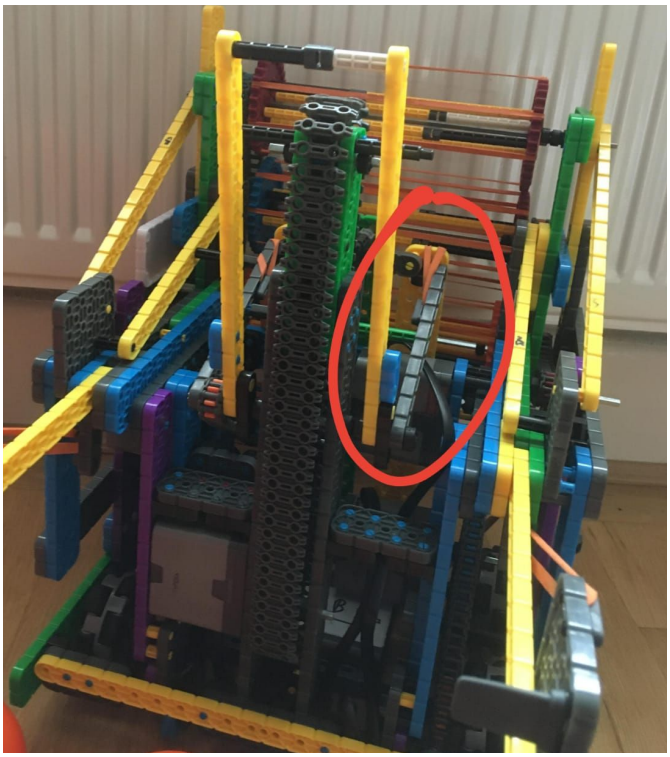
Multi-angle Corner connector

Connector pieces are extremely useful in the VEX IQ competition. They allow beams to be connected together perpendicular to each other. This is useful in both enforcing structure to a robot, and building smaller complex mechanisms. However, we have found that there are not many ways to strengthen an irregular angle between 2 beams.
We have created this part because have had many circumstances when building where an irregular angle is found between 2 beams. For example, in our previous robots, we have used a ramp for balls to travel down. This is built at an angle in order for gravity to push the balls down. We found ourself using 1 width, 1x1 connector pieces to connect the ramp to a vertical beam. However, although they can move to different angles, these are not very strong, as they only have 1 place of connection. Therefore, we wanted to make a piece which could provide a strong connection between beams at different angles.



This piece could be used in many ways. Although it was originally designed with the idea of a slanted ramp in mind, it could be used for other parts of a robot. Another area where the piece could be used on our specific robot is behind the intake. We needed a way of placing a horizontal beam at an angle so that the balls would slide up against this beam and up the intake. This is shown in the following picture:

In this picture, we originally used a different way of making this piece at an angle. We attached angled pieces to the side and connected a beam between 2 of them. However, using this method only allows certain angles to be used, and as you can see from the picture the beam is not at an optimal angle (it needed to be just above the floor). Our new piece would be able to maintain the correct angle for the beam and make sure that this mechanism is functional.

To create this piece we first sketched and outlined our initial ideas. We had various ideas of how our problem could be solved but decided on a hinge-like piece with 2 parts. The 2 pieces would fit together through indents on one part and outdents on the other part in accordance with each other. To avoid the piece being loose, we would add friction. This would be done by added teeth on a circular shape on one part and have a corresponding mouth for these teeth. Therefore, the 2 parts would lock into place at different angles.
This concept was designed in CAD using Autodesk Inventor version 2019
We modified two already existant beams to have the features explained.
This was done using features such as extruding, filleting, and sketching.
We then printed the design using an Ultimaker 2+

To conclude, this project has taught our team many important skills. We have improved our CAD skills by a very large amount and also practised our ability to design a product. We used related aspects such as implementing the design process and working as a team. In the future, we will begin to use CAD more often. This project has encouraged us further to design our robots in CAD and uses it to help us create ideas. For some of our team, this has even given us an insight into the wider world of design and technology and has helped to inspire others. We feel the project has been a success and enjoyed every moment of it.