

AutoCAD[®] 2023 INSTRUCTOR

James A. Leach
Shawna Lockhart



Better Textbooks. Lower Prices.
www.SDCpublications.com



ACCESS CODE
UNIQUE CODE INSIDE

Visit the following websites to learn more about this book:



[amazon.com](https://www.amazon.com)

[Google books](https://books.google.com)

[BARNES & NOBLE](https://www.barnesandnoble.com)

Table of Contents

CHAPTER 1 GETTING STARTED.....	1	AUTOCAD FILE COMMANDS	31
CONCEPTS.....	2	<i>Qnew</i>	32
Coordinate Systems	2	<i>Open</i>	33
The CAD Database	3	<i>Save</i>	35
Angles in AutoCAD.....	3	<i>Qsave</i>	35
Draw True Size	3	<i>Saveas</i>	35
Plot to Scale	5	<i>Close</i>	37
STARTING AUTOCAD.....	5	<i>Closeall</i>	37
THE AutoCAD DRAWING EDITOR.....	6	<i>Closeallother</i>	37
Beginning a Drawing	6	<i>Exit</i>	37
Drafting & Annotation Workspace	7	<i>Quit</i>	38
Command Entry Using the Keyboard.....	11	<i>Partialopen</i>	38
Accelerator Keys (Control Key Sequences) ..	12	<i>Partiaload</i>	39
Special Key Functions	12	<i>Recover</i>	40
Mouse Buttons	12	<i>Dwgprops</i>	40
COMMAND ENTRY.....	12	<i>SAVETIME</i>	41
Methods for Entering Commands.....	12	AutoCAD Backup Files	42
Understanding the “Command Tables”		Drawing Recovery	42
in this Book	13	AutoCAD Drawing File Management.....	43
Command Entry Methods Practice.....	13	Using Other File Formats	43
<i>Line</i>	13		
DRAWING AIDS.....	15	CHAPTER 3 DRAW COMMAND CONCEPTS ..	45
Status Bar.....	15	AutoCAD OBJECTS	46
Function Keys.....	20	LOCATING THE DRAW COMMANDS	46
AutoCAD Text Window.....	20	COORDINATE ENTRY	48
Model Space and Layouts	21	Coordinate Formats and Types	48
CUSTOMIZING THE AUTOCAD SCREEN	22	Coordinate Formats.....	48
Toolbars.....	22	Coordinate Types	48
Ribbon.....	23	Typical Combinations	48
Clean Screen.....	24	Three Methods of Coordinate Input.....	48
Multiple Drawings	24	Mouse Input.....	49
Options	25	Dynamic Input	49
CHAPTER 2 WORKING WITH FILES.....	27	Command Line Input.....	50
AutoCAD DRAWING FILES	28	PRACTICE USING THE THREE	
Naming Drawing Files	28	COORDINATE INPUT METHODS.....	50
Beginning and Saving a Drawing	28	<i>Line</i>	50
Accessing File Commands.....	28	Using Mouse Input to Draw Lines and Circles ..	51
File Navigation Dialog Box Functions.....	29	<i>Circle</i>	51
Windows Right-Click Shortcut Menus	30	Using <i>Dynamic Input</i> to Draw Lines and Circles ..	53
<i>New</i>	31	Using Command Line Input to Draw Lines	
		and Circles	55
		Direct Distance Entry and Angle Override.....	57
		<i>Dynamic Input</i> Settings	57

<i>POLAR TRACKING AND POLAR SNAP</i>	58	Table of Basic Settings for the ACADISO (Metric) Templates.....	96
Polar Tracking	58	SETUP COMMANDS	97
<i>Polar Tracking</i> with Direct Distance Entry	59	<i>Units</i>	97
<i>Polar Tracking</i> Override	60	Keyboard Input of <i>Units</i> Values	98
Polar Snap.....	60	<i>Limits</i>	99
DRAWING LINES USING <i>POLAR TRACKING</i> ..	61	<i>Snap</i>	101
Using <i>Polar Tracking</i> and <i>Grid Snap</i>	61	<i>Grid</i>	103
Using <i>Polar Tracking</i> and <i>Dynamic Input</i>	62	Using <i>Snap</i> and <i>Grid</i>	104
Using <i>Polar Tracking</i> , <i>Polar Snap</i> , and <i>Dynamic Input</i>	63	<i>Dsettings</i>	104
CHAPTER 4 SELECTION SETS	69	INTRODUCTION TO LAYOUTS AND PRINTING	105
MODIFY COMMAND CONCEPTS.....	70	<i>Model</i> Tab and <i>Layout</i> Tabs	105
SELECTION SETS.....	70	Why Set Up Layouts Before Drawing?	108
Selection Set Options.....	71	Printing and Plotting	108
Selection Cycling.....	76	Setting Layout Options and Plot Options.....	109
Select	76	CHAPTER 7 OBJECT SNAP & OBJECT SNAP TRACKING	113
NOUN/VERB SYNTAX	77	CAD ACCURACY	114
SELECTION SETS PRACTICE.....	77	OBJECT SNAP.....	114
Using <i>Erase</i>	78	OBJECT SNAP MODES	115
<i>Erase</i>	78	Acquisition Object Snap Modes	118
Using <i>Move</i>	79	Object Snap Modifiers	120
<i>Move</i>	79	OBJECT SNAP SINGLE POINT SELECTION ..	121
Using <i>Copy</i>	80	Object Snaps (Single Point)	121
<i>Copy</i>	80	OBJECT SNAP RUNNING MODE	123
Noun/Verb Command Syntax Practice	82	Running Object Snap Modes	123
CHAPTER 5 HELPFUL COMMANDS	85	<i>Osnap</i>	123
CONCEPTS.....	86	Running Object Snap Toggle	124
<i>Help</i>	86	Running Object Snap Override	124
<i>Oops</i>	88	Object Snap Options	124
<i>U</i>	88	OBJECT SNAP TRACKING	127
<i>Undo</i>	88	To Use Object Snap Tracking:.....	128
<i>Redo</i>	90	Object Snap Tracking with Polar Tracking.....	128
<i>Mredo</i>	90	Object Snap Tracking Settings.....	130
<i>Regen</i>	91	CHAPTER 8 DRAW COMMANDS I	137
CHAPTER 6 BASIC DRAWING SETUP	93	CONCEPTS.....	138
STEPS FOR BASIC DRAWING SETUP	94	Draw Commands—Simple and Complex	138
STARTUP OPTIONS	94	Draw Command Access	138
DRAWING TEMPLATES.....	95	COMMANDS	139
Table of Basic Settings for the ACAD (Inch) Templates.....	96	<i>Line</i>	139
		<i>Circle</i>	140

<i>Arc</i>	142	<i>Viewres</i>	210
Use Arcs or Circles?.....	146	<i>Ucsicon</i>	211
<i>Point</i>	147	<i>Viewgo</i>	212
<i>Ptype</i>	147	<i>Qvdrawing</i>	212
<i>Pline</i>	148	<i>Vports</i>	213
<i>Pline Arc Segments</i>	150		
CHAPTER 9 MODIFY COMMANDS I.....	155	CHAPTER 11 LAYERS AND	
CONCEPTS.....	156	OBJECT PROPERTIES	219
COMMANDS	157	CONCEPTS.....	220
<i>Erase</i>	157	Assigning Colors, Linetypes, Lineweights, and Transparency.....	220
<i>Move</i>	158	Object Properties	221
<i>Rotate</i>	159	Plot Styles	221
<i>Scale</i>	161	LAYERS AND LAYER PROPERTIES CONTROLS ..	222
<i>Stretch</i>	162	Layer Drop-Down List.....	222
<i>Lengthen</i>	163	<i>Layer</i>	222
<i>Trim</i>	165	<i>Layer Properties Manager</i> Layer List	223
<i>Extend</i>	168	<i>Color, Linetype, Lineweight,</i> <i>and Other Properties</i>	225
<i>Trim and Extend</i> Shift-Select Option	169	Layer Filters.....	227
<i>Break</i>	169	Displaying an Object's Properties and Visibility Settings	229
<i>Join</i>	171	<i>Laymcur</i>	230
<i>Copy</i>	172	<i>Layerp</i>	230
<i>Mirror</i>	173	<i>Layerstate</i>	230
<i>Offset</i>	174	OBJECT-SPECIFIC PROPERTIES CONTROLS ..	233
<i>Array</i>	176	<i>Linetype</i>	233
<i>Arrayrect</i>	177	Linetype Drop-Down List	235
Creating and Editing Arrays Using Grips.....	178	<i>Lweight</i>	235
<i>Arraypolar</i>	178	Lineweight Drop-Down List.....	236
<i>Arraypath</i>	181	<i>Color</i>	237
<i>Fillet</i>	183	Color Drop-Down List	238
<i>Chamfer</i>	185	<i>True Color</i> and <i>Color Books</i>	238
CHAPTER 10 VIEWING COMMANDS	199	<i>Setbylayer</i>	239
CONCEPTS.....	200	CONTROLLING LINETYPE SCALE	240
ZOOM AND PAN WITH THE MOUSE WHEEL ..	201	<i>LTSCALE</i>	240
<i>Zoom and Pan</i>	201	<i>CELTSCALE</i>	241
<i>Zoom</i> with the Mouse Wheel.....	201	CHANGING OBJECT PROPERTIES	242
<i>Pan</i> with the Mouse Wheel.....	202	<i>Properties</i> Panel.....	242
<i>Zoom</i>	203	<i>Properties</i>	243
<i>Pan</i>	207	<i>Matchprop</i>	243
<i>Zoom and Pan</i> with <i>Undo</i> and <i>Redo</i>	208	<i>Laymch</i>	244
<i>Viewback</i>	208	<i>Laycur</i>	245
<i>Viewforward</i>	208	<i>Layiso</i>	245
<i>View</i>	208		

<i>Layuniso</i>	247	Linetype Scale in Viewports— <i>PSLTSCALE</i>	295
<i>Copytolayer</i>	247	<i>Vpmax</i>	296
<i>Laywalk</i>	248	<i>Vpmin</i>	297
<i>Layfrz</i>	251	<i>Scalelistedit</i>	297
<i>Laythw</i>	252	<i>Chspace</i>	298
<i>Layoff</i>	252	Advanced Applications of Paper Space Viewports	299
<i>Layon</i>	252	CHAPTER 14 PRINTING AND PLOTTING	309
<i>Laylck</i>	253	CONCEPTS.....	310
<i>Layulk</i>	253	TYPICAL STEPS TO PLOTTING	310
<i>Layvpi</i>	253	PRINTING, PLOTTING, AND SAVING PAGE SETUPS	311
<i>Laymrg</i>	254	<i>Plot</i>	311
<i>Laydel</i>	255	<i>-Plot</i>	316
CHAPTER 12 ADVANCED DRAWING SETUP	261	<i>Viewplotdetails</i>	316
CONCEPTS.....	262	<i>Pagesetup</i>	317
STEPS FOR DRAWING SETUP	262	<i>Plot</i> Dialog Box or <i>Page Setup Manager?</i>	319
USING AND CREATING TEMPLATE DRAWINGS	266	PLOTTING TO SCALE	320
Using Template Drawings	266	<i>Preview</i>	320
Table of Standard AutoCAD Templates	267	Standard Paper Sizes.....	321
Creating Template Drawings.....	268	Calculating the Drawing Scale Factor.....	321
Additional Advanced Drawing Setup Concepts ..	269	Guidelines for Plotting Model Space to Scale..	322
Steps for Drawing Setup Using Annotative Objects	269	Guidelines for Plotting Layouts to Scale	322
CHAPTER 13 LAYOUTS AND VIEWPORTS	273	TABLES OF <i>LIMITS</i> SETTINGS.....	323
CONCEPTS.....	274	Examples for Plotting to Scale.....	329
Paper Space and Model Space.....	274	CONFIGURING PLOTTERS AND PRINTERS	330
Layouts	274	Plotting Components	330
Viewports.....	275	<i>Plottermanager</i>	330
Layouts and Viewports Example	277	Add-A-Plotter Wizard.....	331
Guidelines for Using Layouts and Viewports ..	280	Plotter Configuration Editor	332
<i>Layoutwizard</i>	281	CHAPTER 15 DRAW COMMANDS II	337
<i>Layout</i>	283	CONCEPTS.....	338
Inserting Layouts with AutoCAD DesignCenter..	285	COMMANDS	338
Setting Up the Layout	285	<i>Xline</i>	338
<i>Options</i>	286	<i>Ray</i>	340
<i>Pagesetup</i>	287	<i>Polygon</i>	341
<i>Psetupin</i>	288	<i>Rectang</i>	342
USING VIEWPORTS IN PAPER SPACE	289	<i>Donut</i>	343
<i>Vports</i>	289	<i>Spline</i>	344
<i>Qvlayout</i>	292	<i>Ellipse</i>	346
Scaling the Display of Viewport Geometry ...	293	<i>Divide</i>	348
Locking Viewport Geometry	295	<i>Measure</i>	349

<i>Mline</i>	350	CHAPTER 17 INQUIRY COMMANDS	407
<i>Multiline Style</i> Dialog Box.....	352	CONCEPTS.....	408
<i>Mlstyle</i>	352	COMMANDS	408
<i>Multiline Style</i> Dialog Box.....	353	<i>Status</i>	408
<i>Multiline Styles</i> Example	354	<i>List</i>	409
Editing Multilines	355	<i>Measuregeom</i>	410
<i>Sketch</i>	355	<i>Id</i>	413
<i>Solid</i>	357	<i>Time</i>	413
<i>Boundary</i>	357	<i>Setvar</i>	414
<i>Region</i>	358	<i>Sysvarmonitor</i>	415
<i>Wipeout</i>	360	<i>Massprop</i>	416
<i>Revcloud</i>	360	CHAPTER 18 TEXT AND TABLES	419
CHAPTER 16 MODIFY COMMANDS II	367	CONCEPTS.....	420
CONCEPTS.....	368	TEXT CREATION COMMANDS.....	422
COMMANDS	368	<i>Text</i>	422
Considerations for Changing		<i>Mtext</i>	425
Basic Properties of Objects.....	369	Bullets and Lists	432
<i>Properties</i>	370	Creating Stacked Text.....	432
<i>Dbclckedit</i>	373	Creating Columns.....	433
<i>Matchprop</i>	374	Calculating Text Height for Scaled Drawings..	434
Object Properties Drop-Down Lists.....	375	<i>Spacetrans</i>	435
Quick Properties.....	376	<i>Txt2mtxt</i>	436
<i>Chprop</i>	376	<i>Style</i>	437
<i>Change</i>	376	Annotative Text	440
<i>Explode</i>	377	Importing External Text into AutoCAD	443
<i>Align</i>	378	Using an External Text Editor for <i>Multiline Text</i> ..	443
<i>Pedit</i>	379	Format Codes for Creating <i>Multiline</i> Text	
Vertex Editing	382	in External Text Editors.....	444
Editing <i>Plines</i> with Grips.....	384	<i>Textedit</i>	446
Editing <i>Spline Fit</i> Data Points.....	385	<i>Mtextedit</i>	446
<i>Splinedit</i>	385	<i>Properties</i>	446
Editing <i>Spline Control</i> Vertices.....	387	<i>Spell</i>	447
Editing <i>Splines</i> with Grips.....	388	<i>Find</i>	448
<i>Reverse</i>	389	<i>Find/Replace</i> in the <i>Text Editor</i> tab.....	450
<i>Blend</i>	389	<i>Scaletext</i>	450
<i>Arrayedit</i>	390	<i>Justifytext</i>	452
<i>Mledit</i>	392	<i>Qtext</i>	453
<i>Overkill</i>	396	TEXTFILL	454
Boolean Commands.....	397	Substituting Fonts.....	454
<i>Union</i>	398	TEXT FIELDS AND TABLES	455
<i>Subtract</i>	398	Text Fields	455
<i>Intersect</i>	399	<i>Field</i>	456
Modifying <i>Revclouds</i>	400	Creating and Editing Tables.....	457

<i>Updatefield</i>	457	<i>Groupedit</i>	503
<i>Table</i>	458	<i>Ungroup</i>	503
<i>Tablestyle</i>	459	Group Examples.....	504
The <i>Table Cell</i> Editor	461	<i>Classicgroup</i>	505
<i>Tabledit</i>	461	Changing Properties of a Group	507
Editing Tables with Grips	463		
Editing Tables with the <i>Properties</i> Palette	463	CHAPTER 21 BLOCKS, DESIGNCENTER, AND TOOL PALETTES	513
Importing and Exporting Tables.....	464	CONCEPTS.....	514
Table Breaks.....	465	COMMANDS	516
Text Fields and Calculations in Tables.....	465	<i>Block</i>	516
Text Attributes.....	468	<i>Block Color, Linetype, and Lineweight</i> Settings ..	517
CHAPTER 19 GRIP EDITING.....	475	<i>Insert</i>	518
CONCEPTS.....	476	<i>-Insert</i>	519
GRIPS FEATURES.....	476	<i>Minsert</i>	520
Activating Grips on Objects	477	<i>-Insert with *</i>	521
Cold and Hot Grips.....	477	<i>Explode</i>	521
GRIPS System Variable Settings	478	<i>Xplode</i>	522
Grips Menus	478	<i>Wblock</i>	523
Grip Editing Options	479	Redefining Blocks and the Block Editor.....	525
Shift to Turn on <i>Ortho</i>	481	<i>Base</i>	525
Auxiliary Grid	481	<i>Bedit</i>	526
Editing Dimensions.....	481	<i>Blocks</i> Search Path	528
Multifunctional Grips.....	482	<i>Purge</i>	528
GUIDELINES FOR USING GRIPS.....	482	<i>Rename</i>	530
GRIPS SETTINGS	483	<i>Setbylayer</i>	531
Point Specification Precedence.....	484	<i>Adcenter</i>	532
More Grips.....	485	DesignCenter Options	533
CHAPTER 20 ADVANCED SELECTION SETS ...	489	To Open a Drawing from DesignCenter.....	537
CONCEPTS.....	490	To <i>Insert</i> a <i>Block</i> Using DesignCenter.....	538
SELECTION SET VARIABLES.....	490	TOOL PALETTES.....	540
Changing the Settings	490	<i>Toolpalettes</i>	540
<i>Options</i>	491	Creating and Managing Tool Palettes.....	542
OBJECT SELECTION TOOLS AND FILTERS ..	493	COUNTING BLOCKS.....	544
<i>Selall</i>	493	<i>Count</i>	544
<i>Selectsimilar</i>	493		
<i>Hideobjects</i>	494	CHAPTER 22 BLOCK ATTRIBUTES AND DATA LINKS	553
<i>Unisolateobjects</i>	495	CONCEPTS.....	554
<i>Isolateobjects</i>	495	CREATING ATTRIBUTES	554
<i>Qselect</i>	495	Steps for Creating and Inserting Block Attributes	554
<i>Filter</i>	498	<i>Attdef</i>	555
OBJECT GROUPS.....	501	Saving the Attributed Block	559
<i>Group</i>	502		

<i>Inserting Attributed Blocks</i>	559	Creating .DWF and .PDF Files with ePlot and Export	603
The <i>ATTDIA</i> Variable	560	<i>Exportpdf</i>	604
The <i>ATTREQ</i> Variable	560	<i>Exportdwf</i>	605
DISPLAYING AND EDITING ATTRIBUTES	560	ePlot Options.....	606
<i>Attdisp</i>	560	Creating .DWF and .PDF Files with <i>Publish</i>	606
<i>Attedit</i>	561	<i>Publish</i>	606
Multiple <i>Attedit</i>	562	IMPORTING .PDF FILES	609
<i>Eattedit</i>	562	<i>Import</i>	609
<i>Properties</i>	563	<i>Pdfimport</i>	612
<i>Find</i>	564	Importing SHX Fonts from .PDF Files	613
<i>-Attedit</i>	565	<i>PDFSHXTEXT</i>	613
Global and Individual Editing Example	567	Suggested Steps for Scaling and Importing .PDF Files	614
<i>Battman</i>	571	Considerations for Importing and Exporting .PDF Files	615
<i>Attredef</i>	573	VIEWING .DWF AND .PDF FILES	616
<i>Refedit, Properties, and Refclose</i>	574	Autodesk Design Review	616
The Block Editor	575	<i>DWF Underlay and PDF Underlay</i> in AutoCAD ..	618
Grip Editing Attribute Location.....	576	<i>Attach</i>	618
EXTRACTING ATTRIBUTES.....	576	<i>Dwfclip</i>	620
<i>Attsync</i>	576	To Detach a DWF or PDF Underlay	621
<i>Eattext</i>	577	Viewing URLs (Hyperlinks) in a DWF Image..	621
Updating Attribute Data	581	<i>Dwflayers</i>	621
<i>Datalink</i>	582	COLLABORATING AND MARKUP TOOLS.....	622
Data Link Examples	583	The Markup Tools	622
<i>Datalinkupdate</i>	585	The Markup Process	622
CHAPTER 23 INTERNET TOOLS AND COLLABORATION.....	591	Shared Views	623
CONCEPTS.....	592	<i>Shareview</i>	623
<i>Browser</i>	593	Marking Up a Shared View.....	626
Autodesk App Store (formerly Autodesk Exchange)	594	Making Markup in Autodesk Design Review ..	628
<i>Inetlocation</i>	594	Markups from Autodesk Design Review.....	629
USING HYPERLINKS	596	<i>Opendwfm Markup</i>	629
<i>Open from/Save to Web & Mobile</i>	596	<i>Markup</i>	629
<i>Hyperlink</i>	596	<i>Share</i>	630
HYPERLINKBASE	598	DRAWING COMPARE.....	631
<i>Selecturl</i>	598	<i>Trace</i>	631
Transmitting Drawings	599	<i>Compare</i>	631
<i>Etransmit</i>	599	DRAWING HISTORY	632
Transmittal Setups.....	600	<i>DWGHISTORY</i>	632
<i>Modify Transmittal Setup</i> Dialog Box	600		
CREATING .DWF AND .PDF FILES.....	602		
Raster Files and Vector Files.....	603		

CHAPTER 24 MULTIVIEW DRAWING	637	CHAPTER 26 SECTION VIEWS	675
CONCEPTS.....	638	CONCEPTS.....	679
PROJECTION AND ALIGNMENT OF VIEWS	638	DEFINING HATCH PATTERNS AND HATCH	
Using <i>Ortho</i> and <i>Object Snap</i>		BOUNDARIES	679
to Draw Projection Lines	638	Steps for Creating a Section View Using the	
Using <i>Polar Tracking</i> to Draw Projection Lines...	639	<i>Hatch</i> Command	680
Using <i>Object Snap Tracking</i> to Draw Projection		<i>Hatch</i>	681
Lines Aligned with <i>Object Snap</i> Points....	640	<i>Pattern</i> Panel.....	682
Using <i>Xline</i> and <i>Ray</i> for Construction Lines	642	<i>Properties</i> Panel.....	683
Using <i>Offset</i> for Construction of Views	642	<i>Boundaries</i> Panel (Selecting the Hatch Area)..	684
Realignment of Views Using <i>Polar Snap</i> and		<i>Origin</i> Panel.....	686
<i>Polar Tracking</i>	643	<i>Options</i> Panel.....	686
USING CONSTRUCTION LAYERS	643	<i>Hatch and Gradient</i> Dialog Box	688
USING LINETYPES	644	<i>Gradient</i> Hatches	689
Drawing With Hidden and Center Linetypes..	645	- <i>Hatch</i> Command Line Options	690
Managing Linetypes, Lineweights, and Colors ..	646	Creating Tool Palettes.....	694
ASSOCIATIVE CENTERLINES & CENTERMARKS..	648	<i>Toolpalettes</i>	694
Drawing Associative Centerlines		EDITING HATCH PATTERNS & BOUNDARIES..	696
and Centermarks.....	648	<i>Hatchedit</i>	696
<i>Centerline</i>	648	Using Grips with	
<i>Centermark</i>	649	Hatch Patterns.....	697
Modifying <i>Centerlines</i> and <i>Centermarks</i>	650	Using <i>Trim</i> with Hatch Patterns	697
Grips.....	650	Object Selection Features of Hatch Patterns ..	697
<i>Properties</i>	651	Solid <i>Hatch</i> Fills.....	698
<i>Centerdisassociate</i>	652	<i>Draworder</i>	699
<i>Centerreassociate</i>	652	<i>Texttofront</i>	699
<i>Centermark</i> and <i>Centerline</i> System Variables..	653		
<i>Centerreset</i>	653	CHAPTER 27 AUXILIARY VIEWS	706
CREATING FILLETS, ROUNDS, AND RUNOUTS ..	655	CONCEPTS.....	707
GUIDELINES FOR CREATING A TYPICAL		CONSTRUCTING AN AUXILIARY VIEW	707
THREE-VIEW DRAWING	657	Setting Up the Principal Views	707
CHAPTER 25 PICTORIAL DRAWINGS	665	Using <i>Snap Rotate</i> and <i>Ortho</i>	708
CONCEPTS.....	666	Rotating <i>Snap</i> Back to the Original Position ..	709
Types of Pictorial Drawings	666	Using <i>Polar Tracking</i>	711
Pictorial Drawings Are 2D Drawings.....	667	Using the <i>Offset</i> Command	712
ISOMETRIC DRAWING IN AUTOCAD	668	<i>Offset</i>	713
<i>Snap</i>	668	Using the <i>Xline</i> and <i>Ray</i> Commands.....	714
Isometric Ellipses	670	<i>Xline</i>	714
<i>Ellipse</i>	670	<i>Ray</i>	714
Creating an Isometric Drawing	672	Constructing Full Auxiliary Views	715
Dimensioning Isometric Drawings in AutoCAD..	674	Reorienting the User Coordinate System.....	716
OBLIQUE DRAWING IN AUTOCAD.....	674		
Isometric Drawing.....	676		
Oblique Drawing	678		

CHAPTER 28 DIMENSIONING	720	<i>Dimtedit</i>	769
CONCEPTS.....	721	<i>Dimedit</i>	770
Dimension Components	721	<i>Properties</i>	771
Dimension Placement	721	Customizing Dimensioning Text.....	772
Associativity.....	722	Associative Dimensions.....	773
Accessing Dimension Commands	722	<i>Dimreassociate</i>	775
DIMENSION DRAWING COMMANDS.....	723	<i>Dimdisassociate</i>	776
<i>Dim</i>	723	DIMENSIONING VARIABLES INTRODUCTION ...	777
<i>Dimlinear</i>	723	<i>Dimregen</i>	777
<i>Dimaligned</i>	726	CHAPTER 29 DIMENSION STYLES	
<i>Dimbaseline</i>	727	AND VARIABLES	779
<i>Dimcontinue</i>	728	CONCEPTS.....	780
<i>Dimspace</i>	729	Dimension Variables	780
<i>Dimangular</i>	730	Dimension Styles.....	781
<i>Dimdiameter</i>	731	Dimension Style Families	781
<i>Dimradius</i>	732	Dimension Style Overrides.....	782
<i>Dim</i>	734	DIMENSION STYLES	783
<i>Dimjogline</i>	738	<i>Dimstyle</i> or <i>Ddim</i>	783
<i>Dimjogged</i>	739	- <i>Dimstyle</i>	787
<i>Dimarc</i>	739	DIMENSION VARIABLES.....	788
<i>Dimcenter</i>	740	Changing Dimension Variables	
<i>Dimbreak</i>	741	Using the Dialog Box Method.....	789
<i>Leader</i>	742	<i>Lines</i> Tab	789
<i>Qleader</i>	743	<i>Dimension Lines</i> Section (<i>Lines</i> Tab)	789
<i>Mleader</i>	746	<i>Extension Line</i> Section (<i>Lines</i> Tab)	791
<i>Mleaderstyle</i>	747	<i>Symbols and Arrows</i> Tab.....	792
<i>Mleaderedit</i>	750	<i>Arrowheads</i> Section	
<i>Mleaderalign</i>	751	(<i>Symbols and Arrows</i> Tab)	792
<i>Mleadercollect</i>	752	Other Sections (<i>Symbols and Arrows</i> Tab)..	793
<i>Dimordinate</i>	753	<i>Text</i> Tab	794
<i>Qdim</i>	755	<i>Text Appearance</i> Section (<i>Text</i> Tab)	795
<i>Tolerance</i>	758	<i>Text Placement</i> Section (<i>Text</i> Tab).....	796
Editing Feature Control Frames.....	760	<i>Text Alignment</i> Section (<i>Text</i> Tab).....	797
Basic Dimensions.....	760	<i>Fit</i> Tab.....	797
GDT-Related Dimension Variables	761	<i>Scale for Dimension Features</i> Section	
Geometric Dimensioning and		(<i>Fit</i> Tab)	798
Tolerancing Example	761	<i>Fit Options</i> Section (<i>Fit</i> Tab)	798
<i>Diminspect</i>	765	<i>Text Placement</i> Section (<i>Fit</i> Tab)	800
EDITING DIMENSIONS	766	<i>Fine Tuning</i> Section (<i>Fit</i> Tab)	800
Grip Editing Dimensions.....	766	<i>Primary Units</i> Tab	801
Multifunctional Grips.....	768	<i>Linear Dimensions</i> Section	
Exploding Associative Dimensions.....	769	(<i>Primary Units</i> Tab).....	802
Dimension Editing Commands	769		

Measurement Scale Section (Primary Units Tab).....	803	Dependent Objects and Names	844
Zero Suppression Section (Primary Units Tab).....	804	Evaluating New Layers	846
Angular Dimensions Section (Primary Units Tab) ..	804	VISRETAIN/VISRETAINMODE/ XREFOVERRIDE	848
Alternate Units Tab	804	Evaluating and Reconciling Layers	849
Alternate Unit Section (Alternate Units Tab) ..	805	Xattach	849
Zero Suppression Section (Alternate Units Tab) ..	806	Xbind	849
Placement Section (Alternate Units Tab).....	806	Adcenter	850
Tolerances Tab	806	Xclip.....	852
Tolerance Format Section (Tolerances Tab) ..	806	XCLIPFRAME	853
Alternate Unit Tolerance Section (Tolerances Tab)	808	Demand Loading	854
DIMCONTINUEMODE	808	INDEXCTL.....	855
Changing Dimension Variables Using the Command Line Format	808	XLOADCTL	856
Dim... (variable name)	808	XLOADPATH.....	856
DIMASSOC (Associative Dimensions).....	809	XREFOVERRIDE	857
MODIFYING EXISTING DIMENSIONS.....	810	EDITING FOR XREFS AND BLOCKS	858
Modifying a Dimension Style	810	Xopen	858
Creating Dimension Style Overrides and Using -Dimstyle, Apply (Update)	811	In-Place Xref and Block Editing	859
Properties.....	811	Refedit	860
-Dimstyle	811	Using -Refedit at the Command Line	862
Apply	811	Refset	862
Dimoverride	812	Refclose	863
Matchprop	813	XEDIT	863
Dimension Right-Click Menu	814	XFADECTL	864
GUIDELINES FOR NON-ANNOTATIVE DIMENSIONING IN AUTOCAD	815	XREFNOTIFY.....	864
Strategy 1. Dimensioning a Single Drawing ...	815	PROJECTNAME	865
Strategy 2. Creating Dimension Styles as Part of Template Drawings	817	Reference Manager.....	867
Optional Method for Fixed Dimension Text Height in Template Drawings.....	817	XREFCTL	867
DIMENSIONING IN PAPER SPACE LAYOUTS.....	818	CHAPTER 31 OBJECT LINKING AND EMBEDDING (OLE)	875
When to Dimension in Paper Space.....	819	CONCEPTS.....	876
Procedure for Dimensioning in Paper Space ..	819	Cut and Paste Between AutoCAD Drawings ..	876
DIMENSIONING ISOMETRIC DRAWINGS	823	Cut and Paste Between AutoCAD and Other Windows Applications (OLE) ...	877
CHAPTER 30 XREFERENCES	831	The Windows Clipboard	879
CONCEPTS.....	832	OLE RELATED COMMANDS	880
An Xref Example	836	Copyclip.....	881
CREATING AND USING XREFS	838	Copybase	882
Xref or External-references.....	839	Copylink.....	882
		Cutclip	883
		Cutbase	883
		Pasteclip	883
		Pasteorig	885

<i>Pasteblock</i>	885	<i>SAVEFIDELITY</i>	924
<i>Pastespec</i>	886	Linetype Scales for Annotative Drawings	924
<i>Insertobj</i>	888	<i>MSLTSCALE</i>	925
<i>Pasteashyperlink</i>	889	Applications for Multiple Viewports.....	926
MANAGING OLE OBJECTS	890	Using Two Layouts to Plot the Same Geometry at Different Scales	926
<i>Olelinks</i>	890	Using Two Viewports to Display the Same Geometry at Different Scales	928
OLE Right-Click Shortcut Menu	891	Using One Layout to Plot <i>Xref</i> Drawings in Multiple Viewports at Different Scales	930
<i>Olescale</i>	891	PLOT STYLE TABLES AND PLOT STYLES	931
<i>Oleopen</i>	891	What is the Difference between a Plot Style and a Plot Style Table?.....	932
Other AutoCAD Commands with OLE Objects ..	892	Color-Dependent and Named Plot Style Tables..	934
OLE-RELATED SYSTEM VARIABLES.....	893	Attaching a Plot Style Table to a Layout	935
<i>MSOLESCALE</i>	893	Creating a Plot Style Table	936
<i>OLEHIDE</i>	893	<i>Stylesmanager</i>	936
<i>OLEQUALITY</i>	893	Editing Plot Styles	937
<i>OLESTARTUP</i>	893	Assigning Named Plot Styles to Objects	939
CHAPTER 32 ADVANCED LAYOUTS, ANNOT- ATIVE OBJECTS, & PLOTTING ..	897	<i>Plotstyle</i>	941
CONCEPTS.....	898	Named Plot Style Table Example	942
ADVANCED LAYOUTS	898	<i>Convertpstyles</i>	944
Layer Visibility for Viewports	899	PLOT STAMPING.....	945
<i>Layer</i>	900	<i>Convertctb</i>	945
<i>Vplayer</i>	902	<i>Plotstamp</i>	945
Layer Property Overrides	905	CHAPTER 33 3D BASICS, NAVIGATION, AND VISUAL STYLES	957
Linetype Scale in Viewports	908	SETTING UP AUTOCAD TO DRAW IN 3D	958
<i>Psltscale</i>	908	Setting Up a Workspace.....	958
Dimensioning in Paper Space	910	Activating the ACAD3D or ACADISO3D Drawing Template.....	959
The “Reverse Method” for Calculating Drawing Scale Factor	912	TYPES OF 3D MODELS	960
Steps for Calculating the Drawing Scale Factor by the “Reverse Method”	913	Wireframe Models	960
ANNOTATIVE OBJECTS	914	Surface Models.....	961
Setting Annotation Scale and Viewport Scale ..	914	Solid Models.....	962
Creating and Displaying Annotative Objects in Multiple Viewports	916	3D COORDINATE ENTRY	963
<i>SELECTIONANNODISPLAY</i>	918	3D Coordinate Entry Formats.....	964
Adding and Deleting Scale Representations for Annotative Objects	918	COORDINATE SYSTEMS.....	969
<i>Objectscale</i>	918	The World Coordinate System (WCS) and WCS Icon	970
Adjusting Positions for Individual Annotative Object Scale Representations	920	User Coordinate Systems (UCS) and Icons.....	970
<i>ANNOALLVISIBLE</i>	922	The Right-Hand Rule.....	972
<i>Annoreset</i>	922	<i>Ucsicon</i>	972
<i>Annouupdate</i>	923		

3D NAVIGATION AND VIEW COMMANDS	974	<i>Dducsp</i>	1041
<i>Pan</i>	975	<i>Ucsman</i>	1042
<i>Zoom</i>	976	ViewCube UCS Drop-Down List.....	1043
<i>Navvcube</i>	976	UCS SYSTEM VARIABLES.....	1044
3D Orbit Commands.....	980	<i>Ucsbase</i>	1044
<i>3Dorbit</i>	981	<i>Ucsview</i>	1044
<i>3Dforbit</i>	982	<i>UcsOrtho</i>	1044
<i>3Dcorbit</i>	984	<i>Ucsfollow</i>	1046
<i>PERSPECTIVE</i>	984	<i>Ucsvp</i>	1046
<i>3Ddistance</i>	985	<i>UCS3DPERPDISPLAYSETTING</i>	1047
View Presets	986	<i>UCS3DPARADISPLAYSETTING</i>	1047
<i>View</i>	988	<i>UCSSELECTMODE</i>	1047
Adjusting the Amount of Perspective.....	990	<i>Ucsaxisang</i>	1047
<i>3Dclip</i>	991	USER COORDINATE SYSTEMS AND 3D MOD- ELING	1048
<i>Camera</i>	992	Dynamic User Coordinate Systems	1048
Editing Camera Settings.....	994	CHAPTER 35 SOLID MODELING	
<i>3Dswivel</i>	995	CONSTRUCTION.....	1051
<i>Navswheel</i>	995	CONCEPTS.....	1052
SteeringWheel Shortcut Menu	996	Solid Model Construction Process	1052
SteeringWheel Navigation Tools.....	997	Solid Primitives Commands	1052
SteeringWheel Settings.....	999	Dynamic User Coordinate Systems	1053
<i>-Vpoint</i>	1000	Commands to Move, Rotate, Mirror, and Scale Solids	1053
<i>Vpoint</i>	1001	Boolean Operations.....	1053
<i>Plan</i>	1002	SOLID PRIMITIVES COMMANDS	1055
<i>Grid</i>	1002	<i>Box</i>	1056
<i>Vports</i>	1003	<i>Cone</i>	1057
VISUAL STYLES	1005	<i>Cylinder</i>	1059
Default Visual Styles.....	1006	<i>Wedge</i>	1060
<i>Vscurrent</i>	1006	<i>Sphere</i>	1061
Face Settings	1010	<i>Torus</i>	1062
Shadow Settings	1012	<i>Pyramid</i>	1063
Edge Effects	1013	<i>Polysolid</i>	1064
<i>Visualstyles</i>	1014	<i>Extrude</i>	1066
Named Views and Viewports	1019	<i>Revolve</i>	1068
Graphics Performance Tuning	1021	<i>Sweep</i>	1069
Shade, SHADEDIF, SHADEDGE	1023	<i>Loft</i>	1071
<i>Render</i>	1023	DYNAMIC USER COORDINATE SYSTEMS..	1074
Printing 3D Models	1023	COMMANDS TO MOVE, ROTATE, MIRROR, AND SCALE SOLIDS	1075
CHAPTER 34 USER COORDINATE SYSTEMS ...	1033	<i>Move</i>	1076
CONCEPTS.....	1034	<i>3Dalign</i>	1077
CREATING AND MANAGING		<i>3Dmove</i>	1078
USER COORDINATE SYSTEMS	1034		
<i>Ucs</i>	1035		

3Dscale 1080
3Drotate..... 1080
Mirror3D 1082
3Darray..... 1084
 BOOLEAN OPERATION COMMANDS 1087
 Union 1087
 Subtract 1088
 Intersect..... 1089
 Chamfer..... 1090
 Fillet..... 1092
 DESIGN EFFICIENCY 1093

CHAPTER 36 SOLID MODEL EDITING..... 1105
 CONCEPTS..... 1106
 EDITING PRIMITIVES USING THE *PROPERTIES*
 PALETTE 1106
 Editing *Properties* of Individual Primitives .. 1106
 Composite Solid Subobject Selection 1108
 Editing *Properties* of Composite Solids 1109
 EDITING SOLIDS USING GRIPS AND GIZMOS.. 1109
 Move, Rotate, and Scale Gizmos 1115
 Grip Editing Composite Solids..... 1117
 Subobjects and Selection 1118
 Grip Editing Faces, Edges, and Vertices 1119
 Selecting Overlapping Subobjects 1123
 History Settings 1123
 SOLIDS EDITING COMMANDS 1125
 Solidedit..... 1126
 Face Options 1127
 Edge Options..... 1134
 Body Options..... 1135
 Slice..... 1138
 Presspull..... 1139
 Sectionplane..... 1141
 Sectionplane Contextual Tab 1145
 Section Settings Dialog Box 1147
 Interfere 1147
 Imprint 1149
 Massprop..... 1150
 USING SOLIDS DATA 1150
 Stlout 1151
 3Dprint..... 1152
 Acisin..... 1152
 Acisout..... 1152

**CHAPTER 37 2D DRAWINGS
 FROM 3D MODELS 1159**
 CONCEPTS..... 1160
 COMMANDS 1161
 Viewbase 1161
 Viewbase Options 1165
 Viewedit..... 1167
 Drawing View Editing..... 1168
 Viewproj..... 1169
 Viewstd..... 1170
 Viewsection 1171
 Section View Examples 1173
 Viewsectionstyle 1177
 Modify *Section View Style* and *New Section*
 View Style Dialog Boxes..... 1178
 Section View Style and *Detail View*
 Style Issues 1181
 Viewcomponent..... 1182
 Viewdetail 1183
 Viewdetailstyle..... 1185
 Modify *Detail View Style* and *New Detail View*
 Style Dialog Boxes 1186
 Viewupdate..... 1188
 Viewupdateauto..... 1190
 Viewsymbolsketch..... 1190
 Creating Auxiliary Views Using *Viewsection*... 1191
 Dimensioning a Documentation Drawing ... 1193

APPENDIX A..... 1201
 APPENDIX A 1202
 AutoCAD 2023 Command Alias List
 Sorted by Command 1202

APPENDIX B..... 1207
 APPENDIX B 1208
 BUTTONS AND SPECIAL KEYS 1208
 Mouse and Digitizing Puck Buttons 1208
 Function (F) Keys 1208
 Control Key Sequences (Accelerator Keys) ... 1209
 Special Key Functions 1210
 List of Drawing Exercise File Names
 (when files were created or changed) .. 1228