Final Project

Mechanical CAD - 41615

This journal is a combination of illustrations and explanations for the final project. We will go through the process of creating the individual parts and assembly in Creo, utilizing the processes learned in the course. Furthermore, we will show the renderings of the final model in 3ds Max.

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The skateboard

A skateboard consist of quite a few things. There's the wooden board, the trucks, the wheels and the hardware. The board has a very complex shape, with twists and curves. Surface modeling is therefore the perfect tool to create the shapes we are looking for. The trucks are by far the most complex part of the skateboard. The have a very specific shape and furthermore they must fit perfectly in the joint and holes of the base plate that they are mounted to.

The board

For the board we had to use surface modelling. Our idea was that we could create a fourth of the board, and then mirror it on the side and front plane.

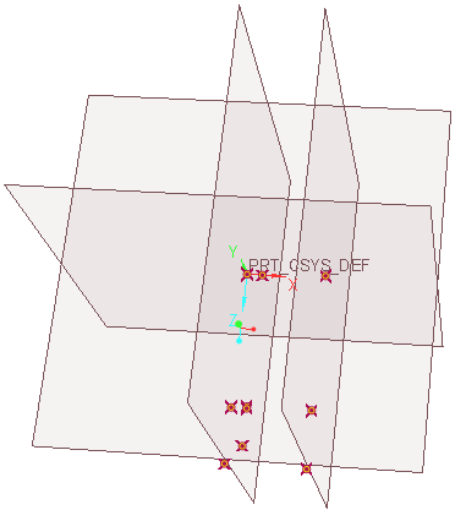
We measured one of our own skateboards, and found the dimensions, of the size and the bends of the board.

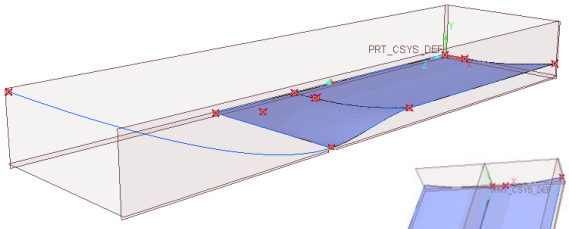
After that we placed datum point for all the measurements and created lines between these datumpoints. Making sure they were tangent and normal to the symmetry planes.

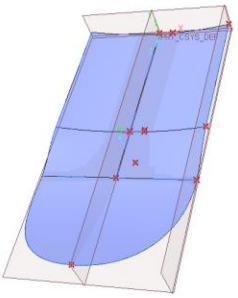
The tip of the board was created after we mirrored the board with the side plane, to make sure that the tip only would bend in one direction, and not have a visible midpoint.

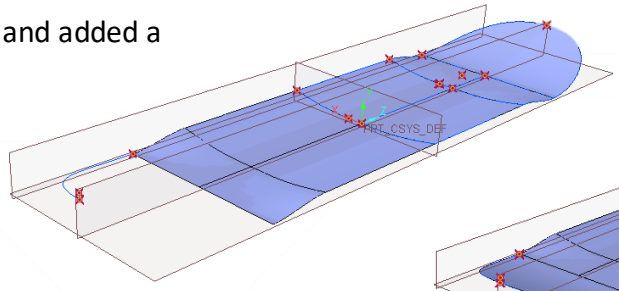
Skateboards usually have different back and front tips. Th skateboard has a lower and narrower backtip, to make it 'pop' better. We therefore made the front and back separate

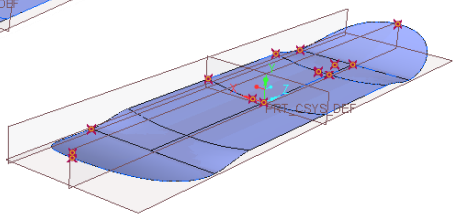
Lastly, we created the screwholes and added a chamfer. Then the board was rounded, and we were done

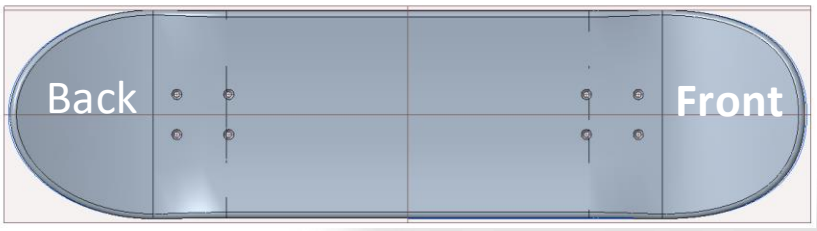


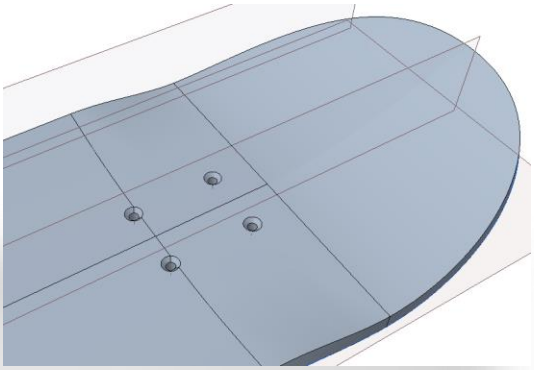












The Truck base

We started by measuring the rectangle of the base plate to 55x75, which became the guideline for the rest of the features on the trucks.

Extrude and pattern for the holes as seen in picture 1.

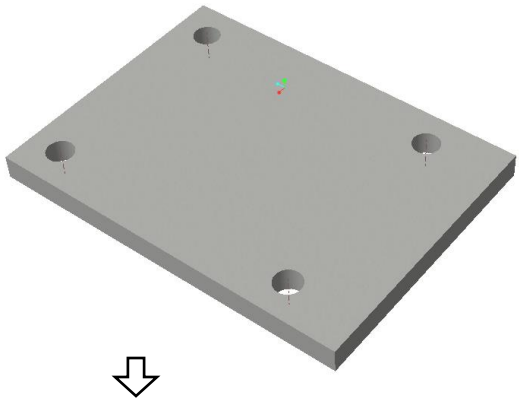
After that we made a box on top where we sketched the angle and made a cut out. The angle was verry important for the alignment of the other parts.

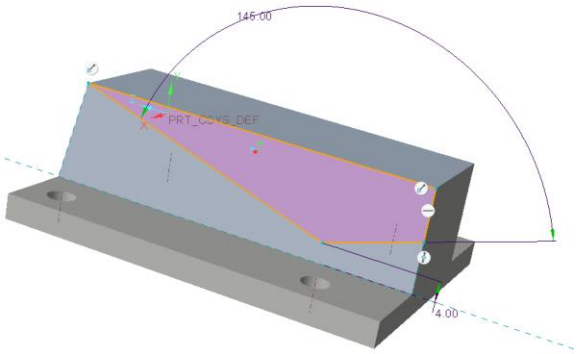
We used chamfer on alle sides of the box to create the inwards slopes.

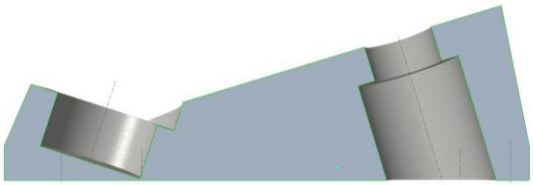
We made holes one through the bottom with countersink, the other from the top also countersinked.

Lastly, we created the royal trucks logo on the front of the truck.

We then rounded all the edges to create a smoother finish.

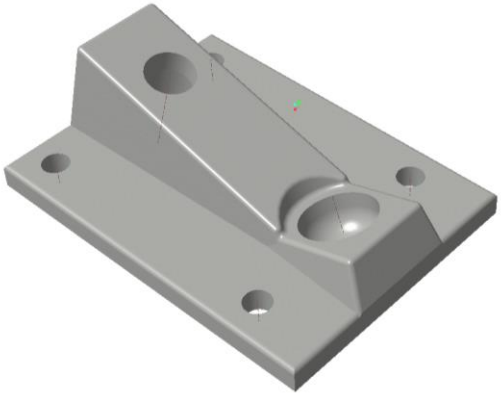






Mount for truck

Hole for fixation pin



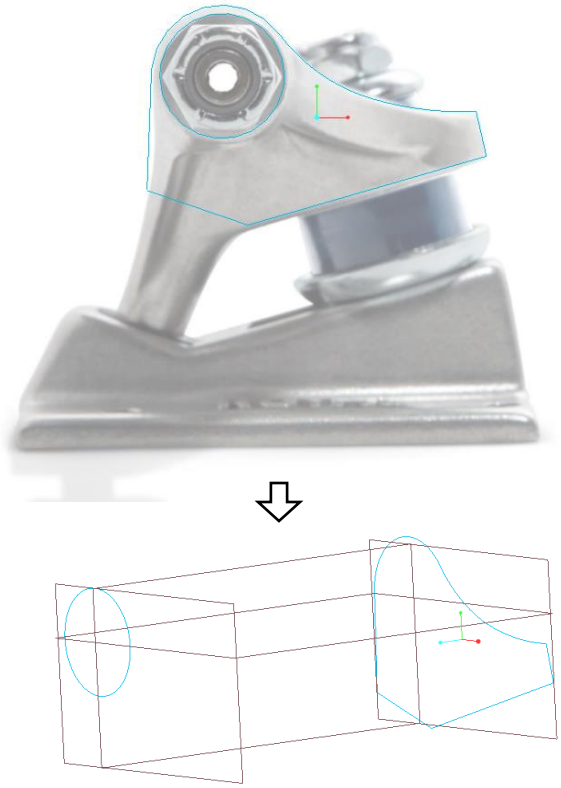
The truck Axle

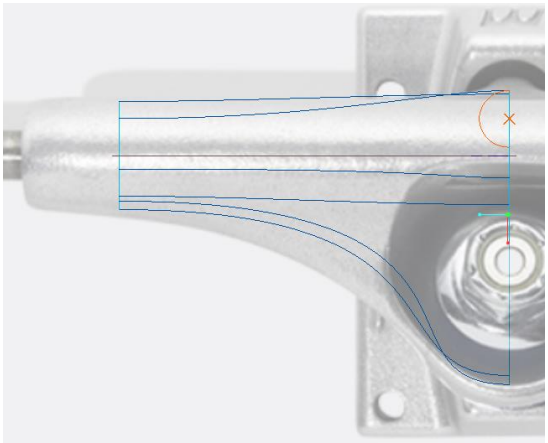
For the truck axle we used the method from the helmet exercise using pictures to sketch and make surfaces.

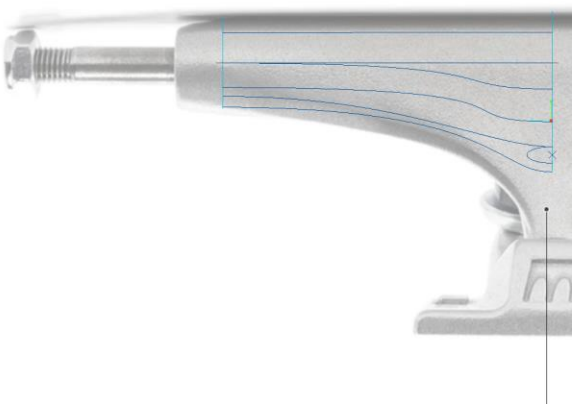
We made two sketches one on the front plane and the other on an offset datumplane.

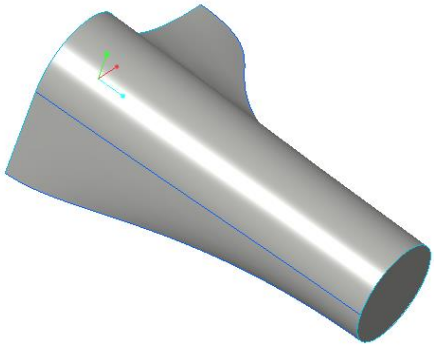
We traces the curves matching the pictures getting as close to the shape as we could .

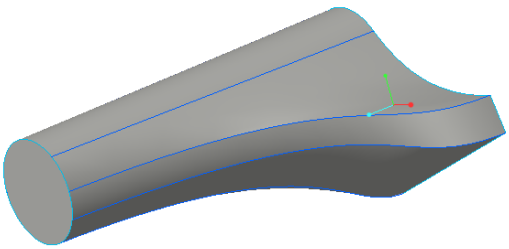
We had a lot of trouble with solidifying our surface model, so we ended up going with a simpler design with less curves. We could then ad simple extrusion to that shape avoiding errors in creo.





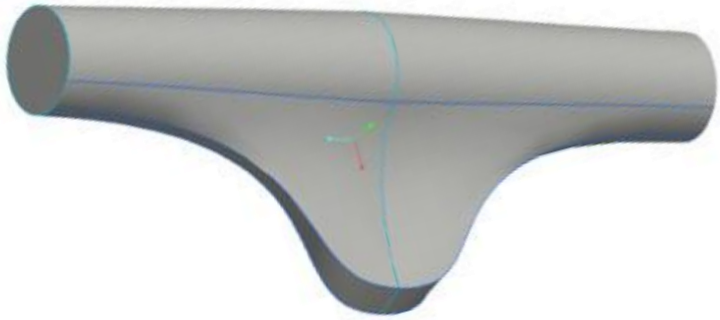


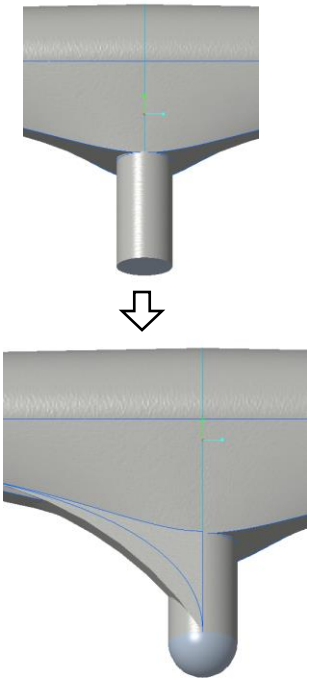




We mirrored our surface and solidified it.

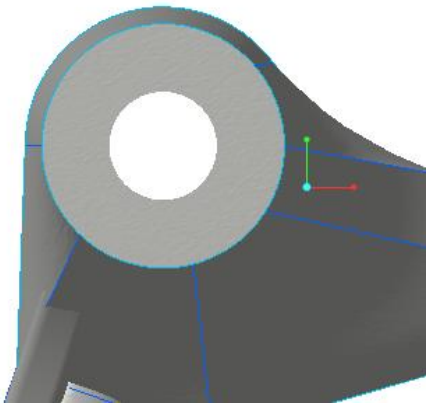
On the bottom we extruded a cylinder and an extension of the surface going down the length of the cylinder.

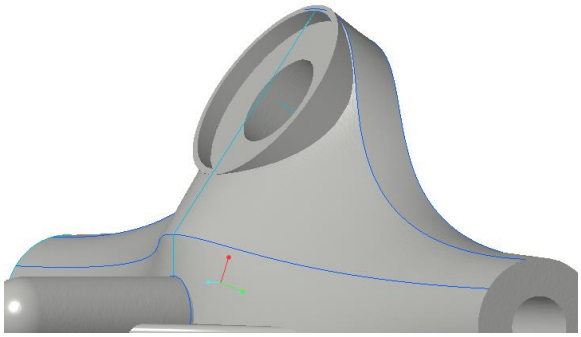




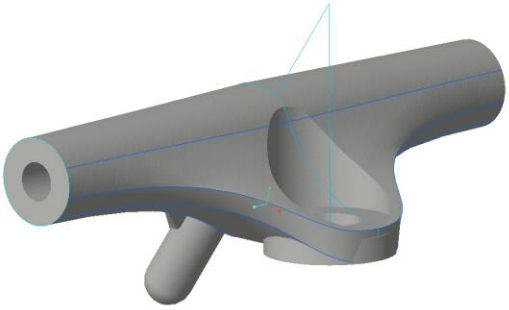
We made a hole through the entire length of the model for housing the wheel axle.

On the underside we made the mounting point for the rubber bushings consisting of a circular extrude. On that surface we create a centered hole and a recess around it. This hole is for the fixation pin

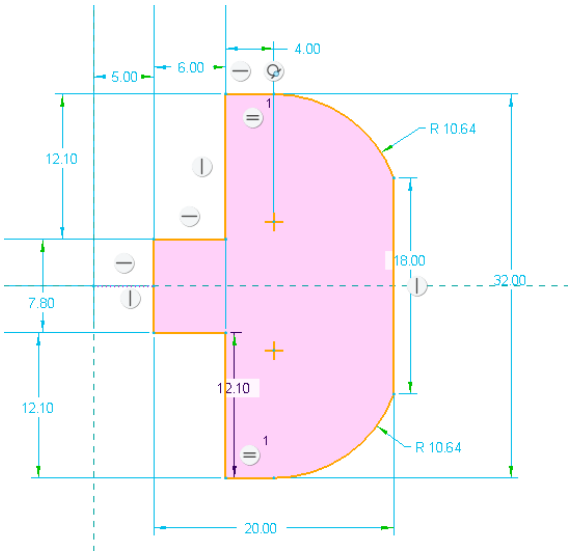




To finish the model, we created a matching recess on the top again to fit the bushing .



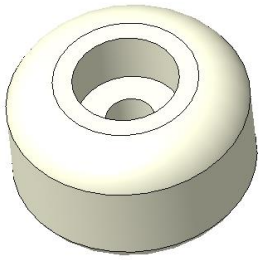
The wheels

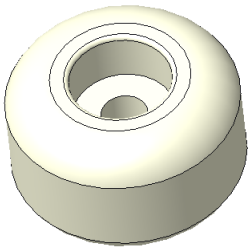


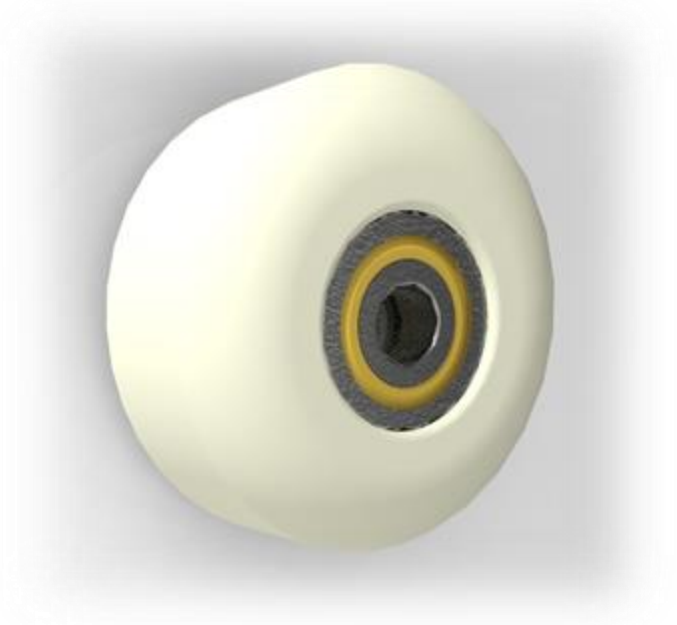
The wheels was made with a simple revolve. We finished up with a round.

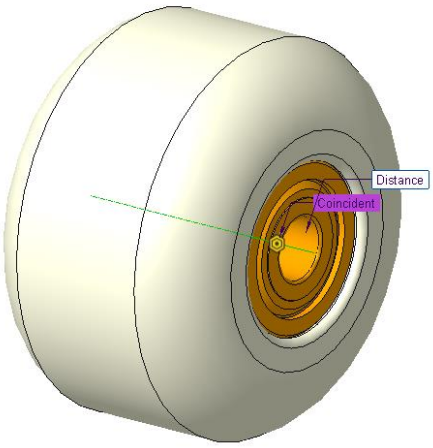
Afterwards we added wheel bearings. The wheel bearings are a standard item so we found them on https://www.3dmodelspace.com/

The sub assembly was done using coincident constraints of the mid axes, and then a distance constrained between the surfaces of the wheel and the bearing, just so that the bearing would be tucked a bit in.









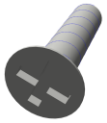
The hardware

We could find some of the hardware online on https://www.3dmodelspace.com/ others we had to create ourselves. The imported material is on the right →

Stuff like the washers, and axle rods we had to make ourselves.

Imported stuff:

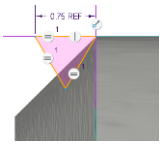
M10 bolt



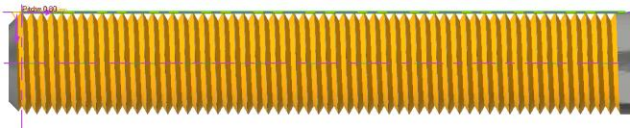
M5 screw

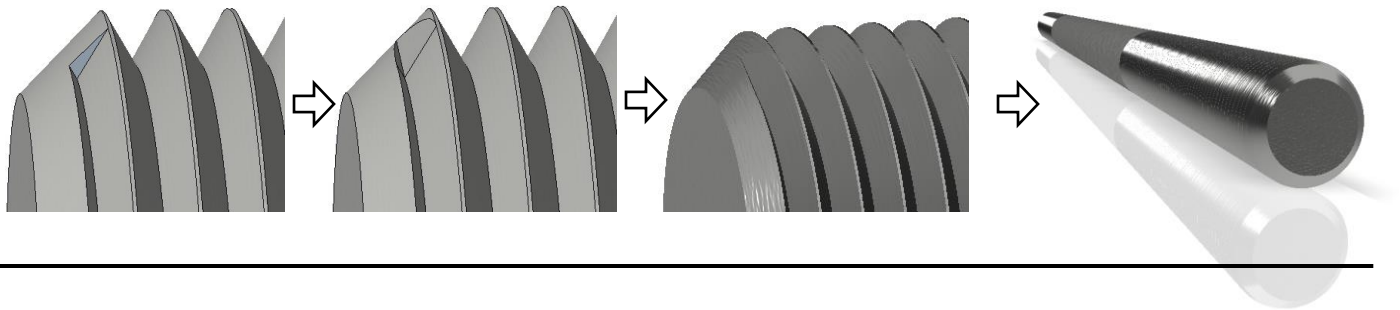
The axlerod was created as a circle extruded symmetrically from the side plane. We chamfered it on both sides with 1 mm.

We created a helical sweep using the pitch(0.8) and dimensions of a m8 thread we found on the internet.

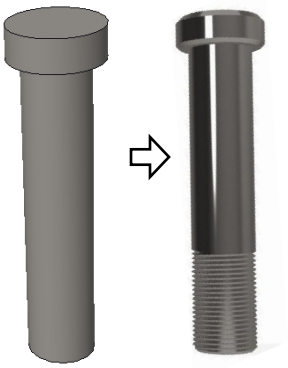


We removed the hard ends of the screw by making a ”remove material” extrusion of a projection of the hard ends.



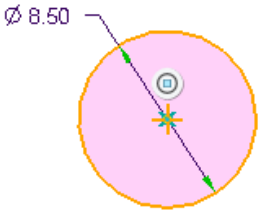


The fixation pin was created with 2 circular extrudes, and chamfers on the end. The helical sweep was this time the dimensions of a M10 thread. We removed the hard ends with the same technique as the axle rods.

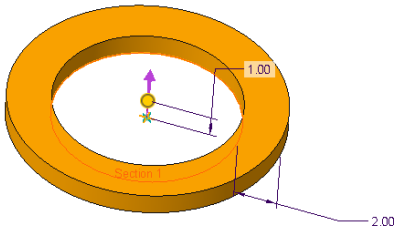


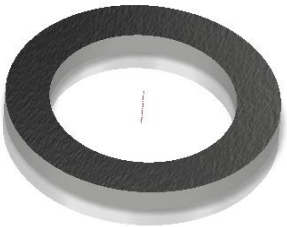
The washers

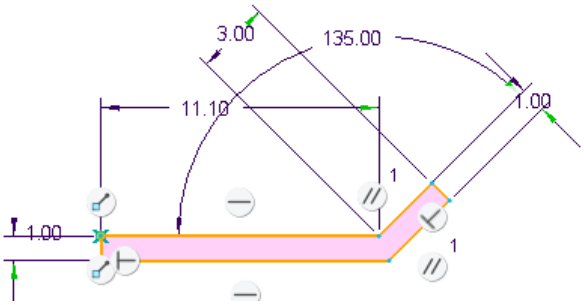
The small spacer was verry simple a circular extrude with a hole in the center.

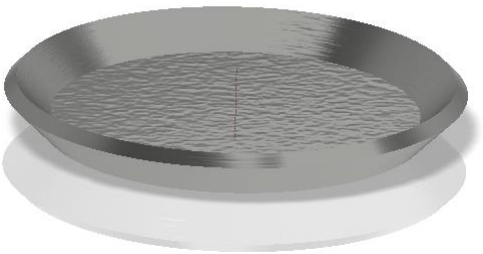


The first washer was created with a sketch and a round and a centered hole again.



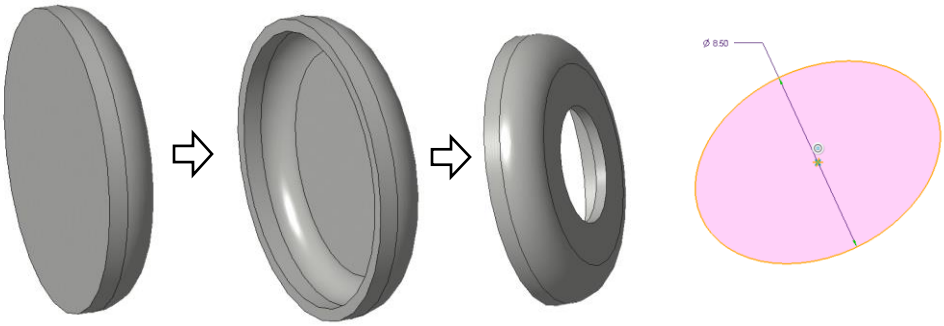






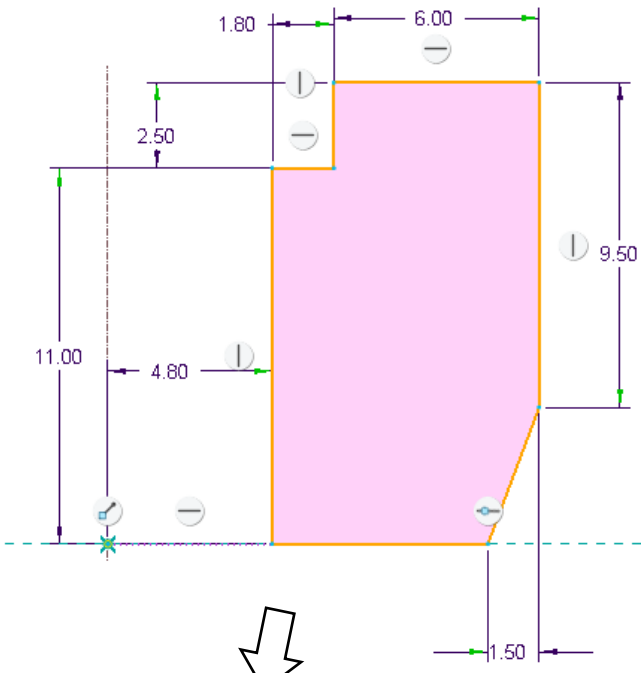
The washer on below the M10 nut, could be created in various different ways. But used the shell command here, just to do something else than revovle.

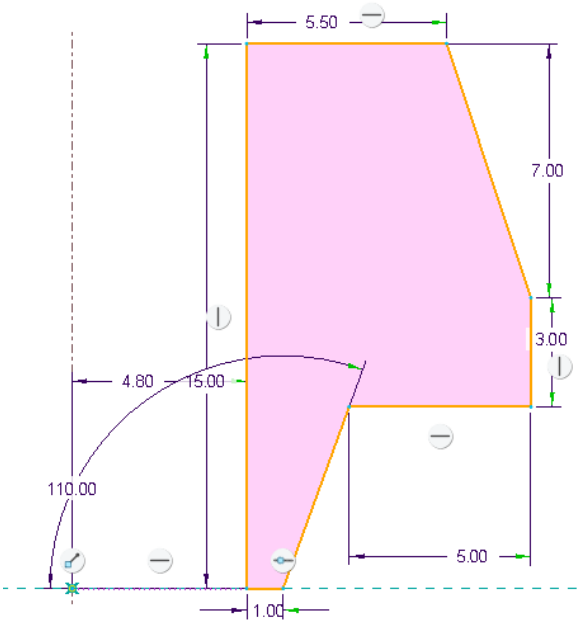
We extruded and rounded. Shelled the body and added a 10.5 mm hole.

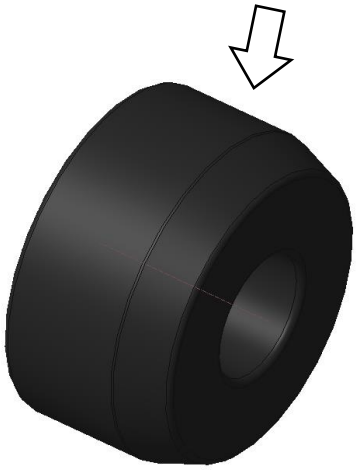


Rubber parts

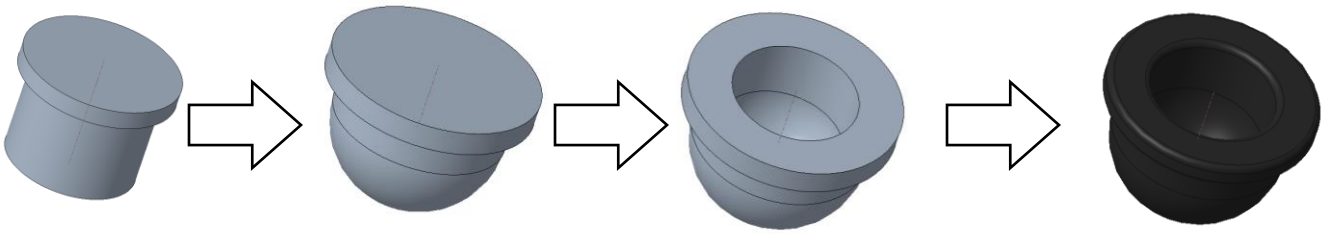
The two rubber parts for the fixation pin was very simple to make. They're all round and completely symmetrical around the center axis, so we measured the diameter of the parts and created a revolve, and rounded it.







The pivot was made with two extrudes, a round and then a shell command. We could have used a revolve command here, but we thought we could show, how we can use the shell command in clever way together with the round. Essentially the same technique as we used with one of the washers.

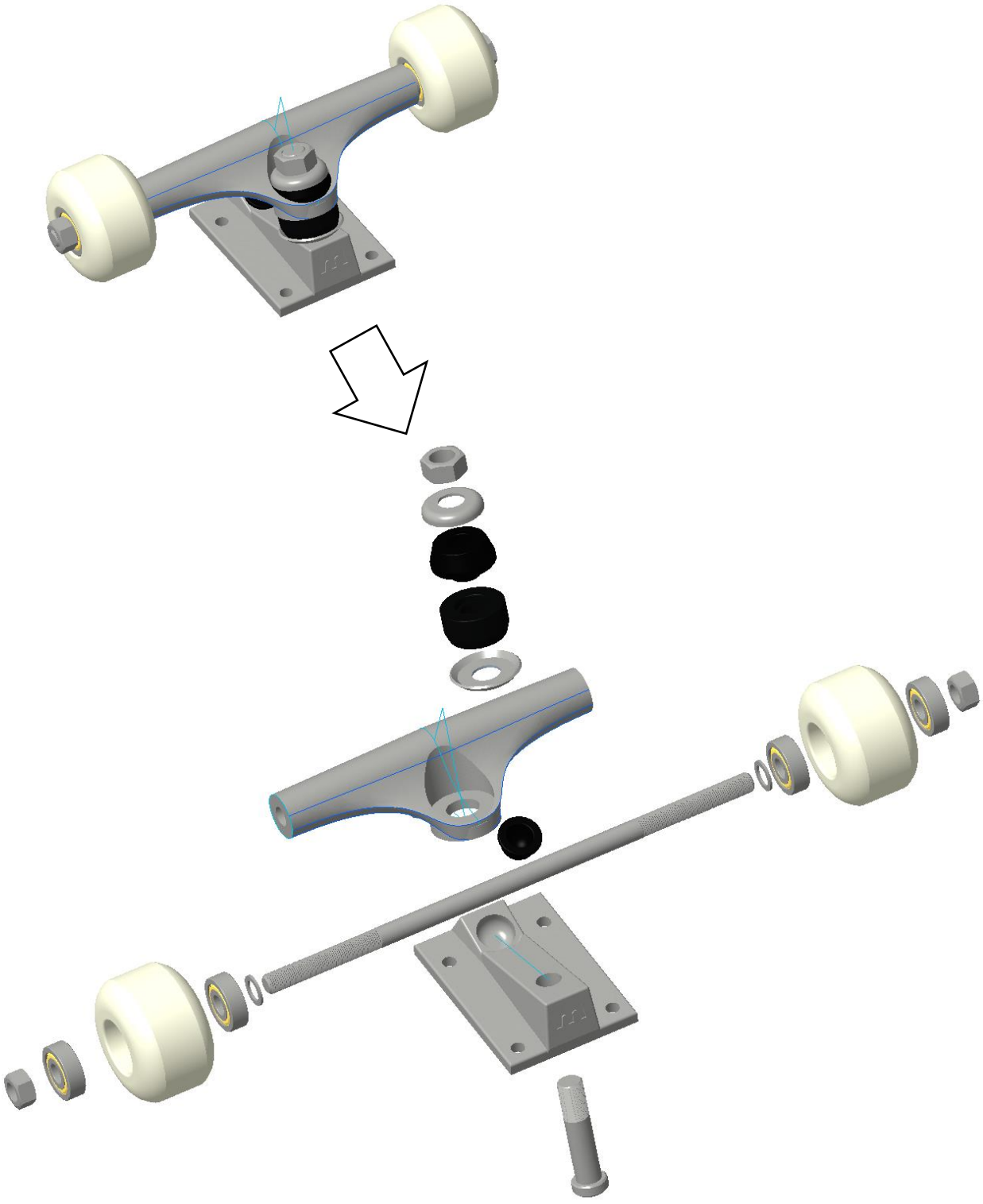


Sub Assembly

We split the assembly process up in two, first we did the trucks and wheels.

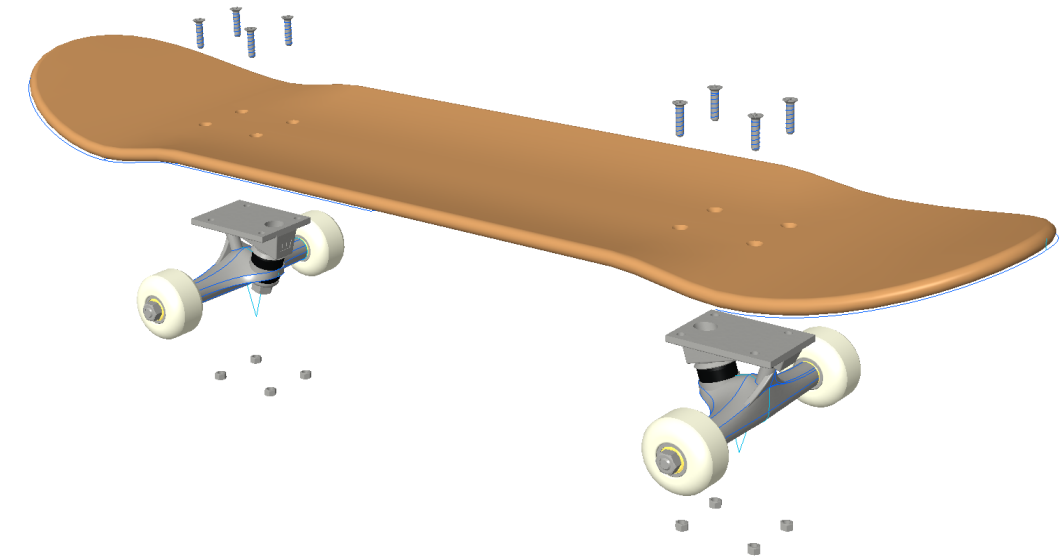
We primarily used the coincide feature on the center axes and surfaces on the different components.

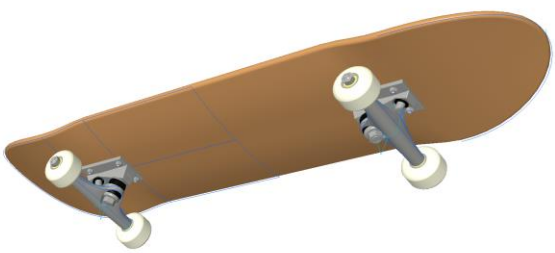
On the exploded view we can see all the components and how they fit together.



Assembly

We continued our assembly connecting the trucks to the board using coincide one the holes and the surface. Screws and bolts again using coincidence.



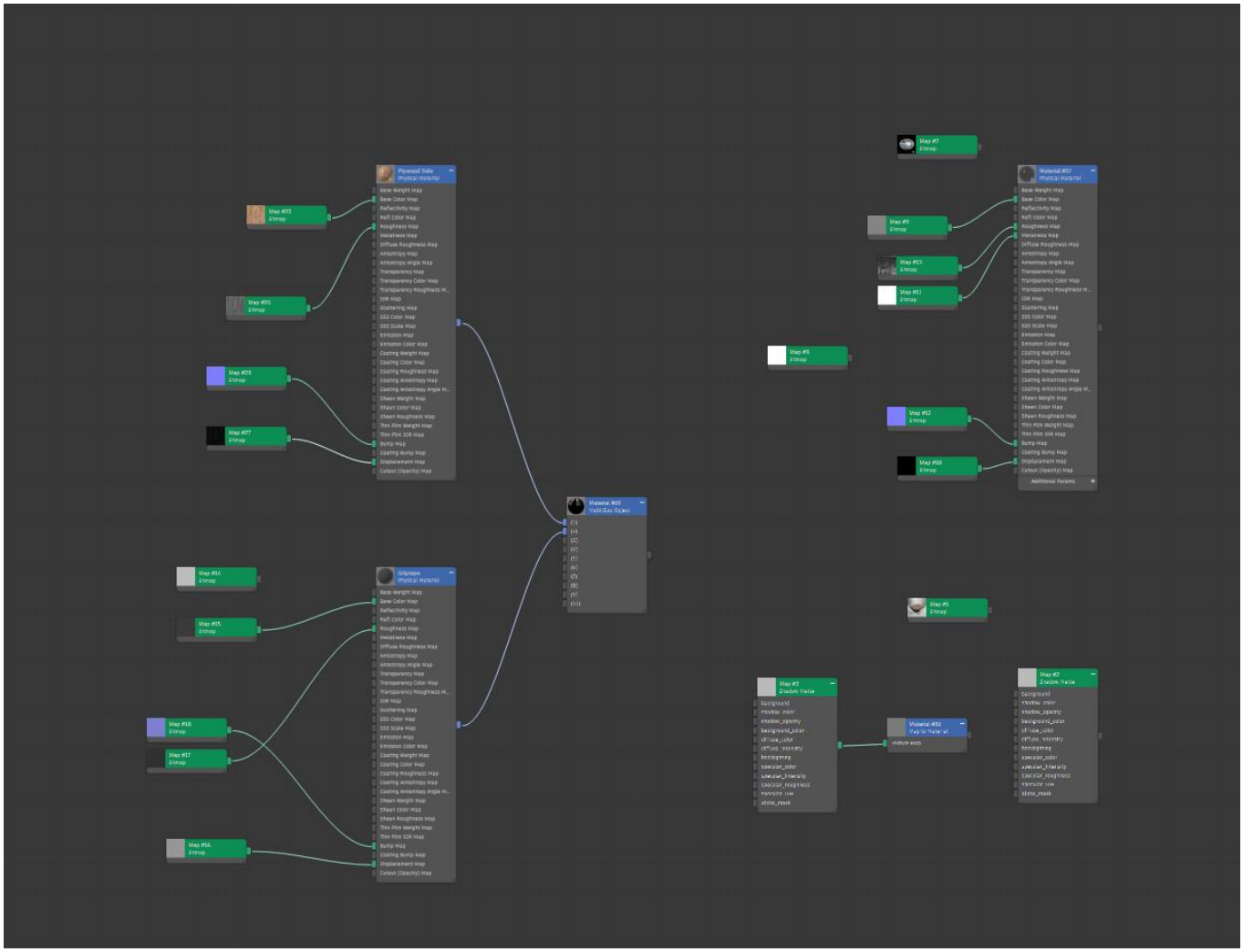


3DS Max/textures

We downloaded materials from the internet from various websites so we could have griptape, rubber, wood, and metal textures.

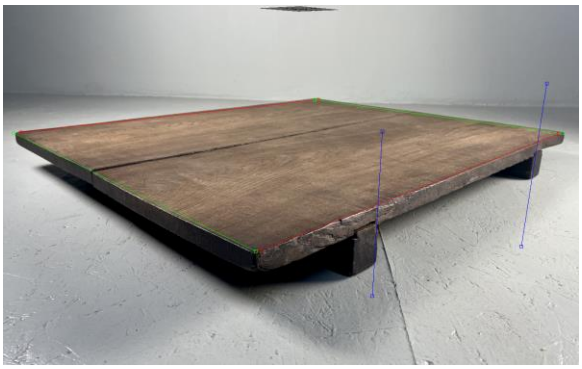
We created physical materials for the different components. A metal material, rubber, grip tape and wood. We then applied the bitmaps, normal maps and so on to the physical material and applied it to our components.

For the board we had to use the technique, where we selected the polygons on the the top part of the board and made them select ID: 2. And then we applied a texture with sub-textures.

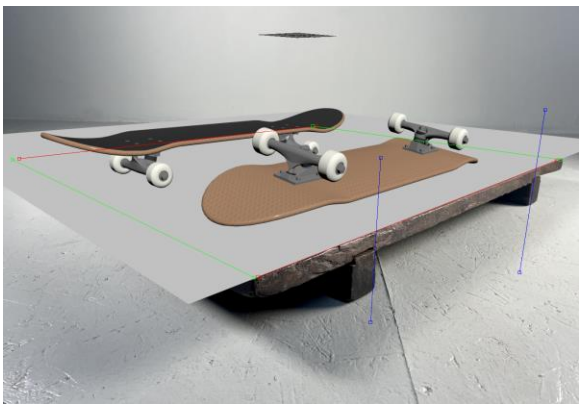


Creating a scene

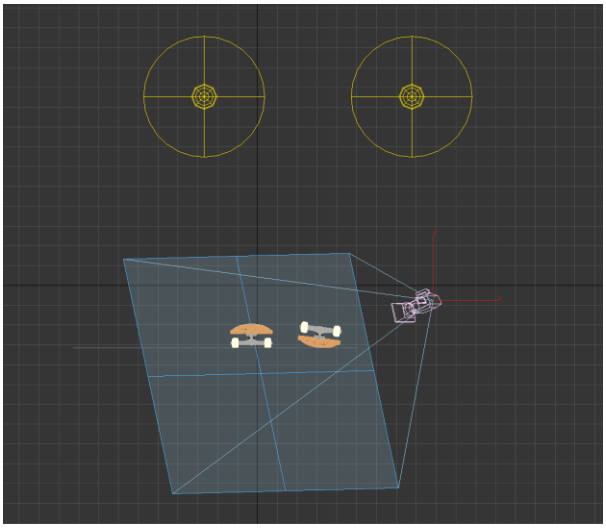
Using a weel lit background picture we perspective matched our scene with the background and scaled the skateboard to the wooden surface.



Placement of the skateboard was a bit tricky because the surface of the board hides a lot of the feature. We therefore decided to put two skateboards in different orientations.



Ligh sources was matched to the picture being lit from multiple angels.

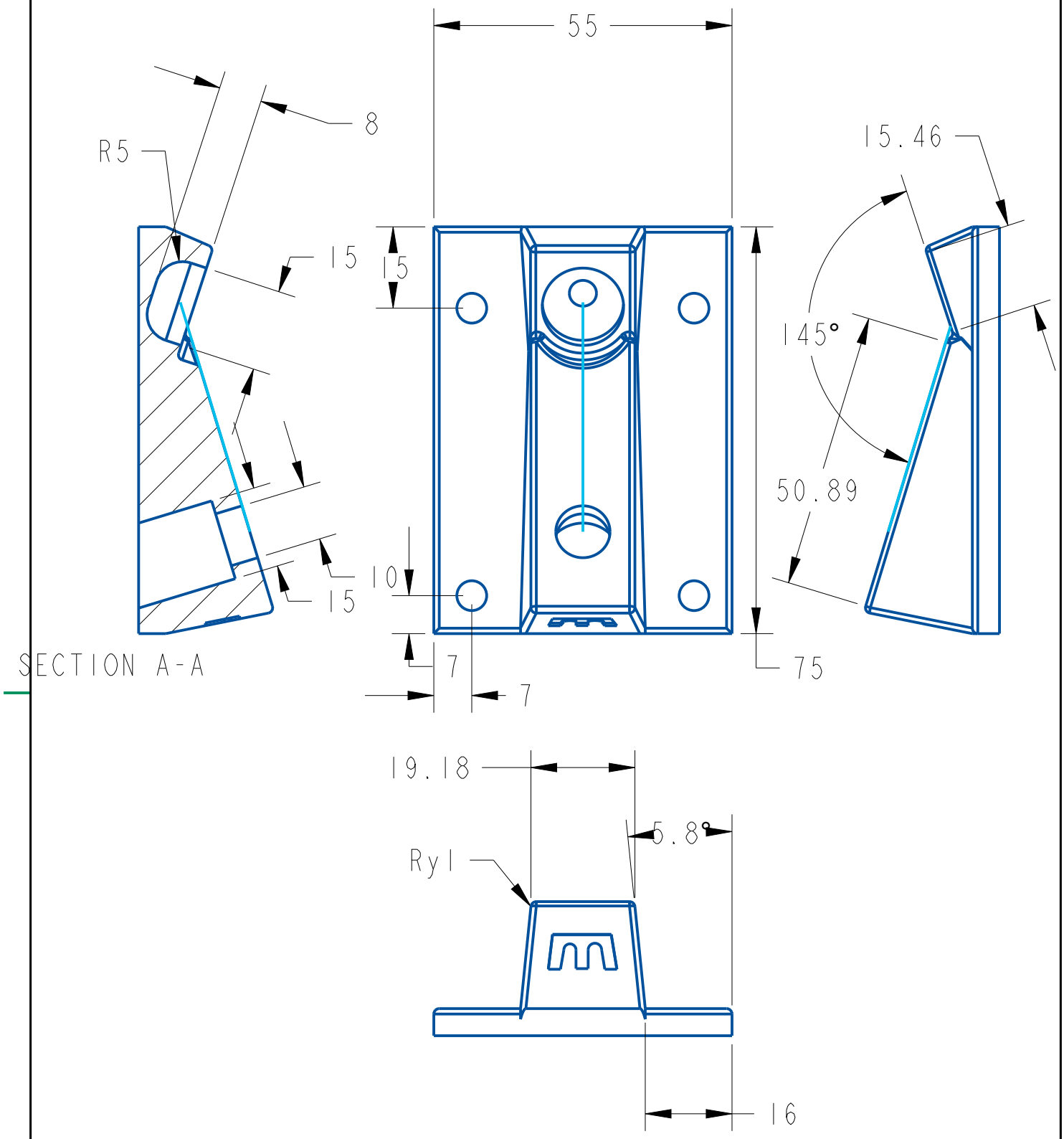


Final render

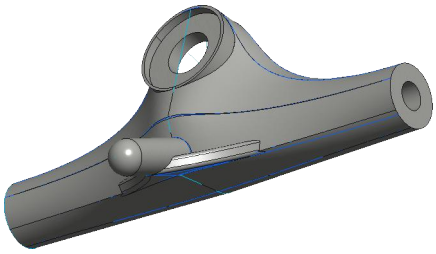
Reflections

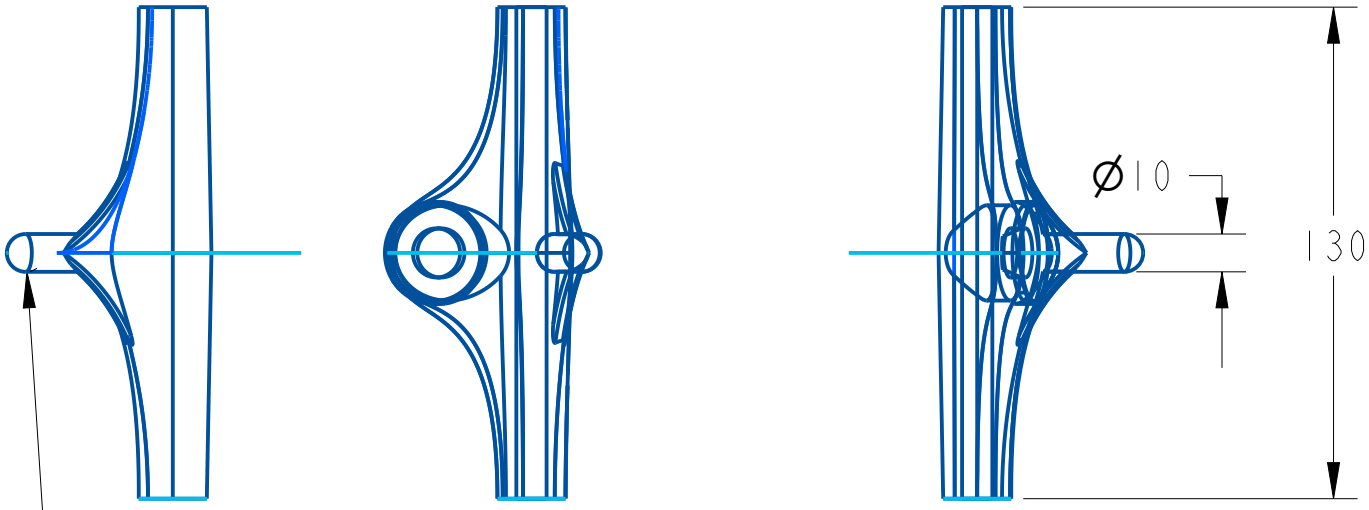
Doing the project, we found that surface modeling has a lot of hidden constrains and rules that can be very hard to navigate. This led us to do multiple iterations of the truck axle ending up with a simpler surface consisting of as few curves as possible. We ended up spending most of our time getting this feature solidified. A lot of the other parts of the project ended up being rushed. For future projects we want to manage our time better especially with this experience in mind we now know that some things take a lot more time than expected.

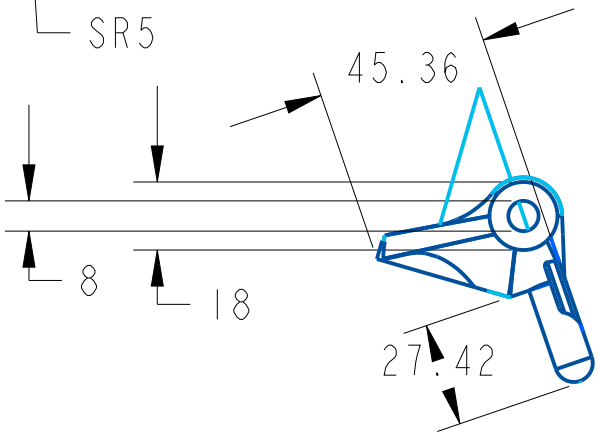
On the rendering aspect of thing, we could improve our textures and maps, making them more smooth and less repeating.

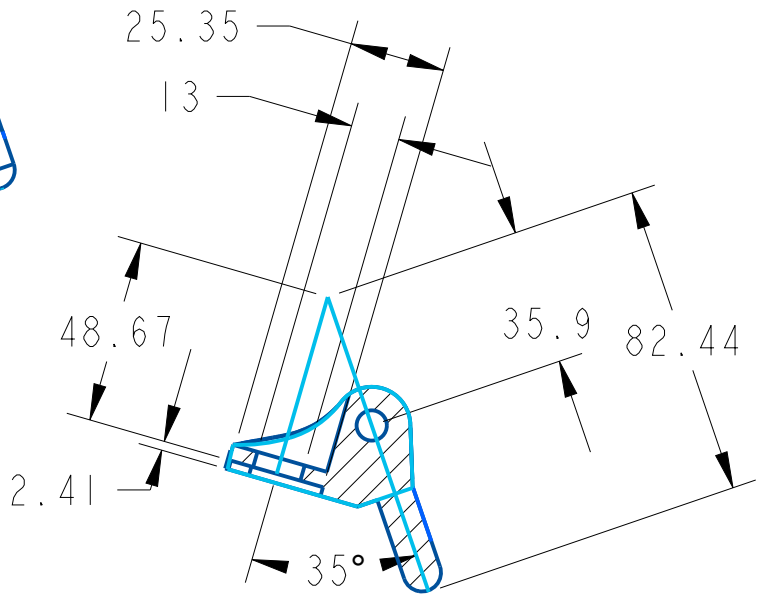


DTU **Technical University of Denmark** **Department of Mechanical Engineering** DK 2800 Kgs.Lyngby			Name: Date: May-19-23
DB-navn: TUCKBASE	Matr: Aluminium	Mass:	Draw.(DB): TRUCKBASE
Title: Truckbase		Format: V4 Scale: 1.000	Drawing no.: 1



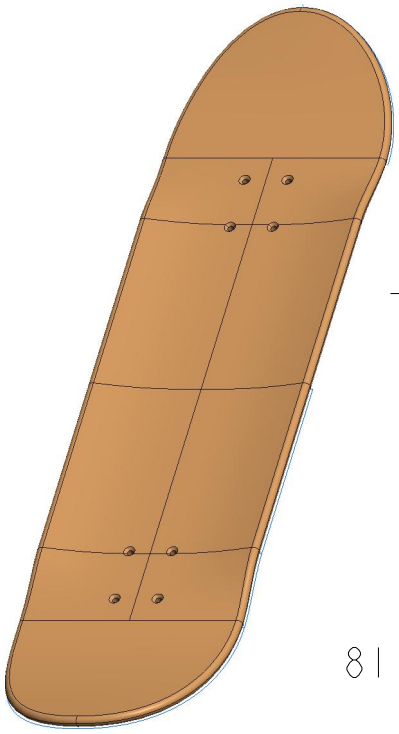


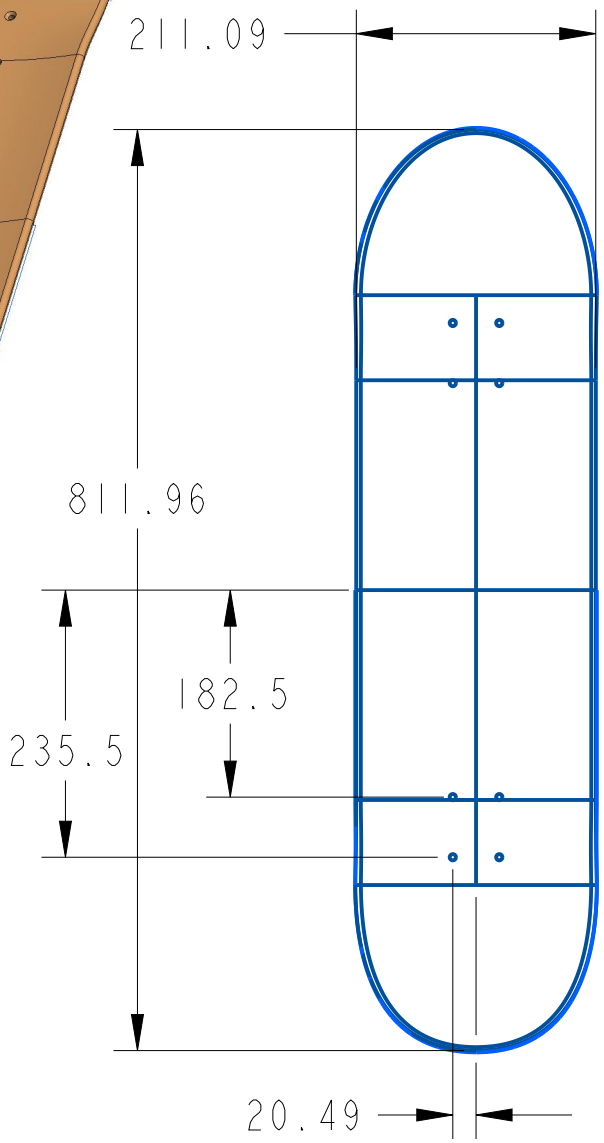


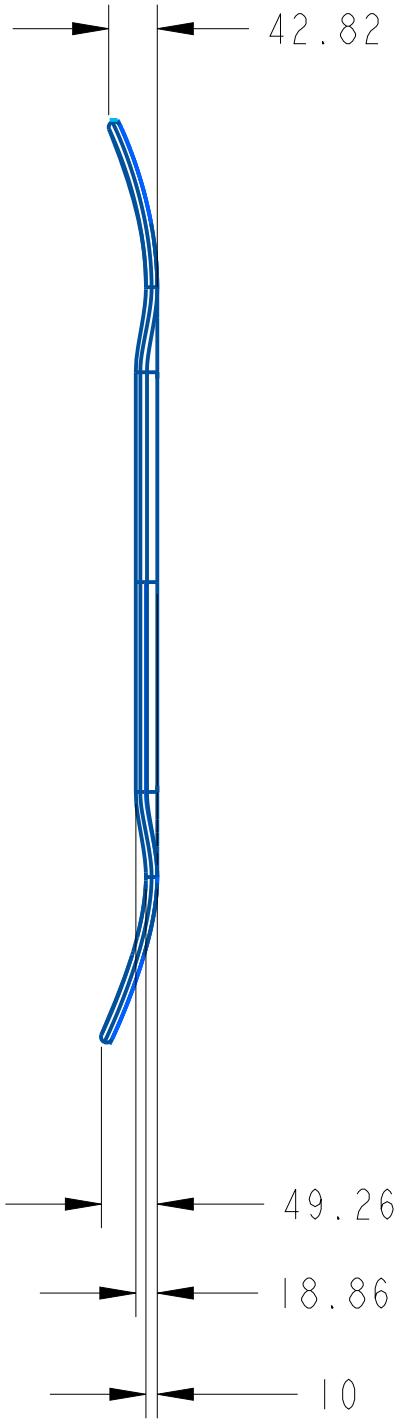


SECTION A-A

DTU **Technical University of Denmark** Department of Mechanical Engineering DK 2800 Kgs.Lyngby			Name: Truck Date: May-19-23
DB-navn: TRUCKSS	Matr: Aluminium	Mass:	Draw.(DB): TRUCK
Title: Truck		Format: V4 Scale: 0.500	Drawing no.: 1







DTU **Technical University of Denmark** **Department of Mechanical Engineering** DK 2800 Kgs.Lyngby			Name: Date: May-19-23
DB-navn: BOARD	Matr: Wood	Mass:	Draw.(DB): BOARD
Title: Board		Format: V4 Scale: 0.150	Drawing no.: 1