Project #1 – CAD & 3D Printing

ME 366 Computer Aided Engineering & Manufacturing
Name
Date

Overview

I chose a medical tray for project 1, however since it had to have 3 mechanically dependent parts, I chose to use cross supports like in a gurney to be the mechanism that holds and moves the tray. (hold base or one support still, move the other, and the tray and other support will move relative to the base.)

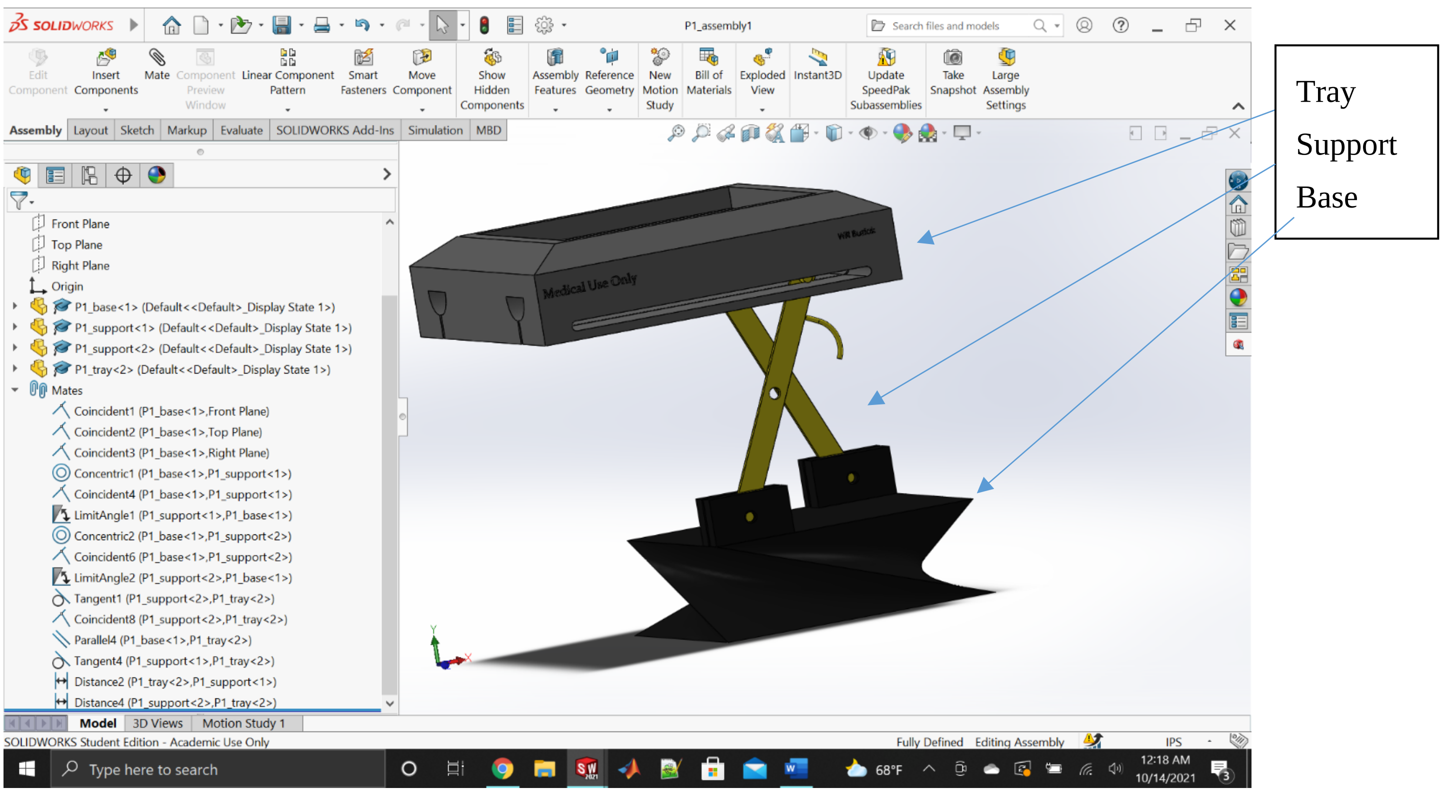
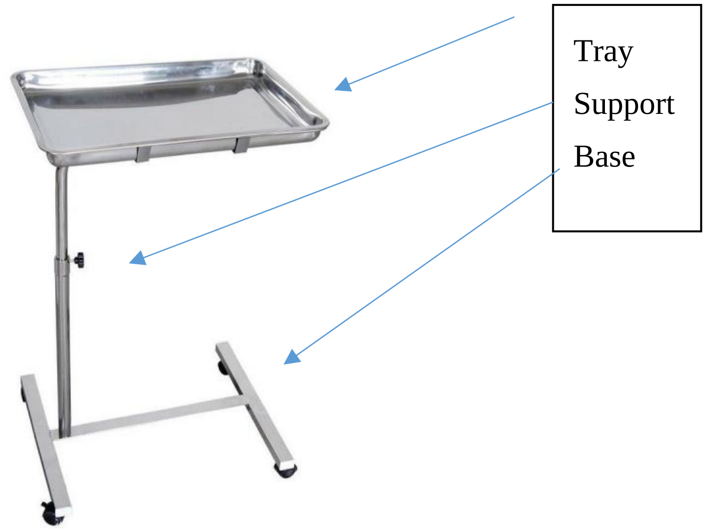
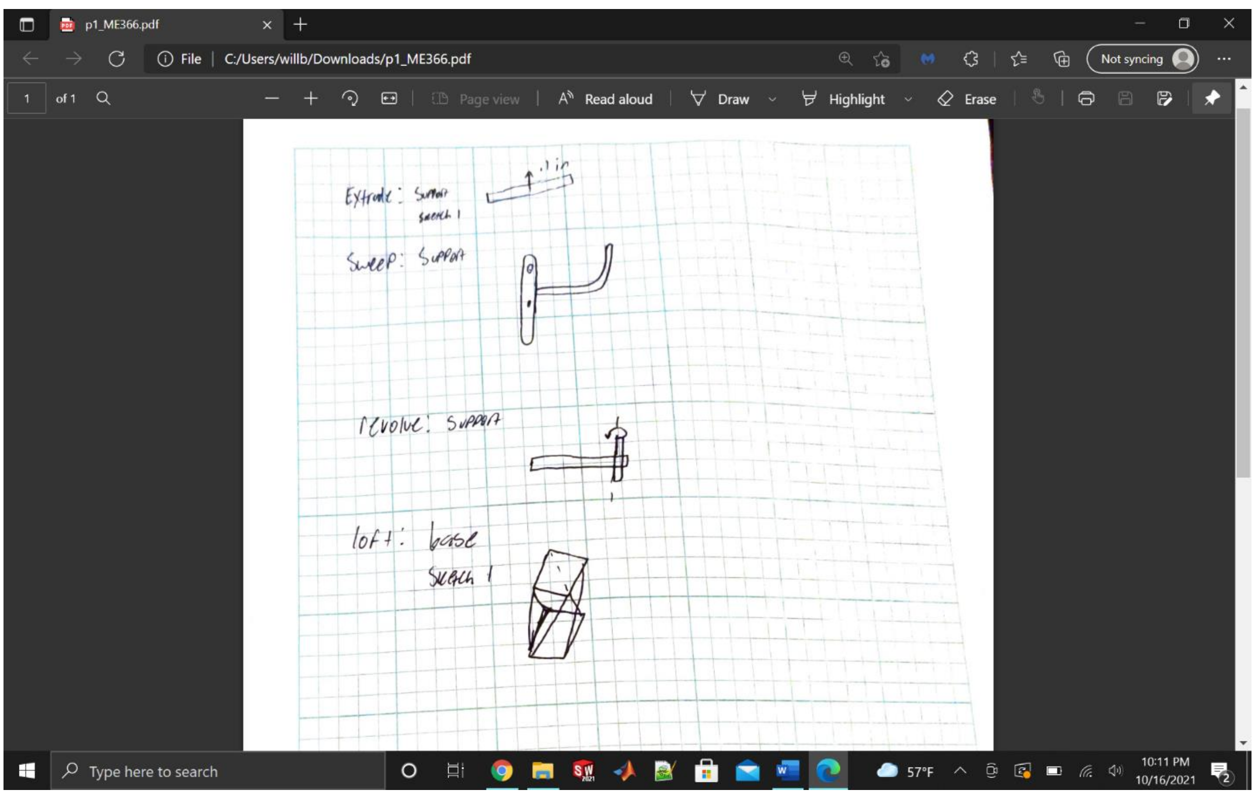


Figure 1. Overall <u>CAD</u> picture of selected assembly with labeled parts
(whatever view best communicates what you picked)
(follow this format when including pictures in sections below)

How It’s Made



This medical tray was most likely manufactured by extruding the cylinders for the support and the base, and rolling a sheet and drawing the tray which can be done in a number of methods such as pressing. This design differs mainly due to the lack of assignment constraints requiring relative motion within the assembly, moving cylinders would be considered links and it would not satisfy the assignment definition.

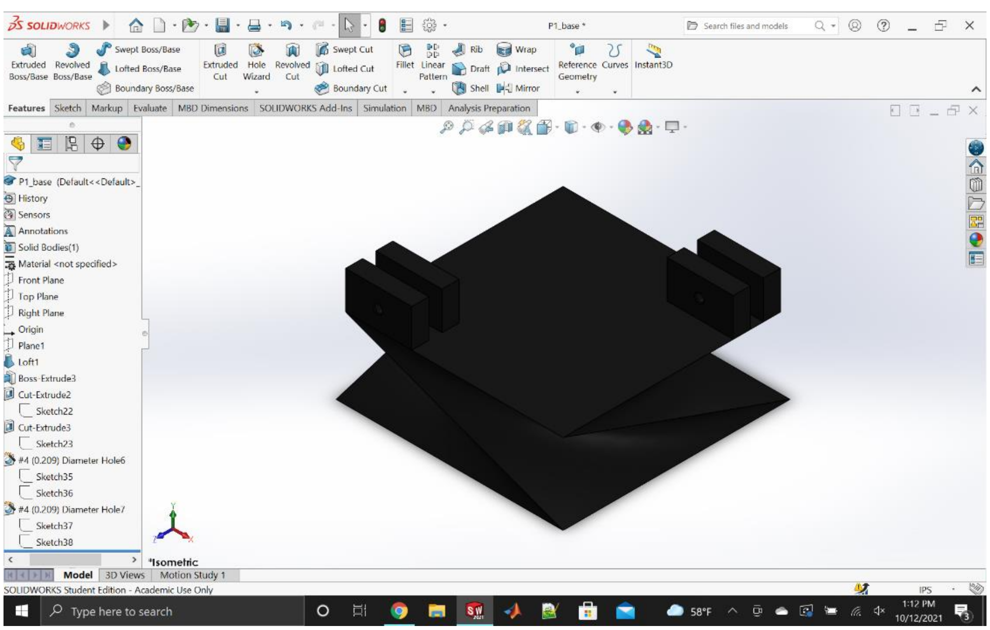


Conventional Mnfg Steps	Part 1 Name “base”	Support	Part 3 Name Tray
Raw Stock	Plastic pellets	Plastic pellets	Plastic pellets
Create feed stock	Melt down	melt down	Melt down
Manufacture	Cast into block w/ two blocks for pins	Roll into sheet or cast	Roll into sheet (or cast due to thick bottom)
Drill	drill holes for pins	Attach pins if sheet worked (welding)	Draw basin
Milling			Create gap for supports w/ cylinder to connect supports
Finish	Trim excess	Trim excess	Trim excess
Finished Product	Base for tray	Support that attaches base to tray	Tray to hold medical supplies

These particular parts would most likely be cast due to their simple geometries, technically the holes could be included as part of the shape in the mold and finished to meet tolerances. Using this manufacturing process, you could make units quickly and cost effectively. Plastic poses environmental concerns, which produces motivation to seek a “greener” stock. Especially since it is only economical to buy casting molds for these parts if used in mass quantities.

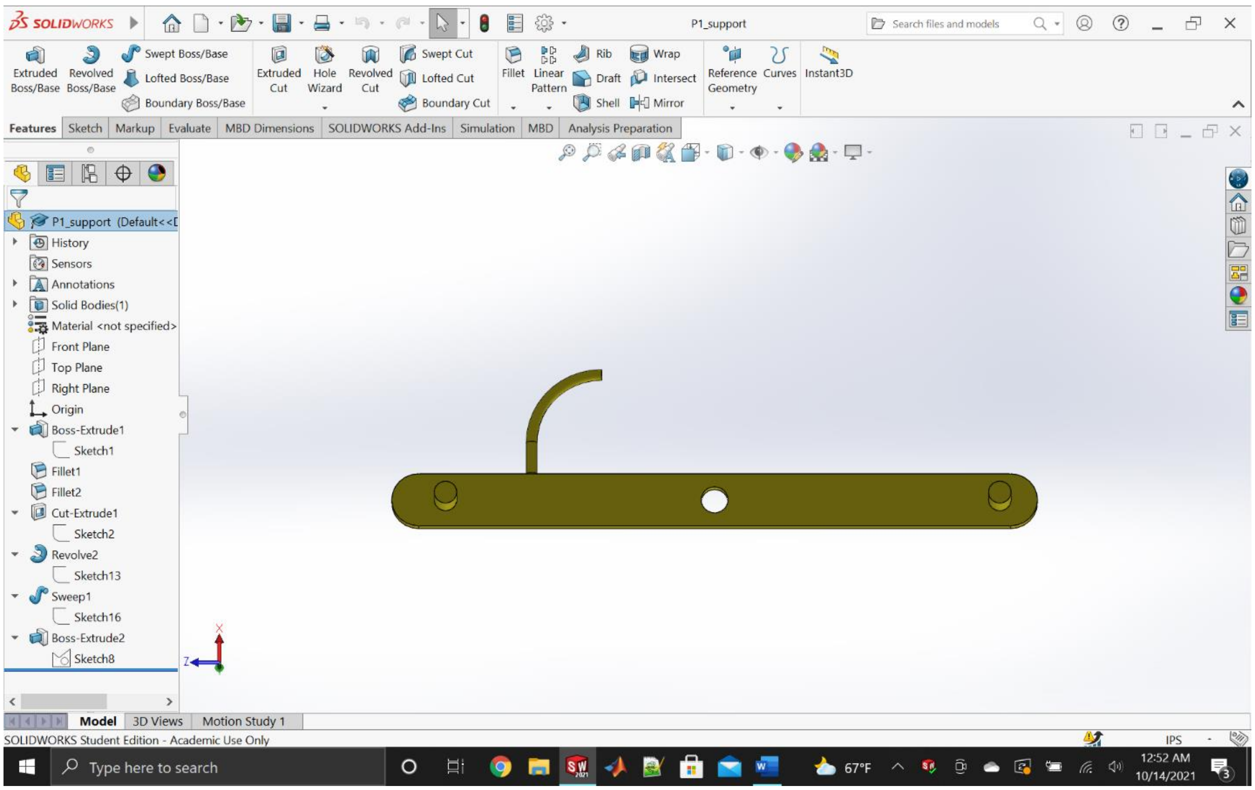
Part Models

Base



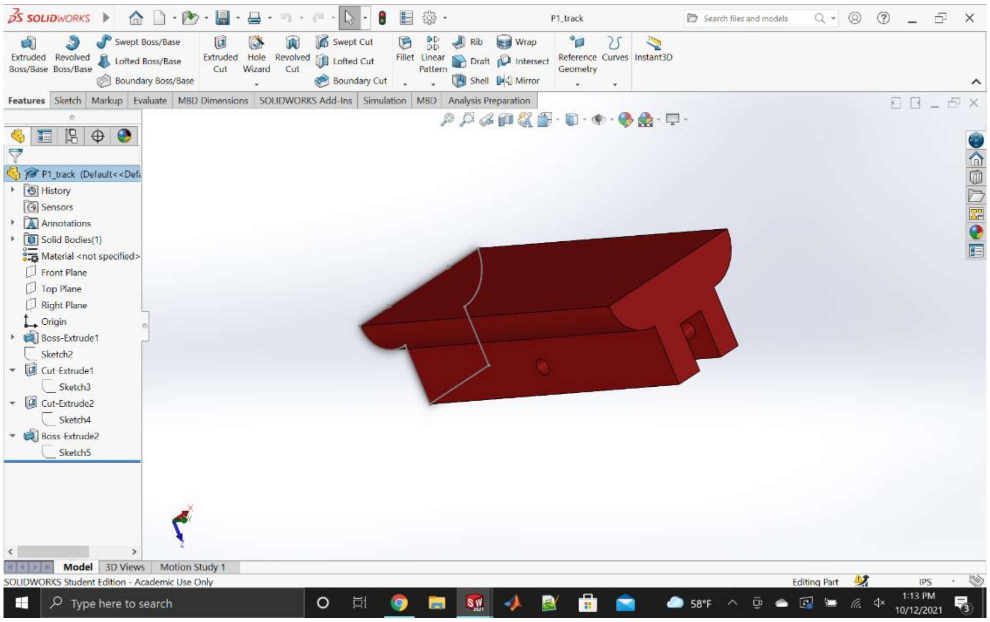
- I used loft to create the base for my part, while playing around with the features I found that by switching the order of the sketches you are lofting can change from (in this situation) a block to this spiral shape. I would imagine this is not desirable for actually printing, due to the need for support material on overhangs, added complexity of geometry, etc.
- Extrude base for pin blocks.
- Extrude cut holes
- Shell to create gaps in the blocks.

Support



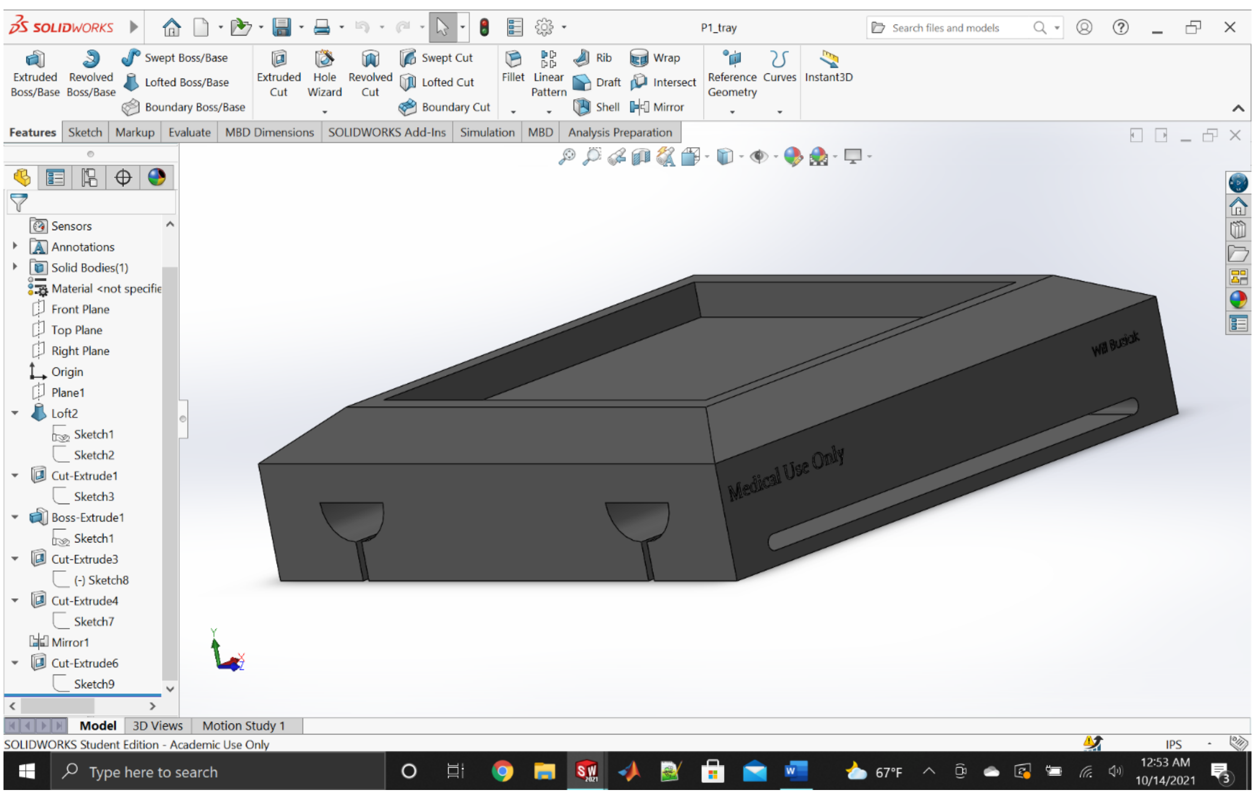
- Casting is a cheap way to manufacture this if it is produced in mass quantities, although, an alternative is sheet metal working, however, you would need to add the cylinders by welding or another alternative method to attach.

Track (did not end up using in final assembly, unnecessary part if tray and support are designed to attach straight to each other using cylinders and slots)



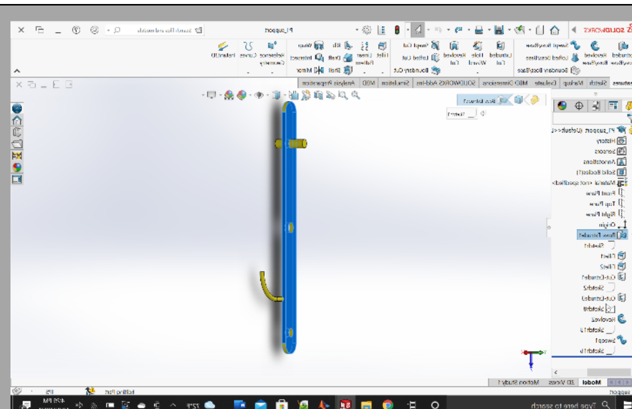
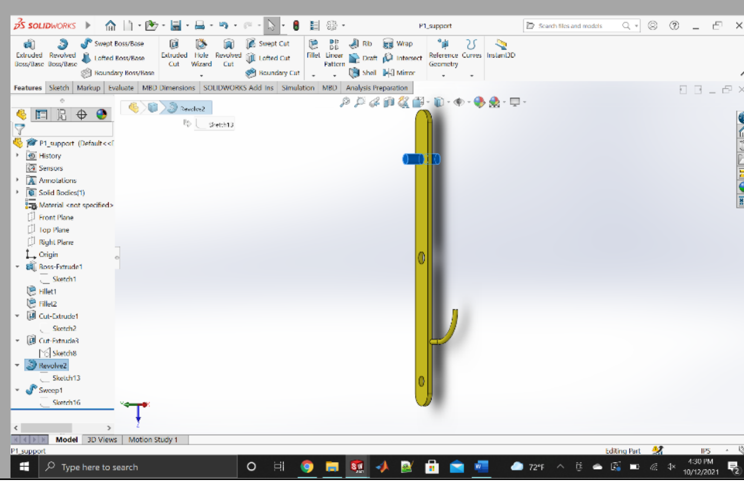
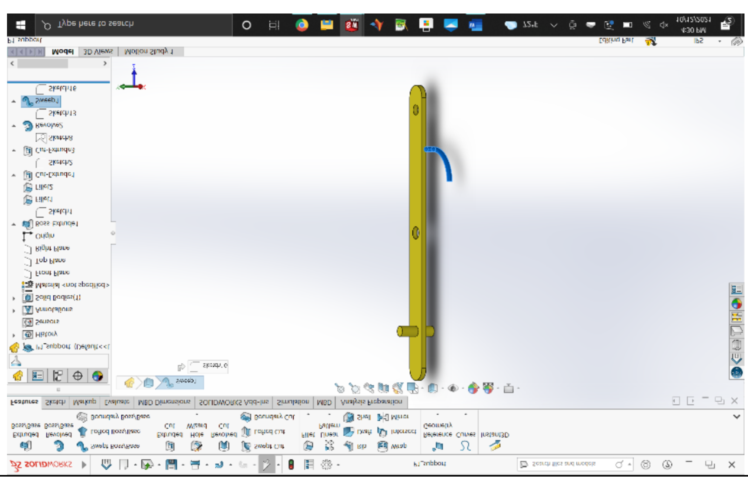
- This would be easiest to cast as well, given large quantities but it can also be cold worked if needed to meet strength tolerances or to avoid paying for a mold.

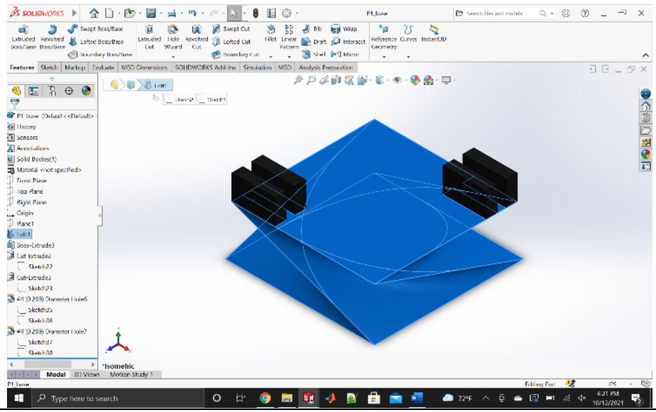
Tray



- This part could be made in a multitude of ways, depending on material, number of units and desired tolerances, if made of metal in high quantities it can be sheet metal worked or cast.
- Problem with sheet metal working is depth of the tray would make it stronger and therefore require stronger tools.

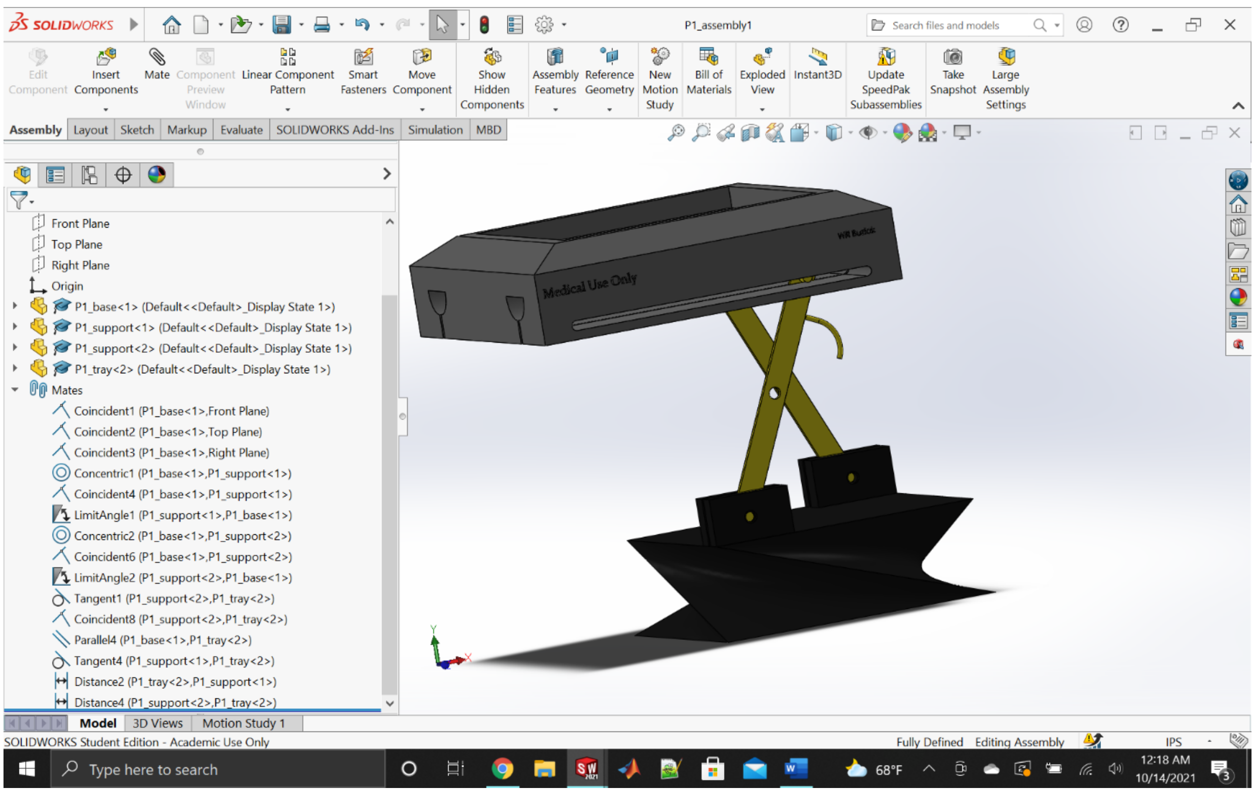
CAD Operations

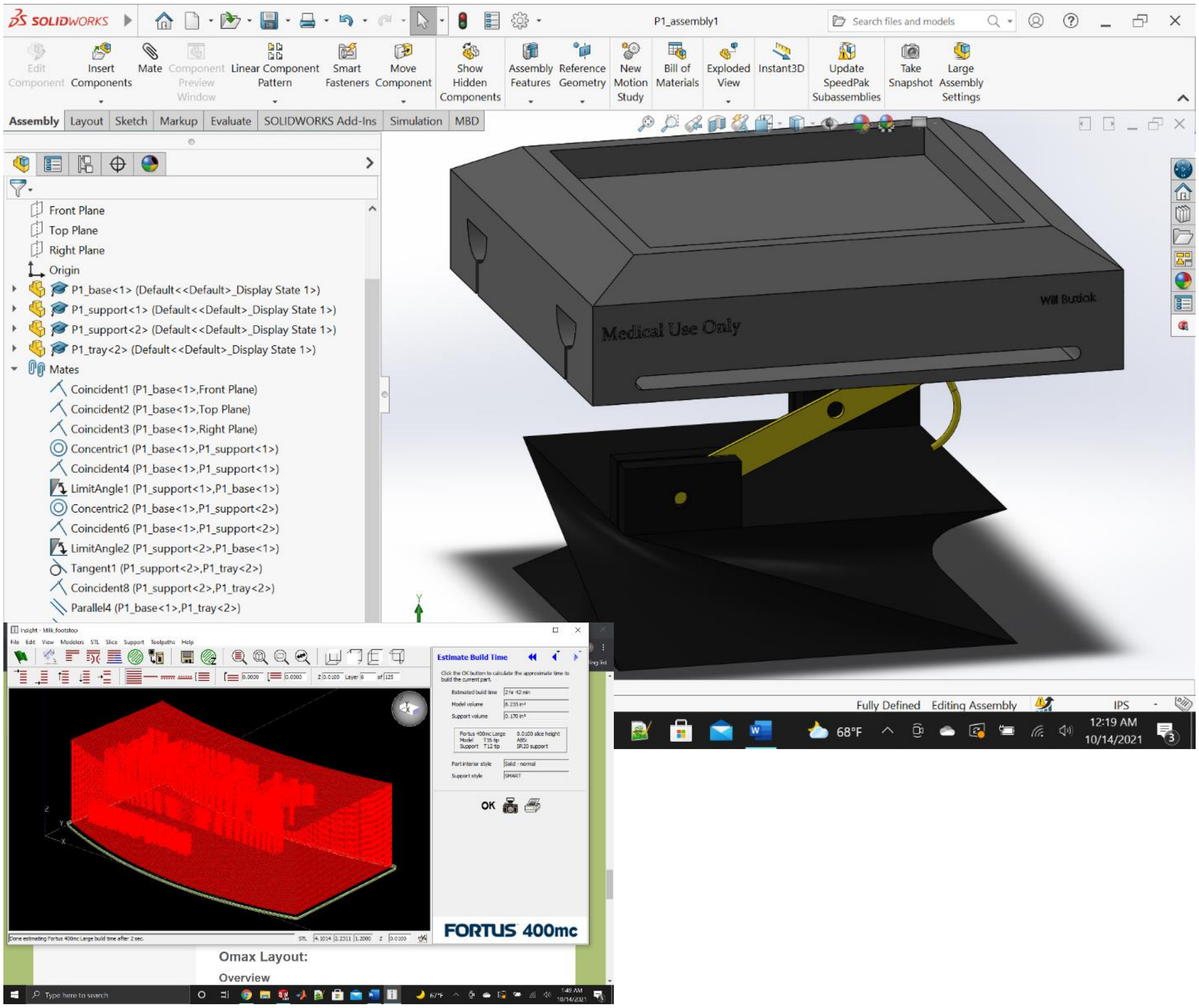
CAD Operation	Part name	Profile Sketch	Profile or Path Sketch
Extrude	Support	Sketch 1	
Revolve	Support	Sketch 13	
Sweep	Support	Sketch 14	

Loft	Base	Sketch 1	

Assembly Model

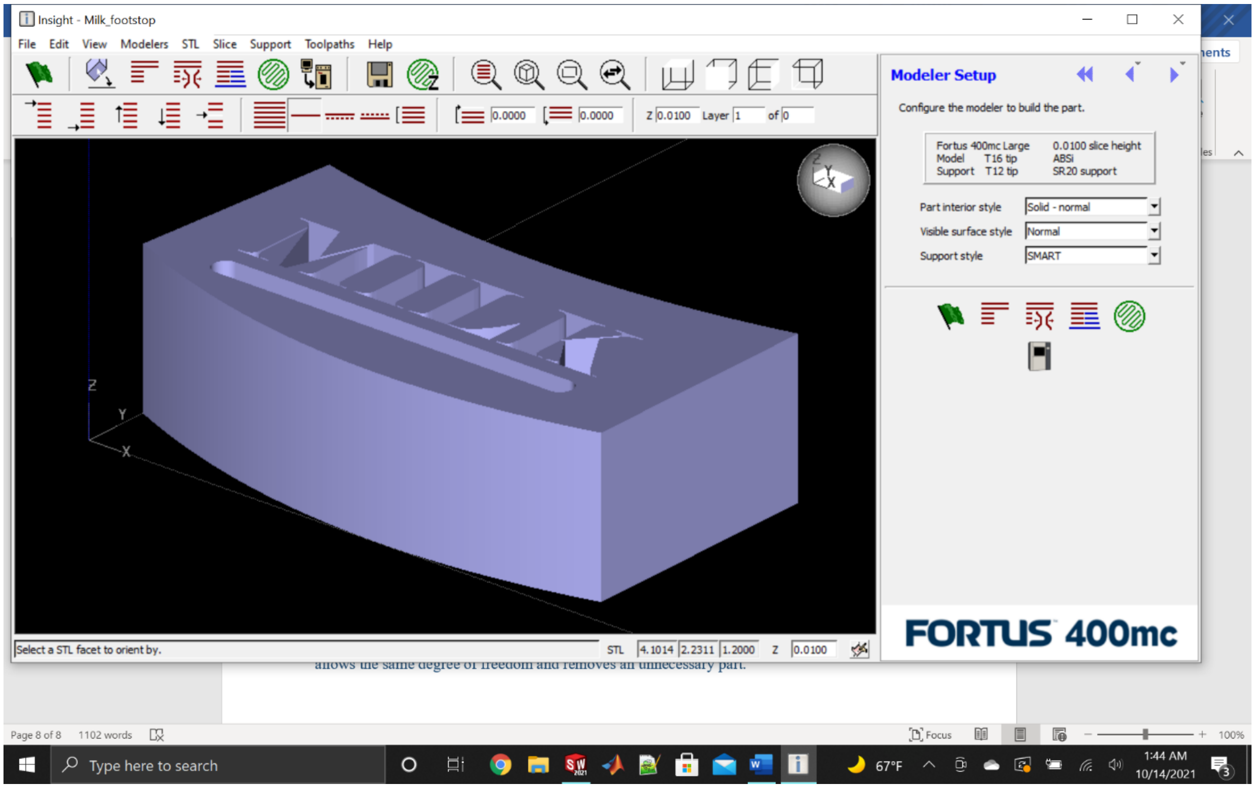
Support A and B are constrained to the holes in the base and support A can rotate from 0-90 deg, and Support B can rotate from 90-190 degrees, giving 2 positions for the tray. Supports A and B are also constrained to the slot in the tray, only able to slide tangent to the slot with boundaries 1 in from both sides, tray must remain parallel with the top plane (base plane)





3D Printing

The design is simple, a block with an outward facing slope of about 2.5 in tall, 4 in wide, and 3 in deep. I will be using it as a foot stop to nook my foot and keep it rooted whilst I skateboard. “MILK” is cut extruded into the top.



- The resolution primarily impacts the curvature of the edge, since 3D printing converts my file first into triangular geometry, with worth resolution, the sharper the steps will be on the curve. Orientation is important specifically for the words that will be cut into the part due to layering which can affect resolution.
- Insight is to me, like the printer window for word but in a separate application in which you can select part orientation, calculate build time, support material volume, part volume, etc.
- Name and group letter debossed on bottom

Conclusion

I would say the most beneficial thing I got from this project was just playing around with solidworks trying to figure out how to get what is in my head down on the screen. Specifically, constraints for certain solidworks operations. For example, having the correct bases and guidelines to loft between two different shapes, or ensuring correct dimensions for mating. Although the majority of what I learned is simple navigation through solidworks, like rotating, zoom, ensuring your in the correct sketch, all simple but important for time sake. There are often shortcuts you can make to simplify your design if you can figure out a more efficient way to design it. For example, removing the “track” part from design by simply making a slot that allows the same degree of freedom and removes an unnecessary part.