



AutoCAD[®] 2022 Advanced

***Learning Guide
Metric Units - 1st Edition***

ASCENT - Center for Technical Knowledge®
AutoCAD® 2022
Advanced
Metric Units - 1st Edition

Prepared and produced by:

ASCENT Center for Technical Knowledge
630 Peter Jefferson Parkway, Suite 175
Charlottesville, VA 22911

866-527-2368
www.ASCENTed.com

Lead Contributor: Renu Muthoo



ASCENT - Center for Technical Knowledge (a division of Rand Worldwide Inc.) is a leading developer of professional learning materials and knowledge products for engineering software applications. ASCENT specializes in designing targeted content that facilitates application-based learning with hands-on software experience. For over 25 years, ASCENT has helped users become more productive through tailored custom learning solutions.

We welcome any comments you may have regarding this guide, or any of our products. To contact us please email: feedback@ASCENTed.com.

© ASCENT - Center for Technical Knowledge, 2021

All rights reserved. No part of this guide may be reproduced in any form by any photographic, electronic, mechanical or other means or used in any information storage and retrieval system without the written permission of ASCENT, a division of Rand Worldwide, Inc.

The following are registered trademarks or trademarks of Autodesk, Inc., and/or its subsidiaries and/or affiliates in the USA and other countries: 123D, 3ds Max, ADSK, Alias, ATC, AutoCAD LT, AutoCAD, Autodesk, the Autodesk logo, Autodesk 123D, Autodesk Alias, Autodesk Docs, ArtCAM, Autodesk Forge, Autodesk Fusion, Autodesk Inventor, AutoSnap, BIM 360, Buzzsaw, CADmep, CAMduct, Civil 3D, Configurator 360, Dancing Baby (image), DWF, DWG, DWG (DWG logo), DWG Extreme, DWG TrueConvert, DWG TrueView, DWGX, DXF, Eagle, ESTmep, FBX, FeatureCAM, Flame, FormIt 360, Fusion 360, The Future of Making Things, Glue, Green Building Studio, InfraWorks, Instructables, Instructables (Instructables logo), Inventor, Inventor CAM, Inventor HSM, Inventor LT, Make Anything, Maya, Maya LT, Moldflow, MotionBuilder, Mudbox, Navisworks, Netfabb, Opticore, PartMaker, Pier 9, PowerInspect, PowerMill, PowerShape, Publisher 360, RasterDWG, RealDWG, ReCap, ReCap 360, Remake, Revit LT, Revit, Scaleform, Shotgun, Showcase, Showcase 360, SketchBook, Softimage, Tinkercad, TrustedDWG, VRED.

NASTRAN is a registered trademark of the National Aeronautics Space Administration.

All other brand names, product names, or trademarks belong to their respective holders.

General Disclaimer:

Notwithstanding any language to the contrary, nothing contained herein constitutes nor is intended to constitute an offer, inducement, promise, or contract of any kind. The data contained herein is for informational purposes only and is not represented to be error free. ASCENT, its agents and employees, expressly disclaim any liability for any damages, losses or other expenses arising in connection with the use of its materials or in connection with any failure of performance, error, omission even if ASCENT, or its representatives, are advised of the possibility of such damages, losses or other expenses. No consequential damages can be sought against ASCENT or Rand Worldwide, Inc. for the use of these materials by any third parties or for any direct or indirect result of that use.

The information contained herein is intended to be of general interest to you and is provided "as is", and it does not address the circumstances of any particular individual or entity. Nothing herein constitutes professional advice, nor does it constitute a comprehensive or complete statement of the issues discussed thereto. ASCENT does not warrant that the document or information will be error free or will meet any particular criteria of performance or quality. In particular (but without limitation) information may be rendered inaccurate by changes made to the subject of the materials (i.e. applicable software). Rand Worldwide, Inc. specifically disclaims any warranty, either expressed or implied, including the warranty of fitness for a particular purpose.



Contents

Preface	ix
In This Guide	xi
Practice Files	xiii
Chapter 1: Introduction	1-1
Practice 1a Introduction	1-2
Chapter 2: Advanced Text Objects	2-1
2.1 Annotation Scale Overview	2-2
Working with Annotative Styles	2-3
Viewing Annotative Objects at Different Scales	2-5
Annotation Scale and Model Space	2-7
Modifying Annotative Object Scales	2-7
Practice 2a Annotation Scale	2-10
2.2 Using Fields	2-14
Updating and Modifying Fields	2-16
Field Settings	2-16
Object Fields	2-17
Fields in Blocks	2-18
Fields in Attributes	2-18
Practice 2b Fields	2-20
Practice 2c Object Fields	2-22
2.3 Controlling the Draw Order	2-24
Draw Order	2-24
Draw Order of Hatching	2-25
Masking Annotation Objects	2-26
Adding a Wipeout	2-28
Practice 2d Controlling the Draw Order	2-30
Chapter Review Questions	2-33
Command Summary	2-34

Chapter 3: Working with Tables	3-1
3.1 Working with Linked Tables	3-2
Using the Data Link Manager.....	3-5
Updating Table Links	3-7
3.2 Creating Table Styles	3-9
Table Style Options.....	3-10
Cell Style Options.....	3-11
Practice 3a Working with Tables	3-14
Chapter Review Questions	3-19
Command Summary	3-20
Chapter 4: Projects - Advanced Annotation	4-1
Practice 4a Fields and Tables	4-2
Chapter 5: Dynamic Blocks	5-1
5.1 Working with Dynamic Blocks	5-2
Inserting Dynamic Blocks.....	5-3
Modifying Dynamic Blocks	5-4
Typical Dynamic Block Grips	5-5
Practice 5a Inserting and Modifying Dynamic Blocks	5-8
5.2 Creating Dynamic Block Definitions	5-12
5.3 Dynamic Block Authoring Tools	5-14
Block Editor Contextual Tab.....	5-15
Parameters.....	5-16
Actions	5-18
Parameter Sets	5-20
Constraints.....	5-21
Labeling Parameters	5-22
Testing the Block.....	5-23
Construction Geometry	5-23
Applying Constraints in Dynamic Blocks.....	5-24
Creating a Block Table.....	5-26
Practice 5b Creating Dynamic Block Definitions	5-30
Practice 5c Creating Dynamic Blocks with Constraints	5-34
5.4 Additional Visibility Options	5-45
Chapter Review Questions	5-46
Command Summary	5-48

Chapter 6: Attributes	6-1
6.1 Inserting Blocks with Attributes	6-2
What Are Attributes?	6-2
How Attribute Values Are Entered	6-2
Retain Attribute Display	6-3
6.2 Editing Attribute Values	6-5
Editing Attributes One at a Time	6-5
Editing Multiple Attribute Values	6-7
Practice 6a Inserting and Editing Attribute Values	6-9
6.3 Defining Attributes	6-13
Attribute Definition	6-14
Associating Attributes with Blocks	6-16
Practice 6b Defining Attributes	6-17
6.4 Redefining Blocks with Attributes	6-20
Updating Blocks with New Attributes	6-23
Practice 6c Redefining Blocks with Attributes	6-24
6.5 Extracting Attributes	6-27
Practice 6d Extracting Object Data to a Table	6-35
Chapter Review Questions	6-38
Command Summary	6-40
Chapter 7: Projects - Advanced Blocks and Attributes	7-1
Practice 7a Dynamic Block Practice - Desk Unit	7-2
Practice 7b Mechanical Attribute Project - Amplifier	7-6
Practice 7c Architectural Attribute Project - Door Schedule	7-10
Chapter 8: Output and Publishing	8-1
8.1 Output for Electronic Review	8-2
Plotting Electronic Files	8-3
Exporting DWF or PDF Files	8-4
8.2 Autodesk Design Review	8-8
Viewing Markups in AutoCAD	8-11
8.3 Publishing Drawing Sets	8-13
Practice 8a Reviewing and Publishing Drawing Sets	8-17
8.4 Shared Views	8-26
Shared Views Palette	8-26
Autodesk Viewer	8-28
Measure and Markup	8-30

Practice 8b Create Shared Views	8-33
Chapter Review Questions	8-41
Command Summary	8-43
Chapter 9: Other Tools for Collaboration	9-1
9.1 eTransmit	9-2
Transmittal Setups	9-4
Practice 9a eTransmit	9-8
9.2 Hyperlinks	9-10
Using a Hyperlink	9-12
Practice 9b Hyperlinks	9-13
9.3 Revision Clouds	9-15
Revcloud Properties	9-16
9.4 Compare Drawings	9-19
Compare Toolbar	9-20
Practice 9c Compare Drawings	9-22
Chapter Review Questions	9-25
Command Summary	9-26
Chapter 10: Introduction to Sheet Sets	10-1
10.1 Overview of Sheet Sets	10-2
Understanding the Sheet Set Manager	10-4
Practice 10a Overview of Sheet Sets	10-9
10.2 Creating Sheet Sets	10-12
Sheet Set Properties	10-15
10.3 Creating Sheets in Sheet Sets	10-17
Organizing Sheets in Subsets.....	10-19
10.4 Adding Views to Sheets	10-22
Sheet Views Tab	10-26
Practice 10b Introduction to Sheet Sets	10-29
10.5 Importing Layouts to Sheet Sets	10-37
Create a Sheet Set from Existing Layouts	10-37
Importing a Layout to a Sheet Set.....	10-40
Practice 10c Importing Layouts to Sheet Sets	10-42
Chapter Review Questions	10-45
Command Summary	10-47
Chapter 11: Publishing and Customizing Sheet Sets	11-1
11.1 Transmitting and Archiving Sheet Sets	11-2
Archiving Sheet Sets.....	11-3

11.2 Publishing Sheet Sets	11-4
Publish to DWFx	11-4
Control Plotting Output.....	11-6
Practice 11a Transmitting, Archiving, and Publishing Sheet Sets	11-7
11.3 Customizing Sheet Sets	11-11
Sheet Set Properties	11-12
Creating Custom Properties	11-14
11.4 Custom Blocks for Sheet Sets	11-15
Creating a Title Label Block	11-18
Creating a Callout Block.....	11-18
Practice 11b Customizing Sheet Sets	11-19
Chapter Review Questions	11-25
Command Summary	11-27
Chapter 12: Projects - Sheet Sets	12-1
Practice 12a Sheet Sets	12-2
Chapter 13: Managing Layers	13-1
13.1 Working in the Layer Properties Manager	13-2
Displaying Columns in the Layer Properties Manager	13-2
Layer Settings	13-5
Practice 13a Working in the Layer Properties Manager	13-10
13.2 Creating Layer Filters	13-14
Using the Filter Tree.....	13-14
Property Filters	13-16
Group Filters	13-18
13.3 Setting Layer States	13-20
Practice 13b Layer Filters and Layer States	13-25
Practice 13c Setting Up Layer States (Mechanical)	13-28
Chapter Review Questions	13-31
Command Summary	13-32
Chapter 14: CAD Standards	14-1
14.1 CAD Standards Concepts	14-2
Creating a Standards File	14-2
14.2 Configuring Standards	14-3
Plug-ins	14-4
CAD Standards Status Bar Icon.....	14-4
14.3 Checking Standards	14-5
CAD Standards Settings	14-6

Practice 14a Creating, Configuring, and Checking Standards	14-8
14.4 Layer Translator	14-13
Settings	14-14
Practice 14b Layer Translator	14-16
Chapter Review Questions	14-18
Command Summary	14-19
Chapter 15: System Setup	15-1
15.1 Options Dialog Box	15-2
Options	15-3
Practice 15a Options Dialog Box	15-7
15.2 System Variables	15-10
Some Common System Variables	15-11
System Variable Monitor	15-12
Practice 15b System Variables	15-15
15.3 Dynamic Input Settings	15-19
Practice 15c Dynamic Input Settings	15-23
15.4 Drawing Utilities	15-25
Renaming Named Objects	15-25
Drawing Recovery and Repair	15-26
Checking a Drawing's Status	15-28
Practice 15d Drawing Utilities	15-29
15.5 Managing Plotters	15-31
Add Plotter Wizard	15-31
Plotter Manager	15-32
Plotter Configuration Editor	15-33
Practice 15e Managing Plotters	15-34
15.6 Plot Styles	15-36
Concepts	15-36
Types of Plot Style Tables	15-37
Creating Plot Style Tables	15-38
Attaching Plot Style Tables to Layouts	15-39
Practice 15f Color Plot Styles	15-41
Practice 15g Named Plot Styles	15-43
Chapter Review Questions	15-46
Command Summary	15-48

Chapter 16: Introduction to Customization	16-1
16.1 Why Customize?	16-2
Customization Guidelines	16-2
What Can Be Customized?	16-3
16.2 Creating a Custom Workspace	16-4
Practice 16a Setting Up Workspaces	16-8
Chapter Review Questions	16-10
Command Summary	16-11
Chapter 17: Customizing the User Interface	17-1
17.1 Using the Customize User Interface (CUI) Dialog Box	17-2
Overview of the CUI Interface	17-4
17.2 Customizing the Ribbon	17-10
Customize User Interface Dialog Box	17-11
Ribbon Contextual Tabs	17-13
Ribbon Fold Panels	17-15
Ribbon Galleries	17-17
17.3 Customizing the Quick Access Toolbar	17-18
Multiple Quick Access Toolbars	17-18
17.4 Customizing Menus	17-21
Controlling Menus in Workspaces	17-22
Modifying Shortcut Menus	17-23
17.5 Keyboard Shortcuts	17-25
Mouse Buttons	17-26
Customizing Double-Click Actions	17-26
Practice 17a Customizing AutoCAD	17-30
Chapter Review Questions	17-38
Command Summary	17-40
Chapter 18: Macros and Custom Routines	18-1
18.1 Custom Commands and Macros	18-2
Creating a New Command	18-2
Command Macro	18-3
Special Characters Used in Macros	18-4
Button Image	18-5
Practice 18a Custom Command Macros	18-6
18.2 Running Scripts	18-9
Practice 18b Running Scripts	18-10
18.3 Action Recorder	18-12

18.4 Editing Action Macros	18-16
Working with the Action Macro Manager	18-16
Establishing a Base Point	18-18
Specifying Playback Values	18-20
Practice 18c Action Recorder	18-21
18.5 Loading Custom Routines	18-25
Loading Routines	18-26
APPLOAD Options	18-27
Secureload	18-28
Practice 18d Loading and Running an AutoLISP Routine	18-30
Chapter Review Questions	18-32
Command Summary	18-34
Appendix A: Cloud Collaboration and 2D Automation	A-1
A.1 Connecting to the Cloud	A-2
Stay Connected Menu	A-2
Autodesk Account Log In	A-3
Autodesk App Store	A-3
A.2 Share Drawings	A-4
Share Drawings	A-4
Autodesk AutoCAD Web App	A-6
AutoCAD Web App Interface	A-7
Settings	A-10
Open in Desktop	A-11
Practice A1 Shared Drawings	A-12
A.3 Trace	A-21
Trace Mode	A-22
Practice A2 Create Trace in Share Drawing	A-25
A.4 Save to Web and Mobile	A-34
Open on a Mobile Device	A-35
Navigate the Model on a Mobile App	A-38
A.5 Rendering in the Cloud	A-39
Practice A3 Working in the Cloud	A-40
A.6 Attach Navisworks Files	A-45
Coordination Model Contextual Tab	A-48
Practice A4 Attach a Navisworks File	A-49
Chapter Review Questions	A-52
Command Summary	A-54
Appendix B: Skills Assessment	B-1
Index	Index-1



Preface

The *AutoCAD® 2022: Advanced* guide is designed for those using AutoCAD® 2022 with a Windows operating system. This guide is not designed for the AutoCAD for Mac software.

The *AutoCAD 2022: Advanced* guide introduces advanced techniques and teaches you to be proficient in your use of the AutoCAD software. This is done by teaching you how to recognize the best tool for the task, the best way to use that tool, and how to create new tools to accomplish tasks more efficiently.

Topics Covered

- Advanced text objects
- Working with tables
- Defining dynamic blocks and attributes
- Outputting and publishing files for review
- Collaboration and automation tools
- Creating, publishing, and customizing sheet sets
- Managing layers
- CAD management and system setup
- Enhancing productivity by customizing the AutoCAD interface
- Using macros and custom routines

Prerequisites

- Access to the 2022.0 version of the software, to ensure compatibility with this guide. Future software updates that are released by Autodesk may include changes that are not reflected in this guide. The practices and files included with this guide might not be compatible with prior versions (e.g., 2021).
- Completion of the *AutoCAD® 2022: Fundamentals* guide, or equivalent experience using the AutoCAD software.

Note on Software Setup

This guide assumes a standard installation of the software using the default preferences during installation. Lectures and practices use the standard software templates and default options for the Content Libraries.

Students and Educators Can Access Free Autodesk Software and Resources

Autodesk challenges you to get started with free educational licenses for professional software and creativity apps used by millions of architects, engineers, designers, and hobbyists today. Bring Autodesk software into your classroom, studio, or workshop to learn, teach, and explore real-world design challenges the way professionals do.

Get started today - register at the Autodesk Education Community and download one of the many Autodesk software applications available.

Visit www.autodesk.com/education/home/

Note: Free products are subject to the terms and conditions of the end-user license and services agreement that accompanies the software. The software is for personal use for education purposes and is not intended for classroom or lab use.

Lead Contributor: Renu Muthoo

Renu uses her instructional design training to develop courseware for AutoCAD and AutoCAD vertical products, Autodesk 3ds Max, Autodesk Showcase and various other Autodesk software products. She has worked with Autodesk products for the past 20 years with a main focus on design visualization software.

Renu holds a bachelor's degree in Computer Engineering and started her career as a Instructional Designer/Author where she co-authored a number of Autodesk 3ds Max and AutoCAD books, some of which were translated into other languages for a wide audience reach. In her next role as a Technical Specialist at a 3D visualization company, Renu used 3ds Max in real-world scenarios on a daily basis. There, she developed customized 3D web planner solutions to create specialized 3D models with photorealistic texturing and lighting to produce high quality renderings.

Renu Muthoo has been a Lead Contributor for *AutoCAD: Advanced* since 2016.



In This Guide

The following highlights the key features of this guide.

Feature	Description
Practice Files	The Practice Files page includes a link to the practice files and instructions on how to download and install them. The practice files are required to complete the practices in this guide.
Chapters	<p>A chapter consists of the following - Learning Objectives, Instructional Content, Practices, Chapter Review Questions, and Command Summary.</p> <ul style="list-style-type: none">• Learning Objectives define the skills you can acquire by learning the content provided in the chapter.• Instructional Content, which begins right after Learning Objectives, refers to the descriptive and procedural information related to various topics. Each main topic introduces a product feature, discusses various aspects of that feature, and provides step-by-step procedures on how to use that feature. Where relevant, examples, figures, helpful hints, and notes are provided.• Practice for a topic follows the instructional content. Practices enable you to use the software to perform a hands-on review of a topic. It is required that you download the practice files (using the link found on the Practice Files page) prior to starting the first practice.• Chapter Review Questions, located close to the end of a chapter, enable you to test your knowledge of the key concepts discussed in the chapter.• Command Summary concludes a chapter. It contains a list of the software commands that are used throughout the chapter and provides information on where the command can be found in the software.
Appendices	Appendices provide additional information to the main course content. It could be in the form of instructional content, practices, tables, projects, or skills assessment.

Sample provided by ASCENT for review only
All copying and reuse strictly forbidden.

Introduction

Learn how to use the AutoCAD® software by completing a practice that will help you familiarize yourself with the structure of the practices available in this training guide, and learn the concepts that you are expected to know.

Learning Objective in This Chapter

- Review the use of the AutoCAD software by drawing, editing, and dimensioning a cross-section.

Practice 1a

Introduction

Practice Objective

- Review the use of the AutoCAD software by drawing, editing, and dimensioning a cross-section.

In this practice, you will draw, edit, and dimension a simple cross-section using a variety of tools (such as drawing aids and shortcut menu options), as shown in Figure 1–1. The purpose of this practice is to familiarize you with the style of the practices in this training guide and to review how to use the AutoCAD software.

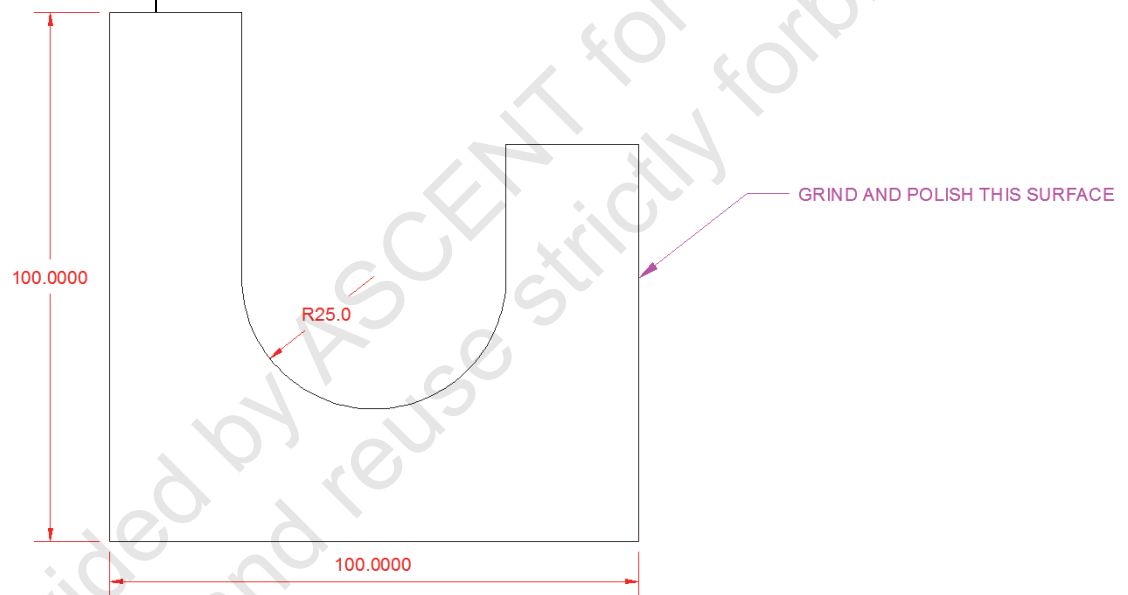






Figure 1–1

If  *Object Snap* is not displayed in the Status Bar, expand  (Customization) and select **2D Object Snap**.

- Open **Cross Section-M.dwg** from the practice files folder.
- In the Status Bar, expand  (Object Snap) and select only **Endpoint** and toggle **Object Snap On**.
- Start the **Polyline** command. Use the **Endpoint** object snap to pick the left endpoint of the top right horizontal line.
- Toggle  (Polar Tracking) on if it is not already done.
- Move the cursor straight down, type **25**, and press <Enter>.
- Right-click in the drawing window and select **Arc**. Move the crosshair horizontally to the left, type **50**, and press <Enter> to select a point 50 units to the left.

7. Right-click in the drawing window and select **Line**. Draw a polyline segment straight up and pick the right endpoint of the top left horizontal line.
8. Right-click and select **Enter** to end the command.
9. Without starting another command, select the new polyline object that you just created to display the grips.
10. Right-click, expand **Polyline**, and select **Edit Polyline**. Select the **Join** option. Select all of the other lines in the drawing and press <Enter>. Press <Enter> again or press <Esc> to end the command. Note that the polyline and all the other lines are converted into a single object.
11. Select the polyline object (single object), the leader, and the Mtext note. Right-click and select **Move**. Move the objects **75 units** to the right.
12. In the ribbon, in the *Annotate* tab>Dimensions panel, expand the Layer Control and select the layer **Dimensions**.
13. Create a linear dimension on the bottom of the object and a radius dimension on the arc, as shown in Figure 1–1. When you are done dimensioning, press <Esc> to end the dimension command.
14. Select only the linear dimension, hover the cursor over the dimension grip for the dimension text and select **Above Dim Line** from the multifunctional grip list. The text moves above the line. Press <Esc> to exit the dimension.
15. Select the radius dimension, right-click and change the *Precision* to **0.0**. The text changes to **R25.0**.
16. Add a linear dimension to the left vertical line.
17. Double-click on the magenta text and modify it to say **GRIND AND POLISH THIS SURFACE**.
18. Open the Layer Properties Manager. Select the layer **Object** and set it to be active if it is not already active.
19. Right-click in the Layer Properties Manager and select **Select All but Current**. Freeze the selected layers and close the Layer Properties Manager. Only the PLine object displays in the drawing window without any dimensions or text.
20. Save and close the drawing.