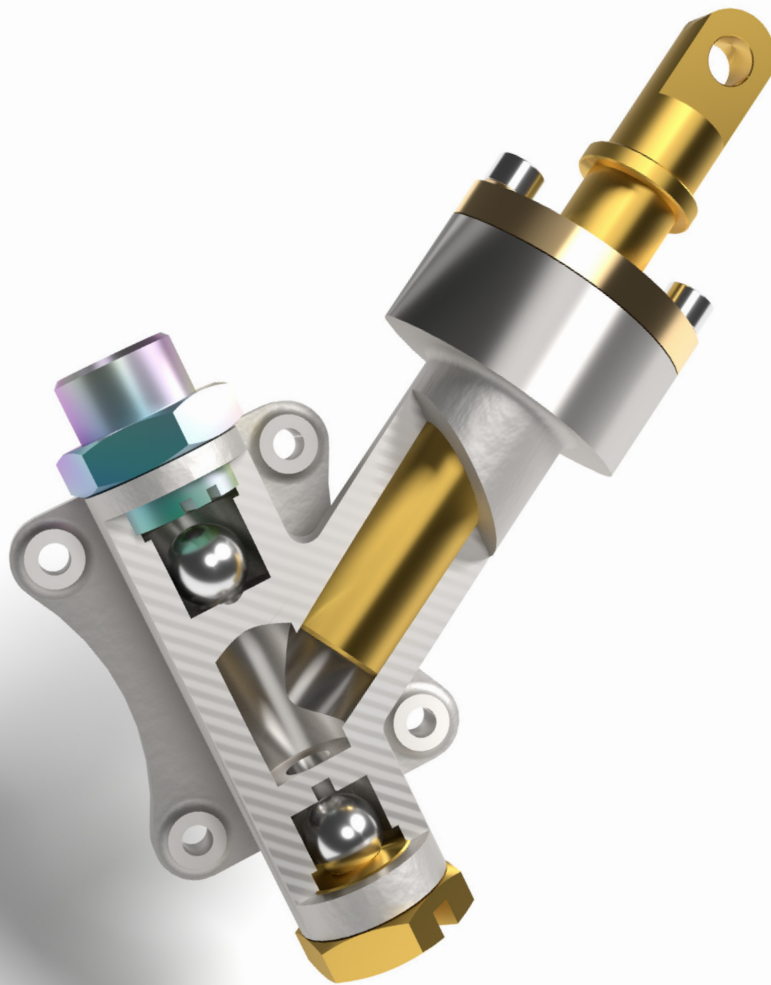


Autodesk®

Inventor® 2023 Essentials Plus

Shawna Lockhart & Daniel T. Banach



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)

CONTENTS

1 Getting Started

1

Introduction.....	1
Objectives.....	1
Getting Started with Autodesk Inventor	2
User Interface	3
Application Menu.....	3
Quick Access Toolbar	3
Tabs	3
Panels	3
Commands	3
Information Toolbar	3
ViewCube.....	3
Navigation Bar	4
Documents Menu.....	4
Capacity Meter	4
Status Bar	4
Document Tabs.....	4
Browser	4
Graphics Window/Canvas	4
File Tab	5
Recent Documents	5
Open Documents.....	5
Display	5
Order to List Files.....	5
Pin to Menu	5
Preview Image	5
Ribbon	6
Quick Access Toolbar	7
Open Files	7
Opening Multiple Documents	8
Document Tabs.....	8
New Files.....	9
File Information.....	10
File Types	10
Part (.ipt)	10
Assembly (.iam)	10
Presentation (.ipn).....	10
Sheet Metal (.ipt).....	11
Drawing (.dwg and .idw)	11
Project (.ipj).....	11
iFeature (.ide).....	11

Save File Options	11
Save	11
Save All.....	12
Save As.....	12
Save Copy As	12
Save Copy As Template.....	12
Pack and Go	12
Save Reminder	12
Application Options.....	12
General	13
Save	13
File	13
Colors.....	13
Display	13
Hardware	14
Prompts.....	14
Drawing.....	14
Notebook	14
Sketch	14
Part.....	14
iFeature	14
Assembly	14
Content Center.....	14
Exercise 1-1: User Interface	14
Command Entry	17
Tooltips.....	17
Marking Menus and Context (Overflow) Menus ..	18
Autodesk Inventor Shortcut Keys	18
Repeat Last Command.....	18
Undo and Redo	19
Help System	19
Projects in Autodesk Inventor	19
Project Setup.....	20
Project File Search Options	20
Creating Projects	20
What Type of Project Are You Creating?	22
New Single-User Project.....	22
New Vault Project.....	22
Creating a New Single-User Project	22
Autodesk Vault.....	24
Exercise 1-2: Projects.....	24
Changing your Viewpoint.....	27
Home (Isometric) View.....	27

Navigation Bar	27
ViewCube	29
Dynamically Rotate Viewpoint Shortcuts	30
Exercise 1-3: Viewing a Model.....	30

2 Sketching, Constraining, and Dimensioning **35**

Introduction.....	35
Objectives.....	35
Part and Sketch Application Options	36
Part Options	36
Sketch Options	37
Units	38
Templates	39
Creating a Part File.....	40
Creating a Part File from a Specified Template... 41	
Sketches and Origin (Default) Planes..... 41	
Origin 3D Indicator	42
New Sketch.....	42
Sketching the 2D Outline of the Part	44
Sketching Overview	44
Sketch Commands	44
Using the Sketch Commands	44
Dimension Input.....	45
Line Command	45
Object Tracking – Inferred Points	46
Automatic Constraints.....	47
Scrubbing	47
Deleting Objects	47
Common Sketch Commands.....	48
Selecting Objects	49
Exercise 2-1: Creating a Sketch with Lines	50
Exercise 2-2: Creating a Sketch with Tangencies..	52
Constraining A Sketch	53
Constrain to the Origin Point.....	53
Constraint Types	54
Adding Constraints	55
Showing Constraints	55
Modifying Constraint Size	55
Deleting Constraints	56
Hiding Constraints	56
Construction Geometry.....	57
Number of Required Constraints or Dimensions ..	58

Degrees of Freedom	58
Dragging a Sketch.....	58
Exercise 2-3: Adding and Displaying Constraints..	59
Adding Dimensions Manually	63
Scale Sketch	63
General Dimensioning	63
Dimensioning Lines	64
Dimensioning Angles.....	64
Dimensioning Arcs and Circles	64
Dimensioning to a Tangent of an Arc or Circle..	64
Entering and Editing a Dimension Value	65
Fractions	66
Repositioning a Dimension	66
Fully Constrained Sketch	66
Over Constrained Sketch.....	67
Relax Mode	67
Driven Dimension.....	68

Exercise 2-4: Constraining and Dimensioning a Sketch.....	69
Measure Command.....	72
Region Properties.....	75
Inserting an AutoCAD File.....	76
Inserting 2D AutoCAD Data into a Sketch..	76
Insert AutoCAD File with Associativity	78
Open Other File Types.....	78
Exercise 2-5: Inserting AutoCAD Data	79
Applying Your Skills.....	83
Skills Exercise 2-1	83
Skills Exercise 2-2.....	83

3 Creating & Editing Sketched Features **85**

Introduction.....	85
Objectives.....	85
Features	86
Consumed and Unconsumed Sketches.....	86
Understanding the Browser	87
Switching Environments	88
3D Modeling Commands.....	88
Direct Manipulation.....	88
Mini-Toolbars.....	89
Property(ies) Panels	90

Extrude a Sketch	90	Chamfers	131
Input Geometry	91	Methods	132
Extents	92	Edge Chain	133
Advanced Properties	94	Setback	133
Exercise 3-1: Extruding a Sketch	94	Preserve All Features	134
Linear Diameter Dimensions	96	Create Partial Chamfer	134
Centerline	96	Exercise 4-1: Creating Fillets and Chamfers	135
Normal Line	97	Holes	138
Revolve a Sketch	97	Creating Hole Features	138
Input Geometry	98	Holes Dialog Box	139
Exercise 3-2: Revolving a Sketch	100	Advanced Settings	141
Primitive Shapes/Features	102	Editing Hole Features	141
Secondary 2D Sketched Features	104	Exercise 4-2: Creating Holes	142
Create a new 2D Sketch	104	Shelling	146
Select Other-Face Cycling	105	Direction	147
Slice Graphics	105	Remove Faces	147
Exercise 3-3: Sketch Features	106	Automatic Face Chain	147
Editing a Feature and Sketch	108	Solids	147
Edit Feature Command	108	Thickness	147
Editing a Feature's Sketch	109	Unique Face Thickness	148
Renaming Features and Sketches	109	Exercise 4-3: Shelling a Part	148
Deleting a Feature	110	Work Features	150
Failed Features	110	Creating a Work Axis	150
Exercise 3-4: Editing Features and Sketches	110	Exercise 4-4: Creating Work Axes	151
Projecting Geometry	112	Creating Work Points	153
Projecting Edges	112	Creating Work Planes	155
Exercise 3-5: Projecting Geometry	114	UCS—User Coordinate System	157
Part Material, Properties and Appearance	116	Feature Visibility	159
Part Material	116	Editing the UCS	159
Appearance	117	Exercise 4-5: Creating Work Planes and a UCS	160
Additional Appearance Commands	117	Exercise 4-6: Creating Holes Through Cylinders	164
Skills Exercise 3-1	120	Patterns	167
Skills Exercise 3-2	121	Rectangular Patterns	167
Skills Exercise 3-3	122	Exercise 4-7: Creating a Rectangular Pattern	170
		Circular Patterns	171
4 Creating Placed Features	125	Exercise 4-8: Creating Circular Pattern	174
Introduction	125	Linear Patterns—Pattern along a Path	176
Objectives	125	Exercise 4-9: Creating a Pattern Along a Nonlinear Path	176
Fillets	126	3D Printing – Additive Manufacturing	178
Edge Fillet	127	Applying Your Skills	180
Face Fillet	129	Skills Exercise 4-1	180
Full Round Fillet	130	Skills Exercise 4-2	181

5 Creating & Editing Drawing Views 183

Introduction.....	183
Objectives.....	183
Drawing Options.....	184
Creating a Drawing.....	185
Drawing Sheet Preparation	186
Border	187
Title Block	188
Edit Property Fields Dialog Box.....	189
Save Drawing to a Template	189
Creating Drawing Views.....	190
Creating a Base View.....	190
Creating Projected Views.....	192
Moving Drawing Views.....	193
Drawing Zone Identifiers.....	193
Exercise 5-1: Creating a Multiview Drawing	194
Creating Auxiliary Views.....	197
Creating Section Views.....	198
Creating a Detail View	202
Exercise 5-2: Creating Auxiliary, Section, and Detail Views	204
Creating Break Views	206
Exercise 5-3: Creating Break View	208
Editing Drawing Views	209
Editing Drawing View Properties.....	209
Deleting Drawing Views	210
Break and Align Views	210
Replace Model Reference	211
Exercise 5-4: Editing Drawing Views	212
Annotations.....	214
Drawing Standards and Styles	214
Centerlines and Center Marks	217
Automated Centerlines for Drawing Views	219
Exercise 5-5: Adding Centerlines	220
Adding Dimensions to a Drawing View	223
Retrieving Model Dimensions	223
Selecting Dimensions – Additional Options.....	225
Auto Arrange Dimensions.....	226
Moving and Centering Dimension Text.....	226
Editing a Model Dimension's Value in a Drawing.....	226
Creating General Dimensions.....	227

Exercise 5-6: Adding Dimensions.....	229
Creating Baseline Dimensions.....	233
Creating Chain Dimensions	236
Exercise 5-7: Creating Baseline & Chain Dimensions	238
Creating Ordinate Dimensions.....	240
Adding Text and Additional Symbols	242
Text and Leader Text.....	242
Annotation Symbols	243
Hole and Thread Notes.....	244
Exercise 5-8: Adding Annotations	246
Creating a Hole Table	249
Exercise 5-9: Creating Hole Tables	251
Shortcut for Opening Referenced Files	254
Opening a Model File from a Drawing	254
Opening a Drawing from a Model File	255
Create a 3D PDF	255
3D Annotations / Model-Based Definition (MBD)	257
Creating a 3D Annotation.....	257
Tolerance Advisor	258
Controlling Visibility of Annotations.....	258
Retrieving 3D Annotations in a Drawing	259
Applying Your Skills.....	260
Skills Exercise 5-1	260
Skills Exercise 5-2.....	261

6 Creating & Documenting Assemblies 263

Introduction.....	263
Objectives.....	263
Assembly Options.....	264
Creating Assemblies.....	264
Placing Components	266
Placing Components from Another CAD System	268
Creating a Component in an Assembly.....	270
The Assembly Browser	271
Occurrences	271
The Assembly Capacity Meter.....	272
Editing a Component in Place	272
Opening a Component in an Assembly.....	273
Grounded Component.....	274
Degrees of Freedom (DOF)	274

Adding Assembly Constraints	275	Exercise 6-6: Driving a Constraint	316
Assembly Constraint Command	275	Creating a Presentation File	319
Constraint Limits	277	Creating Presentation Views and Snapshots..	320
Assembly Constraint Examples	277	Tweak Components	322
Motion Constraints	280	Capture Camera Viewpoint.....	324
Transitional Constraint.....	281	Play the Animation	325
Constraint Set Constraint	282	Create a New Storyboard	325
Selecting Geometry and the Select Other Command	282	Publish a Video from a Storyboard	325
Applying an Assembly Constraint	283	Snapshot View	326
ALT + Drag Constraining Technique.....	283	Create a Drawing from a Snapshot View	327
Moving and Rotating Components	283	Publish a Raster Image from a Snapshot View ...	328
Free Move	283	Exercise 6-7: Creating a Presentation Storyboard ..	329
Free Rotate.....	284	Creating Drawing Views from Assemblies & Presentations	334
Editing Assembly Constraints	285	Bill of Material (BOM)	334
Identify under-constrained components	286	Sorting Items in the BOM.....	335
Exercise 6-1: Assembling Parts	288	Renumbering Items in the BOM	336
Assembly Joints	293	Adding Columns to the BOM.....	336
Creating an Assembly Joint	294	Changing the View Options of the BOM.....	336
Tips for using the joint command	296	Opening a Part from the BOM Editor	337
Exercise 6-2: Assembly Joints	296	Exercise 6-8: Editing a Bill of Material (BOM)	337
Additional Assembly Commands	298	Creating Balloons	340
Browser Views.....	298	Placing Individual Balloons.....	340
Other Half.....	299	Auto Ballooning.....	342
Constraint Tooltip	300	Moving and Aligning Balloons	343
User-Defined Assembly Folders	300	Editing a Balloon's Value.....	344
Isolating Assembly Components	300	Parts List	345
Visibility Control.....	301	Editing a Parts List	345
Adaptivity	301	Editing Parts List BOM Data	346
Project Geometry in the Context of an Assembly...302		Creating Custom Parts.....	347
Creating an Adaptive Sketch/Part Manually...302		Wrapping a Parts List	347
Exercise 6-3: Designing a Part in Context of an Assembly	303	Exercise 6-9: Creating a Drawing from an Assembly	348
Patterning Components	306	Applying Your Skills	357
Associative Pattern	306	Skills Exercise 6-1	357
Rectangular Pattern	307	Skills Exercise 6-2.....	359
Circular Pattern	308		
Exercise 6-4: Patterning Components	309		
Analysis Commands	311		
Measure Distance.....	311		
Identifying the Center of Gravity of an Assembly ..311			
Interference Checking	312		
Exercise 6-5: Analyzing an Assembly	313		
Driving a Constraint	315		
		<hr/>	
		7 Advanced Modeling Techniques	363
		<hr/>	
		Introduction	363
		Objectives	363
		Dimension Display, Relationships, and Equations ..	364
		Dimension Display	364
		A Dimension's Relationship.....	364
		Equations	365

Parameters	365	Split a Part or Face	438
Creating Parameters	366	Behavior	439
Creating User Parameters	367	Exercise 7-8: Splitting a Part into	
Creating Linked Parameters	368	Multiple Solid Bodies	439
Exercise 7-1: Relationships and Parameters	370	Mirror Features	441
iParts	375	Suppressing Features	443
Creating an iPart	376	Reordering a Feature	443
Editing iParts	380	Feature Rollback.....	444
Placing an iPart Member into an Assembly..	380	Content Center	445
Creating a Drawing for an iPart Factory	381	Introduction to Stress Analysis	446
Exercise 7-2: Creating and Placing an iPart	383	Create a Simulation Study – Step 1	447
iAssemblies	389	Assign Material – Step 2	448
iAssembly Author Dialog Box Options.....	390	Applying Constraints – Step 3	448
Editing iAssemblies	391	Applying a Load – Step 4	449
Placing an iAssembly member into an Assembly ..	392	Mesh Options – Step 5	451
Creating a drawing for an iAssembly factory ..	392	Run Simulation – Step 6.....	451
Exercise 7-3: Creating and Placing an iAssembly ..	394	Review Simulation Results – Step 7	452
Sectioning a Part or Components in an Assembly .	398	Display Results – Step 8	452
Design View Representations in a Part		Animate or Probe Results	453
or an Assembly File	399	Report	454
Emboss Text and Closed Profiles	400	Exercise 7-9: Run a Stress Analysis on a Part ..	454
Exercise 7-4: Creating Text and Emboss Features..	403	Exercise 7-10: Run a Stress Analysis on	
Sweep Features	407	an Assembly	457
The Sweep Dialog Box	407	The Frame Generator	461
Creating a Sweep Feature Using a Profile ..	410	Exercise 7-11: Creating a Frame	465
Exercise 7-5: Creating Sweep Features	410	Applying Your Skills.....	472
3D Sketching	413	Skill Exercise 7-1	472
3D Sketch Overview	413	Checking Your Skills	473
3D Sketch Environment.....	413		
3D Sketch from Intersecting Geometry	413	8 Introduction to Sheet Metal Design	475
Project to Surface	414	Introduction.....	475
Project to a 3D Sketch	415	Objectives.....	475
3D Lines	416	Sheet Metal Design	476
Create a 3D Sweep	417	Creating a Sheet Metal Part	476
Import Points	417	Convert a Regular Part File to a Sheet Metal Part...	476
Exercise 7-6: 3D Sketch & Sweep Features.....	419	Sheet Metal Environment	476
Coil Features	423	Adding Features from the 3D Model Tab....	477
Input Geometry	423	Sheet Metal Parameters.....	477
Behavior	424	Sheet Metal Defaults, Rules and Styles	477
Output	425	Sheet Metal Defaults.....	477
Loft Features	426	Sheet Metal Rules and Styles	478
Create a Loft	426	Sheet Metal Unfold Rule	482
Exercise 7-7: Creating a Loft Feature	432	Exercise 8-1: Editing a Sheet Metal Style and Rule ...	483
Freeform Modeling.....	436		

Face.....	486
Unfold Options and Bend Tabs	487
Contour Flange.....	487
Width Extents	488
Unfold Options and Bend Tabs	489
Flange.....	490
Unfold Options and Bend Tabs	491
Exercise 8-2: Creating Sheet Metal Parts.....	492
Hem.....	496
Shape Tab.....	497
Unfold Options and Bend Tabs	497
Bend	497
Shape Tab.....	499
Unfold Options and Bend Tabs	499
Edit a Bend	499
Cut.....	500
Fold.....	501
Shape Tab.....	502
Unfold Options and Bend Tabs	503
Corner Round.....	503
Corner Chamfer	503
Exercise 8-3: Creating Bend, Cut, Hem and Fold Features	504
Flat Pattern	510
Define A-Side.....	510
Create Flat Pattern	510
Flat Pattern Environment.....	511
Flat Pattern Definition and Extents.....	511
Export a Flat Pattern	512
Detailing Sheet Metal Parts	512
Exercise 8-4: Flattening & Documenting Sheet Metal Parts	513
Applying Your Skills.....	517
Skill Exercise 8-1.....	517