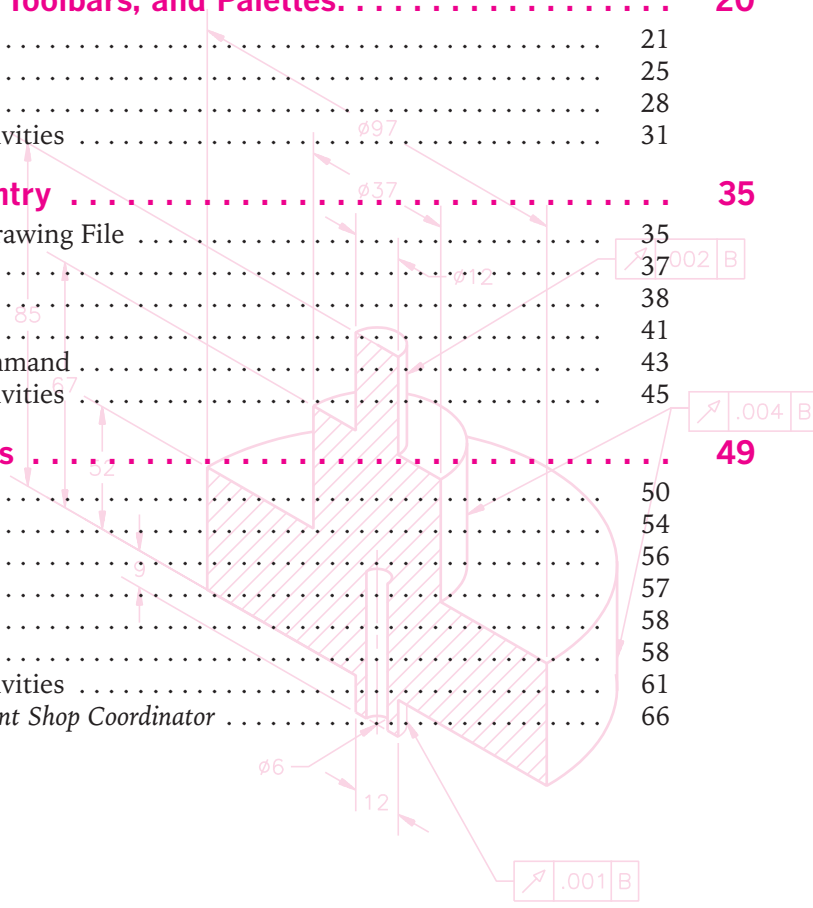


# Contents

## Part 1 – Groundwork

<b>Chapter 1: Exploring AutoCAD</b> .....	<b>1</b>
Starting AutoCAD .....	2
Viewing Details .....	6
Exiting AutoCAD .....	7
Chapter 1 Review & Activities .....	8
<b>Chapter 2: User Interface</b> .....	<b>10</b>
Overview of the User Interface .....	11
The Ribbon .....	12
The Application Menu .....	14
Other Features .....	15
Chapter 2 Review & Activities .....	17
<b>Chapter 3: Workspaces, Toolbars, and Palettes</b> .....	<b>20</b>
Workspaces .....	21
Toolbars .....	25
Palettes .....	28
Chapter 3 Review & Activities .....	31
<b>Chapter 4: Command Entry</b> .....	<b>35</b>
Creating and Saving a Drawing File .....	35
Opening a Drawing File .....	37
Entering Commands .....	38
Command Aliases .....	41
Reentering the Last Command .....	43
Chapter 4 Review & Activities .....	45
<b>Chapter 5: Basic Objects</b> .....	<b>49</b>
Creating Circles .....	50
Creating Arcs .....	54
Drawing Ellipses .....	56
Donuts .....	57
Rectangles .....	58
Polygons .....	58
Chapter 5 Review & Activities .....	61
<i>AutoCAD at Work: 3D Print Shop Coordinator</i> .....	66



**Chapter 6: Object Selection . . . . . 67**

Objects . . . . .	68
Selecting Objects . . . . .	68
Editing Selection Sets . . . . .	73
Using Grips . . . . .	74
Using Grips with Commands . . . . .	78
Chapter 6 Review & Activities . . . . .	79

**Chapter 7: Entering Coordinates . . . . . 83**

Methods of Entering Coordinates . . . . .	84
Applying Methods of Coordinate Entry . . . . .	89
Chapter 7 Review & Activities . . . . .	91

**Chapter 8: Help and File Maintenance . . . . . 96**

Obtaining Help . . . . .	97
Other Sources of Help . . . . .	99
Context-Sensitive Help . . . . .	100
File and Folder Navigation . . . . .	100
Finding Drawing Files . . . . .	102
Diagnosing, Repairing, and Recovering Files . . . . .	104
Chapter 8 Review & Activities . . . . .	107
<i>AutoCAD at Work: Mechanical Drafter</i> . . . . .	109



**Part 1 Project: Rocker Arm . . . . . 110**

**Part 2 – Drawing Aids and Controls**

**Chapter 9: Object Snap. . . . . 112**

Running Object Snaps . . . . .	113
Specifying Object Snaps Individually. . . . .	118
Object Snap Settings . . . . .	122
Chapter 9 Review & Activities . . . . .	124

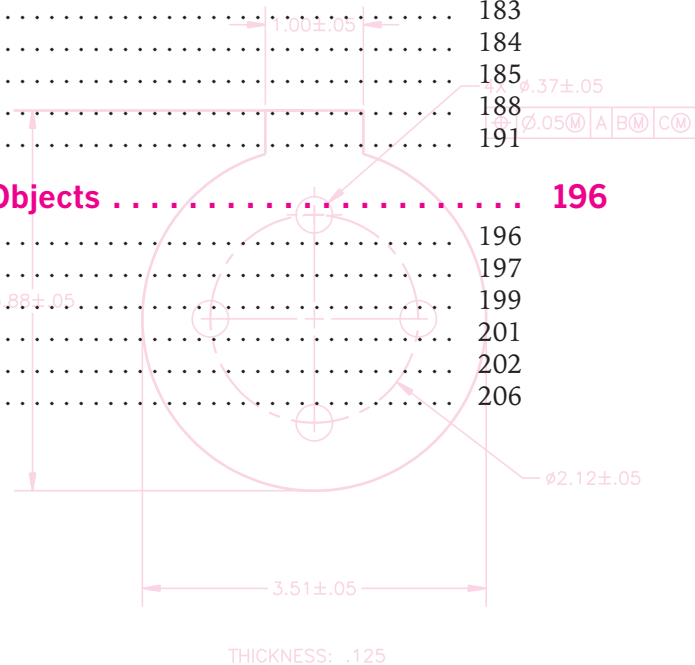
**Chapter 10: Helpful Drawing Features. . . . . 128**

Coordinate Display . . . . .	129
The Ortho Mode . . . . .	130
Tracking Time . . . . .	131
AutoCAD Text Window . . . . .	132
Command Line Window . . . . .	135
Undoing Your Work. . . . .	137
Chapter 10 Review & Activities . . . . .	139

<b>Chapter 11: Construction Aids</b> . . . . .	<b>144</b>
Alignment Grid . . . . .	145
Snap Grid . . . . .	146
Construction Lines . . . . .	148
Rays . . . . .	150
Orthographic Projection . . . . .	151
Chapter 11 Review & Activities . . . . .	154
<i>AutoCAD at Work: Entrepreneur</i> . . . . .	160
<b>Chapter 12: Zooming</b> . . . . .	<b>161</b>
Taking a Closer Look . . . . .	161
Zooming Transparently . . . . .	166
Controlling View Resolution . . . . .	166
Chapter 12 Review & Activities . . . . .	167
<i>AutoCAD at Work: Patent Drafter</i> . . . . .	171
<b>Chapter 13: Panning and Viewing</b> . . . . .	<b>172</b>
Panning . . . . .	172
Capturing Views . . . . .	175
Chapter 13 Review & Activities . . . . .	177
<b>Part 2 Project: Patterns and Developments</b> . . . . .	<b>180</b>

## Part 3 – Drawing and Editing

<b>Chapter 14: Solid and Curved Objects</b> . . . . .	<b>182</b>
Drawing Solid Shapes . . . . .	183
Controlling Object Fill . . . . .	184
Polylines . . . . .	185
Spline Curves . . . . .	188
Chapter 14 Review & Activities . . . . .	191
<b>Chapter 15: Adding and Altering Objects</b> . . . . .	<b>196</b>
Creating Chamfers . . . . .	196
Breaking Objects . . . . .	197
Creating Fillets and Rounds . . . . .	199
Offsetting Objects . . . . .	201
Drawing Multilines . . . . .	202
Chapter 15 Review & Activities . . . . .	206



**Chapter 16: Moving and Duplicating Objects . . . . . 212**

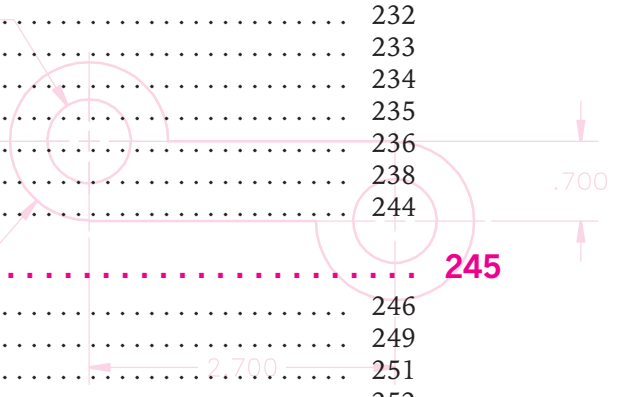
Changing Object Properties . . . . . 213  
Moving Objects . . . . . 213  
Copying Objects . . . . . 215  
Mirroring Objects . . . . . 215  
Producing Arrays . . . . . 217  
Chapter 16 Review & Activities . . . . . 221

**Chapter 17: Modifying and Maneuvering . . . . . 229**

Stretching Objects . . . . . 229  
Scaling Objects . . . . . 231  
Rotating Objects . . . . . 232  
Trimming Lines . . . . . 233  
Extending Lines . . . . . 234  
Joining Lines . . . . . 235  
Working with Multilines . . . . . 236  
Chapter 17 Review & Activities . . . . . 238  
*AutoCAD at Work: Interior Designer* . . . . . 244

**Chapter 18: Hatching and Sketching . . . . . 245**

Hatching . . . . . 246  
Editing a Hatch . . . . . 249  
Tool Palettes Window . . . . . 251  
Sketching . . . . . 252  
Chapter 18 Review & Activities . . . . . 254  
*AutoCAD at Work: Aquatic Designer* . . . . . 259



**Part 3 Project: Signage . . . . . 260**

---

**Part 4 – Text and Tables**

**Chapter 19: Notes and Specifications . . . . . 262**

Types of Text . . . . . 263  
Importing Text . . . . . 266  
Formatting Text . . . . . 267  
Text Styles and Fonts . . . . . 268  
Applying Text in Drawings . . . . . 271  
Chapter 19 Review & Activities . . . . . 272

**Chapter 20: Text Editing and Spell Checking . . . . . 276**

Editing Text . . . . . 276  
Creating Special Characters . . . . . 278  
Finding and Replacing Text . . . . . 279  
Using AutoCAD’s Spell Checker . . . . . 280  
Other Options . . . . . 281  
Chapter 20 Review & Activities . . . . . 282

<b>Chapter 21: Tables</b> .....	<b>285</b>
Creating Tables .....	285
Editing Tables .....	288
Inserting Formulas in Tables .....	290
Chapter 21 Review & Activities .....	291
<b>Part 4 Project: Manufacturer's Product Table</b> .....	<b>294</b>

## Part 5 – Preparing and Printing a Drawing

<b>Chapter 22: Drawing Setup</b> .....	<b>296</b>
Template Files .....	296
Initial Template Setup .....	298
Establishing Other Settings .....	301
Status of the Template File .....	302
Chapter 22 Review & Activities .....	303
<i>AutoCAD at Work: Landscape Designer</i> .....	306
<b>Chapter 23: Layers and Linetypes</b> .....	<b>307</b>
Creating New Layers .....	308
Working with Layers .....	314
Working with Objects .....	317
Applying the Custom Template .....	321
Chapter 23 Review & Activities .....	322
<b>Chapter 24: Plotting and Printing</b> .....	<b>327</b>
Previewing a Plot .....	328
Tailoring the Plot .....	330
Plotting the Drawing .....	333
Creating DWF and PDF Files .....	334
Chapter 24 Review & Activities .....	335
<i>AutoCAD at Work: Technical Illustrator</i> .....	338
<b>Chapter 25: Multiple Viewports</b> .....	<b>339</b>
Viewports in Model Space .....	340
Viewports in Paper Space .....	343
Objects in Viewports .....	346
Working with Paper Space Viewports .....	348
Chapter 25 Review & Activities .....	350
<b>Part 5 Project: Designing a Bookend</b> .....	<b>354</b>

## Part 6 – Dimensioning and Tolerancing

### Chapter 26: Basic Dimensioning . . . . . 356

Setting the Dimension Text Style . . . . .	357
Creating Linear Dimensions . . . . .	358
Dimensioning Round Features . . . . .	360
Dimensioning Angles . . . . .	360
Dimensioning Arcs . . . . .	360
Using Other Types of Dimensioning . . . . .	362
Chapter 26 Review & Activities . . . . .	366

### Chapter 27: Advanced Dimensioning . . . . . 371

Creating a Dimension Style . . . . .	372
Changing a Dimension Style . . . . .	374
Applying a Dimension Style . . . . .	376
Editing a Dimension . . . . .	377
Leaders . . . . .	378
Working with Associative Dimensions . . . . .	380
Adding Dimension and Leader Styles to Templates . . . . .	380
Chapter 27 Review & Activities . . . . .	382

### Chapter 28: Fine-Tuning Dimensions . . . . . 390

Dimension Style Options . . . . .	391
Editing a Dimension's Properties . . . . .	395
Chapter 28 Review & Activities . . . . .	397

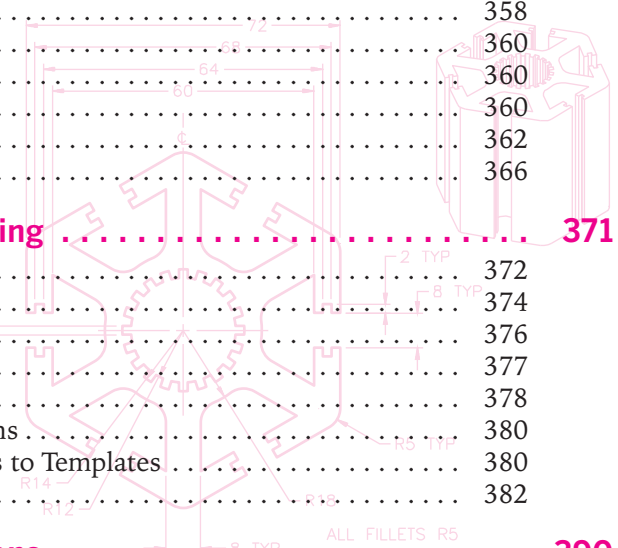
### Chapter 29: Tolerancing . . . . . 402

Methods of Tolerancing . . . . .	403
GD&T Practices . . . . .	407
Chapter 29 Review & Activities . . . . .	413
<i>AutoCAD at Work: Prototype Testing Expert</i> . . . . .	417

### Chapter 30: Calculations . . . . . 418

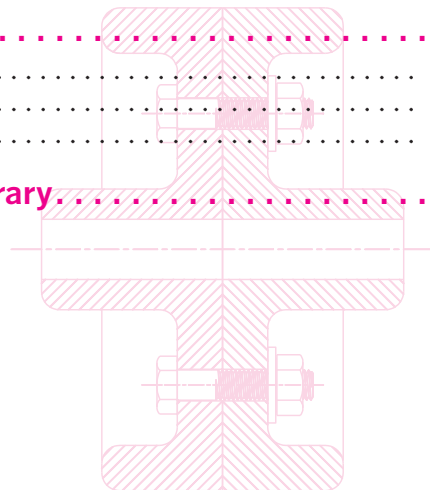
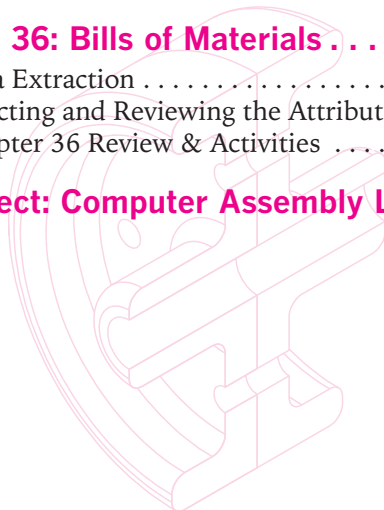
Performing Calculations . . . . .	419
Displaying Database Information . . . . .	424
Editing Objects Mathematically . . . . .	424
Chapter 30 Review & Activities . . . . .	427

### Part 6 Project: Designer Eyewear . . . . . 432



## Part 7 – Groups and Details

<b>Chapter 31: Groups</b> . . . . .	<b>434</b>
Creating a Group . . . . .	434
Changing Group Properties . . . . .	435
Chapter 31 Review & Activities . . . . .	439
<b>Chapter 32: Blocks</b> . . . . .	<b>441</b>
Working with Blocks . . . . .	442
DesignCenter and Too Palettes . . . . .	445
Blocks and Drawing Files . . . . .	448
Chapter 32 Review & Activities . . . . .	450
<b>Chapter 33: Dynamic Blocks</b> . . . . .	<b>453</b>
Creating a Dynamic Block . . . . .	454
Using Dynamic Blocks . . . . .	459
Constraining Parameters . . . . .	459
Chapter 33 Review & Activities . . . . .	463
<b>Chapter 34: Symbol Libraries</b> . . . . .	<b>467</b>
Creating a Library . . . . .	469
Using a Symbol Library . . . . .	470
Chapter 34 Review & Activities . . . . .	474
<b>Chapter 35: Attributes</b> . . . . .	<b>476</b>
Fixed Attributes . . . . .	477
Variable Attributes . . . . .	481
Editing Attributes . . . . .	483
Chapter 35 Review & Activities . . . . .	485
<i>AutoCAD at Work: Architectural Drafter</i> . . . . .	488
<b>Chapter 36: Bills of Materials</b> . . . . .	<b>489</b>
Data Extraction . . . . .	490
Selecting and Reviewing the Attributes . . . . .	491
Chapter 36 Review & Activities . . . . .	494
<b>Part 7 Project: Computer Assembly Library</b> . . . . .	<b>496</b>



## Part 8 – Working in Three Dimensions

### Chapter 37: Isometric Drawing ..... 498

Setting Up an Isometric Drawing .....	499
Creating an Isometric Drawing .....	500
Dimensioning an Isometric Drawing .....	501
Chapter 37 Review & Activities .....	503
<i>AutoCAD at Work: 3D Civil Designer</i> .....	510

### Chapter 38: The Third Dimension ..... 511

Creating a Basic 3D Model .....	512
Viewing Options .....	515
3D Orbit .....	516
The Steering Wheel .....	519
Using the 3D Modeling Workspace .....	521
The ViewCube .....	523
Chapter 38 Review & Activities .....	525

### Chapter 39: Drawing Objects in 3D ..... 529

Drawing 2D Objects in 3D Space .....	529
3D Drawing by Coordinate Entry .....	531
Chapter 39 Review & Activities .....	534
<i>AutoCAD at Work: Engineer</i> .....	537

### Chapter 40: User Coordinate Systems ..... 538

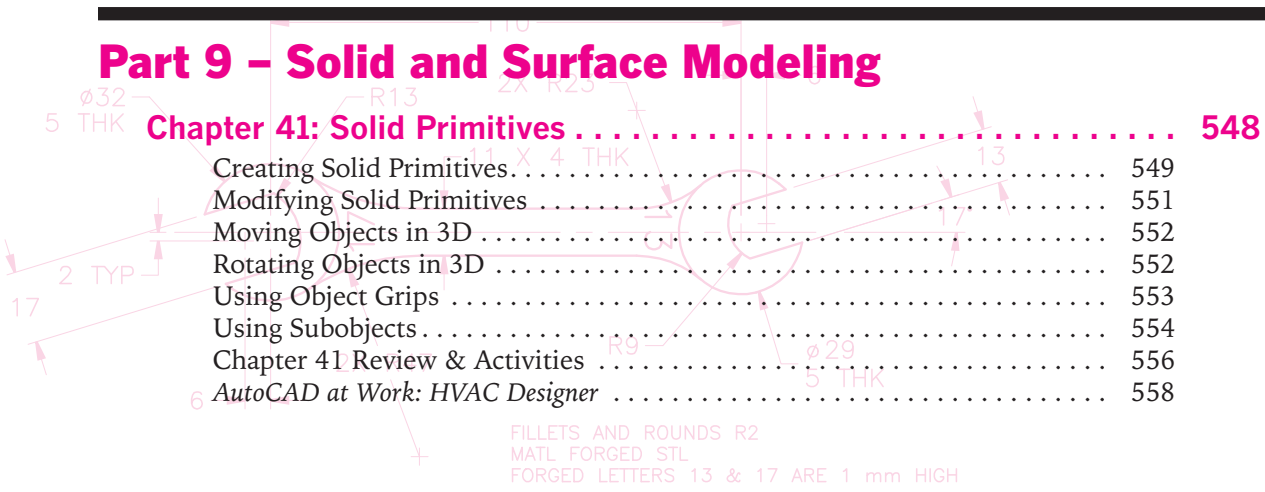
Creating UCSs .....	539
Managing UCSs .....	541
Chapter 40 Review & Activities .....	544

## Part 8 Project: 3D Modeling ..... 546

## Part 9 – Solid and Surface Modeling

### Chapter 41: Solid Primitives ..... 548

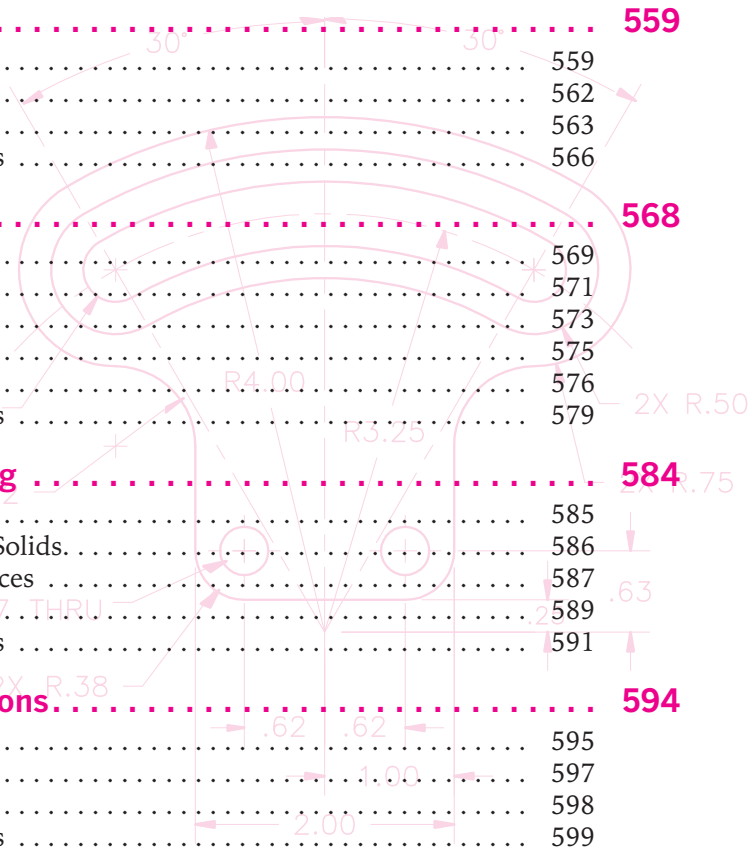
Creating Solid Primitives .....	549
Modifying Solid Primitives .....	551
Moving Objects in 3D .....	552
Rotating Objects in 3D .....	552
Using Object Grips .....	553
Using Subobjects .....	554
Chapter 41 Review & Activities .....	556
<i>AutoCAD at Work: HVAC Designer</i> .....	558




UNLESS OTHERWISE SPECIFIED ALL  
DIMENSIONS ARE IN MILLIMETERS




<b>Chapter 42: Mesh Modeling</b> .....	<b>559</b>
Creating Mesh Primitives .....	559
Controlling Mesh Divisions .....	562
Modifying Mesh Objects .....	563
Chapter 42 Review & Activities .....	566
<b>Chapter 43: Basic Modeling</b> .....	<b>568</b>
Revolution .....	569
Extrusion .....	571
Sweeping .....	573
Lofting .....	575
Pressing and Pulling Solids .....	576
Chapter 43 Review & Activities .....	579
<b>Chapter 44: Surface Modeling</b> .....	<b>584</b>
Planar Surfaces .....	585
Converting Planar Surfaces to Solids .....	586
Working with Procedural Surfaces .....	587
Working with NURBS Surfaces .....	589
Chapter 44 Review & Activities .....	591
<b>Chapter 45: Boolean Operations</b> .....	<b>594</b>
Preparing the Base Solid .....	595
Subtracting the Holes .....	597
Adding the Support Cylinder .....	598
Chapter 45 Review & Activities .....	599
<b>Chapter 46: Modifying Solid Models</b> .....	<b>606</b>
Beveling and Rounding Solid Edges .....	606
Slicing and Shelling a Solid Object .....	609
Testing for Interference .....	610
Chapter 46 Review & Activities .....	612
<i>AutoCAD at Work: CAD Product Manager</i> .....	617
<b>Chapter 47: Documenting Solid Models</b> .....	<b>618</b>
Creating the Solid Model .....	618
Creating a Full Section .....	619
Creating a 2D Representation .....	621
Creating a Drawing .....	622
Creating a Drawing Automatically .....	625
Chapter 47 Review & Activities .....	627
<b>Chapter 48: Visualization and Navigation</b> .....	<b>630</b>
Visualization Tools .....	631
Navigation Tools .....	638
Chapter 48 Review & Activities .....	642
<i>AutoCAD at Work: Pipeline Drafter</i> .....	647





<b>Chapter 49: Benefits of Solid Modeling</b> . . . . .	<b>648</b>
Slicing the Pulley . . . . .	649
Calculating Mass Properties . . . . .	650
Outputting Data for Additive Manufacturing . . . . .	652
Chapter 49 Review & Activities . . . . .	657
<b>Part 9 Project: Designing and Modeling a Desk Set</b> . . . . .	<b>660</b>
<b>Additional Problems</b> . . . . .	<b>662</b>
<b>Appendixes</b>	
Appendix A: Options Dialog Box . . . . .	743
Appendix B: Managing AutoCAD . . . . .	746
Appendix C: Drawing Area Guidelines . . . . .	750
Appendix D: Dimensioning Symbols . . . . .	751
Appendix E: AutoCAD Fonts . . . . .	752
<b>Glossary</b> . . . . .	<b>754</b>
<b>Index</b> . . . . .	<b>767</b>



## AutoCAD at Work

3D Print Shop Coordinator . . . . .	66
Mechanical Drafter . . . . .	109
Entrepreneur . . . . .	160
Patent Drafter . . . . .	171
Interior Designer . . . . .	244
Aquatic Designer . . . . .	259
Landscape Designer . . . . .	306
Technical Illustrator . . . . .	338
Prototype Testing Expert . . . . .	417
Architectural Drafter . . . . .	488
3D Civil Designer . . . . .	510
Engineer . . . . .	537
HVAC Designer . . . . .	558
CAD Product Manager . . . . .	617
Pipeline Drafter . . . . .	647