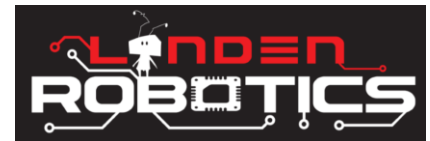


# LINDEN ROBOTICS

FRC-3568 Linden RoboEagles

FTC-7031 Linden Battle Blazers

## Autodesk Fusion 360 Training



**We need to thank our FIRST sponsor -**

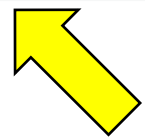


**AUTODESK<sup>®</sup>  
FUSION 360<sup>™</sup>**

autodesk.com/education/competitions/first



AUTODESK®  
FUSION 360™



AUTODESK.



US

SIGN IN

Products ▾ Support ▾ Learn ▾ Community ▾

EDUCATION / STUDENTS EDUCATORS ADMINISTRATORS LEARN LAB GET HELP

## Resources for teams

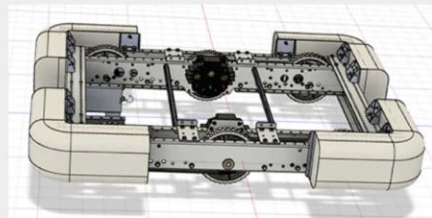
Design and test before you build your robot.



### Prepare for the season

Learn how to use Autodesk Fusion 360 to design your robot in CAD

Take the class



### Use the kit

Download the Autodesk kit of parts to help you in the design process

Download the kit



### Free software for design

Autodesk software is available for all students, teachers, and mentors

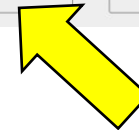
Explore software



### Test with Synthesis

Use simulator technology to test and experiment with your robot models

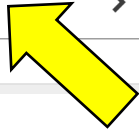
Discover simulation



## F FUSION 360

Autodesk Fusion 360 is a cloud-based 3D CAD/CAM tool that helps teams explore design ideas and create models for 3D printing and machining.

Get Fusion 360



AUTODESK®  
FUSION 360™

# Unlock educational access to Autodesk products

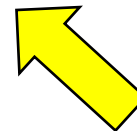
Students and educators can get free one-year educational access to Autodesk products and services, renewable as long as you remain eligible. Confirm your eligibility now.

GET STARTED



▶ [How it works \(3:08 min.\)](#)

Already have educational access? [Sign in](#)



Proof of eligibility is required and may take up to 7 days to be processed. Documentation must include your full legal name, school name and location, and be dated for the current school term. See examples given below. (Image is from video linked on previous slide.)



AUTODESK®  
FUSION 360™

**Autodesk Education Plan: Create an Account and Confirm Eligibility**

Additional documentation needed

Please upload a copy of documentation issued to you by your educational institution (e.g. tuition receipt or student ID, employee ID) as proof that you attend, teach or are employed at a Qualified Educational Institution

You have 14 days to upload your documentation

The document must include:

1. Your full legal name ( Todd Smith )  
*Note: The name on the document you submit must match this.*
2. The name of the educational institution at which you are enrolled or employed (Asd Program (Saint Peter, MN))  
*Note: The school name on the document you submit must match this.*
3. A date within the current school term.

Preferred documents include:

- Transcript
- School-issued confirmation letter
- A copy of your student ID (photo ID not required)

Supported file types: JPEG, PDF, PNG, GIF

Drag documents here, or [browse](#)

**Examples of preferred documents**

- Wilson Central High School**  
School Transcript  
Transcript with full name of student, school name, and date
- Hilltop University**  
School-issued confirmation letter  
School letterhead with full name of student or faculty member, school name, and date
- Hilltop University**  
**EAST WEST ACADEMY**  
School ID  
ID badge with full name of student or faculty member, school name, and date, photo not required

**MORE VIDEOS** If your uploaded document is too fuzzy to read, does not show your full and legal name, or shows a name different from the one you used for this Autodesk account, you will not be able to finalize the verification process. Please do not include any confidential information in the document you upload, such as social security numbers or banking details. Please ensure any sensitive information is blacked out before you upload your document.

1:46 / 3:08

CC HD YouTube

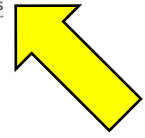


# AUTODESK® FUSION 360™

## Additional resources

To support FIRST students in their design process, we have developed a kit of parts and field models in CAD.

- [FRC 2020 kit of parts](#)
- [FRC 2020 field model](#)
- [FTC Skystone kit of parts](#)
- [FTC Skystone field model](#)
- [Fusion 360 kit of parts](#)
- [Fusion 360 kit of parts](#)
- [Inventor kit of parts](#)
- [Inventor kit of parts](#)
- [STEP kit of parts](#)
- [STEP kit of parts](#)
- [STEP kit of parts](#)
- [STEP kit of parts](#)



**AndyMark**    

New & Deals ▾ Bundles ▾ Mechanical ▾ Electrical ▾ View All FIRST ▾ Resources ▾ Gift Card

<a href="#">Customer Service</a>	<a href="#">Company Info</a>	<a href="#">AM Academy</a>	<a href="#">Services</a>	<a href="#">Help &amp; FAQ</a>
Contact Us	About	3D Printed Parts	Waterjet Cutting	Documentation
Purchasing   W9   Tax Exempt	Careers	FRC Resources	Custom Projects	Assembly Guides
Check Gift Card Balance	Global Distribution	FTC Resources		PDF Drawings
Shipping	Terms   Privacy Policy	Presentations		STEP Files
Warranty   Returns	Newsletters   Contests			Supplemental Documentation

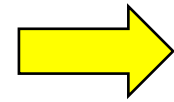


**AndyMark**    

New & Deals ▾ Bundles ▾ Mechanical ▾ Ele

Home / Resources / Help & FAQ / Documentation

Size	File/Folder
0.1 k	../
19.7 M	AM14U4_PNG6.STEP
37.7 M	AM14U4_PW48XL.STEP
37.3 M	AM14U4_PW4XL.STEP
55.2 M	AM14U4_PW68XL.STEP
54.6 M	AM14U4_PW6XL.STEP
13.2 M	EVO-4R-283-135-LH2 2 Stage 4 RedLine EVO Shifter.STEP
36.8 M	Launch Bot.STEP
235.2 k	am-0004 AMS Outside Plate REV5.STEP
210.5 k	am-0020 Dog Gear.STEP
150.4 k	am-0020d Three Tooth Dog Gear REV5.STEP
106.7 k	am-0021 Output Hex Shaft.STEP
892.3 k	am-0022 Large Output Gear, 48 Tooth.STEP
436.0 k	am-0023 35T 20dp Small Output Gear.STEP
677.8 k	am-0023 Small Output Gear, 35 Tooth.STEP
1.0 M	am-0024 40T 20dp 375h.STEP



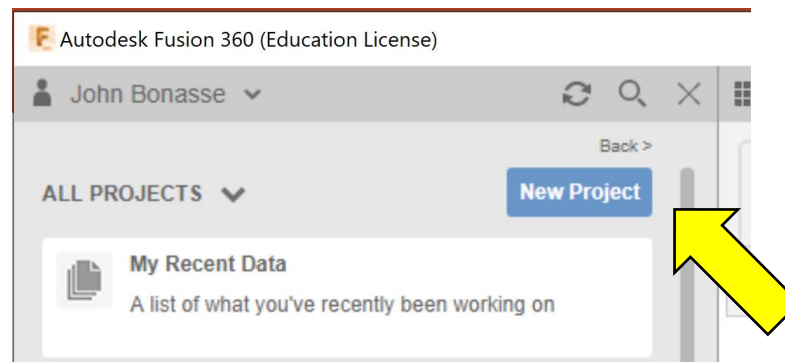


AUTODESK®  
FUSION 360™

You should have already downloaded and installed Fusion 360 and downloaded the KoP STEP files. If you haven't please see the email previously sent with details.

Open the software. You may be prompted to sign into Autodesk.

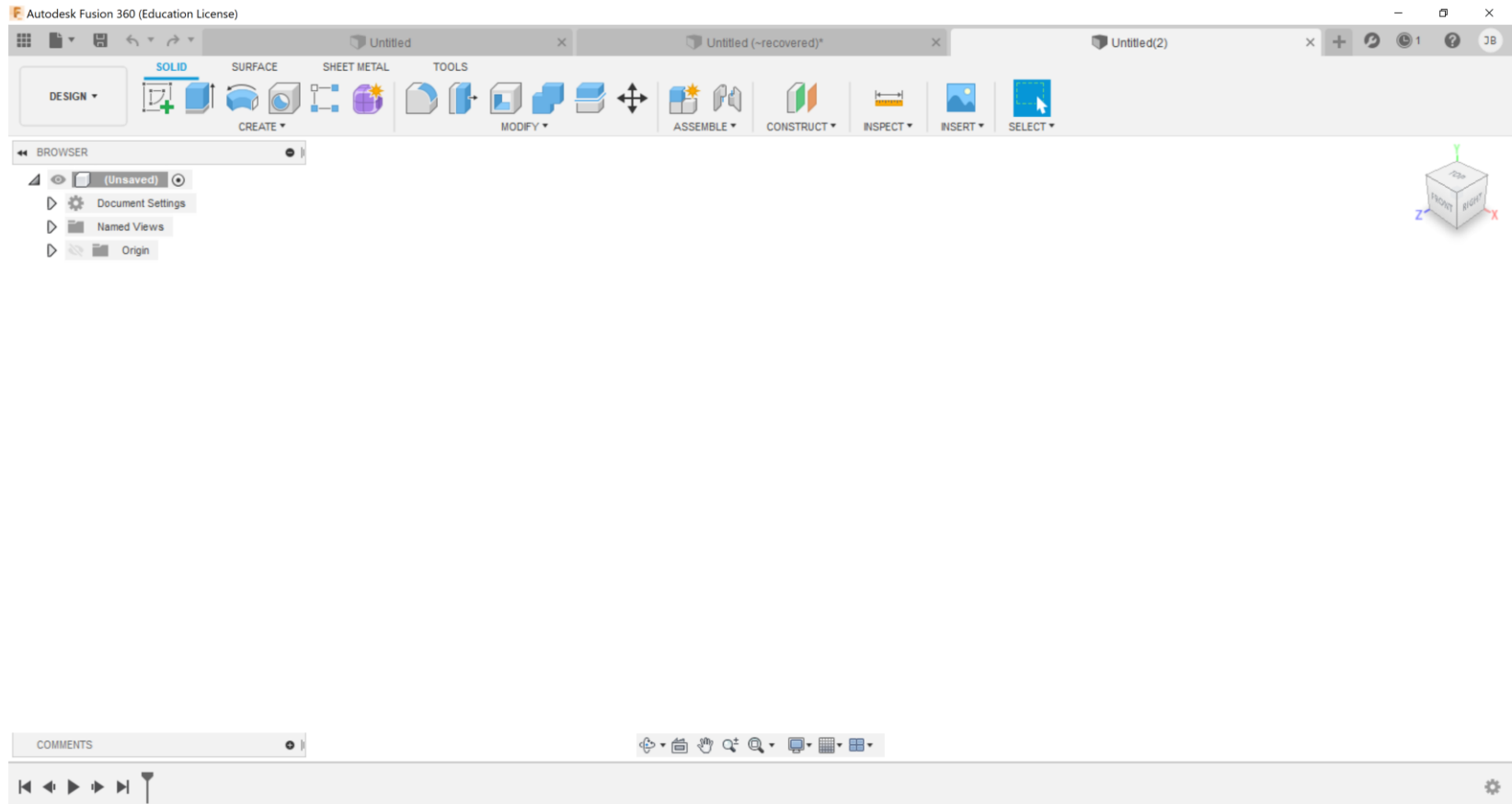
Click on **New Project** and name it “**FreightFrenzy**”.





AUTODESK®  
FUSION 360™

Your screen should look similar to the one shown below.



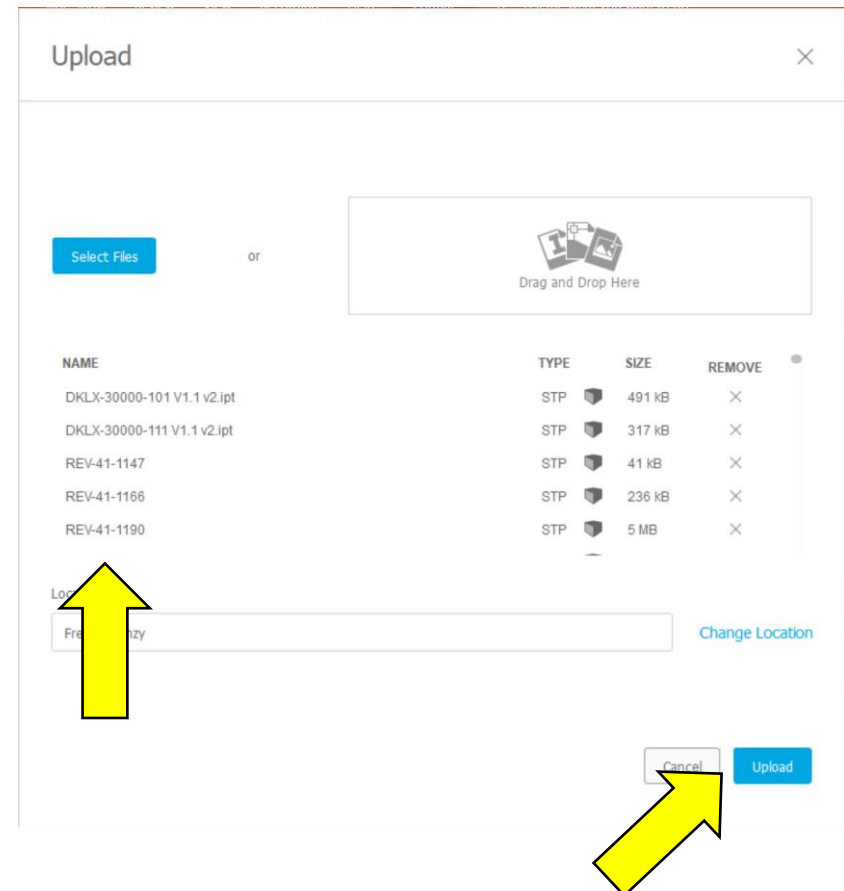
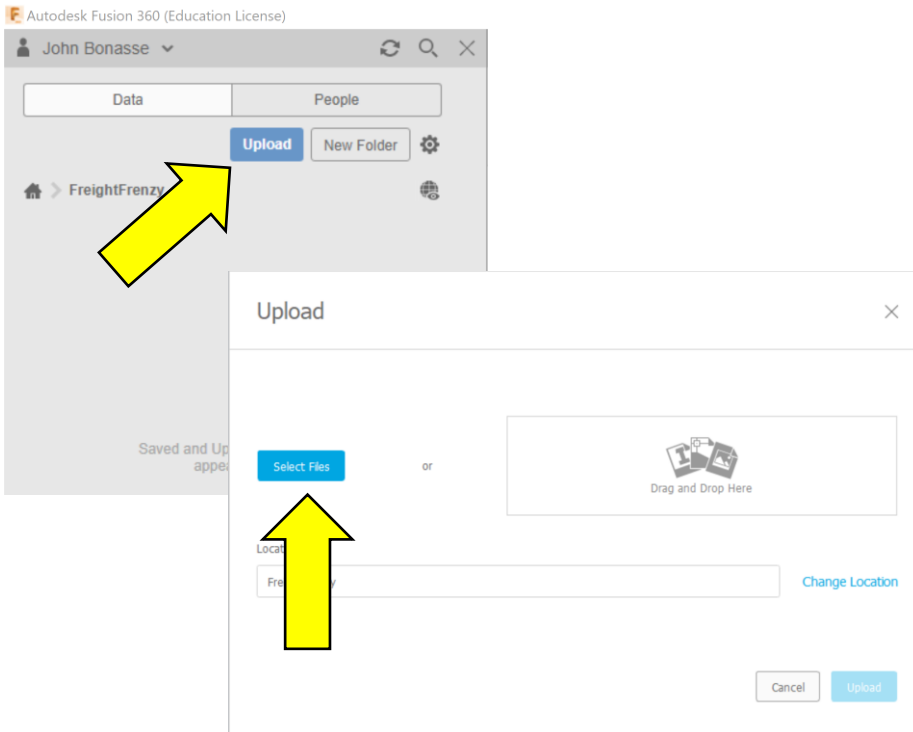




AUTODESK®  
FUSION 360™

## Let's get started

- 1 – **Upload** the STEP files into the project by clicking on the Upload button.
- 2 – Click on **Select Files** and choose the STEP files to add. File names will appear in the list and then click on **Upload**.

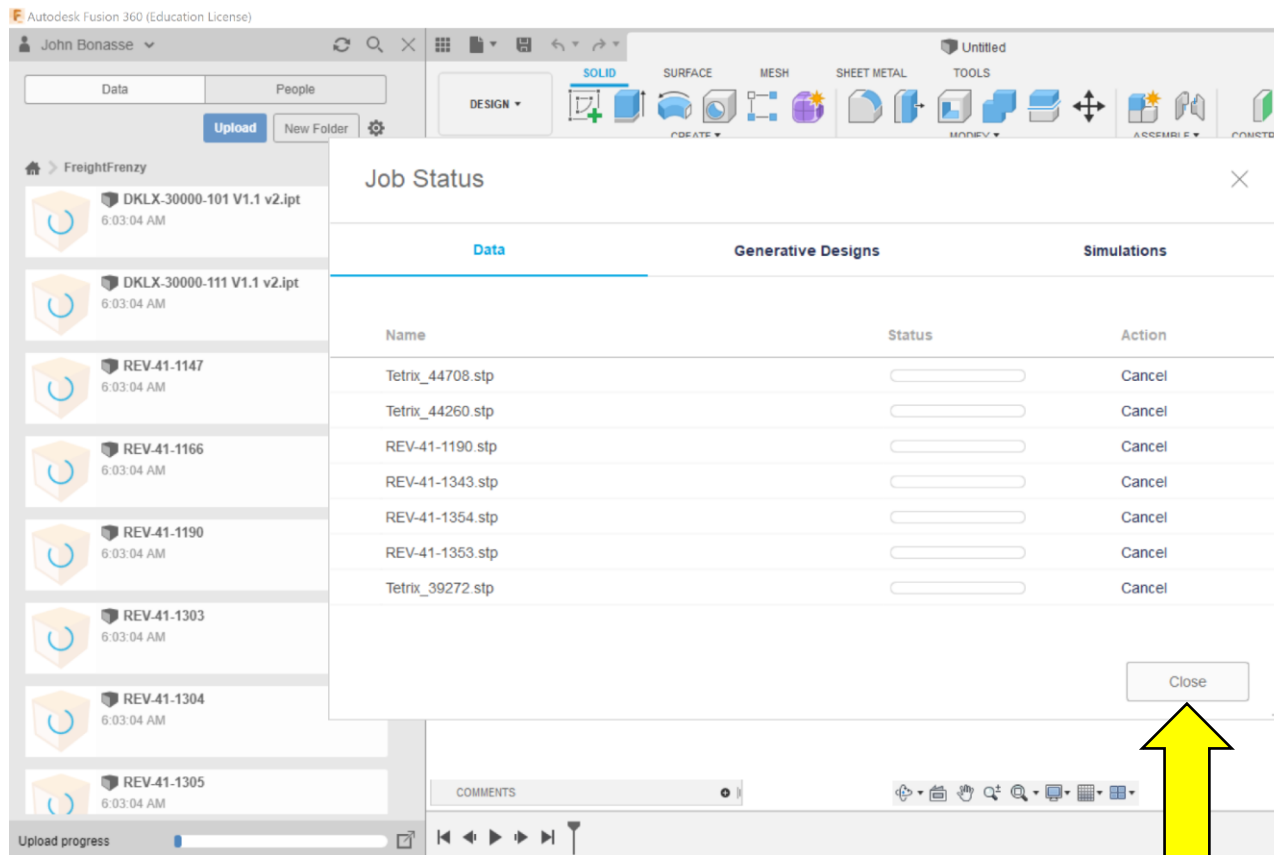




AUTODESK®  
FUSION 360™

## Let's get started

3 – Files will begin to load in the **Data Panel** on the left side of the display. Click the **Close** button when the upload is complete.





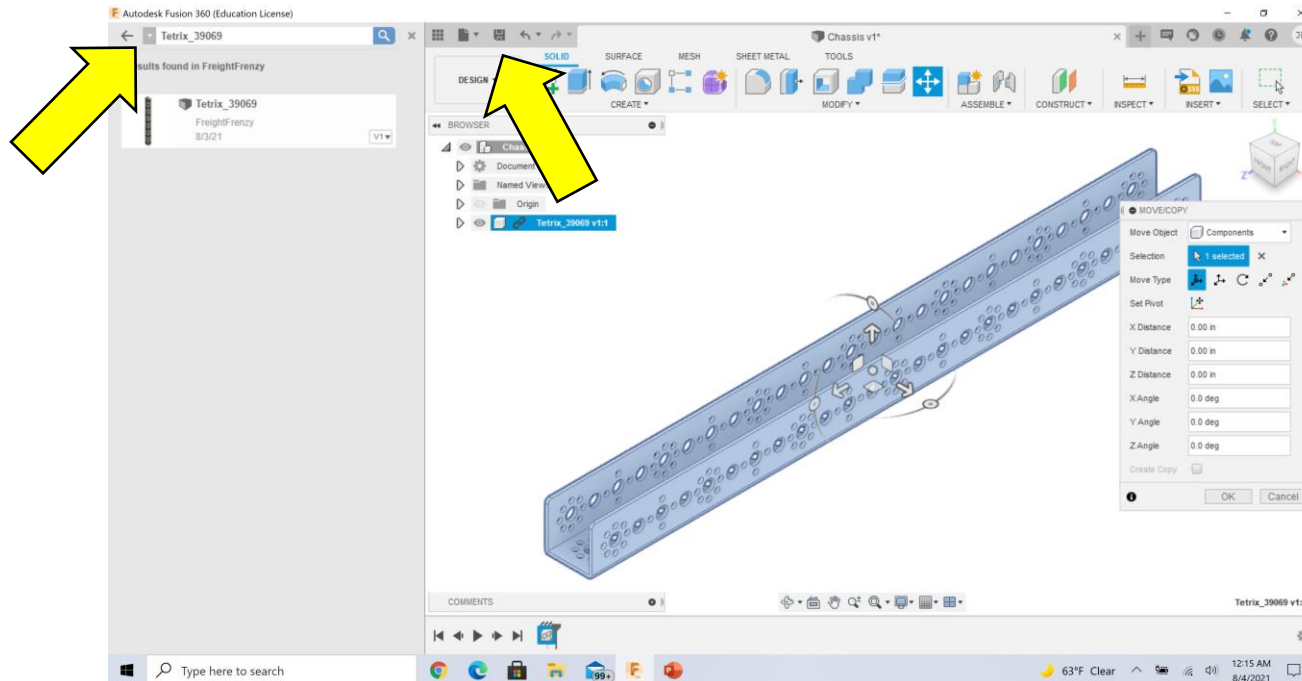
AUTODESK®  
FUSION 360™

## Add Component

4 – Save your project by clicking on the **Save Icon** or by selecting **Save** from the **File Menu** in the **Application Toolbar**. Name the file “**Chassis**”.

5 – Using the **Magnifying Glass Icon** on the **Data Panel**, search for “**Tetrix\_39069**”.

6 – Left click and drag the **Channel** into the **Workspace**.

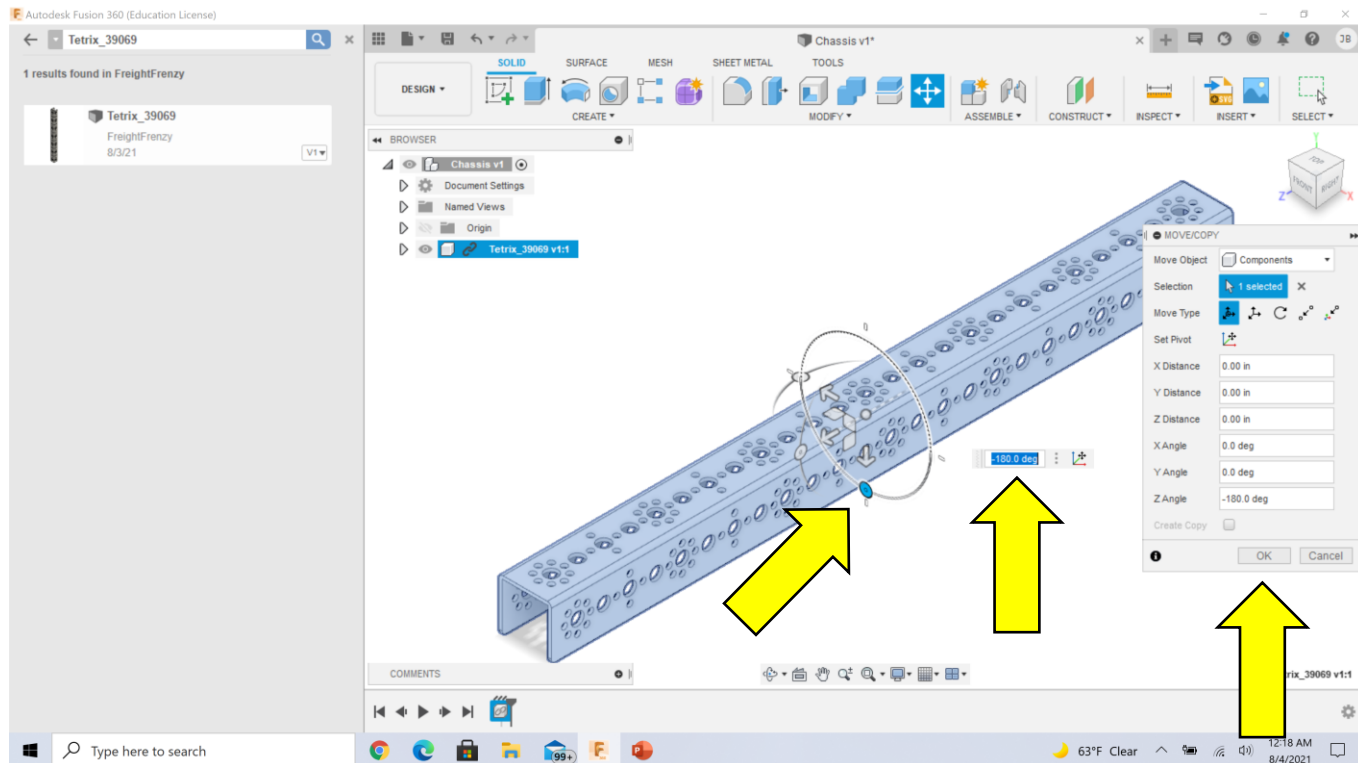




AUTODESK®  
FUSION 360™

## Orient Channel

7 – Using the **Rotation Handles**, orient the **Channel** as shown below (-180 degrees). You can also manually type an angle into the **Entry Box**. Click **OK** when finished.

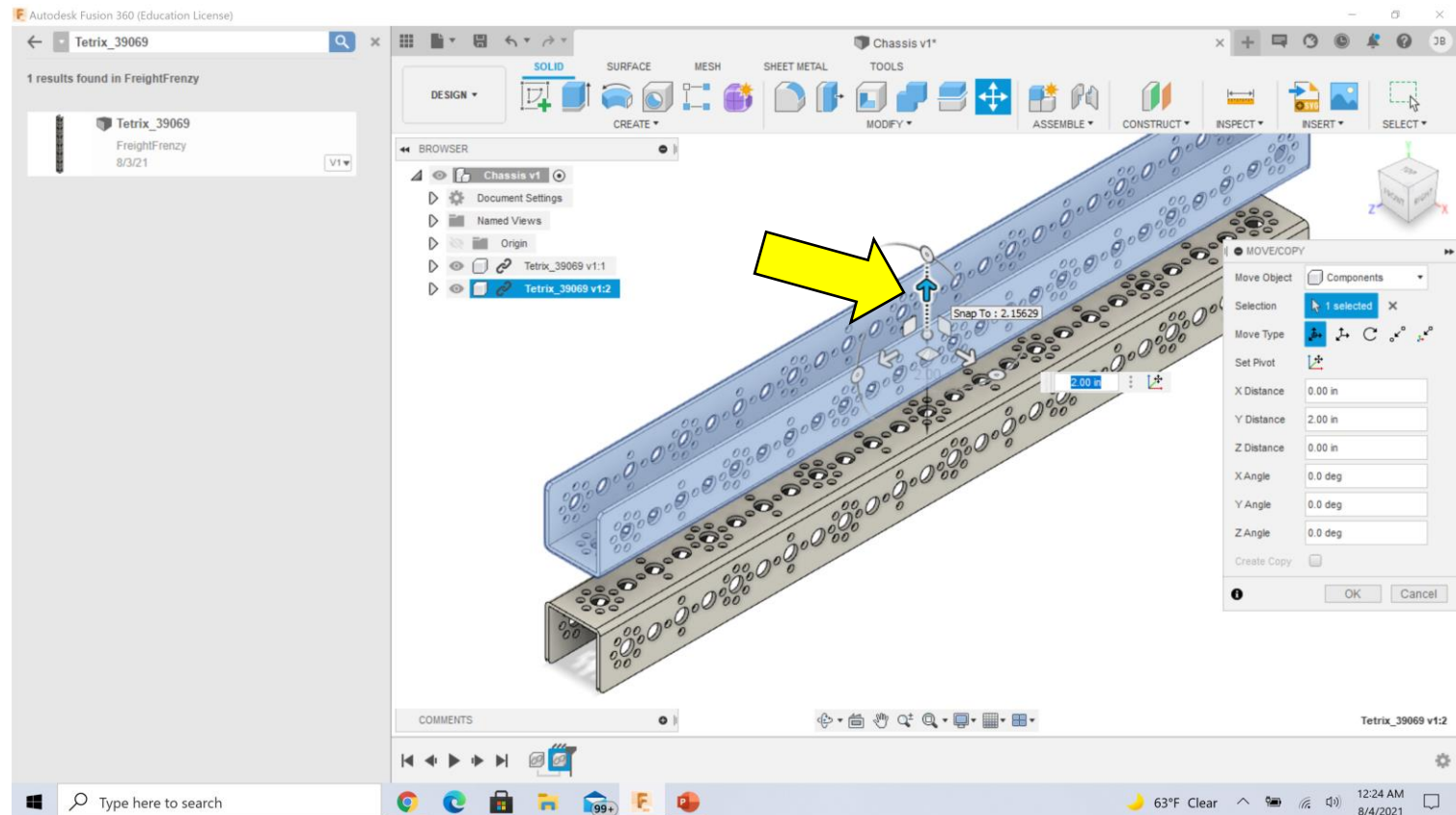




AUTODESK®  
FUSION 360™

## Add Second Component

8 – Drag a second piece of **Channel** into the **Workspace** and use the **Translate Handles** to separate the two **Channels**.

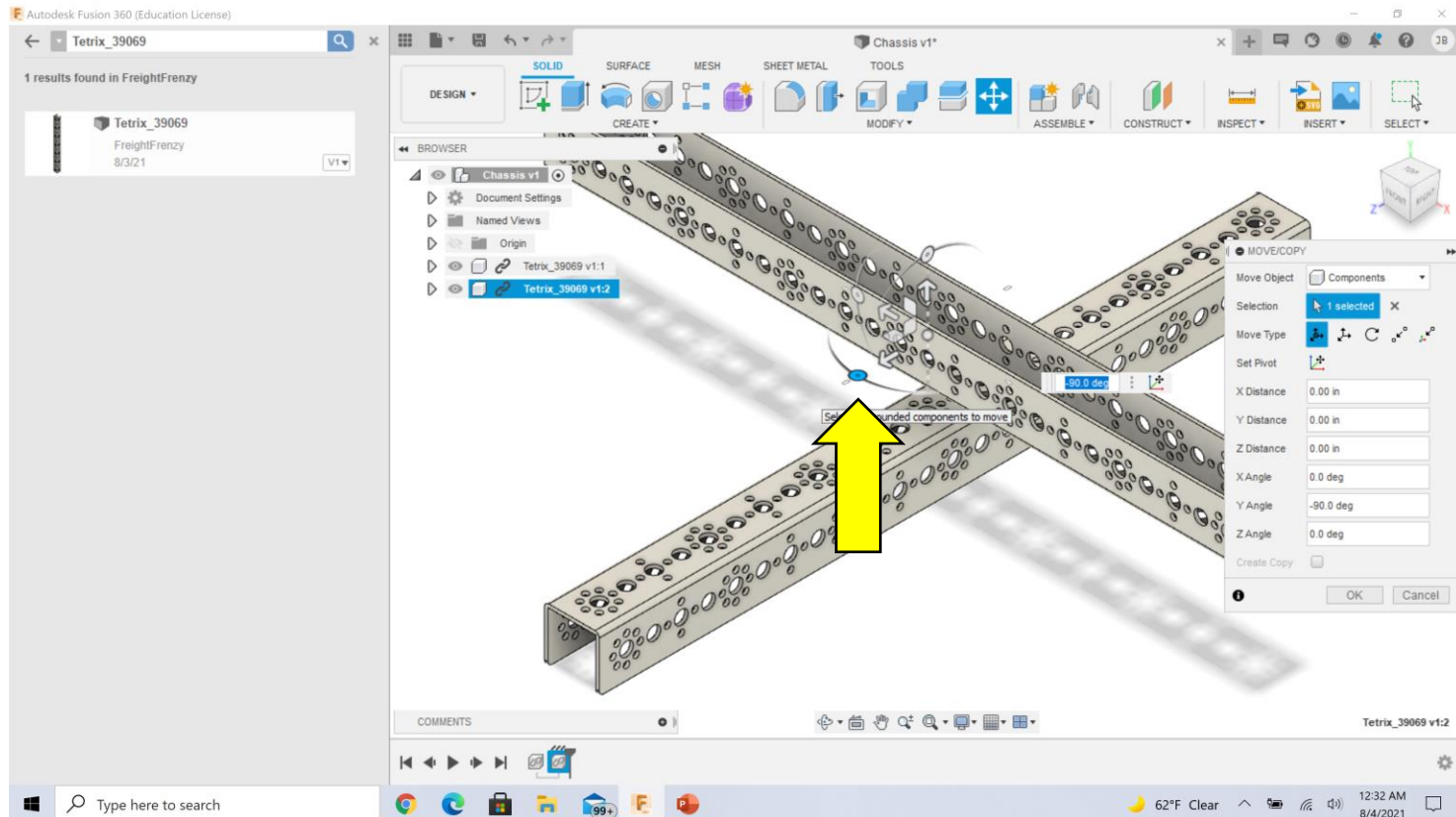




AUTODESK®  
FUSION 360™

## Orient Second Channel

9 – Use the **Rotational Handles** to rotate the **Channel** to be perpendicular to the first (**-90 degrees**).

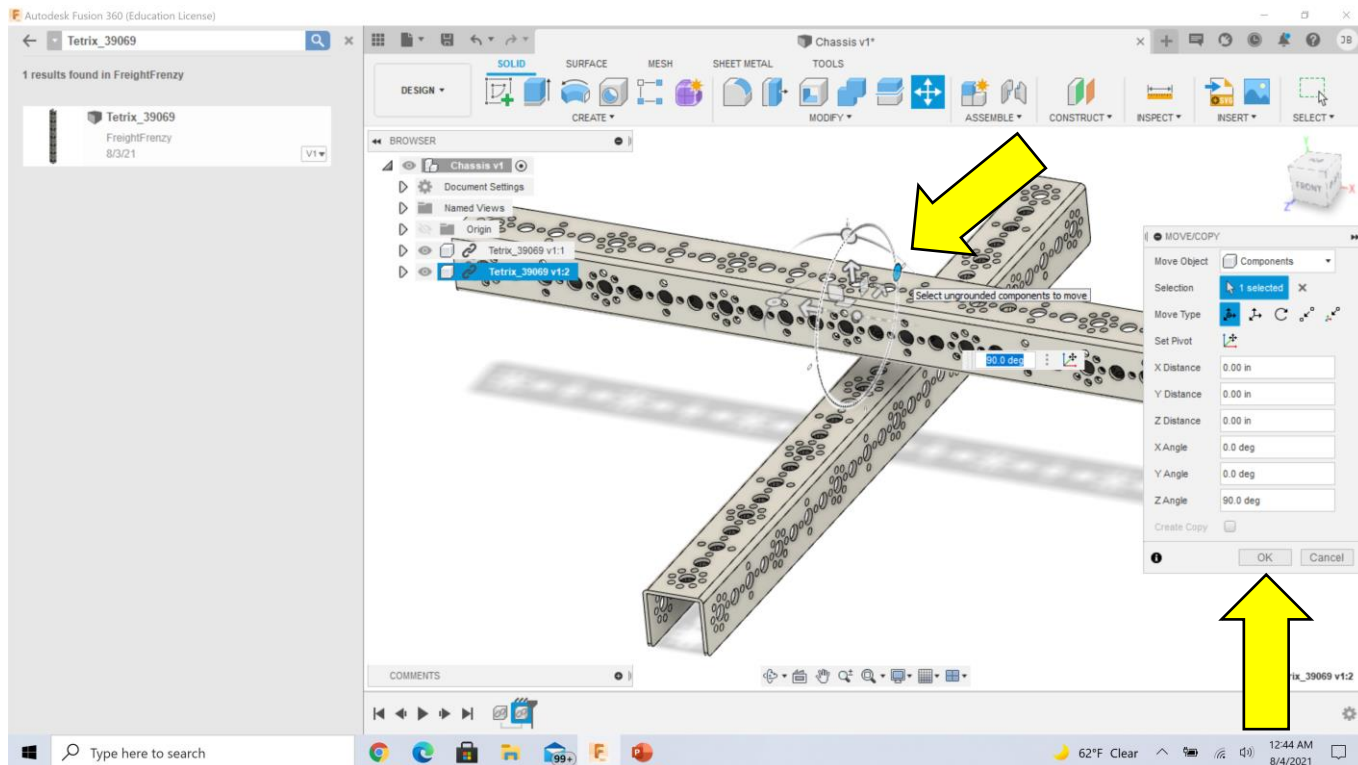




AUTODESK®  
FUSION 360™

## Orient Second Channel

9 – Use the **Rotational Handles** again to roll the **Channel** onto its side (**-90 degrees**). Click **OK** when finished.

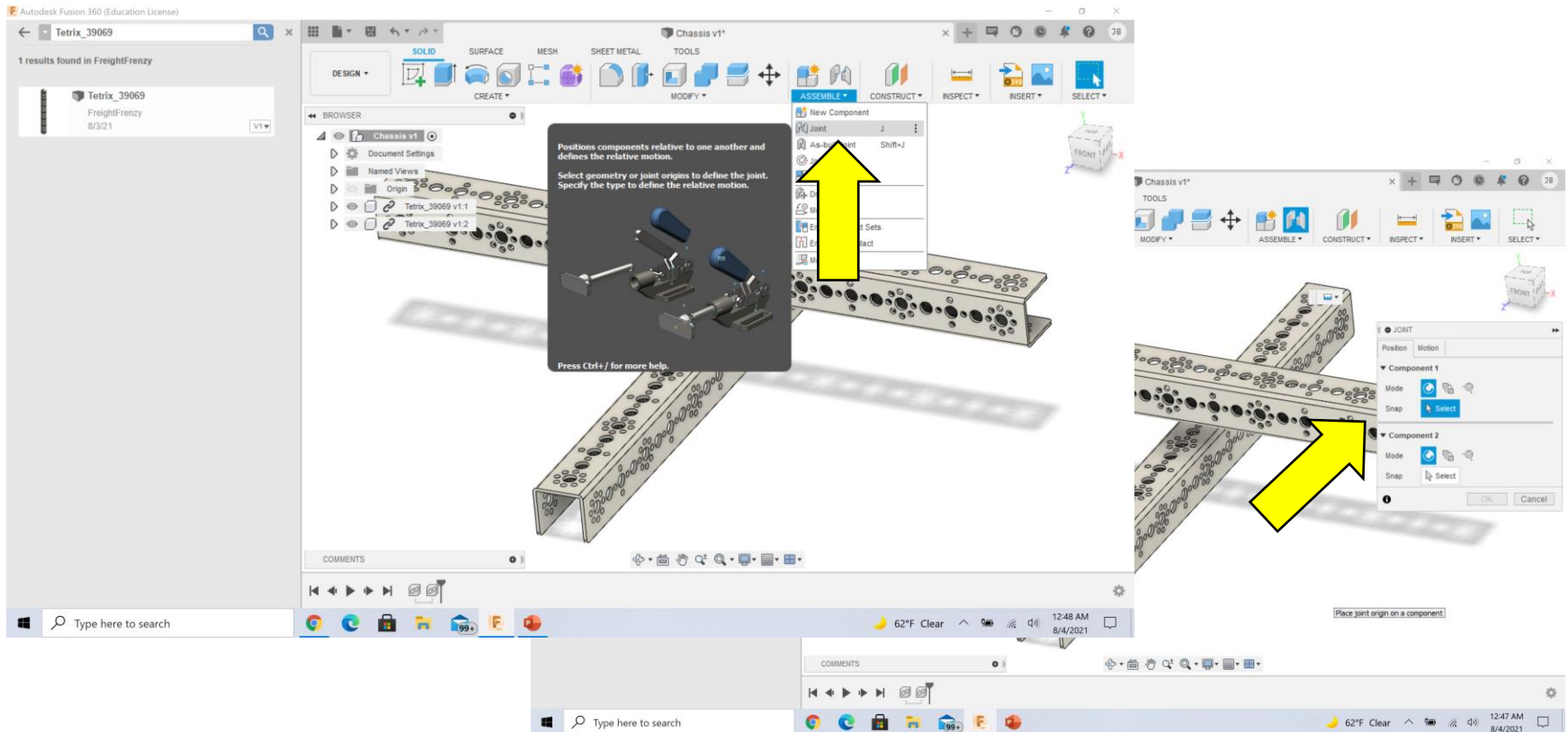




AUTODESK®  
FUSION 360™

## Create Rigid Joint

10 – Create a **Rigid Joint** between the two pieces of **Channel**. To do this, select the **Joint Command** in the **Assembly Menu** (**Shift + J**). The **Joint Window** will be displayed.



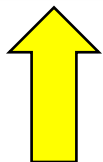




AUTODESK®  
FUSION 360™

## Create Rigid Joint

11 – **Component 1** is the piece that will be moved and **Component 2** is the stationary component. Using the **Navigation & Display Toolbar** at the bottom of the workspace, rotate the workspace to view the bottom of the second **Channel** you added to the project. From left to right the identified tools below are the **Orbit Tool**, **Pan Tool**, **Zoom** and **Fit Tools**. You can also use the **Mouse Scroll Wheel** (if you have one) or the **View Cube** in the upper right corner. Also, use the **Esc Key** to end the commands when finished.

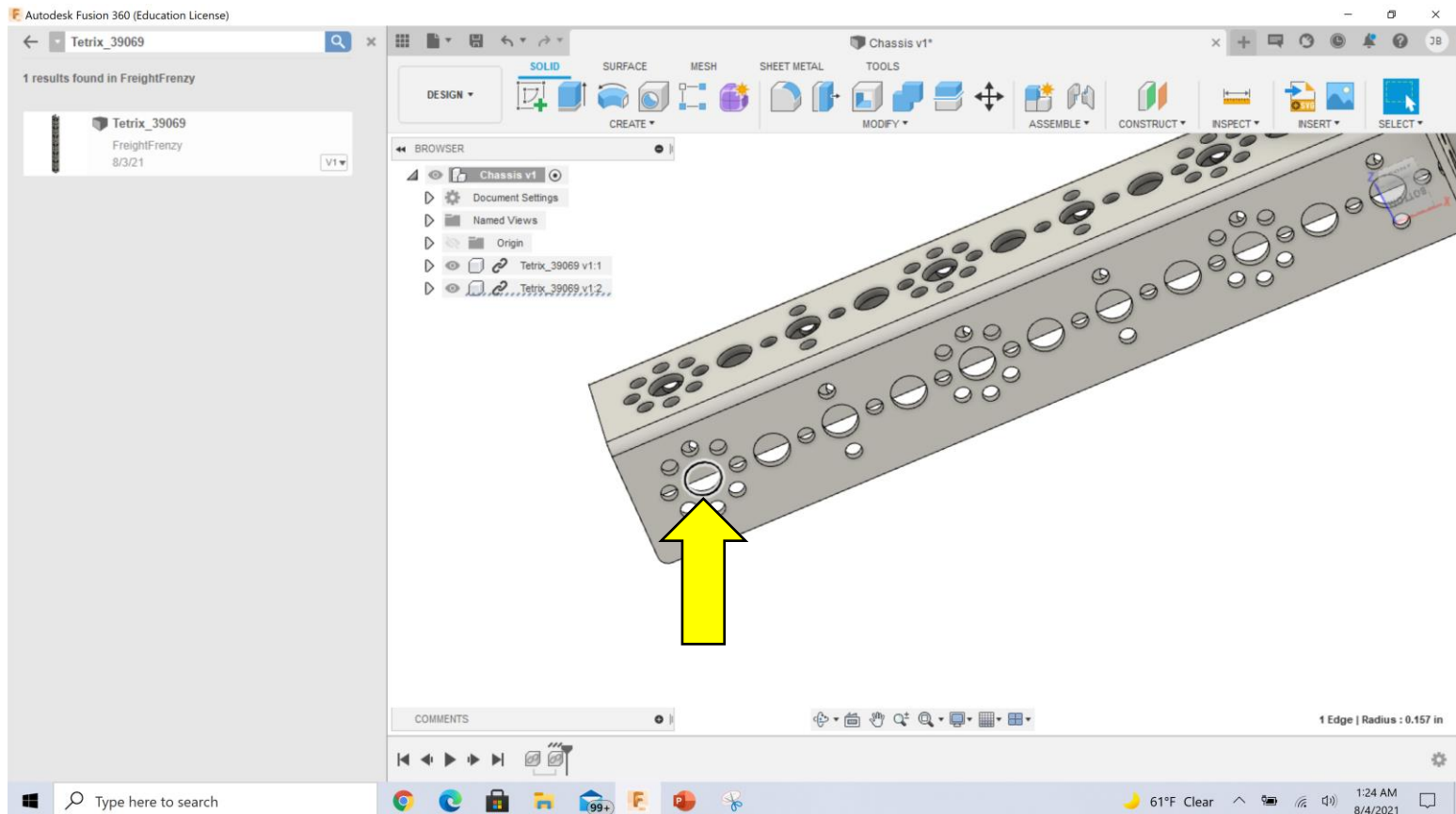




AUTODESK®  
FUSION 360™

## Create Rigid Joint

12 – Select the large outside circle as the first piece of the **Rigid Joint**.

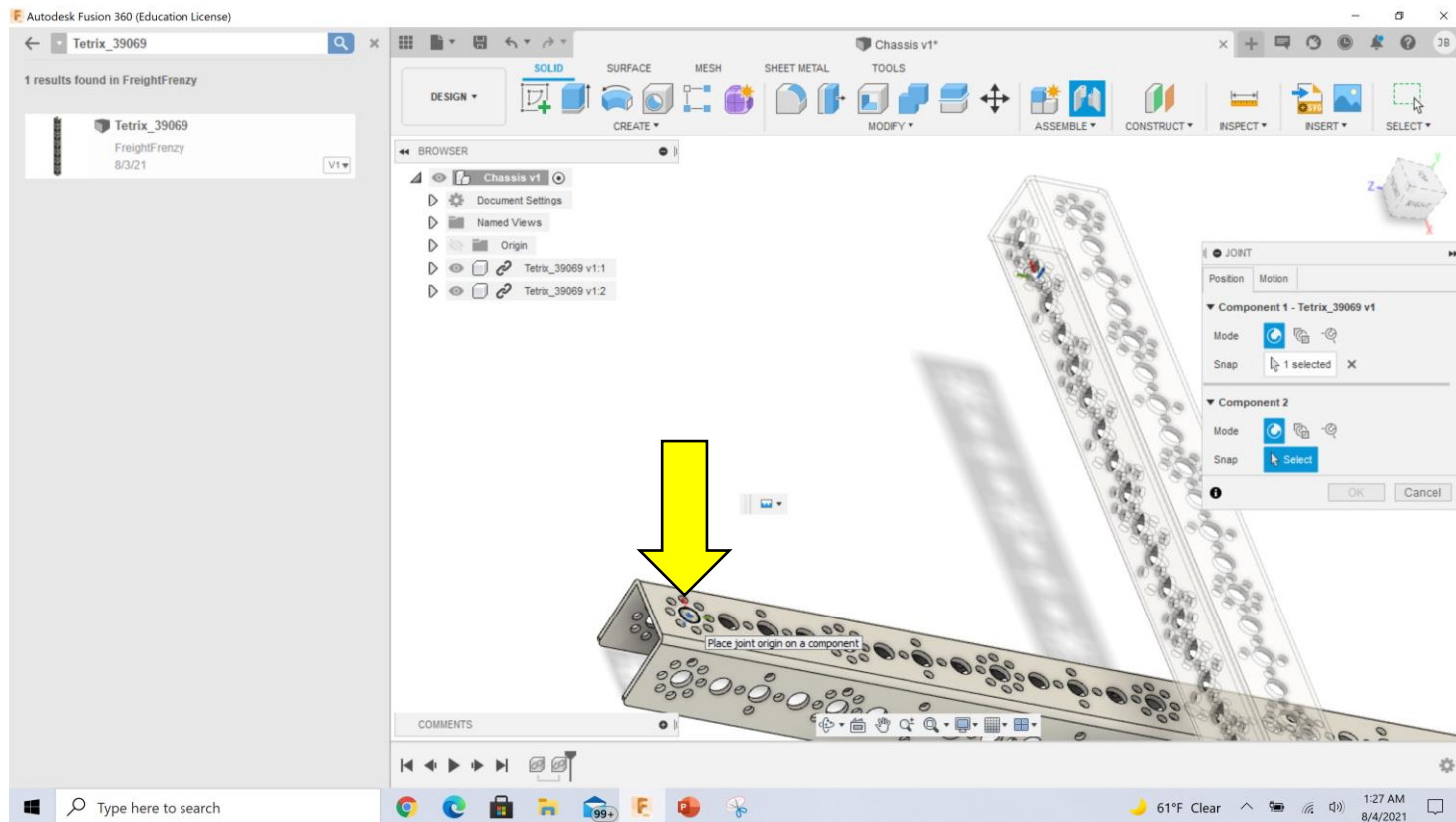




AUTODESK®  
FUSION 360™

## Create Rigid Joint

13 – Orient the workspace to see the large outside hole on the first **Channel** added to the project and select it as the second piece of the **Ridged Joint**.

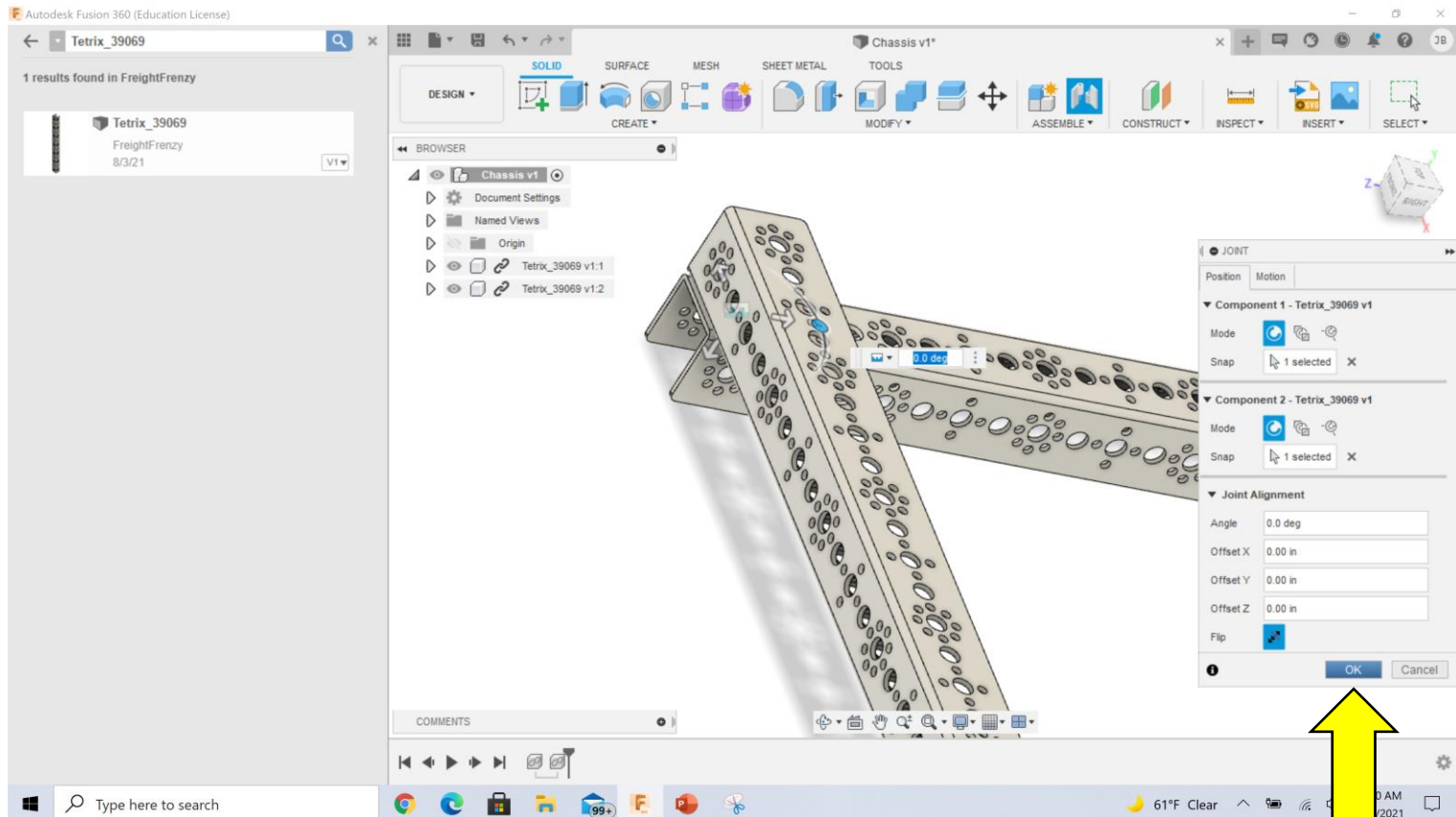




AUTODESK®  
FUSION 360™

## Create Rigid Joint

14 – Component 1 should move into position with Component 2.  
Click **OK** when finished.

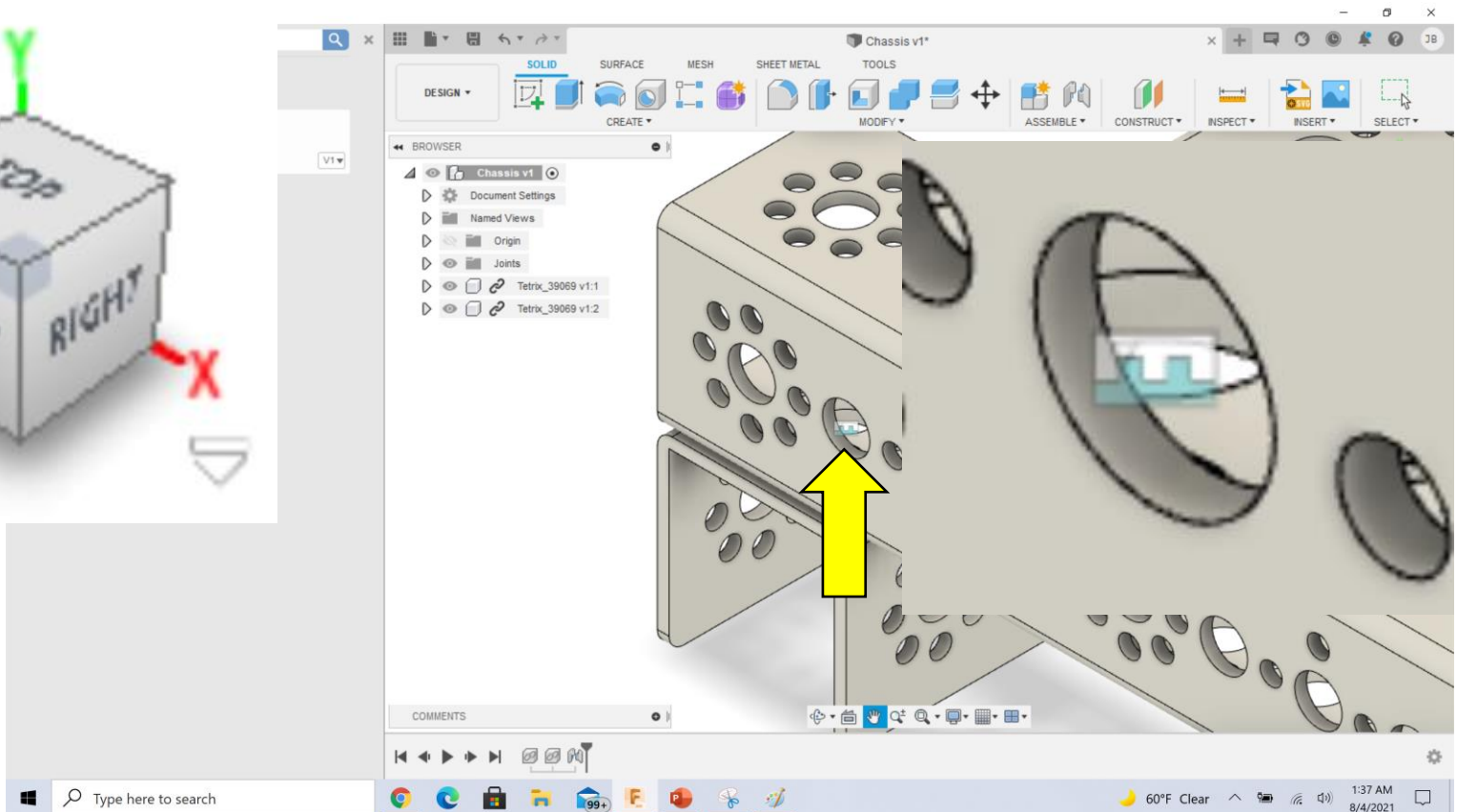
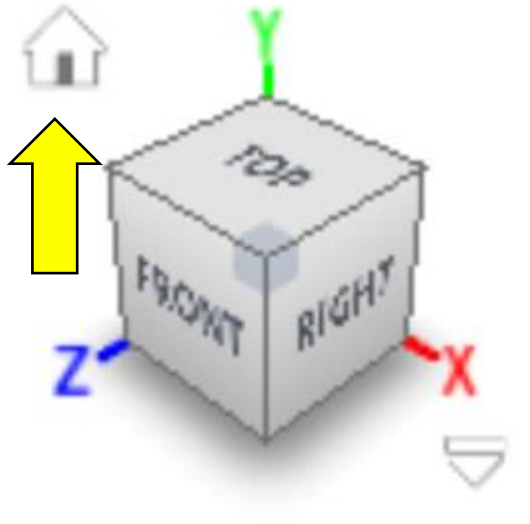




AUTODESK®  
FUSION 360™

## Create Rigid Joint

15 – Use the **Home Icon** in the **View Cube** to reset the workspace. You should see a **Rigid Joint Mark** between the two pieces.

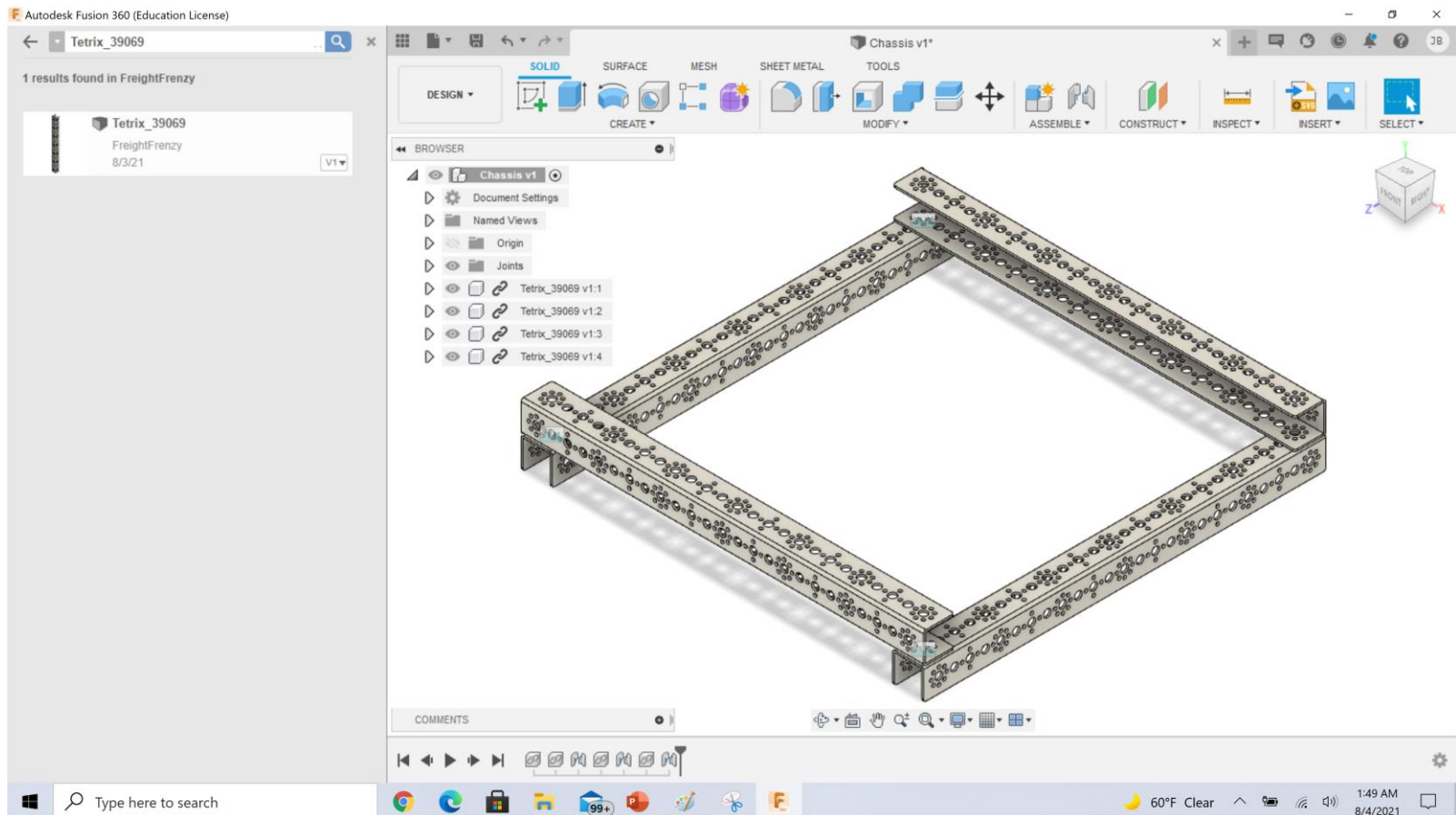




AUTODESK®  
FUSION 360™

## Finish Chassis Frame

16 – Using previous concepts, add two additional **Channels** and create **Rigid Joints** to complete the **Frame**.



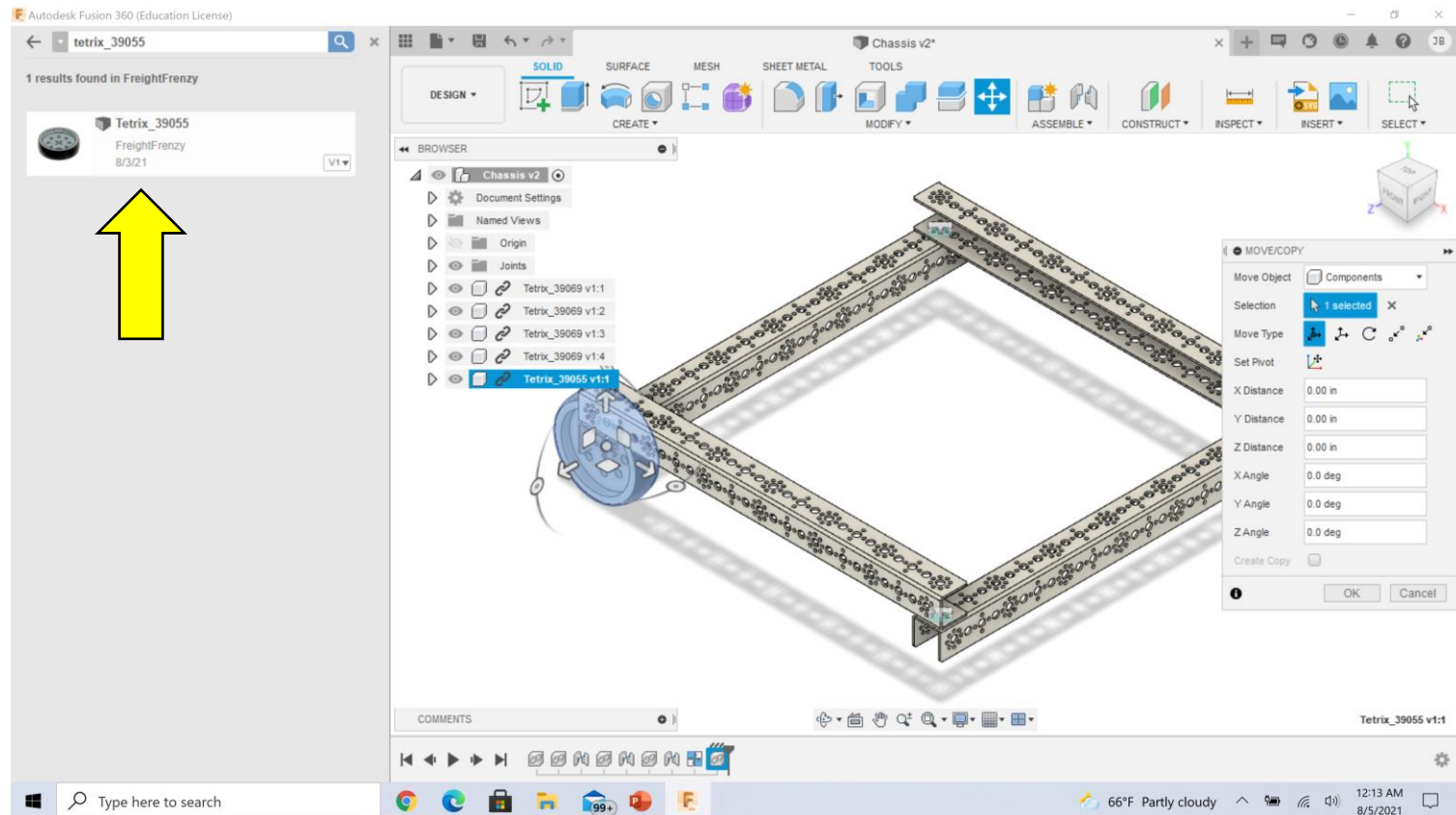


AUTODESK®  
FUSION 360™

## Wheel Assemblies

17 – Using the **Magnifying Glass Icon** on the **Data Panel**, search for **”Tetrix\_39055”**.

18 – Left click and drag the **Wheel** into the workspace.

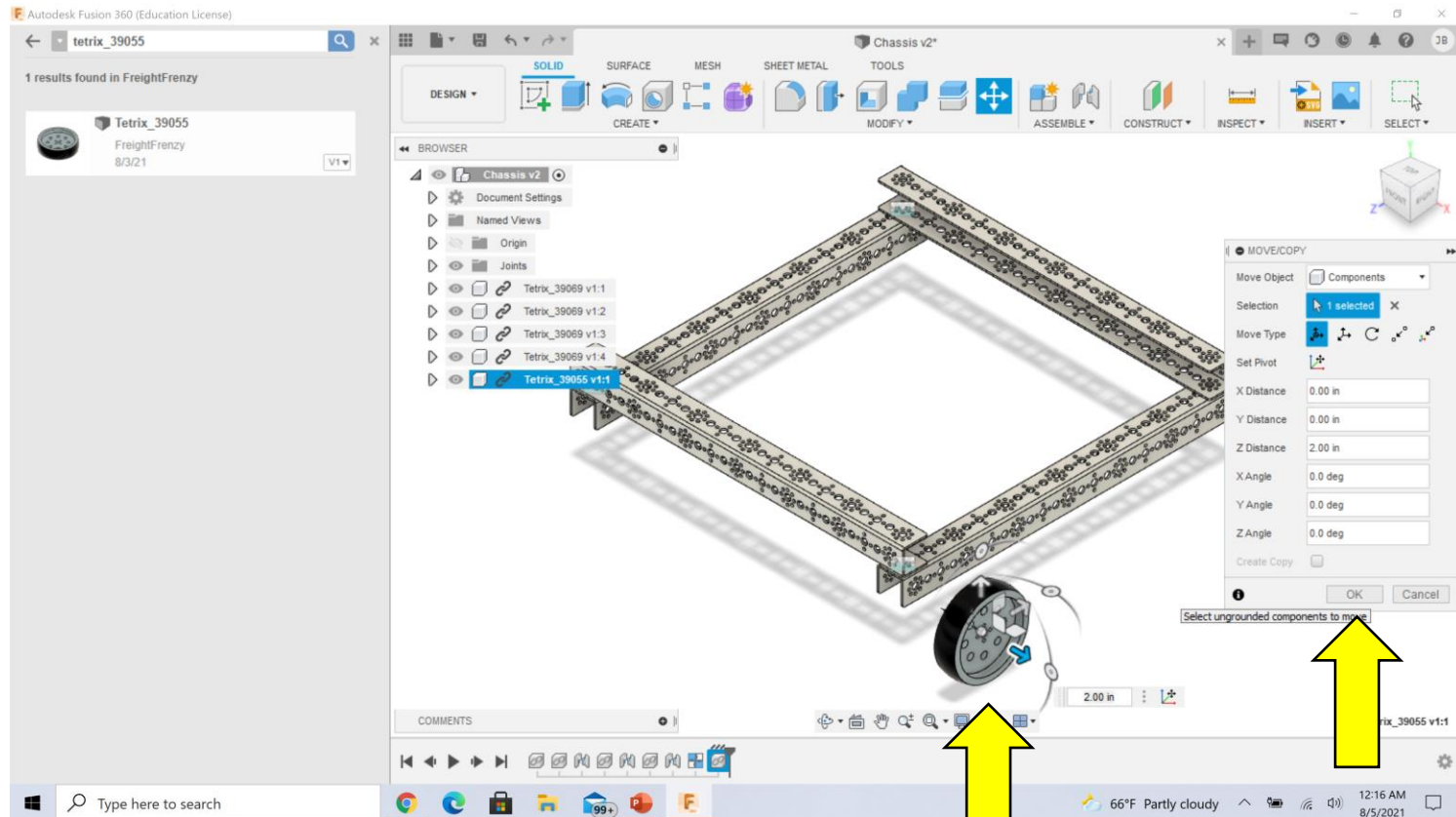




AUTODESK®  
FUSION 360™

## Wheel Assemblies

19 – Using the **Rotation & Translate Handles**, orient the wheel as shown below. Click **OK** when finished.





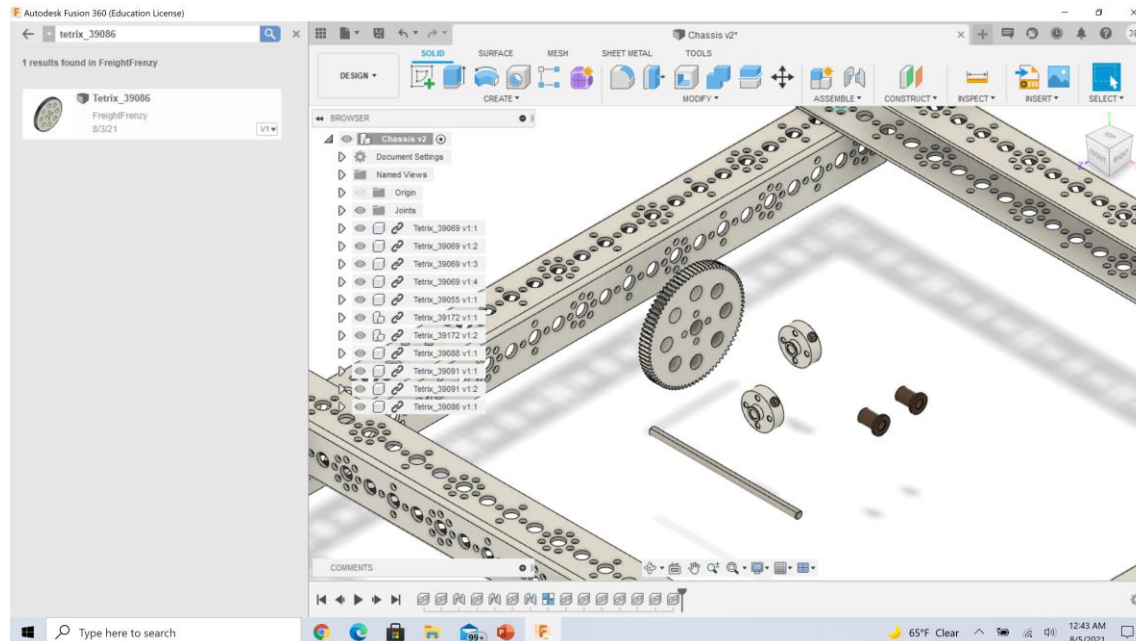


AUTODESK®  
FUSION 360™

## Wheel Assemblies

20 – Using the **Magnifying Glass Icon** on the **Data Panel**, search for the following and drag the needed amount of parts into the workspace.

- (1) Tetrax\_39088, 80mm X 4.7mm Axle
- (2) Tetrax\_39091, 11mm X 4.75mm Bushings
- (1) Tetrax\_39086, 80T Gear
- (2) Tetrax\_39172\_Collar, 4.7mm Locking Collars

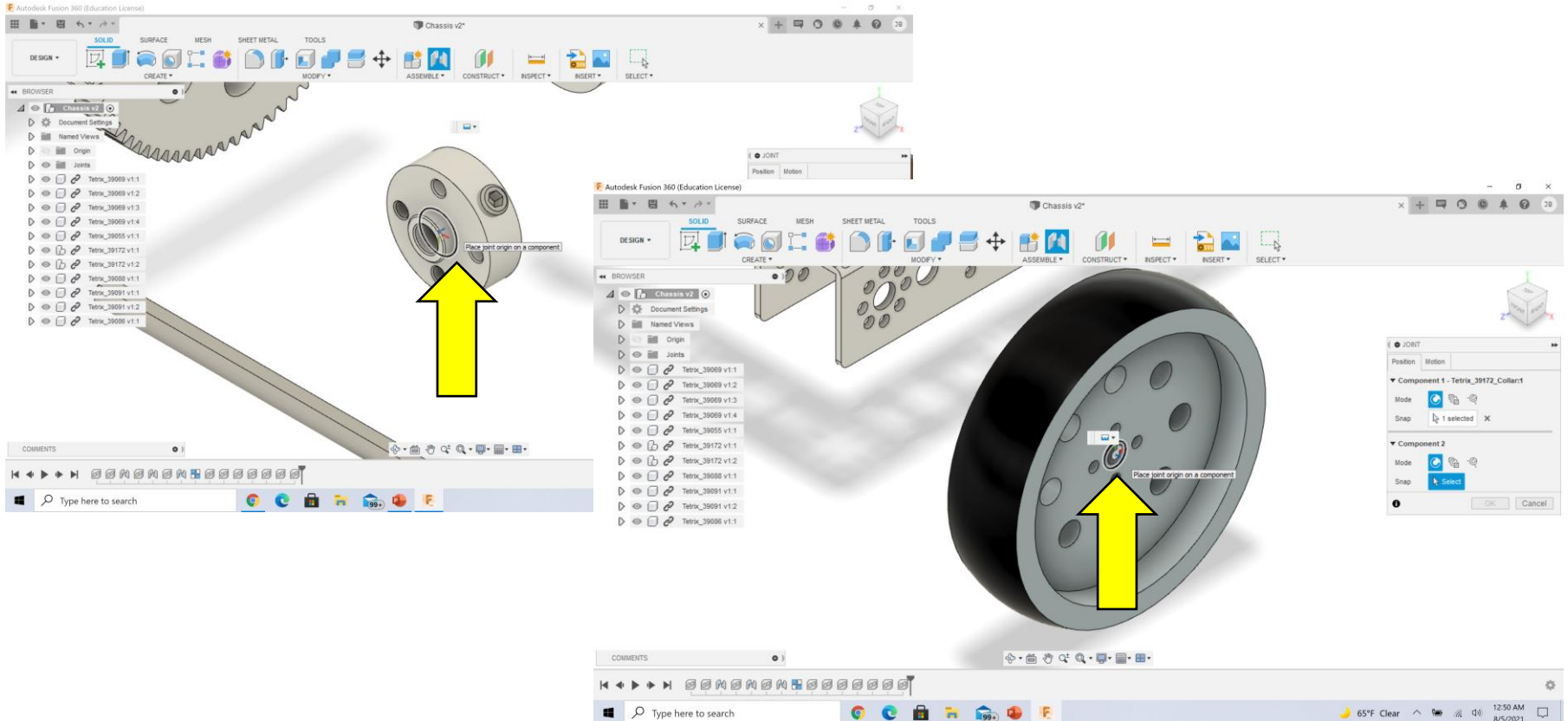




AUTODESK®  
FUSION 360™

## Wheel Locking Collar

21 – Attach a **Locking Collar** to the **Wheel**. Create a **Rigid Joint** between the outside of the **Locking Collar Hub** and the center circle of the **Wheel**.

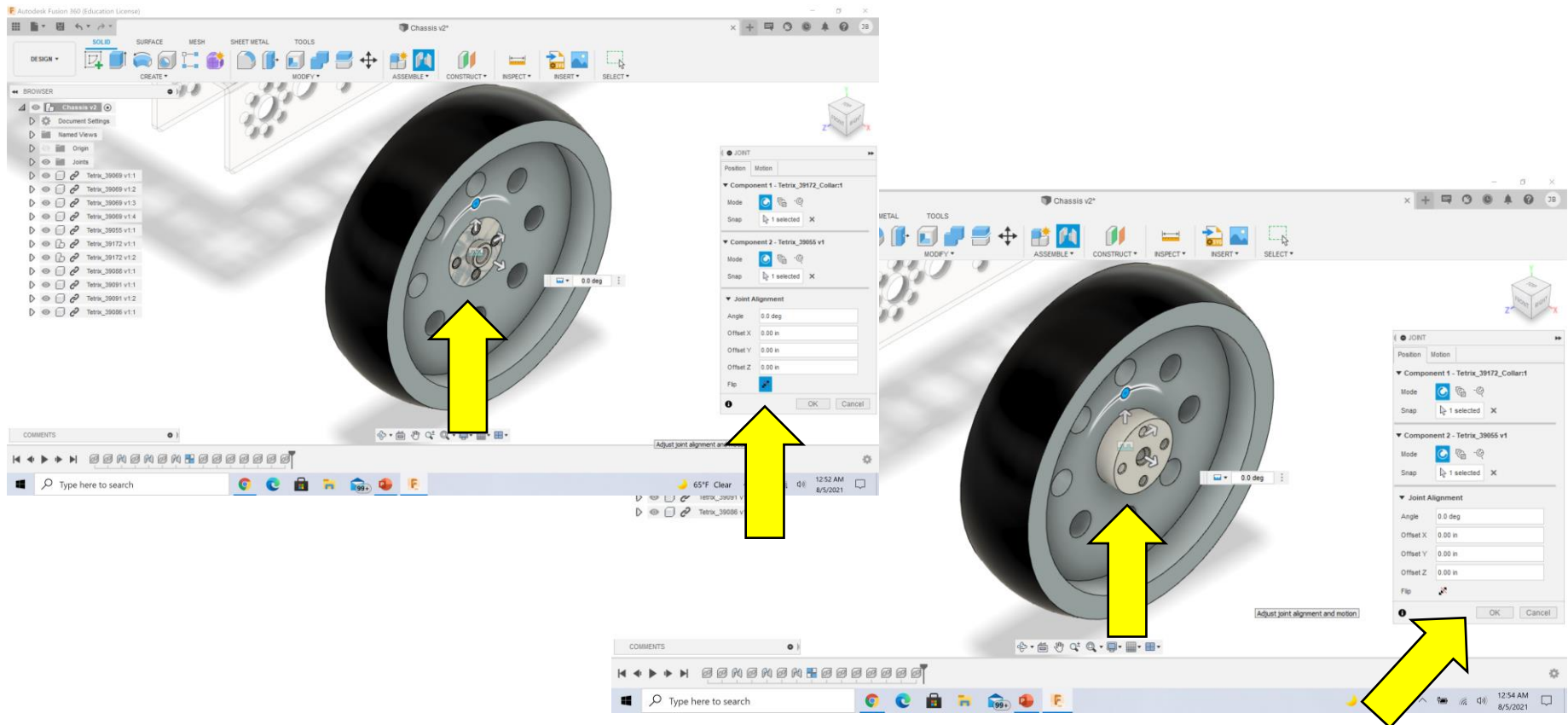




AUTODESK®  
FUSION 360™

## Wheel Locking Collar

22 – The **Locking Collar** will probably be on the wrong side of the **Wheel** surface. Select **Flip** in the **Joint Window** to get the collar in the correct orientation. Click **OK** when finished.

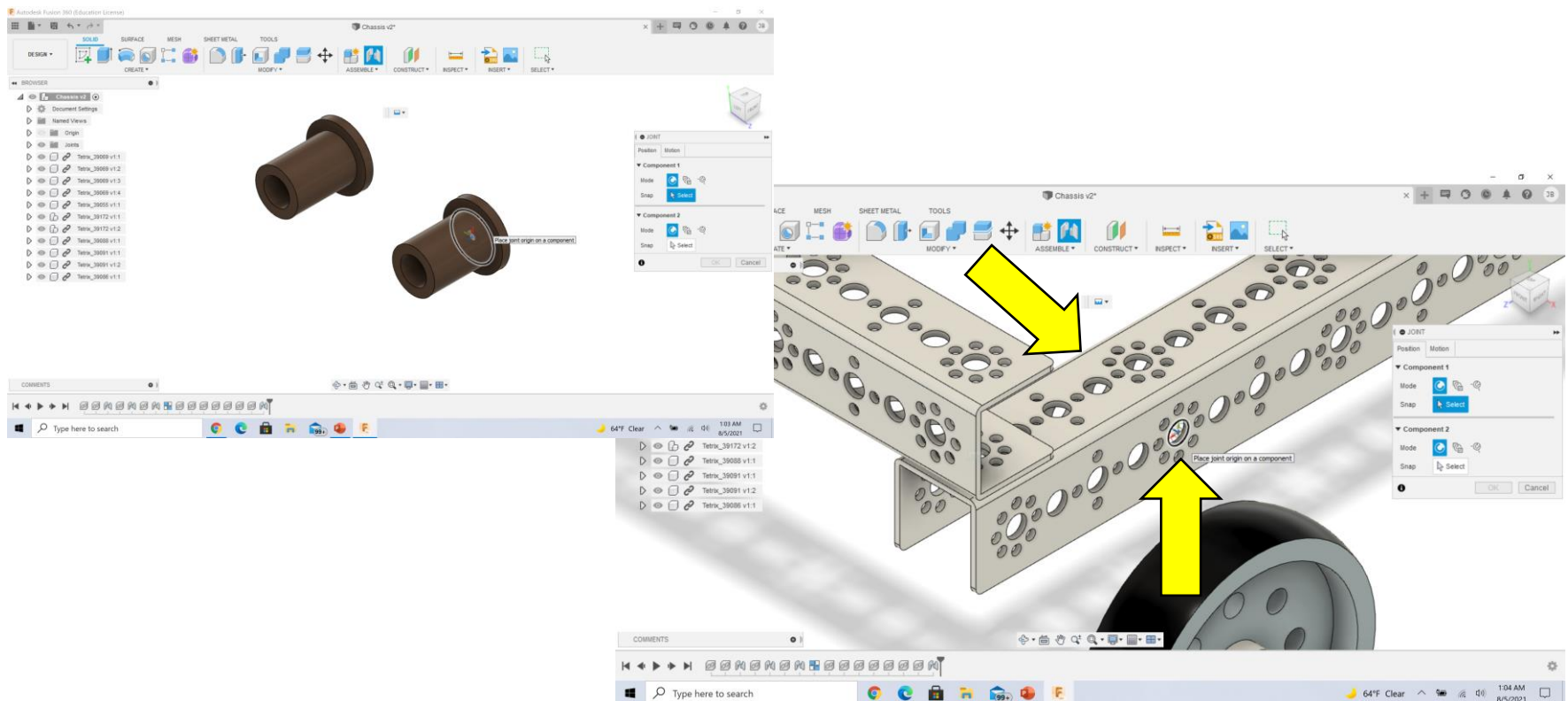




AUTODESK®  
FUSION 360™

## Wheel Axel Bushings

23 – Install the brass **Axle Bushings** into the fifth large hole from the end on both sides of the channel as shown using **Rigid Joints**.

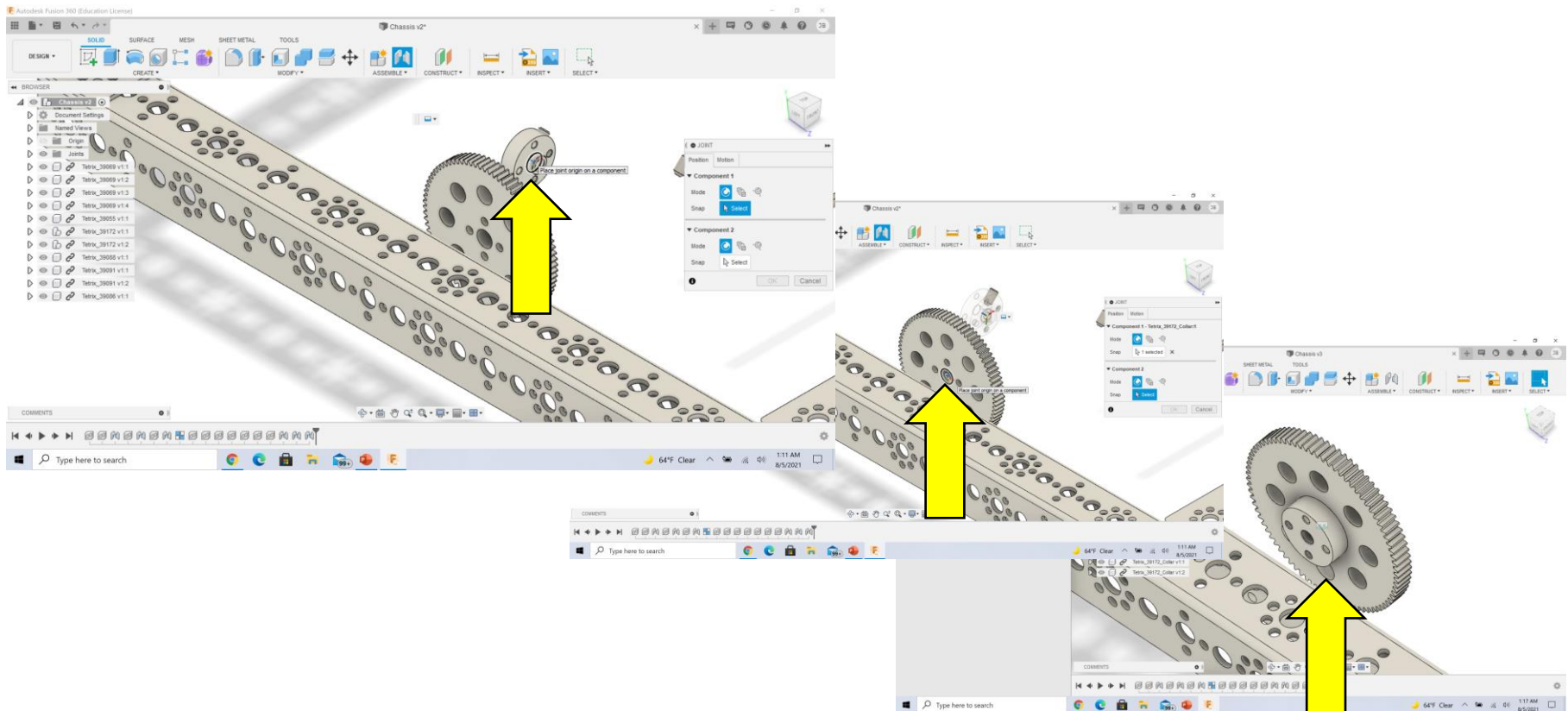




AUTODESK®  
FUSION 360™

## Gear Locking Collar

24 – Install the **Locking Collar** on the **Gear** using a **Rigid Joint** as shown.

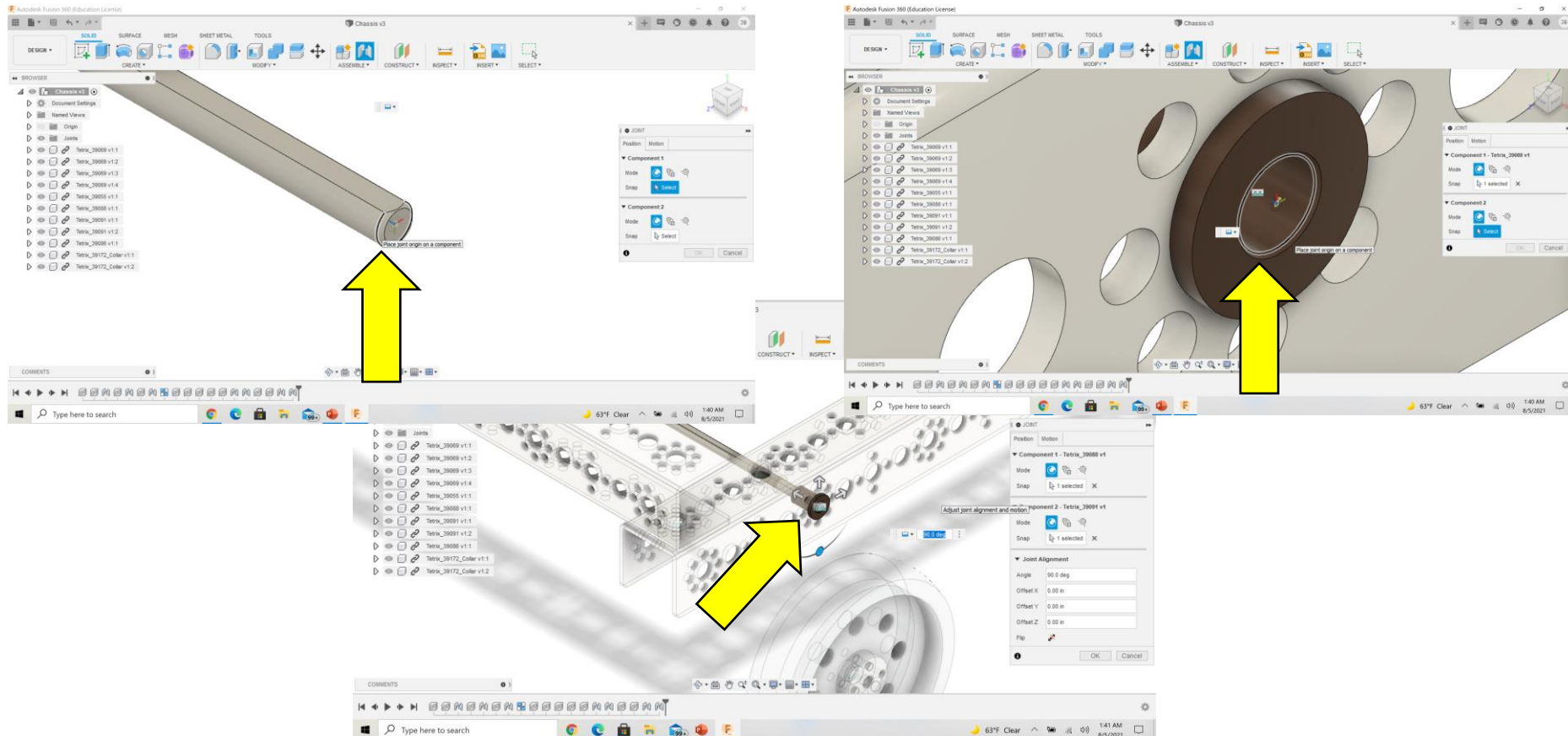




AUTODESK®  
FUSION 360™

## Insert Axle Through Channel

25 – Insert the **Axle** through the **Bushings** using a **Revolute Joint** as shown below. Make sure to select the outside of the **Axle** and the inside of the **Bushing**.



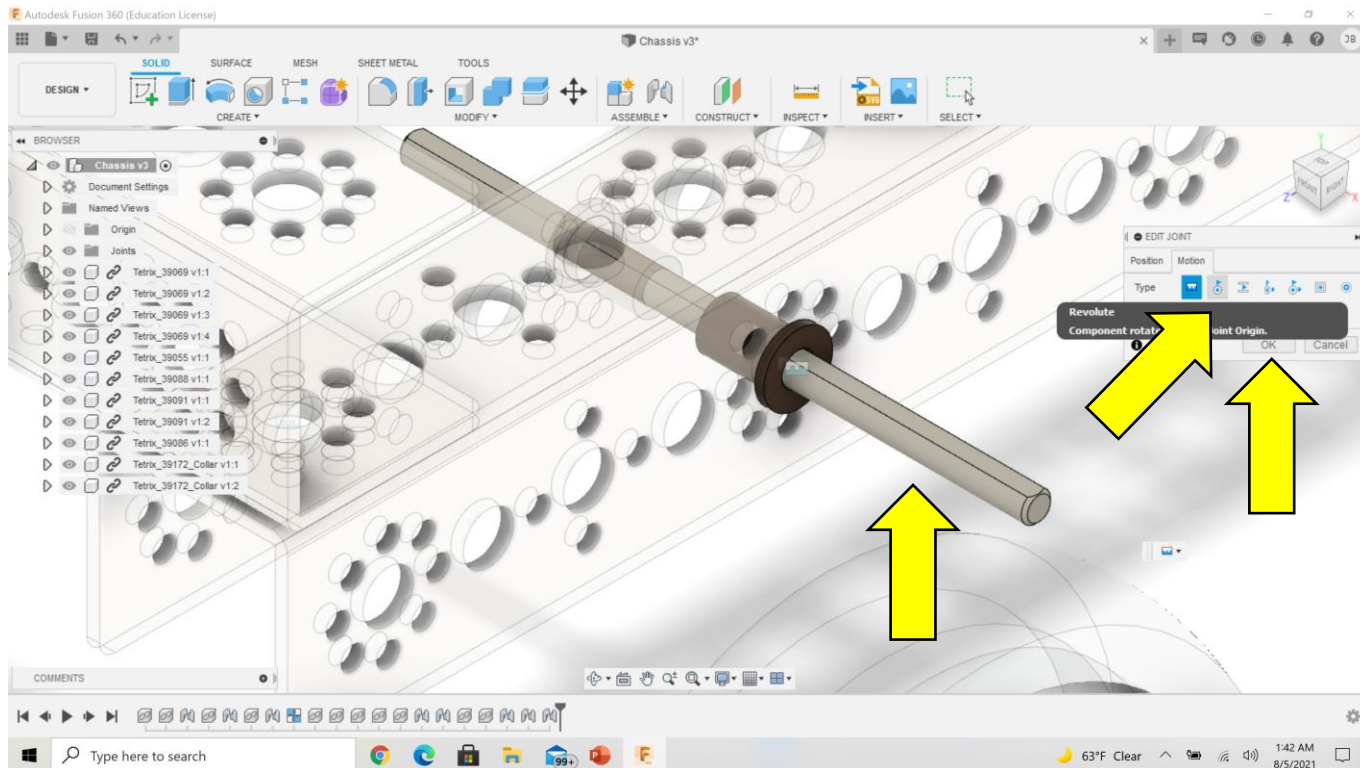


AUTODESK®  
FUSION 360™

## Insert Axle Through Channel

26 – Use the **Translate Handles** to draw the **Axle** out of the **Bushing** (-1.50).

27 – Change the **Joint Type** from **Rigid** to **Revolute** by selecting the **Motion Tab** in the **Joint Window**. You should see the **Axle Animate** and spin inside the **Bushing**. Click **OK** when finished.

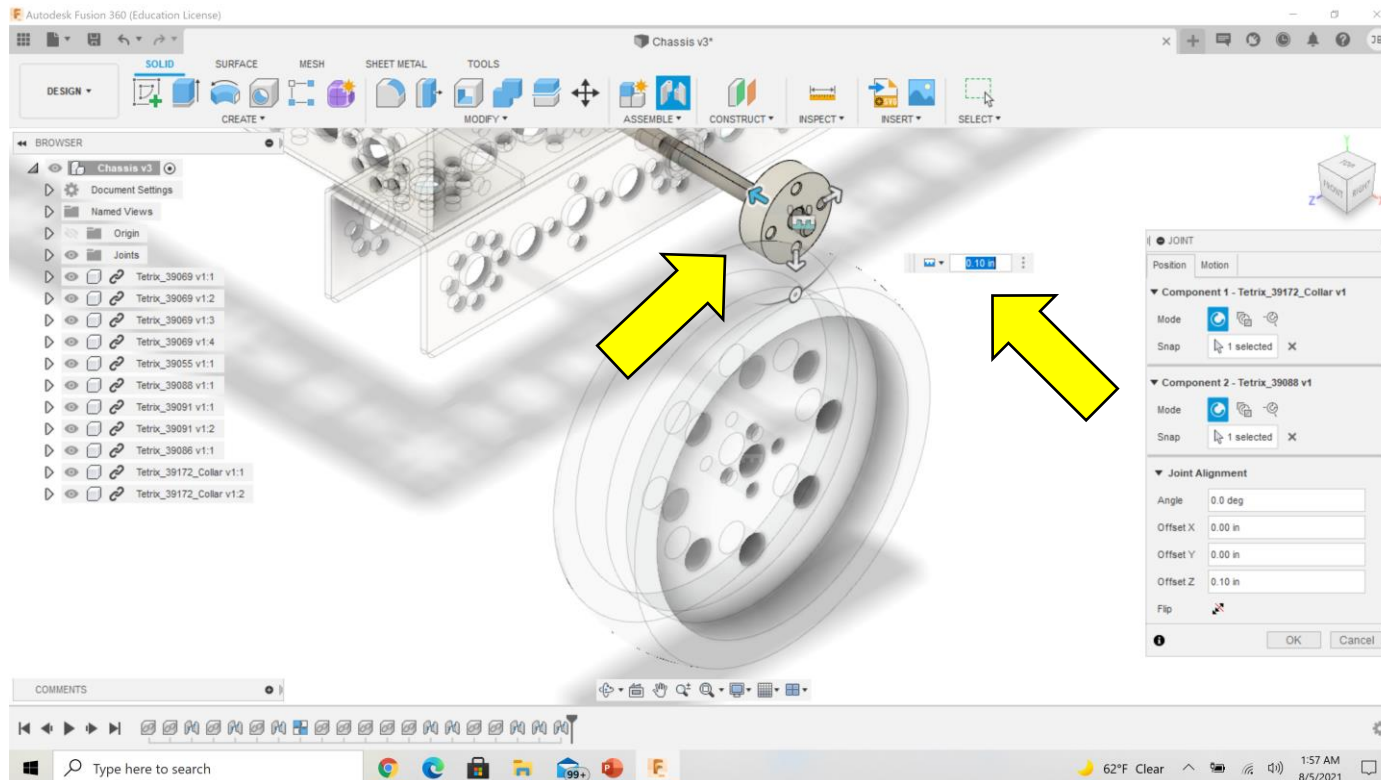




AUTODESK®  
FUSION 360™

## Wheel & Axle

25 – Attach the **Wheel** to the **Axle** using a **Rigid Joint**. Start by selecting the inside of the **Wheel Collar** and the outside of the **Axle**. You will see that only the **Collar** moves, this is normal. Use the **Translate Handles** to move the **Collar** onto the **Axle .25 in.**



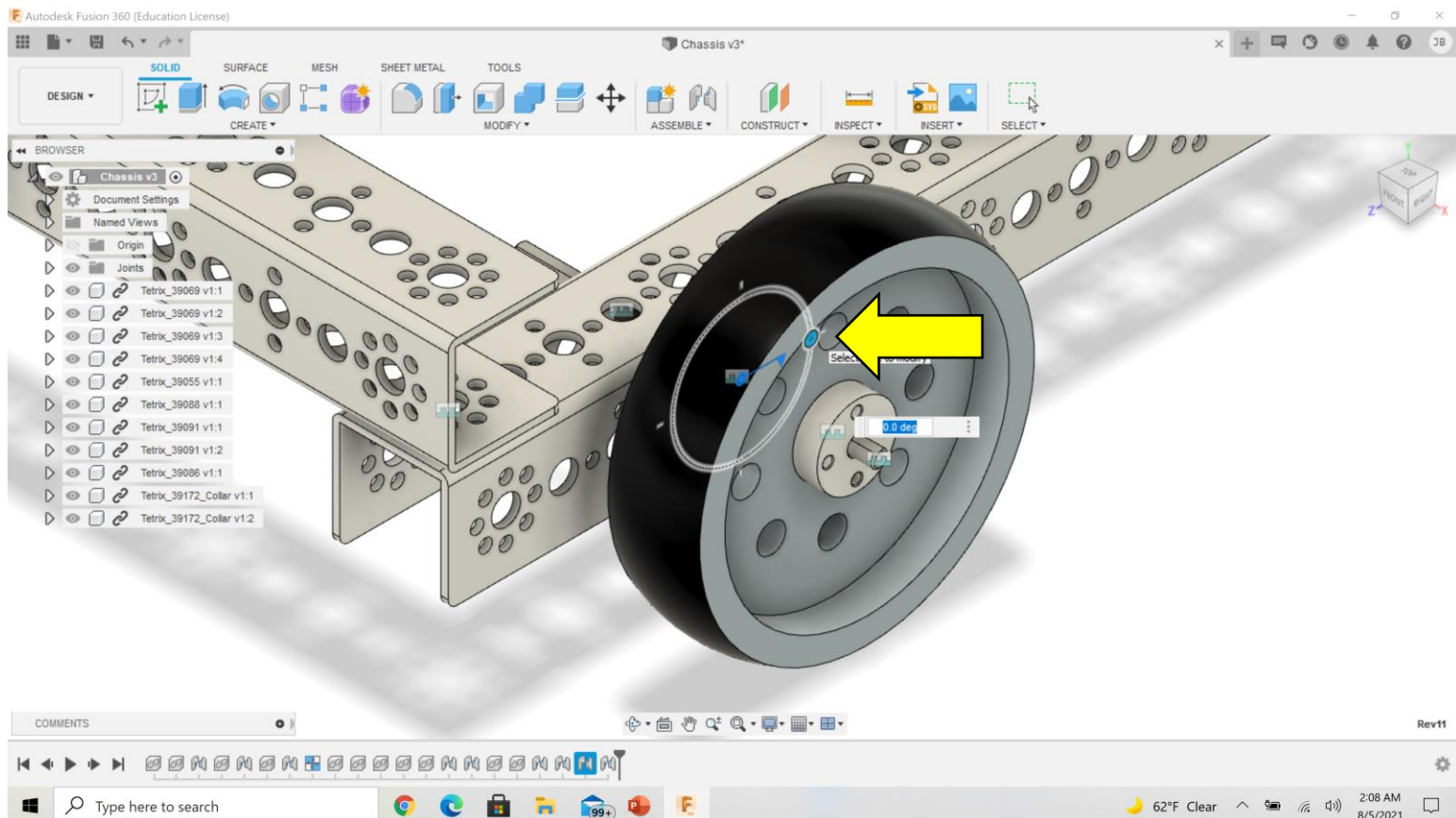




AUTODESK®  
FUSION 360™

## Wheel & Axle

26 – Click **OK** and the **Wheel** will move onto the **Axle**. Double click on the **Revolute Joint** and use the **Handle** to test the **Wheel** rotation. Press **Esc Key** to finish testing the **Wheel**.



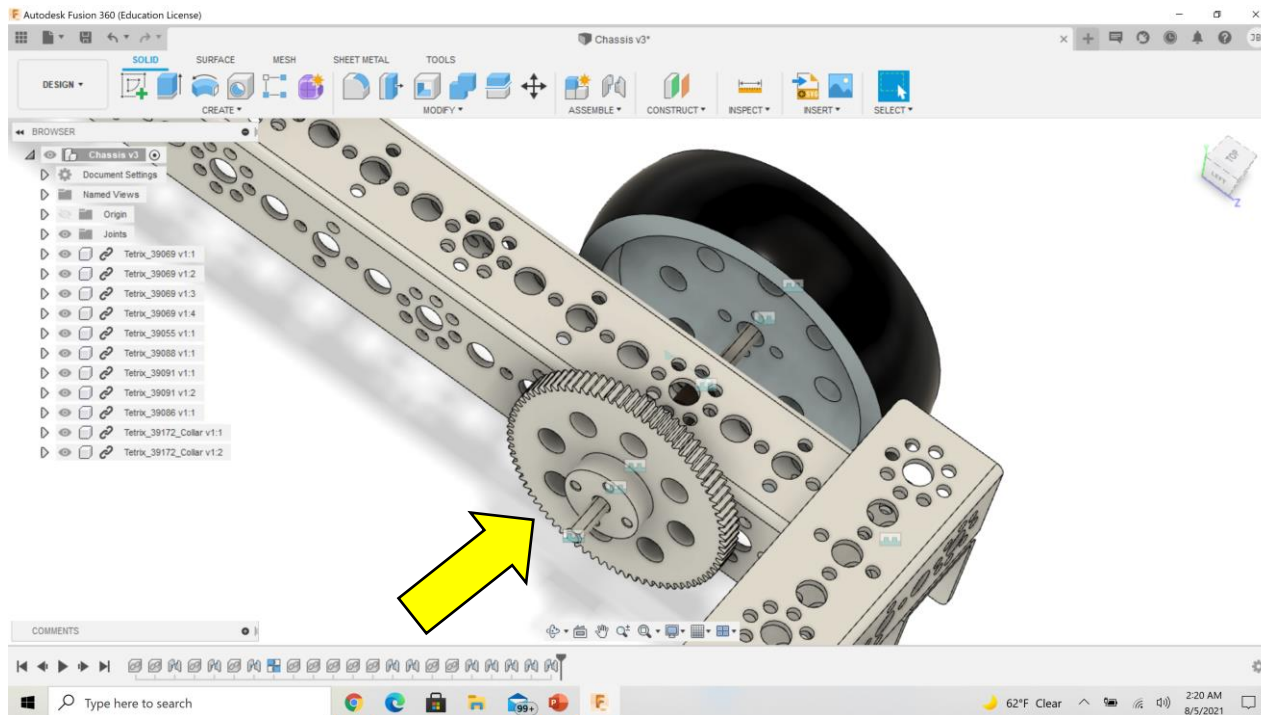


AUTODESK®  
FUSION 360™

## Gear & Axle

27 – Create a **Rigid Joint** between the **Gear Locking Collar** and the **Axle** by selecting the inside of the **Collar** and outside of the **Axle**. Use the **Translate Handles** to move the **Collar** onto the **Axle .50”**.

**Note** – In your physical assembly you will need **Nylon Bushings** to fill the space between the **Wheel/Gear** and the **Bushing**.

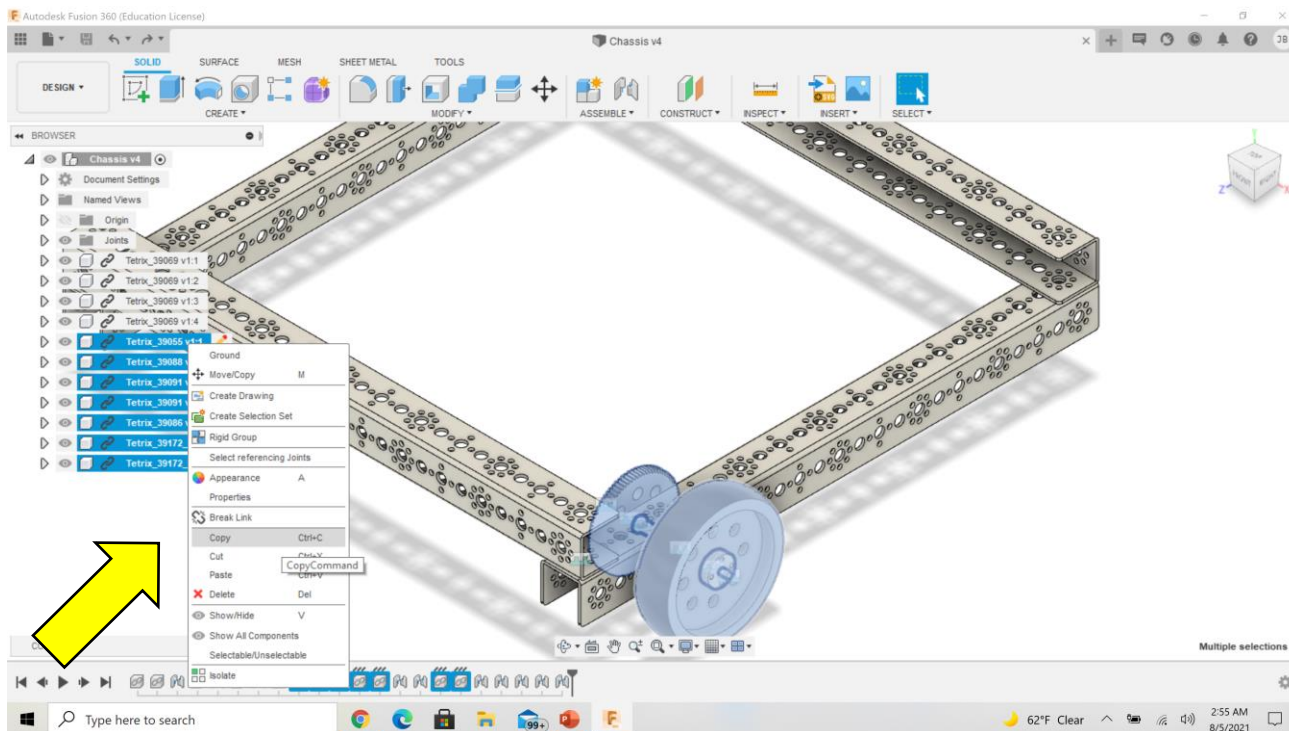




AUTODESK®  
FUSION 360™

## Duplicate Wheel Assembly

- 28 – Select the seven components that make the **Wheel Assembly**. Start by clicking on the top component in the **Browser**, hold the **Shift** key and select the last component.
- 29 – Right click and choose **Copy** from the menu (**Ctrl+C**).



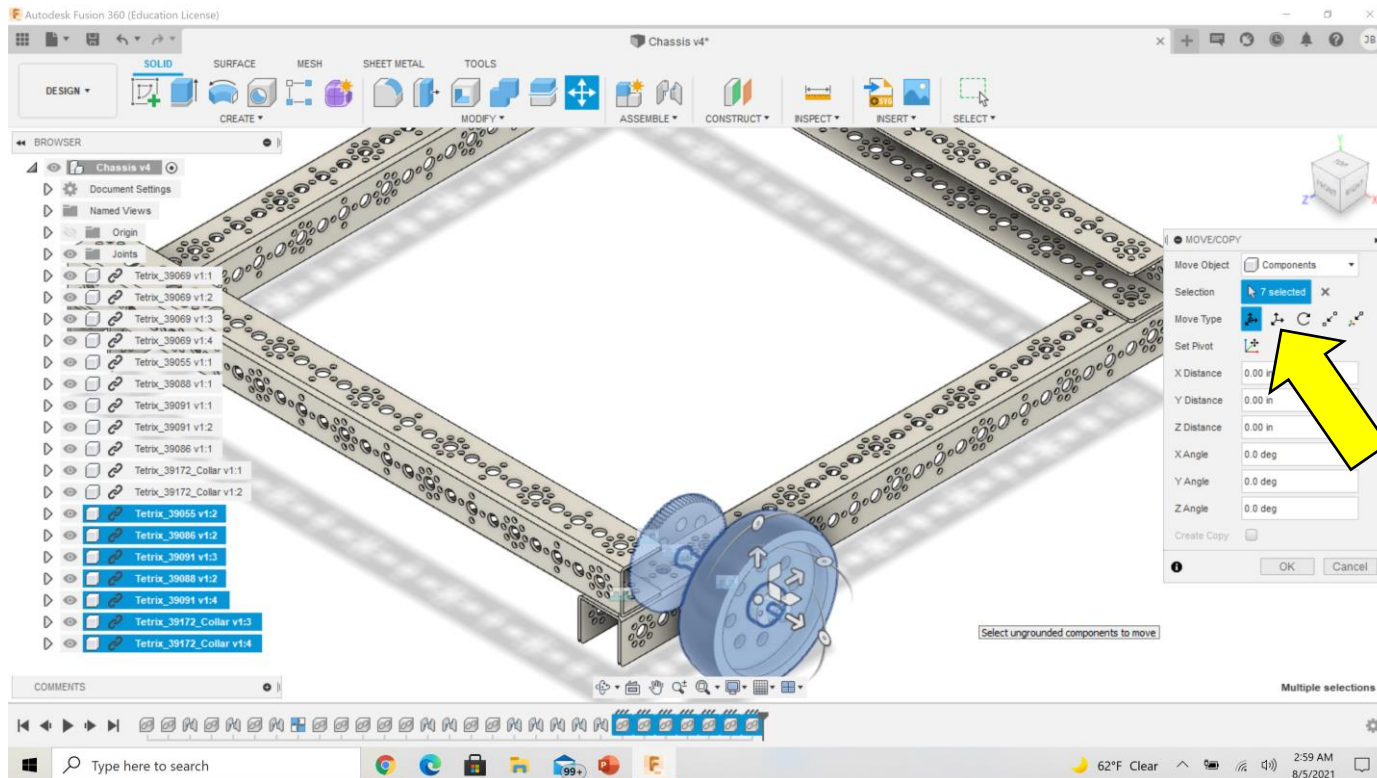


AUTODESK®  
FUSION 360™

## Duplicate Wheel Assembly

30 – Right click again and select **Paste** from the menu (**Ctrl+V**).

31 – Choose **Point to Point** in the **Move/Copy Window**.

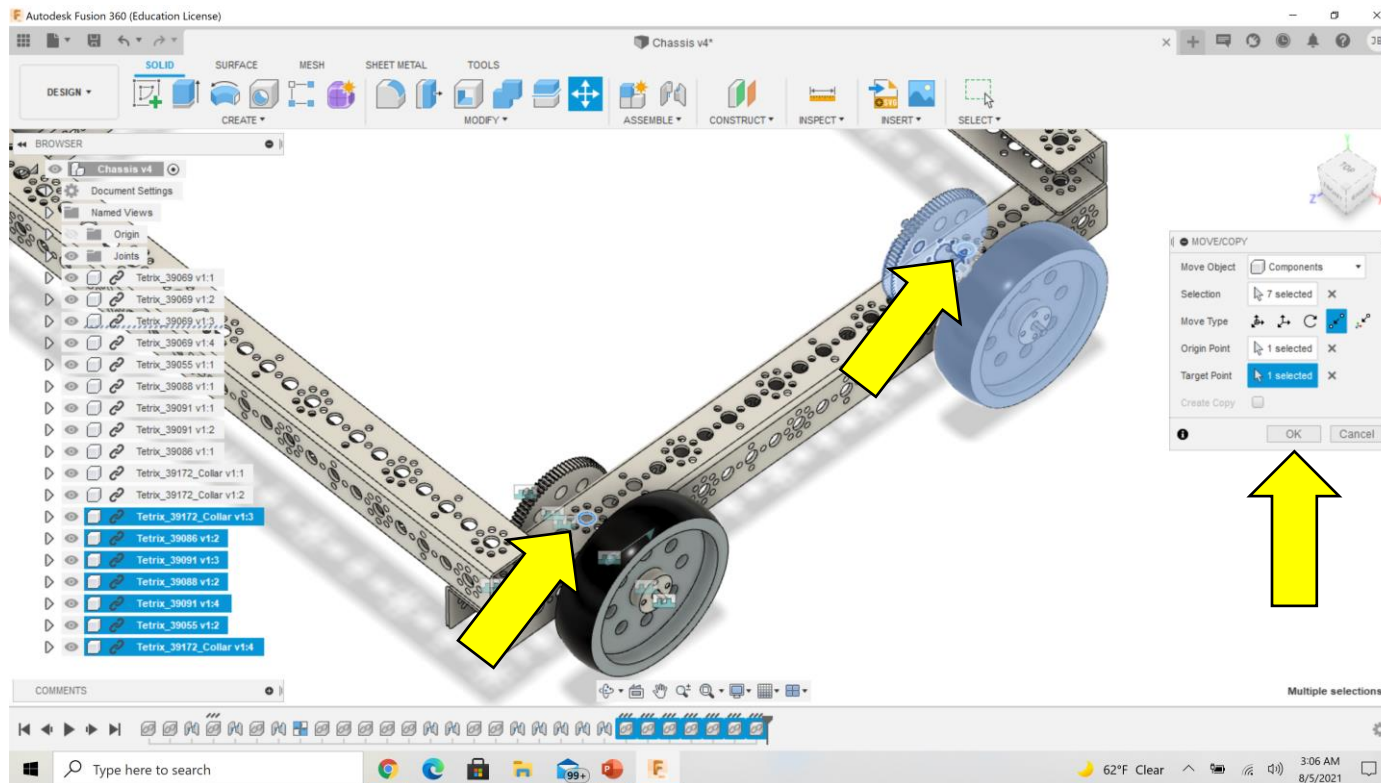




AUTODESK®  
FUSION 360™

## Duplicate Wheel Assembly

32 – Select the **Origin** and **Target Points**. Start by selecting the fifth large hole on the top surface of the channel to set the **Origin Point**. Now select the fifth hole on the opposite end to set the **Target Point**. Click **OK** when finished.

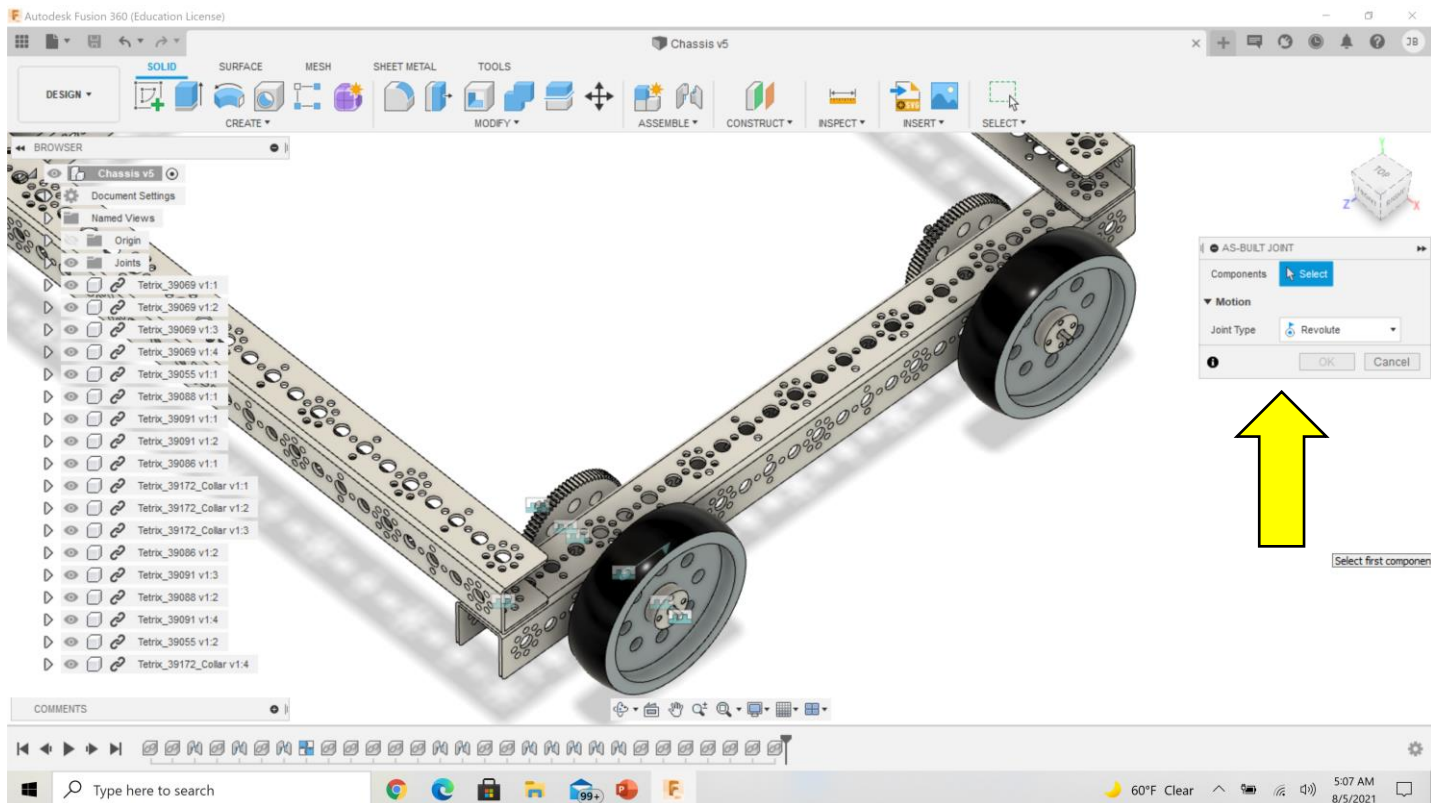




AUTODESK®  
FUSION 360™

## As-Built Joints

33 – The **Joints** were lost in the copy and need to be restored but we don't want any of the components to move from their current positions. To do this we need to use **As-Built Joints**. Select **As-Built Joint** from the **Assemble Menu (Shift + J)**.

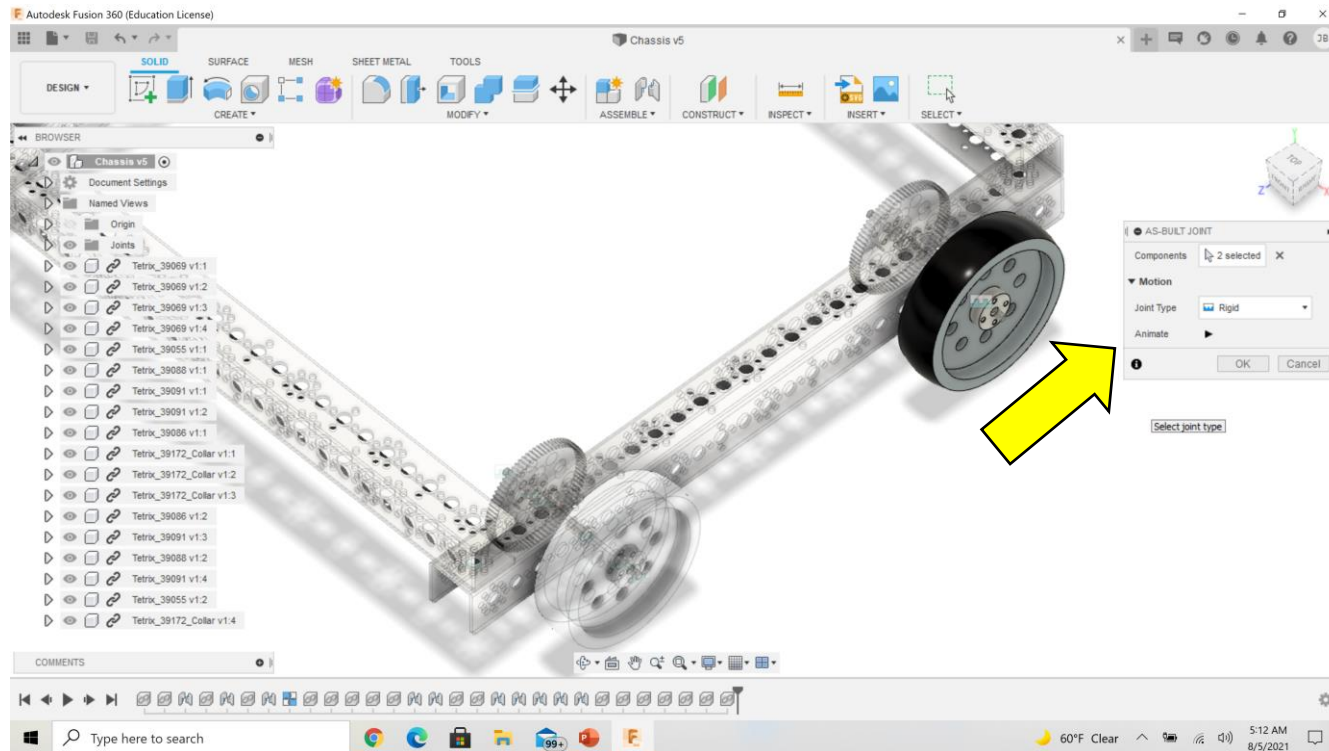




AUTODESK®  
FUSION 360™

## As-Built Joints

34 – Create **Rigid Joints** between the **Collar** and **Wheel**, **Wheel Collar** and **Axle**, **Collar** and **Gear**, **Gear Collar** and **Axle**, and both **Bushings** and the **Frame**. If **Joint Type** is not already set to **Rigid** then do so. Choose each component and use the **Animate Tool** to verify the correct **Joint** was created.

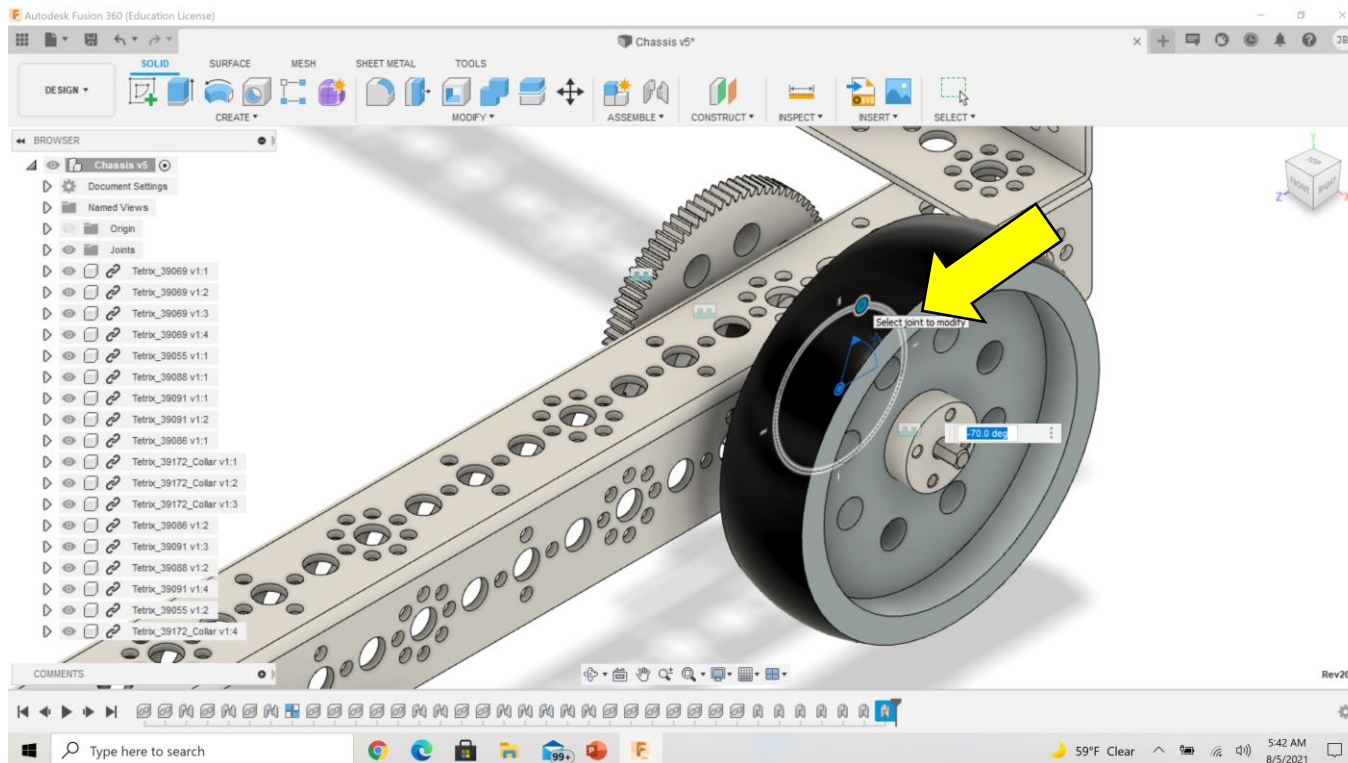




AUTODESK®  
FUSION 360™

## As-Built Joints

35 – Create a **Revolute As-Built Joint** between the **Axle** and **Bushing**. Change the **Joint Type** to **Revolute** and choose the **Axle** first followed by the **Bushing**. Set the **Snap** to the outside **Bushing** opening. Double click on the **Revolute Joint** and use the **Rotation Handle** to verify the correct **Joint** was created.



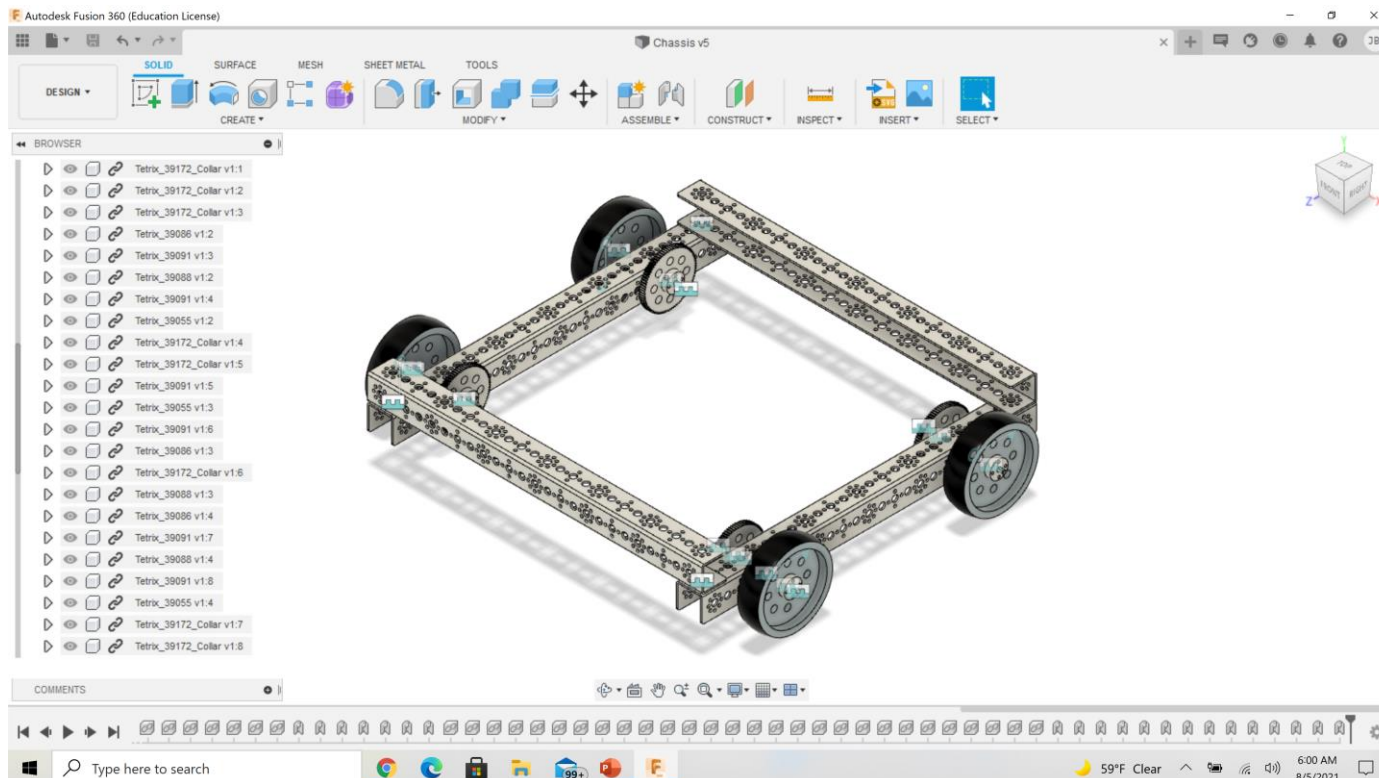




AUTODESK®  
FUSION 360™

## Add Wheels

36 – Using previous concepts, add the remaining two wheels and their appropriate Joints.

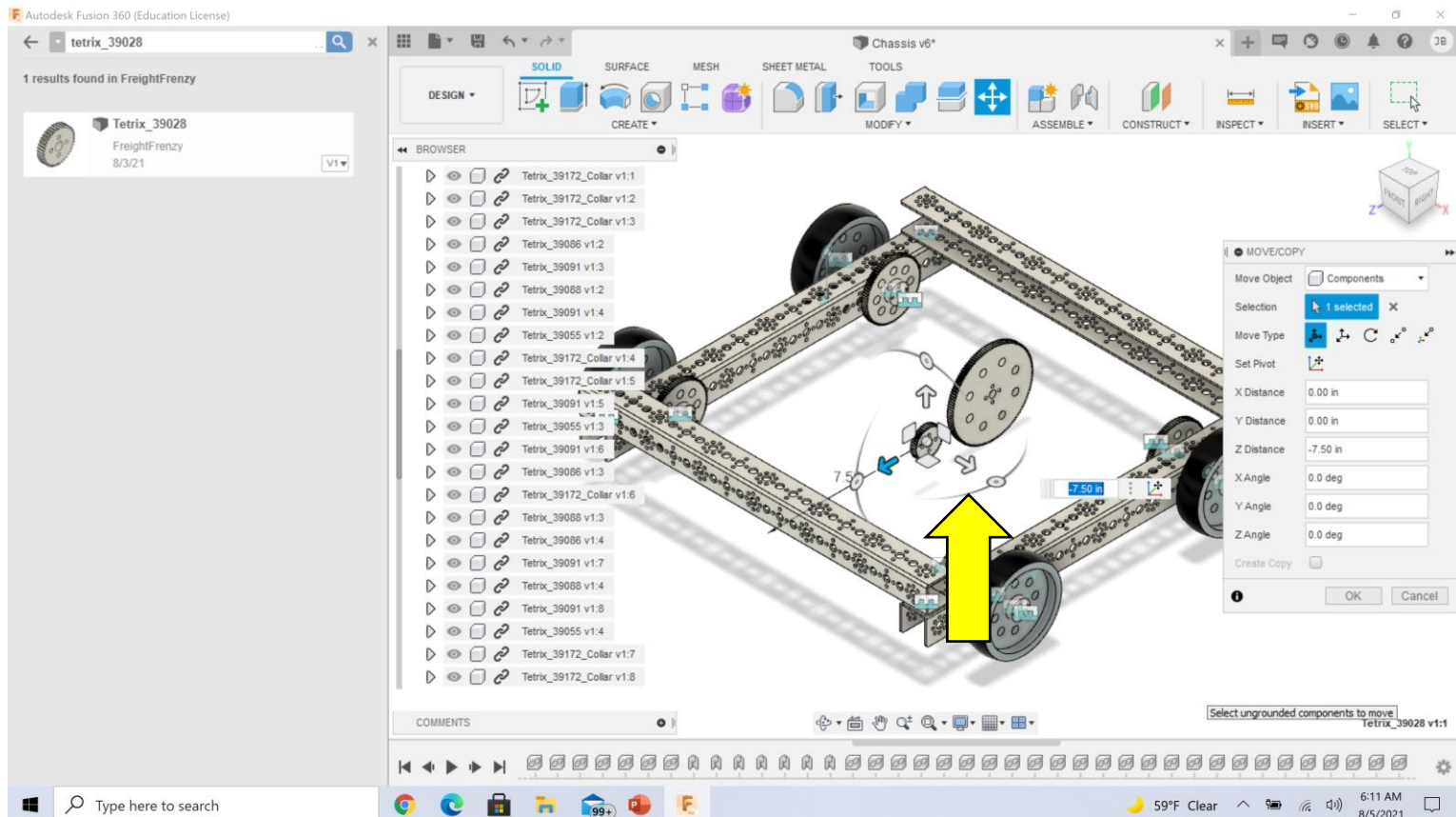




AUTODESK®  
FUSION 360™

## Gear Ratios

37 –Using the **Magnifying Glass Icon** on the **Data Panel**, search for **”Tetrix\_39028”** and **”Tetrix\_39085”**. Left click and drag one of each **Gear** into the workspace.

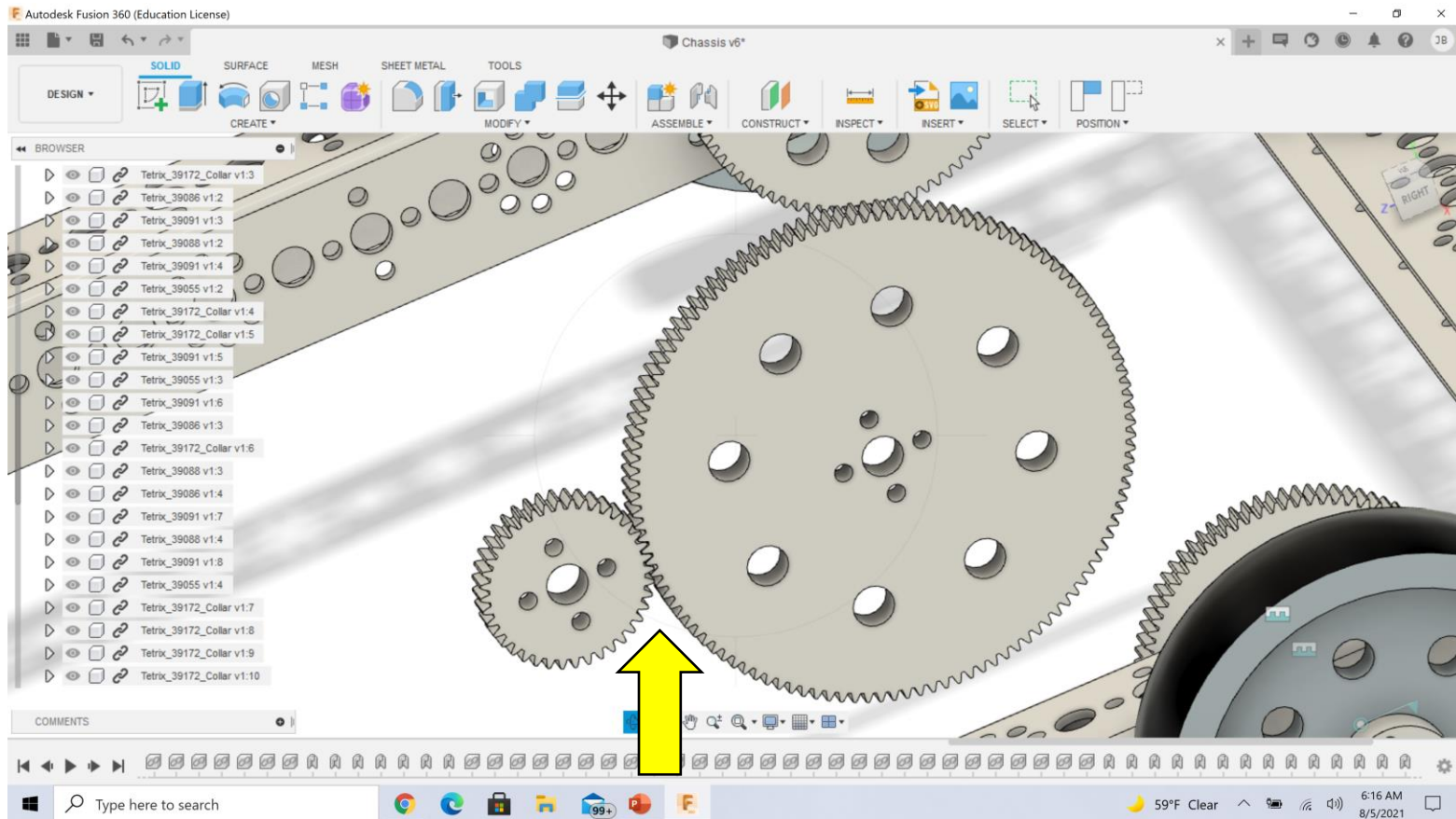




AUTODESK®  
FUSION 360™

## Gear Ratio

38 – Use the **Move/Copy Tool** to align the two **Gears** as shown below.

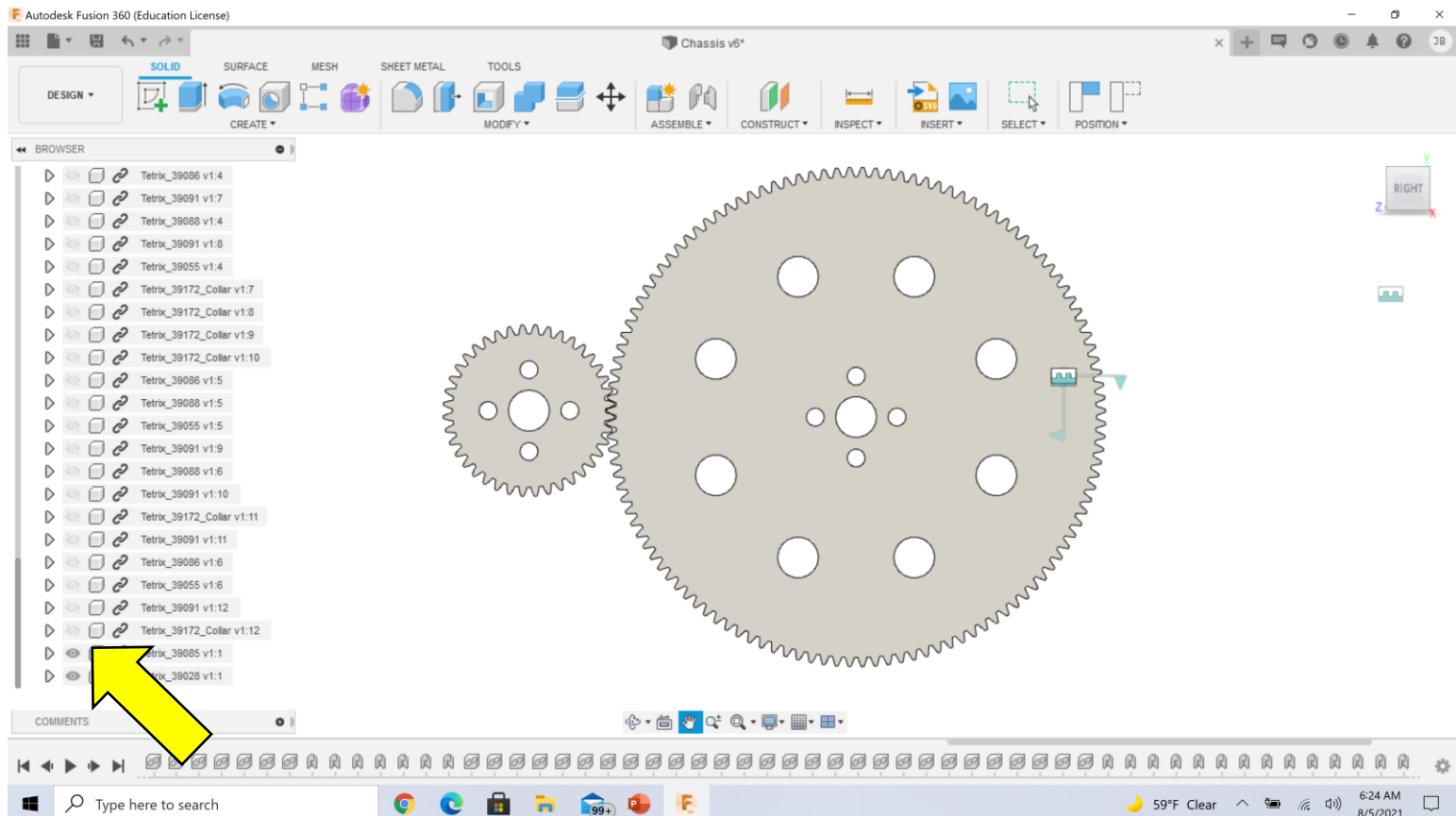




AUTODESK®  
FUSION 360™

## Gear Ratio

39 – Hide the **Chassis** by clicking the **Hide Tool** (eyes) to the left of the component description. Leave the two **Gears** visible.

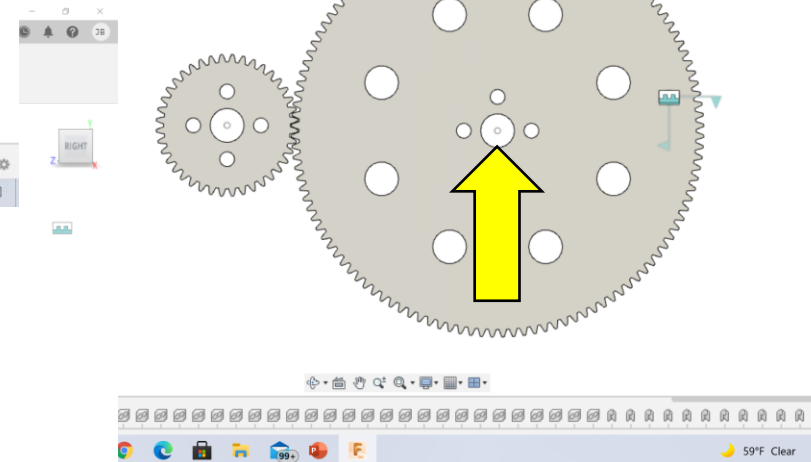
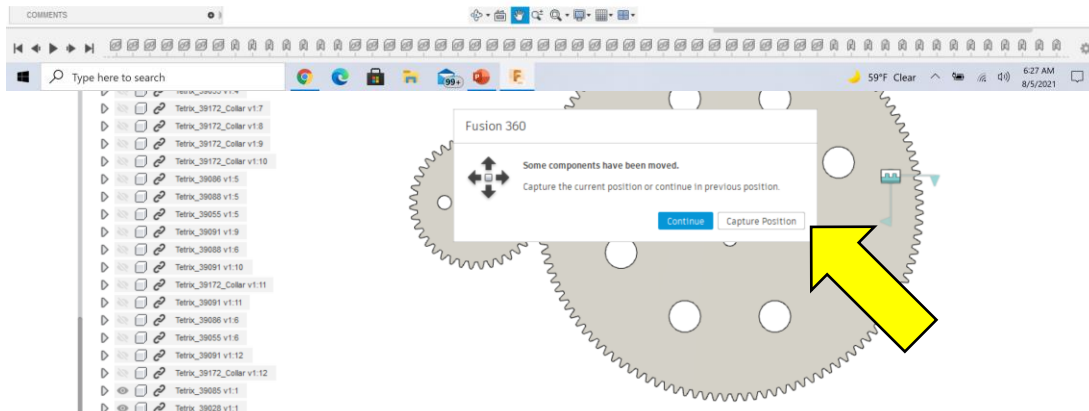
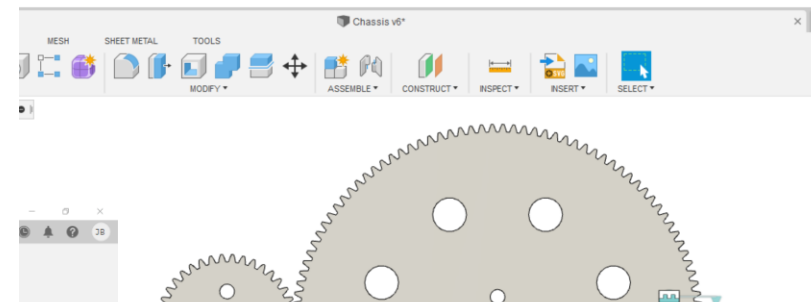
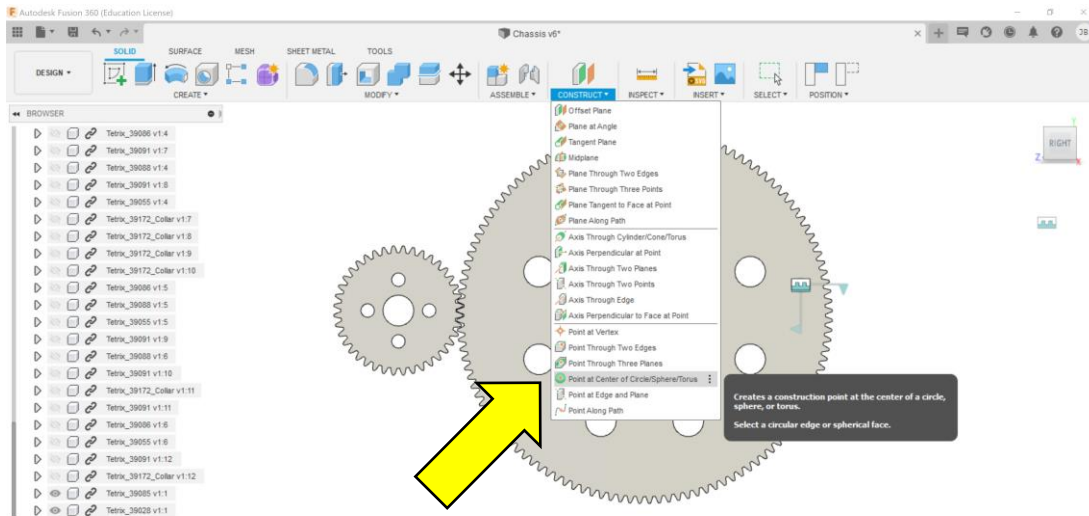




AUTODESK®  
FUSION 360™

## Gear Ratio

40 – Create **Points** at the center of each **Gear** using the **Point at Center of Circle/Sphere/Torus Tool** under the **Construct** Menu. Select the tool and then each circle at the center of the **Gears**.

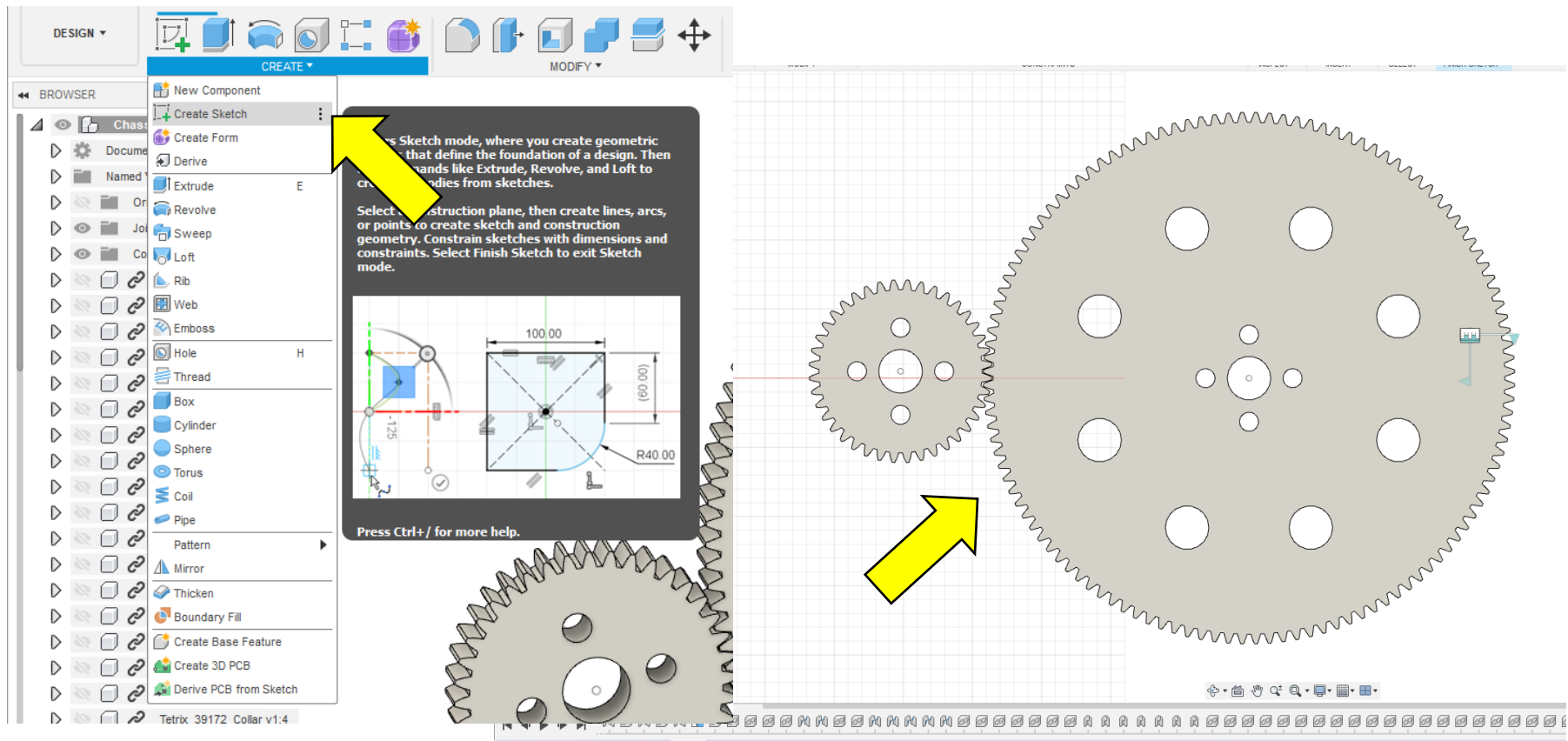




AUTODESK®  
FUSION 360™

## Gear Ratio

41 – Create **Stub Shafts** at the center of each **Gear**. To do this we need to create a **Sketch**. Select **Create Sketch** under the **Create Menu**. Choose the **Surface** you will be drawing on, in this case the face of the small **Gear**, and the **Gears** should move into position.

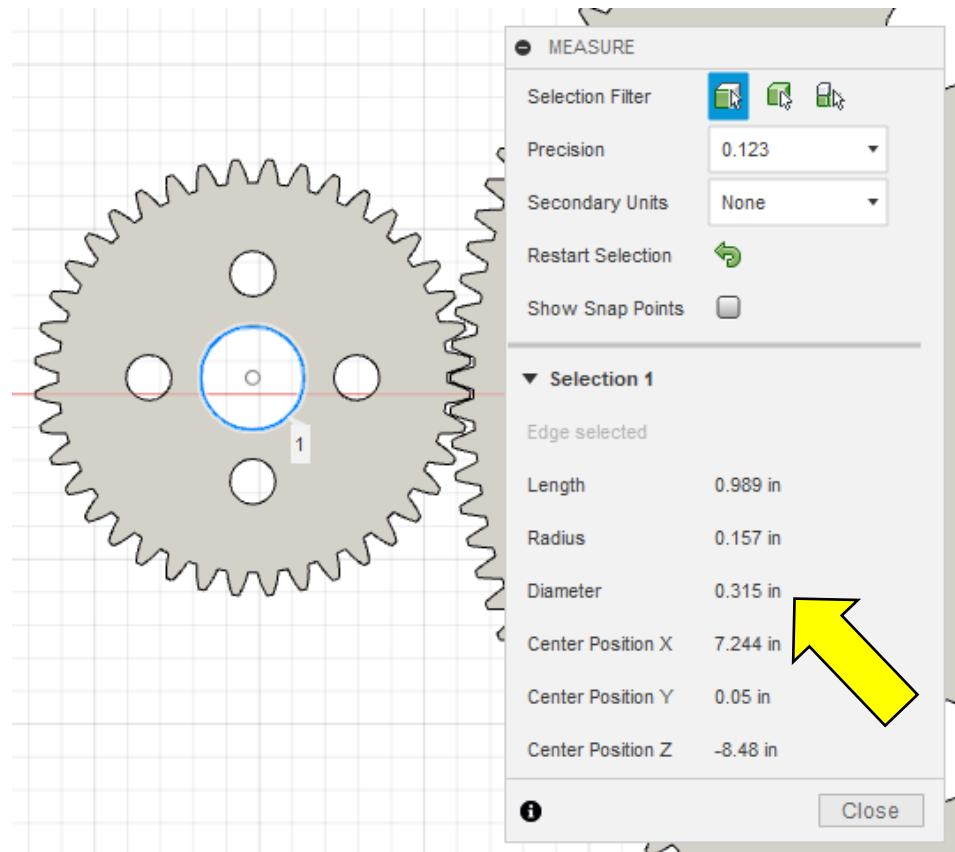




AUTODESK®  
FUSION 360™

## Gear Ratio

42 – Determine the diameter of the hole by using the **Measure Tool** in the **Inspect Menu**. Select the **Measure Tool** and choose the hole in the small **Gear**. The **Diameter** will be shown in the **Measure Window**. Make note of the measurement and **Close** the window.

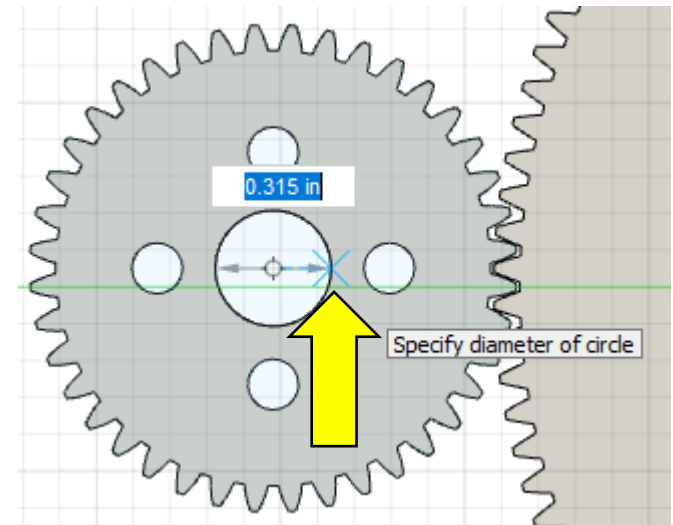
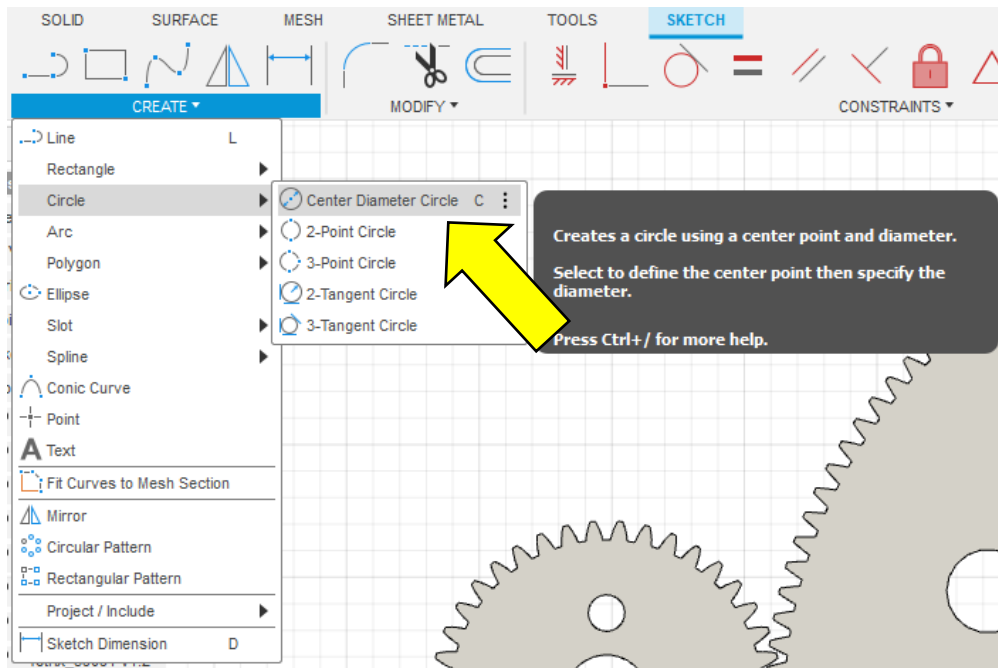




AUTODESK®  
FUSION 360™

## Gear Ratio

43 – Using the diameter from step 42, create **Circles** on your **Sketch** at the center of the **Gears**. To do this select the **Circle Tool** in the **Create Menu**. Choose **Center Diameter Circle**. Select the center of the **Circle** and cursor over to the edge. The **Diameter** should appear or you can type in your measurement.







AUTODESK®  
FUSION 360™

## Gear Ratio

44 – Finish your sketch by choosing **Finish Sketch** in the **Finish Sketch Menu**. Now we can extrude the **Stub Shaft** using the **Press/Pull Tool** in the **Modify Menu**. Select the tool and the circle we sketched. Change **Direction** to **Two Sides** and set the **Distance** for **Side 1** to **.50"** and **Side 2** to **.75"**. Click **OK**.

The image shows a sequence of steps in the Autodesk Fusion 360 software interface:

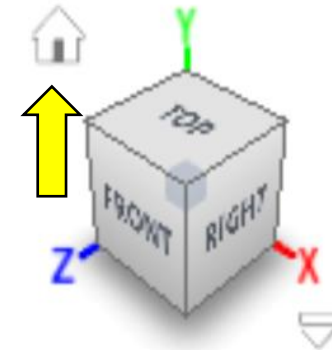
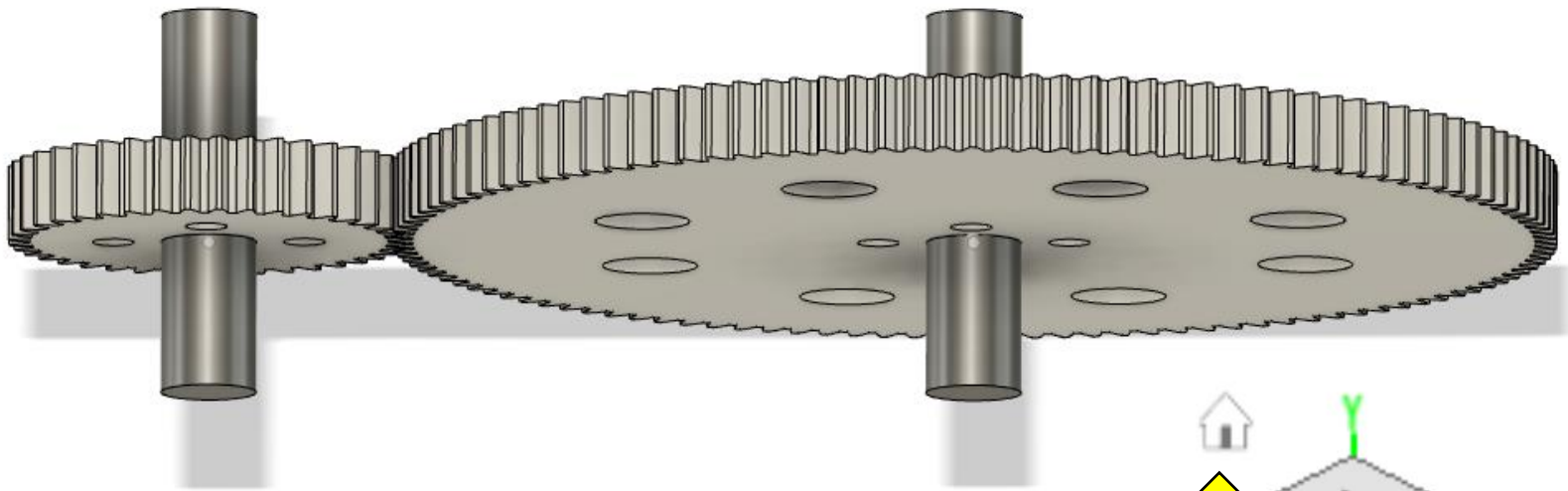
- Top Ribbon:** The 'FINISH SKETCH' button is highlighted with a green checkmark. A yellow arrow points to it.
- Modify Ribbon:** The 'PRESS PULL' tool is selected. A yellow arrow points to it.
- Extrude Dialog:** The 'EXTRUDE' dialog box is open. The 'Direction' is set to 'One Side' (indicated by a yellow arrow), and the 'Distance' is set to '0.00 in'. A yellow arrow points to the 'Distance' field.
- 3D Model:** A gear-like part is shown with a blue circular sketch on its face. A yellow arrow points to this sketch.



AUTODESK®  
FUSION 360™

## Gear Ratio

45 – Rotate the **Gears** to view the **Stub Shaft**. Repeat the process for the **Large Gear**. Use the **Home Icon** in the **View Cube** to reset the workspace.

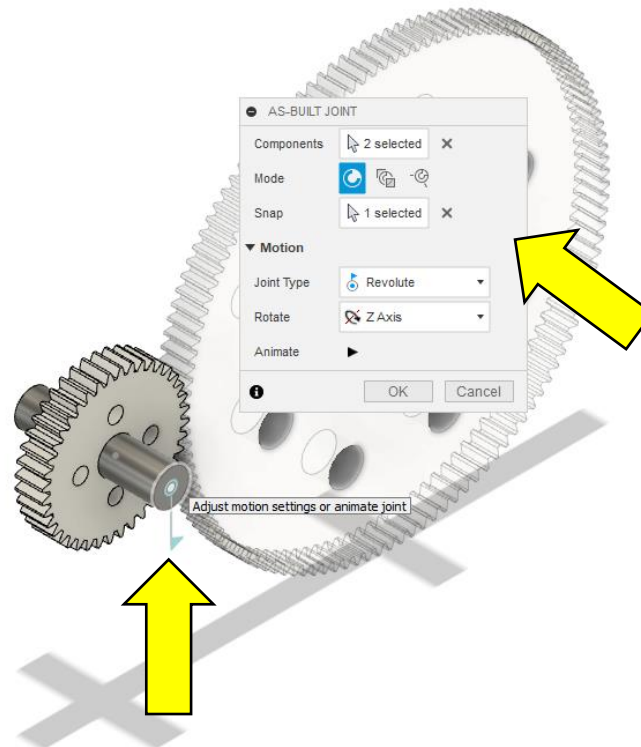




AUTODESK®  
FUSION 360™

## Gear Ratio

46 – Create **Revolute As-Built Joints** between the **Gears** and the **Stub Shafts**. Choose the **As-Built Joint Tool** in the **Assemble Menu** and select the **Small Gear** first followed by its **Stub Shaft**. Change the **Joint Type** to **Revolute** and set the **Snap** to the center of the **Stub Shaft**. Repeat the process for the **Large Gear**.

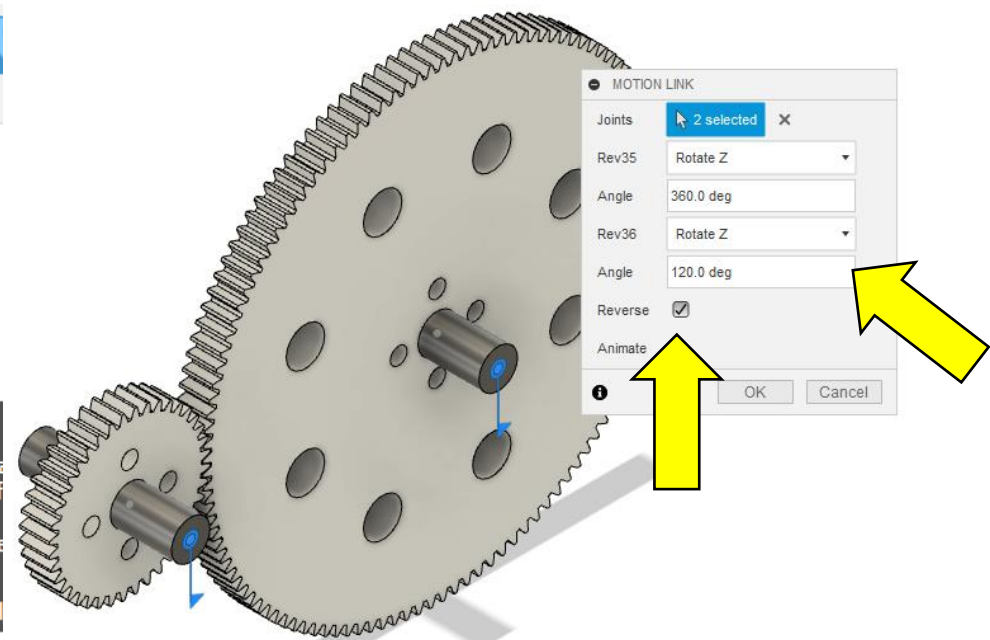
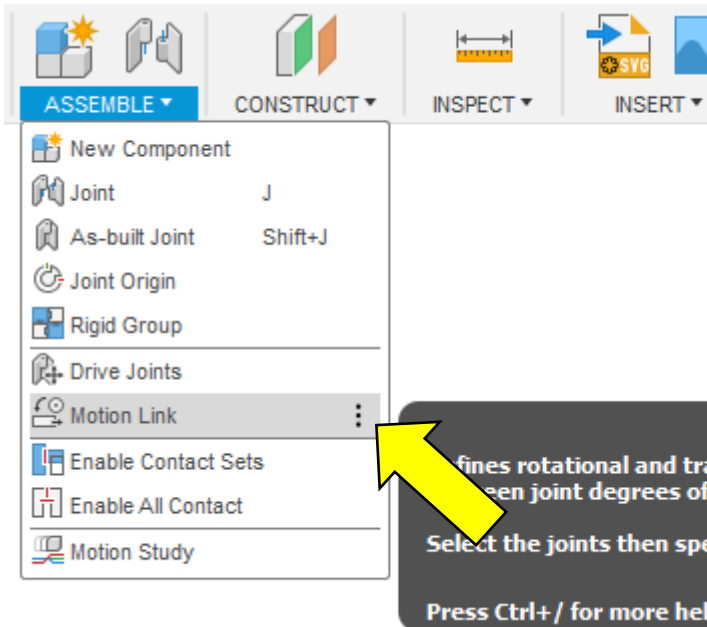




AUTODESK®  
FUSION 360™

## Gear Ratio

47 – We need to link the motion of the two **Gears**. To do this, select the **Motion Link Tool** in the **Assemble Menu**. Select the **Joints** for both **Gears** and set the relationship between them. We know the **Small Gear** has **40 Teeth** and the **Large Gear** has **120 Teeth**. That means that the **Small Gear** has to turn 3 times for every rotation of the **Larger Gear**. Set the **Angle** of the second **Revolute** to **120 degrees** ( $360 * 1/3$ ) and select **Reverse**. Click **OK** when finished and use the **Rotation Handle** to test the **Motion Link**.





AUTODESK®  
FUSION 360™





AUTODESK®  
FUSION 360™

The following slides are from the first lesson our team learned. I've included them for reference only. Feel free to continue on.

These and the subsequent lessons are posted on our website, see the link below. I am NOT an expert by any means. I am only self taught so there are probably better teachers out there on YouTube and Google. You've been warned!

<https://lindenrobotics.weebly.com/fusion360.html>

[lindenrobotics@gmail.com](mailto:lindenrobotics@gmail.com)

Feel free to contact us with any questions and we'll try to help find the answers. I can also provide the source files for what I put together if needed. Hopefully you weren't too bored and thanks for checking us out!



AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

- 1 – Click on **Create**.
- 2 – Choose **Create Sketch**.

The screenshot shows the Autodesk Fusion 360 software interface. The top ribbon has tabs for SOLID, SURFACE, SHEET METAL, and TOOLS. The 'CREATE' dropdown menu is open, showing options like New Component, Create Sketch, Create Form, Derive, Extrude, Revolve, Sweep, Loft, Rib, Web, Emboss, Hole, Thread, Box, Cylinder, Sphere, Torus, Coil, and Pine. The 'Create Sketch' option is highlighted. To the right, a 2D sketch of a part is shown on a grid. The sketch is a rectangle with a semi-circular cutout on the right side. Dimensions are shown: 100.00 for the width, 120.00 for the height, 45.00 for the distance from the left edge to the start of the semi-circle, and R55.00 for the radius of the semi-circle. A text box on the right explains the sketching process.

Use Sketch mode to create basic geometry profiles that define the design. First select a construction plane. Then create lines, arcs, or points and use dimensions to constrain the boundaries. Sketches are used with 3D creation commands such as Extrude.

After creating the boundary, select Finish Sketch to exit Sketch mode.

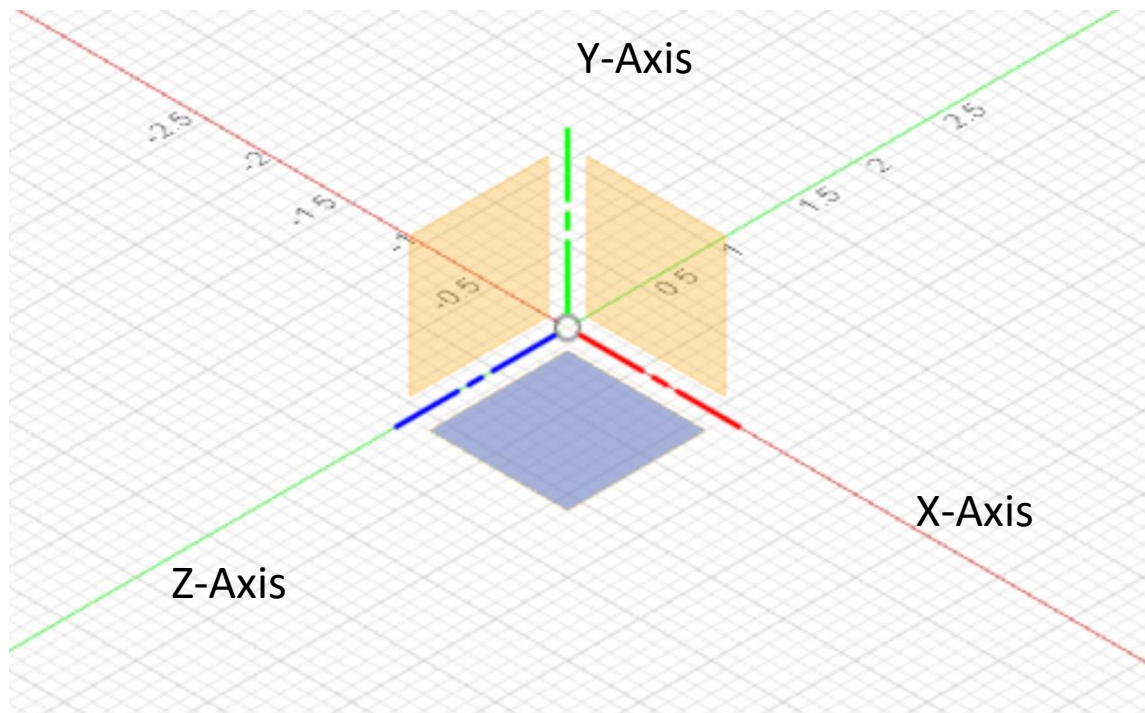


AUTODESK®  
FUSION 360™

Let's draw our first SKETCH

There are 3 drawing planes – X, Y, & Z.

3 – Choose the XZ Plane by clicking on the box.





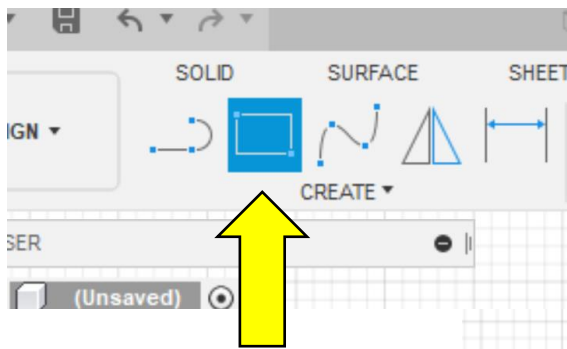


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

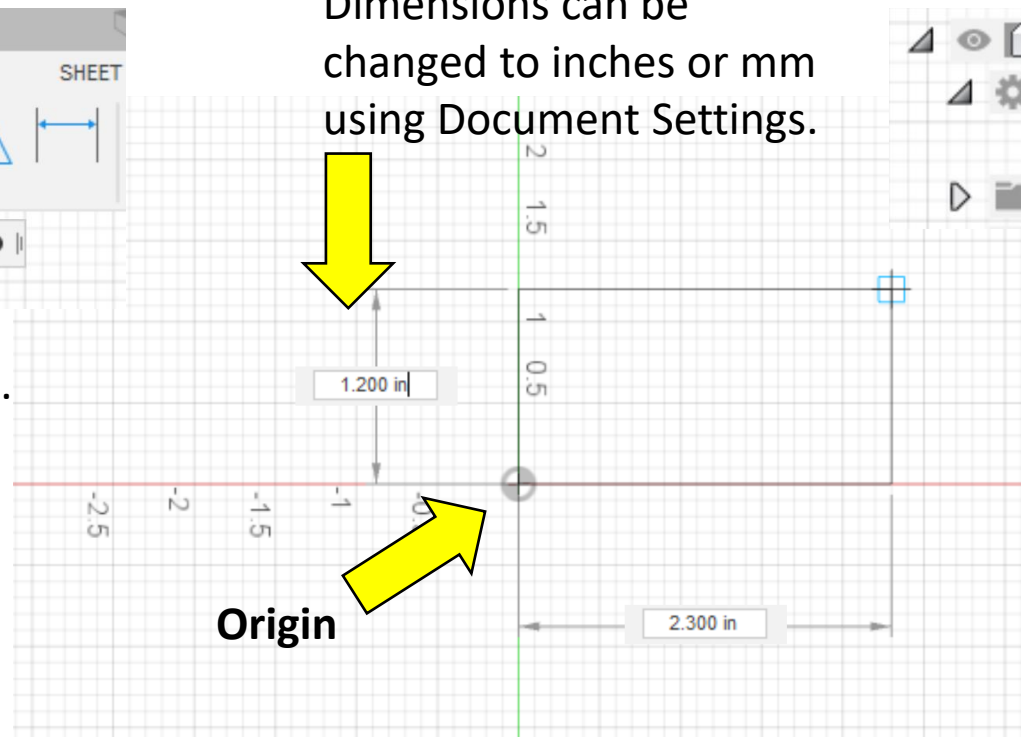
The drawing should spin to show the XZ plane looking down from above it.

4 – Draw a 2.5" X 2.5" rectangle with the bottom left corner at the origin.



Select the **Rectangle Tool**.

Dimensions can be changed to inches or mm using Document Settings.

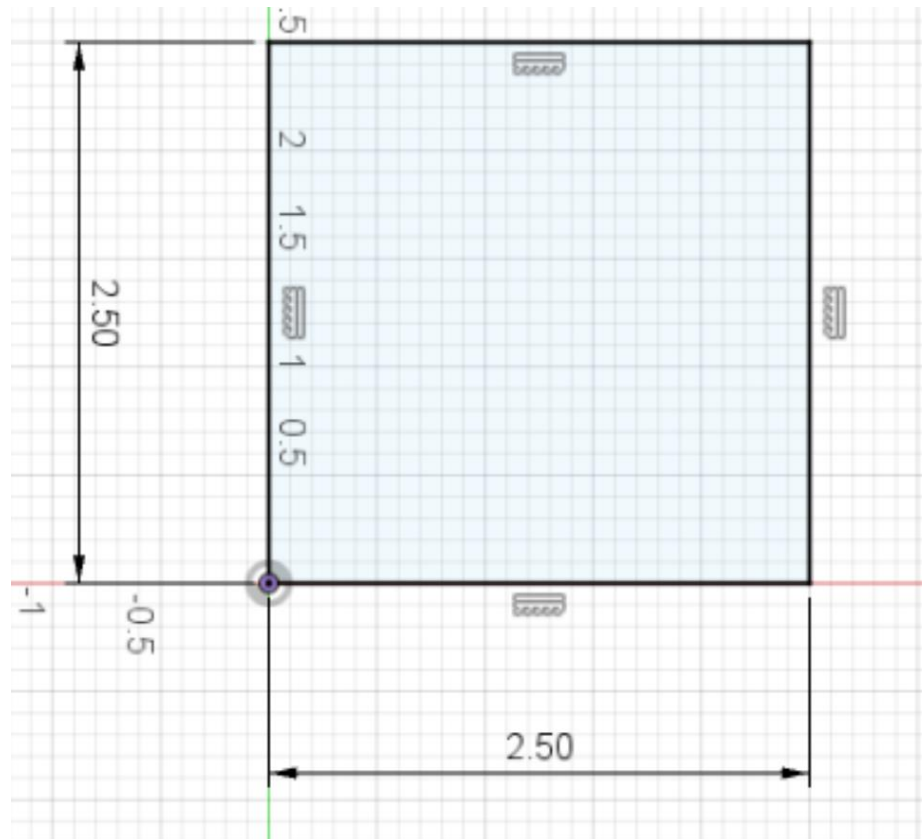




AUTODESK®  
FUSION 360™

Let's draw our first SKETCH

5 – Type **2.50** in the dimension box and press the **Tab** key, type **2.50** again in the other dimension box and press **Enter**.

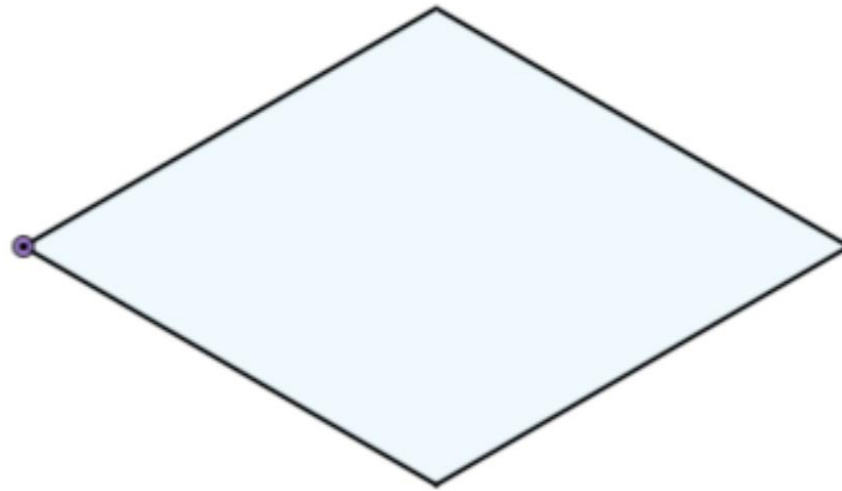
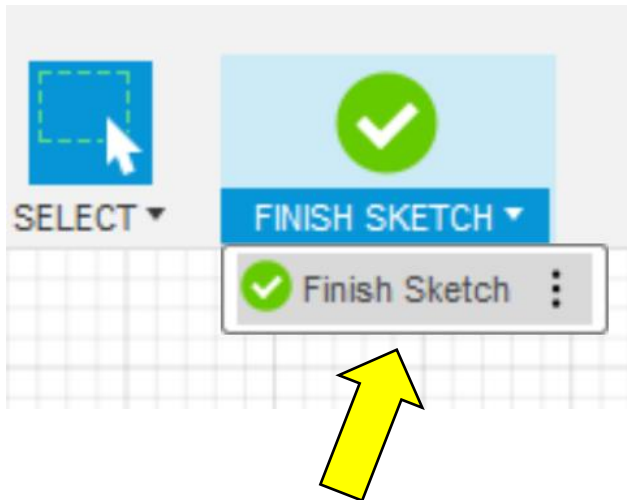




AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

6 – Select **Finish Sketch** from the **Menu Bar**. The image should spin back to the XYZ Planes as shown.



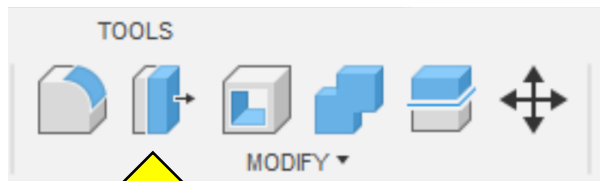


AUTODESK®  
FUSION 360™

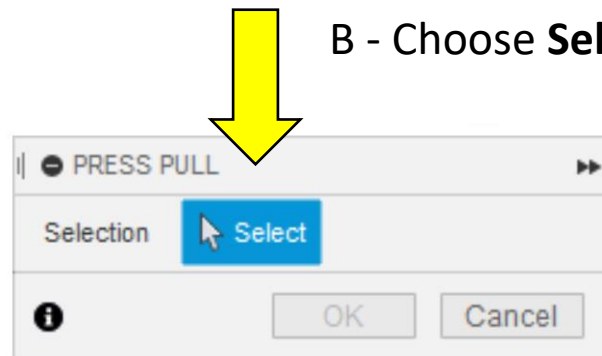
Let's draw our first SKETCH

Let's give the Square thickness.

7 – Choose **Press Pull**, click on **Select**, and choose the Square.

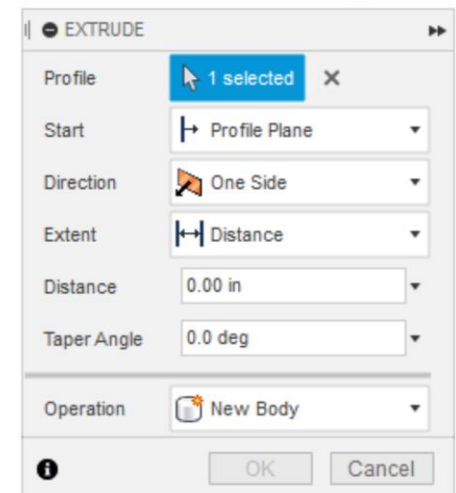
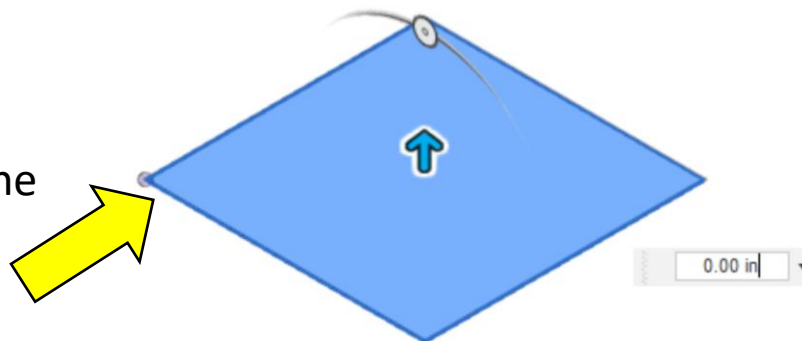


A - Select the **Press Pull Tool**.



B - Choose **Select**.

C - Click on the  
Square.



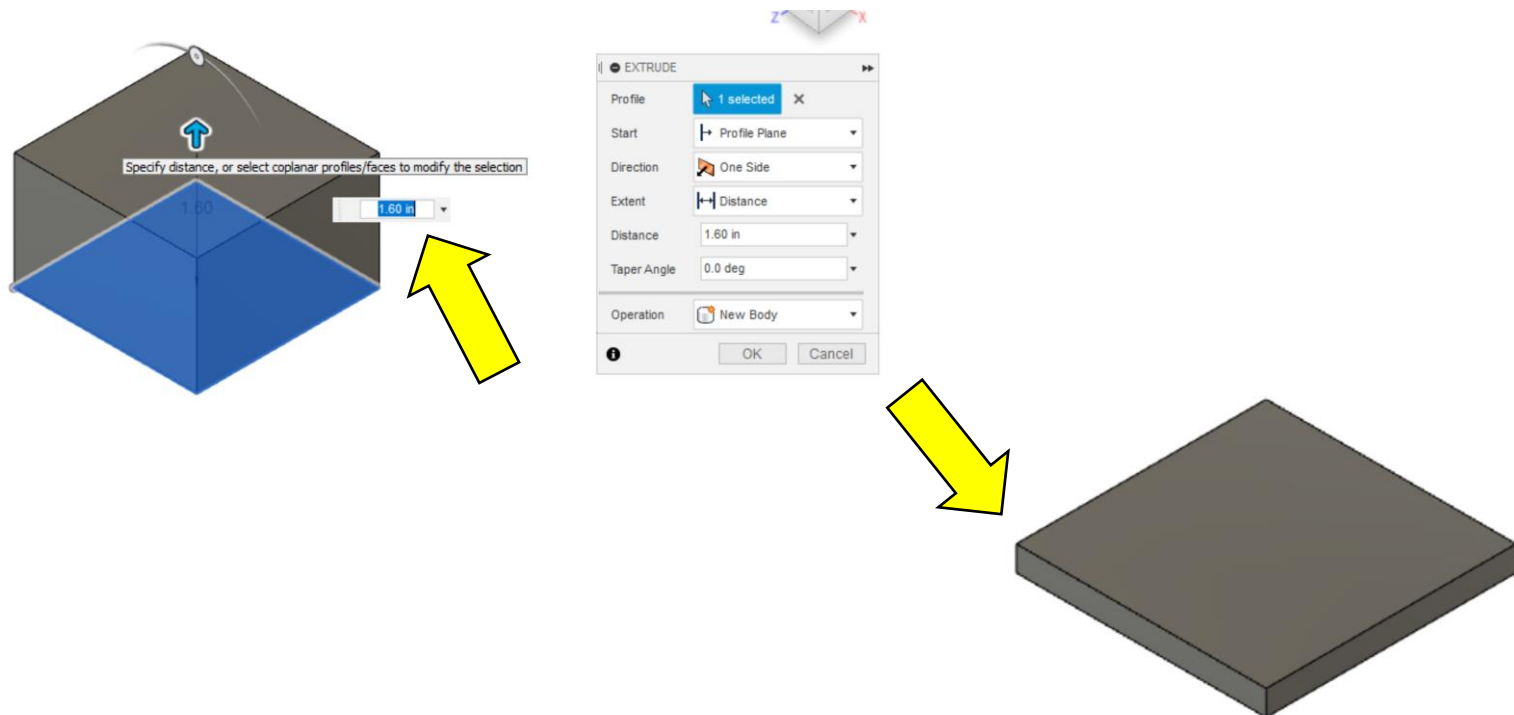


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's give the Square thickness.

7 – Grab the arrow and **Pull** upwards. You can now type in a thickness of 0.25 in and press **Enter**. You'll see a solid square with ¼" thickness.



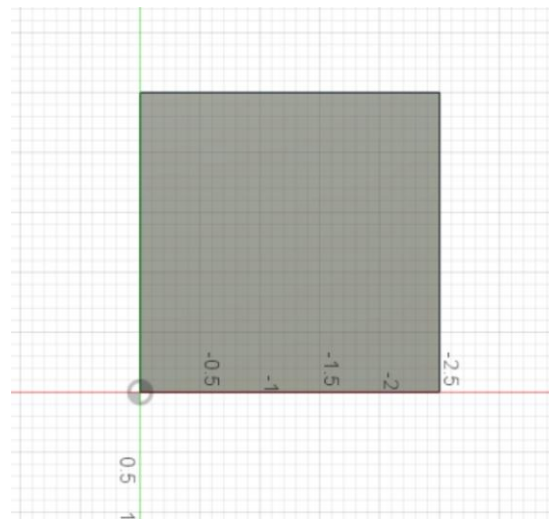
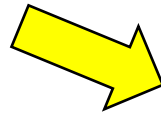
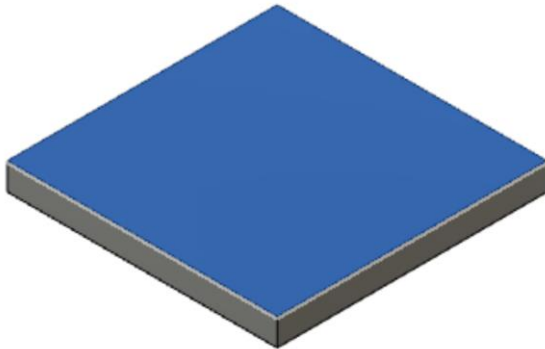


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

8 – Create a new **Sketch** and select the top surface of the square by clicking on it. It will highlight to indicate it's selected. The drawing will spin so that you're looking down on the surface.



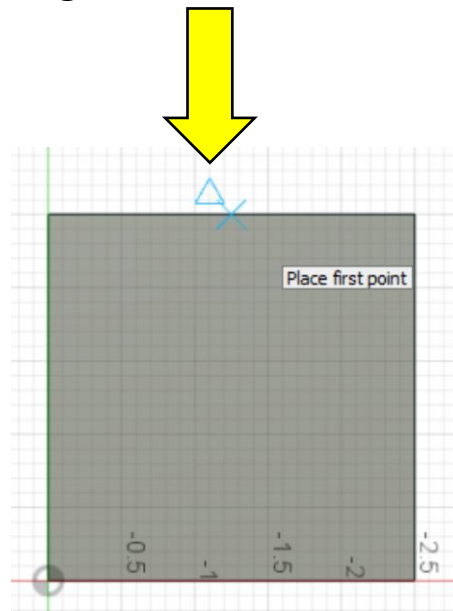
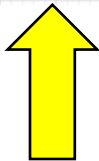
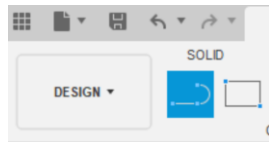


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

9 – Lets add **Construction Lines** to locate the two holes we're adding. Select the **Line Tool**. Drag the cursor across the top of the square until you see a **Triangle** (indicates the center). Click and drag it to the bottom edge keeping it at 90 degrees. Click again to end drawing the Line.



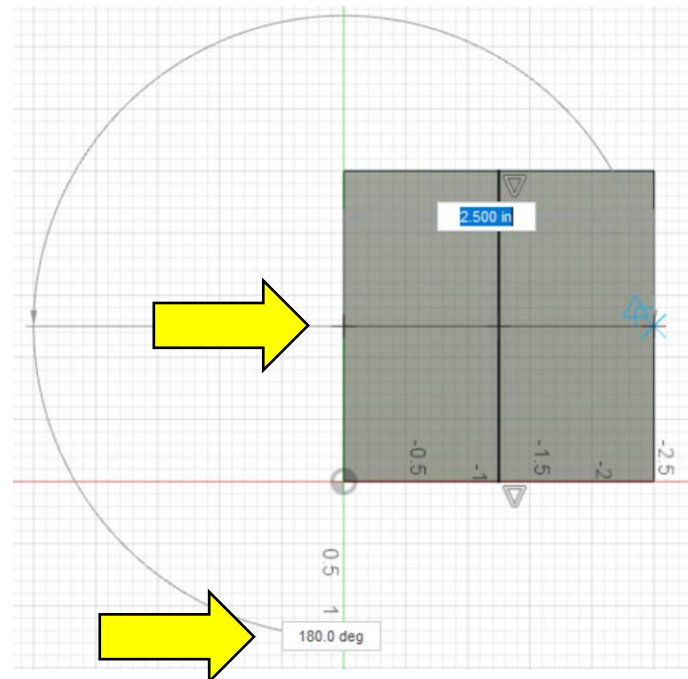


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

10 – Add another horizontal **Construction Line** to locate the two holes we're adding. The **Line Tool** should still be active. Drag the cursor across the side of the square until you see a triangle (indicates the center). Click and drag it to the opposite edge keeping it at 180 degrees. Click again to end drawing the Line.





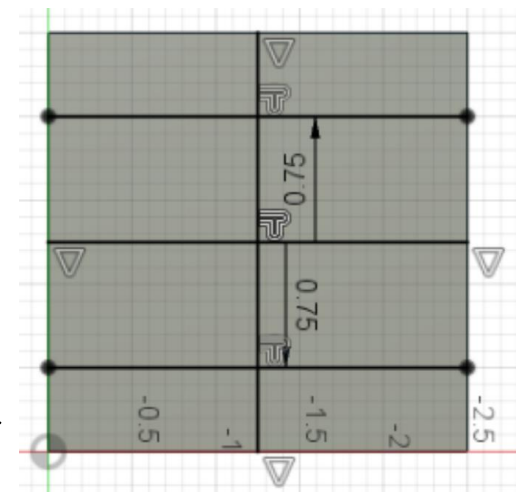
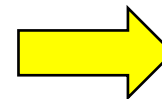
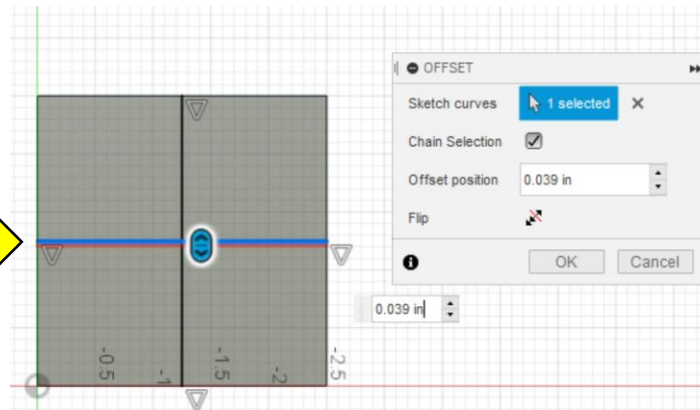
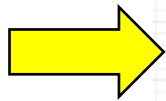
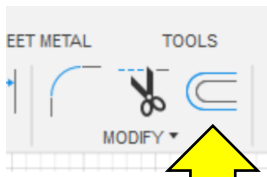


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

11 – We now need to offset the line above and below the centerline. Select the **Offset Tool** or press **O**. Click on the horizontal line and type in 0.75 in. The line will jump down (or up depending on axis) and press **Enter**. Repeat and enter -0.75 in.



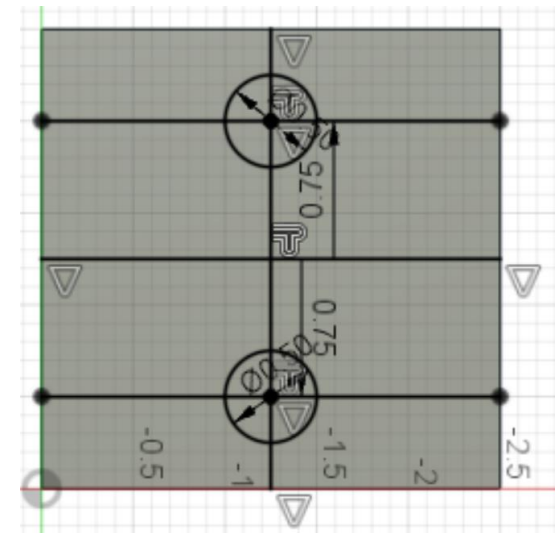
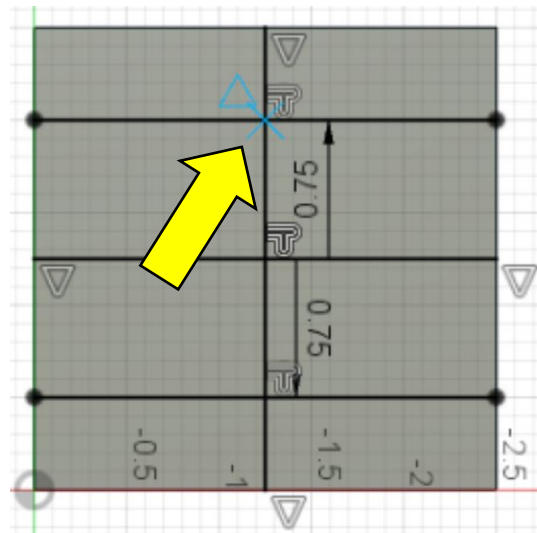
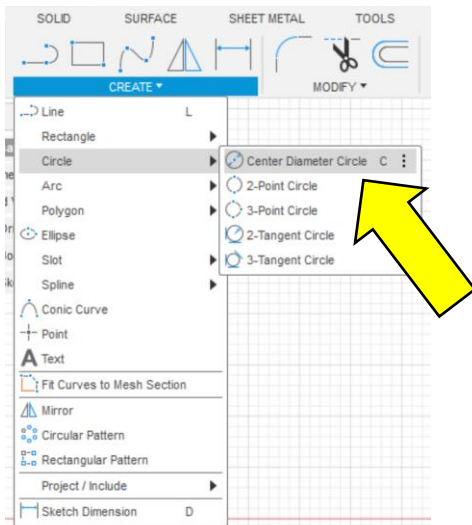


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

12 – We now have **Center Points** for our holes. Draw two circles by using the **Center Diameter Circle Tool**. Select it and click on a **Center Point** we created. Drag the circle out and enter **0.50** in for the diameter. Repeat on the second center point.



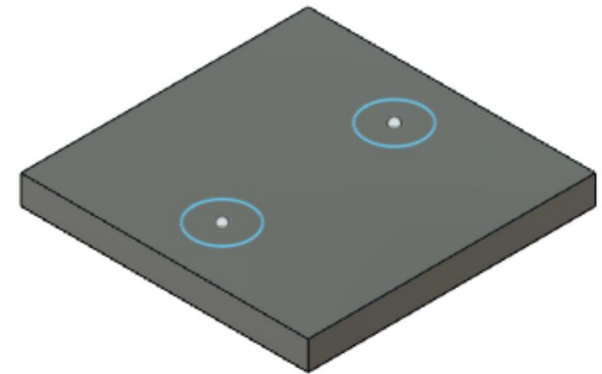
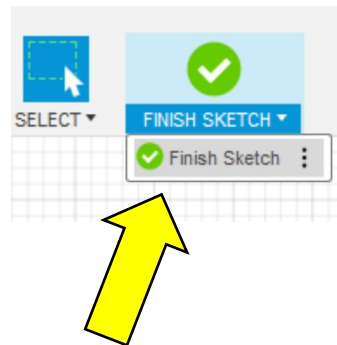
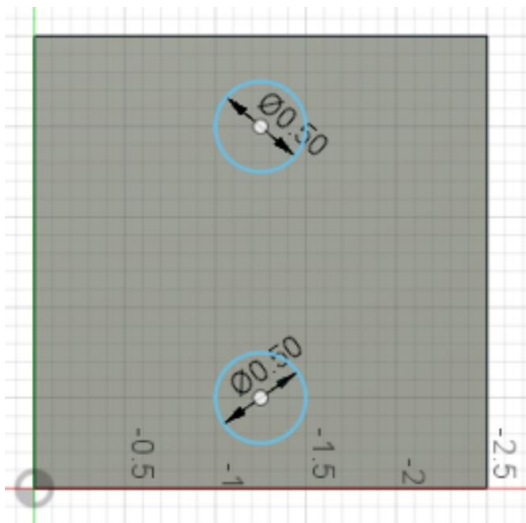


AUTODESK®  
FUSION 360™

Let's draw our first SKETCH

Let's add 2 holes.

13 – Delete the **Construction Lines** we created and finish the sketch. Click on each Line and press **Delete**. When done click on **Finish Sketch**.



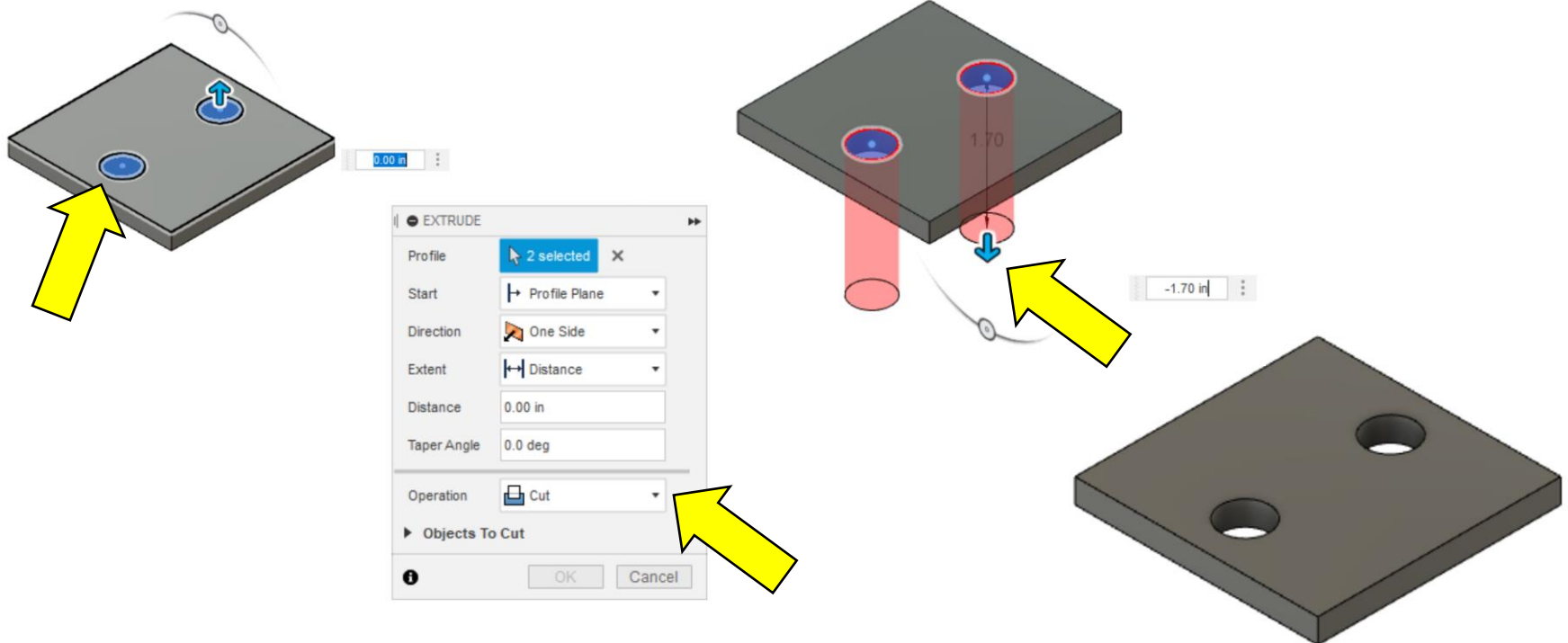


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add 2 holes.

14 – We can now **Press Pull** the circles through the part. Select both circles by holding the **Shift** key while clicking on them. Change the **Operation** to **Cut** and grab the arrow and drag the circles through the part. Press **Enter** and the holes will appear.



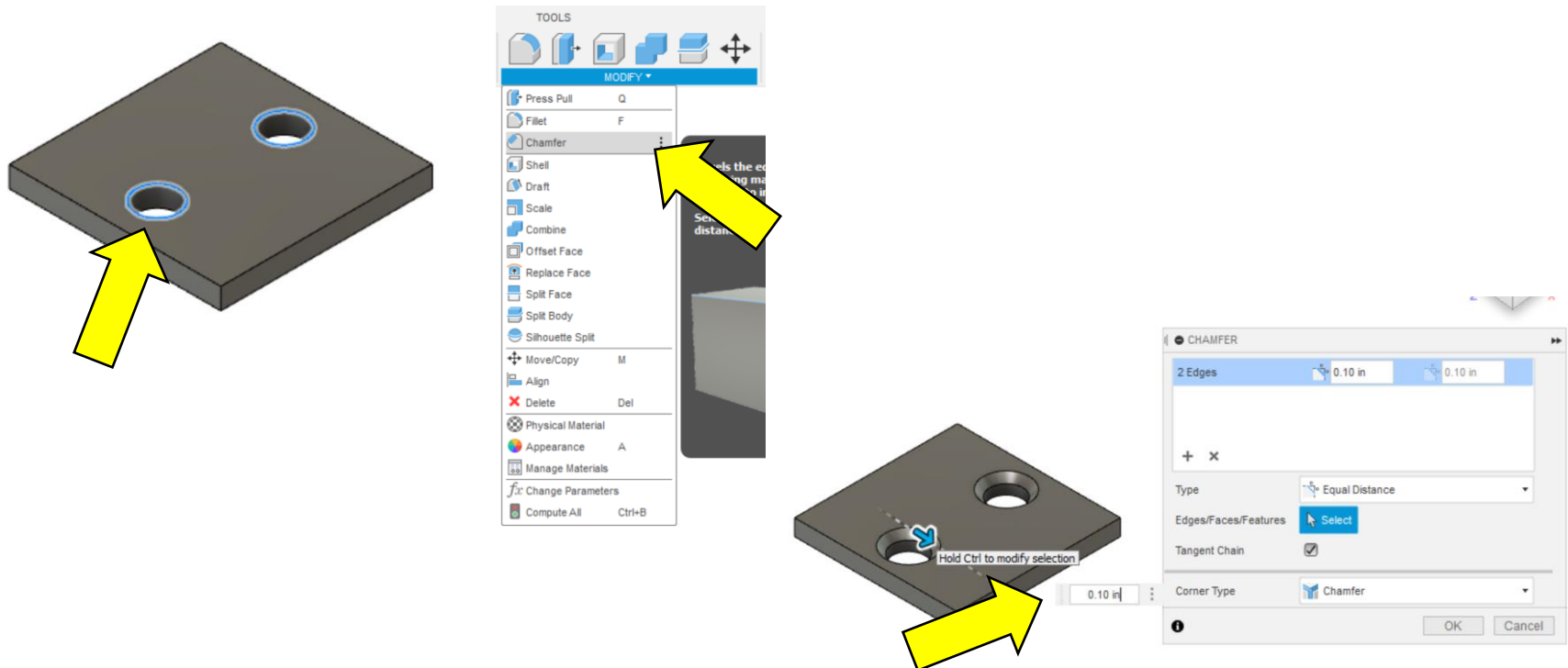


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a chamfer to the hole edges.

15 – Select both holes using the **Shift** key. Select the **Chamfer Tool** from the **Modify Menu**. Drag the arrow or type 0.10 in and press **Enter**.



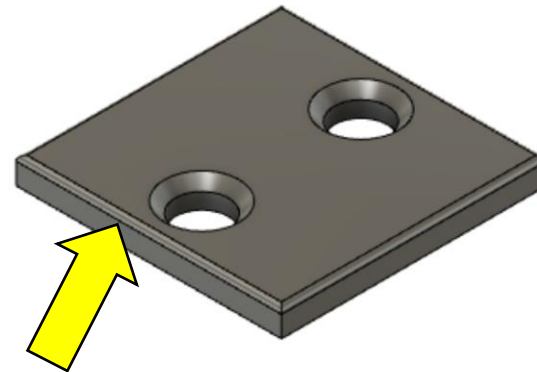
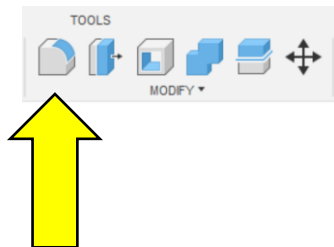


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a fillet to the edges of the part for safety.

16 – Select all four top edges using the **Shift** key. Select the **Fillet Tool** from the **Modify Menu**. Drag the arrow or type **0.05** in and press **Enter**.



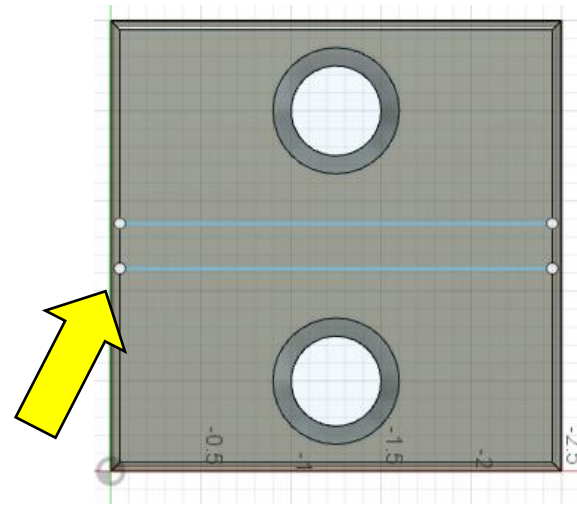
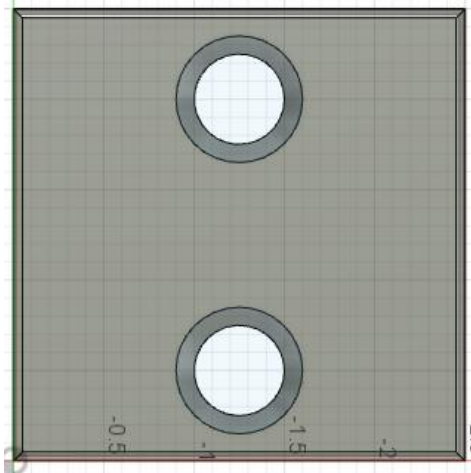


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a mount to the bracket.

17 – Create a new sketch and choose the top surface of the part. The drawing should spin and you should be looking down onto the surface. Add a **Construction Line** through the center of the part and offset it in both directions by **0.125 in**. Delete the **Construction Line** and **Finish Sketch**.



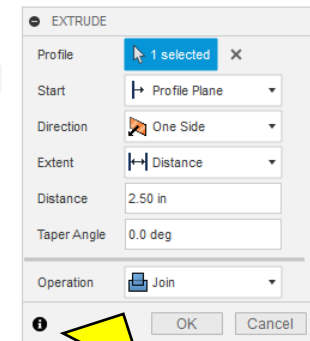
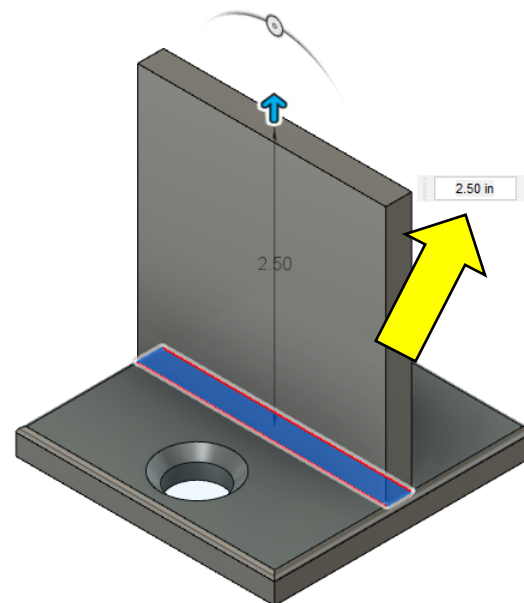
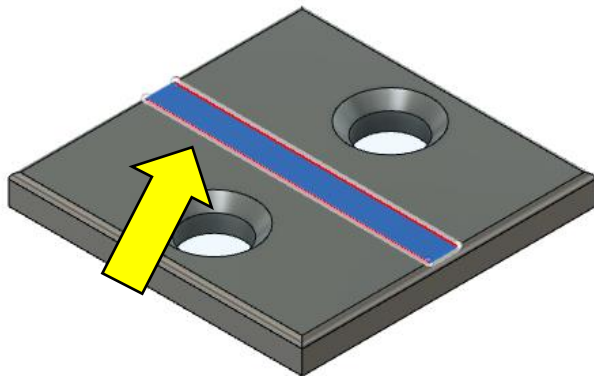


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a mount to the bracket.

18 – Pull the surface you created out of the part. To do this select the rectangle contained between the two lines. Select the **Press Pull Tool** and drag the surface or type in **2.50 in**. Make sure the **Operation Type** is set to **Join**.





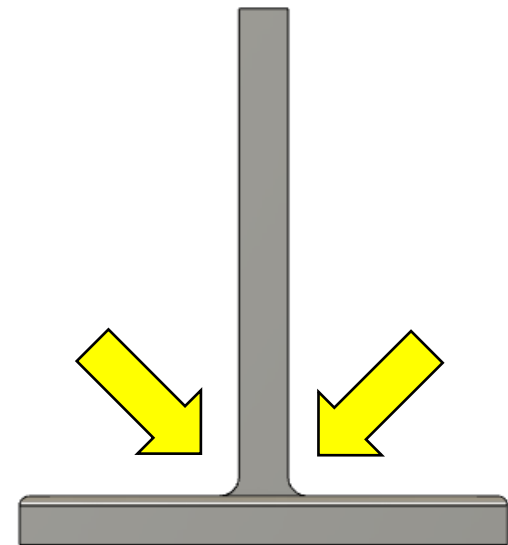
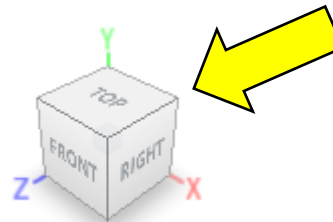
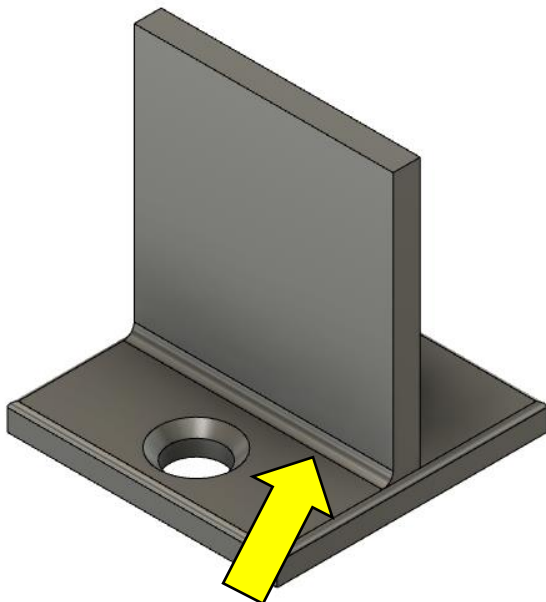
## Let's draw our first SKETCH

Let's add a mount to the bracket.

19 – Add a fillet to the inside edges of the new bracket. Select the edge and **Fillet Tool** and create a **0.10** in fillet. To get access to the back edge you can use the **View Tool** in the upper right corner of the screen. Your current view is shown by the darkened corner (Front Right in this case). Select the corner to the right and the drawing should rotate. Add a fillet to the other edge.



AUTODESK®  
FUSION 360™



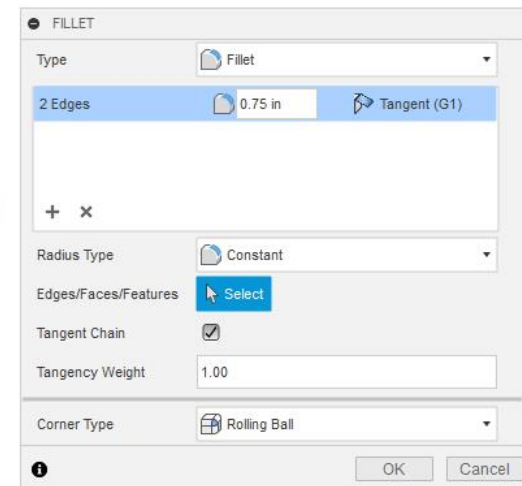
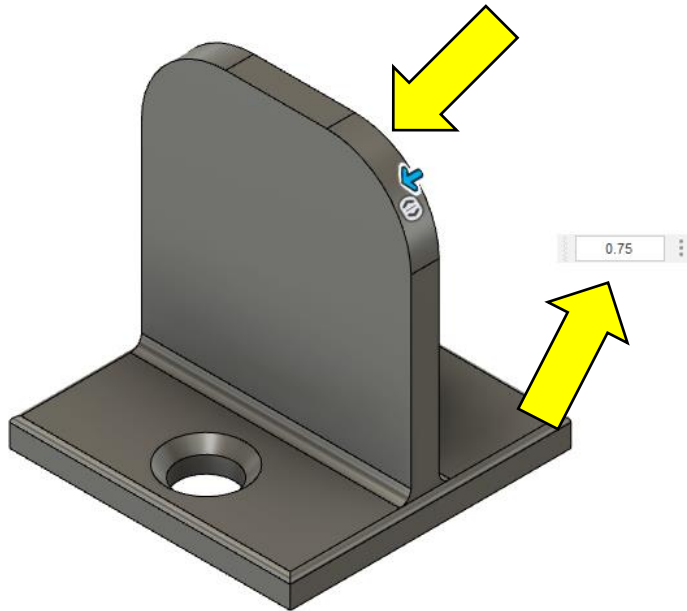


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a mount to the bracket.

20 – Now fillet the corners and add a hole in the center. Select both top corners and choose the **Fillet Tool**. Drag the arrow or type in **0.75** in.



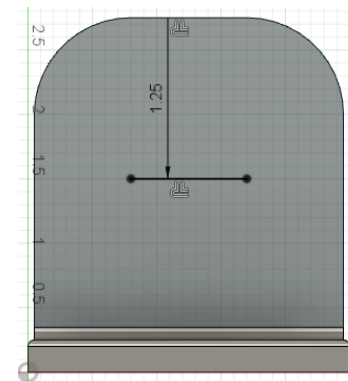
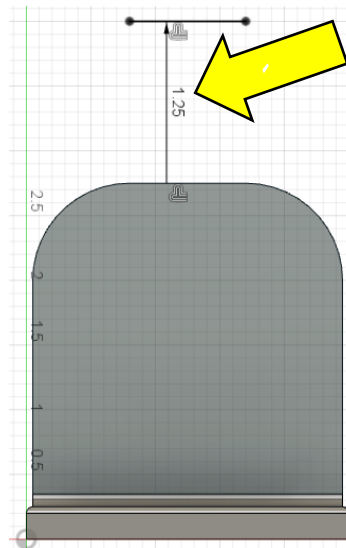
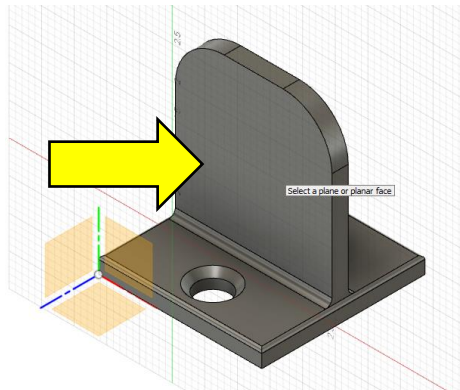


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a mount to the bracket.

21 – To add the hole create a **Sketch** on the surface of the bracket. Draw **Construction Lines 1.25** in down from the top and on center. Notice below my line went in the wrong direction. To fix this just double click on the 1.25" dimension and add a negative sign at the left of the number.



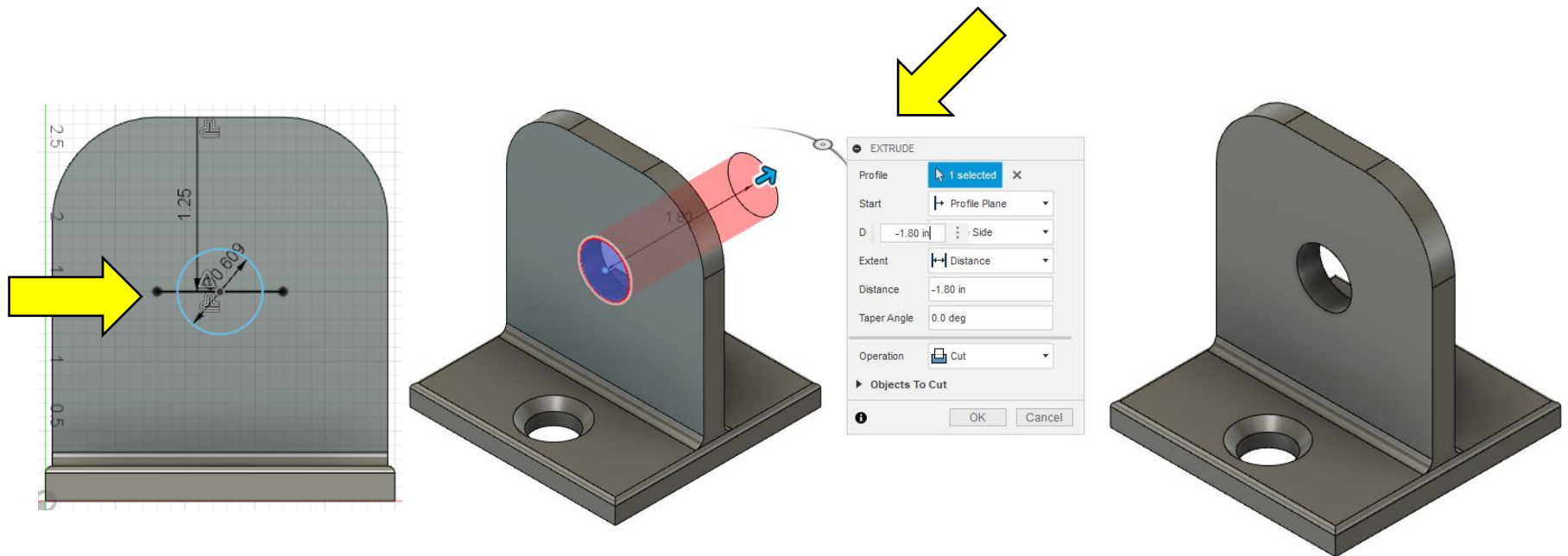


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

Let's add a mount to the bracket.

22 – Add the circles using the **Center Diameter Circle Tool**. Draw the circle at the mid-point of the offset line shown by the triangle ( $39/64'' = 0.609''$ ). **Finish Sketch** and **Press Pull** the circle through the part.



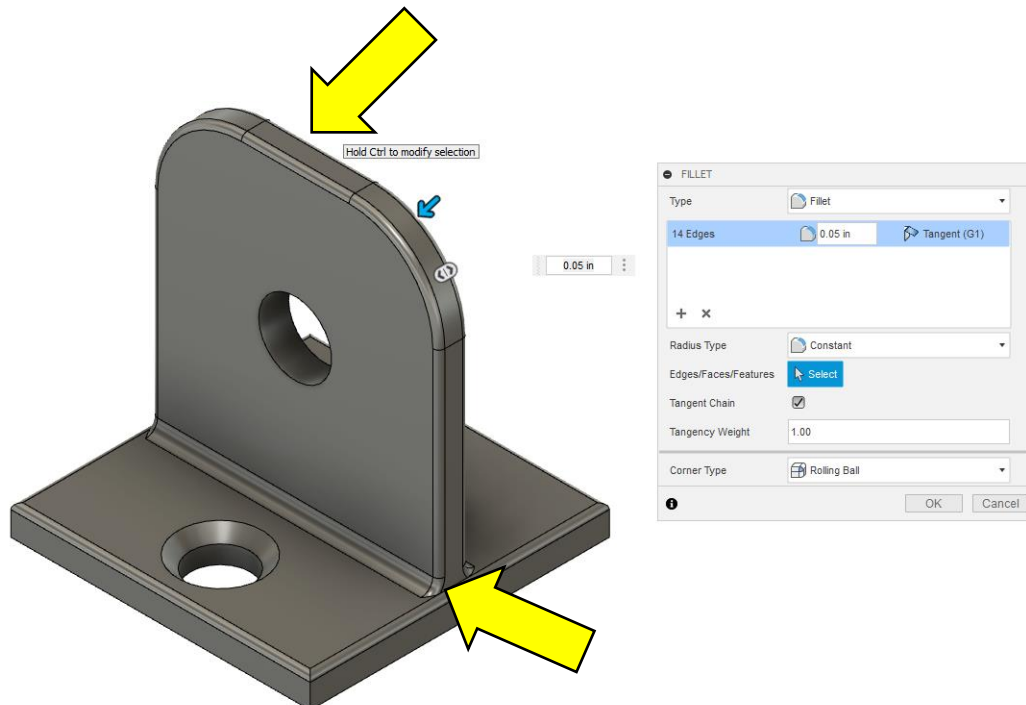


AUTODESK®  
FUSION 360™

## Let's draw our first SKETCH

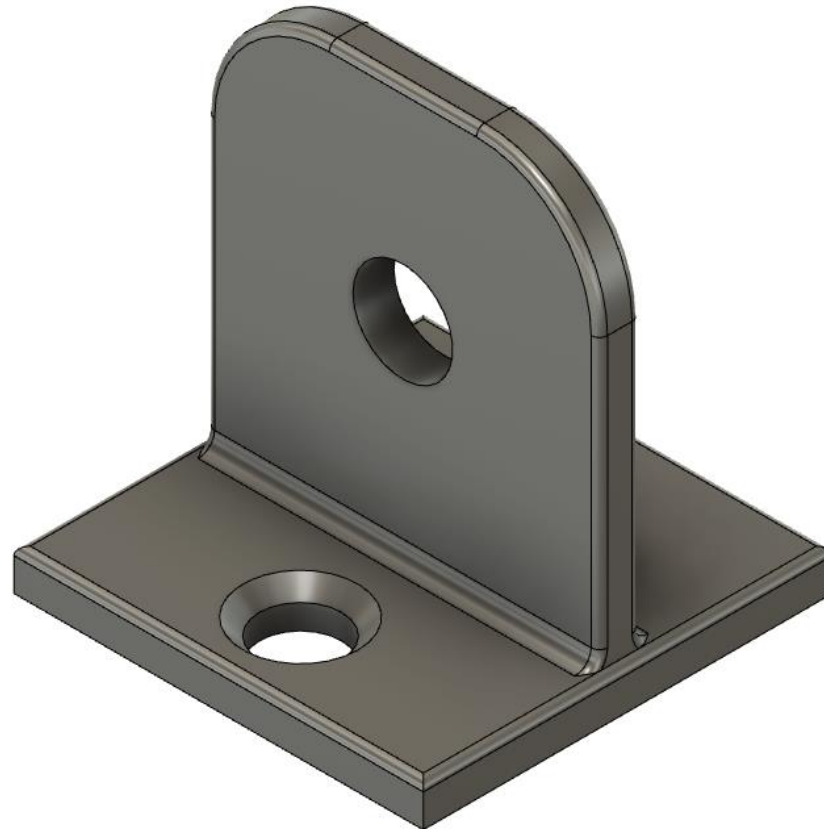
Let's add a mount to the bracket.

23 – Now add a **0.05** in fillet to the edges. To get to the small edges on the lower fillets you may need to **Zoom** in. You can do this using the **Scroll Wheel** on the mouse. Backwards zooms in and forwards pans out.



Let's draw our first SKETCH

Next meeting we will make a new **Component** and add a **Pivot** for motion.



AUTODESK®  
FUSION 360™