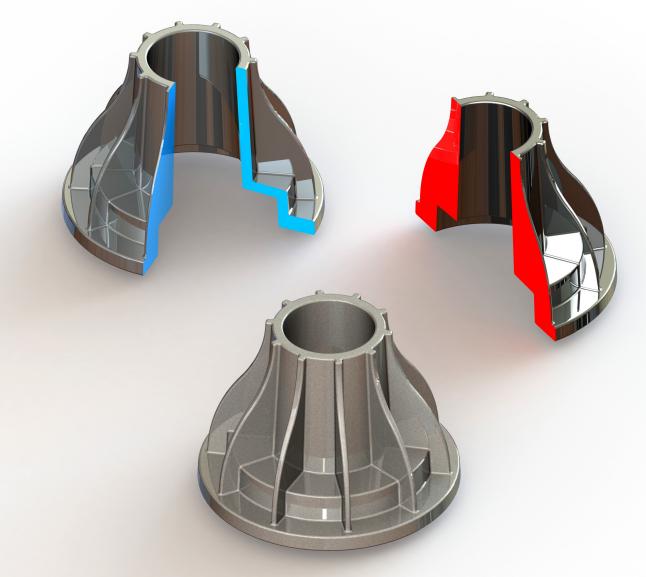
SOLIDWORKS[®] 2021 Basic Tools

Getting Started with Parts, Assemblies and Drawings



Paul Tran CSWE, CSWI



Visit the following websites to learn more about this book:





Googlebooks



Table of Contents

Introduction:	SOLIDWORKS 2021 User Interface	XXI
$\alpha = m \ \text{mod} \ \text{sol} \ \text{mod} \ mod} \ \frac{1}{2} \left[\frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} + \frac$	The 3 reference planes	XXII
	The toolbars	XXII
Man Page	The system feedback symbols	XXIV
	The status bar	XXIV
	2D sketch examples	XXV
	3D feature examples	XXVI

Setting the System Parameters

Chapter 1:	Cha	pter	1:
------------	-----	------	----

	System Options - General	Teach Options	-
Sydem Options . Document I	higedin	All hearth Options	
Denings Dening			
geat.			

System Options	1-1
Setting up the system options	1-1
The general options	1-2
The drawings options	1-3
The display style options	1-3
The area hatch/fill options	1-4
The performance options	1-4
The colors options	1-5
The sketch options	1-5
The relations / snaps options	1-6
The display / selection options	1-6
The performance options	1-7
The assemblies options	1-8
The external references options	1-8
The default templates options	1-9
The file locations options	1-9
The feature manager options	1-10
The spin box increments options	1-10
The view options	1-11
The backups / recover options	1-11
The touch options	1-12
The hole wizards / toolbox options	1-12
The file explorer options	1-13
The search options	1-13
The collaboration options	1-14
The messages/errors/warnings options	1-14
The import options	1-15

	The export options	1-15
	Questions for review	1-16
	Document Templates	2-1
	Setting up the Document Properties	2-1 2-1
	The drafting standard options	2-2
	The annotations options	2-2
	The balloon options	2-3
	The datum options	2-3
	The geometric tolerance options	2-4
	The note options	2-4
	The revision clouds options	2-5
	The surface finish options	2-5
	The weld symbol options	2-6
•	The dimensions options	2-6
0.	The angle options	2-7
	The angular running options	2-7
	The arc length options	2-8
	The chamfer options	2-8
	The diameter options	2-9
Neto	The hole callout options	2-9
	The linear options	2-10
	The ordinate options	2-10
	The radius options	2-11
	The virtual sharps options	2-11
	The table options	2-12
	The bill of materials options	2-13
	The general options	2-13
	The title block table options	2-14
	The DimXpert options	2-14
	The size dimension options	2-15
	The location dimension options	2-15
	The chain dimension options	2-16
	The geometric tolerance options	2-16
	The chamfer controls options	2-17
	The display options	2-17
	The detailing options	2-18
	The grid / snap options	2-18
	The units options	2-19
	The model display options	2-19
	The material properties options	2-20
	The image quality options	2-20
	The sheet metal options	2-21



Chapter 2:

The weldments options	2-22
The plane display options	2-22
The configurations options	2-23
Saving the settings in a part template	2-23
Questions for review	2-24

Basic Modeling Topics

Chapter 3:	Basic Solid Modeling – Extrude Options	3-1
	Tools needed	3-2
	Starting a new part	3-4
	Changing the scene	3-5
	Starting a new sketch	3-6
	Using the Click + Hold + Drag Technique	3-9
	Adding geometric relations	3-10
	Adding a collinear relation	3-11
	Geometric relations examples	3-12
	Adding the horizontal dimensions	3-13
	Adding the vertical dimensions	3-14
	The status of a sketch	3-14
	Hiding the sketch relation symbols	3-15
\sim	Extruding the base	3-16
	Sketching on a planar face	3-17
	Using the Trim Entities command	3-19
	Extruding a boss	3-20
	Extrude summary	3-24
	Adding the model fillets by Lasso	3-25
	Questions for review	3-27
	Using the search commands	3-28
	Exercise: Extrude Boss & Extrude Cut	3-35
Chapter 4:	Basic Solid Modeling – Extrude and Revolve	4-1
-	Link Components	4-2
	Tools needed	4-2
	Sketching the first profile	4-3
	Extruding the first solid	4-3
	Creating the bore holes	4-4
	Cutting the bore holes	4-5
	Mirroring the bore holes	4-6
	Extruding a Through All cut	4-8

Ø		
	R	\mathbb{Y}

Chapter 5:

Adding fillets Creating the sub-components Revolving the base feature Adding chamfers Extruding the base Sketching the Recess Profiles Extruding a blind cut Mirroring the cut Adding holes Adding more fillets Questions for review Exercise: Extrude Boss & Extrude Cut	$\begin{array}{c} 4-8\\ 4-10\\ 4-10\\ 4-11\\ 4-15\\ 4-15\\ 4-15\\ 4-16\\ 4-16\\ 4-17\\ 4-18\\ 4-20\\ 4-21\\ \end{array}$
Revolve Parts	5-1
Ball Joint Arm	5-2
Tools needed	5-3
Creating the base profile	5-4
Revolving the base feature	5-4
Sketching the opened-end profile	5-5
Revolving the opened-end feature	5-6
Mirroring the revolved feature	5-6
Adding fillets	5-6
Questions for review	5-8
Exercise: Flat Head Screw Driver	5-9
Derived Sketches Center Ball Joint Tools needed Creating the base profile Revolving the base profile Revolving the base feature Creating a new work plane Creating a derived sketch Positioning the derived sketch Adding fillets Questions for review Exercise: Revolve Parts - Wheel Exercise: Plastic bottle	5-12 5-12 5-13 5-14 5-14 5-14 5-15 5-15 5-15 5-16 5-17 5-18 5-19 5-21
Rib & Shell Features	6-1
Formed Tray	6-1
Tools needed	6-2
Sketching the base profile	6-3







Chapter 6:





Chapter 7:

	Extruding the base feature Adding the side cutouts Removing more material Creating the rib profiles Adding fillets Shelling the lower portion Questions for review	6-3 6-4 6-5 6-6 6-7 6-8 6-9
)	Shell & Mirror Features - Styrofoam Box Tools needed Starting a new part Extruding the base Adding fillets Creating an offset sketch Creating a recess Creating the rim Creating the fold feature Mirroring the solid body Creating the lock feature Creating the lock cavity Shelling the part Questions for review	6-10 6-11 6-12 6-13 6-14 6-14 6-16 6-17 6-18 6-19 6-20 6-22 6-25
	Patterns Linear Patterns – Test Tray Tools needed Sketching the base profile Extruding the base feature Sketching the seed feature Extruding a seed feature Extruding a seed feature Creating a linear pattern Shelling the base feature Adding fillets Questions for review	7-1 7-2 7-3 7-3 7-4 7-4 7-4 7-5 7-6 7-7 7-8
	Circular Patterns – Spur Gear Tools needed Sketching the body profile Using the dynamic mirror Revolving the base body Sketching the thread profile Converting the entities Trimming the sketch entities	7-9 7-10 7-11 7-13 7-14 7-15 7-16







Chapter 8:



Adding dimensions	7-16
Cutting the first tooth	7-17
Circular patterning the tooth	7-17
Adding the keyway	7-19
Extruding a cut	7-20
Questions for review	7-22
Circular Patterns – Circular Base Mount	7-23
Tools needed	7-24
Creating the base sketch	7-25
Revolving the base feature	7-25
Creating the first-side tab sketch	7-26
Extruding the side-tab	7-26
Adding a counterbore hole	7-27
Creating the circular pattern	7-28
Creating a new plane	7-28
Creating the pockets sketch	7-29
Adding fillets	7-30
Questions for review	7-32
Curve Driven Pattern and Hole Wizard	7-35
Tools needed	7-36
Opening the existing file	7-37
Extruding the base	7-38
Creating the sketch for the first hole	7-38
Constructing the curve-sketch to drive the pattern	7-39
Creating the first curve driven pattern	7-40
Adding the hole wizard	7-41
Creating the second curve driven pattern	7-42
Part Configurations	8-1
Machined Block	8-1
Tools needed	8-2
Sketching the base profile	8-3
Extruding the base feature	8-3
Creating the pocket profiles	8-4
Adding a counterbore from the hole wizard	8-5
Patterning the counterbore	8-6
Creating the mirror-plane	8-6
Mirroring the counterbores	8-7
Creating the blind holes	8-8
Creating a cutaway section	8-9
Sketching a profile for the cut	8-10



Chapter 9:

Creating the section cut	8-11
Switching between the configurations	8-12
Splitting the pane	8-13
Creating a new configuration	8-13
Questions for Review	8-16
Exercise 1: Using Vary-Sketch	8-17
Exercise 2: Using Vary-Sketch	8-20
Modeling Threads	9-1
Threaded Insert	9-1
Tools needed	9-2
Sketching the base profile	9-3
Revolving the base feature	9-4
Creating the right-hand threads	9-4
Using the Mirror bodies option	9-7
Adding chamfers	9-8
Questions for review	9-9
Exercise: Modeling threads - Internal	9-10
Exercise: Internal threads	9-14
Exercise: External threads	9-22

Bottom-Up Assembly Topics

Chapter 10:	Bottom Up Assembly	10-1
	Ball Joint Assembly	10-1
	Tools needed	10-2
	Starting a new assembly template	10-3
	Inserting the components	10-4
	Mating the components	10-6
	Moving the component	10-7
	Inserting another instance into the assembly	10-7
	Constraining the components	10-8
	Questions for review	10-11
	Bottom Up Assembly – Links Assembly	10-12
	Tools needed	10-13
	Starting a new assembly template	10-14
	Placing the first component	10-15
	Adding other components	10-16
	Changing colors	10-17
	Inserting the single link into the assembly	10-18

XIII

|--|

Chapter 11:

Using the selection filters	10-18
Adding mates	10-19
Adding a width mate	10-20
Making copies of the component	10-21
Inserting other components into the assembly	10-23
Rotating the pin head	10-23
Constraining the alignment pin	10-24
Constraining the pinhead	10-25
Using the align & anti-align options	10-27
Questions for review	10-29
Exercise: Gate Assembly	10-30
Using Advanced Mates	11-1
Rack and Pinion	11-1
Open an assembly document	11-2
Adding standard mates	11-3
Suppressing a mate	11-4
Adding a mechanical mate	11-4
Testing the mates	11-5
Creating a linear motion	11-5
Limit & Cam Mates	11-8
Opening a part file	11-8
Adding a width mate	11-9
Adding a cam mate	11-10
Adding a parallel mate	11-12
Adding a limit mate	11-13
Exercise: Cam Followers	11-16
Questions for review	11-20
Exercise: Bottom up assembly	11-21
Level 1 Final Exam: Assembly Motions	11-27
Layout Assembly	12-1
Assembly Motions	12-2
Tools Needed	12-2
Opening an assembly document	12-3
Activating the layout mode	12-3
Creating a new sketch	12-4
Making a block	12-4
Setting the insertion point	12-5
Editing a block	12-5
Adding dimensions	12-6





Chapter 12:

12-7

Testing the relations between the blocks



Converting a block into a component	12-8
Extruding the fixed base	12-8
Adding fillets	12-9
Shelling the part	12-9
Adding a hole	12-10
Converting the next block	12-11
Extruding the arm	12-11
Adding a cut	12-12
Using the extrude-from option	12-13
Hiding the sketches	12-14
Viewing the assembly motions	12-14
SOLIDWORKS Animator – The Basics	12-15
Opening an existing assembly document	12-15
Adding a rotary motor	12-16
Viewing the rotary motions	12-17
Using the animation wizard	12-17
Animating the explode of an assembly	12-19
Animating the collapse of the assembly	12-20
Changing the view orientation of the assembly	12-22
Creating the flashing effects	12-25
Looping the animation	12-28
Saving the animation as AVI	12-29
Viewing the AVI with Windows Media Player	12-30
PhotoView360 Basics	13-1
Activating PhotoView 360	13-1
Setting the appearance	13-2
Setting the scene	13-3
Setting the image quality options	13-4
Rendering the image	13-5
Exercise: HeliDrone Assembly	13-7
Rendering the screen with Ambient Occlusion	13-11
Opening an assembly document	13-11
Changing the scene	13-12
Retrieving a named view	13-13
Applying appearances to the components	13-14



Chapter 13:

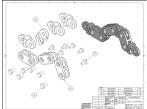


Drawing Topics

Chapter 14:	Drawing Preparations	14-1
-	Customizing the Document Template	14-1
	Tools needed	14-2
Seases	Setting up new drawing	14-3
And MARTING Conception of the	Switching to the sheet format layer	14-5
	Switching to the sheet layer	14-6
Approprint Analysis to the entropy with tool stating over the address and the entropy with tool stating over the address and	Setting up the drawing options	14-7
Desterm Desterm Viter Control relation	Setting up the document template options	14-8
	Saving the document template	14-16
	Questions for review	14-17
Chapter 15:	Assembly Drawings	15-1
	Links Assembly	15-2
	Tools needed	15-2
	Creating a new drawing	15-3
	Editing the sheet format	15-6
	Setting up the anchor point to attach the B.O.M.	15-6
	Switching back to the sheet layer	15-7
	Opening an existing assembly document	15-8
	Switching to the exploded view state	15-10
	Changing the line style	15-11
	Using the view palette	15-12
	Switching to shaded view	15-13
	Adding the bill of material (B.O.M.) to the drawing	15-13
	Selecting the B.O.M. options	15-14
	Modifying the B.O.M.	15-17
	Reversing the column headers	15-19
	Adding balloon callouts	15-20
	Changing the balloon style	15-21
	Questions for review	15-22
	Exercises: Assembly Drawings	15-23
	Alternate Position Views	15-26
	Tools needed	15-27
	Creating a new drawing	15-28
	Creating the isometric drawing view	15-29
	Changing the drawing view scale	15-30
Justific View	Creating an alternate position drawing view	15-31
ANY COMPARENT COMPARENT	Adding the top drawing view	15-32



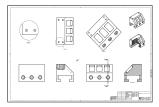
Chap

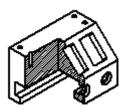


0

Adding text / annotations	15-34
Creating an exploded isometric view	15-35
Adding auto-balloons to the exploded view	15-36
Adding the bill of materials	15-37
Questions for review	15-38

Chapter 16:





Chapter 17:



Drawing Views	16-1
Machined Block	16-1
Tools needed	16-2
Creating a new drawing	16-3
Editing the sheet format	16-4
Modifying the existing text	16-6
Adding the title of the drawing	16-6
Using the view palette	16-7
Adding an isometric view	16-9
Moving the drawing views	16-10
Breaking the alignments between the views	16-11
Creating a detail view	16-12
Using the detail view options	16-12
Creating a projected view	16-13
Creating an auxiliary view	16-14
Creating a section view	16-15
Showing the hidden lines in a drawing view	16-16
Creating a broken-out-section	16-16
Adding a cutaway view	16-17
Changing configurations	16-18
Adding crosshatch to the sectioned surfaces	16-19
Modifying the crosshatch properties	16-20
Geometric tolerances & flag notes	16-22
Modifying & hole symbols	16-23
ANSI symbol descriptions	16-24

Detailing – Machined Block Details	17-1
Machined Block Details	17-2
Tools needed	17-2
Opening a drawing document	17-3
Inserting dimensions from the model	17-3
Re-arranging the new dimensions	17-4
Inserting dimensions to the section view	17-4
Adding dimensions to the auxiliary view	17-6
Adding the center marks	17-6
Adding the datum feature symbols	17-7

Datum reference & geometric tolerance examples	17-8
Adding the hole specifications using the hole-callout	17-9
Adding geometric tolerances	17-9
Align the geometric tolerance	17-11
Attaching the geometric tolerance to the driving dimension	17-12
Adding tolerances / precision to dimensions	17-13
Adding symmetric tolerance to a dimension	17-14
Adding surface finish callouts	17-14
Adding non-parametric callouts	17-16
Inserting notes	17-16
Changing the document's font	17-17
Questions for review	17-19
Exercise: Detailing I	17-20
Exercise: Detailing II	17-21
Fastener Callouts	17-22
Thread Nomenclature	17-23
Attaching note or symbol to a dimension	17-24

Chapter 18:	Sheet Metal Drawings	18-1
	Post Cap	18-1
	Tools needed	18-2
	Starting a new drawing	18-3
	Creating the 3 standard views	18-4
	Rearranging the drawing views	18-5
	Creating the flat pattern drawing view	18-5
	Creating a detail view	18-6
	Adding the ordinate dimensions	18-6
	Adding the model dimensions	18-7
	Creating the isometric flat pattern view	18-9
	Showing / hiding the bend lines	18-10
	eDrawing & 3D Drawing View	18-11
	SOLIDWORKS 2021 – 3D Drawing View	18-20
	Reorienting views	18-23
Chapter 19:	Configurations	19-1
-	Part I: Part, Assembly & Drawing	19-1
	Tools needed	19-2
	Opening an assembly document	19-3
	Using configurations in the part mode	19-3
	Changing the pitch	19-4
	Creating an assembly configuration	19-5

Creating an assembly configuration19-5Changing the mate conditions19-5

XVIII

19-6

Adding new mates

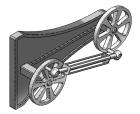
	Changing configuration	19-6
	Using configurations in a drawing	19-7
	Changing the configuration of a drawing view	19-8
	Part II: Part, Assembly & Drawing	19-9
	Tools needed	19-10
	Part Configurations	19-11
	Opening a part document	19-11
	Creating a new configuration	19-11
	Changing the number of the spokes	19-12
	Viewing the configurations	19-13
	Assembly configurations	19-14
	Starting a new assembly	19-14
	Inserting the Sub-Assembly	19-15
	Mating the sub-assembly	19-16
	Viewing the assembly configurations	19-18
	Drawing Configurations	19-19
	Creating an assembly drawing	19-19
	Creating the standard drawing views	19-20
	Auto start the projected view	19-21
· · ·	Creating the aligned section view	19-21
	Creating the isometric view	19-22
	Displaying the exploded view	19-23
	Changing configurations	19-24
	Adding annotations	19-24
Chapter 20:	Design Tables	20-1
	Tools needed	20-2
$\varphi \varphi \varphi$	Copying the document	20-3
	Creating a new design table	20-4
$\Psi \Psi \Psi$	Transferring the dimensions to the design table	20-5
	Using Excel's addition formula	20-5
$\Psi \Psi \Psi$	Controlling the suppression-states of the holes	20-7
	Viewing the configurations generated by the design table	20-8
	Assembly – Design Tables	20-9
AD	Copying the eggbeater assembly	20-9
Car	Creating a new assembly design table	20-10
	Defining the column headers	20-11
	Inserting the control parameters	20-12
	Adding the configuration names	20-13
	Assigning the control values	20-13





	Viewing the new configurations Exercise: Part design tables	20-14 20-15
	Level 2 Final Exam	20-19
	Table of U.S. Measures Table of Metric Measures	20-21 20-22

CSWA Preparation Materials (Certified SOLIDWORKS Associate)



Preparation materials for the CSWA examination	21-1
Drafting competencies	21-3
Basic Part Modeling	21-6
Bottom Up Assembly 1	21-30
Bottom Up Assembly 2	21-42



Glossary Index

SOLIDWORKS 2021 Quick-Guides:

Quick Reference Guide to SOLIDWORKS 2021 Command Icons and Toolbars.

