

AutoCAD® 2016 and AutoCAD LT® 2016

NO EXPERIENCE REQUIRED



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Donnie Gladfelter



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10 9 8 7 6 5 4 3 2 1

*To my son, Jackson
Donald Gladfelter, who
was born on June 30, 2015.*

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To my son, you are the highlight of my day! From your smiles throughout the day to singing you to sleep at night with my (off-tone) renditions of “Take Me Out to the Ballgame,” “Always Look on the Bright Side of Life,” and various campfire songs from the Boy Scouts. Authoring a book, much less six books, was something I long considered an impossible dream. When the day comes that you read this for yourself, may the book you hold in your hands remind you to never stop chasing your dreams, to always strive to get better at everything you do, and to possess the humility to know there is plenty left to learn tomorrow.

As with life, this book was made possible not by the efforts of one individual but instead by an amazing team of talented people. I hope you are as lucky as me to have individuals with the same professionalism, dynamism, and passion to help you achieve your dreams as I did for this book. Special thanks to my editorial manager, Mary Beth Wakefield, for the opportunity to write this book for a sixth year. To my acquisitions editor Stephanie McComb, thanks for helping me move this project forward despite all odds. To my developmental and technical editors Jim Compton and Melanie Perry, respectively, thank you for your exceptional attention to detail and for helping me find ways to continue improving this book. To Dassi Zeidel and Kim Wimpsett, thank you for ensuring every piece fit together as it should while also ensuring that the vision of the book was executed at the highest caliber. Finally, to the entire Wiley/Sybex team, thank you for lending your talents to this project to ensure readers have the best possible experience when learning AutoCAD.

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ABOUT THE AUTHOR

Donnie Gladfelter is a highly visible and respected thought leader in the CAD community. As an Autodesk Certified Instructor, he is well known for his blog The CAD Geek (www.thecadgeek.com), has worked with hundreds of design professionals as a technical product and online manager at CADD Microsystems, and is a top-rated speaker at Autodesk University and other industry events. Donnie has proudly dedicated himself to empowering CAD professionals by providing training and services to companies around the world, has served on the board for the Autodesk User Group International (AUGI), and is an active member of the design community.

A proven communicator, Donnie has reached thousands of people worldwide through many publications and various public speaking engagements. As a speaker at Autodesk University since 2007, Donnie has presented a long list of popular sessions and served as host for Autodesk University Virtual in 2010. Other speaking engagements have drawn audiences of more than 60,000 people.

Leading a peripatetic existence as a highly trusted and respected member of the CAD community, he has earned a professional reputation founded on both integrity and loyalty. Backed by more than a decade of experience, his personal mantra of empowering CAD professionals is embodied by his current position as a business development manager at CADD Microsystems, where he helps design teams throughout the Mid-Atlantic and across the world apply technology the way they do business through frequent seminars, workshops, and classroom-style training.

Donnie and his beautiful wife live in Richmond, Virginia. You can reach him at donnie.gladfelter@thecadgeek.com.

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INTRODUCTION

This book was born of the need for a simple yet engaging tutorial that would help beginners step into the world of the Autodesk® AutoCAD® or Autodesk® AutoCAD LT® software without feeling intimidated. That tutorial has evolved over the years into a full introduction to the ways in which architects and civil and structural engineers use AutoCAD to increase their efficiency and ability to produce state-of-the-art computerized production drawings and designs.

Because the Microsoft Windows versions of AutoCAD and AutoCAD LT are so similar, it makes sense to cover the basics of both programs in one book. For most of the book, the word *AutoCAD* stands for the Windows versions of both AutoCAD and AutoCAD LT. Although Apple Macintosh versions of both AutoCAD and AutoCAD LT are available, the interface and underlying tool set on that platform prevent it from aligning with the workflows and procedures outlined in this book.

When you come to a section of a chapter that applies to AutoCAD only, the icon shown here is displayed in the margin to alert you. When appropriate, extra information for AutoCAD LT users is provided to give you a workaround or otherwise keep you in step with the tutorial.



Because AutoCAD LT doesn't have 3D commands or features, the last two chapters, which are an introduction to drawing in 3D, apply only to AutoCAD. But AutoCAD LT users can be assured that it is very much the same program as AutoCAD, with only minor differences. You'll be prompted when those differences arise, most of which involve 3D features.

When you come to a section that applies to one of the many new features of AutoCAD 2016, the icon shown here is displayed in the margin to alert you. This book is directed toward AutoCAD and AutoCAD LT novices—users who know how to use a computer and perform basic file-managing tasks, such as creating new folders and saving and moving files, but who know little or nothing about AutoCAD or AutoCAD LT. If you're new to the construction and design professions, this book will be an excellent companion as you learn AutoCAD. If you're already practicing in those fields, you'll immediately be able to apply the skills you'll pick up from this book to real-world projects. The exercises have been successfully used to train architects, engineers, and contractors, as well as college and high school students, in the basics of AutoCAD.



For those of you in other trades and professions, the project that runs through the book—drawing a small cabin—has been kept simple so that it doesn't require special training in architecture or construction. Also, most chapters

have additional information and exercises specifically designed for users other than architecture, engineering, and construction (AEC) users. Anyone wanting to learn AutoCAD will find this book helpful.

What Will You Learn from This Book?

Learning AutoCAD, like learning any complex computer program, requires a significant commitment of time and attention and, to some extent, a tolerance for repetition. You must understand new concepts to operate the program and to appreciate its potential as a drafting and design tool. However, to become proficient at AutoCAD, you must also use the commands enough times to gain an intuitive sense of how they work and how parts of a drawing are constructed.

At the end of most chapters, you'll find one or more additional exercises and a checklist of the tools you have learned (or should have learned). The steps in the tutorial have a degree of repetition built into them that allows you to work through new commands several times and build up confidence before you move on to the next chapter.

Progressing through the book, the chapters fall into five general areas of study:

- ▶ **Chapters 1 through 3** familiarize you with the organization of the AutoCAD user interface, cover a few of the basic commands, and equip you with the tools necessary to set up a new drawing, including the use of a standard, such as the National CAD Standard (NCS), to organize your files.
- ▶ **Chapters 4 and 5** introduce the basic drawing commands and develop drawing strategies that will help you use these commands efficiently.
- ▶ **Chapters 6 through 11** work with the major features of AutoCAD, such as blocks, hatches, and annotation. You'll also learn about using layers to organize the various components of a drawing by applying the NCS.
- ▶ **Chapters 12 through 15** examine intermediate and advanced AutoCAD features, including managing and creating document sets by using Sheet Set Manager.
- ▶ **Chapters 16 and 17** cover the 3D modeling tools by exploring 3D solids and 3D surfaces. You'll also learn how to apply materials to 3D objects, allowing you to produce eye-catching 3D visualizations. In the process of exploring these elements, you'll follow the steps involved in laying out the floor plan of a small cabin. You'll then

learn how to generate elevations from the floor plan, and eventually you'll learn how to set up a title block and layouts to print your drawing.

Along the way, you'll also learn how to do the following:

- ▶ Use the basic drawing and modify commands in a strategic manner
- ▶ Set up layers by using an established standard
- ▶ Assign colors to your drawing
- ▶ Define and insert blocks
- ▶ Generate elevation views
- ▶ Place hatch patterns and fills on building components
- ▶ Use text in your drawing

Chapters in the latter part of the book touch on the more advanced features of AutoCAD, including the following:

- ▶ Creating dynamic drawings by using geometric and dimensional parametric constraints
- ▶ Dimensioning the floor plan
- ▶ Drawing a site plan and managing drawings of varying units
- ▶ Efficiently organizing drawing sets by using external references
- ▶ Setting up and managing drawings for printing with layouts
- ▶ Making a print of your drawing
- ▶ Working in 3D (for AutoCAD users)

All these features are taught by using the cabin as a continuing project. As a result, you'll build a set of drawings that document your progress throughout the project. You can use these drawings later as reference material if you need to refresh your memory with content that covers a specific skill.

Files on the Website

If you're already somewhat familiar with AutoCAD and you're reading only some of the chapters or if you want to check your work on the cabin against the book at different stages, you can pull the accompanying files from this book's page on Wiley's website at www.sybex.com/go/autocad2016ner. Click the Resources & Downloads button on that page.

To help you learn AutoCAD further, a companion website is also available at www.thecadgeek.com that, in addition to the dataset, offers a comprehensive library of instructional videos, additional exercises, and more. Visiting this site will also let you view this book's errata and interact with the author by posing questions you may have about its contents.

Hints for Success

Because this book is essentially a step-by-step tutorial, it has a common side effect with tutorials of this type. After you finish a chapter and see that you have progressed further through the cabin project, you may wonder exactly what you just did and whether you could do it again without the help of the step-by-step instructions.

This feeling is a natural result of this type of learning tool, and you can do a couple of things to get beyond it.

- ▶ *You can work through the chapter again.* Doing so may seem tedious, but it will help you draw faster. You'll be able to accomplish the same task in half the time it took you to do it in the first place. If you do a chapter a third time, you'll halve your time again. Each time you repeat a chapter, you can skip more and more of the explicit instructions, and eventually you'll be able to execute the commands and finish the chapter by just looking at the figures and glancing at the steps. In many ways, this process is like learning a musical instrument. You must go slowly at first, but over time and through practice, your pace will pick up.
- ▶ *Follow the course of the book but apply the steps to a different project.* You might draw your own living space or design a new one. If you have a real-life design project that isn't too complex, that's even better. Your chances for success in learning AutoCAD, or any computer program, are greatly increased when you're highly motivated—and a real project of an appropriate size can be the perfect motivator.

Ready, Set...

Even with some of the most knowledgeable and passionate teachers by my side, I remember how overwhelming it was to learn AutoCAD as a student in high school. With each command I learned, it seemed that there were another five I had yet to learn, and that was before AutoCAD evolved into the sophisticated, Microsoft Windows–based modeling and design platform that it is today.

Ironically, the biggest challenge to knowing AutoCAD wasn't learning the commands but rather learning how to apply them in the most efficient way.

For several years, my personal mantra has been simple: to “empower CAD professionals.” While writing this book, I didn't want simply to introduce a bunch of commands without also putting them in context and demonstrating how to apply them to create drawings efficiently. With each exercise building on the previous one, you'll learn not only the individual commands but also how everything snaps together as you produce a complete document setup in the same way as industry professionals do. As the title says, there is “no experience required”—only an interest in the subject and a willingness to learn!

FREE AUTODESK SOFTWARE FOR STUDENTS AND EDUCATORS

The Autodesk Education Community is an online resource with more than 5 million members that enables educators and students to download—for free (see 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.

Getting to Know AutoCAD for Windows

Opening the Autodesk® AutoCAD® or Autodesk® AutoCAD LT® program for the first time presents you with an expansive canvas of tools, settings, and more. Faced with this seemingly endless landscape of options, you are probably wondering where you should start. This chapter faces that question head on and breaks down the many components of the user interface into manageable segments, introducing you to essential operations, such as opening drawings. Even if you've used earlier versions of AutoCAD, you'll still want to review this chapter to become acquainted with changes such as the Start Tab and the streamlined command-line interface that have taken place in recent years.

The 2016 release continues the evolution of the user interface seen in recent versions of the software but maintains a foundational parity between AutoCAD and AutoCAD LT. Generally speaking, both platforms offer the same 2D drafting experience. The biggest difference is that AutoCAD LT doesn't have any 3D capability, whereas AutoCAD offers many powerful tools for 3D modeling. (These tools are the topics of Chapter 16, "Creating 3D Geometry," and Chapter 17, "Rendering and Materials.") With so little separating the two platforms, I refer to both interchangeably as *AutoCAD* for most purposes in this book.

In this chapter, you will learn to

- ▶ **Open a new drawing**
- ▶ **Familiarize yourself with the AutoCAD and AutoCAD LT Application windows**
- ▶ **Modify the display**
- ▶ **Display and arrange AutoCAD tools**

Starting AutoCAD for Windows



If you installed AutoCAD by using the default settings for the location of the program files, start the program by choosing Start > All Programs > Autodesk > AutoCAD 2016 > AutoCAD 2016 or by choosing Start > Programs > Autodesk > AutoCAD LT 2016 > AutoCAD LT 2016, depending on the program you're using. (This command path might vary depending on the Windows operating system and the scheme you are using.) Alternatively, you can double-click the AutoCAD 2016 icon or the AutoCAD LT 2016 icon on your desktop.

WHAT THIS BOOK COVERS

Although this book does not focus on the discipline-specific tools found within products based on AutoCAD for Windows such as AutoCAD® Architecture or AutoCAD® Civil 3D® software, it does focus on the core AutoCAD skills necessary to use those vertical AutoCAD platforms. To use one of the vertical products to learn the topics covered in this book, choose Start > All Programs > Autodesk > AutoCAD *Product Name* 2016 > AutoCAD *Product Name* As AutoCAD 2016.

The Mac version of AutoCAD applies an OS X native interface that differs from its Windows counterparts. Although the core concepts covered in this book are universal, the step-by-step procedures differ between the two operating systems. The procedures covered in this book are intended for use with only the Windows-based version of AutoCAD.

Exploring the User Interface

Like most Windows-based applications, AutoCAD launches inside an Application window. Serving as a starting point, the Start Tab is the first user interface (UI) displayed within the Application window, but workspaces will control the overall composition of your AutoCAD environment from there. I'll explain the general function of workspaces shortly, including the default workspace named Drafting & Annotation, but first I'll explain the Start Tab.

Using the Start Tab



Before you create or open any drawings, the Start Tab is displayed to provide a starting point for your entire AutoCAD experience. This interface is organized

into two parts: one page for creating drawings and one page for learning about AutoCAD. The Create page shown in Figure 1.1 is displayed by default and serves as a launch pad for creating and working with the drawing files that compose your projects.



WARNING The Start Tab is part of the default installation of AutoCAD 2016 but can be disabled by an administrator. If it's disabled, it needs to be reenabled so you can follow this section and several exercises in early chapters of this book. Changing the HKEY_LOCAL_MACHINE\SOFTWARE\Autodesk\AutoCAD\R20.1\ACAD-F001\Variables*DISPLAYSTARTTAB registry key to a value of 1 will enable the Start Tab interface. Be sure to let your IT department know what you're doing and why the change is needed; in some organizations, the IT department will want to handle all registry changes.

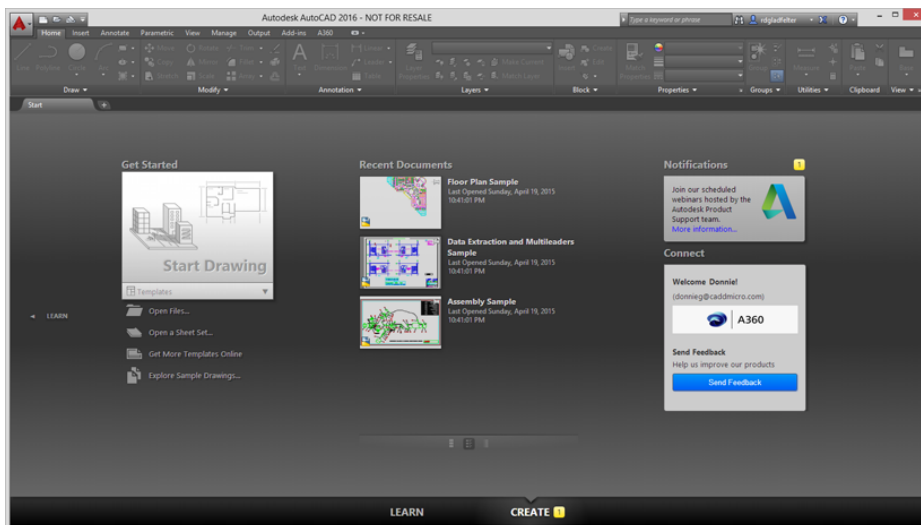


FIGURE 1.1: The Create page on the Start Tab

The Create page contains three columns and may include up to four panels.

Get Started Serving as a pseudo File menu, the Get Started panel is focused on creating new files and browsing for existing files. The Start Drawing tool enables you to create new drawing files quickly, whereas the other tools let you open existing drawings and sheet sets, access templates online, and even view a collection of sample drawings.

Recent Documents AutoCAD keeps a running record of each drawing file you open and displays the most recent drawings in this panel. You can configure the length of this recent document history with the `OPTIONS` command.

Notifications This panel is visible only when there is an issue regarding your current configuration of AutoCAD or a new announcement from Autodesk. It notifies you of graphic configuration issues, product updates, webinars, and more.

Connect Autodesk® A360 software is the cloud computing platform integrated into AutoCAD 2016. The Connect panel consists of cloud services such as storage and rendering, and it provides quick access to the full portfolio of A360 services.

Selecting the Learn page tab at the bottom of the Start Tab, or the page arrow on the left edge, opens the Learn page shown in Figure 1.2. You can access basic information about AutoCAD from this page.

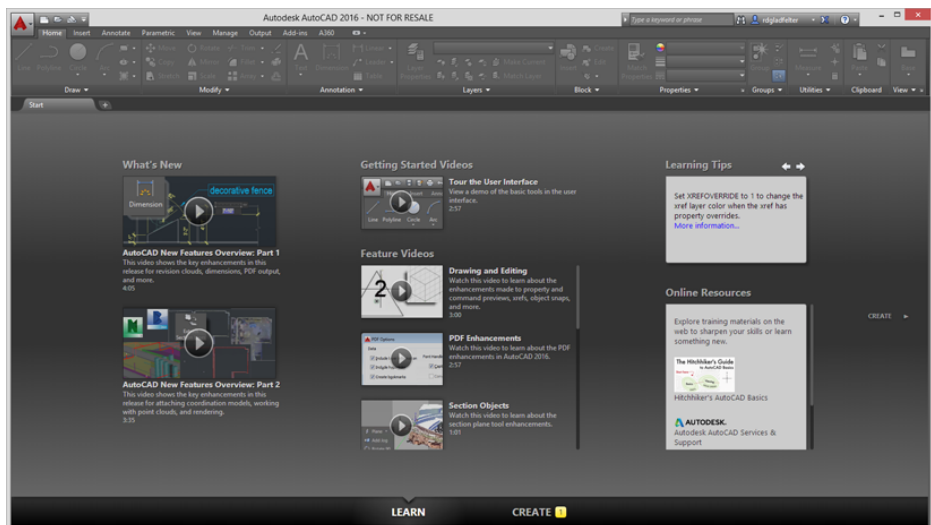


FIGURE 1.2: The Learn page on the Start Tab

Like the Create page, the Learn page is divided into three columns and includes panels for the following:

What's New This panel features video content demonstrating the many new features and enhancements in AutoCAD 2016.

Getting Started Videos The videos on this panel are intended for anyone just getting started with AutoCAD, and they highlight a collection of tools essential for creating drawings.

Tip of the Day This panel is especially helpful after you master the basics of AutoCAD. It displays suggestions for streamlining your existing workflows.

Online Resources Quickly access web-based materials such as the main AutoCAD Services & Support page, which provides access to product information, troubleshooting articles, and even training videos.

Introducing Workspaces

This tour of the user interface has so far been limited to the Start Tab that displays after starting AutoCAD. Opening or creating a drawing will dismiss the Start Tab interface and load a vast assortment of tools in addition to the drawing you selected. To load this interface, click the Start Drawing tool on the Create page.

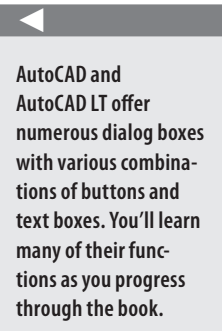
The collection of tools displayed after creating or opening a drawing is called a *workspace*, and AutoCAD includes several designed to match the type of work you're doing. Most of this book uses the default Drafting & Annotation workspace, but Chapters 16 and 17 (which focus on 3D) use the available 3D workspaces. The standard workspaces found within AutoCAD are as follows:

Drafting & Annotation Utilizing the Ribbon, this workspace (shown in Figure 1.3) is considered the default AutoCAD workspace. Unless otherwise specified, this is also the workspace used throughout this book.

3D Basics This workspace provides the core tools needed to get started with 3D modeling in AutoCAD (for AutoCAD users only—3D features are not included in AutoCAD LT).

3D Modeling This workspace provides the complete set of 3D modeling tools in AutoCAD, including materials via the Materials Browser (for AutoCAD users only—3D features are not included in AutoCAD LT).

AutoCAD verticals such as AutoCAD Architecture and AutoCAD Civil 3D build on the standard workspaces outlined here and introduce discipline-specific tools in tandem with those in the standard version of AutoCAD discussed in this book. Although any AutoCAD vertical can be used to complete the exercises in this book, I recommend using the AutoCAD vertical (for example, Architecture or Civil 3D) as an AutoCAD application shortcut to start AutoCAD and maintain parity with this book.



AutoCAD and AutoCAD LT offer numerous dialog boxes with various combinations of buttons and text boxes. You'll learn many of their functions as you progress through the book.