



# Laser Cut Spinning Top

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How to design and customise a wooden spinning top to be laser cut

# Finished Product

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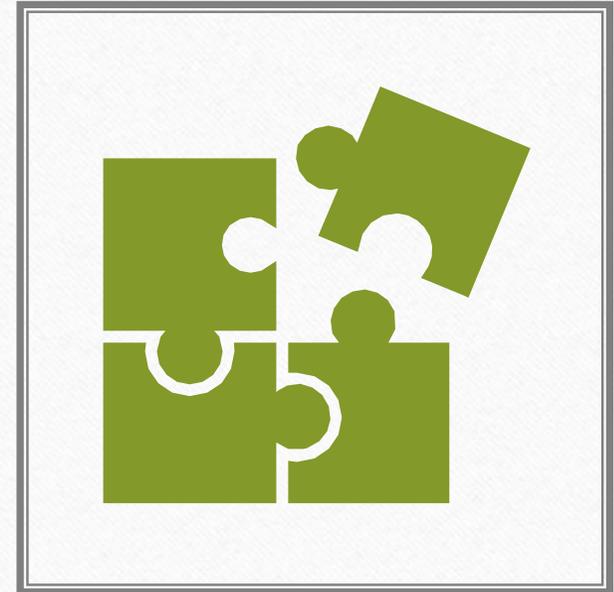
- Here you can see the basic finished spinning top
- It is made from 3mm thick laser ply.



# Introduction

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- To do this activity, Autodesk Fusion 360 will be used
- We will construct 3 different parts of a basic shape
- The spinning top can then be coloured or painted for customisation!



# Step 1

Open

Open Fusion 360 and click save to setup your files.

Create

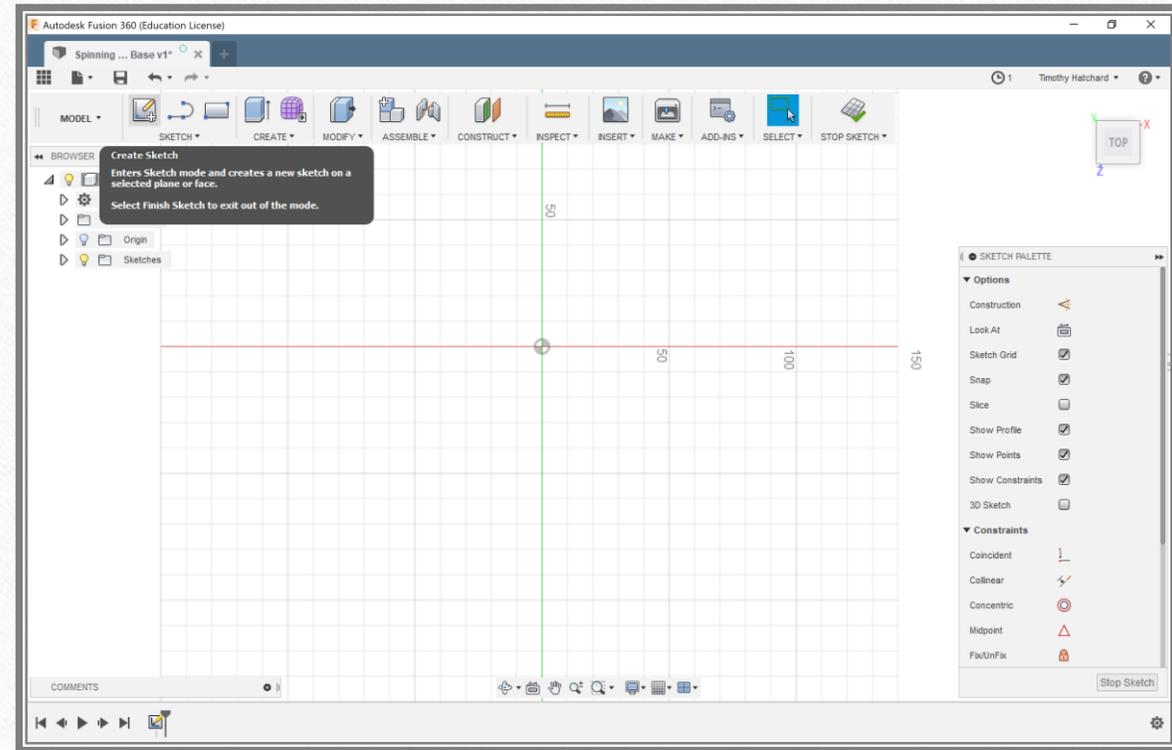
Create a new project called Spinning Top Activity.

Save

Save this part inside that project as the spinning top base.

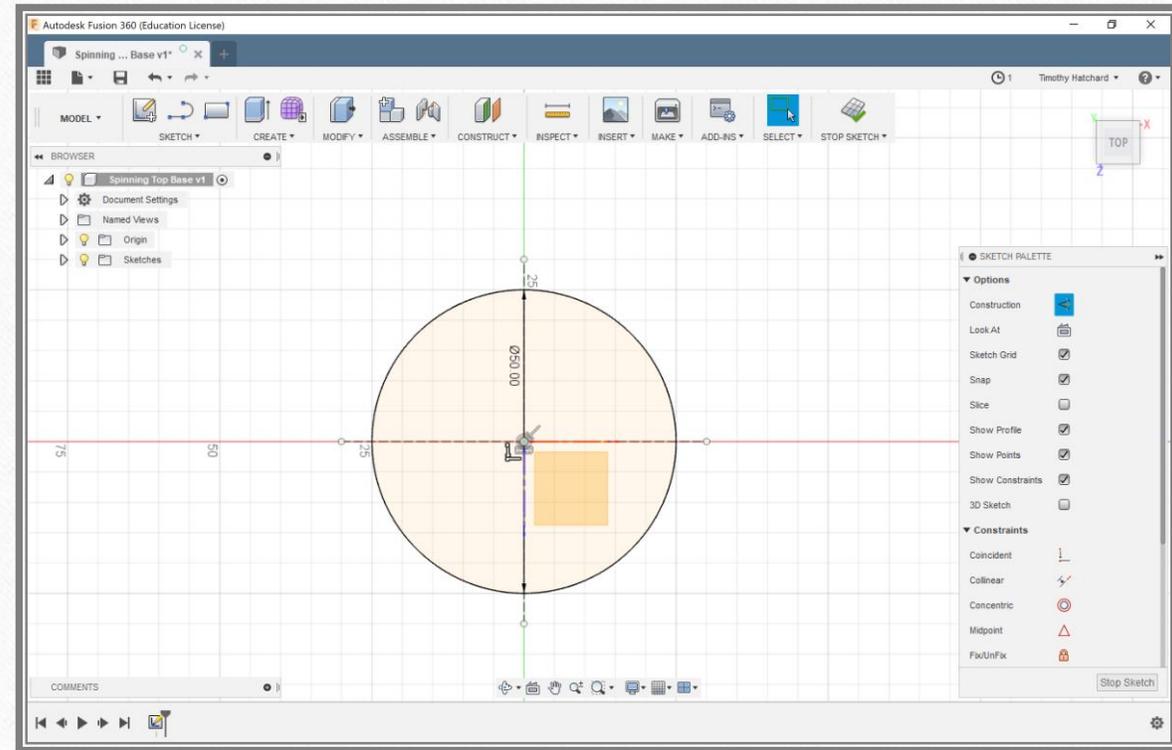
## Step 2

- Create a new sketch using the button shown in the image.
- Choose the bottom work plane.
- Ensure that the origin is visible by clicking the lightbulb next to it.
- The view will change to as shown in the image



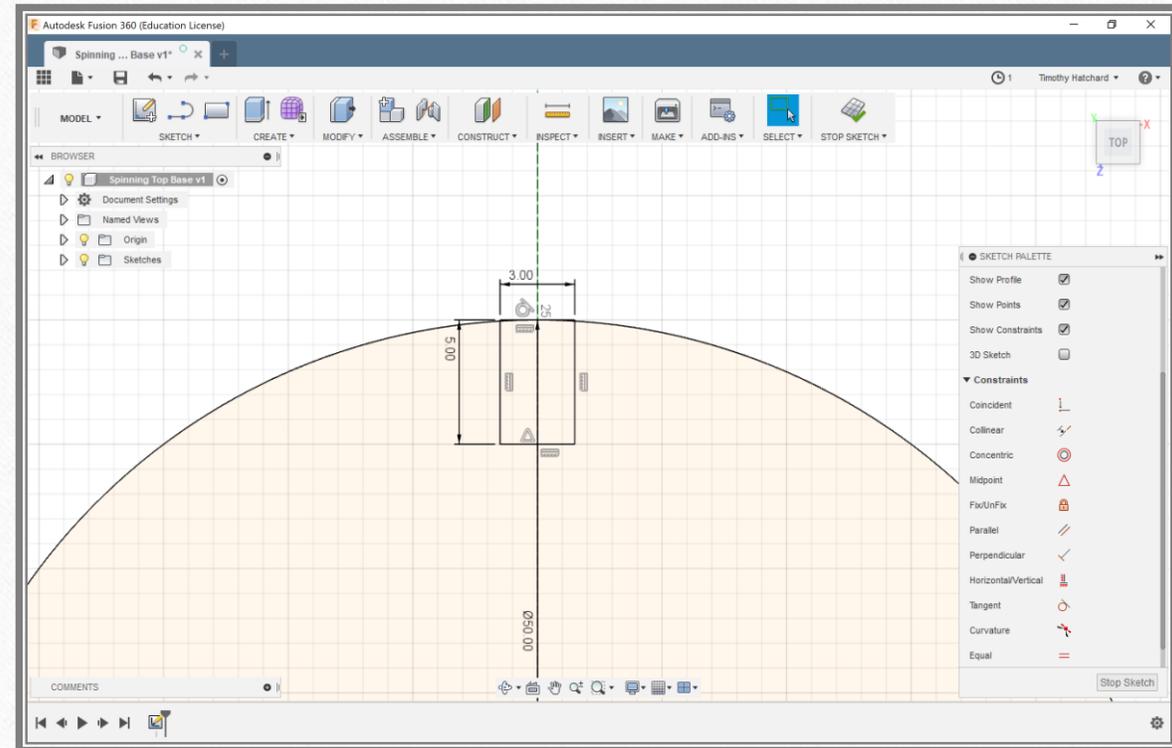
## Step 3

- We will start by creating the circular base.
- Make a circle of diameter 50mm.
- Add construction lines across the x and y axis through the centre of the circle
- Ensure the circle and construction lines are constrained to the origin.



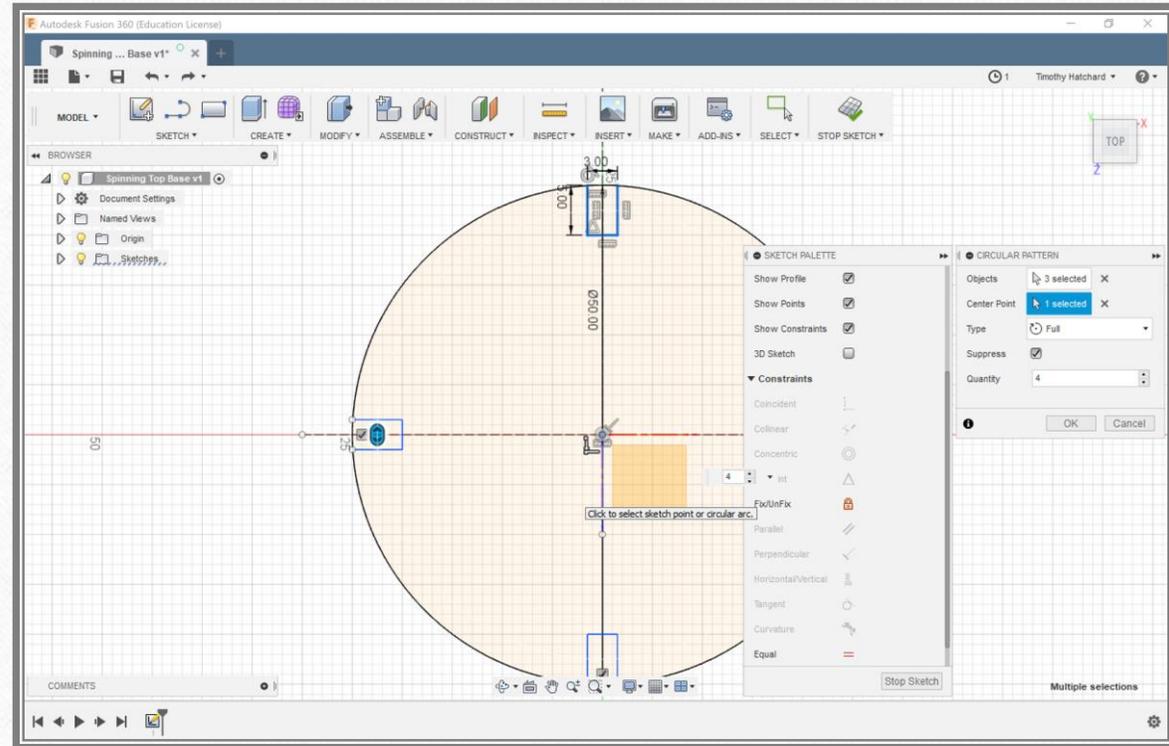
## Step 4

- Zoom into the top of the circle.
- Where the construction line meets the edge of the circle, add a 2 point rectangle
- Dimension this rectangle to be 3mm across by 5mm down.
- Constrain the top edge of the rectangle to be a tangent of the circle, and the construction line to be the midpoint.



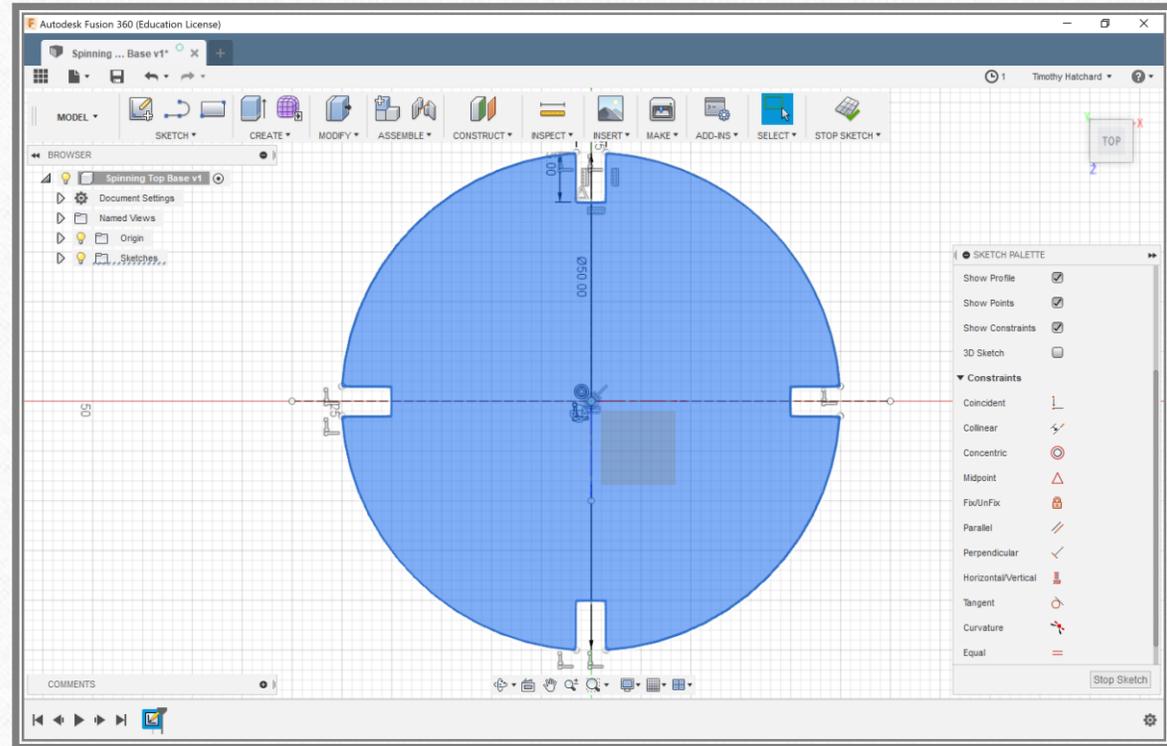
## Step 5

- Use the circular pattern function to repeat this 4 times around the circle.



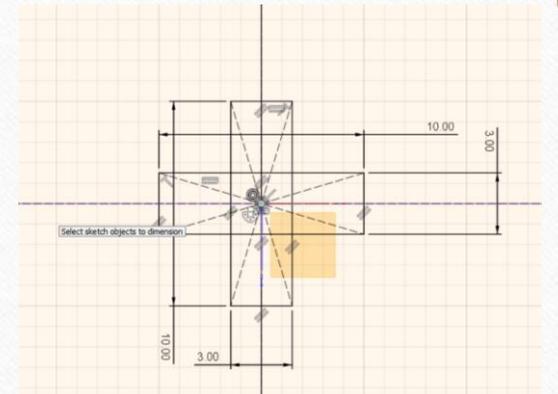
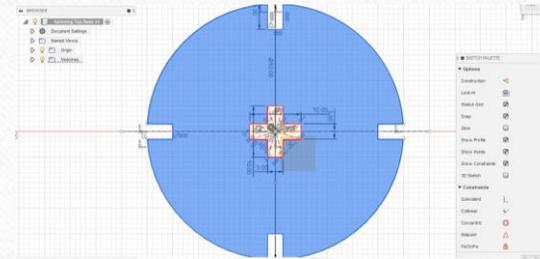
## Step 6

- Trim the edges of the circle and rectangles such that the rectangles cut out from the circle.



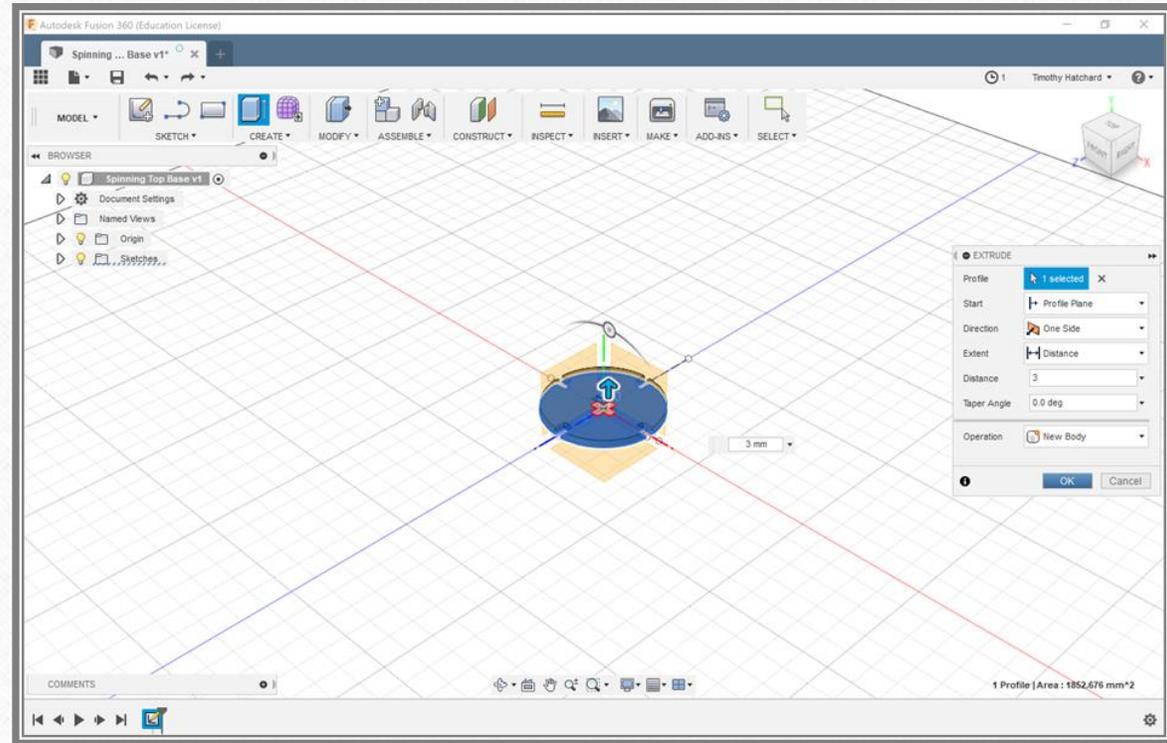
# Step 7

- In the centre create two 3mm by 10mm centre corner rectangles crossing over themselves.
- Trim the centre so it becomes a cross in the centre.



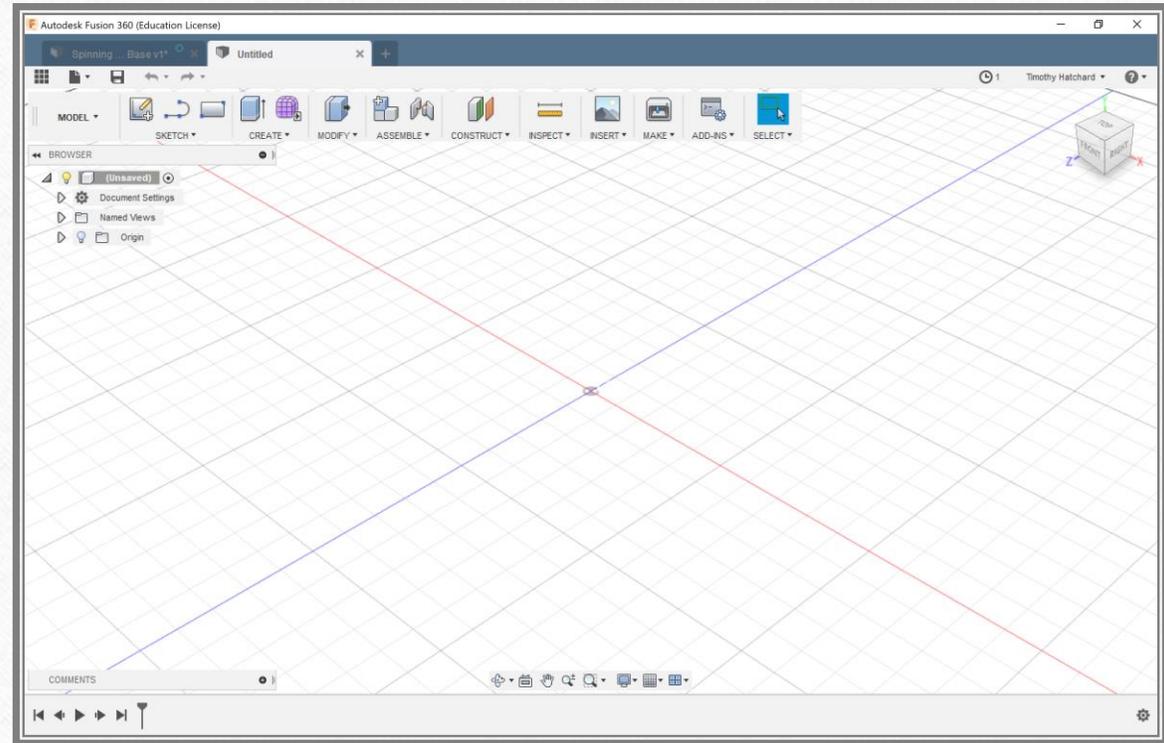
## Step 8

- Create an extrude from this face of 3mm.
- This is unnecessary for the laser cutter, but useful to check the pieces fit together in fusion.



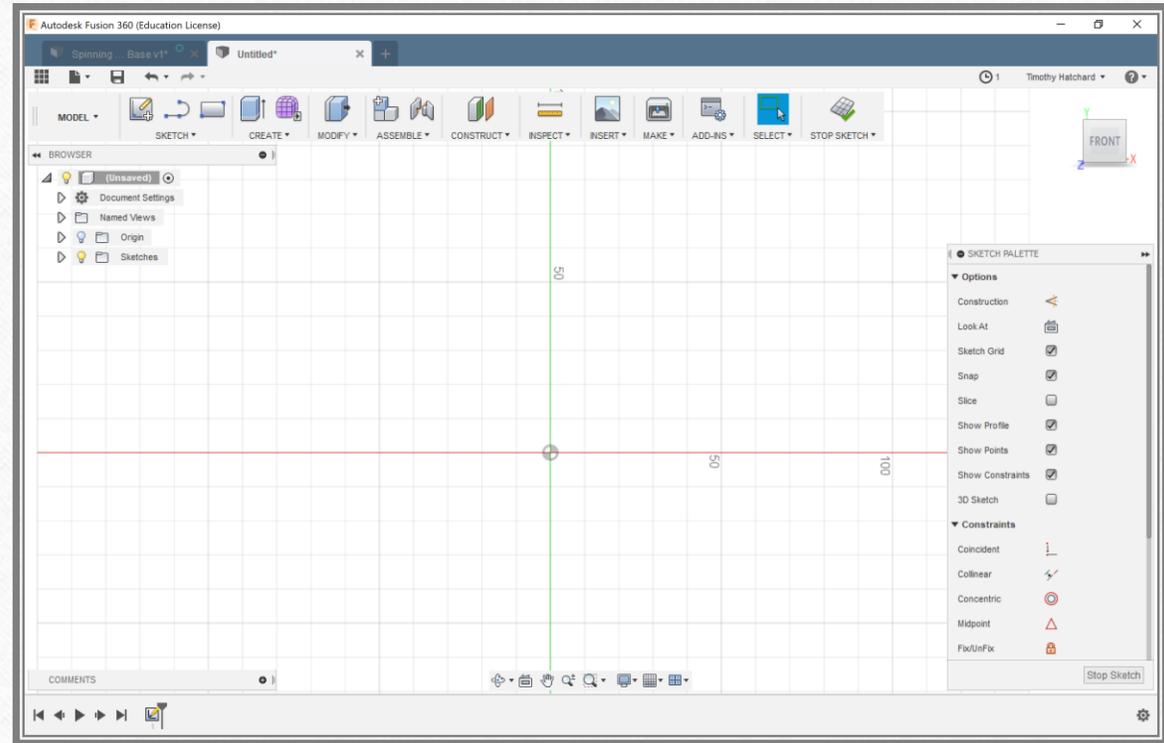
## Step 9

- Create a new design by clicking the plus at the top next to your tab.
- Save this as “Spinning Top – T”
- This will be the top half of the cross sectional handle.



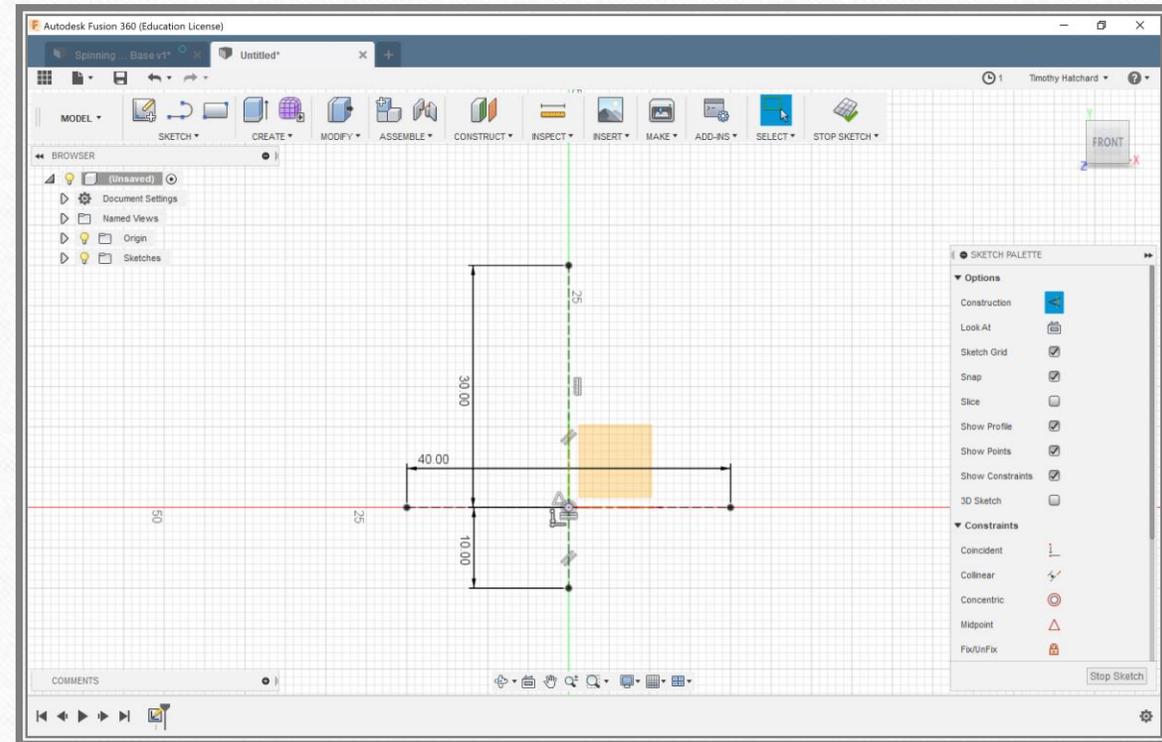
## Step 10

- Create a new sketch and this time choose the front work plane.
- Again ensure the origin is visible using the light bulb.



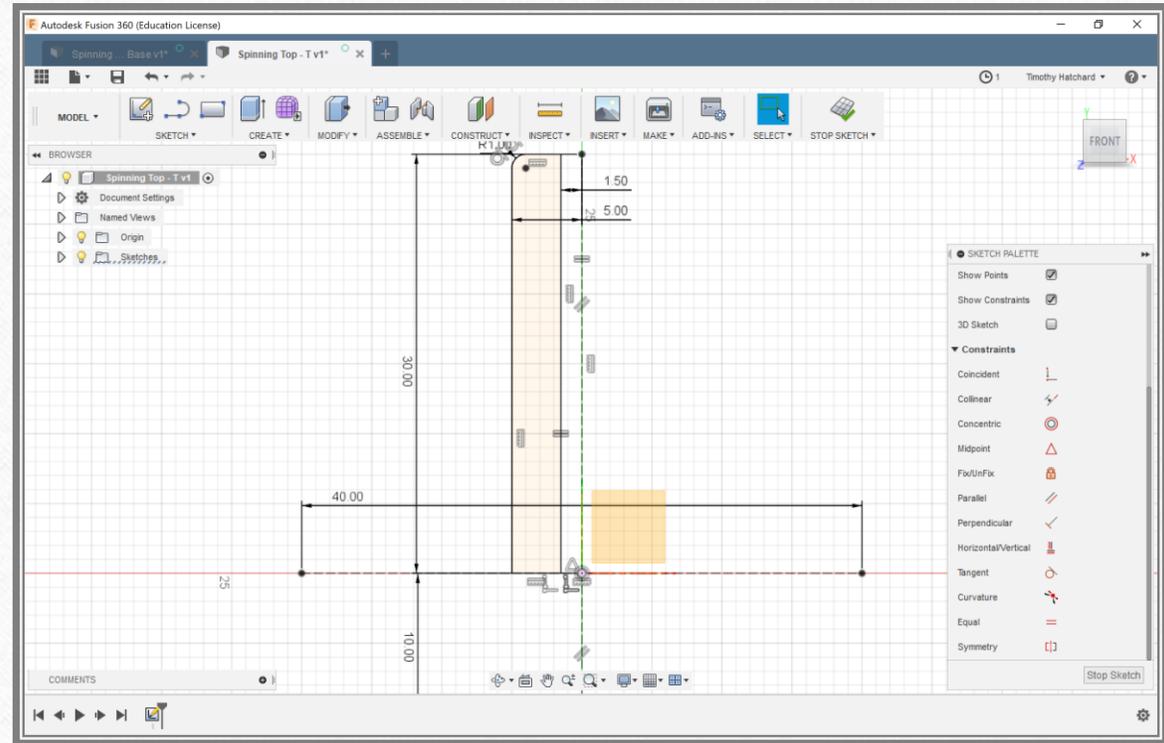
## Step 11

- To start we will make construction lines along the X and Y axis.
- Make the X axis line 40mm long, centred on the origin.
- For the Y axis, make it 30mm above and 10mm below the origin.
- Ensure these lines are constrained to the origin and their orientation.



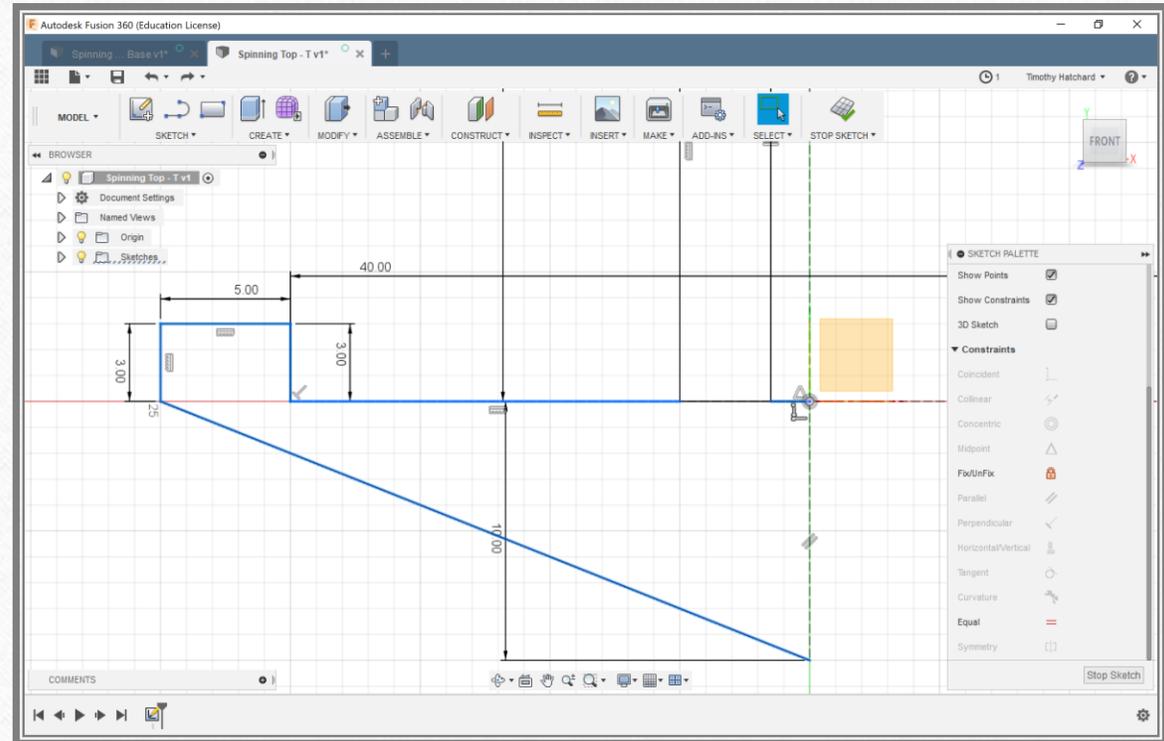
## Step 12

- Create a 2 point rectangle to the left of the top construction line. Ensure it is the same length of the construction line.
- Make the closer edge 1.5mm from the construction edge, and the further edge 5mm from the construction line.
- Ensure they are sufficiently constrained.
- Make a 1mm fillet on the outer corner



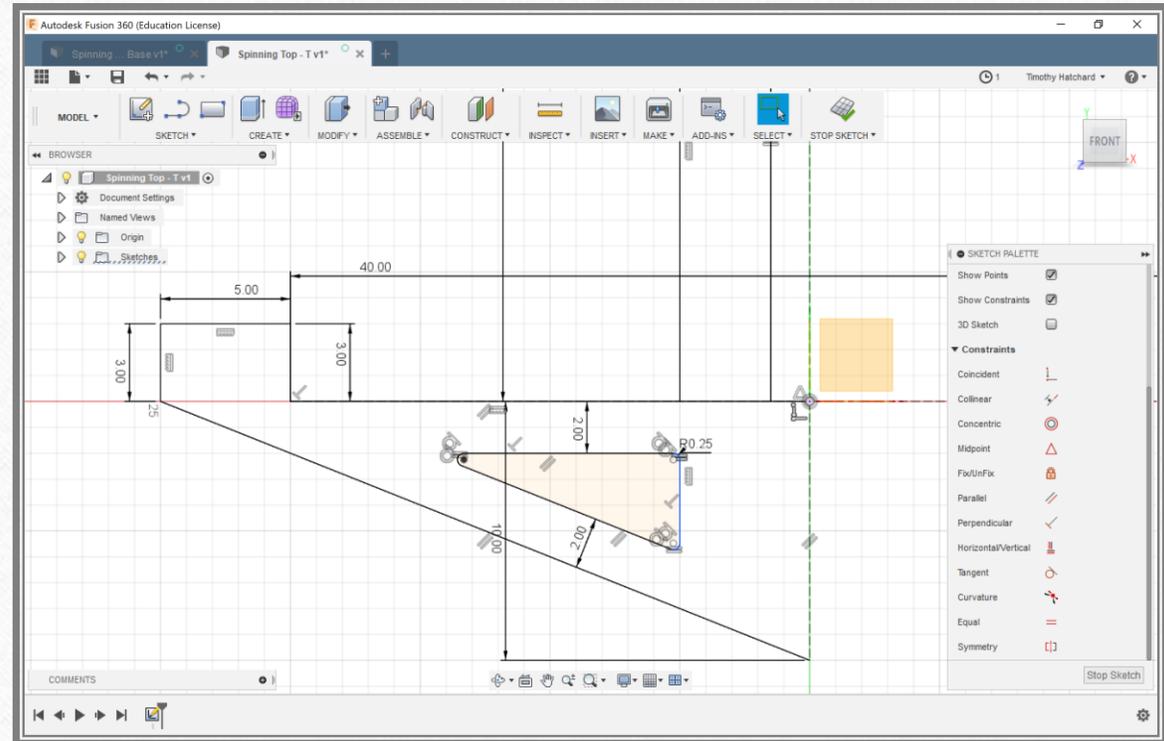
## Step 13

- Draw the following shape as shown by the blue lines.
- This connect the bottom right of the rectangle to the origin, then the bottom left extends out to the edge of the horizontal construction line
- Create the 5mm by 3mm rectangle, as shown, then connect this diagonally to the bottom of the bottom construction line.



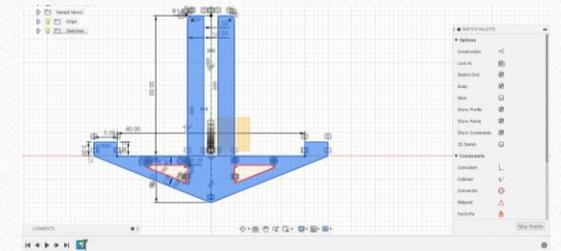
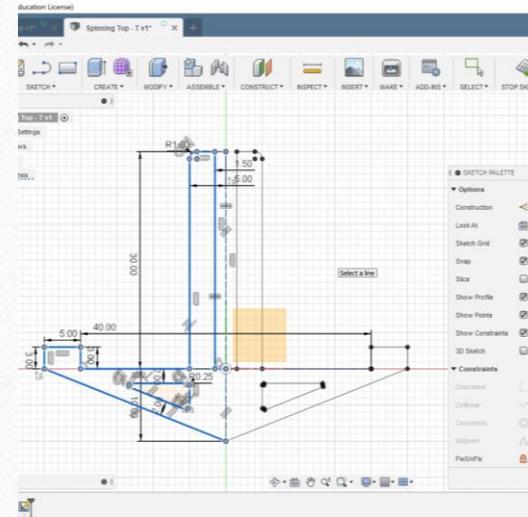
## Step 14

- Cut a triangle into the larger triangle.
- Make each edge parallel with the outer triangle edges.
- Then dimension the edges to be 2mm away from the outer edges.
- Make sure the vertical part of the triangle is collinear with the left edge of the rectangle you drew earlier.
- Ensure you fillet the edges, I chose 0.25mm. This will stop the edges causing cracking.



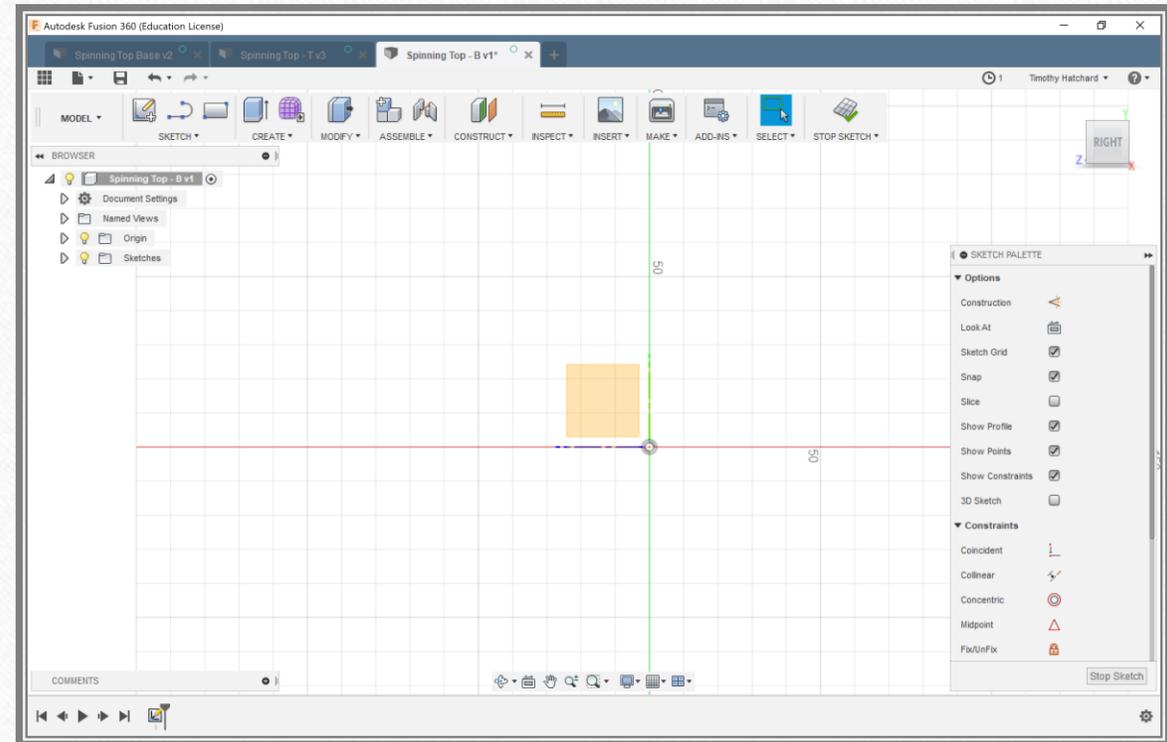
# Step 15

- Select all shapes apart from the centre construction line.
- Mirror everything along the centre construction line.
- Again make this an extrude of 3mm.



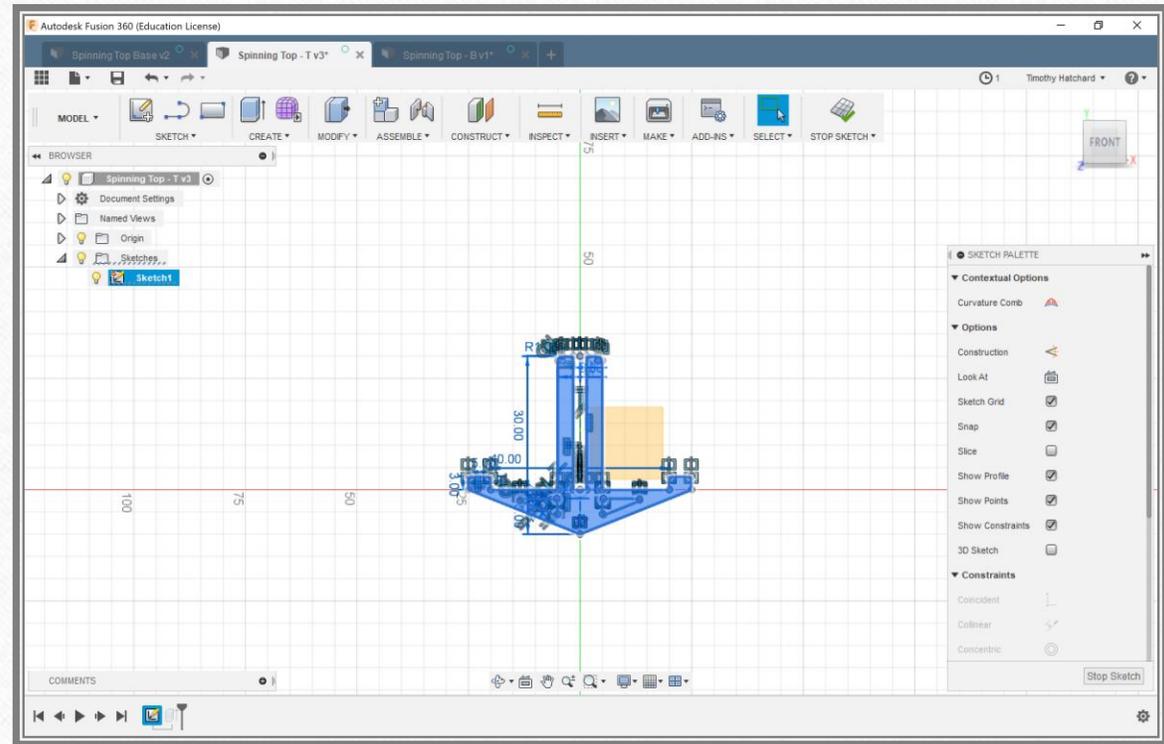
## Step 16

- Create another new design, this time calling it “Spinning Top – B”.
- Create a new sketch this time choosing the right work plane.
- Show the origin again.



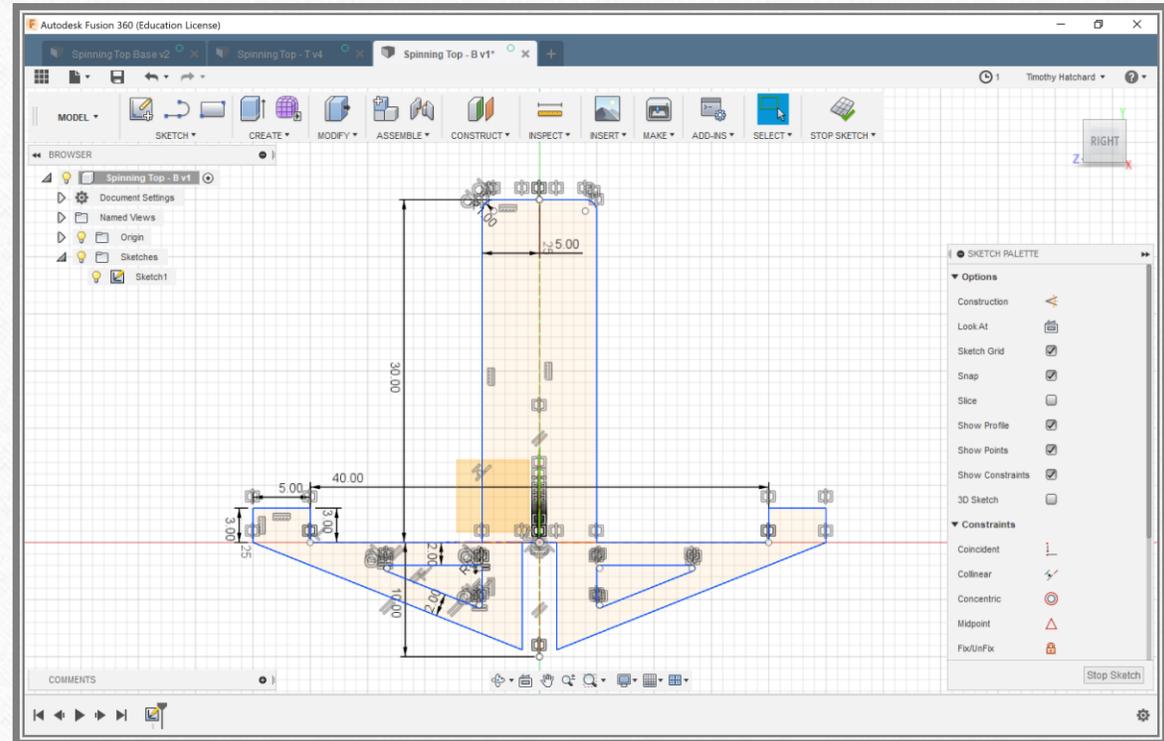
## Step 17

- Go into the sketch from the “Spinning Top – T” design. Select all of it and copy it into your new design's sketch.



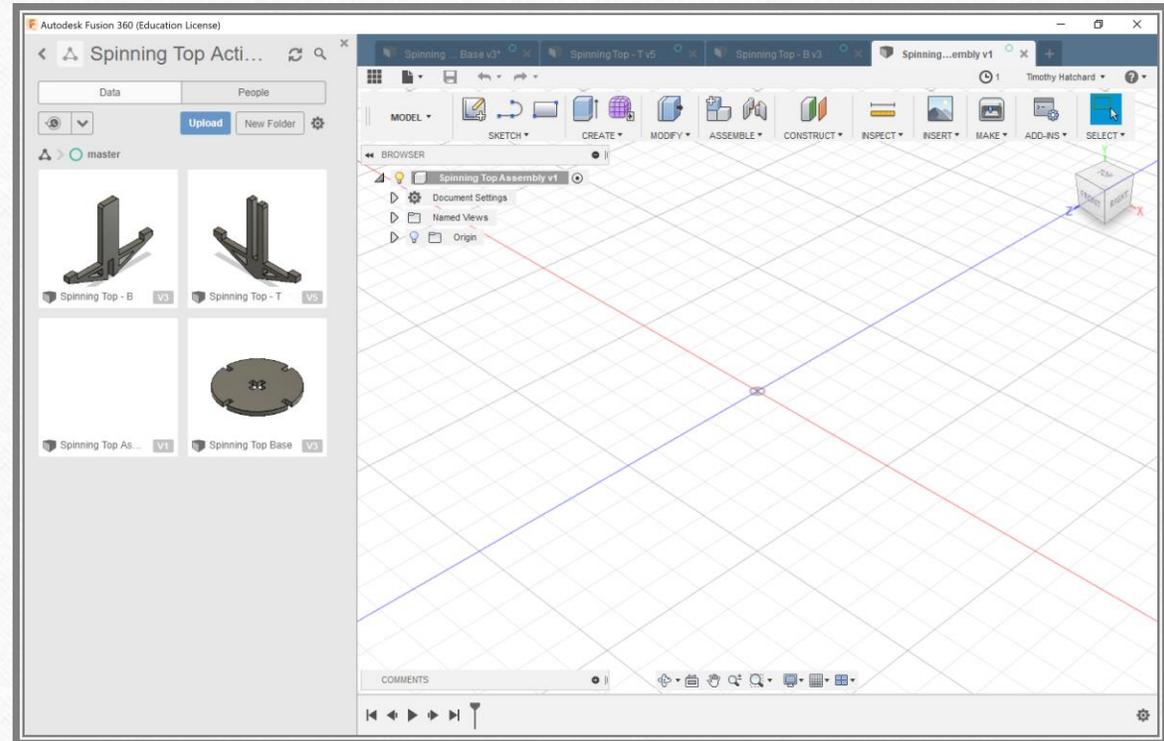
## Step 18

- Simple connect the top of the two rectangles.
- Next, trim the inner lines from the rectangles, leaving the bottom line.
- Now connect the edges of the bottom line vertically downwards to the diagonal line.
- Lastly, trim the middle lines from the diagonal line, creating an almost inverse of the other sketch.
- Once done, extrude your shape.



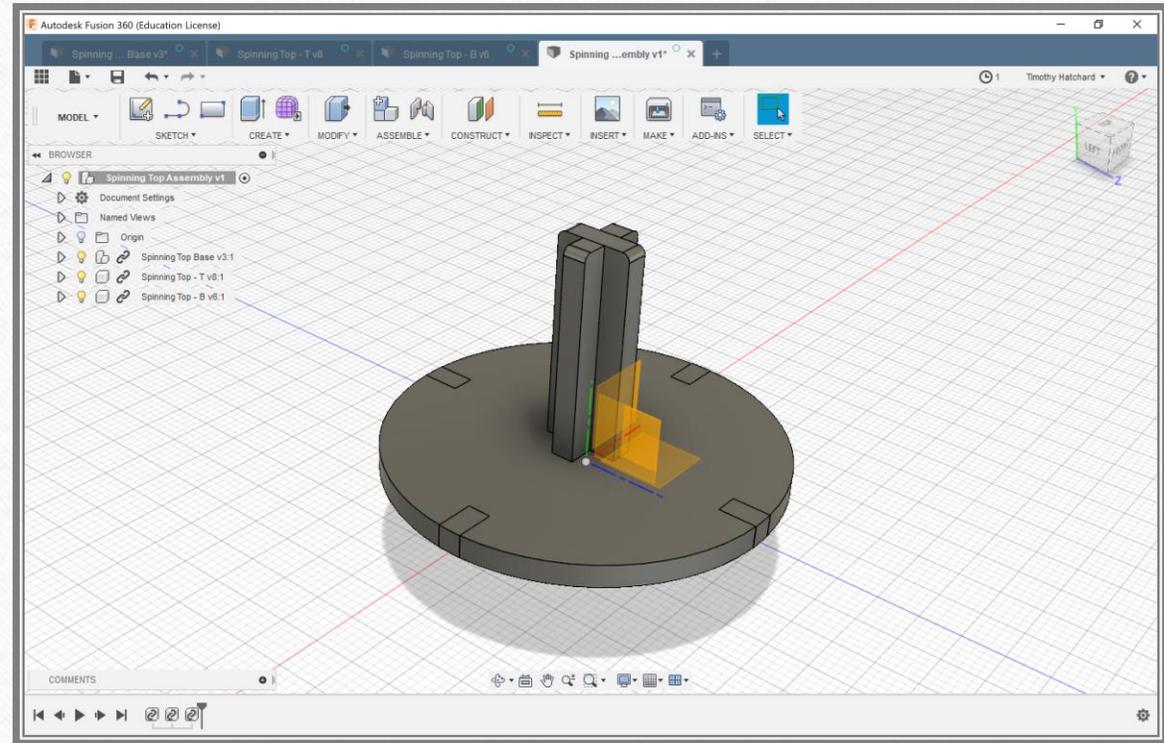
## Step 19

- Create a new design and call it “Spinning Top Assembly”.
- We will use this to test the fit of the basic spinning top.
- For each part that you made, go into the bodies folder, click “Body 1” and select “Create components from bodies”.
- Next go back to the assembly, click the 9 squares icon in the top left and find your project.



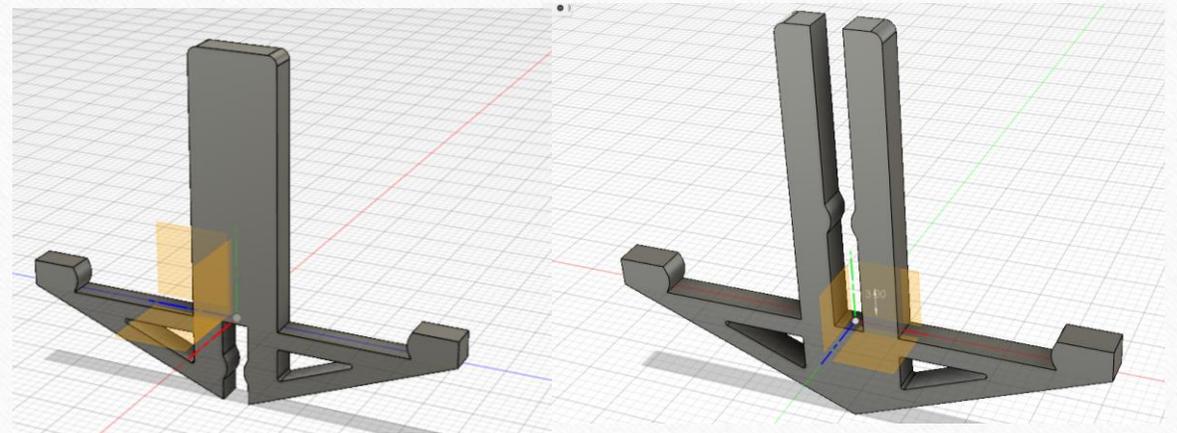
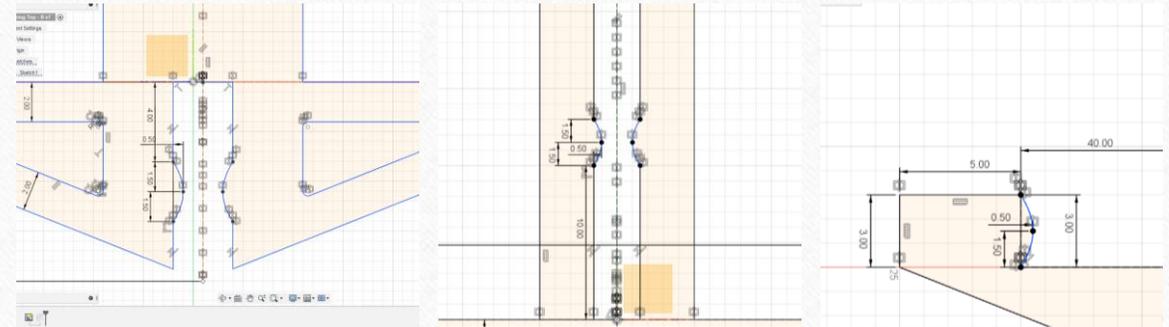
## Step 20

- Drag each component into the work plane and try to line them up together.
- To make it easier to line up, when creating the extrudes for the cross section parts, select symmetric extruding and whole length measurement before defining the 3mm extrude.
- Now that the shapes line up and look good, we can add customisations.



# Step 21

- No we must add grippers to the connecting sections to ensure it's a tight fit.
- Simply add 3mm by 0.5mm splines to joints as shown on the right.
- This will ensure the spinning top fits together snugly.
- Make sure this is done to both cross sectional pieces.



# Laser Cutting

- Export each part (not the assembly) as a DXF file by right clicking on the sketch.
- Import the DXF into the laser cutting software.
- Resize and move to appropriate position, then cut it onto 3mm laser ply.
- Ensure that when laser cutting, the grain of the wood goes along the width of the cross sections as shown; align the grain with the orange arrows when cutting the shape. Otherwise they will become brittle and snap easily.



# Finished Product

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- When assembling it is recommended to file down the grippers so the spinning top fits together snugly without breaking.
- Use sharpies or felt tip pens to colour your spinner and make it your own!



Thank you for taking part!

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