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Autodesk® Inventor™: The Sharpest Tool for **Woodworking** & Cabinetry

Steven Widom – Widom Associates, - Northport, New York

Code MA319-5

About the Speaker:

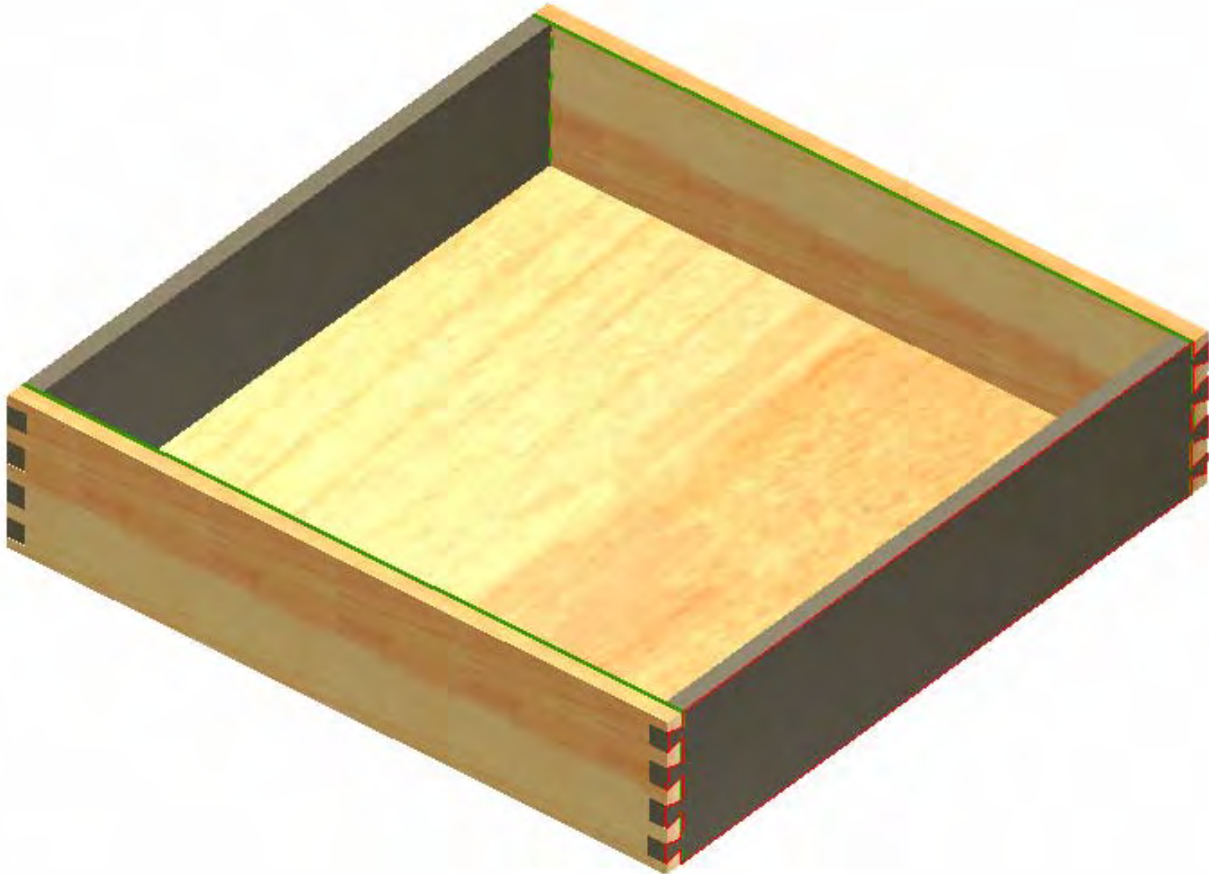
Steven is the senior solutions engineer and CTO for Widom Associates, an Autodesk reseller in Long Island, New York. He has used Autodesk software since 1984 in the manufacturing and architectural fields as a trainer and application expert, providing custom classes and support for Autodesk Inventor and AutoCAD 3D specific to the metal, plastic, and wood industries. He has over 22 years of teaching experience. In his life before computers, Steven designed and manufactured award-winning, juried custom-hardwood furniture.

support@widom-assoc.com



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Adaptive Woodworking – One part or assembly being used in many projects



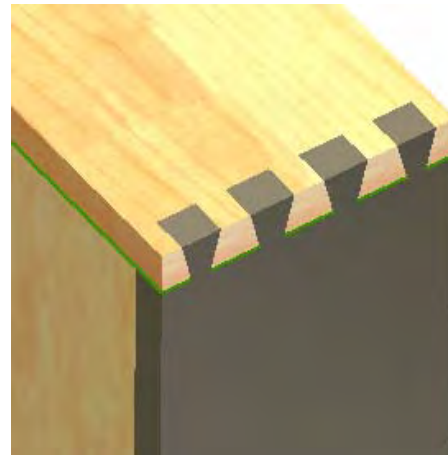
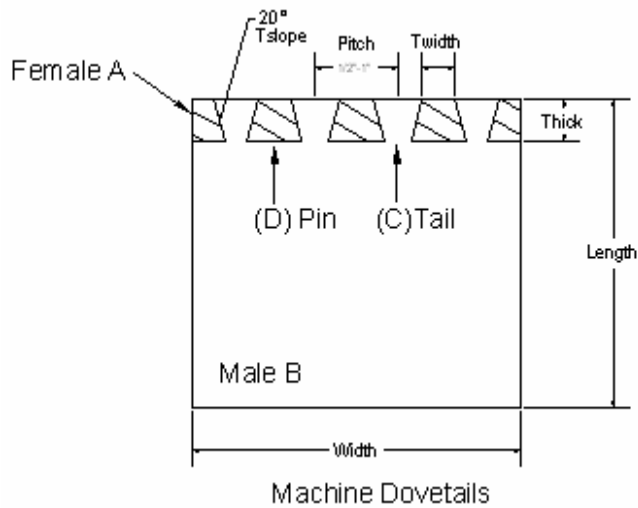
In the following illustration:

(A) is the drawer front and (B) the drawer side (C) is the tail and (D) the pin.

In the diagram (T slope) or angle of the dovetail which gives the construction its holding power, usually an angle of 15-25 degrees is standard. The pitch refers to the spacing of the pins. ($\frac{1}{2}$ " – 1") .

In our example I have set the angle at 15 degrees with a tail width of .4 and a pitch of 1".

The material thickness will be $\frac{1}{2}$ " and a drawer bottom $\frac{3}{16}$ "



Hands on: Creation of front, sides and bottom of drawer unit.

I-Parts- utilizing parameter table – 2 Sides Thru Dovetails 4", 8", 12" Width – Any length



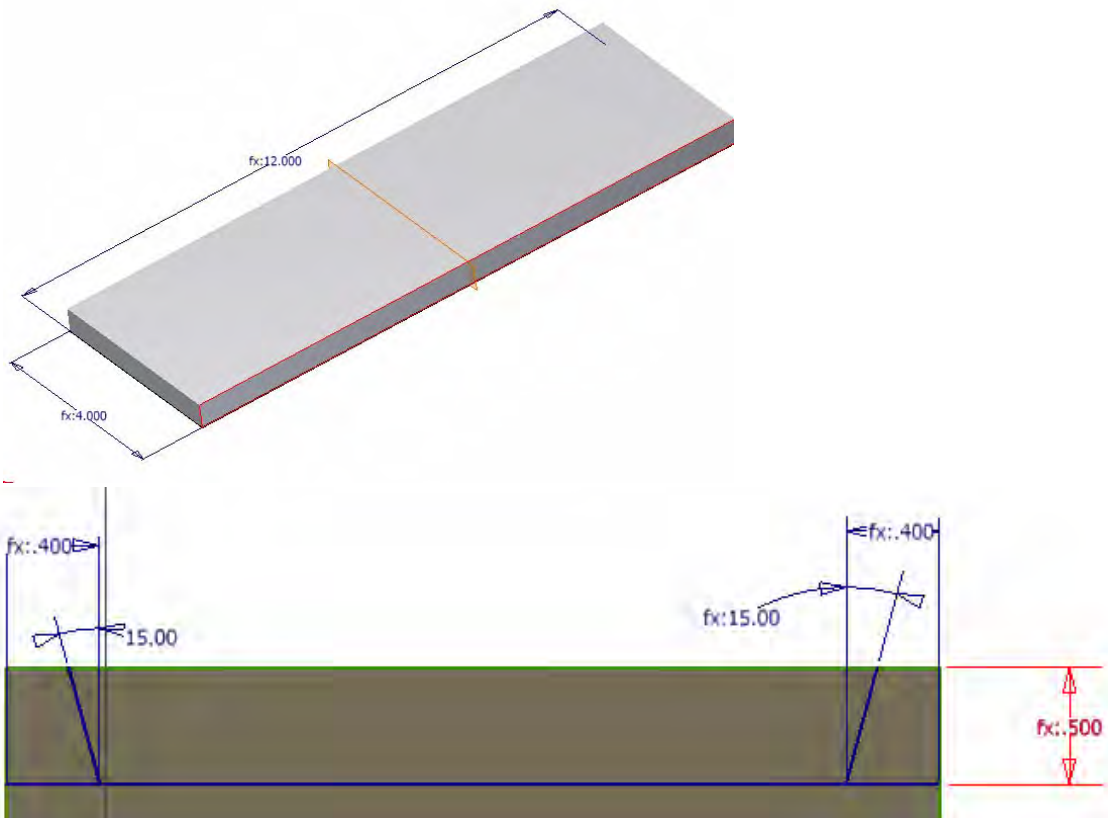
Model Parameters						
User Parameters						
Length	in	12 in	12.000000	●	12.000000	<input checked="" type="checkbox"/>
Width	in	4 in	4.000000	●	4.000000	<input checked="" type="checkbox"/>
Thick	in	0.5 in	0.500000	●	0.500000	<input checked="" type="checkbox"/>
Twidth	in	0.5 in	0.500000	●	0.500000	<input type="checkbox"/>
Tslope	deg	20 deg	20.000000	●	20.000000	<input type="checkbox"/>
Pitch	in	1.0 in	1.000000	●	1.000000	<input type="checkbox"/>



Be sure to use parameters in the creation of the dimensions, a work plane in the middle of the part will also be necessary.

We are also going to create a cut list in our 2d drawings when we are done - Thus
Check off “export parameter” (Length, Width, Thick)

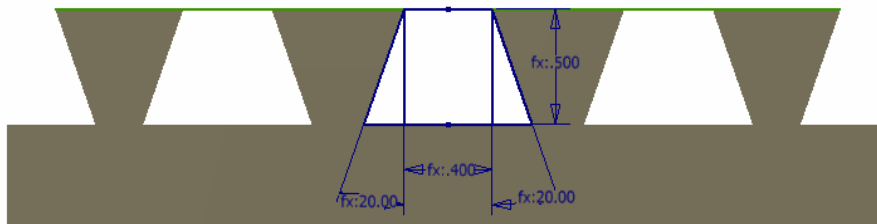
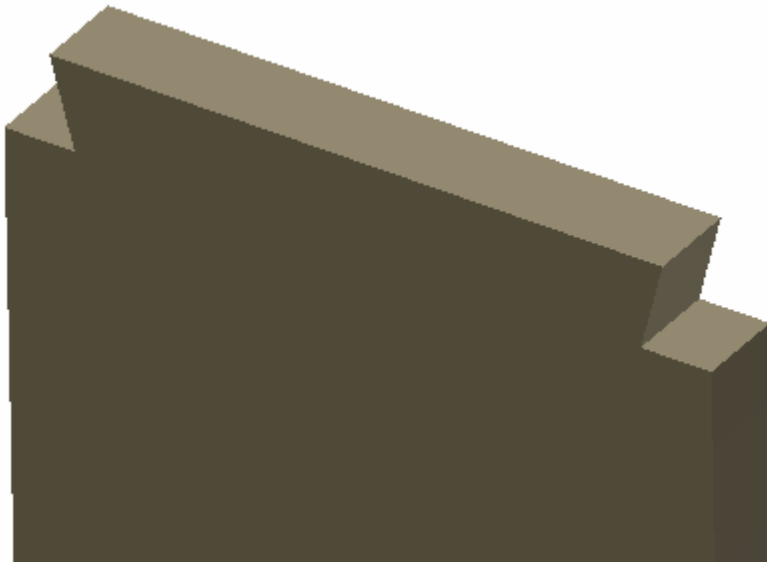
We will also change the color of the part to beige dark; it will allow the dovetails to contrast the wood grain



Plan view of end of part – please sketch and then utilizing the extrude command cut the pin ends off

In our model we will have the end pins equal $\frac{1}{2}$ of a tail pitch dimension.

Do not forget to use parameters that we already set up. After complete, change the parameter “Twidth” to .4 ... Verify that the part model updated.

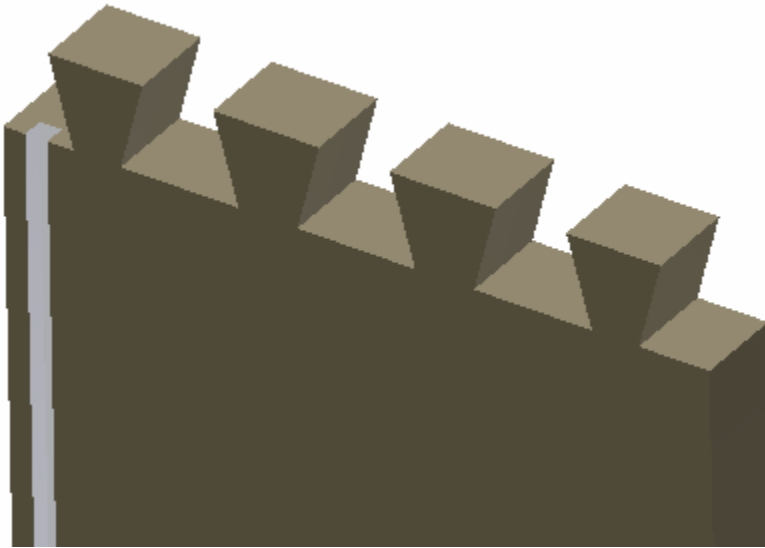


Utilizing the parameters, cut the negative shape for the middle pin, when done, execute a rectangular pattern, also utilizing the parameter, “pitch” and add a new parameter “Tquantity” and set it for “2” (rectangular pattern).

Mirror the tails from one side of the part to the other.

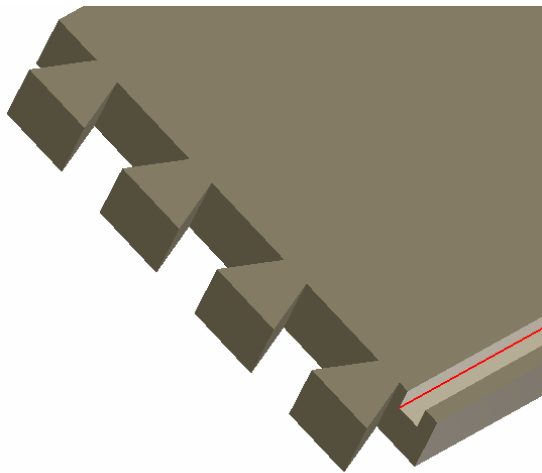
To finish the part we will need a dado joint for the drawer bottom. Create a 3/16” x 3/16” dado 1/8” off the bottom of the drawer side.

Autodesk® Inventor™:

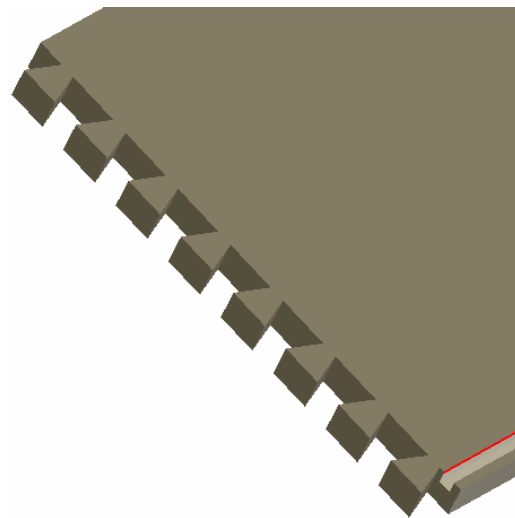


The procedure in which we developed this part, allows us to create new drawer sides in multiples of 4”.

Experiment with changing the parameters (Length, Thick, Width, Tquantity)



Parameter - Width of 4” with a “Tquantity” of 2

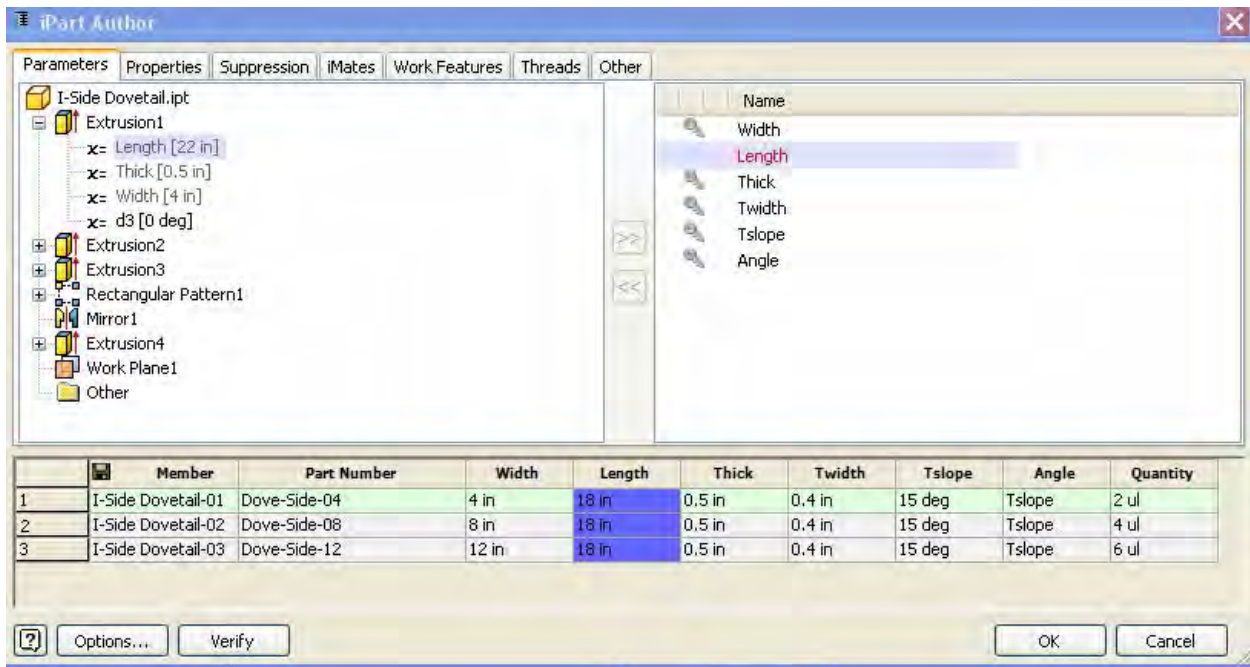


Width of 8” with a “Tquantity” of 4

Please save this part file and name it “Drawer-Side-Dovetail-V.ipt”

check your work and test your parameters (Length, Width Tquantity).

Creation of a table driven “Ipart” – three sizes 4”, 8”, 12”



Under the “Tools” pull down menu, execute the command “Create Ipart” – right click on item 1 in the lower section of the table and insert 2 new rows for a total of three.

Change the part number to a more descriptive name In this example I used Dove-Side-04, 08, and 12. The reason for this is that when we use this part in an assembly it will generate the correct naming convention.

Thus a 4” wide drawer side will be a Dove-Side-04 and a 12” drawer side will be a Dove-Side-12

Change the width to 4 in, 8 in, and 12 in

Lastly change the “Tquantity” or Tail quantity to 2 ul, 4 ul, and 6 ul

We will also make the length of the drawer side a custom parameter column. The purpose of this action is to facilitate the many lengths a drawer side can be.

Right click on the column heading length and check on “custom parameter column”.

Save your part – it should now be an Inventor Ipart.

Testing: Create a new assembly file and place this new Ipart into it. – Pick table when placing

I-Parts- utilizing parameter table – 1 Front 1 Back – Thru Dovetails 4”, 8”, 12”

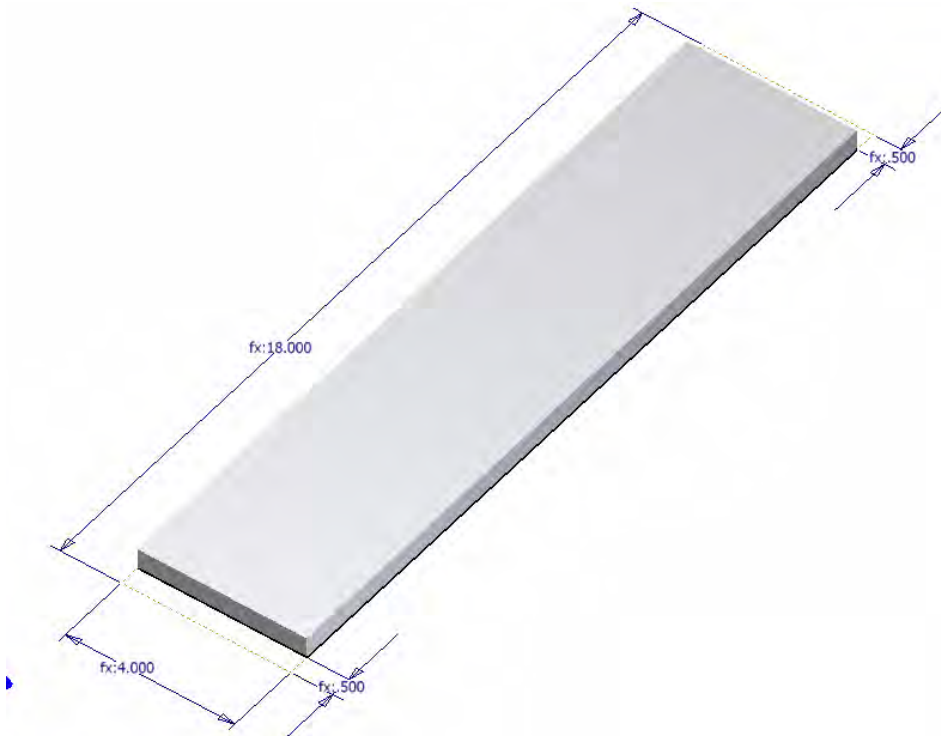
Creation of new mating Dovetail parts

Creation of Parameter Table:

Parameter Name	Unit	Equation	Nominal Value	Tol.	Model Value	Export Parameter
Model Parameters						
User Parameters						
Length	in	12 in	12.000000	●	12.000000	<input checked="" type="checkbox"/>
Width	in	4 in	4.000000	●	4.000000	<input checked="" type="checkbox"/>
Thick	in	0.5 in	0.500000	●	0.500000	<input checked="" type="checkbox"/>
Twidth	in	0.4 in	0.400000	●	0.400000	<input type="checkbox"/>
Tslope	deg	15 deg	15.000000	●	15.000000	<input checked="" type="checkbox"/>
Pitch	in	1.0 in	1.000000	●	1.000000	<input type="checkbox"/>
Tquantity	ul	2 ul	2.000000	●	2.000000	<input type="checkbox"/>

Be sure to check off export parameter, also “Tquantity” unit type is ul, “Tslope” unit type is degree

Start a new part file – Creation of front and back of drawer



Background – The front of the drawer will be made very much the same way the side was created. There are some key exceptions!

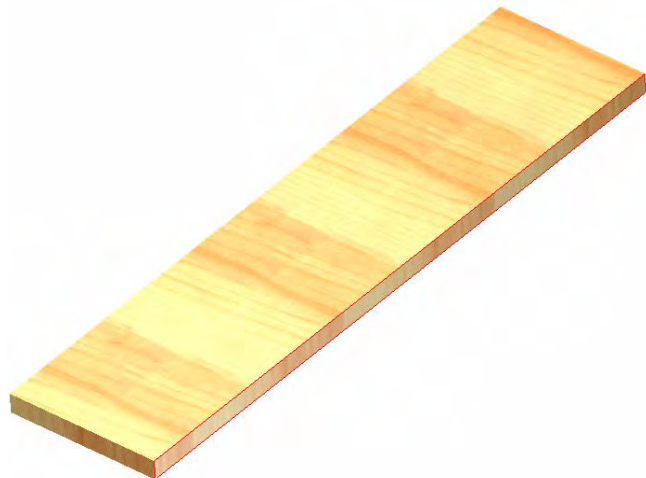
We will be working adding pins to the end grain at this time, thus we create construction geometry to compensate for the total length of the drawer front. The purpose of this is to maintain an accurate dimensional input by the user.

The parameters we use at this time will be “Length”, “Width”, Thick,

As before create a work plane at the center of the part, this will allow us to mirror the dovetails created on the one side.

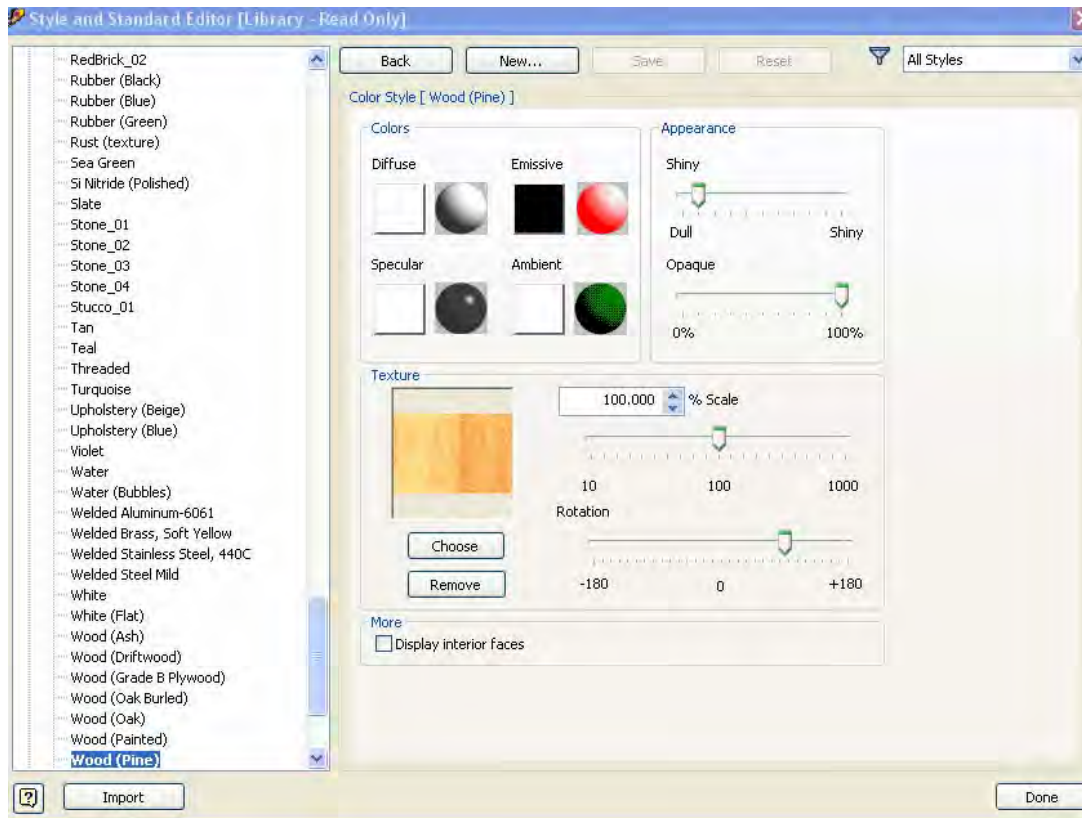
It is a good time to change the color of the part to Wood (Pine)

As you see the grain is running in the wrong direction, the end grain is also incorrect, The scale of the grain could also be wrong.

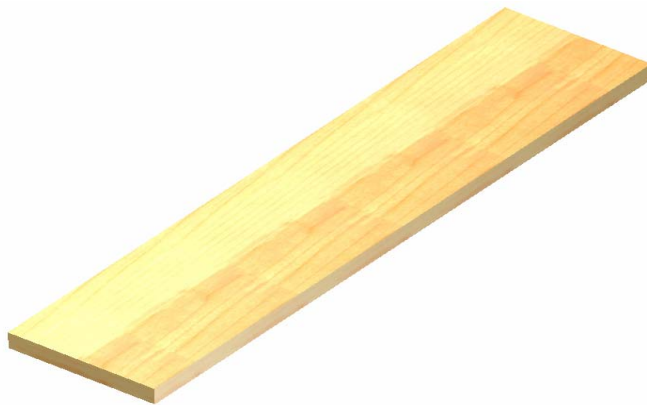


If you have not adjusted your colors, or scanned in your own grain patterns, the following is a quick way to get closer visual appeal for your parts and models.

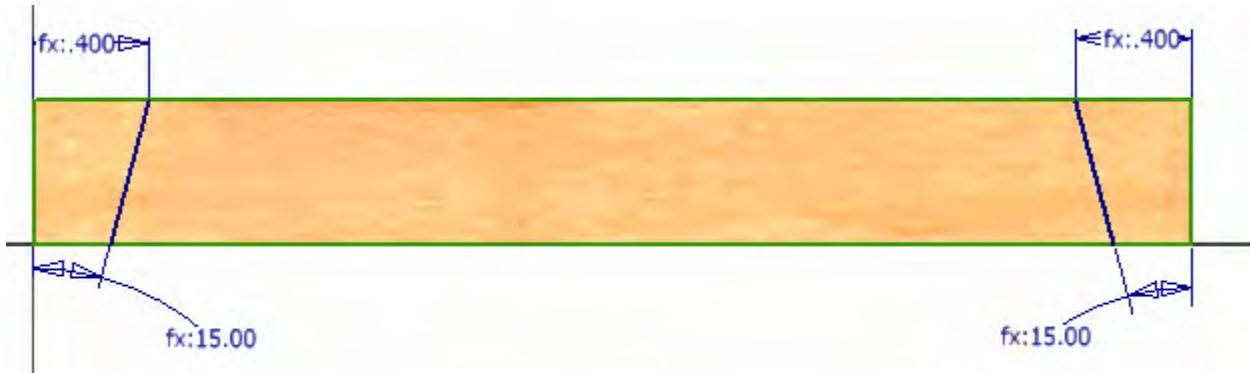
First want to change the scale of the grain pattern “Wood (Pine)” than we want to create another color called “Wood (Pine 90)” and rotate the pattern 90 degrees



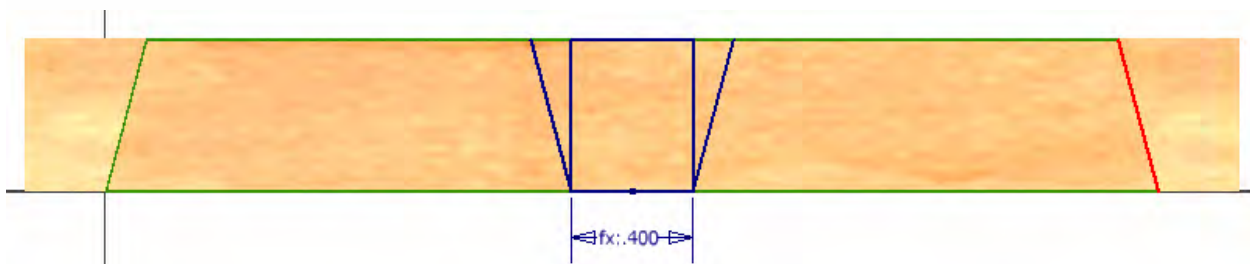
After a little experimentation your results should be acceptable



End grain pin development:

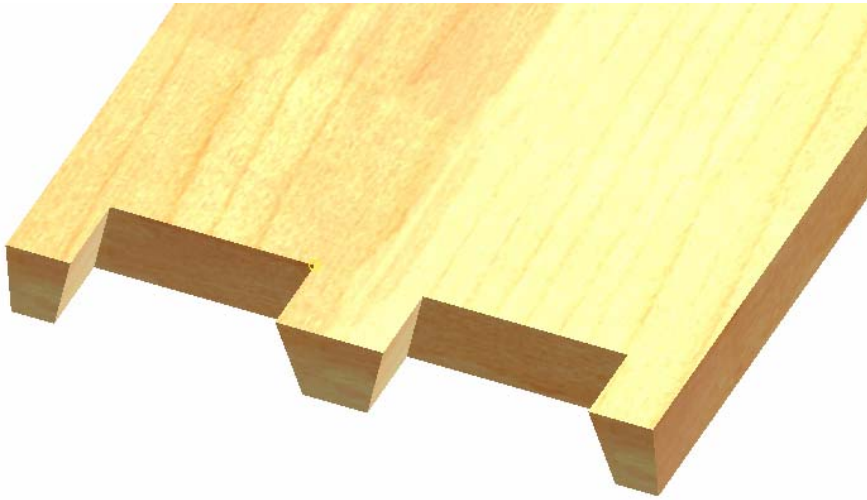


Parameter "Thick", "Tslope", "Twidth"



Middle Tail – Parameter - "Thick", "Twidth", Sketch angle is parallel, and centered in sketch

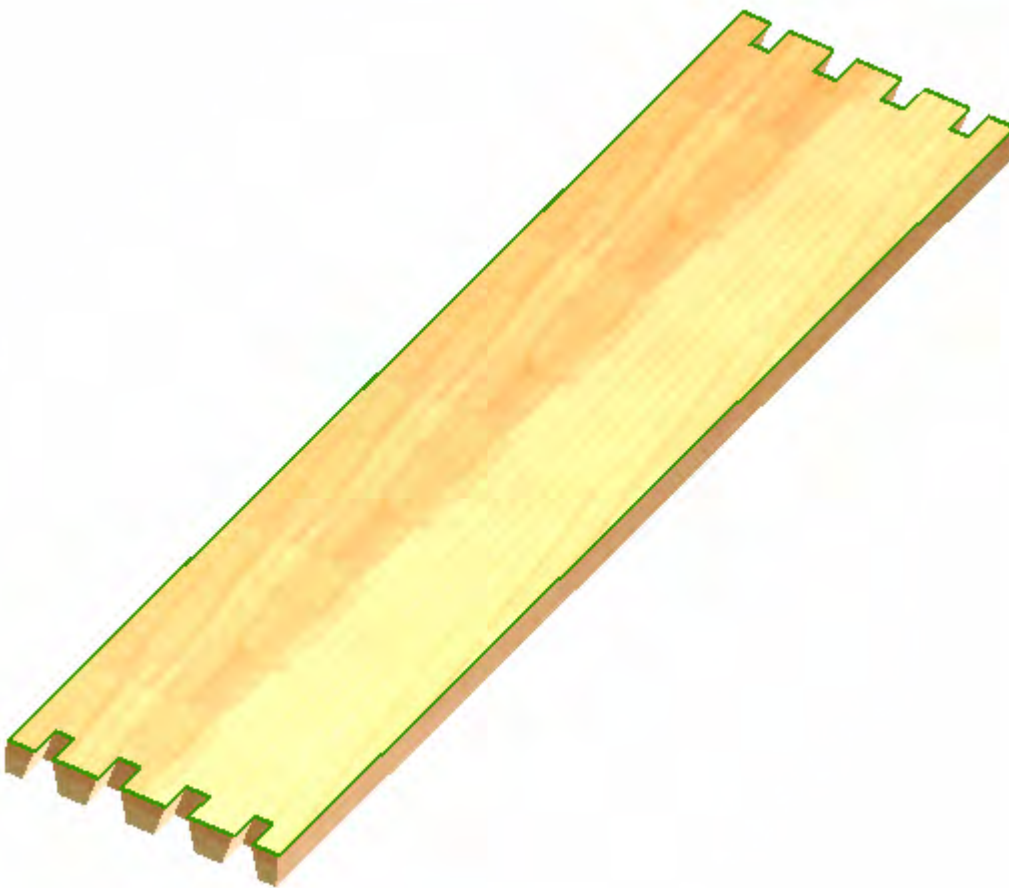
Hint! Start with a rectangle and constrain it



Rectangular pattern of
the center pin

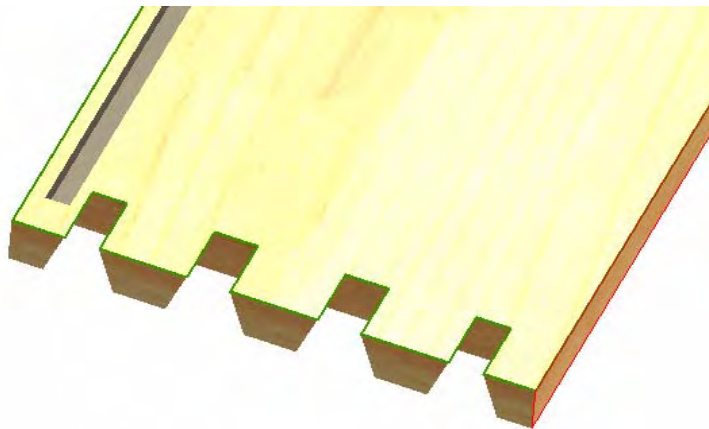
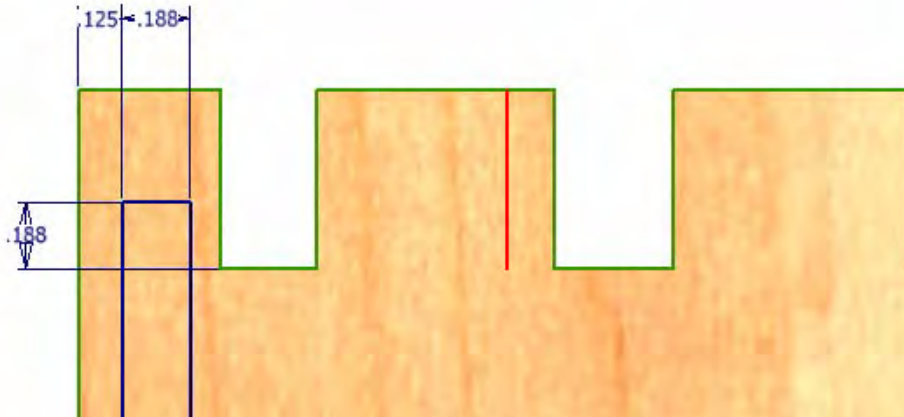
Parameter – “Tquantity”
– “Pitch”

Mirror the pins to the
other side of the part



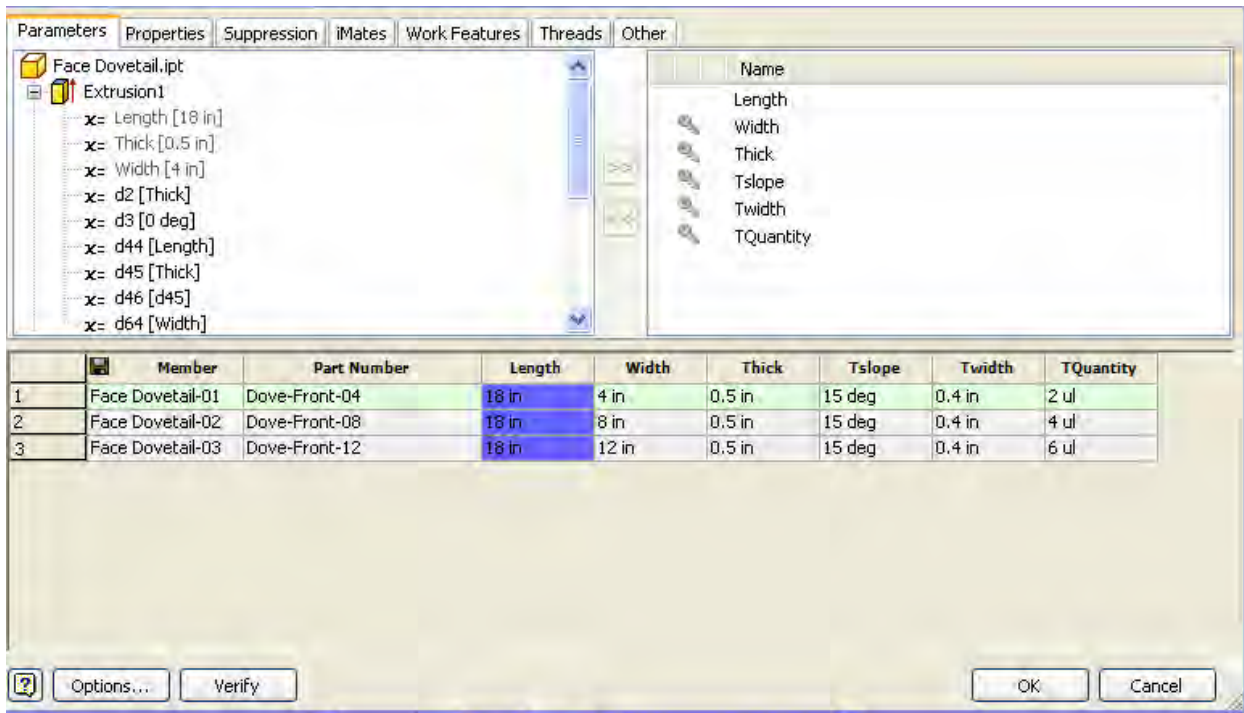


The last step in developing the front of the drawer will be to create the dado for the drawer bottom. 3/16" x 3/16" dado 1/8" from bottom of drawer



Save your part - "Drawer-Front-Dovetail-V.ipt"

Creation of a table driven “Ipart” – three sizes 4”, 8”, 12” Drawer Front



Under the “Tools” pull down menu, execute the command “Create Ipart” – right click on item 1 in the lower section of the table and insert 2 new rows for a total of three.

Change the part number to a more descriptive name In this example I used Dove-Front-04, 08, and 12. The reason for this is that when we use this part in an assembly it will generate the correct naming convention.

Thus a 4” wide drawer side will be a Dove-Front-04 and a 12” drawer side will be a Dove-Front-12

Change the width to 4 in, 8 in, and 12 in

Lastly change the “Tquantity” or Tail quantity to 2 ul, 4 ul, and 6 ul

We will also make the length of the drawer side a custom parameter column. The purpose of this action is to facilitate the many lengths a drawer side can be.

Right click on the column heading length and check on “custom parameter column”.

Save your part – it should now be an Inventor Ipart.

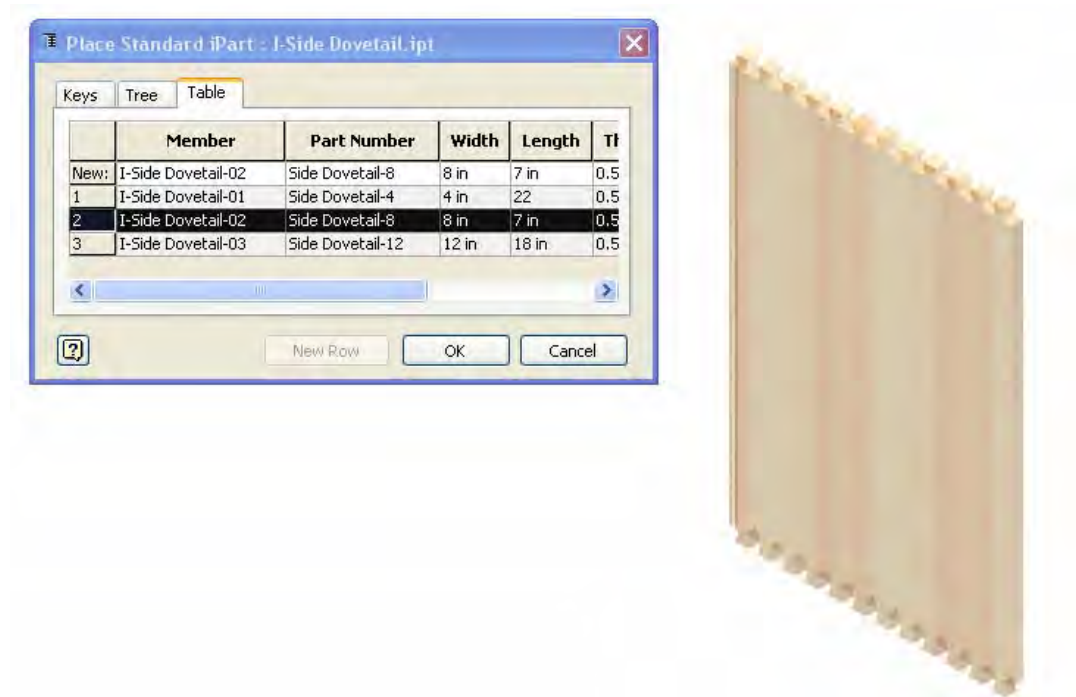
Creation Drawer Assembly - Adaptive

Start a new assembly file

Place the new parts we just created

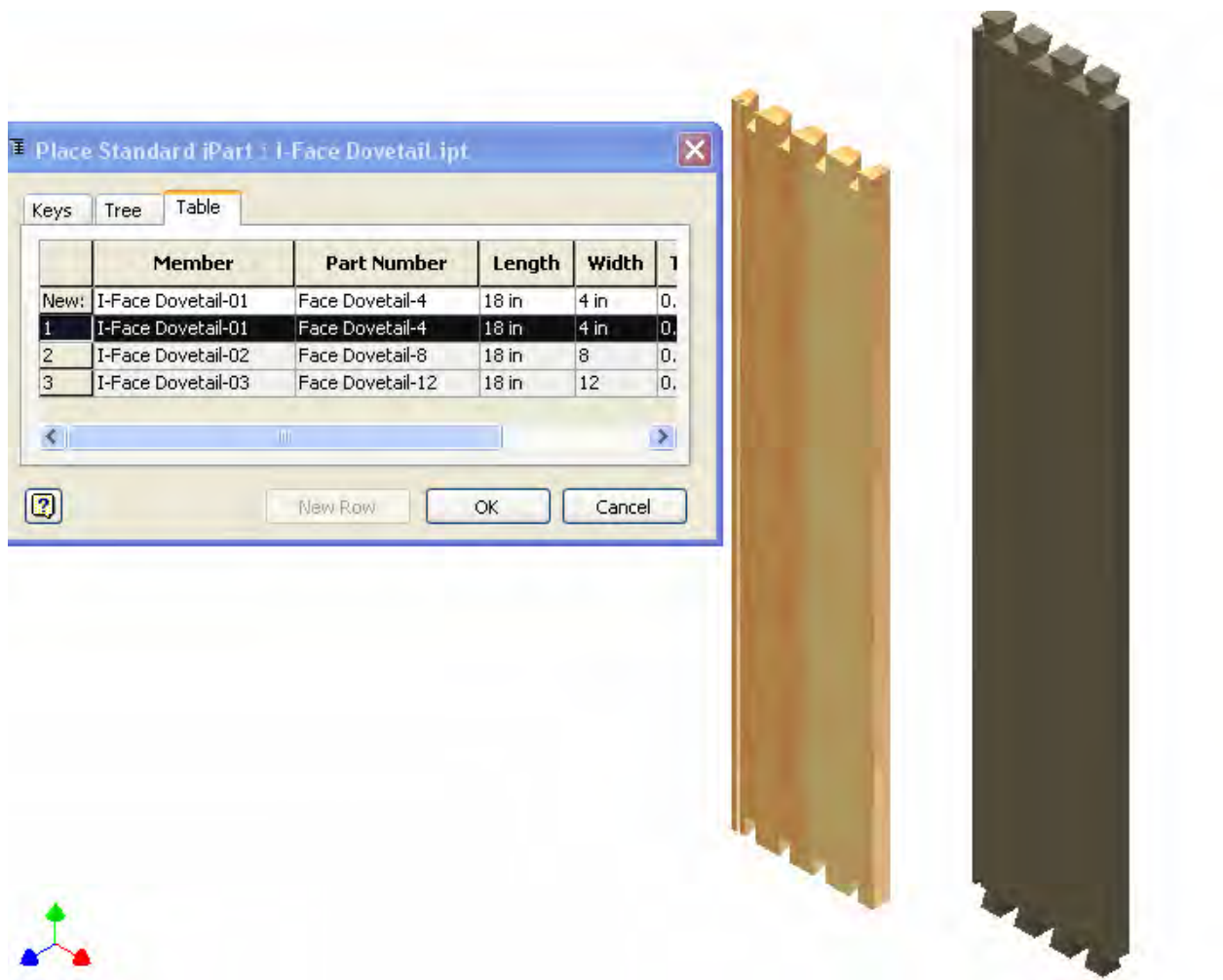
Place part name “Drawer-Side-Dovetail-V.ipt” into the assembly – this will be our grounded part.

As we place it in our assembly, pick the tab “Table” notice you now have the three rows we added when we created the Ipart. Pick Column 2 this will set all the parameters at one time , at this point you can also set the total length of the side. If you are not sure you will be able to change it later.



Place part name “Drawer-Front-Dovetail-V.ipt” into the assembly – this will be our second part.

As we place it in our assembly, pick the tab “Table” notice you now have the three rows we added when we created the Ipart. Pick Column 2 this will set all the parameters at one time , at this point you can also set the total length of the side. If you are not sure you will be able to change it later.

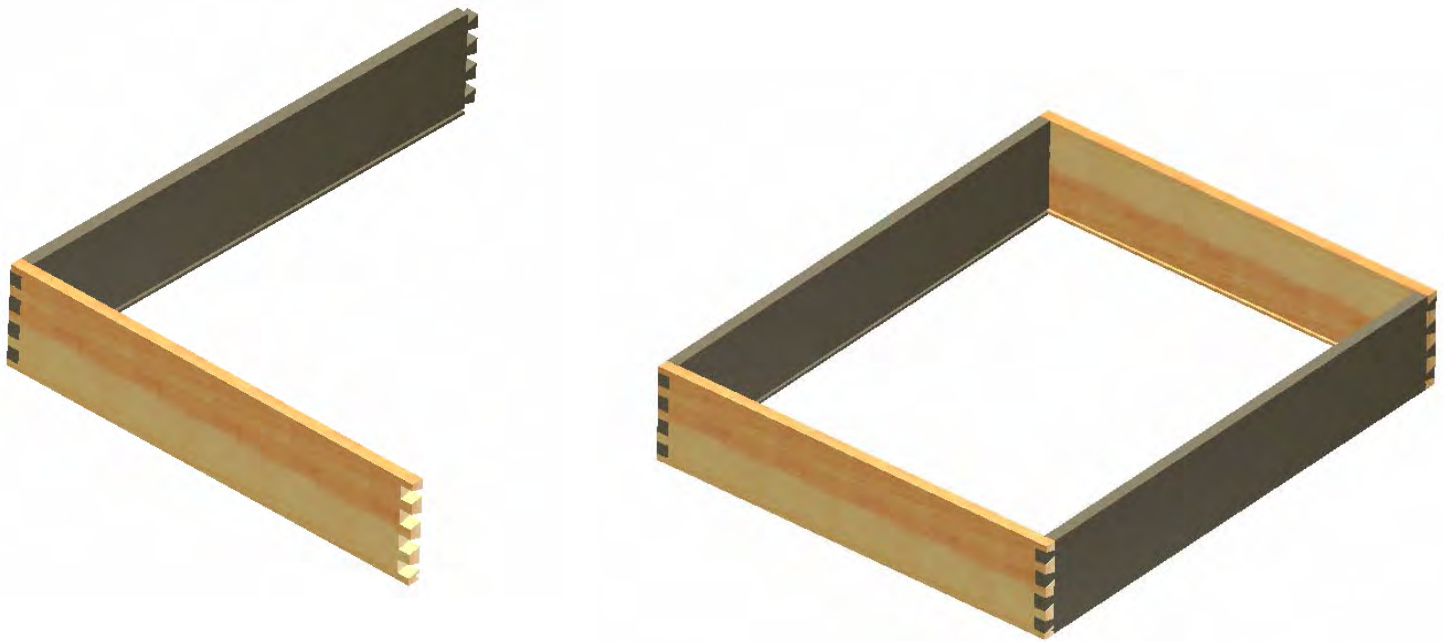


Using copy and past create duplicates of the original parts (Instances).

Hint! If one side or face changes in length, width or Thickness the copy will change also

Using Assembly constraints complete the drawer assembly utilizing the other two copied parts.

When complete, check for any interference conditions.



Creation of the drawer bottom “adaptivity”

The last step in the drawer assembly will be creation of the bottom of the drawer.

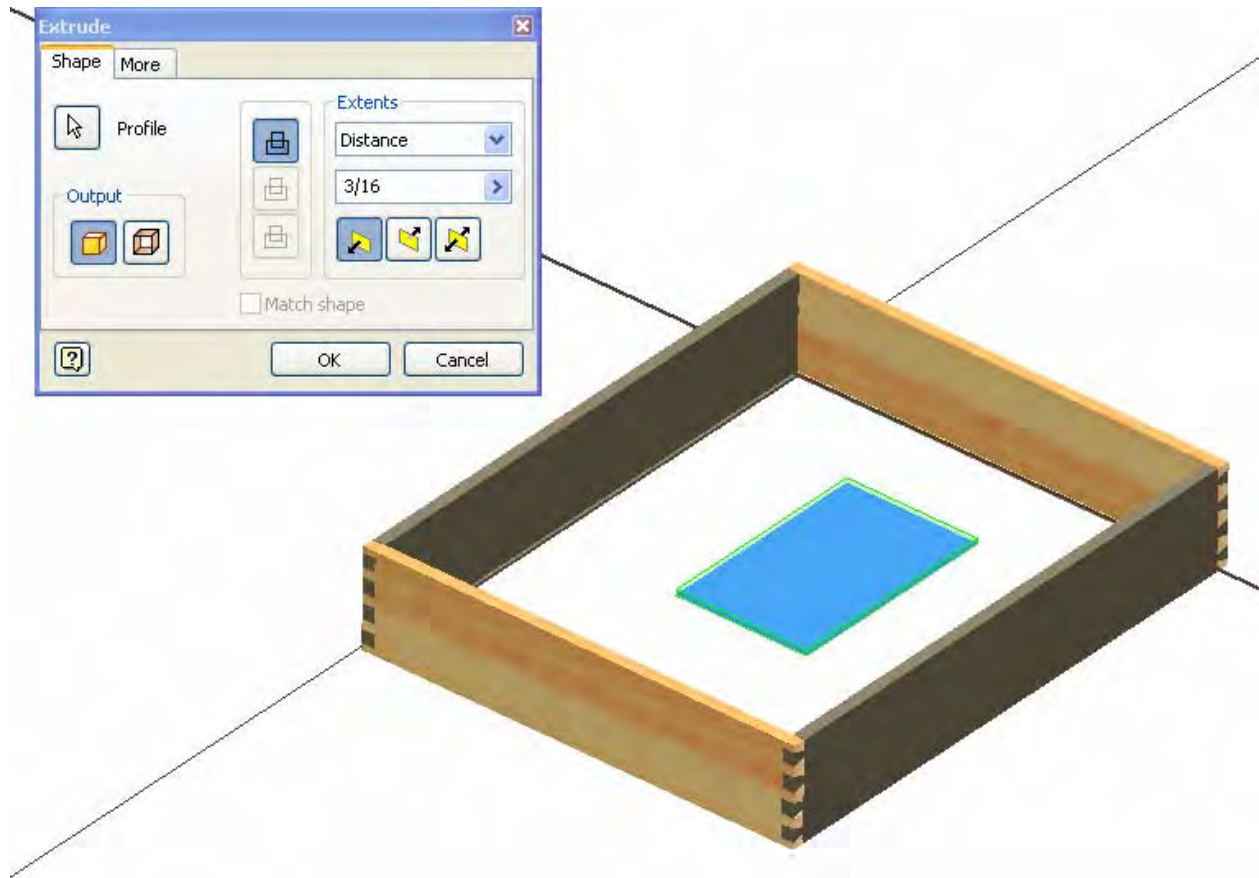
It is obvious that drawers come in all sizes, thus the bottom will have to adapt to whatever the designer dictates.

It's best that we build it in the assembly file.

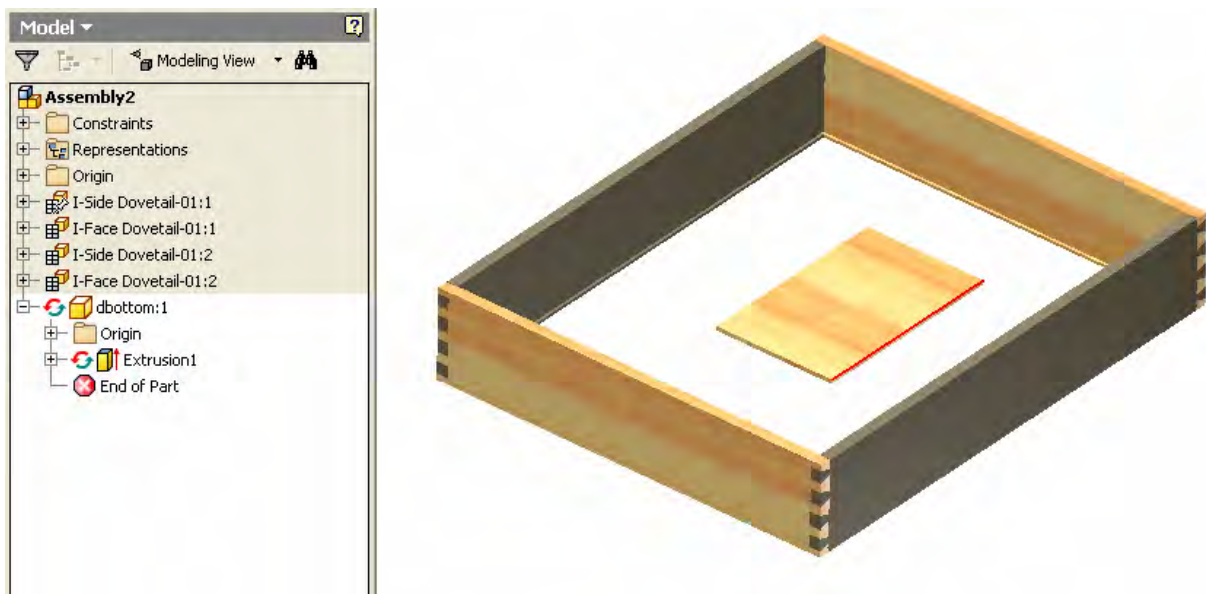
The first step is to create a new component part in the assembly, name it “drawer bottom” constrain it to the bottom of the dado in the assembly.

After you constrain it, create a small rectangle, do not give it any dimensions, extrude it 3/16”.

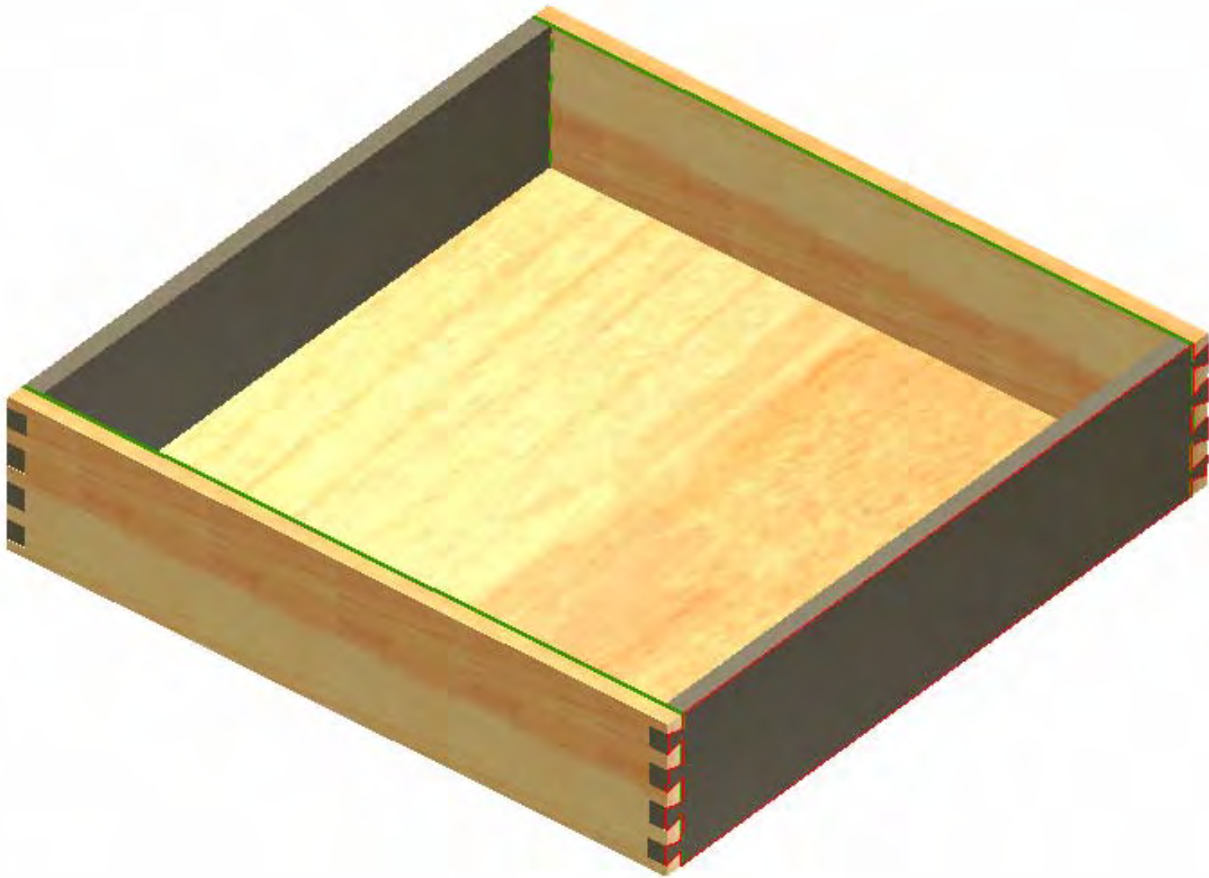
At this point you can change the visual color to “Wood (Pine), change the scale or rotation to suit your needs.



We must now make the drawer bottom adaptive, the drawer bottom will then have the ability to stretch and meet the dimensions of the full dado of the drawer sides (width and length).



Finish edit and return to assembly mode, at this time using assembly constraints, mate the sides of the drawer bottom to meet the dado depths.



Once this is complete the internal drawer assembly is done.