `clip.dwg` file under the name **MyFirst**. For convenience, you can save your files in the My Documents folder.
2. From the Home tab’s Modify panel, click the Erase tool.
3. Notice that the cursor has turned into a small square. This square is called the *pickbox*. You also see `Select objects:` in the Command window and the Dynamic Input display. This message helps remind new users what to do.
4. Move the pickbox over the drawing, placing it on various parts of the clip. Don’t click anything yet. Notice that as you hover your cursor over objects with the pickbox, they’re dimmed and a red X appears by the cursor. This helps you see the objects that the pickbox is likely to select and erase should you click the left mouse button.
5. Place the pickbox on the crosshatch pattern of the clip (see Figure 1.23), and click. The crosshatch dims. The pickbox and the `Select objects:` prompt remain, indicating that you can continue to select objects.



**FIGURE 1.23**

Erasing a portion of the clip



6. Press `↵`. The crosshatch disappears. You’ve just erased a part of the drawing.

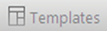
In this exercise, first you issued the Erase command, and then you selected an object by using a pickbox to click it. The pickbox tells you that you must select items on the screen, and it shows you what you’re about to select by highlighting objects as you hover the cursor over them. Once

you've clicked an object or a set of objects, press  $\downarrow$  to move on to the next step. This sequence of steps is common to many of the commands you'll work with in AutoCAD.

You can also click an object or a set of objects and then press the Delete key.

## Working with Multiple Files

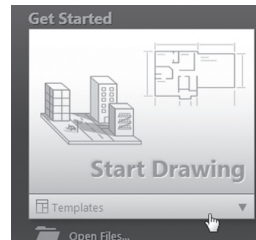
You can have multiple documents open at the same time in AutoCAD. This feature can be especially helpful if you want to exchange parts of drawings between files or if you want another file open for reference. Try the following exercise to see how multiple documents work in AutoCAD:



1. In the Start tab, locate the Templates option at the bottom of the Start Drawing icon and click it (see Figure 1.24).

**FIGURE 1.24**

Click the Templates option below the Start Drawing icon.



2. Select `acad.dwt` from the drop-down list.
3. Go to the Ribbon and, in the View tab's Interface panel, click Tile Vertically to get a view of both drawing files and the Start tab.
4. Click the minimize button in the upper-right corner of the Start tab window, and then click Tile Vertically in the Interface panel again to get a better view of the two drawings.

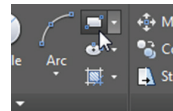
When you create a new file in AutoCAD, you're actually opening a copy of a *template file*, as you saw in step 1. A template file is a blank file that is set up for specific drawing types. The `acad.dwt` file is a generic template set up for Imperial measurements. Another template file, called `acadiso.dwt`, is a generic template useful for metric measurements. Other templates are set up for specific drawing-sheet sizes and measurement systems. You'll learn more about templates in Chapter 6, "Editing and Reusing Data to Work Efficiently."

Next let's try drawing a rectangle to see how AutoCAD behaves while drawing objects:

1. Making sure that you have the newly created drawing as the active window, click the Rectangle tool in the Home tab's Draw panel, as shown in Figure 1.25.

**FIGURE 1.25**

Click the Rectangle tool in the Draw panel.



Notice that the Command window now shows the following prompt:

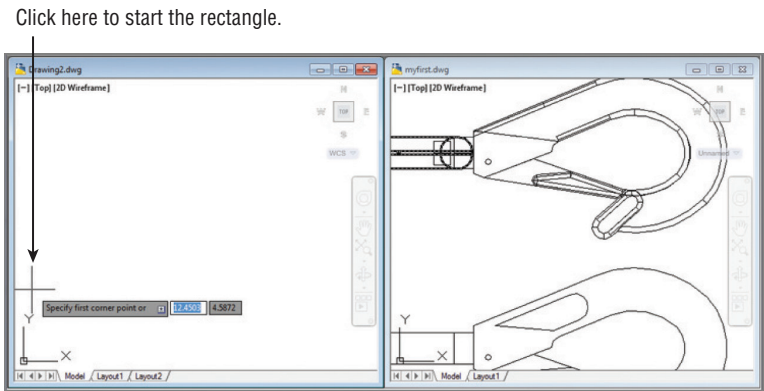
Specify first corner point or  
[Chamfer/Elevation/Fillet/Thickness/Width]:

AutoCAD is asking you to select the first corner for the rectangle, and in brackets, it's offering a few options of which you can take advantage at this point in the command. Don't worry about those options right now. You'll have an opportunity to learn about command options in Chapter 2. You also see the same prompt, minus the bracketed options, in the Dynamic Input display at the cursor. You can view the command options at the cursor by pressing the down arrow key on your keyboard.

- 2. Click a point roughly in the lower-left corner of the drawing area, as shown in Figure 1.26. Now as you move your mouse, a rectangle follows the cursor, with one corner fixed at the position you just selected. You also see the following prompt in the Command window, with a similar prompt in the Dynamic Input display:

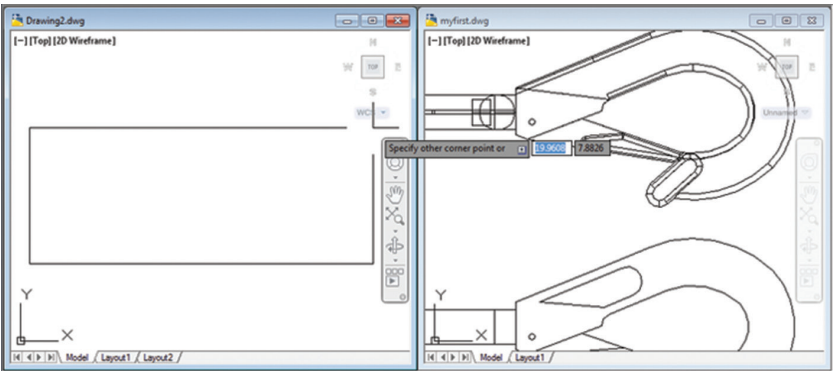
Specify other corner point or [Area/Dimensions/Rotation]:

**FIGURE 1.26**  
Selecting the first point of a rectangle



- 3. Click another point anywhere in the upper-right region of the drawing area, but avoid getting too close to the ViewCube (see Figure 1.27). A rectangle appears. If you happen to accidentally open the ViewCube context menu, press Escape once and you will be able to position the corner. You'll learn more about the different cursor shapes and what they mean in Chapter 2.

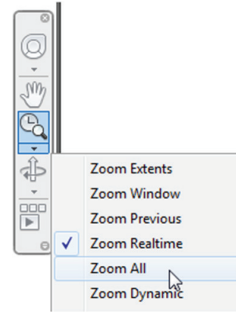
**FIGURE 1.27**  
After you've selected the first point of the rectangle, you'll see a rectangle follow the motion of your mouse.



4. Let's try copying objects between these two files. Click in the window with the clip drawing to make it active.
5. Click Zoom All from the Zoom flyout of the Navigation bar to get an overall view of the drawing (see Figure 1.28). You can also type **Z+A**.

**FIGURE 1.28**

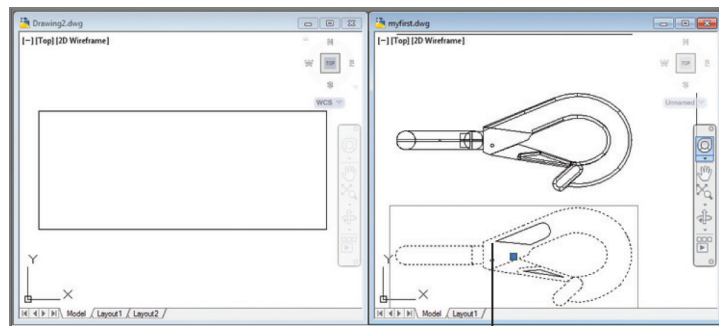
The Zoom All option gives you an overall view of your drawing.



6. Click the 2D version of the clip at the bottom of the drawing to select it. A dot appears at the center of the clip, and a rectangle encloses it. You may find that some parts of the drawing within the rectangle have not been highlighted. If this happens, just click them in addition to the main clip drawing. The dot is called a *grip*; you'll learn more about grips in the next chapter (see Figure 1.29).

**FIGURE 1.29**

Grip shown in the 2D drawing



Select this part of the drawing.

7. Right-click, select Clipboard, and then select Copy. You can also press **Ctrl+C** to invoke the Windows Copy To Clipboard shortcut.
8. Click inside the other drawing window to make it active.
9. Right-click, select Clipboard, and then select Paste. You can also press **Ctrl+V** to invoke the Windows Paste From Clipboard shortcut. The Specify Insertion Point prompt appears.

10. Click inside the rectangle. The clip appears at the cursor in the new drawing.
11. This ends the exercises for this chapter. Save your `myfirst.dwg` file for future reference. You can close the new drawing without saving it. You may have to maximize the Start tab, which will still be minimized at the bottom of the screen.

### LOSE THE NAVIGATION BAR?

If for some reason the Navigation bar is not visible, you can find it on the View tab's Viewport Tools panel. Click the Navigation Bar tool. The tool will highlight in blue and the Navigation bar will appear. You can also type **Navbar** at the command line and choose one of the two options (On/Off). This panel also shows the tool to display the UCS icon and ViewCube if they also get misplaced.

Note that you've had two files open at once. You can have as many files open as you want as long as your computer has adequate memory to accommodate them. You can control the individual document windows as you would any window, using the window control buttons in the upper-right corner of the drawing area.

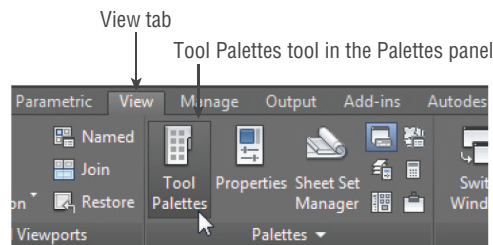
## Adding a Predrawn Symbol with the Tool Palettes

In the preceding exercise, you saw how you could easily copy an object from one file to another by using the standard Windows Cut and Paste feature. AutoCAD offers several tool palettes that enable you to click and drag predrawn objects into your drawing.

You can open the tool palettes by clicking the Tool Palettes tool in the View tab's Palettes panel, as shown in Figure 1.30.

**FIGURE 1.30**

Open the Tool Palettes tool from the View tab.



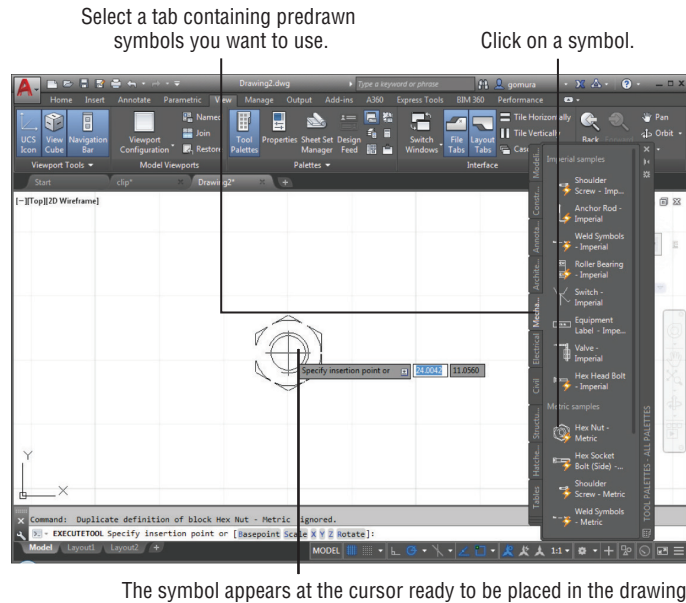
Once the tool palettes are open, you can select a tab containing the predrawn objects you want to use and then click the specific object you want to add. The object appears at the cursor, ready for you to select a location (see Figure 1.31).

In addition to predrawn objects, the tool palettes offer a way to add hatch patterns and other components quickly to your drawing. They're great tools to help you manage your library of custom, predrawn symbols. Chapter 25, "Managing and Sharing Your Drawings," shows you how to use and customize the tool palettes.



**FIGURE 1.31**

The tool palettes offer predrawn symbols that you can easily place in your drawings.

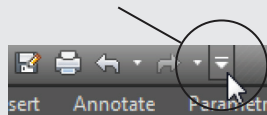


### CAN'T FIND THE TOOL OR PANEL WE'RE DISCUSSING?

The AutoCAD interface is easy to customize, and sometimes tools and options are hidden from view due to changes other users have made or as a result of changes from our review software to the final release version. If you don't see a tool or icon we're asking you to use in this or other chapters, here are a few places to check.

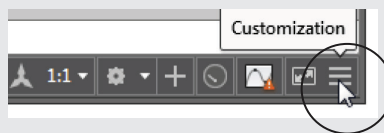
**Quick Access Toolbar** If you don't see an icon in the Quick Access toolbar, you can click the Customize Quick Access Toolbar tool at the right end of the toolbar to open a list of additional Quick Access toolbar options.

Customize Quick Access Toolbar



Options that already appear in the toolbar show a check mark next to their name in the menu. Click the option that you want to have visible in the toolbar to make it visible. Clicking on an option that shows a check mark will hide that option from the toolbar.

**Status Bar** Items missing from the status bar can be found by clicking the Customization tool in the lower-right corner of the AutoCAD window.

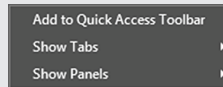


*continues*

*continued*

This opens a menu of tools that can be added to the status bar. Just as with the Quick Access toolbar, items that already appear in the status bar will display a check mark in the menu next to their name. If you need to check and uncheck multiple options, you can turn on the Lock UI option in the list. Lock UI keeps the menu open after you make a selection.

**Ribbon** If a Ribbon panel or Ribbon tab is missing, you can right-click in the Ribbon panel to open a menu that offers a list of available panels and tabs.



If you select the Show Tabs option, you will see a list of all of the tabs that are available for the current workspace. If you select the Show Panels option, you will see a list of panels that are available for the current Ribbon tab.

**USC Icon, ViewCube, and Navigation Bar** Some of the more useful panels in the AutoCAD interface can be turned on and off through tools in the Ribbon. The UCS icon, ViewCube, and Navigation bar can be controlled through tools in the View tab's Viewport Tools panel.



**Reset AutoCAD to the Default Settings** Finally, if your version of AutoCAD looks completely different from what you see here, you can reset your AutoCAD profile to the default settings.

1. Type `options`.↵
2. In the Options dialog box, select the Profiles tab at the upper right.
3. Click the Reset button in the right-hand column.
4. Click OK to exit the Options dialog box.

See “The Profiles Tab” in Appendix B for more information on how to save and restore the way AutoCAD is set up. Note that AutoCAD LT 2018 does not have a Profiles tab.

## The Bottom Line

**Use the AutoCAD® window.** AutoCAD® is a typical Windows graphics program that makes use of menus, toolbars, Ribbon panels, and palettes. If you’ve used other graphics programs, you’ll see at least a few familiar tools.

**Master It** Name the components of the AutoCAD window that you can use to select a function.

**Get a closer look with the Zoom command.** One of the first things that you'll want to learn is how to manipulate your views. The Zoom command is a common tool in graphics programs.

**Master It** Name at least two ways of zooming into a view.

**Save a file as you work.** Nothing is more frustrating than having a power failure that causes you to lose hours of work. It's a good idea to save your work frequently. AutoCAD offers an Automatic Save feature that can be a lifesaver if you happen to forget to save your files.

**Master It** How often does the AutoCAD Automatic Save feature save your drawing?

**Make changes and open multiple files.** As with other Windows programs, you can have multiple files open and exchange data between them.

**Master It** With two drawings open, how can you copy parts of one drawing into the other?





## Chapter 2

# Creating Your First Drawing

This chapter examines some of the basic functions of the AutoCAD® software. You'll get a chance to practice with the drawing editor by building a simple drawing to use in later exercises. You'll learn how to give input to AutoCAD, interpret prompts, and get help when you need it. This chapter also covers the use of coordinate systems to give AutoCAD exact measurements for objects. You'll see how to select objects that you've drawn and how to specify base points for moving and copying.

If you're not a beginning AutoCAD user, you may want to move on to the more complex material in Chapter 3, "Setting Up and Using the Drafting Tools." You can use the files supplied at the book's web page ([www.sybex.com/go/masteringautocad2018](http://www.sybex.com/go/masteringautocad2018)) to continue the tutorials at that point.

Beginning in this chapter, we'll be using a setup that displays a white drawing background instead of the dark gray background you see on your screen. We do this to keep the figures legible in the printed version of this book, but the difference should not hinder your understanding of the figures. If you like, you can set up your screen with a white background by following the instructions in Appendix B, "Installing and Setting Up AutoCAD," in the section "Set Up AutoCAD with a White Background."

In this chapter, you will learn to

- ◆ Specify distances with coordinates
- ◆ Interpret the cursor modes and understand prompts
- ◆ Select objects and edit with grips
- ◆ Use dynamic input
- ◆ Display data in a text window
- ◆ Display the properties of an object
- ◆ Get help

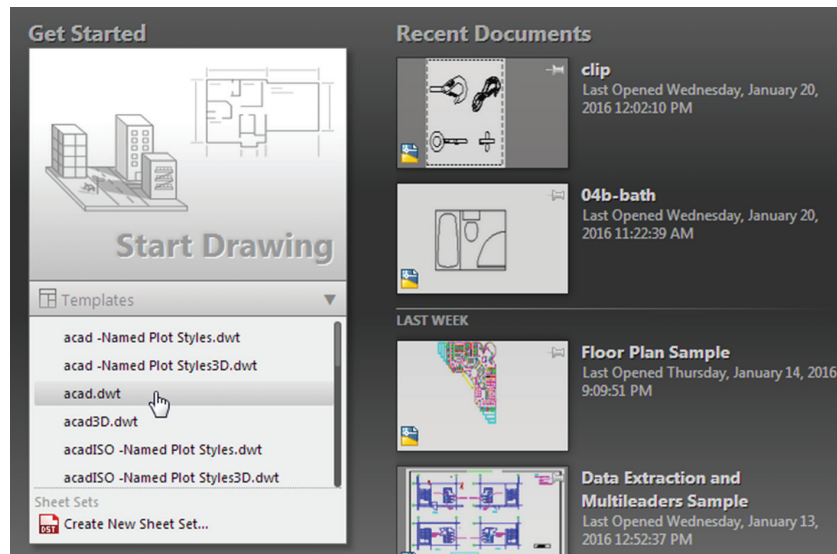
## Getting to Know the Home Tab's Draw and Modify Panels

Your first task in learning how to draw in AutoCAD software is simply to draw a line. Since AutoCAD is designed as a precision drawing tool, you'll be introduced to methods that allow you to input exact distances. But before you begin drawing, take a moment to familiarize

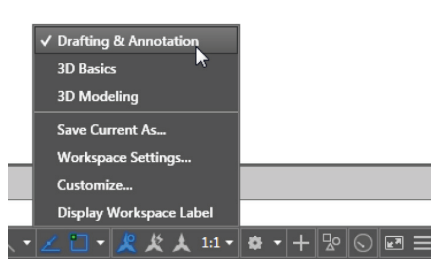
yourself with the features that you'll be using more than any other to create objects with AutoCAD: the Draw and Modify panels. Try these steps:

1. Start AutoCAD just as you did in Chapter 1, "Exploring the Interface," by choosing Start > All Programs > Autodesk > AutoCAD 2018 > AutoCAD 2018.
2. Click the Templates drop-down arrowhead in the Dashboard and select `acad.dwt` (see Figure 2.1). Metric users should use the `acadiso.dwt` template. You could also click the Start Drawing icon, but we ask you to use the `acad.dwt` or `acadiso.dwt` template to ensure that you are set up with the same defaults as in this exercise.

**FIGURE 2.1**  
The Templates  
drop-down list



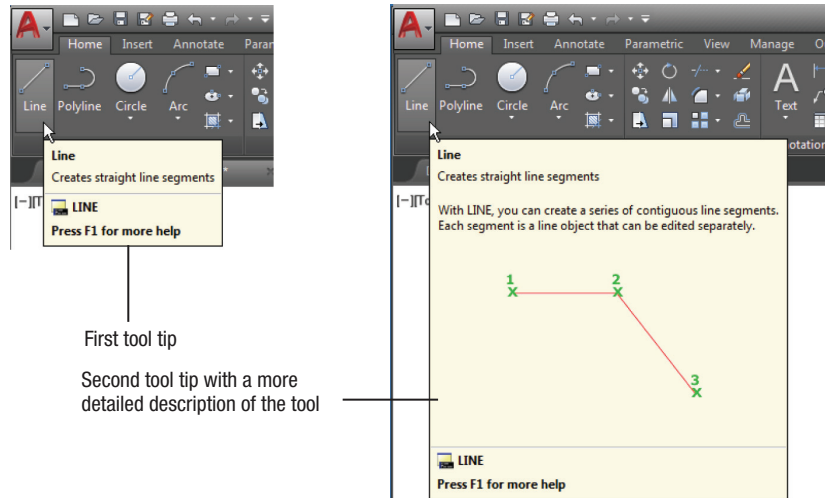
3. Make sure that you are in the Drafting & Annotation workspace. Click the Workspace Switching tool in the status bar, and select Drafting & Annotation.



Workspace Switching tool.

4. Move the arrow cursor to the Line tool in the Home tab's Draw panel at the far upper-left portion of the AutoCAD window, and rest it there so that the tool tip appears. As you hold the cursor over the tool, first one tool tip appears and then another (see Figure 2.2).

**FIGURE 2.2**  
The Draw panel



First tool tip  
Second tool tip with a more detailed description of the tool

5. Slowly move the arrow cursor to the right over the other tools in the Home tab's Draw panel, and read each tool tip.

In most cases, you'll be able to guess what each tool does by looking at its icon. The icon with an arc, for instance, indicates that the tool draws arcs; the one with the ellipse signifies that the tool draws ellipses; and so on. If you hover over the tool, you'll see the tool tip name and the keyboard command associated with the tool. Hold the cursor for a bit longer, and a cue card appears that gives a brief explanation of how to use the tool.

### DON'T GET STUCK ON THE PROMPTS

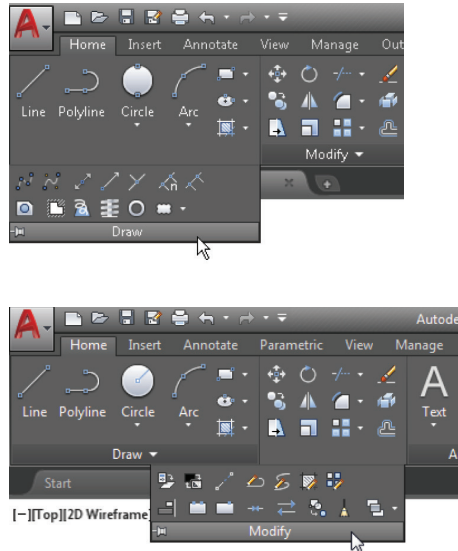
In many of the exercises in this book, we'll mention the Command prompt that appears in the Command window. The prompts are shown for your reference, but don't let yourself get too bogged down by them. For example, we'll say, "At the Specify lower left corner or [ON/OFF] <0.0000,0.0000>: prompt, press ↵." The important part is to press ↵. You can skim over the prompt. Just keep in mind that the prompts can offer some direction and show the options for the current command. They can also serve as helpful reminders later when you're working on your own.

You see several tools in the Home tab's Draw and Modify panels. In Chapter 1, you saw that if you click the arrow in a panel's title bar, the panel expands to reveal more tools (see Figure 2.3). Once you've selected a tool from the expanded Draw or Modify panel, the expanded panel closes. If you want to keep the expanded panel open, click the pushpin icon at the left end of the expanded panel's title bar.



**FIGURE 2.3**

The Home tab's Draw and Modify panel tools



## Starting Your First Drawing

In Chapter 1, you looked at a preexisting sample drawing. This time, you'll begin to draw your own drawing by creating a door that will be used in later exercises. First, though, you must learn how to tell AutoCAD what you want, and, even more important, you must understand what AutoCAD wants from you.

### IMPERIAL AND METRIC

In this chapter, you'll start to see instructions for both Imperial and metric measurements. In general, you'll see the instructions for Imperial measurement first, followed by the metric instructions. You won't be dealing with inches or centimeters yet, however. You're just getting to know the AutoCAD system.

You'll start by setting the size of the work area, known as the drawing *limits*. These limits aren't fixed in any way, and you aren't forced to stay within the bounds of the drawing limits unless the Limits command's ON/OFF option is turned on. But limits can help to establish a starting area from which you can expand your drawing.

You currently have a new blank file, but it's a little difficult to tell the size of your drawing area. Let's set up the work area so that you have a better idea of the space with which you're working:

1. Enter **Limits**.↓
2. At the Specify lower left corner or [ON/OFF] <0.0000,0.0000>: prompt, press ↓.
3. At the Specify upper right corner <12.0000,9.0000>: prompt, press ↓ to accept the default of 12.0000,9.0000. Metric users should enter **40,30**.↓

**Certification  
Objective**

4. Type **Z**↵ **A**↵ for the Zoom All command. You can also select Zoom All from the Zoom flyout on the Navigation bar.
5. Metric users do the following: Open the Application menu and choose Drawing Utilities > Units↵. In the Units dialog box, select Centimeters from the Insertion Scale panel's drop-down list and click OK. See "Inserted Drawings Not to Scale?" in Chapter 25, "Managing and Sharing Your Drawings," for more on the Insertion Scale setting.

In step 4, the All option of the Zoom command uses the limits you set up in steps 2 and 3 to determine the display area. In a drawing that contains objects, the Zoom tool's All option displays the limits plus the area occupied by the objects in the drawing if they happen to fall outside the limits. Now give your file a unique name:

**Certification  
Objective**

1. Choose Save As from the Application menu or type **Saveas**↵ to open the Save Drawing As dialog box.
2. Type **Door**. As you type, the name appears in the File Name text box.
3. Save your file in the My Documents folder or, if you prefer, save it in another folder of your choosing. Just remember where you put it because you'll use it later.
4. Click Save. You now have a file called **Door.dwg**, located in the My Documents folder. Of course, your drawing doesn't contain anything yet. You'll take care of that next.

### UNDERSTANDING THE DRAWING AREA

The new file shows a drawing area roughly 12 inches wide by 9 inches high. Metric users have a file that shows an area roughly 40 centimeters (cm) wide by 30 cm high. This is just the area you're given to start with, but you're not limited to it in any way. No visual clues indicate the size of the area. To check the area size for yourself, move the crosshair cursor to the upper-right corner of the drawing area and observe the value in the coordinate readout in the lower-left corner. The coordinate readout won't show exactly 12'9 inches, or 40'30 cm for metric, because the proportions of your drawing area aren't likely to be exactly 12'9 or 40'30. AutoCAD does try to optimize the display for the drawing area when you choose the All option of the Zoom command.

Now you can start to explore the drawing process. To begin a drawing, follow these steps:

1. Click the Line tool on the Home tab's Draw panel, or type **L**↵.

You've just issued the Line command. AutoCAD responds in two ways. First, you see the message

Specify first point:

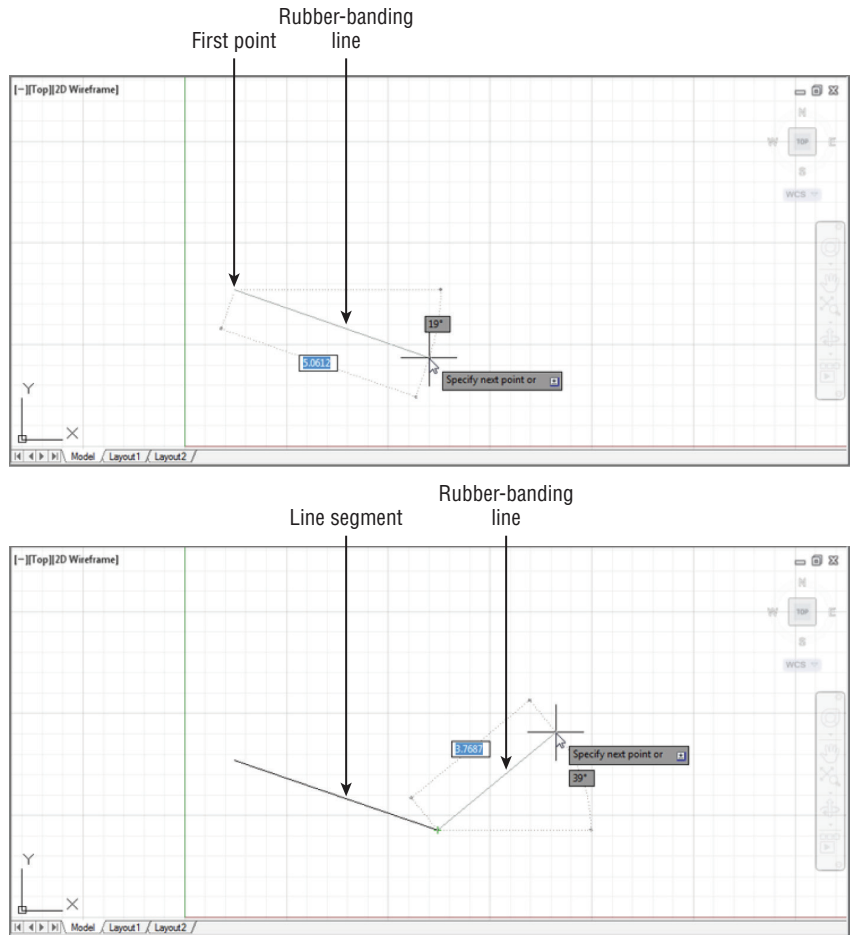
in the Command prompt, asking you to select a point to begin your line. Also, the cursor changes its appearance; it no longer has a square in the crosshairs. This is a clue telling you to pick a point to start a line.

2. Using the left mouse button, select a point on the screen just a little to the left and below the center of the drawing area (see Figure 2.4). After you select the point, AutoCAD changes the prompt to this:

Specify next point or [Undo]:

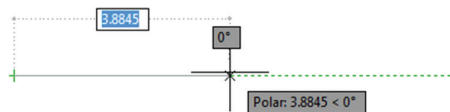


**FIGURE 2.4**  
A rubber-banding  
line



Now, as you move the mouse around, notice the line with one end fixed on the point you just selected and the other end following the cursor in a *rubber-banding* motion (see the first image in Figure 2.4). You also see a message at the cursor asking you to *Specify next point or*.

3. Move the cursor to a location directly to the left or right of the point you clicked, and you'll see a dashed horizontal line appear along with a different message at the cursor. This action also occurs when you point directly up or down. Your cursor seems to jump to a horizontal or vertical position.



This feature is called *Polar Tracking*. Like a T square or triangle, it helps restrict your line to an exact horizontal or vertical direction. You can turn Polar Tracking on or off by clicking the Polar Tracking tool in the status bar. You'll learn more about this tool in Chapter 3.

4. Continue with the Line command. Move the cursor to a point below and to the right of the first point you selected and click again. You've just drawn a line segment, and a second rubber-banding line appears (see the second image in Figure 2.4).
5. If the line you drew isn't the exact length you want, you can back up during the Line command and change it. To do this, type **U↵**. The line you drew previously rubber-bands as if you hadn't selected the second point to fix its length.
6. Right-click and select Enter. This terminates the Line command.

The Undo and Redo tools in the Quick Access toolbar offer Undo and Redo drop-down lists from which you can select the exact command you want to undo or redo. See the sidebar "Getting Out of Trouble" later in this chapter for more information.

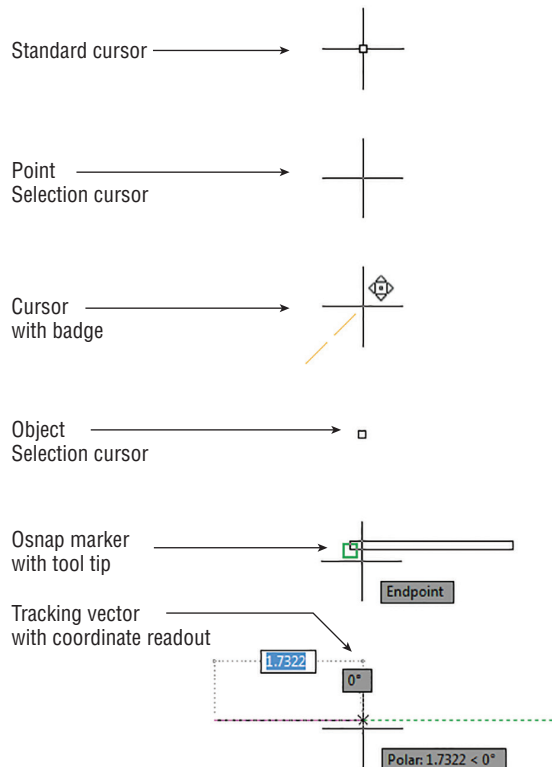
You've just drawn, and then undrawn, a line of an arbitrary length. In step 6 of the previous exercise, you were asked to terminate the Line command. If you happen to forget that a command is still active, two onscreen clues can remind you of the status of AutoCAD. If you don't see the words **Type a Command** in the Command window, a command is still active. Also, the cursor is the plain crosshair without the box at its intersection.

Many tools will display a small icon or *badge* next to the cursor. The badge will be similar to the tool's icon in most cases. A red X appears when you hover over an object while using the Erase tool. A question mark appears when you use the Measure, ID, or List tool.

From now on, we'll refer to the crosshair cursor without the small box as the **Point Selection** mode of the cursor. Figure 2.5 shows all the modes of the drawing cursor.

**FIGURE 2.5**

The drawing cursor's modes



### WHY USE THE KEYBOARD COMMANDS?

For many years, Autodesk has been encouraging users to move away from the command line and keyboard method of command entry, but it seems that AutoCAD users will have none of that. Although you would expect “grizzled veteran” users to stick with the keyboard entry method, you might be surprised to find that young, “fresh out of school” apprentice architects also prefer the keyboard over the newer palettes and ribbons in AutoCAD.

We made this observation to one of the designers of AutoCAD at a recent Autodesk function. Without hesitation, he answered that “keyboard entry is much faster.” In our experience, it isn’t just faster. Entering commands via the keyboard gives you a more “connected” feeling with AutoCAD. Work seems to flow much smoother. If you learn the keyboard commands, you’ll also find that customizing AutoCAD is much easier. So for these reasons, we encourage you to try both the keyboard and the buttons to see which you prefer. You’ll find that, wherever possible, we’ll give the keyboard command equivalent to a tool selection in the exercises of this book. Remember that a tool’s tool tip will also show its keyboard command.

## Specifying Exact Distances with Coordinates



Next, you’ll continue with the Line command to draw a plan view (an overhead view) of a door, to no particular scale. This will give you some practice in drawing objects to exact distances. Later, you’ll resize the drawing for use in future exercises. The door will be 3 units long and 0.15 units thick. For metric users, the door will be 9 units long and 0.5 units thick. To specify these exact distances in AutoCAD, you can use either relative polar coordinates or Cartesian coordinates.

### GETTING OUT OF TROUBLE

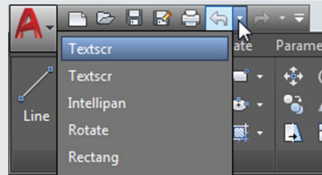
Beginners and experts alike are bound to make a few mistakes. Before you get too far into the exercise, here are some powerful but easy-to-use tools to help you recover from accidents:

**Backspace** If you make a typing error, press the Backspace key to back up to your error and then retype your command or response. The Backspace key is in the upper-right corner of the main keyboard area.

**Escape (Esc)** This is perhaps the single most important key on your keyboard. When you need to exit a command or a dialog box quickly without making changes, press the Esc key in the upper-left corner of your keyboard. In most cases, you need to press Esc only once, although it won’t hurt to press it twice. (Press Esc before editing with grips or issuing commands through the keyboard.)

**U** If you accidentally change something in the drawing and want to reverse that change, click the Undo tool in the Quick Access toolbar (the left-pointing curved arrow). You can also type **U** at the Command prompt. Each time you do this, AutoCAD undoes one operation at a time, in reverse order. The last command performed is undone first, then the next-to-last command, and so on. The prompt displays the name of the command being

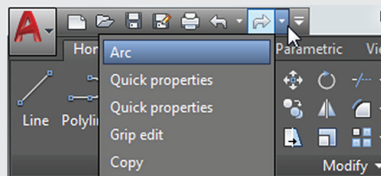
undone, and the drawing reverts to its state prior to that command being issued. If you need to, you can undo everything back to the beginning of an editing session. You can also select the exact command to back up to by using the Undo drop-down list in the Quick Access toolbar.



You can open the Undo drop-down list by clicking the down-pointing arrow found to the right of the Undo tool.

**Undo** If you want more control over the way Undo works, you can use the Undo command. This command allows you to “bookmark” places to which you can “undo” in your editing session. Type **Undo**.J, and you’ll see the Enter the number of operations to undo or [Auto/Control/BEGIN/End/Mark/Back] <1>: prompt. Enter a number indicating the number of steps you want to undo. Use the Mark option to bookmark a location; then use Back to undo your work to that bookmark. You can use Begin and End to mark the beginning and ending of a set of operations that will be undone all at once. Control offers options to control the behavior of the Undo command. Auto is an option that is on by default and causes AutoCAD to undo the action of the whole command rather than the individual actions within a command.

**Redo** If you accidentally undo one too many commands, you can redo the last undone command by clicking the Redo tool (the right-pointing curved arrow) in the Quick Access toolbar, or you can type **Redo**.J. You can redo several operations that you may have undone with the **Undo** command. You can also select the exact command to redo by using the Redo drop-down list in the Quick Access toolbar.



**Oops** If you’ve deleted something and gone on to use other commands, you can restore the last deleted object or objects by using the Oops command. Oops enables you to restore the last deleted set of objects without having to undo a series of commands.

The Imperial and metric distances aren’t equivalent in the exercises in this chapter. For example, 3 units in the Imperial-based drawing aren’t equal to 9 metric units. These distances are arbitrary and based on how they appear in the figures in this chapter.



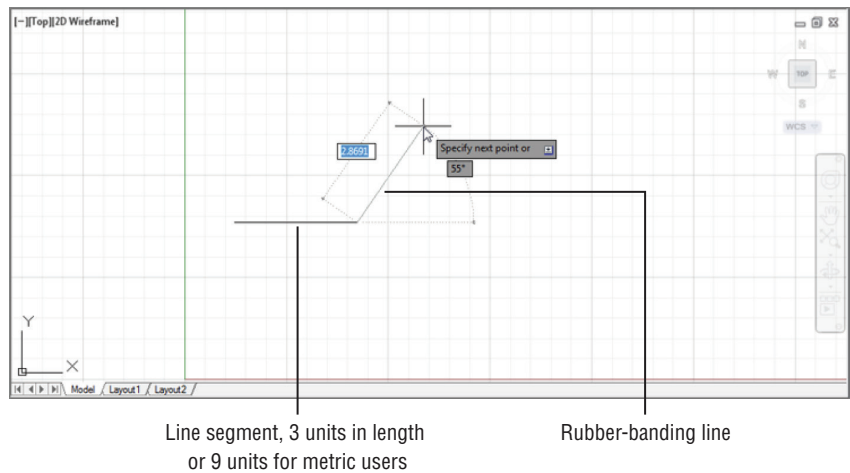
## Specifying Polar Coordinates

To enter the exact distance of 3 (or 9 metric) units to the right of the last point you selected, do the following:

1. Click the Line tool on the Home tab's Draw panel, or type **L**.
2. Click a point slightly to the left of the center of the drawing area to select the start point.
3. Type **@3<0**. Metric users should type **@9<0**. As you type, the letters appear at the Command prompt.
4. Press **↵**. A line appears, starting from the first point you picked and ending 3 units to the right of it (see Figure 2.6). You've just entered a relative polar coordinate.

**FIGURE 2.6**

Notice that the rubber-banding line now starts from the last point selected. This indicates that you can continue to add more line segments.

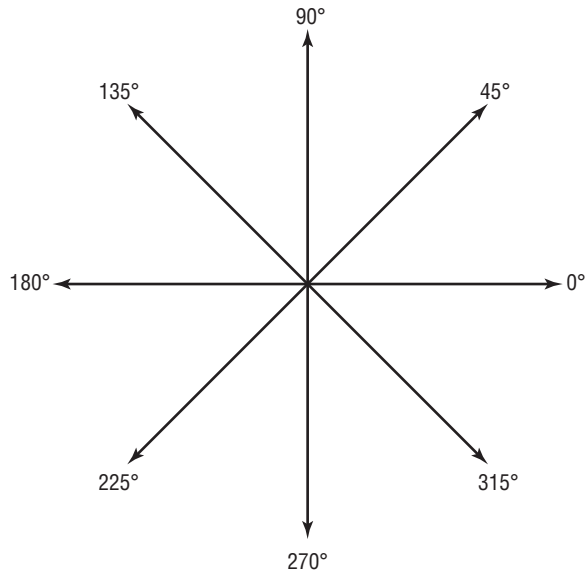


The “at” sign (@) you entered tells AutoCAD that the coordinate you’re specifying is from the last point you selected. The 3 (or 9, metric) is the distance, and the less-than symbol (<) tells AutoCAD that you’re designating the angle at which the line is to be drawn. The last part is the value for the angle, which in this case is 0 for 0°. This is how to use polar coordinates to communicate distances and directions to AutoCAD.

If you’re accustomed to a different method for describing directions, you can set AutoCAD to use a vertical direction as 0°. See Chapter 3 for details.

Angles are given based on the system shown in Figure 2.7, in which 0° is a horizontal direction from left to right, 90° is straight up, 180° is horizontal from right to left, and so on. You can specify degrees, minutes, and seconds of arc if you want to be that exact. You can also specify angles using negative values, which would mirror the direction around the x-axis. For example, a minus 45° angle would point in the direction shown as 315° in Figure 2.7. We’ll discuss angle formats in more detail in Chapter 3.

**FIGURE 2.7**  
AutoCAD default  
system for specifying  
angles



## Specifying Relative Cartesian Coordinates

For the next line segment, let's try another method for specifying exact distances:

1. Enter `@0,0.15↵`. Metric users should enter `@0,0.5↵`. A short line appears above the end-point of the last line. Once again, `@` tells AutoCAD that the coordinate you specify is from the last point picked. But in this example, you give the distance in X and Y values. The X distance, 0, is given first, followed by a comma, and then the Y distance, 0.15 or 0.5. This is how to specify distances in relative Cartesian coordinates.

### COMMAS AND PERIODS

Step 1 indicates that metric users should enter `@0,0.5↵` for the distance. Instead, you could enter `@0,.5` (zero comma point five). The leading zero is included for clarity. European metric users should be aware that the comma is used as a separator between the X and Y components of the coordinate. In AutoCAD, commas aren't used for decimal points; you must use a period to denote a decimal point.

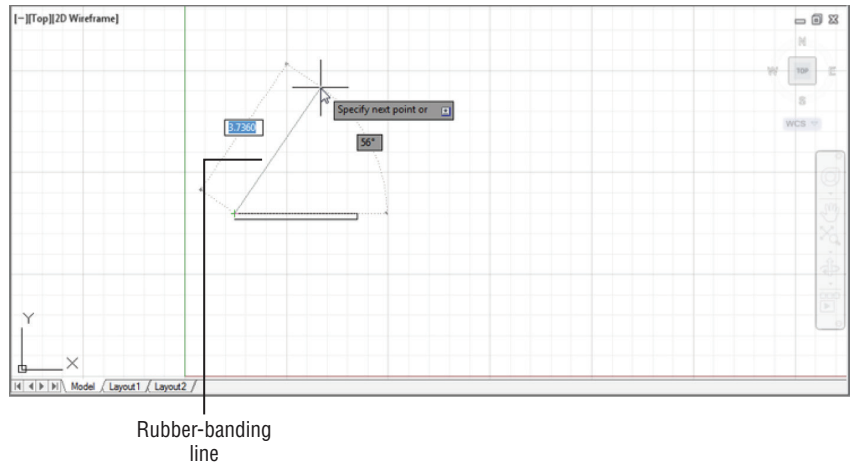
2. Enter `@-3,0↵`. Metric users should enter `@-9,0↵`. This distance is also in X,Y values, but here you use a negative value to specify the X distance. The result is a drawing that looks like Figure 2.8.

Positive values in the Cartesian coordinate system are from left to right and from bottom to top (see Figure 2.9). (You may remember this from your high school geometry class!) If you want to draw a line from right to left, you must designate a negative value. It's also helpful to know where the origin of the drawing lies. In a new drawing, the origin—or coordinate 0,0—is in the lower-left corner of the drawing.

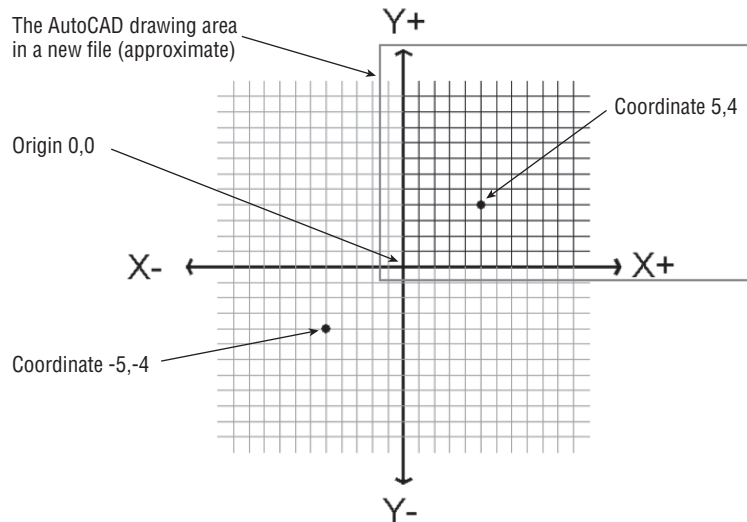


**FIGURE 2.8**

The Line tool was used to draw these three sides of the door. Points are specified by using either relative Cartesian or polar coordinates.

**FIGURE 2.9**

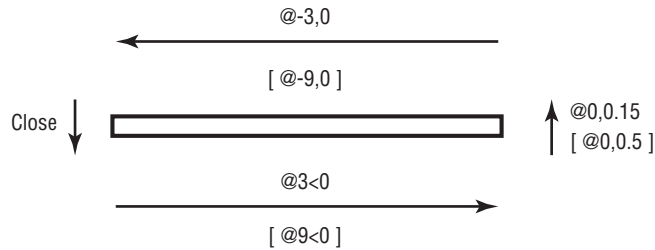
Positive and negative Cartesian coordinate directions



3. Type **C**. This C stands for the Close option. You can also click the Close option in the command line or right-click and select Close from the context menu. A line connecting the first and last points of a sequence of lines is drawn (see Figure 2.10), and the Line command terminates. The rubber-banding line also disappears, telling you that AutoCAD has finished drawing line segments. You can also use the rubber-banding line to indicate direction while simultaneously entering the distance through the keyboard. See the sidebar “Other Ways to Enter Distances” later in this chapter.

**FIGURE 2.10**

Distance and direction input for the door. Distances for metric users are shown in brackets.



To finish drawing a series of lines without closing them, you can press Esc, ↵, or the spacebar.

## Interpreting the Cursor Modes and Understanding Prompts

The key to working with AutoCAD successfully is understanding the way it interacts with you. The following sections will help you become familiar with some of the ways AutoCAD prompts you for input. Understanding the format of the messages in the Command window and recognizing other events on the screen will help you learn the program more easily.

### Understanding Cursor Modes

As the Command window aids you with messages, the cursor gives you clues about what to do. Earlier in this chapter, Figure 2.5 illustrates the various modes of the cursor, and it gives a brief description of the role of each mode. Take a moment to study this figure.

**Standard Cursor** The Standard cursor tells you that AutoCAD is waiting for instructions. You can also edit objects by using grips when you see this cursor. *Grips* are squares, rectangles, or arrowheads that appear at endpoints and at the midpoint of objects when they're selected. (You might know them as *workpoints* from other graphics programs.)

**Point Selection Cursor** The Point Selection cursor appears whenever AutoCAD expects point input. It can also appear in conjunction with a rubber-banding line. You can either click a point or enter a coordinate through the keyboard.

**Cursor with Badge** The Cursor with Badge lets you know at a glance which tool you are using. The badge will be similar to the tool icon currently being used. A red X badge appears when you hover over an object while using the Erase tool. A question mark badge appears when you use the Measure, ID, or List tool.

**Object Selection or Pickbox Cursor** The Object Selection or Pickbox cursor tells you that you must select objects—either by clicking them or by using any of the object-selection options available.

**Osnap (Object Snap) Marker** The osnap (object snap) marker appears along with the Point Selection cursor when you invoke an osnap. Osnaps let you accurately select specific points on an object, such as endpoints or midpoints.

**Tracking Vector** The tracking vector appears when you use the Polar Tracking or Object Snap Tracking feature. Polar Tracking aids you in drawing orthogonal lines, and Object Snap

Tracking helps you align a point in space relative to the geometry of existing objects. Object Snap Tracking works in conjunction with osnaps. You'll learn more about the tracking vector in Chapter 3.

#### Certification Objective

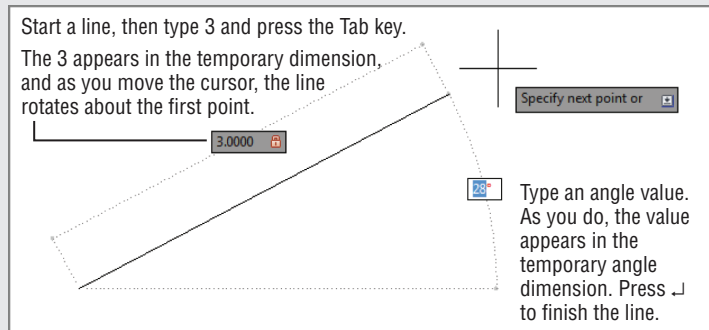
If you're an experienced AutoCAD user, you may prefer to use the old-style crosshair cursor that crosses the entire screen. Choose Options from the bottom of the Application menu to open the Options dialog box, and then click the Display tab. Set the Crosshair Size option near the bottom right of the dialog box to 100. The cursor then appears as it did in previous versions of AutoCAD. As the option name implies, you can set the crosshair size to any percentage of the screen you want. The default is 5 percent.

### OTHER WAYS TO ENTER DISTANCES

#### Certification Objective

A third method for entering distances is to point in a direction with a rubber-banding line and then enter the distance through the keyboard. For example, to draw a line 3 units long from left to right, click the Line tool on the Home tab's Draw panel, click a start point, and then move the cursor so that the rubber-banding line points to the right at some arbitrary distance. With the cursor pointing in the direction you want, type **3**. The rubber-banding line becomes a fixed line 3 units long. Using this method, called the *Direct Distance method*, along with the Ortho mode or Polar Tracking (described in Chapter 3), can be a fast way to draw orthogonal lines of specific lengths.

You can also specify an exact angle along with the distance. For example, start the Line command and then pick the first point. Type **3** for the length, but don't press **↵**. Press the Tab key instead. The line segment will become fixed at 3 units, and as you move the cursor, the segment will rotate freely around the first point. Next, type an angle in degrees, **30**. for example, and the line will be drawn at 30 degrees. Or, instead of typing in an angle, just adjust the angle of the line visually until you see the angle you want on the Dynamic Input temporary angle dimension and then click.



If you watch the temporary dimensions as you press the Tab key, you'll see that the Tab key lets you move from the length dimension to the angle dimension and back again. You can press the Tab key at any time to shift back and forth between dimensions. A lock appears next to a dimension that you have entered, telling you that the dimension is "locked" until you tab to it again.

You'll learn more about how to enter values with Dynamic Input's temporary dimensions later in this chapter.

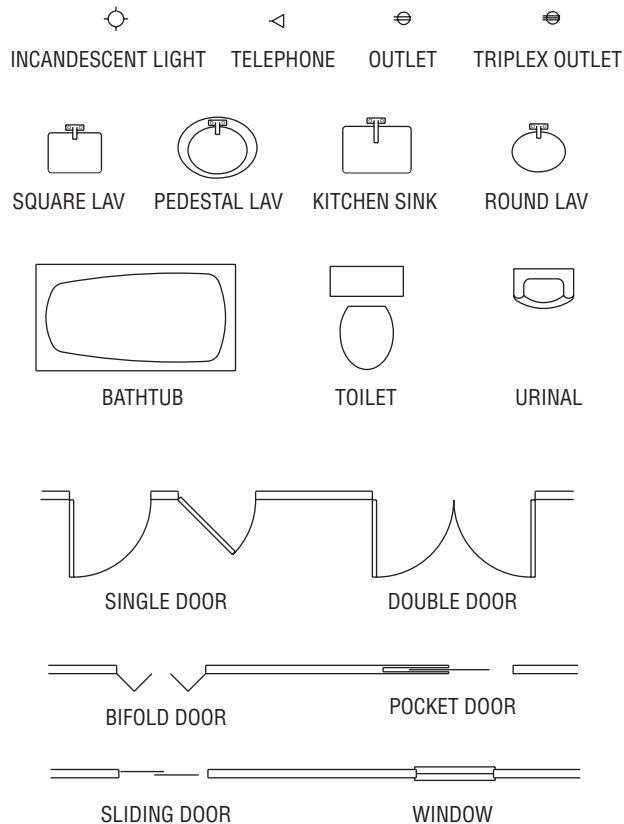
## Choosing Command Options

Many commands in AutoCAD offer several options, which are often presented to you in the Command window in the form of a prompt. This section uses the Arc command to illustrate the format of AutoCAD prompts.

Usually, in a floor plan drawing in the United States, an arc is drawn to indicate the direction of a door swing. Figure 2.11 shows other standard symbols used in architectural drawings.

**FIGURE 2.11**

Samples of standard symbols used in architectural drawings



Next, you'll draw the arc for the door you started in the previous exercise:



1. Click the 3-Point Arc tool in the Home tab's Draw panel. Click the Arc flyout and select 3-Point. The Specify start point of arc or [Center]: prompt appears in the Command window, and the cursor changes to Point Selection mode. You also see the prompt Specify start point of arc or prompt next to the cursor.

Examine the Specify start point of arc or [Center]: prompt. The prompt contains two options. The default is stated in the main part of the prompt, which is to specify the start point of the arc. If other options are available, they appear within square brackets. In the Arc command, you see the word Center within brackets telling you that, if

you prefer, you can also start your arc by selecting a center point instead of a start point. If multiple options are available, they appear within the brackets and are set off with a slightly darker background. This background tells you that the option is selectable using your cursor and also aids in separating option names. The default is the option AutoCAD assumes you intend to use unless you tell it otherwise.

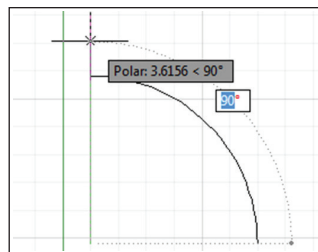
2. Type **C** to select the Center option or click the word Center in the command line. The Specify center point of arc: prompt appears. Notice that you had to type only the C and not the entire word Center.

When you see a set of options in the Command window, note their capitalization. If you choose to respond to prompts by using the keyboard, these capitalized letters are all you need to enter to select the option. In some cases, the first two letters are capitalized to differentiate two options that begin with the same letter, such as LAYER and LTYPE. You can also just click the option name in the Command prompt to select the option.

3. Pick a point representing the center of the arc near the upper-left corner of the door (see Figure 2.12). The Specify start point of arc: prompt appears.
4. Type **@3<0**. Metric users should type **@9<0**. The Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: prompt appears.
5. Move the mouse and a temporary arc appears, originating from a point 3 units to the right of the center point you selected and rotating about that center, as shown in Figure 2.12. (Metric users will see the temporary arc originating 9 units to the right of the center point.)

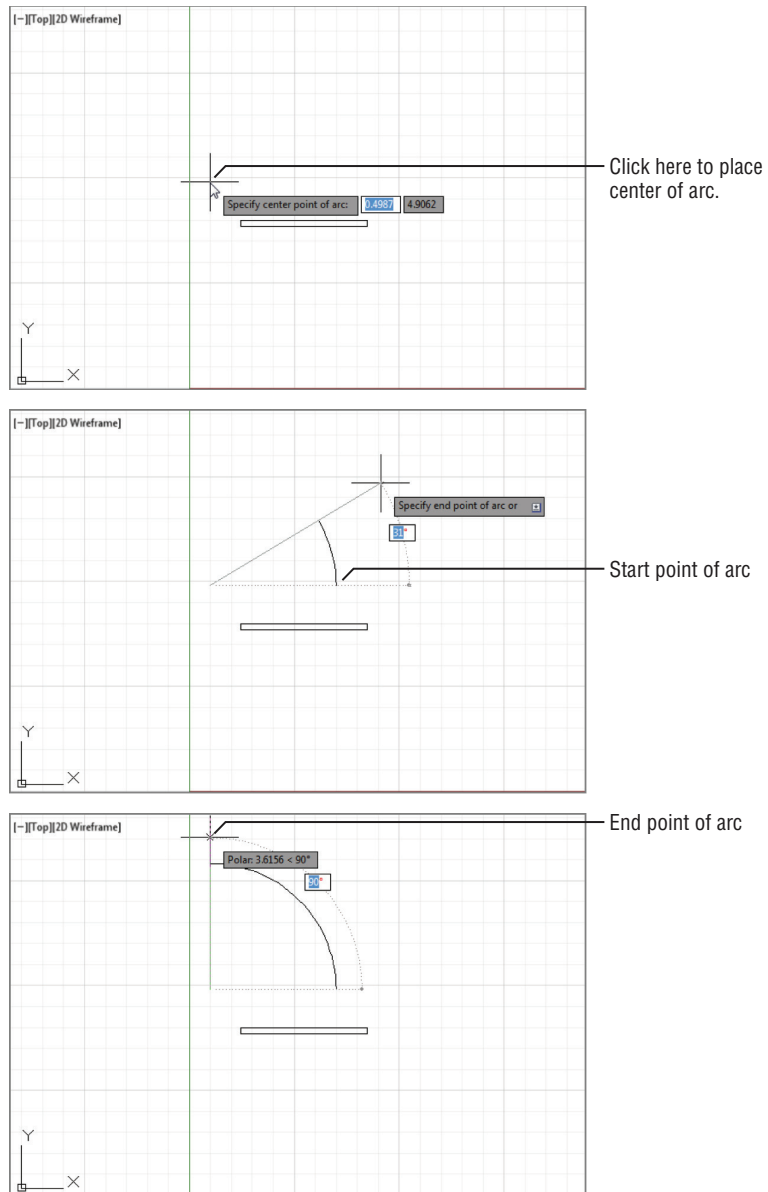
As the prompt indicates, you now have three options. You can enter an angle, a chord length, or the endpoint of the arc. The prompt default, to specify the endpoint of the arc, picks the arc's endpoint. Again, the cursor is in Point Selection mode, telling you it's waiting for point input. To select this default option, you only need to pick a point on the screen indicating where you want the endpoint.

6. Move the cursor so that it points in a vertical direction from the center of the arc. You'll see the Polar Tracking vector snap to a vertical position.



7. Click any location with the Polar Tracking vector in the vertical position. The arc is now fixed in place, as shown in Figure 2.12.

**FIGURE 2.12**  
Using the Arc  
command



This exercise has given you some practice working with AutoCAD Command window prompts and entering keyboard commands—skills you'll need when you start to use advanced AutoCAD functions.

As you can see, AutoCAD has a distinct structure in its prompt messages. You first issue a command, which in turn offers options in the form of a prompt. Depending on the option you select, you get another set of options or you're prompted to take some action, such as picking a point, selecting objects, or entering a value.

As you work through the exercises, you'll become intimately familiar with this routine. After you understand the workings of the Ribbon panels, the Command window prompts, and the dialog boxes, you can almost teach yourself the rest of the program!

### USING AUTOCOMPLETE AND AUTOCORRECT

You may have noticed that as you enter a command through the keyboard, the Command window offers suggestions to complete your typing in a way similar to many web browsers. For example, if you type **LI**, a list pops up offering a number of commands that start with **LI**. You can then click the option that you want to use. This feature can be helpful when you forget the full name of a command.

AutoCorrect works in a similar way, but instead of offering a list of commands that start with the letters you type, AutoCAD will try to "correct" a mistyped command. For example, if you type **crl**, AutoCAD will display several commands that come close to what you typed.

You can also control how the AutoComplete and AutoCorrect features work. Right-click in the Command window, and then point to the Input Settings option that appears in the context menu. You can then toggle several options on or off. The options are AutoComplete, AutoCorrect, Search System Variables, Search Content, Mid-string Search, and Delay Time.

### SELECTING OPTIONS FROM A CONTEXT MENU

Now you know that you can select command options by typing them. You can also right-click at any time during a command to open a context menu containing those same options. For example, in step 2 in the previous exercise, you typed **C** to tell AutoCAD that you wanted to select the center of the arc. Instead of typing, you can also right-click to open a menu of options applicable to the Arc command at that time.

In addition to the options shown in the Command prompt, the context menu shows you a few more: Enter, Cancel, Pan, and Zoom. The Enter option is the same as pressing **↵**. Cancel cancels the current command. Pan and Zoom let you adjust your view as you're working through the current command.

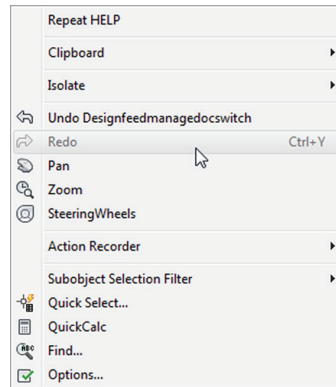
The menu is context sensitive, so you see only those options that pertain to the command or activity that is currently in progress. Also, when AutoCAD is expecting a point, an object selection, or a numeric value, right-clicking doesn't display a context menu. Instead, AutoCAD treats a right-click as **↵**.

The location of your cursor when you right-click determines the contents of the list of available operations. A right-click in the Command window displays a list of operations that you can apply to the command line, such as repeating one of the last several commands you've used or copying the most recent history of command activity to the Clipboard.

A right-click in the drawing area when no command is active displays a set of basic options for editing your file, such as the command most recently used, Undo, Redo, Pan, and Zoom, to name a few (see Figure 2.13). The Cut, Copy, and Paste commands can be found under the Clipboard option.

**FIGURE 2.13**

A set of basic options



If you're ever in doubt about what to do in AutoCAD, you can right-click to see a list of options. You'll learn more about these options later in this book. For now, let's move on to the topic of selecting objects.

## HOW WE'LL SHOW COMMAND OPTIONS

As mentioned earlier, the options in the command line are shown with a slightly darker background color so that you can easily determine the name of the options (see Figure 2.14).

**FIGURE 2.14**

The Angle and chord Length options are separated by a gray background.

---

```
Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]:
```

---

Unfortunately, it's a bit more difficult to show the options in the same way in this book. Thus, from now on when we show the command options, we'll use a forward slash mark to separate the options. For example, in the Arc command options discussed earlier, you saw this command prompt:

Specify end point of arc or [Angle chord Length]

We'll show it like this, using the / symbol to separate the command options:

Specify end point of arc or [Angle/chord Length]



Without the / symbol, you might confuse the option names as Angle chord and Length, or you may even think that there are three options named Angle, chord, and Length. Those of you familiar with older versions of AutoCAD will recognize this use of the / symbol as the way AutoCAD used to separate command options in the command line.

## Selecting Objects



In AutoCAD, you can select objects in many ways. The following sections cover two ways: object-selection methods unique to AutoCAD and the Noun/Verb method, the more common selection method used in most popular graphics programs. Because these two methods play a major role in working with AutoCAD, it's a good idea to familiarize yourself with them early on.

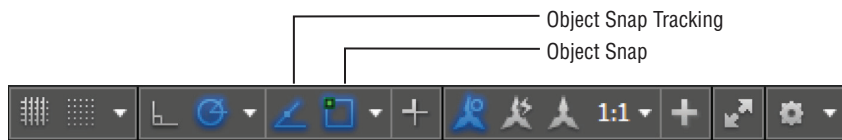
If you need to select objects by their characteristics rather than by their location, see Chapter 14, "Advanced Editing and Organizing," which describes the Quick Select and Object Selection Filters tools. These tools let you easily select a set of objects based on their properties, including object type, color, layer assignment, and so on.

### Selecting Objects in AutoCAD

With many AutoCAD commands, you'll see the `Select objects:` prompt. Along with this prompt, the cursor changes from crosshairs to the Object Selection cursor (look back at Figure 2.5). Whenever you see the `Select objects:` prompt and the square Pickbox cursor, you have several options while making your selection. Often, as you select objects on the screen, you'll change your mind about a selection or accidentally select an object that you don't want. Let's look at most of the selection options available in AutoCAD and learn what to do when you make the wrong selection.

Before you continue, you'll turn off two features that, although extremely useful, can be confusing to new users. These features are called Running Osnaps and Osnap Tracking. You'll get a chance to explore these features in depth later in this book, but for now follow these steps to turn them off:

1. Check to see if either Object Snap or Object Snap Tracking is turned on in the status bar. If they're turned on, they will be a light blue.



2. To turn off Object Snap, click the tool in the status bar. When turned off, it will change to gray.

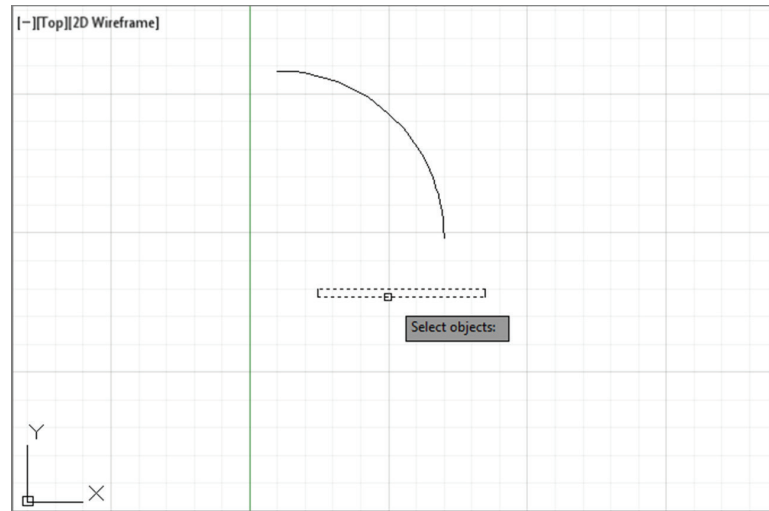
Now, let's see how to select an object in AutoCAD:



1. Choose Move from the Home tab's Modify panel, or type `M`.
2. At the `Select objects:` prompt, click each of the two horizontal lines that constitute the door. As you know, whenever AutoCAD wants you to select objects, the cursor turns into the small square pickbox. This tells you that you're in Object Selection mode. As you place the cursor over an object, it appears thicker to give you a better idea of what you're about to select. As you click an object, it's highlighted, as shown in Figure 2.15.

**FIGURE 2.15**

Select the lines of the door, and they become highlighted.



If objects don't become "thicker" as you roll over them with your selection cursor, the Selection preview system variable may be turned off. You can turn it back on by entering **selectionpreview**. ↵ 3.↵. This setting can also be found in the Selection tab of the Options dialog box. See Appendix B for more on the Options dialog box, and see Bonus Chapter 4, "System Variables and Dimension Styles," for more on system variables, available at [www.omura.com/chapters](http://www.omura.com/chapters).

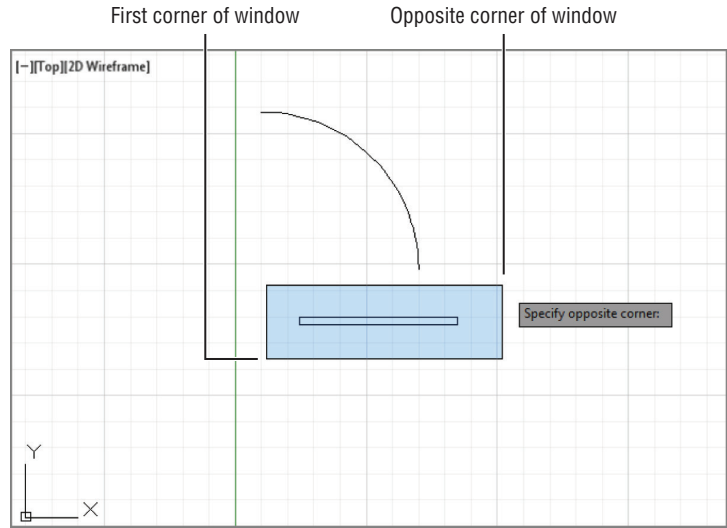
3. After making your selections, you may decide to deselect some items. Enter **U**↵ from the keyboard. Notice that one line is no longer highlighted. When you type **U**↵, objects are deselected, one at a time, in reverse order of selection.
4. You can deselect objects in another way. Hold down the Shift key and click the remaining highlighted line. It reverts to a solid line, showing you that it's no longer selected for editing.
5. By now, you've deselected both lines. Let's try another method for selecting groups of objects. To select objects with a window selection, type **W**↵. The cursor changes to a Point Selection cursor, and the prompt changes to

Specify first corner:

6. Click a point below and to the left of the rectangle representing the door. As you move your cursor across the screen, a selection window appears and stretches across the drawing area. Also notice that the window has a blue tint.
7. After the selection window completely encloses the door but not the arc, click this location to highlight the entire door. This window selects only objects that are completely enclosed by the window, as shown in Figure 2.16.

Don't confuse the selection window you're creating here with the zoom window you used in Chapter 1, which defines an area of the drawing you want to enlarge. Remember that the Window option works differently under the Zoom command than it does for other editing commands.

**FIGURE 2.16**  
Selecting the door in a  
selection window

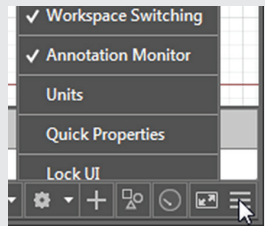


- 8. Press **↵**. This tells AutoCAD that you’ve finished selecting objects. It’s important to remember to press **↵** as soon as you finish selecting the objects you want to edit. A new prompt, **Specify base point or [Displacement] <Displacement>:**, appears. The cursor changes to its Point Selection mode.

Now you’ve seen how the selection process works in AutoCAD—but you’re in the middle of the Move command. The next section discusses the prompt that’s on your screen and describes how to enter base points and displacement distances.

**CONTROLLING THE STATUS BAR DISPLAY**

Toward the right side of the status bar, you’ll see a tool icon with three horizontal lines. This tool opens a menu that controls the display of the status bar. You use this menu to turn the items in the status bar on or off. A check mark by an item indicates that it’s currently on. If for some reason you don’t see all of the buttons mentioned in the following exercise, check this menu to make sure all the status bar options are turned on. For the items in the left half of the status bar, choose Status Toggles from the menu.



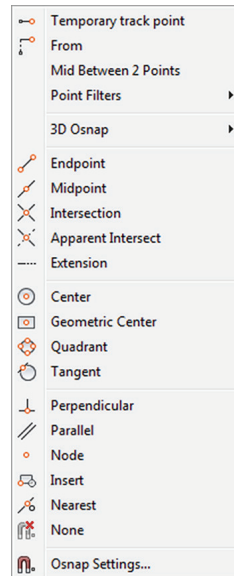
## Providing Base Points

When you move or copy objects, AutoCAD prompts you for a base point, which is a difficult concept to grasp. AutoCAD must be told specifically *from* where and *to* where the move occurs. The *base point* is the exact location from which you determine the distance and direction of the move. After the base point is determined, you can tell AutoCAD where to move the object in relation to that point.

Follow these steps to practice using base points:

1. To select a base point, press Shift+right-click. A menu appears, displaying the Object Snap options (see Figure 2.17).

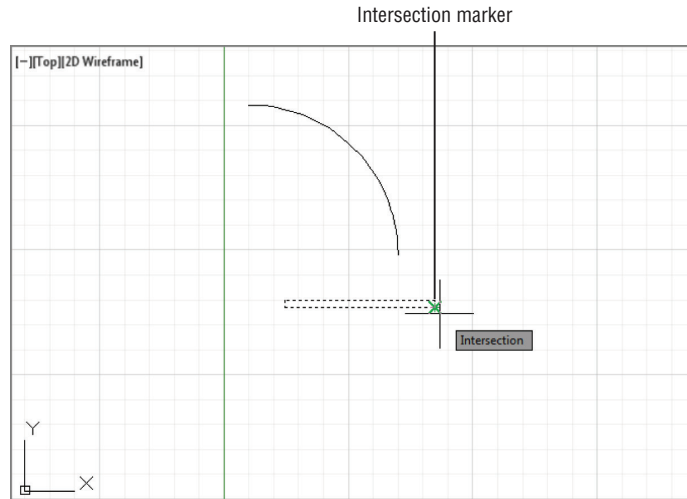
**FIGURE 2.17**  
The Object Snap  
options



When you right-click, make sure that the cursor is within the AutoCAD drawing area; otherwise, you won't get the results described in this book.

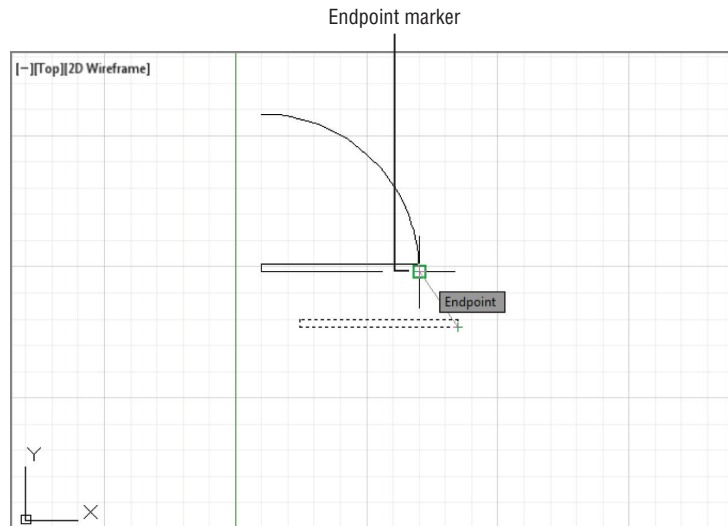
2. Choose Intersection from the Object Snap menu. The Object Snap menu closes.
3. Move the cursor to the lower-right corner of the door. Notice that as you approach the corner, a small x-shaped graphic appears on the corner. This is called an *osnap marker*.
4. After the x-shaped marker appears, hold the mouse motionless for a second or two. A tool tip appears, telling you the current osnap point that AutoCAD has selected.
5. Click the left mouse button to select the intersection indicated by the osnap marker. Whenever you see the osnap marker at the point you want to select, you don't have to point exactly at the location with your cursor. Just left-click to select the exact osnap point (see Figure 2.18). In this case, you selected the exact intersection of two lines.

**FIGURE 2.18**  
Using the Point  
Selection cursor and  
osnap marker



6. At the Specify second point or <use first point as displacement>: prompt, hold down the Shift key and right-click again to open the Object Snap menu.
7. This time, you'll use the Endpoint osnap, but instead of clicking the option with the mouse, type E.
8. Pick the lower-right end of the arc you drew earlier. (Remember that you need to move your cursor close to the endpoint just until the osnap marker appears.) The door moves so that the corner connects exactly with the endpoint of the arc (see Figure 2.19).

**FIGURE 2.19**  
Moving the rectangle  
to its new position  
using the Endpoint  
osnap



As you can see, the osnap options let you select specific points on an object. You used Endpoint and Intersection in this exercise, but other options are available. Chapter 3 discusses some of the other osnap options. You may have also noticed that the osnap marker is different for each of the options you used. You'll learn more about osnaps in Chapter 3. Now let's continue with our look at point selection.

You may have noticed the statement *Use first point as displacement* in the prompt in step 6 of the preceding exercise. This means that if you press  $\downarrow$  instead of clicking a point, the object will move a distance based on the coordinates of the point you selected as a base point. If, for example, the point you click for the base point is at coordinate 2,4, the object will move 2 units in the x-axis and 4 units in the y-axis.

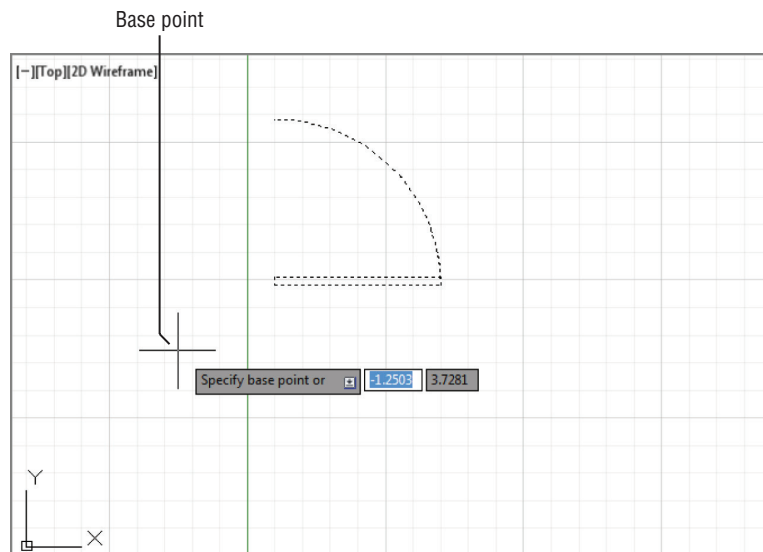
If you want to specify an exact distance and direction by typing a value, select any point on the screen as a base point. As an alternative, you can type @ followed by  $\downarrow$  at the base point prompt; then, enter the second point's location in relative coordinates. Remember that @ means the last point selected. In the next exercise, you'll try moving the entire door an exact distance of 1 unit at a 45° angle. Metric users will move the door 3 units at a 45° angle. Here are the steps:



1. Click the Move tool on the Home tab's Modify panel.
2. Type **P** $\downarrow$ . The set of objects you selected in the previous exercise is highlighted. P is a selection option that selects the previously selected set of objects.
3. You're still in Object Selection mode, so click the arc to include it in the set of selected objects. The entire door, including the arc, is highlighted.
4. Press  $\downarrow$  to tell AutoCAD that you've finished your selection. The cursor changes to Point Selection mode.
5. At the Specify base point or [Displacement] <Displacement>: prompt, choose a point on the screen between the door and the left side of the screen (see Figure 2.20).

**FIGURE 2.20**

The highlighted door and the base point just to the left of the door. Note that the base point doesn't need to be on the object that you're moving.



6. Move the cursor around slowly and notice that the door moves as if the base point you selected were attached to it. The door moves with the cursor, at a fixed distance from it. This demonstrates how the base point relates to the objects you select.
7. Type `@1<-45.↵`. (Metric users should type `@3<-45.↵`.) The door moves to a new location on the screen at a distance of 1 unit (3 for metric users) from its previous location and at an angle of minus 45°, which is a direction that is downward at a 45-degree angle.

If AutoCAD is waiting for a command, you can repeat the last command used by pressing the spacebar or pressing `↵`. You can also right-click in the drawing area and select the option at the top of the list. If you right-click the Command window, a context menu offers an option for the most recent commands.

This exercise illustrates that the base point doesn't have to be on the object you're manipulating; it can be virtually anywhere on your drawing. You also saw how to reselect a group of objects that were selected previously without having to duplicate the selection process.

## Using Noun/Verb Selection

Nearly all graphics programs today allow the Noun/Verb method for selecting objects. This method requires you to select objects before you issue a command to edit them—that is, you identify the “noun” (the object that you want to work on) before the “verb” (the action that you want to perform on it). The following exercises show you how to use the Noun/Verb method in AutoCAD.

You've seen that when AutoCAD is waiting for a command, it displays the crosshair cursor with the small square. As mentioned, this square is a pickbox superimposed on the cursor. It indicates that you can select objects even while the Command prompt appears at the bottom of the screen and no command is currently active. The square momentarily disappears when you're in a command that asks you to select points.

### OTHER SELECTION OPTIONS

There are several other selection options that you haven't tried yet. You'll see how these options work in exercises later in this book. Or, if you're adventurous, try them now on your own. To use these options, type their keyboard abbreviations (shown in brackets in the following list) at any `Select objects:` prompt:

**Add [A.↵]** Switches from Remove mode to the Add mode. See the description for Remove later in this sidebar.

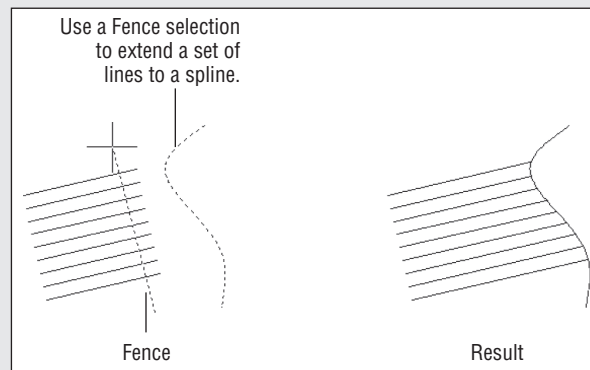
**All [ALL.↵]** Selects all of the objects in a drawing except those in frozen or locked layers. (See Chapter 5, “Keeping Track of Layers and Blocks,” for information on layers.)

**Box [B.↵]** Forces the standard selection window so that a left-to-right selection uses a standard window and a right-to-left selection uses a crossing window.

**Crossing [C.↵]** Similar to the Window selection option (described later in this sidebar) but selects anything that is entirely within or crosses through the window that you define.

**Crossing Polygon [CP-]** Acts exactly like Window Polygon (described later in this sidebar), but like the Crossing selection option, selects anything that crosses through a polygon boundary.

**Fence [F-]** Selects objects that are crossed by a temporary line called a *fence*. This operation is like using a line to cross out the objects you want to select. After you invoke this option, you can then pick points, as when you're drawing a series of line segments. After you finish drawing the fence, press ↵, and then go on to select other objects or press ↵ again to finish your selection.



**Group [G-]** Allows you to select a group by name.

**Last [L-]** Selects the last object you created.

**Multiple [M-]** Lets you select several objects first before AutoCAD highlights them. In a large file, selecting objects individually can cause AutoCAD to pause after each selection while it locates and highlights each object. The Multiple option can speed things up: First you select all of the objects quickly and then you highlight them all by pressing ↵. This has no menu equivalent.

**Previous [P-]** Selects the last object or set of objects that was edited or changed.

**Remove [R-]** Switches to a selection mode whereby the objects you click are removed from the selection set.

**Subobject [SU-]** Allows selection of faces, edges, and vertices of 3D solid objects. This can also be accomplished by pressing the Ctrl key while picking.

**Object [O-]** Ends selecting by Subobject and restores normal behavior.

**Undo [U-]** Removes the most recently added object from the selection set.

**Window [W-]** Forces a standard window selection. This option is useful when your drawing area is too crowded to use the Autoselect feature to place a window around a set of objects. (See the Auto entry later in this sidebar.) It prevents you from accidentally selecting an object with a single pick when you're placing your window.

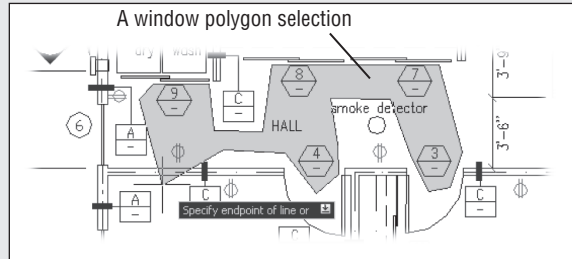
**Window Polygon [WP-]** Lets you select objects by enclosing them in an irregularly shaped polygon boundary. When you use this option, you see the *First polygon point:* prompt. You then pick points to define the polygon boundary. As you pick points, the *Specify endpoint of line or [Undo]:* prompt appears. Select as many points as

*continues*



*continued*

you need to define the boundary. You can undo boundary line segments as you go by pressing **U**. With the boundary defined, press **J**. The bounded objects are highlighted and the **Select objects**: prompt returns, allowing you to use more selection options.



The following two selection options are also available but are seldom used. They're intended for use in creating custom menu options or custom tools:

**Auto [AU]** Forces the standard automatic window or crossing window when a point is picked and no object is found. (See the section "Using Autoselect" later in this chapter.) You produce a standard window when you pick the two window corners from left to right, and you produce a crossing window when you pick the two corners from right to left. After you select this option, it remains active for the duration of the current command. Auto is intended for use on systems on which the Autoselect feature has been turned off.

**Single [SI]** Forces the current command to select only a single object. If you use this option, you can pick a single object and the current command acts on that object as if you had pressed **J** immediately after selecting it. This has no menu equivalent.

In addition to Noun/Verb selection, AutoCAD offers selection options that let you use familiar GUI techniques. See Appendix B to learn how you can control object-selection methods. This appendix also describes how to change the size of the Standard cursor.

Try moving objects by first selecting them and then using the Move command:

1. Press the Esc key twice to make sure that AutoCAD isn't in the middle of a command, which you might have accidentally issued. Then click the arc. The arc is highlighted, and you may also see squares appear at various points on the arc. As stated earlier, these squares are called *grips*. You'll get a chance to work with them later.



2. Choose Move from the Home tab's Modify panel. The cursor changes to Point Selection mode. Notice that the grips on the arc disappear but the arc is still selected.
3. At the Specify base point or [Displacement] <Displacement>: prompt, pick any point on the screen. The following prompt appears:  
Specify second point or:  
<use first point as displacement>:
4. Type @1<0. The arc moves to a new location 1 unit (3 units for metric users) to the right.

If this exercise doesn't work as described here, chances are that the Noun/Verb setting has been turned off on your copy of AutoCAD. To turn on the Noun/Verb setting, choose Options from the Application menu to open the Options dialog box and then click the Selection tab. In the Selection Modes group, select the check box next to the Noun/Verb Selection option and click OK.

In this exercise, you picked the arc *before* issuing the Move command. Then, when you clicked the Move tool, you didn't see the `Select objects:` prompt. Instead, AutoCAD assumed that you wanted to move the arc that you selected and went directly to the `Specify base point or [Displacement] <Displacement>:` prompt.

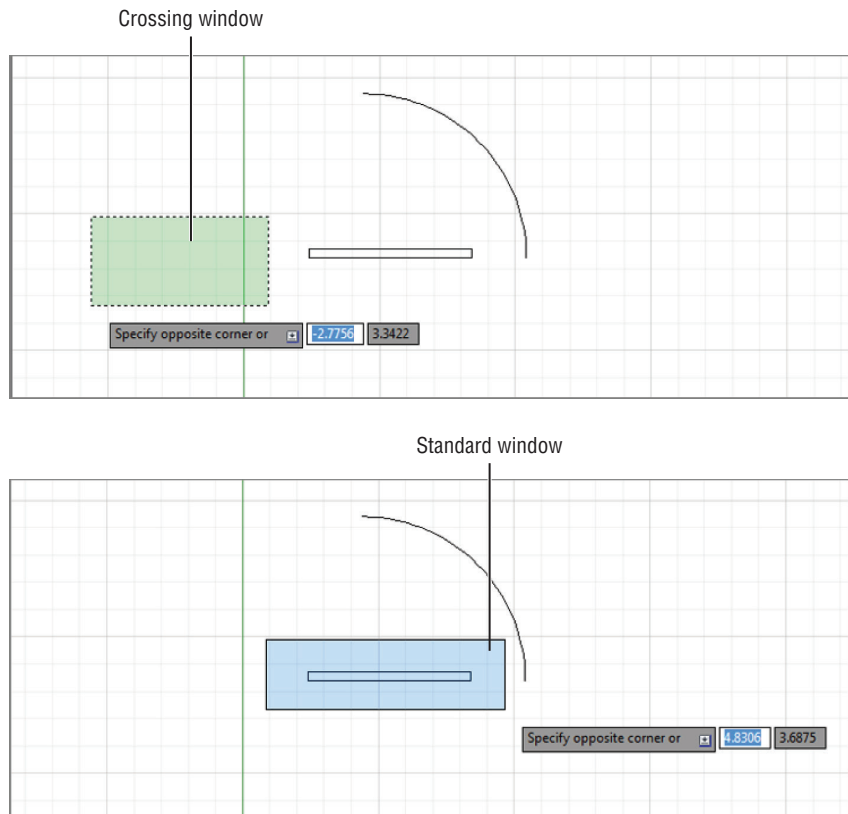
## USING AUTOSELECT

Next, you'll move the rest of the door in the same direction by using the Autoselect feature:

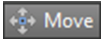
1. Pick a point just above and to the left of the rectangle representing the door. Be sure not to pick the door itself. A selection window appears that you can drag across the screen as you move the cursor. If you move the cursor to the left of the last point selected, the window outline appears dotted and there's a green tint inside the window (see the first image in Figure 2.21). If you move the cursor to the right of that point, the outline appears solid and there's a blue tint inside (see the second image in Figure 2.21).

**FIGURE 2.21**

The dotted window (first image) indicates a crossing selection; the solid window (second image) indicates a standard selection window.



2. Pick a point below and to the right of the door so that the door, but not the arc, is completely enclosed by the window, as shown in the bottom image in Figure 2.21. The door is highlighted (and, again, you may see grips appear at the lines' endpoints and midpoints).
3. Click the Move tool again. Just as in the preceding exercise, the Specify base point or [Displacement] <Displacement>: prompt appears.
4. Pick any point on the screen; then enter @1<0. J. Metric users should enter @3<0. J. The door joins with the arc.

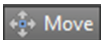
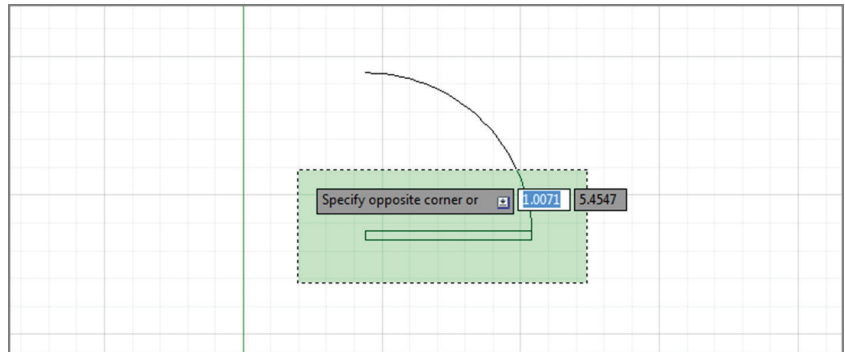


The two selection windows you've just seen—the blue solid one and the dotted green one—represent a standard window and a crossing window. If you use a *standard window*, anything completely within the window is selected. If you use a *crossing window*, anything that crosses through the window is selected. These two types of windows start automatically when you click any blank portion of the drawing area with a Standard cursor or a Point Selection cursor, hence the name *Autoselect*.

Next, you'll select objects with an automatic crossing window:

1. Pick a point below and to the right of the door. As you move the cursor left, the crossing (dotted) window appears.
2. Select the next point so that the window encloses the door and part of the arc (see Figure 2.22). The entire door, including the arc, is highlighted.

**FIGURE 2.22**  
The door enclosed  
by a crossing  
window



3. Click the Move tool.
4. Pick any point on the screen; then enter @1<180. J. Metric users should type @3<180. J. The door moves back to its original location.

You'll find that, in most cases, the Autoselect standard and crossing windows are all that you need when selecting objects. They really save you time, so you'll want to become familiar with these features.

### MODIFYING AN AUTOSELECT WINDOW

Two settings, known as *system variables*, enable you to use the Autoselect feature in a more flexible way. These two settings, **Pickdrag** and **Pickauto**, control the behavior of the Autoselect window, giving you more options to select objects in your drawing.

**Pickdrag** If you click to start a selection window and then decide that you want to use a window polygon, crossing polygon, or fence, you can type **W** for a window polygon, **C** for a crossing polygon, or **F** for a fence. If this does not work, make sure that the **Pickdrag** system variable is set to 2 by typing **PICKDRAG** **2**.

**Pickauto** In a crowded drawing, you may want to use a selection window, but objects close to the cursor may be selected instead. If you set **Pickauto** to 2 by typing **PICKAUTO** **2**, you can click and drag your mouse over an object in a crowded drawing without having the single object selected. AutoCAD will start a selection window instead. You can still use a single click to select a single object.



Before continuing, click the Save tool in the Quick Access toolbar to save the **Door.dwg** file. You won't want to save the changes you make in the next section, so saving now stores the current condition of the file on your hard disk for safekeeping.

### RESTRICTIONS ON NOUN/VERB OBJECT SELECTION

For many of the modifying or construction-oriented commands, the Noun/Verb selection method is inappropriate because, for those commands, you must select more than one set of objects. You'll know whether a command accepts the Noun/Verb selection method right away. Commands that don't accept the Noun/Verb selection method clear the selection and then ask you to select an object or set of objects.

If you'd like to take a break, now is a good time to do so. If you want, exit AutoCAD, and return to this point in the chapter later. When you return, start AutoCAD and open the **Door.dwg** file.

### CLICK AND DRAG TO LASO OBJECTS

If you need to use an irregular-shaped window to select objects, you can use a click-and-drag motion to start a lasso selection. A lasso enables you to draw an irregular "freehand" selection window of any shape. Just as with the rectangular selection window, the direction of the lasso determines the method of selection. A clockwise lasso creates a standard window, and a counterclockwise lasso creates a crossing window.

## Editing with Grips



Earlier, when you selected the door, grips appeared at the endpoints, center points, and midpoints of the lines and arcs. You can use grips to make direct changes to the shape of objects or to move and copy them quickly.

If you didn't see grips on the door in the previous exercise, your version of AutoCAD may have the Grips feature turned off. To turn them on, refer to the information on grips in Appendix B.

So far, you've seen how operations in AutoCAD have a discrete beginning and ending. For example, to draw an arc, you first issue the Arc command and then go through a series of operations, including answering prompts and picking points. When you're finished, you have an arc and AutoCAD is ready for the next command.

The Grips feature plays by a different set of rules. Grips offer a small yet powerful set of editing functions that don't conform to the lockstep command/prompt/input routine that you've seen so far. As you work through the following exercises, it's helpful to think of grips as a subset of the standard method of operation in AutoCAD.

To practice using the Grips feature, you'll make some temporary modifications to the door drawing.

## Stretching Lines by Using Grips

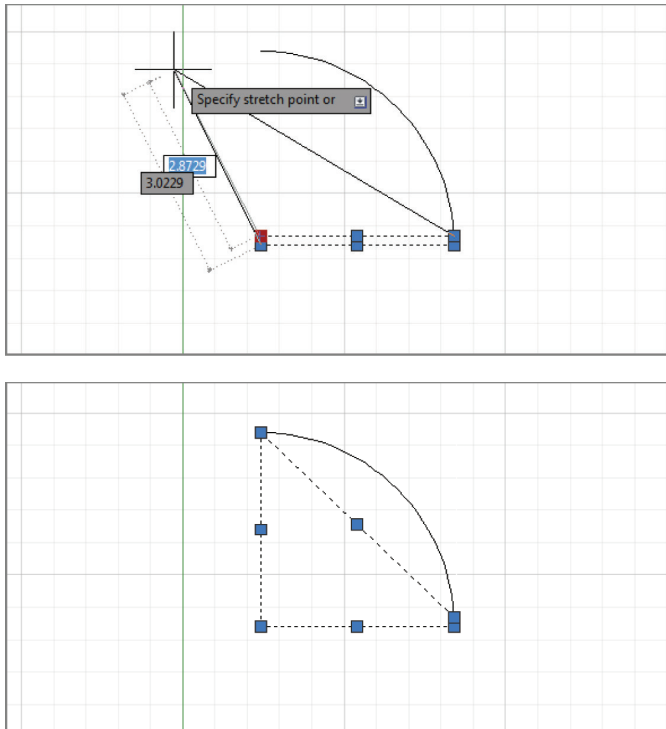
Certification  
Objective

In this exercise, you'll stretch one corner of the door by grabbing the grip points of two lines:

1. Use the Zoom Realtime tool from the Zoom tool in the View tab's Navigate 2D panel to adjust your view so that the size of the door is similar to what is shown in Figure 2.23. You can click and drag the mouse wheel to pan the view if needed.

**FIGURE 2.23**

Stretching lines by using grips. The top image shows the rectangle's corner being stretched upward. The bottom image shows the new location of the corner at the top of the arc.



2. Press the Esc key to make sure that you're not in the middle of a command. Click a point below and to the left of the door to start a selection window.

3. Click above and to the right of the rectangular part of the door, placing the selection window around the door rectangle to select it.
4. Place the cursor on the lower-left corner grip of the rectangle, *but don't press the mouse button yet*. Notice that the cursor jumps to the grip point and that the grip is highlighted. You also see some dimensions related to the objects associated with the grip.
5. Move the cursor to another grip point. Notice again how the cursor jumps to it. When placed on a grip, the cursor moves to the exact center of the grip point. This means that, for example, if the cursor is placed on an endpoint grip, it's on the exact endpoint of the object.
6. Move the cursor to the upper-left corner grip of the rectangle and click. The grip becomes a solid color and is now a *hot grip*. The prompt displays the following message:

**\*\*STRETCH\*\***

Specify stretch point or [Base point/Copy/Undo/exit]:

This prompt tells you that Stretch mode is active. Notice the options in the prompt. As you move the cursor, the corner follows, and the lines of the rectangle stretch (see Figure 2.23).

You can control the size and color of grips by using the Selection tab in the Options dialog box; see Appendix B for details.

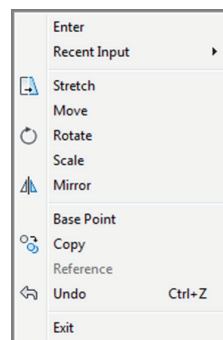
7. Move the cursor upward toward the top end of the arc and click that point. The rectangle deforms with the corner placed at your pick point (see Figure 2.23).

Here you saw that a command called Stretch is issued by clicking a grip point. As you'll see in these next steps, a handful of other hot-grip commands are also available:

1. Notice that the grips are still active. Click the grip point that you moved before to make it a hot grip again.
2. Right-click to open a context menu that contains a list of grip-edit options (see Figure 2.24).

**FIGURE 2.24**

A list of grip-edit options



When you click the joining grip point of two contiguous line segments, AutoCAD selects the overlapping grips of two lines. When you stretch the corner away from its original location, the endpoints of both lines follow.

3. Choose Base Point from the list, and then click a point to the right of the hot grip. Now as you move the cursor, the hot grip moves relative to the cursor.
4. Right-click again, choose Copy from the context menu, and enter @1<-30. (Metric users should enter @3<-30.) Instead of the hot grip moving and the lines changing, copies of the two lines are made with their endpoints 1 unit (or 3 units for metric users) below and to the right of the first set of endpoints.
5. Pick another point just below the last. More copies are made.
6. Press ↵ or enter X.↵ to exit Stretch mode. You can also right-click again and choose Exit from the context menu.

In this exercise, you saw that you can select a base point other than the hot grip. You also saw how you can specify relative coordinates to move or copy a hot grip. Finally, you saw that with grips selected on an object, right-clicking opens a context menu that contains grip-edit options.

### SELECTING MULTIPLE GRIPS

Suppose you want to stretch two grips together. You can select multiple grips by holding down the Shift key while selecting grips. For example, if you want to stretch the top two corners of a rectangle, select the rectangle, and then Shift-click the two top corner grips. Click one of the selected grips and move it to a new location. All of the selected grips will move together.

## Moving and Rotating with Grips

As you've just seen, the Grips feature is an alternative method for editing your drawings. You've already seen how you can stretch endpoints, but you can do much more with grips. The next exercise demonstrates some other options. You'll start by undoing the modifications you made in the preceding exercise:

1. Type U.↵. The copies of the stretched lines disappear.
2. Press ↵ again. The deformed door snaps back to its original form.  
Pressing ↵ at the Command prompt causes AutoCAD to repeat the last command entered—in this case, U.
3. Type Zoom.↵0.6.↵ to show more of the drawing's work area.
4. You are going to select the entire door. First, click a blank area below and to the right of the door.
5. Move the cursor to a location above and to the left of the rectangular portion of the door and click. Because you went from right to left, you created a crossing window. Recall that the crossing window selects anything enclosed and crossing through the window.
6. Click the lower-left grip of the rectangle to turn it into a hot grip. Just as before, as you move your cursor the corner stretches.
7. Right-click and choose Move from the context menu. The Command window displays the following:

```
**MOVE**
```

```
Specify move point or [Base point/Copy/Undo/eXit]
```

Now as you move the cursor, the entire door moves with it.

8. Position the door near the center of the screen and click. The door moves to the center of the screen. Notice that the Command prompt returns but the door remains highlighted, indicating that it's still selected for the next operation.
9. Click the lower-left grip again, right-click, and choose Rotate from the context menu. The Command window displays the following:

**\*\*ROTATE\*\***

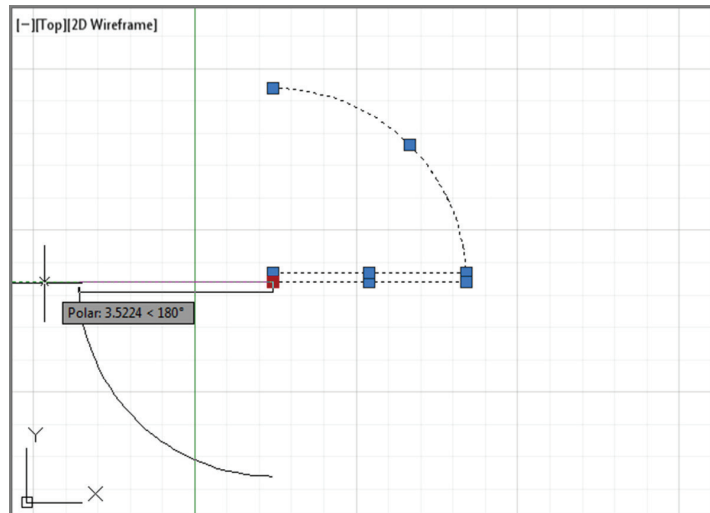
Specify rotation angle or [Base point/Copy/Undo/Reference/eXit]:

As you move the cursor, the door rotates about the grip point.

10. Position the cursor so that the door rotates approximately 180° (see Figure 2.25). Then Ctrl+click (hold down the Ctrl key and press the left mouse button). A copy of the door appears in the new rotated position, leaving the original door in place.

**FIGURE 2.25**

Rotating and copying the door by using a hot grip. Notice that more than one object is affected by the grip edit, even though only one grip is hot.



11. Press ↵ to exit Grip Edit mode.

You've seen how the Move command is duplicated in a modified way as a hot-grip command. Other hot-grip commands (Stretch, Rotate, Scale, and Mirror) have similar counterparts in the standard set of AutoCAD commands. You'll see how those work in Chapter 11, "Using Dimensions," and Chapter 13, "Copying Existing Drawings from Other Sources."

After you complete any operation by using grips, the objects are still highlighted with their grips active. To clear the grip selection, press the Esc key.

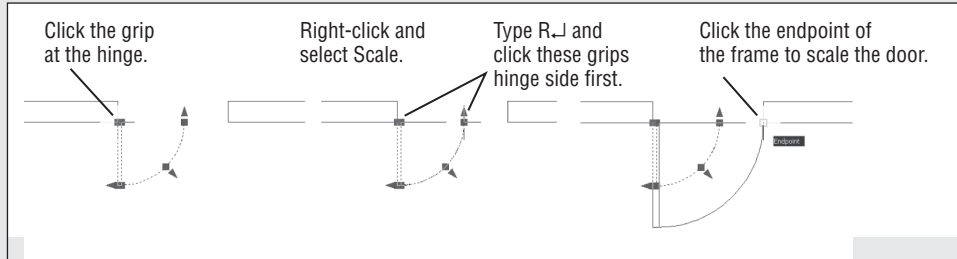
In this exercise, you saw how hot-grip options appear in a context menu. Several other options are available in that menu, including Exit, Base Point, Copy, and Undo.

You can access many of these grip-edit options by pressing the spacebar or ↵ while a grip is selected. With each press, the next option becomes active. The options then repeat if you continue to press ↵. The Ctrl key acts as a shortcut to the Copy option. You have to use it only once; then, each time you click a point, a copy is made.



### SCALING WITH GRIPS

Grips can be used to scale an object graphically to fit between two other objects. For example, a door can be scaled to fit within a door frame. Place the door so that its hinge side is at the door frame and the door is oriented properly for the frame. With the door selected, click the grip at the hinge side. Right-click and select Scale. Type **R↵** or select Reference from the command line, and then click the grip at the hinge again. Click the grip at the end of the arc representing the door swing. Finally, click the opposite side of the door frame.



## Understanding Dynamic Input

You've seen how AutoCAD displays a lot of information at the cursor through its Dynamic Input display. In this section, you'll now get a chance to explore the Dynamic Input display through grip editing.

You'll start by going back to the original version of the Door .dwg drawing that you saved earlier:



1. Click the Close icon in the Drawing tab of the drawing area.
2. When you're asked if you want to save changes, click No.
3. Click Open from the Quick Access toolbar, and then locate and select the Door .dwg file that you saved earlier. You can also open the doorsample.dwg file from the sample files that you installed from this book's web page.

The door appears in the condition in which you left it when you last saved the file.

4. Click the Pan tool in the Navigation bar, and click and drag the mouse to pan the view to the center of the drawing area.
5. Right-click and select Exit to exit the Pan tool.
6. Click the arc to expose its grips.

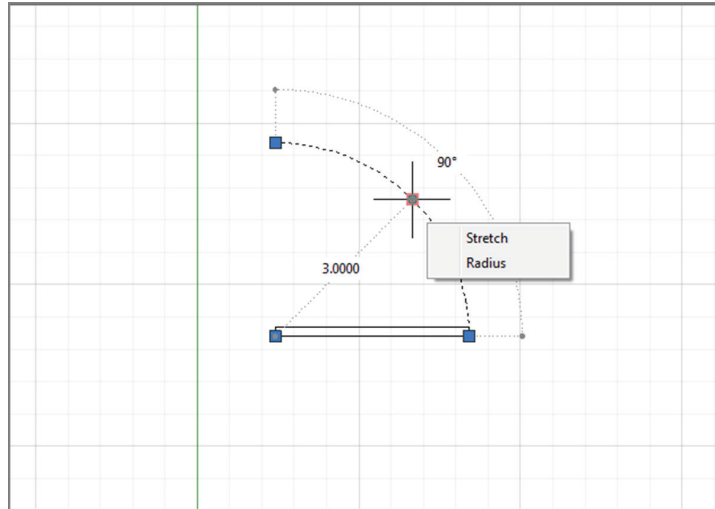


### DON'T SEE THE DYNAMIC INPUT DISPLAY?

If you don't see the Dynamic Input display at the cursor, type **Dynmode ↵** to turn it on. You can also click the Customization tool at the far-right end of the status bar and select Dynamic Input to add the Dynamic Input tool to the status bar. This tool lets you toggle the Dynamic Input display on and off.

7. Place the cursor on the grip at the middle of the arc, but don't click it. (This is called *hovering* over a grip.) You see the dimensions of the arc appear as well as a menu offering two options: Stretch and Radius. The dimensions are useful when you need to check the size of objects you've drawn (see Figure 2.26).

**FIGURE 2.26**  
Hovering over a grip



8. Click the Radius option in the grip menu. The Command prompt appears at the cursor, and the radius dimension changes to a text box.
9. Move the cursor toward the upper-right corner of the drawing area. The radius dimension of the arc changes as you move the cursor.
10. Enter 4↵. Metric users enter 12↵. As you type, the new value appears in the radius dimension. When you press ↵, the arc changes to the new radius.
11. Click the Undo button to revert to the original arc size.

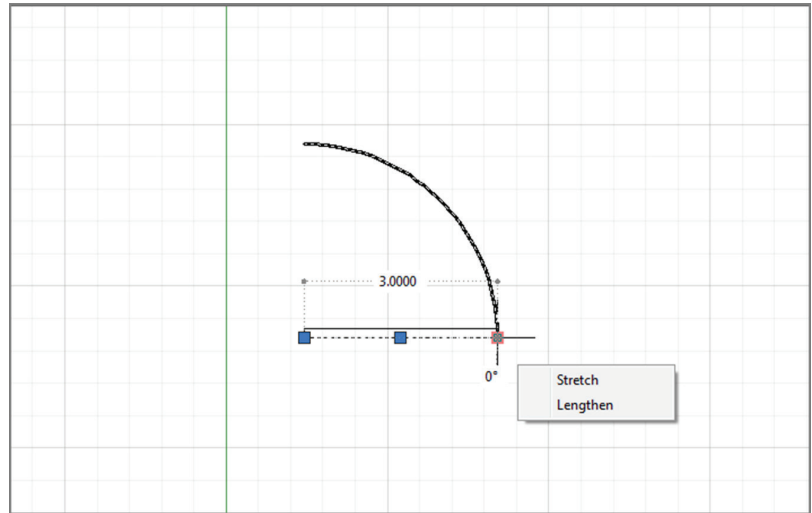
Here you saw the basic methods for using the Dynamic Input display. You can hover over an object's grip to display its dimensions along with a grip menu. The menu appears for many but not all grips, and the contents of the menu depend on the object selected. Click the grip, and if available, the dimensions can be edited directly through the keyboard. In this example, you were able to change the radius of the arc to an exact value by selecting the Radius option from the grip menu and then entering a value. Depending on the grip you click, you can change a dimension through direct keyboard input. For example, if you want to change the degrees the arc covers instead of its radius, you can hover over the arrow grip at either end of the arc and select Lengthen. The dimensions that appear can then be edited to increase or decrease the length of the arc without affecting its radius.

Next, try Dynamic Input display on a line:

1. Click the bottommost line of the door, as shown in Figure 2.27. Hover over the rightmost grip on the selected line. Just as you saw with the arc, you can see the dimensions of the line, including its length and directional angle. You also see a menu that offers the Stretch and Lengthen options.

**FIGURE 2.27**

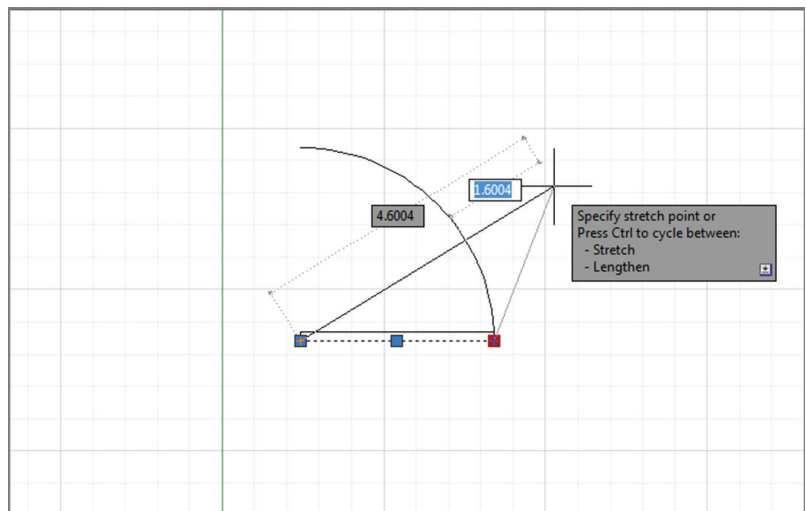
Selecting a line on the door



2. Click the grip over which you're hovering, and then move the cursor up and to the right. You see two dimensions: One indicates the overall length, and the other shows the change in length of the line. You also see the Command prompt at the cursor. Notice that the dimension indicating the change in length is highlighted (see Figure 2.28).

**FIGURE 2.28**

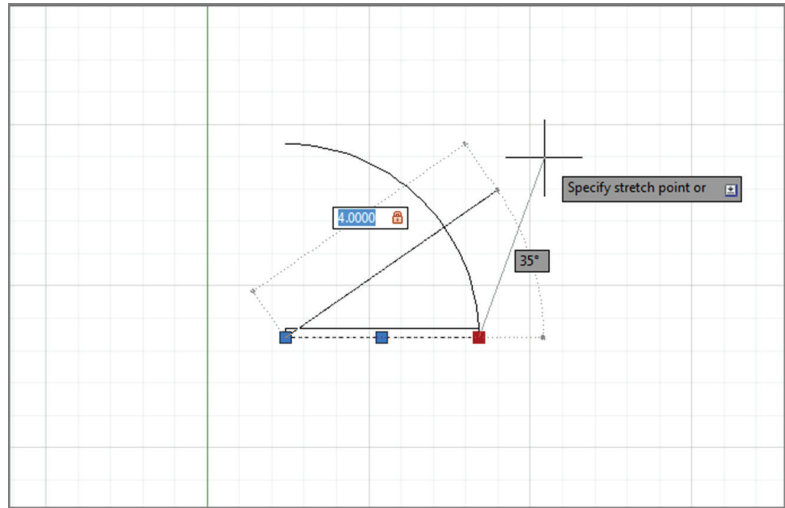
The overall length dimension and the change in length dimension



3. Type 1 and press the Tab key, not the Enter key, to increase the length of the line by 1 unit. Metric users should enter 3 and press the Tab key. Now, as you move the cursor, the line is locked at a new length that is 1 (or 3) units longer than its original length. Also notice that the overall dimension is highlighted. You also see a lock icon on the length dimension (see Figure 2.29).

**FIGURE 2.29**

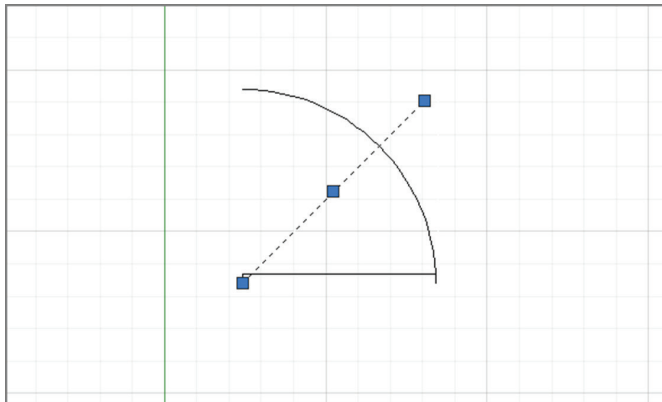
The line locked at a new length



4. Press the Tab key again. The angle value is highlighted.
5. Type 45 and press the Tab key to lock the angle of the line at 45°.
6. Make sure that the cursor isn't too close to the locked endpoint of the line and then click the left mouse button. The line is now in its new orientation with a length of 4 (12 for metric users) and an angle of 45°, as shown in Figure 2.30.

**FIGURE 2.30**

The line's new length and orientation

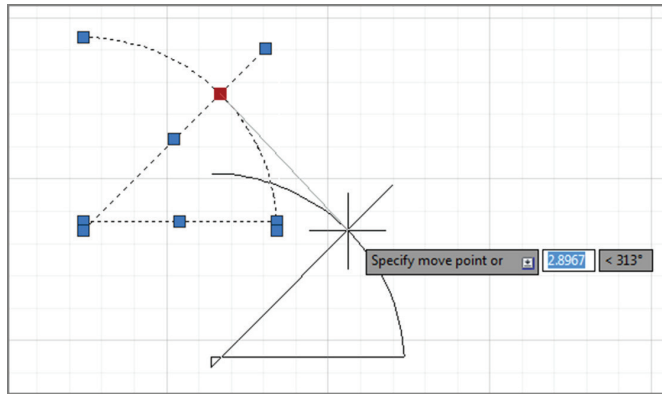


You can see that the Dynamic Input display lets you enter specific dimensions for the selected object, making possible precise changes in an object's size. Choose Lengthen from the grip menu if you just want to change the length of the line.

You can also use the Dynamic Input display while using other grip-editing features. Try the following exercise to see how the Dynamic Input display works while moving objects:

1. Click above and to the right of the door drawing to start a crossing selection window.
2. Click below and to the left to select the entire door drawing.
3. Click the middle grip of the arc.
4. Right-click and choose Move. You see the Command prompt at the cursor with the distance value highlighted. As you move the cursor, you can see the distance and angle values in the Dynamic Input display change (see Figure 2.31).

**FIGURE 2.31**  
The Dynamic Input display



5. Type 4 (metric users enter 12) and then press the Tab key. As you move the cursor, the distance from the original location of the arc's midpoint is locked at 4 (or 12) units. The angle value is now highlighted and available for editing.
6. Type 225 and then press the Tab key to lock the angle at 225°.
7. Click a location away from the door drawing. The door moves to its new location, exactly 4 units (12 units for metric users) from its original location.

As you can see from these exercises, the Dynamic Input display adds some helpful methods for editing objects. To summarize, here is a rundown of the basic Dynamic Input display features:

- ◆ You can quickly check the dimensions of an object by selecting it and then hovering over a grip.
- ◆ You can alter an object's dimensions by entering values into the highlighted dimensions of the Dynamic Input display.

- ◆ To highlight a different dimension, press the Tab key.
- ◆ To accept any changes you've made using the Dynamic Input display, click at a location away from the grip you're editing. You can also press  $\downarrow$  or the spacebar.

Not all grips offer dimensions that can be edited. If you click the midpoint grip on the line, for example, you won't see the dimensions of the line, although you'll see the Command prompt and you'll be able to enter a new coordinate for the midpoint.

As you've seen in the arc and line examples, each object offers a different set of dimensions. If you like the way that the Dynamic Input display works, you can experiment on other types of objects. AutoCAD offers a number of settings that let you control the behavior of the Dynamic Input display. You'll learn about those settings in Appendix B.

### TYPING COORDINATES WITH DYNAMIC INPUT

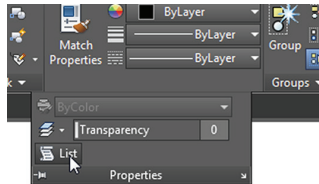
When entering coordinates through the keyboard while Dynamic Input is enabled, you have to use a slightly different notation for relative and absolute coordinates. If you're entering relative coordinates for a series of points as in drawing a polygon with the Line command, you can leave off the @ sign after the first point is selected, so instead of typing @12,9 $\downarrow$ , you can simply type 12,9 $\downarrow$ . If you are entering absolute coordinates, you need to precede your coordinate list with a # sign. So instead of entering 1,1 $\downarrow$  to specify a point at coordinate 1,1, you would need to enter #1,1 $\downarrow$ .

## Displaying Data in a Text Window

You may have noticed that as you work in AutoCAD, the activity displayed in the Command window scrolls up. Sometimes, it's helpful to view information that has scrolled past the view shown in the Command window. For example, you can review the command activity from your session to check input values or to recall other data-entry information. Try the following exercise to see how the text window works:

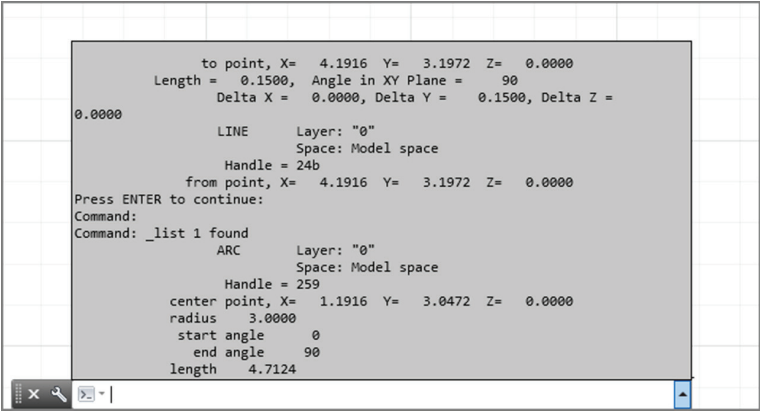


1. From the Home tab's expanded Properties panel, click the List tool.



2. At the Select objects: prompt, click the arc and press  $\downarrow$ . A text window appears and displays information about the arc (see Figure 2.32). If your command window is undocked, it will expand to display the information. Toward the bottom is the list of the arc's properties. Don't worry if the meaning of some listed properties isn't obvious yet; as you work your way through this book, you'll learn what the properties of an object mean.

**FIGURE 2.32**  
The expanded  
AutoCAD Command  
window showing the  
data displayed by the  
List tool



3. If your command window is unlocked, you can dismiss the expanded Command window by clicking in the drawing area. To bring it back, press the F2 function key or click the up-pointing arrowhead at the far right of the unlocked Command window.

You can set the number of lines that AutoCAD retains by using the Options dialog box, or you can have AutoCAD record the AutoCAD Text Window information in a text file.

When you have more than one document open, the AutoCAD Command window displays a listing for the drawing that is currently active.

### DOCKING THE COMMAND WINDOW

If you've used AutoCAD before, you may wonder if you can restore the old-style Command window. You can do this by docking the window to the bottom of the AutoCAD window. Once this is done, the Command window behaves the same way as in earlier versions of AutoCAD. You can open a separate Text Window by entering **TEXTSCR** or by pressing F2.

## Displaying the Properties of an Object



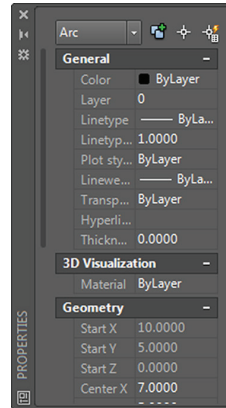
While we're on the subject of displaying information, you'll want to know about the Properties palette. In the preceding exercise, you saw how the List command showed some information regarding the properties of an object, such as the location of an arc's center and endpoints. You can also double-click an object to display the Quick Properties palette that shows other basic information about the object. (You might accidentally display the Quick Properties palette from time to time!) The Properties palette provides a more complete view of an object's properties with the additional feature of allowing you to make changes to those properties. The Properties palette is so useful that you may want to consider leaving it open all the time.

To see what the Properties palette is for, try the following exercise:

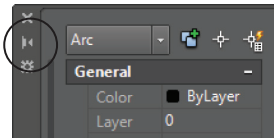
1. If you haven't done so already, select the arc in the drawing, right-click it, and select Properties to open the Properties palette, which displays a list of the arc's properties.

Don't worry if many of the items in this palette are undecipherable; you'll learn more about this palette as you work through the early chapters of this book. For now, just be aware that you can get to this palette with a right-click and that it displays the object's properties. You can also use it to modify many of the properties listed (see Figure 2.33).

**FIGURE 2.33**  
Object Properties  
palette



2. Click the small Auto-hide box at the top of the Properties palette. It's the icon that looks like a double arrow. The icon changes to a single arrow. The Auto-hide option in the Properties palette lets you keep the palette open without having it take up too much of the drawing area. This can be useful when you need to edit the properties of many objects.



3. Move the cursor away from the Properties palette. The Properties palette collapses so that only the title bar remains.
4. Hover the cursor on the Properties palette title bar. The Properties palette opens to display all of the options again.
5. Click the Auto-hide box again to restore the "always open" mode of the palette.
6. Close the Properties palette by clicking the X in its upper corner. (The X appears in the upper-left or upper-right corner, depending on the placement of the palette in the AutoCAD window.) You can also right-click the title bar on the side of the Properties palette and then choose Close from the context menu.
7. You're finished with the door drawing, so choose Close from the Application menu.



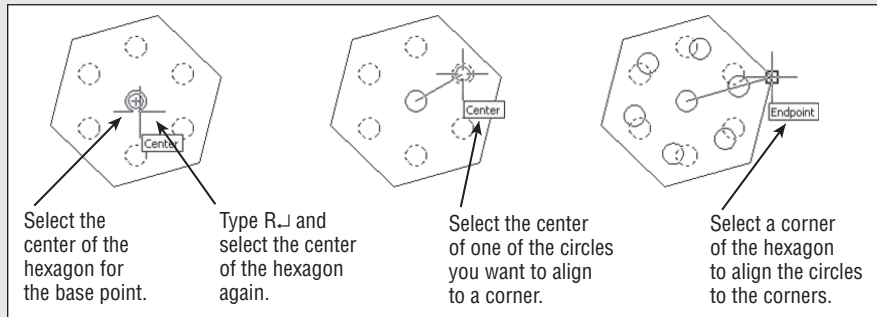
8. In the AutoCAD dialog box, click the No button. (You've already saved this file just as you want it, so you don't need to save it again.)

### USING ROTATE REFERENCE TO ALIGN OBJECTS

You can use the Rotate command's Reference option to align a set of objects graphically to another object. For example, suppose you want to rotate a set of circles inside a hexagon to align with the corner of the hexagon.

To do this, you can use the Reference option as follows:

1. Start the Rotate command, and select the circles.
2. At the Specify base point: prompt, use the Center osnap to select the center of the hexagon as represented by the central circle. Once you do this, the objects rotate around the selected point as you move your cursor.



3. At the Specify rotation angle or [Copy/Reference]: prompt, enter **R, J**.
4. At the Specify the reference angle <0>: prompt, use the Center osnap to select the center of the hexagon again. You can also enter @, J since the last point you selected was the center.
5. At the Specify second point: prompt, use the Center osnap to select the center of one of the circles you want to align with the hexagon. Now, as you move the cursor, the circle whose center you selected is aligned with the cursor angle.
6. At the Specify the new angle or [Points]: prompt, use the Endpoint osnap to select one of the corners of the hexagon. The circles align with the corners.

You can also use grips to align objects. Here's how: Select the object or set of objects and then click a grip. The grip you select becomes the rotation point, so select this first grip carefully. Right-click and select Rotate. Type **R, J** and select the grip you just selected and another point to determine the reference angle. Finally, select the new angle for the object or set of objects. If you want to rotate around a point other than the first grip, use the Grip Base right-click option. If you'd like to experiment with the Rotate Reference option, we've provided a sample file that you can use called `rotatereference.dwg`.