LEARNING MADE EASY

18th Edition

AutoCAD®

for dummies®

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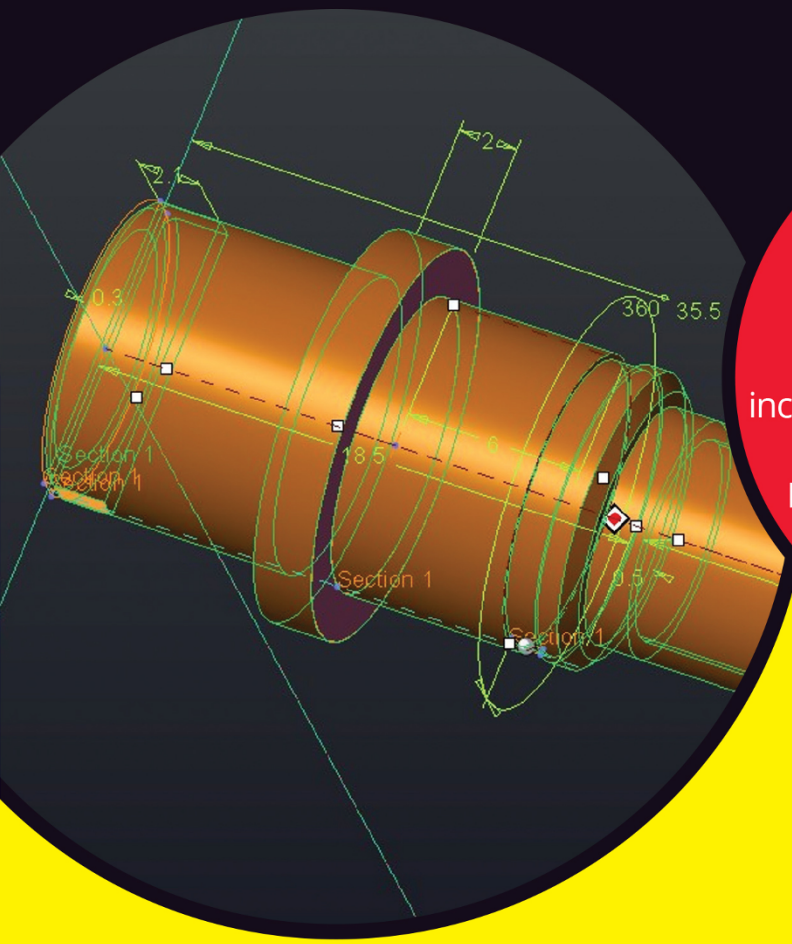

Build your AutoCAD project from the ground up

Tackle basic drawing shapes including straight lines and curves

Move into advanced drawing and 3D modeling

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Autodesk Authorized Training Center certified instructor

AutoCAD®

18th Edition

by Bill Fane

for dummies®
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Contents at a Glance

Table of Contents

Introduction

Welcome to the wonderful world of AutoCAD and to the fame and fortune that awaits you as an AutoCAD user. (Would I lie to you?)

Believe it or not, AutoCAD is almost 40 years old, having been born in December 1982, when most people thought that personal computers weren't capable of industrial-strength tasks like CAD. The acronym stands for Computer-Aided Drafting, Computer-Aided Design, or both, depending on who you talk to. What's equally scary is that many of today's hotshot AutoCAD users, and most of the readers of this book, weren't even born when the program first hit the street and when the grizzled old-timer writing these words began using it.

AutoCAD remains the king of the PC computer CAD hill by a tall margin, making it one of the longest-lived computer programs ever. It's conceivable that the long-term future of CAD may belong to special-purpose, 3D-based software such as the Autodesk Inventor and Revit programs, or to specialized market-specific variations built on top of AutoCAD. At any rate, AutoCAD's DWG file format is the de facto standard, and so AutoCAD will be where the CAD action is for the foreseeable future.

You may have heard that AutoCAD is complex, and therefore is difficult to learn and use. Yes, the user interface includes about 1,300 icons. But it has been my observation that the easier any software is to learn and use, the sooner you bump up against its limitations. A car with no accelerator, one forward gear, no steering, and no brakes would be easy to use until you reached a hill, a curve, or a stop sign or you needed to back out of a parking space.

Yes, AutoCAD is complex, but that's the secret to its success. Some claim that few people use more than 10 percent of AutoCAD's capabilities. Closer analysis reveals that most people use the same basic 5 percent and everyone else uses a different 5 percent after that. The trick is to find *your* 5 percent, the sweet spot that suits your particular industry. If you follow my advice, I think you will find that using AutoCAD is as simple and intuitive as driving a car.

It should be perfectly clear that if your career path has put you in a position where you need to know how to use AutoCAD, you're no dummy!

About This Book

Unlike many other *For Dummies* books, this one *often* tells you to consult the official software documentation. AutoCAD is just too big and powerful for a single book to attempt to describe it completely. The book that ultimately covers every AutoCAD topic would need a forklift to move it. Literally. They stopped shipping paper instruction manuals with the software somewhere around 1995, when the full documentation package grew to about a dozen volumes and more than 30 pounds.

In *AutoCAD For Dummies,* I occasionally mention differences from previous releases so that everyone gains some context and so that upgraders can more readily understand the differences; plus, you're bound to encounter a few of the billions and billions of drawings that were created using older methods. I also mention the important differences between AutoCAD and AutoCAD LT. In particular, AutoCAD LT has no programming language and has extremely limited support for parametrics (Chapter 19) and 3D (Chapter 21).

This book is not *Mechanical Drafting For Dummies,* or *Architectural Drafting For Dummies,* or even *Crash Testing For Dummies.* It doesn't cover drafting principles and procedures, but it does cover the AutoCAD commands necessary to create drawings. Remember, though, that knowing AutoCAD's drawing commands won't make you a great designer, just as knowing how to touch-type and run a word processor won't make you a great author. The job title *CAD operator* doesn't exist, but almost all drafters and designers use CAD.

In addition, the book does *not* cover the discipline-specific features in AutoCAD-based vertical market products, such as AutoCAD Electrical or AutoCAD Mechanical, although most of the information in this book applies to the general-purpose features of those programs as well.

This book covers AutoCAD 2015 through 2020. The obvious major differences between these versions and 2014 and earlier are the initial startup screen and the format of the Ribbon menu. The underlying principles remain the same. I will draw your attention to other differences where appropriate.

Late in 2010, Autodesk released the first non–Microsoft Windows version of AutoCAD in 20 years. Although AutoCAD for Mac is now available, *AutoCAD For Dummies* covers only the Windows version. The two versions are file-compatible, but they differ in many ways in how they look and what they can do. If you have AutoCAD for Mac, you should be able to grasp basic concepts but you might be better off with a Mac-specific book such as *Mastering AutoCAD For Mac,* by George Omura and Rick Graham (Sybex Publishing) or *What's Inside? AutoCAD for Macintosh,*

by Ralph Grabowski, available as an e-book at `www.worldcadaccess.com/ebookonline/2015/07/wia.html`. Halfway down the page ("To Place Your Order") is a drop-drown list, from which you can choose the Mac version of the ebook.

Foolish Assumptions

AutoCAD has a large, loyal, dedicated group of longtime users. *AutoCAD For Dummies* is not for you if you've been using AutoCAD for a decade or more, if you plan your vacation time around Autodesk University, if you used AutoCAD to create your wedding invitations, if you tell police officers that you can walk a straight line if they will press F8 first, or if you read 1,200-page technical tomes about AutoCAD for pleasure. This book *is* for you if you want to get going quickly with AutoCAD, and you understand the importance of developing proper CAD techniques from the beginning.

However, you do need to have an idea of how to use your computer system before tackling AutoCAD and this book. You need to have a computer system with AutoCAD or AutoCAD LT (preferably the 2020 version but at least 2015 or later). A printer or plotter and a connection to the Internet are helpful, too.

You also need to know how to use your version of Windows to copy and delete files, create a folder, and find a file. You need to know how to use a mouse to select (highlight) or to choose (activate) commands, how to close a window, and how to minimize and maximize windows. You should be familiar with the basics of your operating system before you start using AutoCAD.

Conventions Used in This Book

Here are some conventions that you'll run across in this book.

Using the command line

The command line is that gray area near the bottom of the screen that says *Type a command*. One way of using AutoCAD is to type command names in this area. In addition, this is where AutoCAD talks back when it needs information from you. Examples of AutoCAD prompts appear in a `special typeface`, as does any other text in the book that replicates a message, a word, or text that appears onscreen.

Sequences of prompts that appear in the AutoCAD command line have a shaded background, like this:

```
Specify lower left corner or [ON/OFF] <0.0000,0.0000>:
```

When there is a specific action that I want you to take at one of these prompts, look for the italic passage at the end of this line, such as when I want you to press Enter:

```
Specify ending width <5.0000>: Press Enter
```

Text that I want you to type into the program at the command line, in a dialog box, in a text box, or elsewhere appears in **boldface** type, like the 3 at the end of the following line.

```
Specify starting width <0.0000>: 3
```

Many figures in this book also show AutoCAD command-line sequences that demonstrate AutoCAD's prompts and sample responses.

Using aliases

Many AutoCAD commands have *aliases* — these shortcut versions have fewer letters than their full commands, in case you like to type commands at the AutoCAD command line. In this book, I show aliases in uppercase as part of the command names. To start a command, you have to type only its uppercase letters. For example, to draw a line, type either **LINE** (the official command), or just **L** (its alias) and then press Enter to execute the command. When I tell you to start a command, I spell it out in full (such as Line, Circle, or COpy), but you need to enter only the letters shown in uppercase (**L**, **C**, or **CO**, respectively). Note also that the uppercase letters aren't always the initial letters nor are they always adjacent. For example, the eXit command can be entered as the full word or as just the letter **X** and DimANgular can be entered simply as **DAN**.

Command entry at the keyboard became even easier starting with AutoCAD 2014. As you begin to type a command name, the program will try to guess what you want and display a list of suggestions. You can then click the one you want or keep typing until your choice rises to the top.

Icons Used in This Book

Throughout this book, I point out certain morsels of particularly important or useful information by placing handy little icons in the margin. Naturally, different icons indicate different types of information:


TIP

Herein lies a pointed insight that can save you time and trouble as you use AutoCAD. In many cases, Tip information acts as a funnel on AutoCAD's impressive but sometimes overwhelming flexibility: After telling you many of the ways that you *can* do something, I tell you the way that you *should* do it, in most cases.


TECHNICAL STUFF

The Technical Stuff icon points out places where I delve a little more deeply into AutoCAD's inner workings or point out information that most people don't need to know most of the time. These paragraphs definitely are not required reading, so if you see one at a point when you've reached your techie-detail threshold, feel free to skip it.


WARNING

Warning tells you how to stay out of trouble when living close to the edge. Failure to heed its message may have unpleasant consequences for you or your drawing — or both.


REMEMBER

You have a lot to remember when you're using AutoCAD, so I've remembered to remind you not to forget about some of those things that you should remember.

Beyond the Book

I have written a lot of extra content that you won't find in this book. Go online to find

- **AutoCAD drawings:** Drawings that you can use with this book are at `www.dummies.com/go/autocadfd18`. The drawings, which are on the Downloads tab, are in Zip format; just download and unzip them and they're ready to open in AutoCAD. The Zip files, which are named according to chapter, contain one or more drawing files. For example, `afd03.zip` contains the versions of the drawing in Chapter 3. Note that not all chapters have associated drawing files.
- **Cheat sheet:** The cheat sheet for this book has a roadmap for setting up your drawings as well as a list of keyboard shortcuts. To get to the cheat sheet, go to `www.dummies.com` and type *AutoCAD For Dummies* in the Search box.

» **Updates:** If I have any updates to the book, you can find them at `www.dummies.com/extras/autocad18`.

Where to Go from Here

Because you're reading this Introduction, you're like me — you like to read. (The cut-to-the-chase people tend to flip to the index right away and look up what they need to know at that instant.) If you're a total AutoCAD newbie, you can read this book in order, from front to back; it follows a straightforward route from setting up the drawing environment to outputting your masterworks on hard copy to sharing your work with others.

If you're an experienced user, you'll probably be an index-flipper who looks for the missing information needed to complete a specific task. You can probably find the index on your own, but I encourage you to browse through this book anyway, with a highlighter or sticky notes in hand, so that you can find those particularly important places when you need them again.

Whichever route you choose, I hope that you enjoy your time with *AutoCAD For Dummies*. A-a-and, you're off!

1

Getting Started with AutoCAD

IN THIS PART . . .

Find your way around the AutoCAD screen, and discover the location of the tools you will use most often, such as the Ribbon, the graphic screen, and command line.

Discover the half-dozen commands that will account for much of your AutoCAD activities.

See the big picture: from how to start a drawing to printing it.

Correctly set up AutoCAD and create templates for drawing success.

Navigate through your drawing by panning and zooming.

IN THIS CHAPTER

- Launching AutoCAD
- Creating your first drawing in AutoCAD
- Seeing the complete picture
- Understanding the difference between pixels and vectors
- Comprehending the Cartesian coordinate system

Chapter 1
Introducing AutoCAD and AutoCAD LT

This chapter helps ease you into using AutoCAD to create engineering drawings and how to get started. Although it's not uncommon to feel overwhelmed the first time you see AutoCAD, rest assured that you don't need to learn all the controls that you see in the default environment to be an efficient user of the program.

After a brief introduction to the program, I take you through an exercise to show you just how easy it can be to use AutoCAD. The exercise is followed up with some key concepts that you should understand when using AutoCAD, including how it differs from most other computer applications.

REMEMBER

When you're starting out with AutoCAD, heed this quote from *The Hitchhiker's Guide to the Galaxy:*

Don't panic!

Launching AutoCAD

The first thing you need to do to start using AutoCAD is to launch the AutoCAD program (well, duh!) and, if necessary, maximize its screen display. AutoCAD has so many tools and palettes that you'll almost always want to use it in full-screen mode. Follow these steps:

1. **Launch AutoCAD.**

   As indicated in the Introduction, I assume that you have a working knowledge of how to use your version of Windows, including how to launch applications. Depending on your version of Windows and how it is set up, you might have to double-click a desktop icon or find a suitable entry in the Start→[All] Programs menu or Start→All Apps menu on the start screen. The wording of the selections varies depending on the version of AutoCAD and Windows.

2. **Start a new drawing.**

   Click the large Start Drawing icon towards the upper-left corner of the screen.

3. **If something called the Design Feed palette is displayed, close it by clicking the X in its top-left corner.**

   I'm assuming that you aren't quite ready to post your drawing to the web so you can share it and collaborate live with other people.

4. **If necessary, expand AutoCAD to full-screen mode.**

   Click the middle Windows button in the upper-right corner of the application window.

5. **If necessary, expand the graphic area (the big, gray area in the middle) to full-screen size.**

   Click the middle button in the upper-right corner, near the compass rosette.

6. **Place the cursor in the gray graphics area (midscreen), and then press the Esc key twice to make sure that no commands are active.**

   Now you're ready to start drawing in AutoCAD, as shown in Figure 1-1.

REMEMBER

Your screen may look a little different from Figure 1-1 depending on your version of AutoCAD and Windows and your screen resolution. Note too that although you will draw using white on dark gray (refer to Figure 1-1), I drew using black on white (see Figure 1-2), and my menu icons have a white background compared to your gray background.

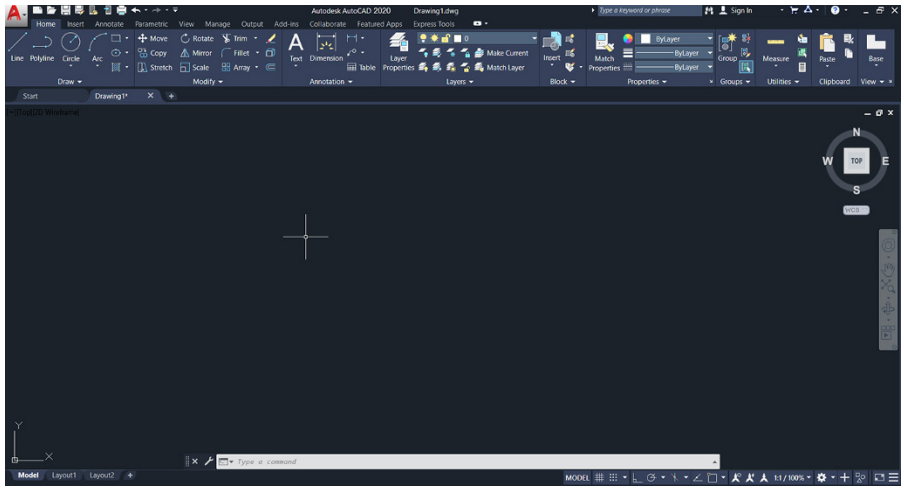

FIGURE 1-1: Your AutoCAD, ready to draw!

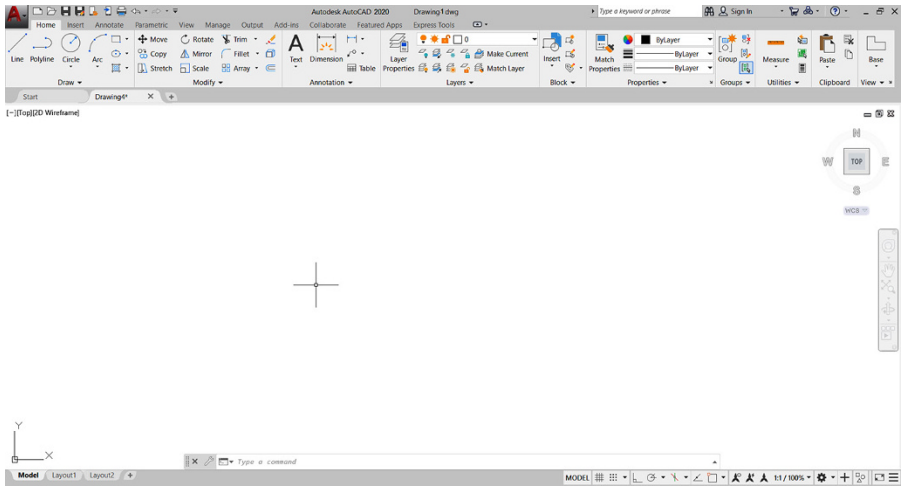

FIGURE 1-2: My AutoCAD, ready to draw!

Drawing in AutoCAD

AutoCAD offers a wide range of commands to create, modify, and annotate 2D designs. Don't feel as though you need to learn and master every one of the 1,300 or so commands and options that AutoCAD offers to be a proficient drafter; most veteran drafters probably use only 20 or so commands for most basic drafting tasks.

The following simple exercise introduces a few of the commonly used commands to establish the size of your drawing area as well as the commands for creating straight line segments and circles.

You can start a command by clicking its button in the Ribbon menu, across the top of the screen, or by entering the command's name in the *command line,* which is the light-gray text-entry area at the bottom of the screen that reads *Type a command*.

In this exercise and others in this book, AutoCAD's command line entries `look like this`, and you type the commands and responses shown in **bold**. Press Enter or the spacebar after each command or response that you type.


TIP

You don't even have to move the cursor to the command line. As you type, AutoCAD tries to guess which command you want and displays a list of possibilities at the command line, even if the cursor is in the Ribbon menu area. When you see the command you want, simply click it in the list.


WARNING

In the following exercise, don't add spaces on either side of a comma! In most situations, AutoCAD treats pressing the spacebar the same as pressing Enter, which makes keyboard entry fast and easy but messes things up if you do it at the wrong time. In addition, make sure you use a comma as the X,Y separator and the period (.) as the decimal delimiter, and don't use a thousands separator. Some parts of the world use the comma as the decimal separator and the space as the thousands delimiter, either of which confuses AutoCAD no end.

In this first exercise I ask you to do things without explaining why. Trust me; all will become clear in later chapters:

1. **Set up an appropriate size for the drawing:**

```
LIMITS
Reset Model space limits:
Specify lower left corner or [ON/OFF] <0.0000,0.0000>: 0,0
Specify upper right corner <12.0000,9.0000>: 60,40
```

Now type the letters **Z A** and press Enter. Note that there must be a space between the Z and the A.

2. **Disable Dynamic Input mode to work with the command line:**

```
DYNMODE
Enter new value for DYNMODE <3>: -3
```

3. **Draw the frame:**

```
Line
Specify first point: 26,12
Specify next point or [Undo]: 13,12
Specify next point or [Undo]: 22,24
Specify next point or [Undo]: 40.5,24
Specify next point or [Undo]: 41,22
Specify next point or [Undo]: 26,12
Specify next point or [Undo]: 20.6667,28
Specify next point or [Undo]: 25,28
Specify next point or [Undo]: Enter
```

4. **Draw a bit more:**

```
Line
Specify first point: 45,12
Specify next point or [Undo]: 42.87,14.53
Specify next point or [Undo]: 39.38,28.5
Specify next point or [Undo]: 35.3,30
Specify next point or [Undo]: Enter
```

5. **Draw a round thing:**

```
Circle
Specify center point for circle or [3P/2P/Ttr (tan tan
  radius)]: 13,12
Specify radius of circle or [Diameter]: 8
```

6. **Draw another round thing:**

```
Circle
Specify center point for circle or [3P/2P/Ttr (tan tan
  radius)]: 45,12
Specify radius of circle or [Diameter]: 8
```

Figure 1-3 shows the bicycle you've drawn, and you didn't even need training wheels!

It has been claimed that Line and Circle are the second- and third-most-used commands after UNDO. You should now SAVE your drawing as an historic artifact. That was easy, wasn't it?

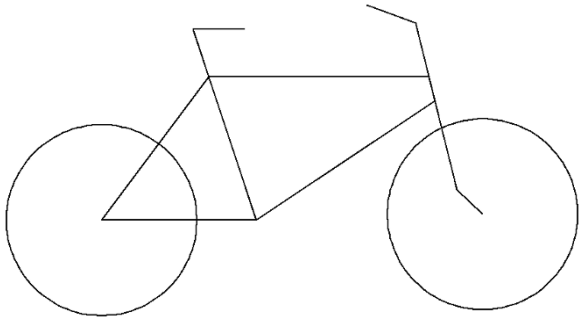

FIGURE 1-3: Your first AutoCAD drawing.

Understanding Pixels and Vectors

To use AutoCAD effectively (or even at all) you need to understand how an image is displayed on your computer screen, and how the image is stored when it is not being displayed.

- **An image on a computer screen is made up of pixels.** If you look closely at the screen with a strong magnifying glass, you'll see that the image is formed from a large number of small dots of light, as shown in Figure 1-4, called *pixels.* This has nothing to do with Tinker Bell, except that an onscreen image of her would indeed be made up of pixels.

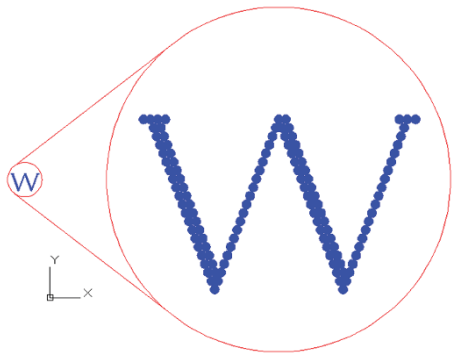

FIGURE 1-4: Pixels.

- **All programs that display a graphic image simply turn on or off suitable spots to build the picture.** This is a *raster* image. A straight line in a raster image is just a fortuitous alignment of appropriate dots, and after it's been created, it can't be edited as a single object.
- **A major difference between CAD programs and computer graphics programs (such as Microsoft Paint) lies in how they save the image to disk.** When the image from a Paint-type program is saved to disk, it's stored as a bitmap that simply lists the color of each pixel. What gets saved to disk is simply a snapshot of what you see onscreen.
- **All CAD programs work with and store on a vector file on disk.** A *vector file* is a big collection of numbers and words that list the type, size, and location of every entity in the drawing. When a CAD program displays your drawing