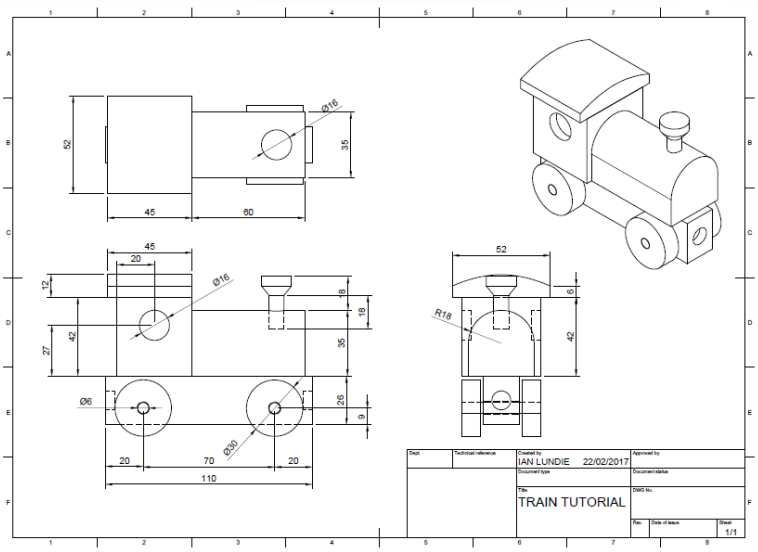
# Train Tutorial Fusion 360 – Year 7

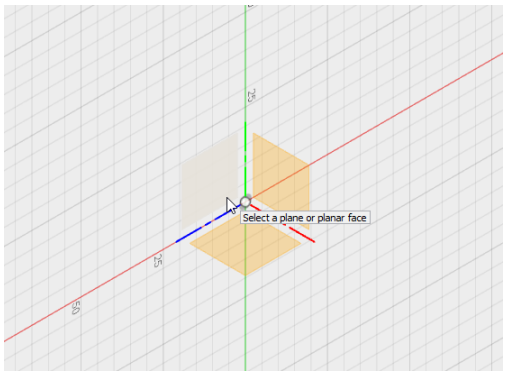
AUTODESK® FUSION 360™



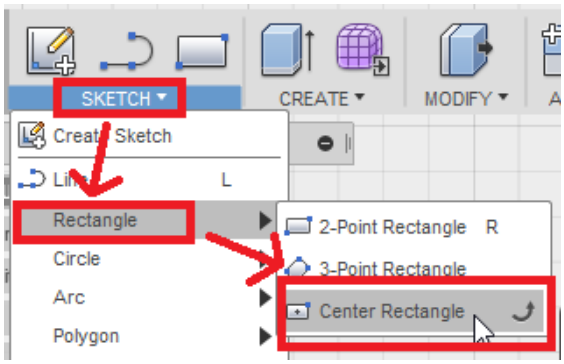
# Contents

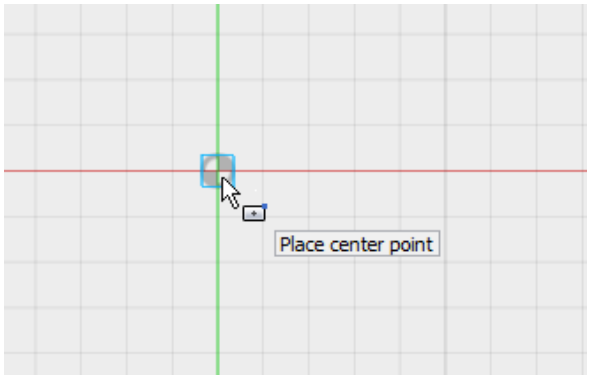
## Part 1. Basic Shape

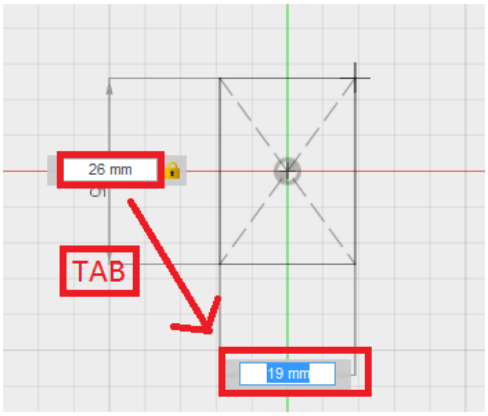
**Step 1.1.** Click the Create Sketch button and select the plane as shown:



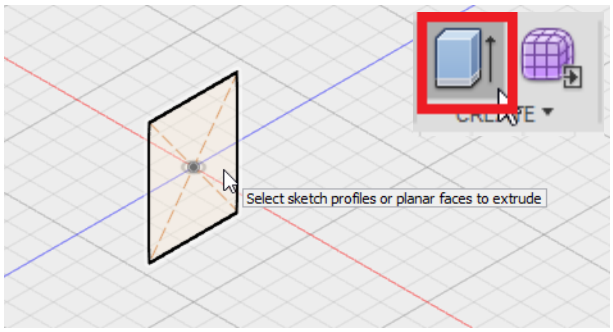

**Step 1.2** From the drop-down Sketch menu, select Center Rectangle and start at the origin. Set the dimensions to 26x19mm. Use the Tab key to switch between fields.

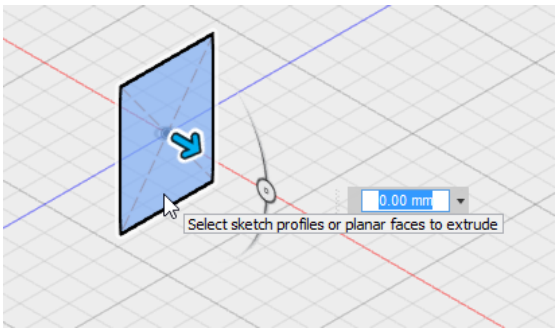


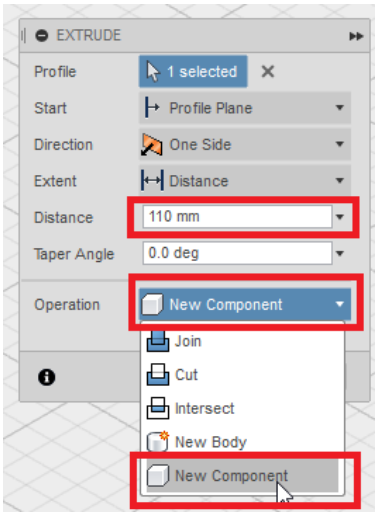



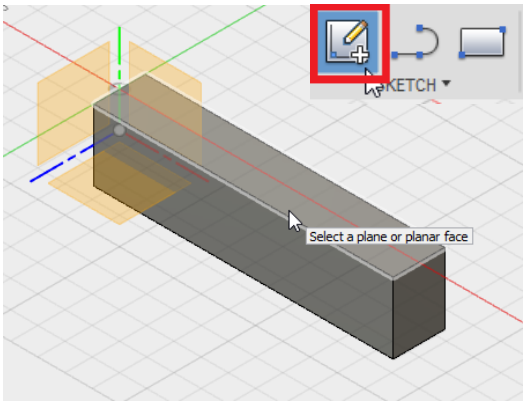
**Step 1.3** Click the Extrude button in the create menu to make the sketch 3D. Type or drag the blue arrow to a distance of 110mm.



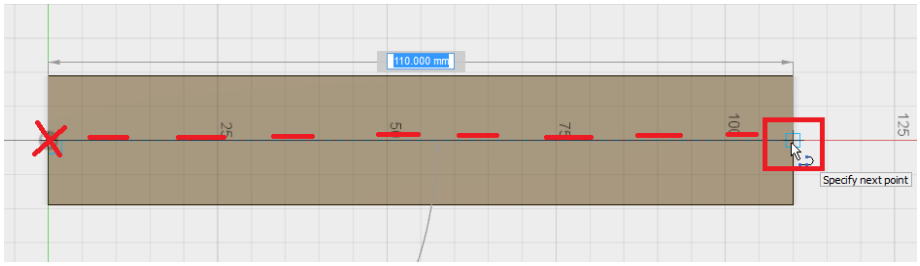



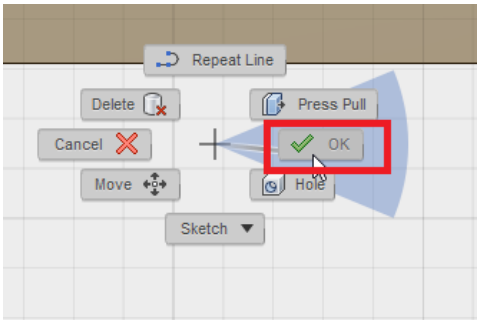

**Step 1.4** Click the Create Sketch button again and select the top of the chassis.



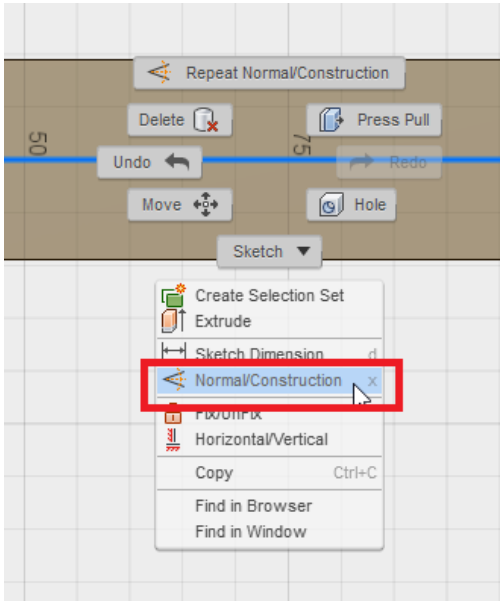

**Step 1.5** Using the line tool from the Sketch menu, draw a line through the center as shown.



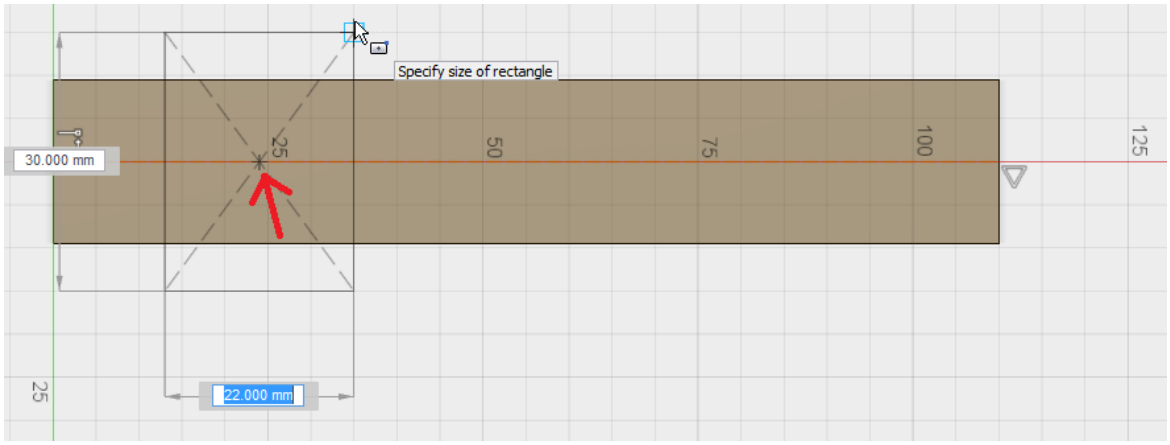
Right click and select OK to deselect the line tool. Pressing ESC does the same job.




**Step 1.6** Right click on the line and select 'Normal/Construction' to make it a construction line.

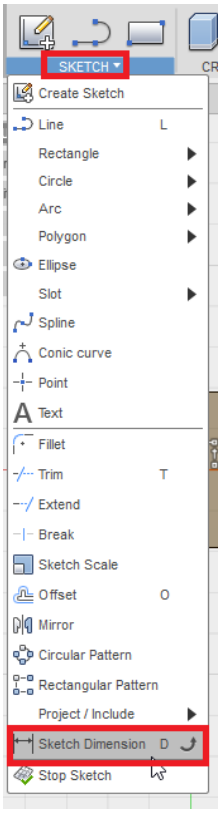


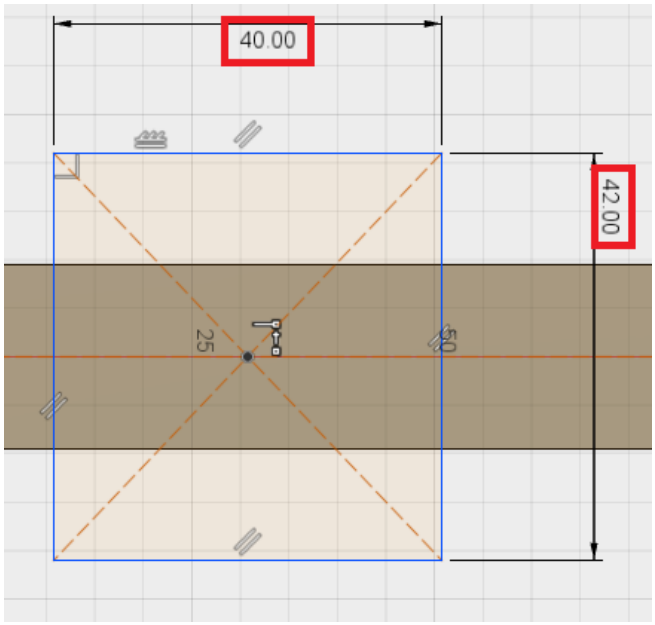

**Step 1.7** Using the Center Rectangle tool (from the Sketch menu) draw a rectangle centered on the construction line.



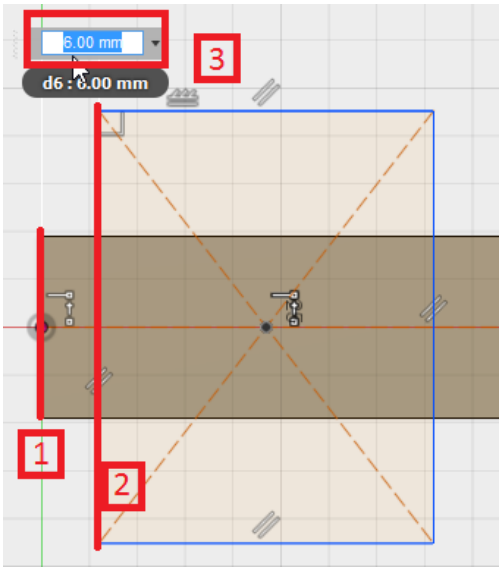
**Step 1.8** Use the Sketch Dimension tool (from the Sketch menu) to specify a 40x42mm rectangle. Click to select a line, move the dimension out from the model and type a value.

**Having trouble with this step?** *View the step-by-step animations on MyTGS.*



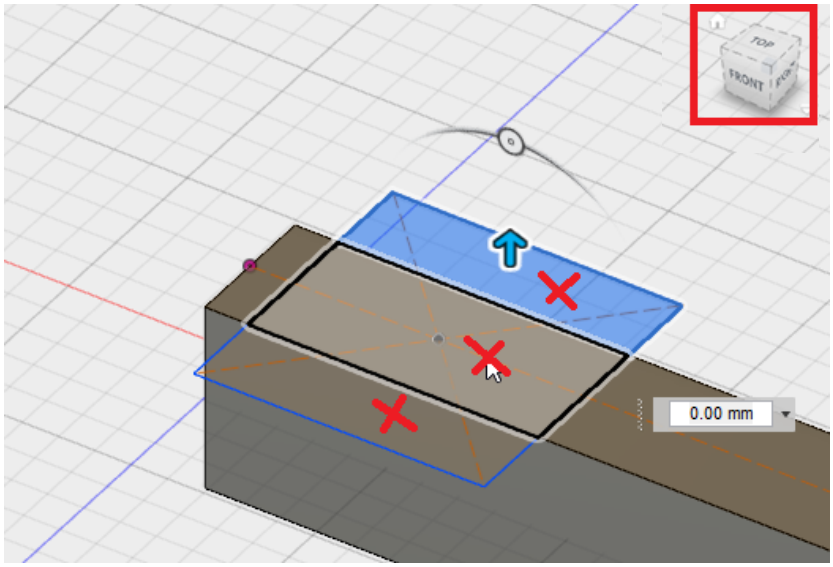



**Step 1.9** Again using the Sketch Dimension tool (from the Sketch menu), offset the rectangle 6mm from the end of the chassis.



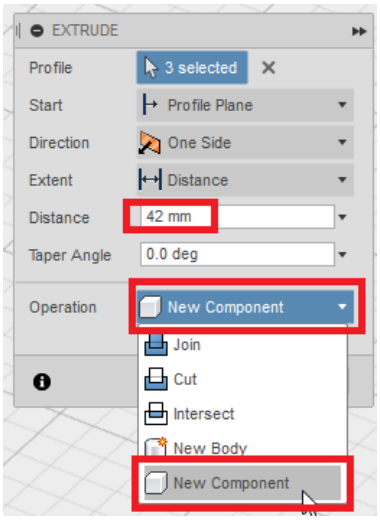

**Step 1.10** Click the Extrude button (Modify menu) to Extrude the rectangle 42mm. Make sure that the operation is set to 'New Component'.

*The view can be rotated by clicking and dragging the view cube in the upper right corner.*

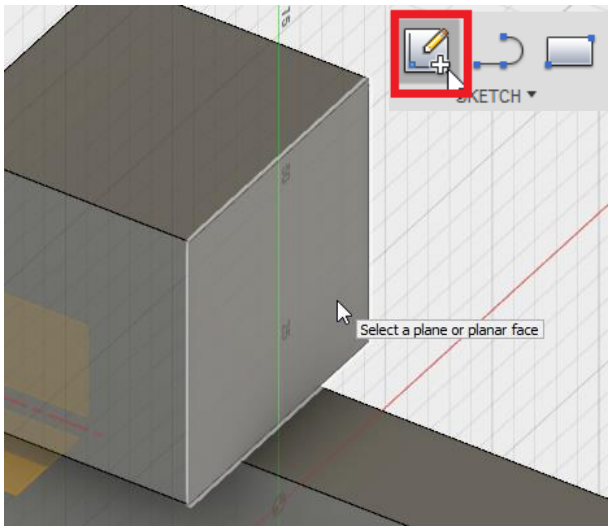



Select the entire rectangle by clicking all the divisions.

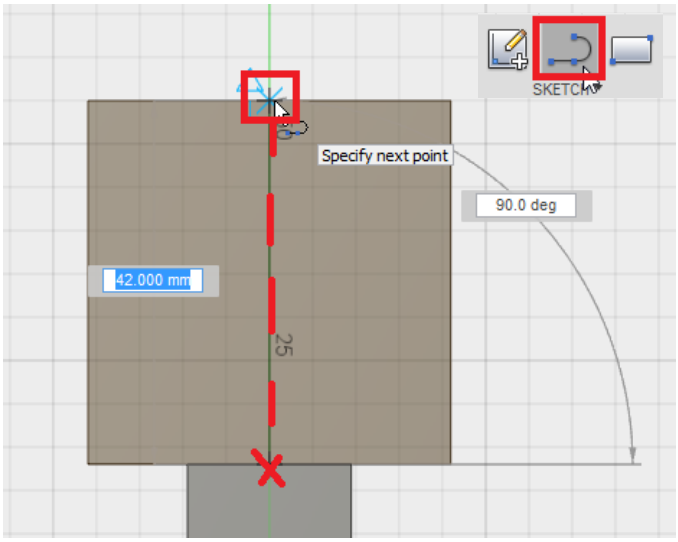
Select the following parameters and click OK. **'New Component' must be selected** to keep each part separate for assembly.

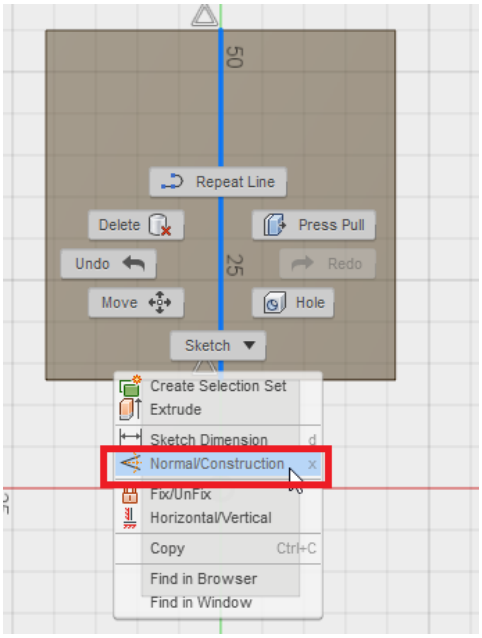



**Step 1.11** Using the Create Sketch button, create a new sketch on the front face of the cabin.

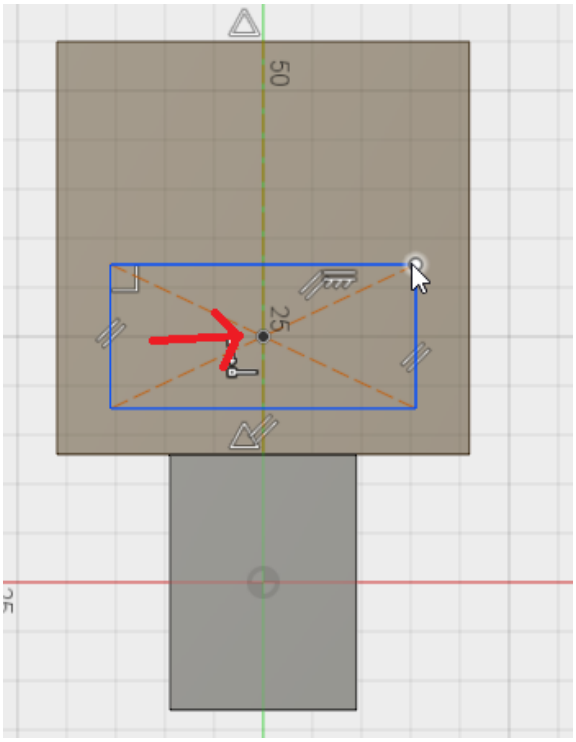



**Step 1.12** Draw a center line using the line tool. Press the Esc key to deselect the line tool, right click and select 'Normal/Construction' to make it a construction line.

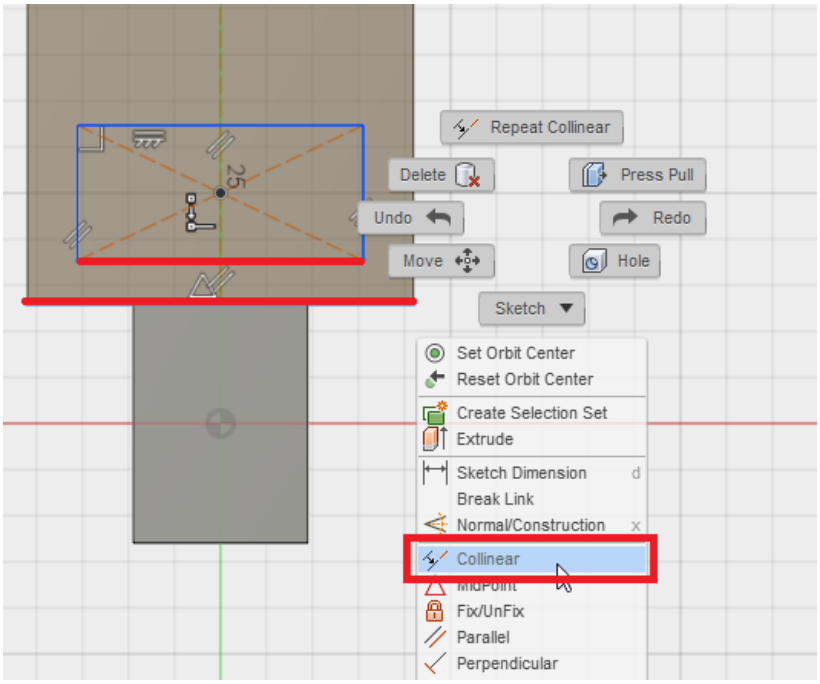




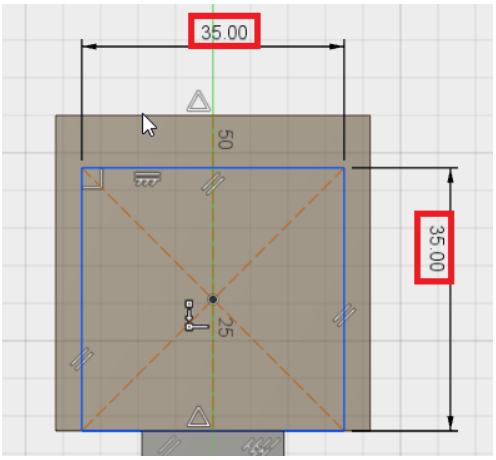

**Step 1.13** Draw a center rectangle on the center line. Roughly draw it as shown, dimensions will be added next.



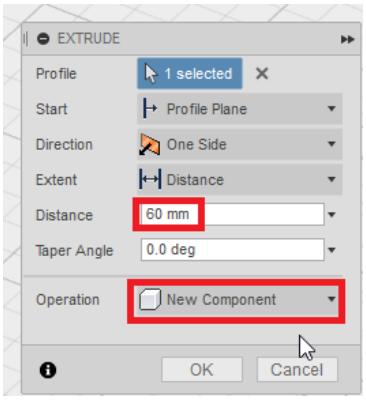
**Step 1.14** Select both lines as shown by holding the Shift key. Right click and select 'Collinear'.



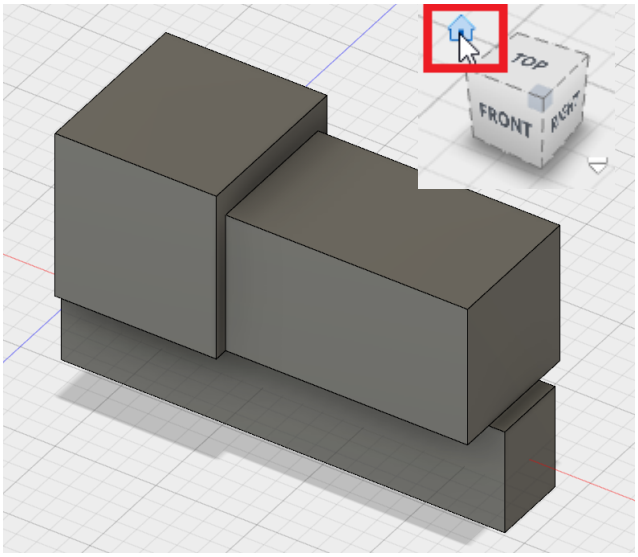

**Step 1.15** Use the sketch dimension tool from the sketch menu to specify the 35x35mm square.



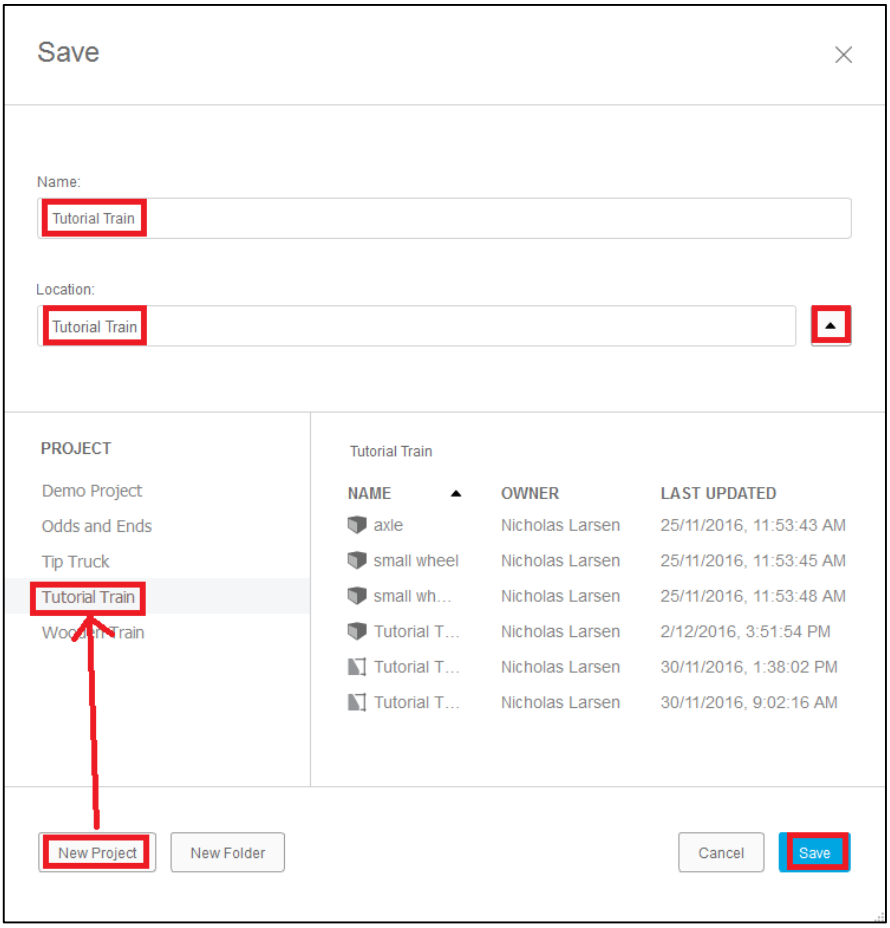

**Step 1.16** Extrude the square 60mm. **Make sure that the operation is 'New Component'.**



**Step 1.17** Pressing the home button displays the standard view.

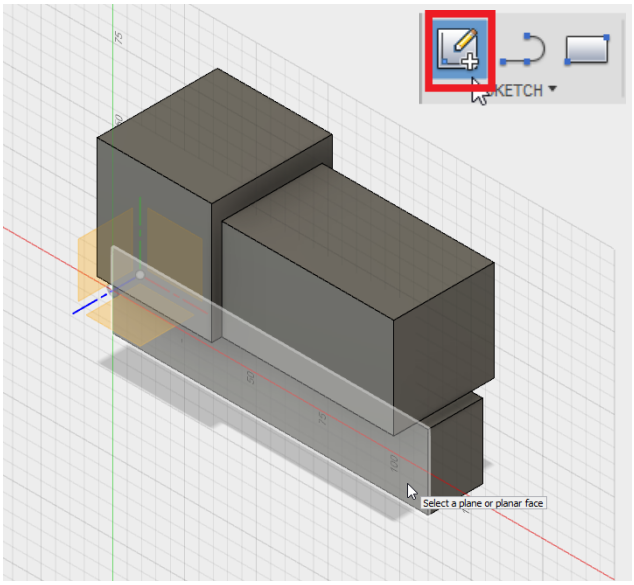



*Save your work under a new project named 'Tutorial Train'.*

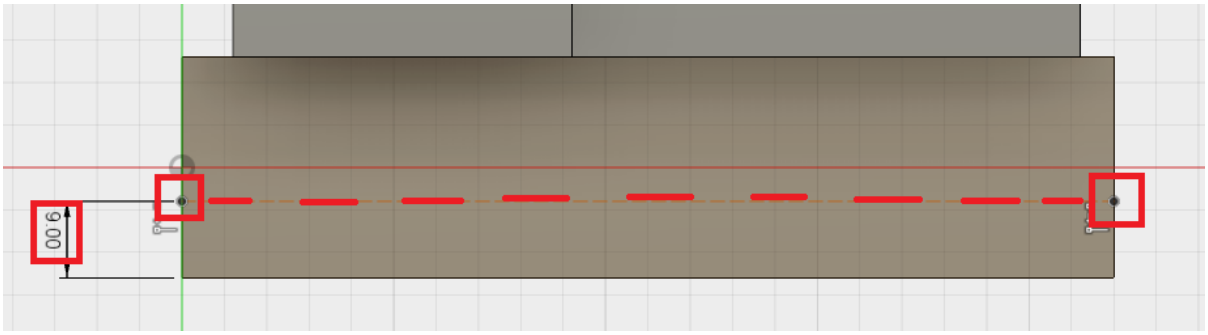


## Part 2. Axle Holes

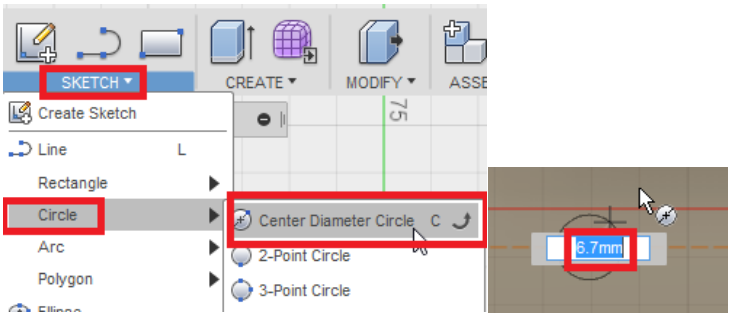
**Step 2.1** Create a new sketch on the side of the chassis.

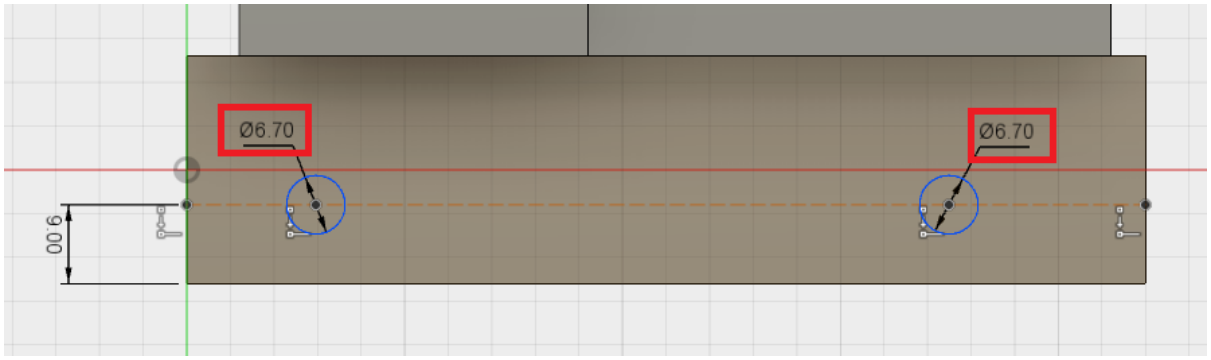



**Step 2.2** Draw a line across the chassis as shown below. Use the dimension tool to set the distance 9mm from the bottom of the chassis. Press the Esc key to deselect the line tool, right click and select 'Normal/Construction' to make it a construction line.



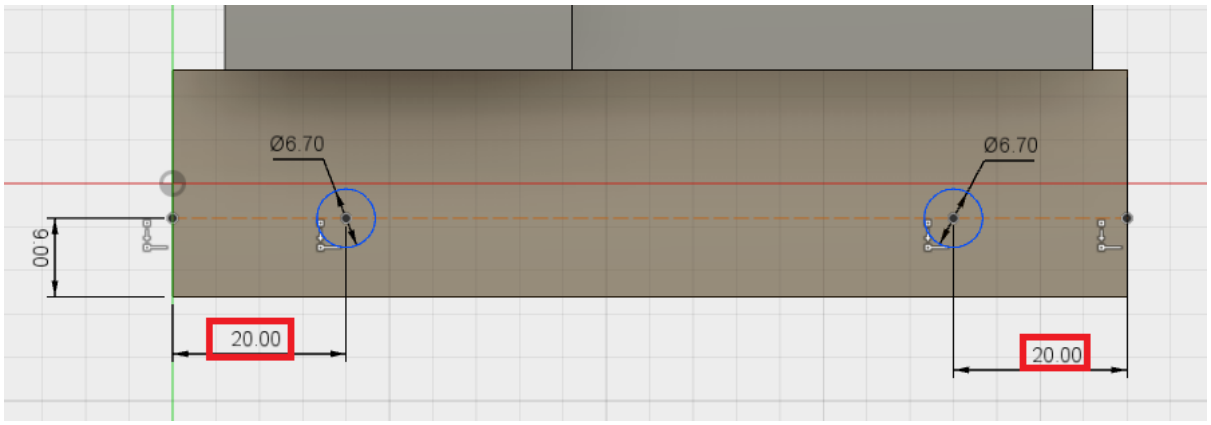

**Step 2.3** Draw two 6.7mm center circles along the construction line.



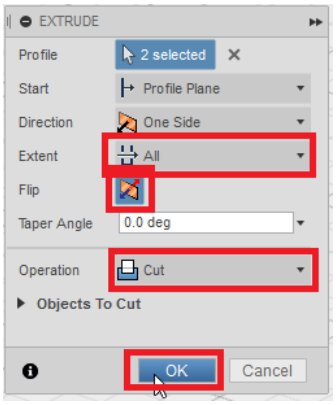


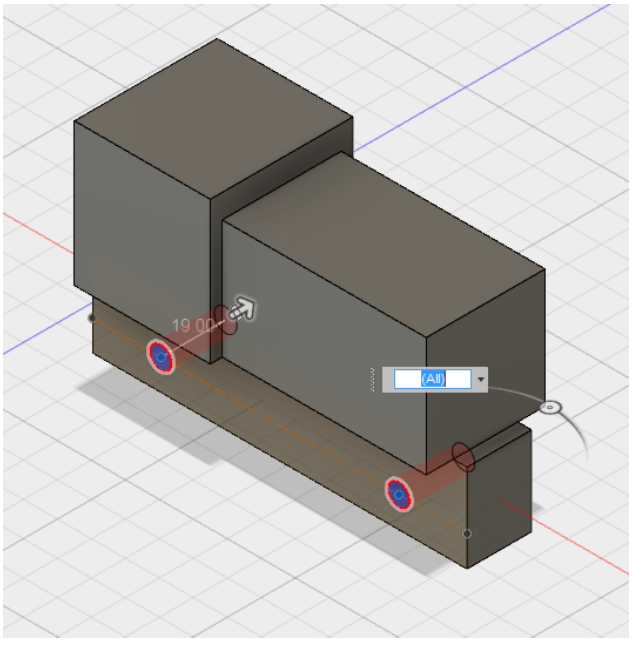

**Step 2.4** Dimension the circles to be 20mm from each end of the chassis.

*Using the dimension tool, first click the center of the circle, then the edge of the chassis.*



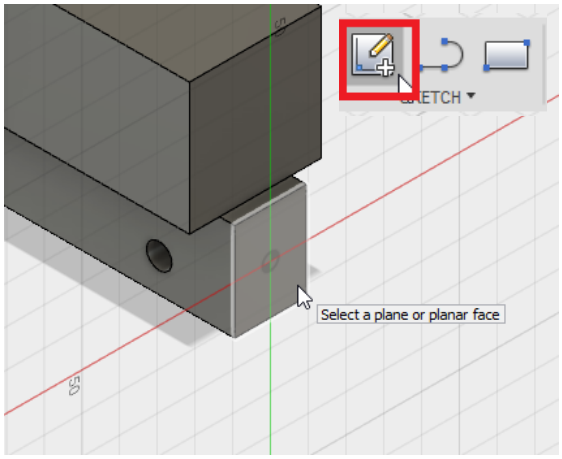

**Step 2.5** Use the extrude tool to cut through the chassis. Select Extent 'All' to cut all the way through. Click the Flip button to change the direction of the extrusion.

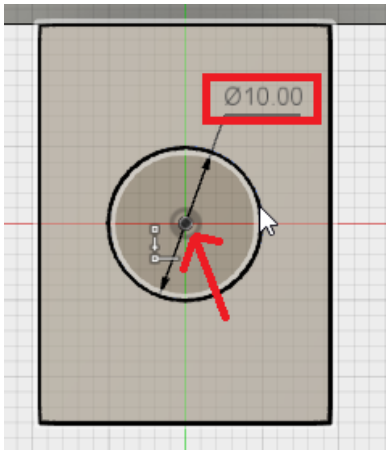


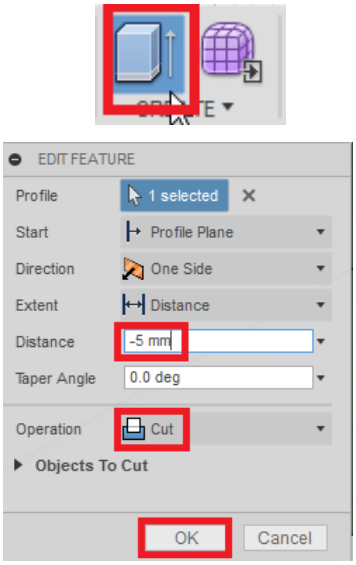
## Part 3. Magnet Holes

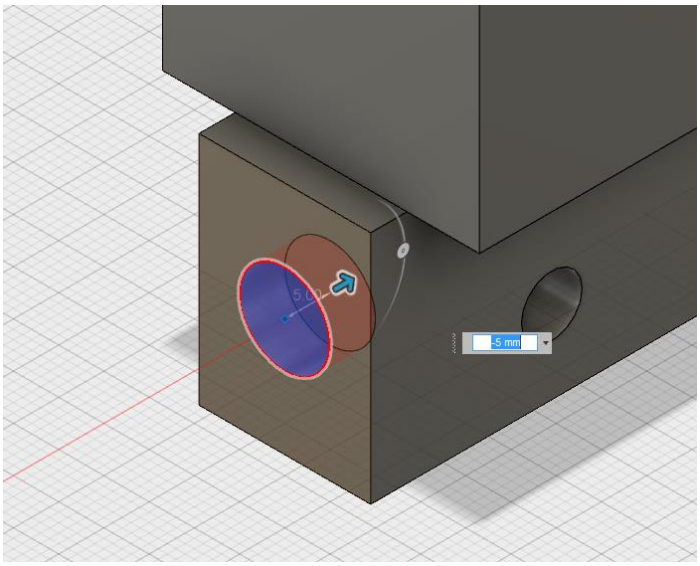
**Step 3.1** Create a sketch on the front face of the chassis and draw a 10mm circle at the center point.



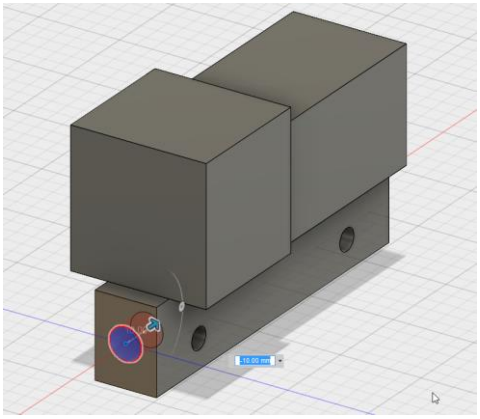




**Step 3.2** Use the extrude button to cut 5mm into the chassis.



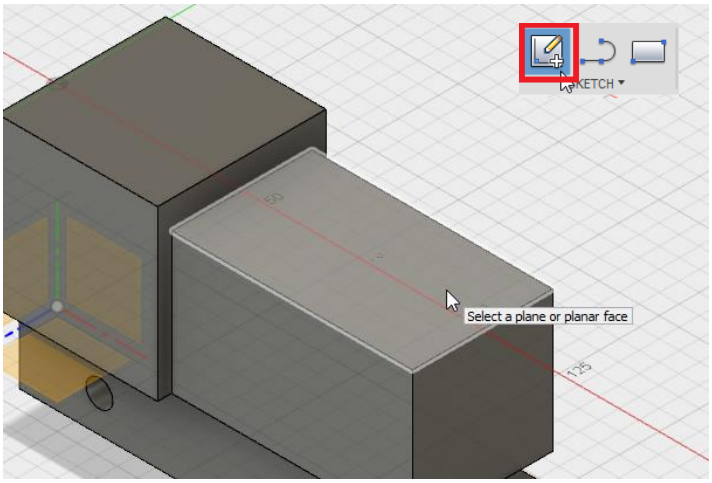



**Step 3.3** Repeat for the other end of the chassis.

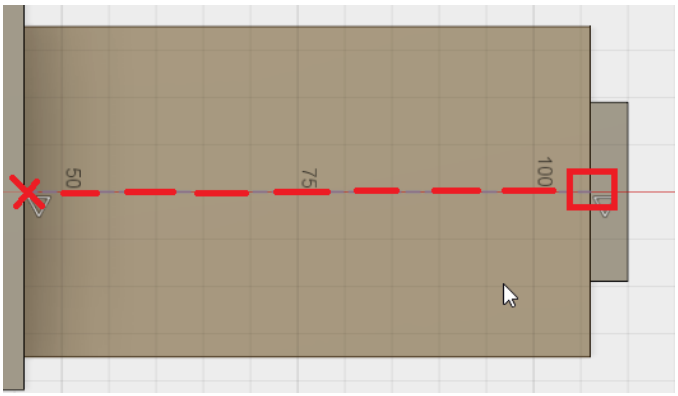


## Part 4. Funnel Hole

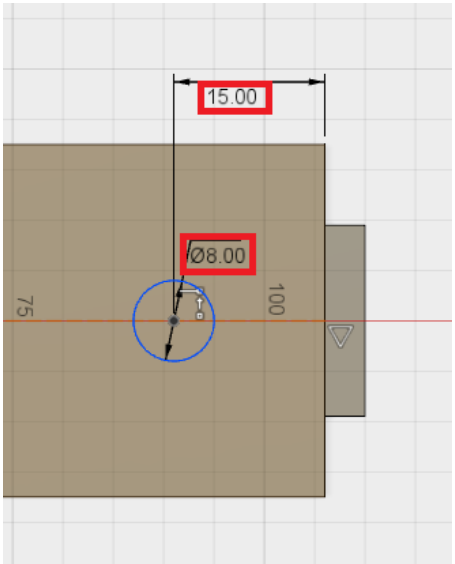
**Step 4.1** Create a new sketch on the top face of the boiler.



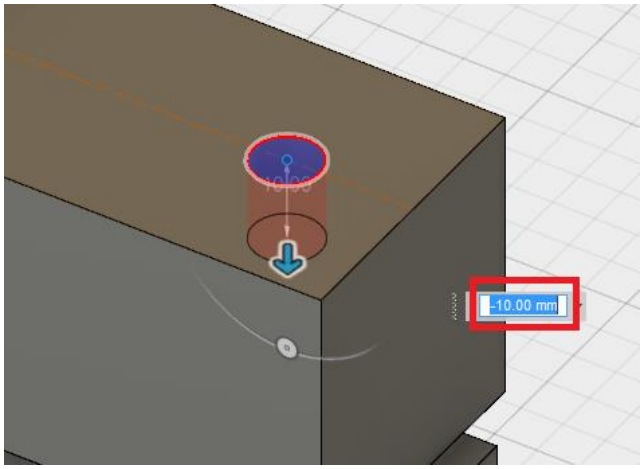

**Step 4.2** Draw a center construction line. Right-click and select ‘Normal/Construction’ to make it a construction line.



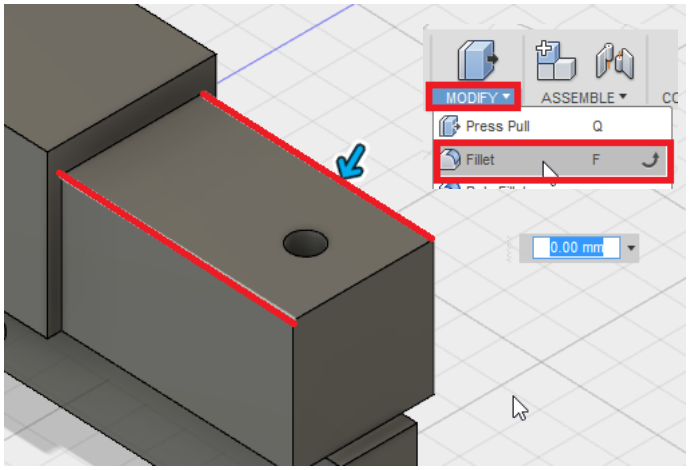

**Step 4.3** Draw an 8mm diameter center circle 15mm from the front of the boiler.

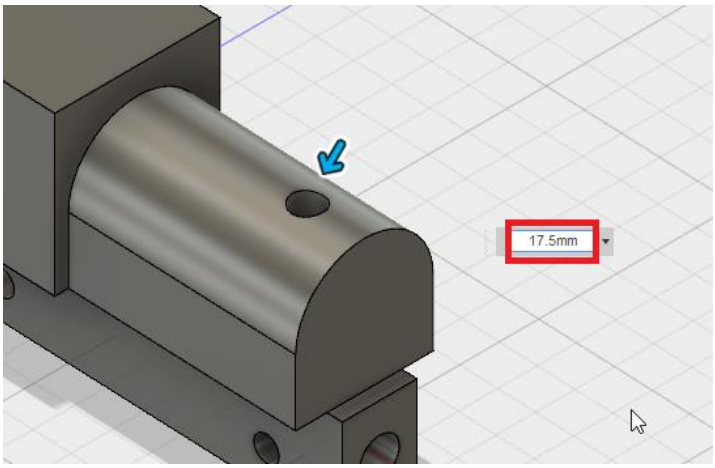


**Step 4.4** Use the extrude tool to cut 10mm into the boiler.



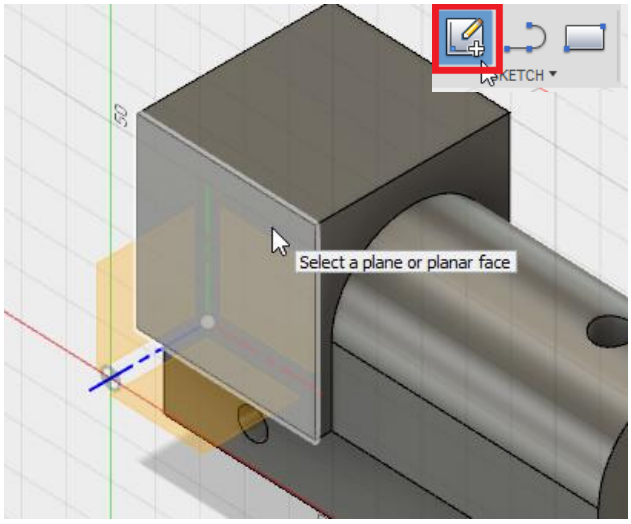

**Step 4.5** Use the 'fillet' tool from the Modify menu. Click on both side edges of the boiler and specify a radius of 17.5mm.



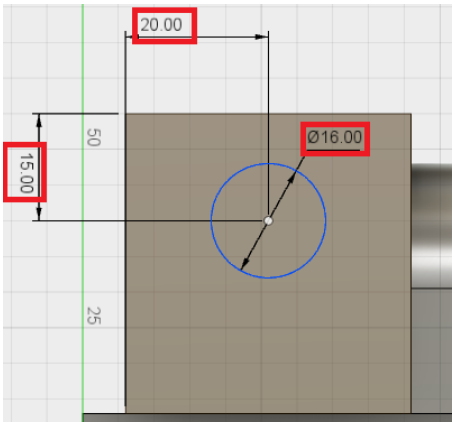



## Part 5. Cabin Windows

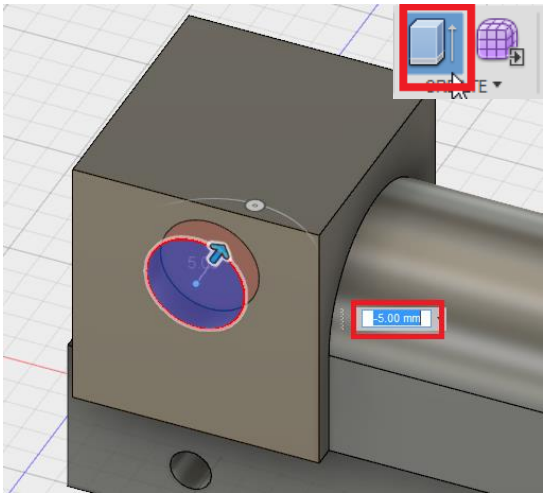
**Step 5.1** Create a new sketch on the side of the cabin.



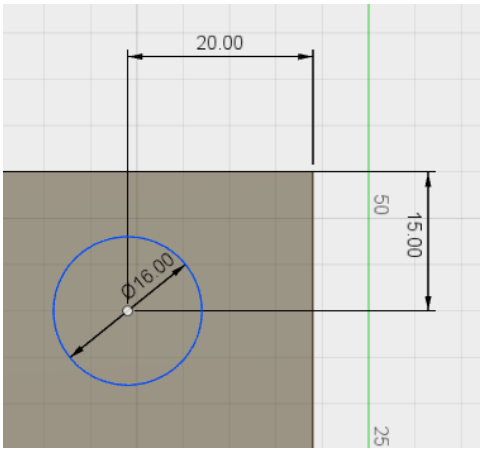

**Step 5.2** Draw a 16mm circle inside the cabin. Dimension the circle 20mm from the rear and 15mm from the top of the cabin.

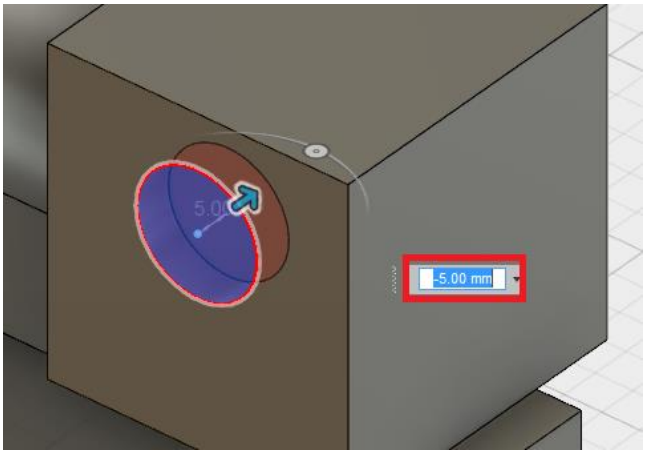


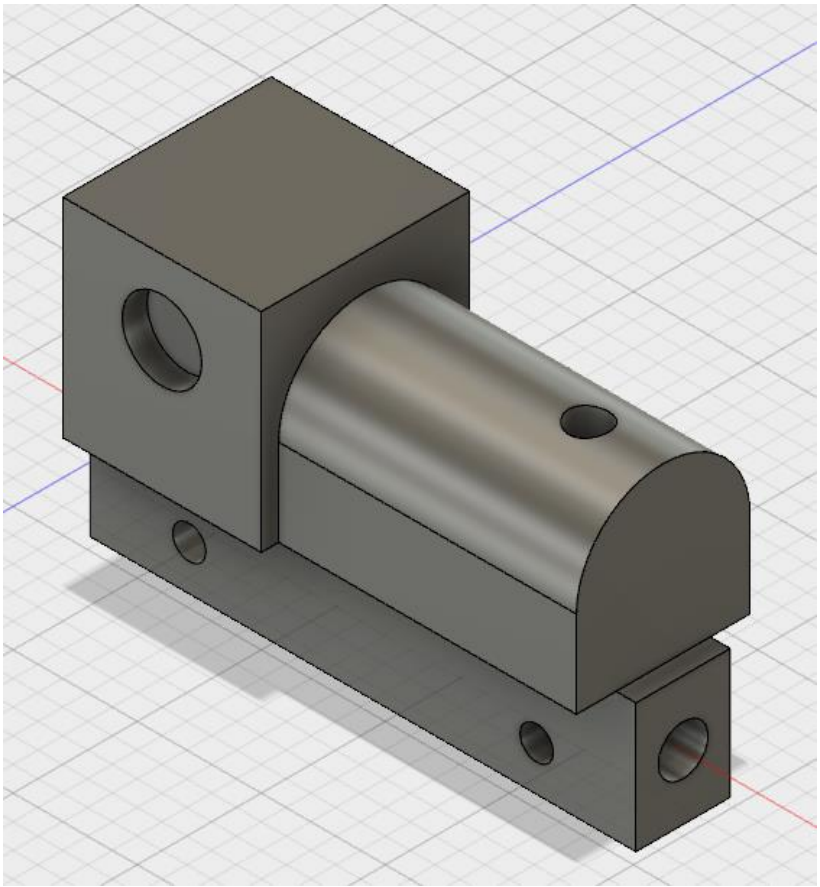

**Step 5.3** Use the extrude tool to cut 5mm into the cabin.



**Step 5.4** Repeat for the other side of the cabin.

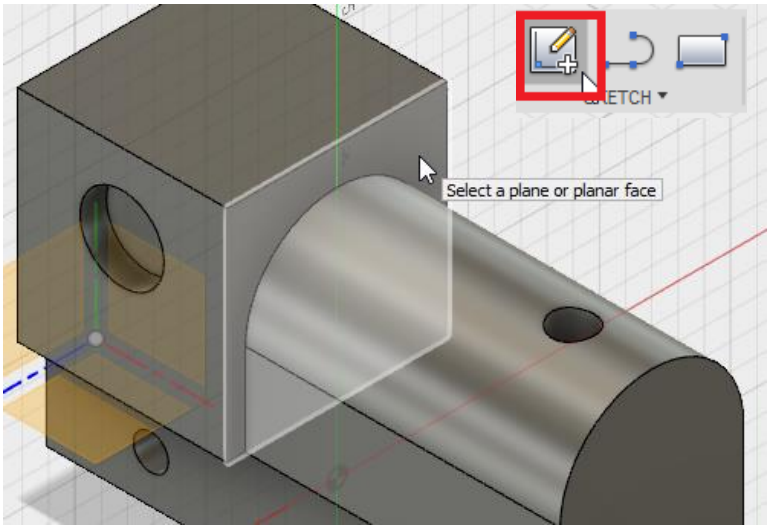


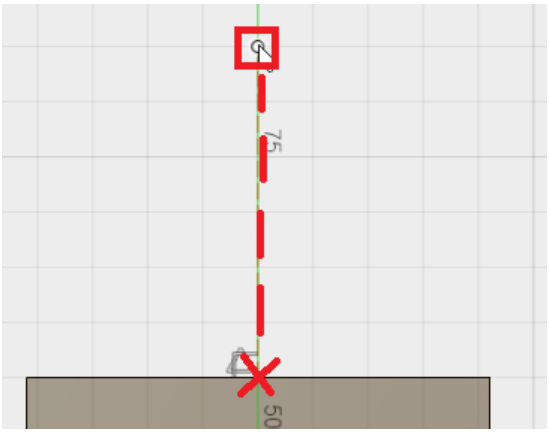



## Part 6. Cabin Roof

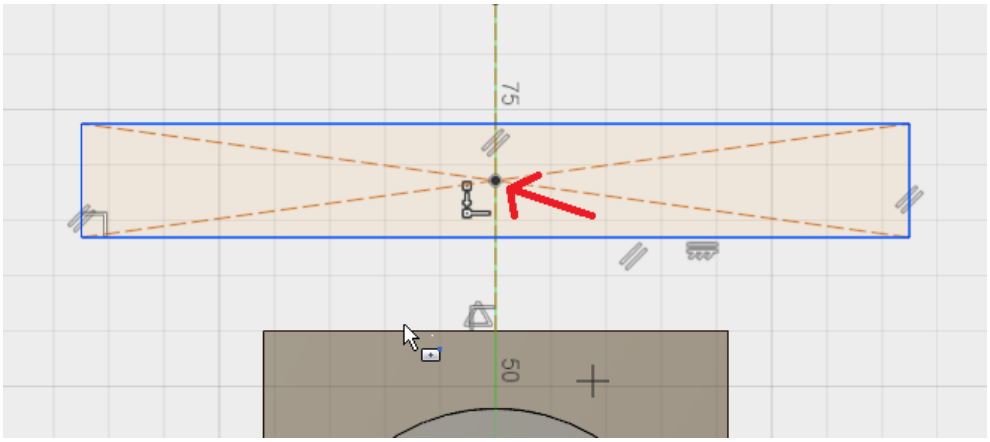
**Step 6.1** Click the Create Sketch button (from the Sketch menu) and select the front face of the cabin.



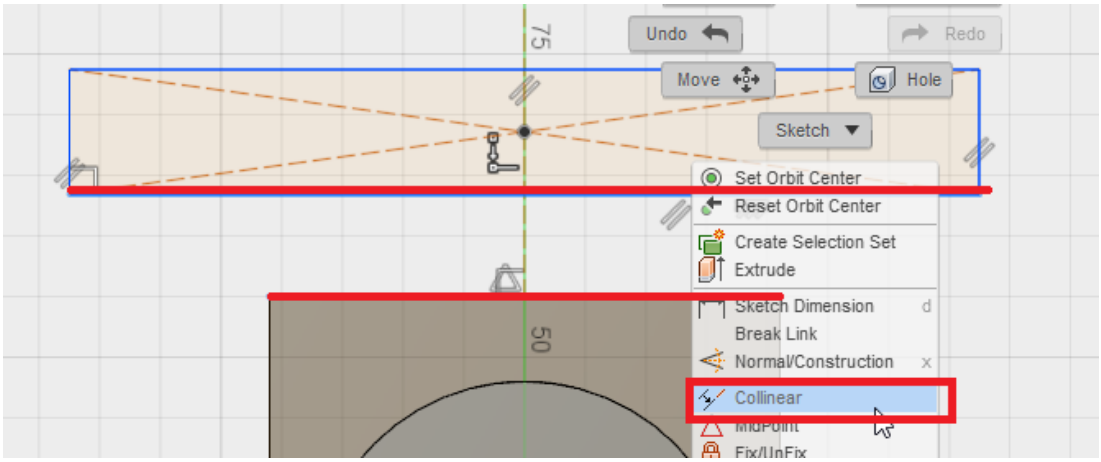

**Step 6.2** Draw a construction line up from the center of the cabin top. Press the Esc key to deselect the line tool, right click and select 'Normal/Construction' to make it a construction line.



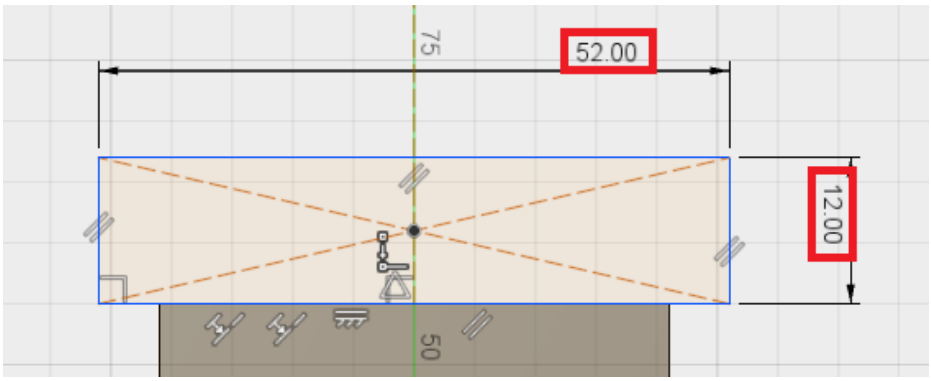

**Step 6.3** Draw a Center Point Rectangle on the construction line. Draw it roughly to size as shown.



**Step 6.4** Constrain the bottom edge of the rectangle to be collinear with the top of the cabin. Hold the shift key to select both edges and right-click to bring up the menu.

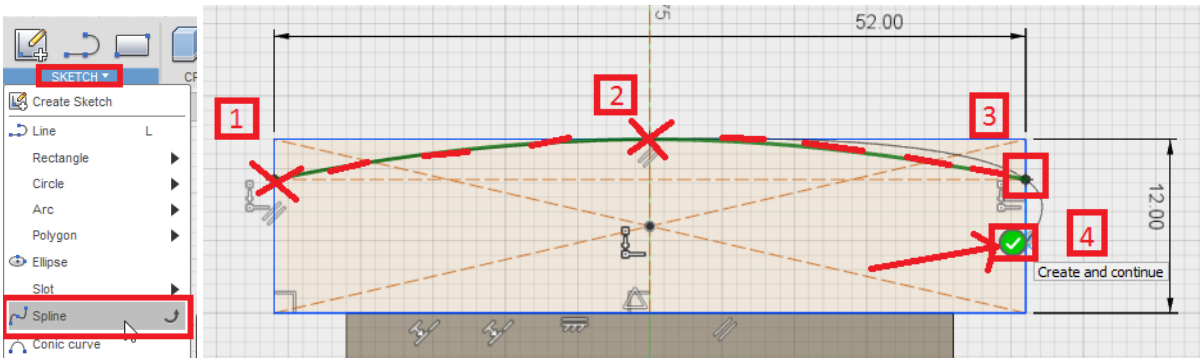



**Step 6.5** Using the dimension tool from the Sketch menu, specify the dimensions of the rectangle to be 12x52mm.

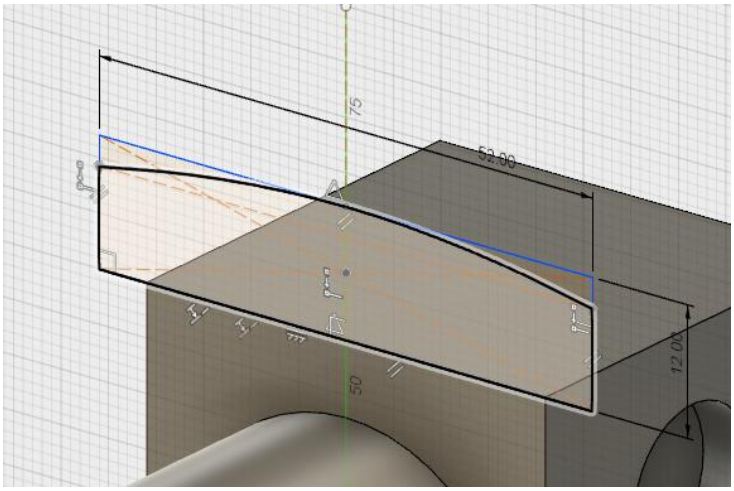


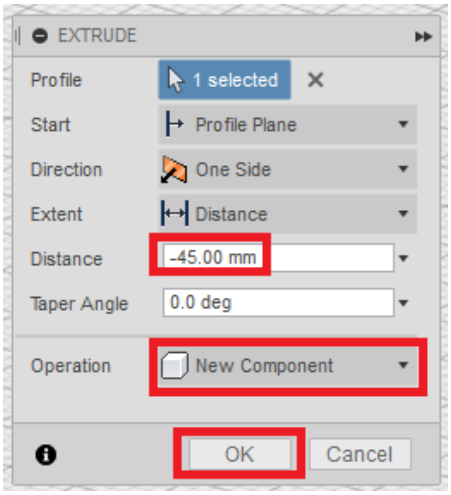

**Step 6.6** Draw a construction line below the top of the rectangle. Specify a dimension of 8mm from the bottom. Right-click and select 'Normal/Construction' to make it a construction line.

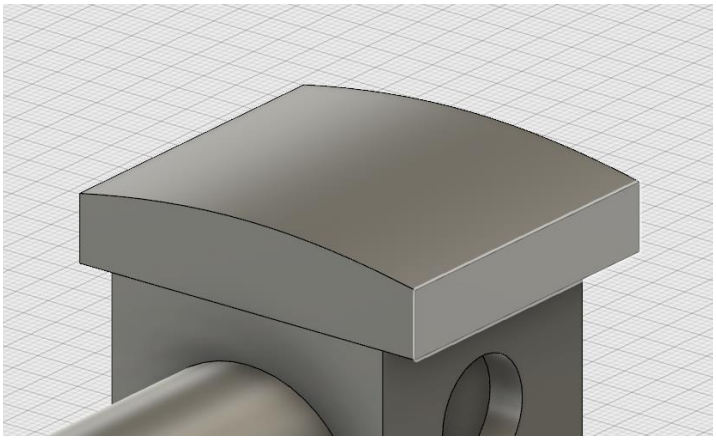
**Step 6.7** Use the spline tool from the Sketch menu to draw a curve using the construction line as endpoints. Click the tick when finished.




**Step 6.8** Click the extrude button and select the sketch profile. Extrude a distance of 45mm towards the rear of the train. *Make sure that 'New Component' is selected.*

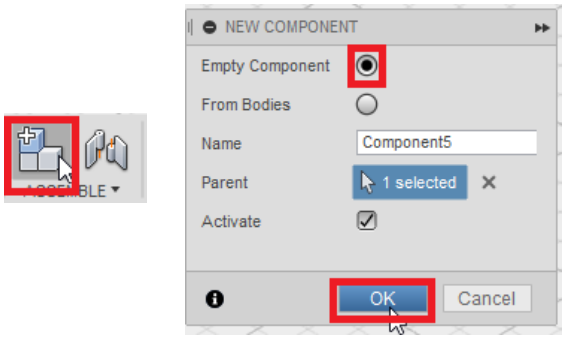




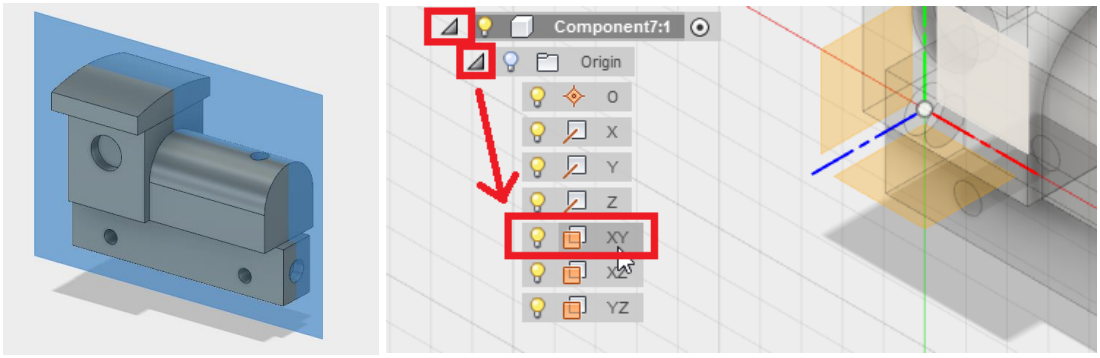
## Part 7. Funnel

**Step 7.1** Click the New Component button (from the Assemble menu) and click OK to insert an empty component.

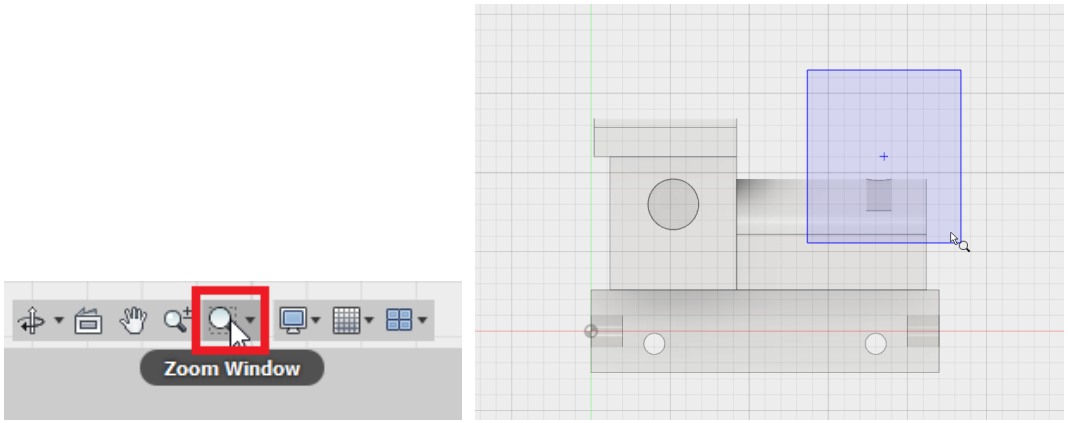



**Step 7.2** We want to create a new sketch on the center plane of the part (as illustrated below). Click Create Sketch and select the XY plane from the Browser (under Origin).

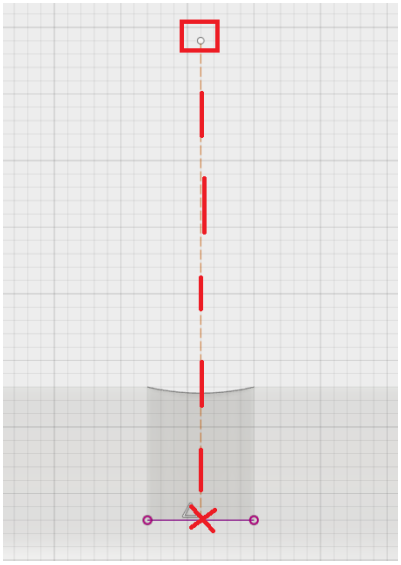
*This step is tricky. Watch the GIF for this step on MyTGS.*



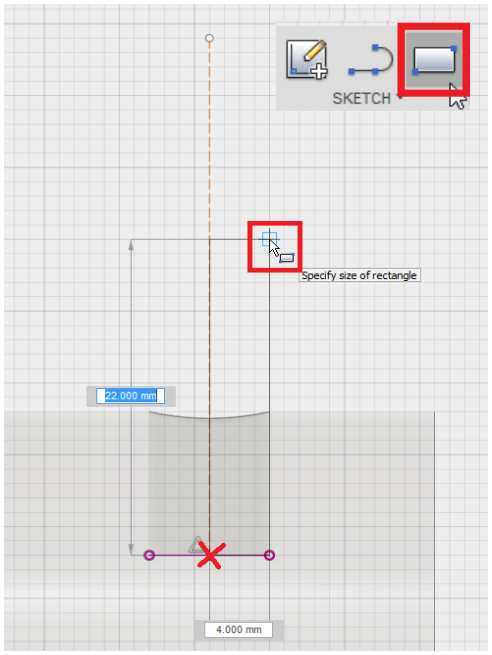

**Step 7.3** Use the zoom tool to get a closer look.



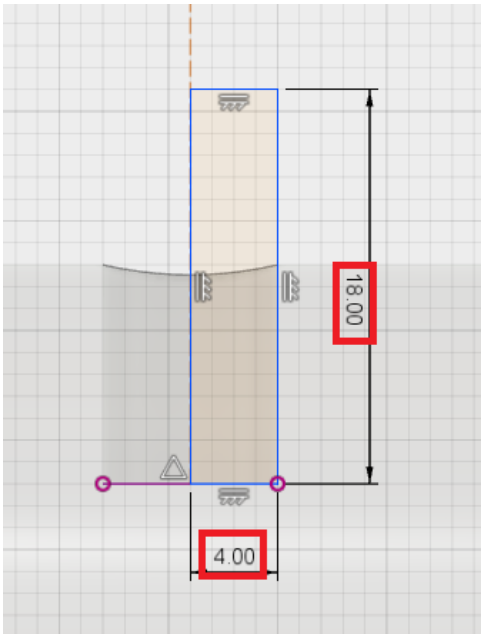
**Step 7.4** Use the line tool and draw a line through the center of the funnel hole. Right click and make it a construction line.



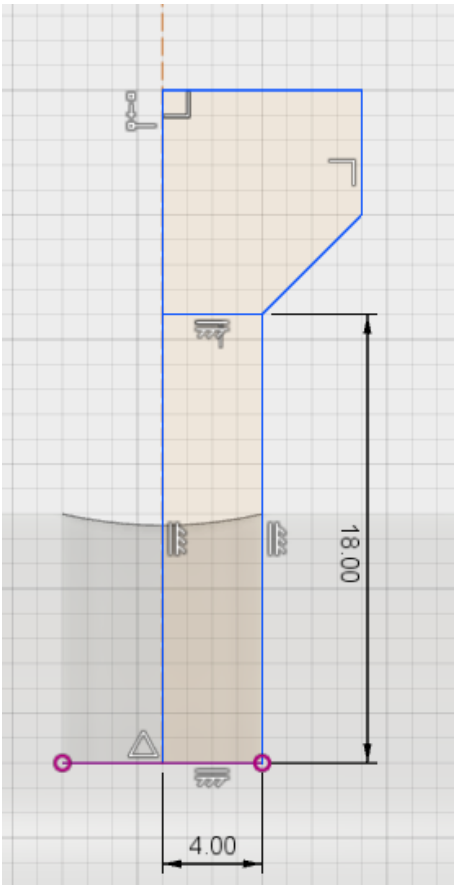
**Step 7.5** Draw a 2-Point rectangle from the end of the line.



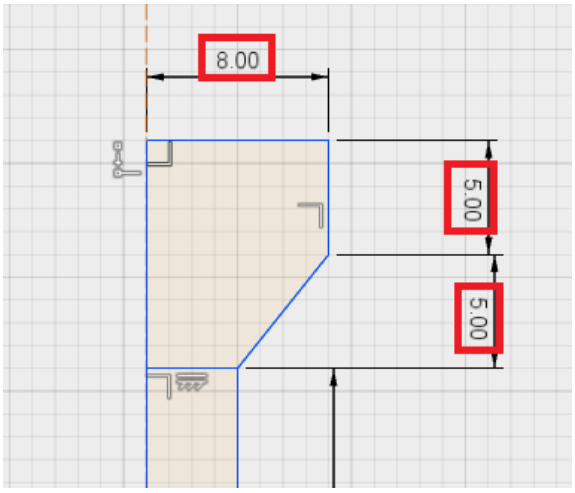
**Step 7.6** Add the dimensions to specify the 4x18mm rectangle.



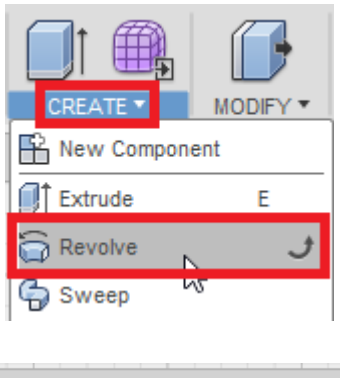

**Step 7.7** Use the line tool to roughly draw the profile of the funnel.

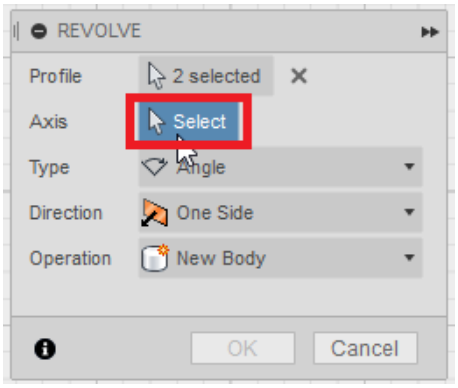


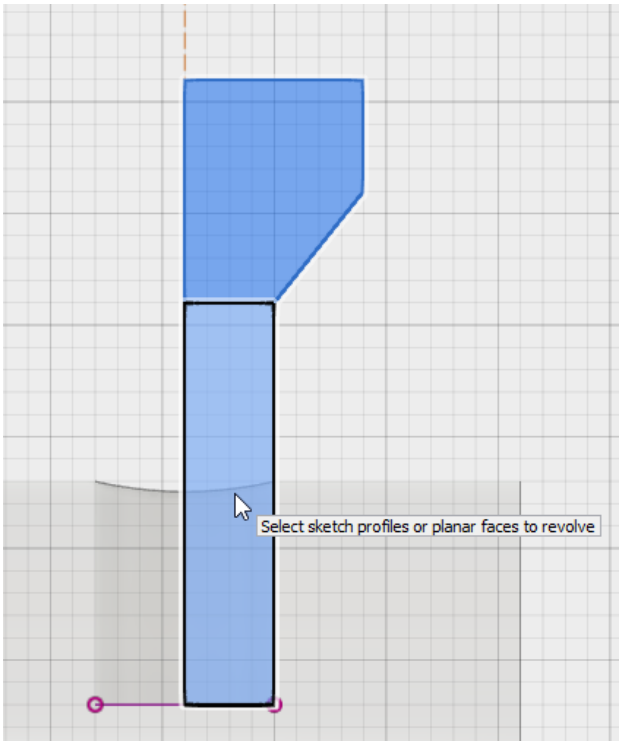
**Step 7.8** Add dimensions as shown below:

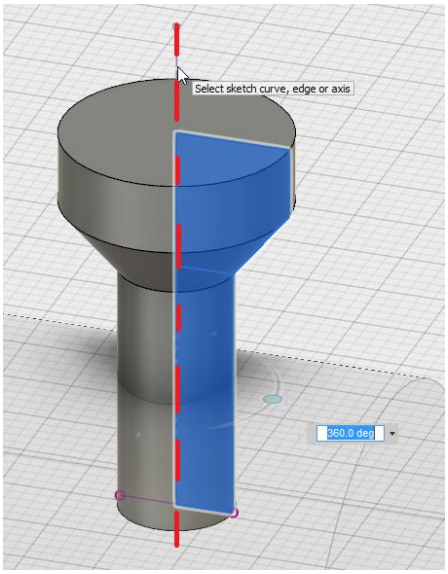



**Step 7.9** Choose 'Revolve' from the Create menu. Select both profiles and select the construction line as the axis.

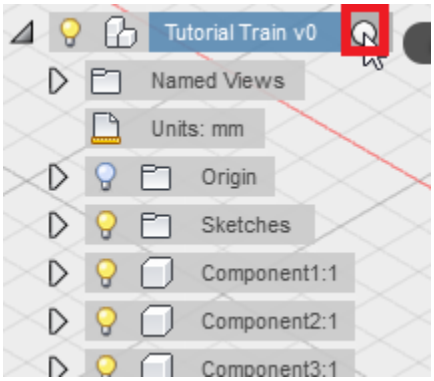




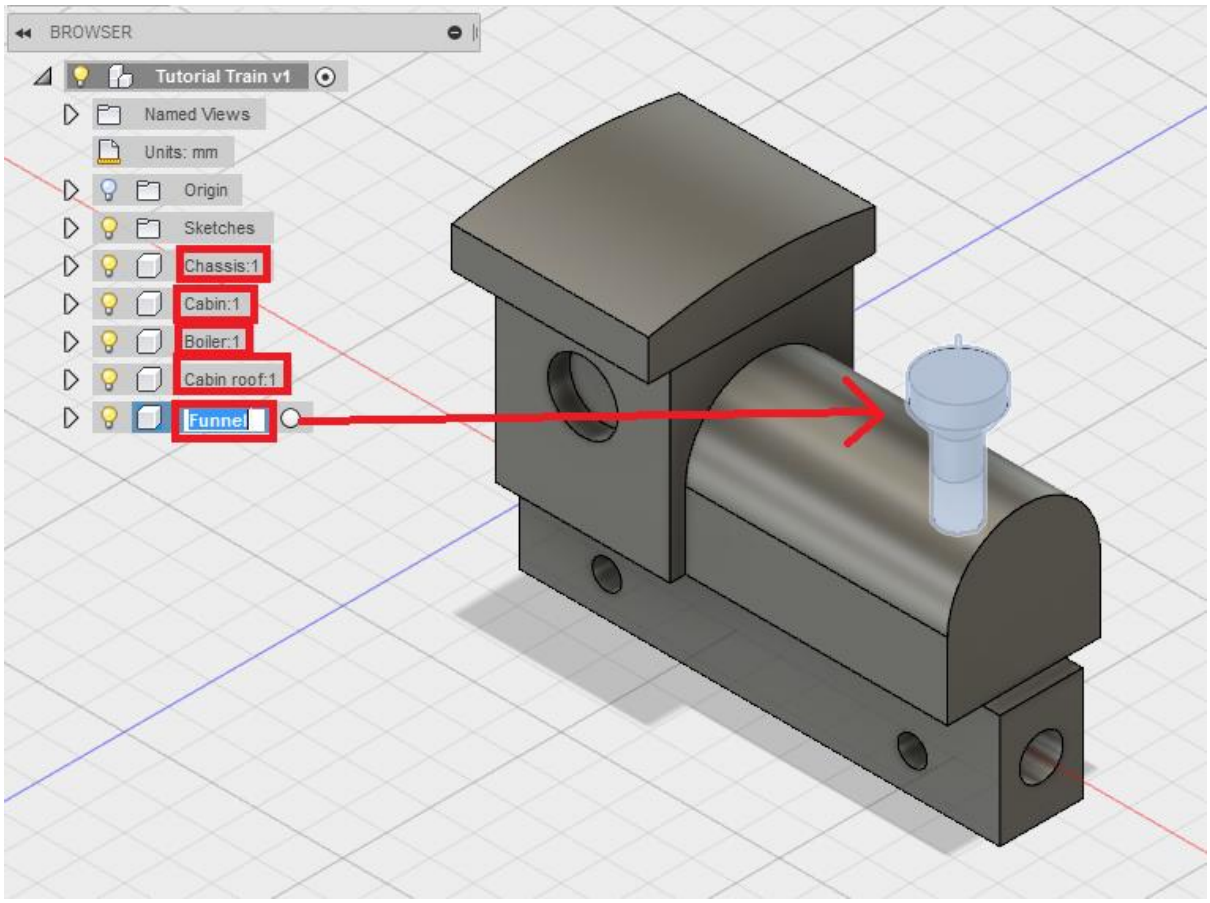

**Step 7.10** Click the white circle in the browser to make the entire train visible.



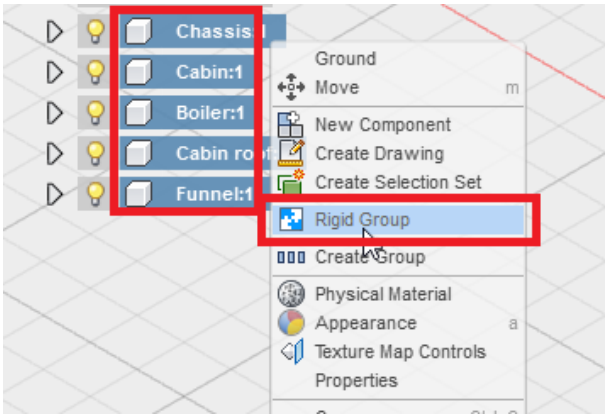
## Part 8. Assembly

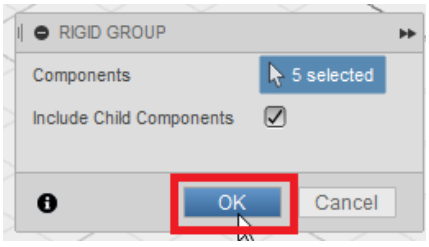
**Step 8.1** First, let's name the components in the document. Click twice on the component and type the name. This will help us keep track of components.

Each component will become blue when selected.

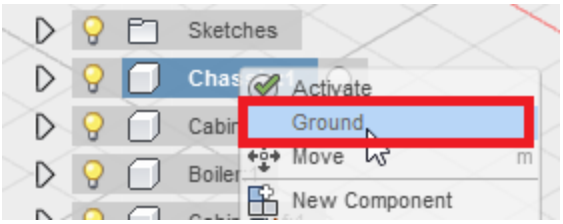



**Step 8.2** Notice how the components are not fixed to each other. Without moving their position, shift-click to select all of the components, right click and select 'Rigid Group'. In the popup box click OK.



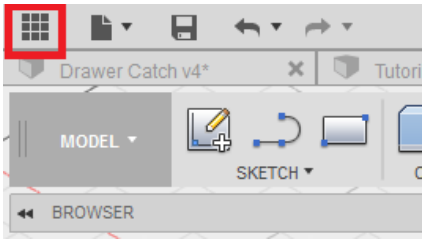



**Step 8.3** Notice how the train itself can move freely. To fix it in place, right click on the chassis and select 'Ground'.

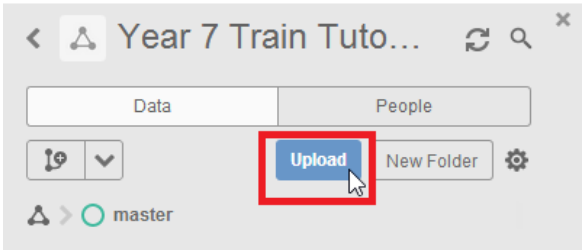



**Step 8.4** Download the wheel assembly from myTGS and upload it to your project folder.
*Click Refresh to see the newly uploaded component.*

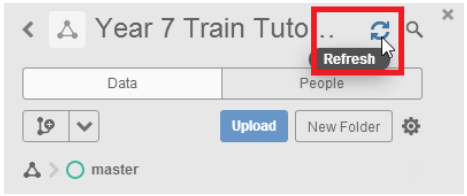
http://mytgs.trinity.vic.edu.au/design-and-technology/year-7/train-tutorial-fusion-360



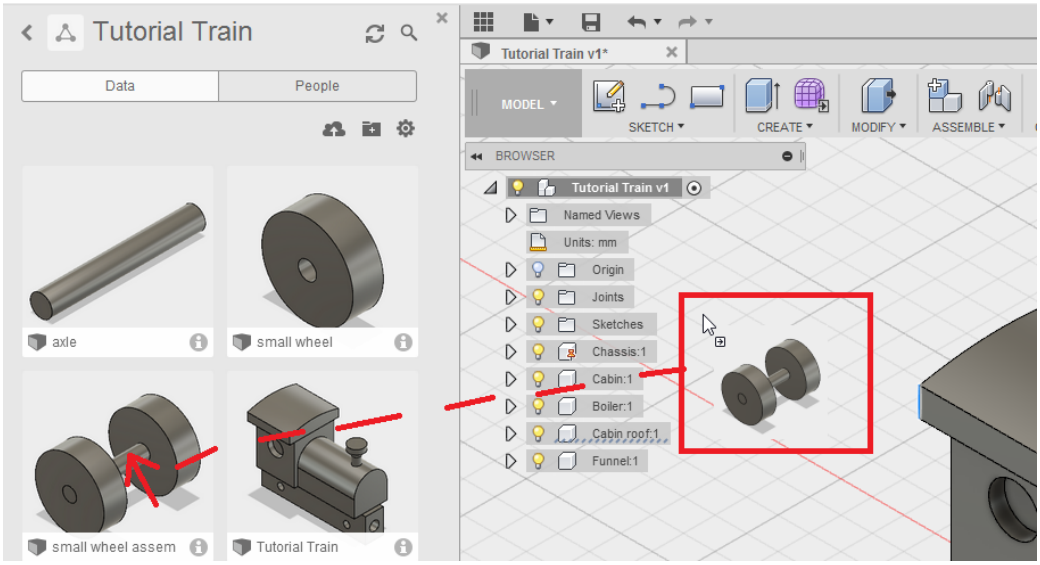


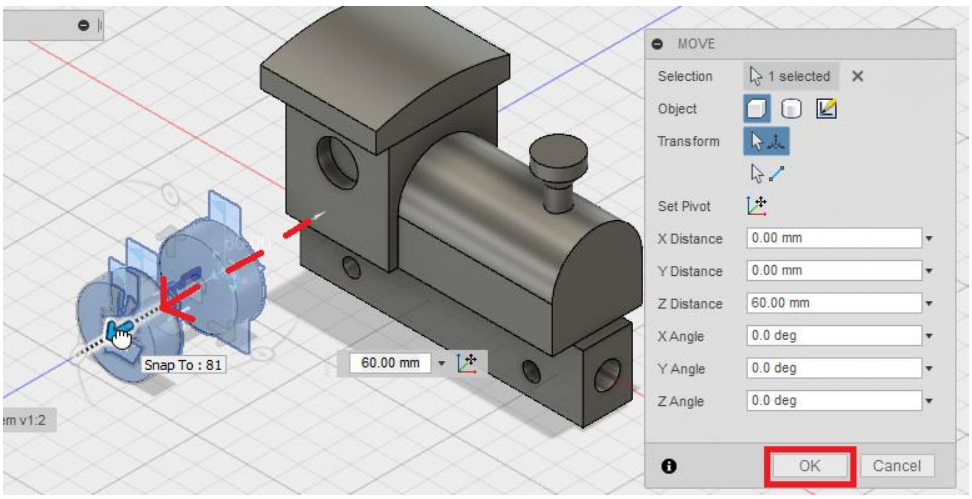




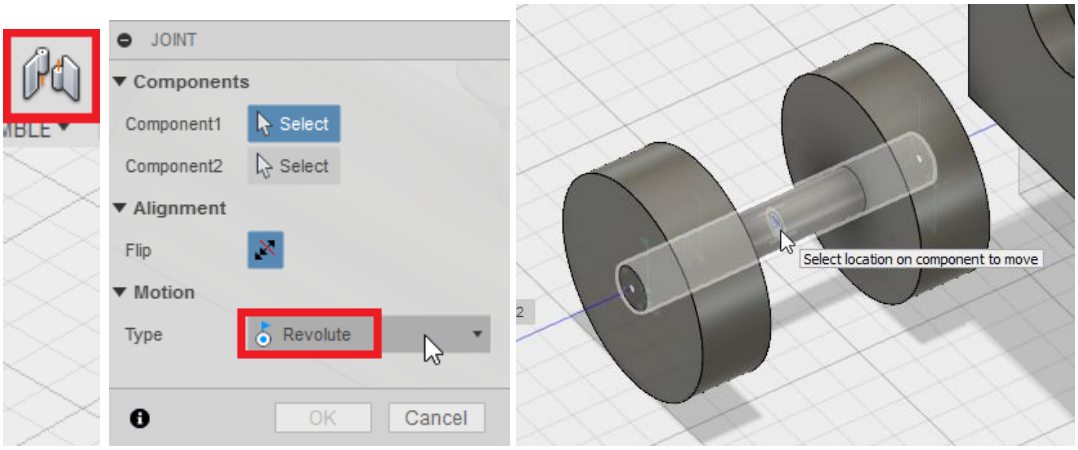


**Step 8.5** Click and drag the 'small wheel assem' component into the design. Move the wheel assembly away from the train to see it better. Click OK to accept.

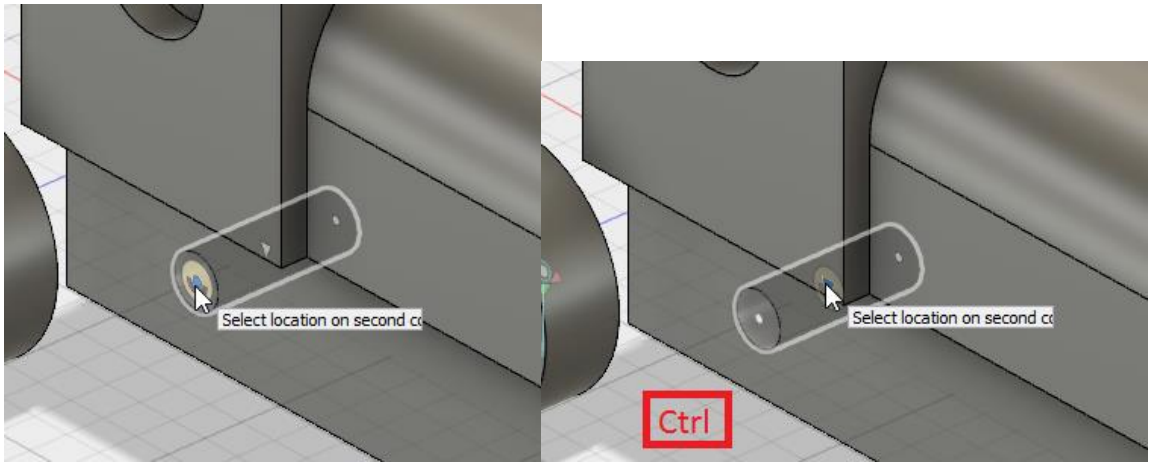


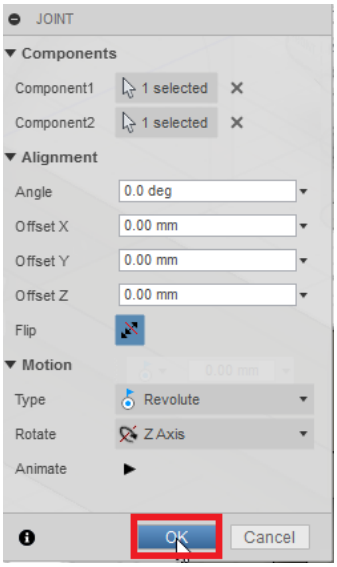

**Step 8.6** Click the Joint button (from the Assemble menu), select type as Revolute and click the center of the axle as shown.



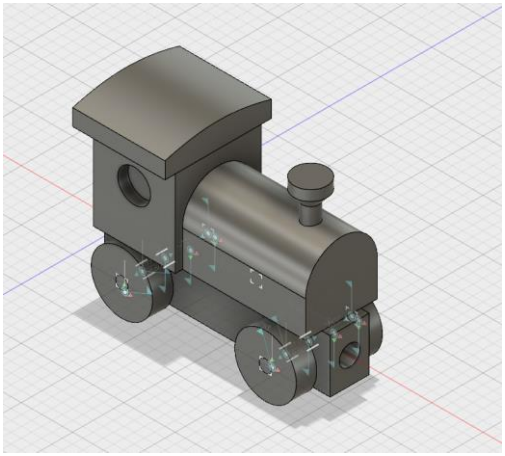
Hover the cursor over the axle hole and by holding the Ctrl key, select the center of the axle hole.




Click OK to accept.

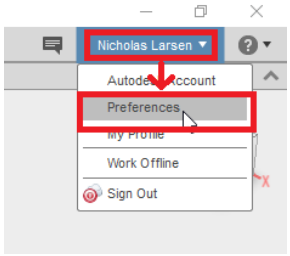


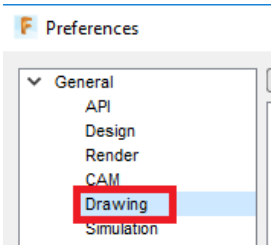

**Step 8.7** Repeat Steps 8.5 & 8.6 for the other wheel assembly.

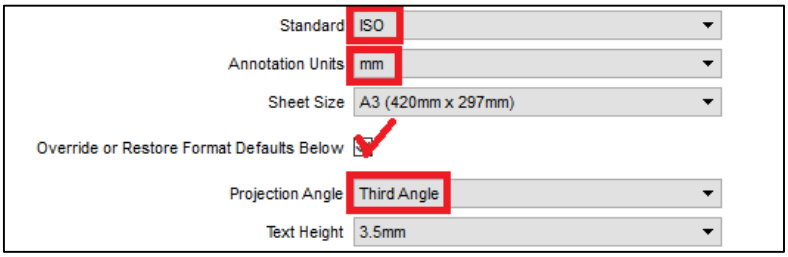


## Part 9. Engineering Drawing

**Step 9.1** In the upper right-hand corner, click on your name and choose preferences. Under the 'Drawing' section, choose the settings as shown below.

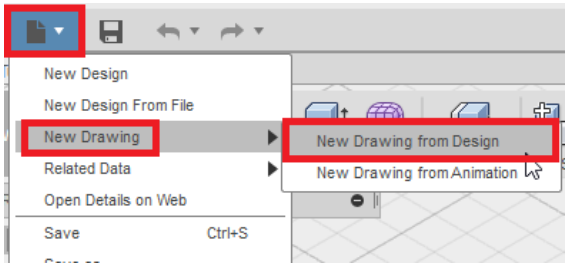


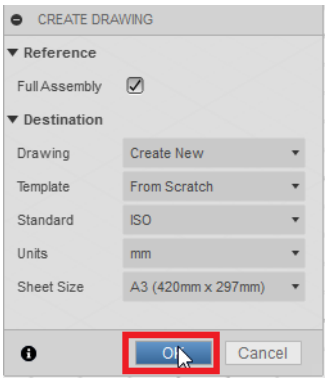



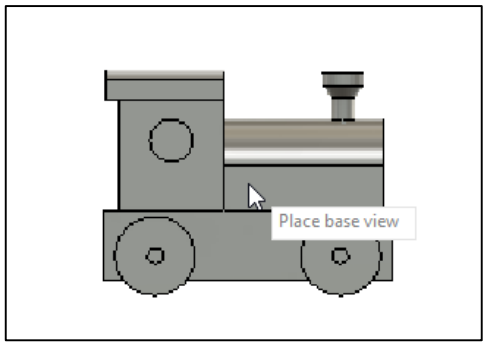

Click OK to accept the changes.

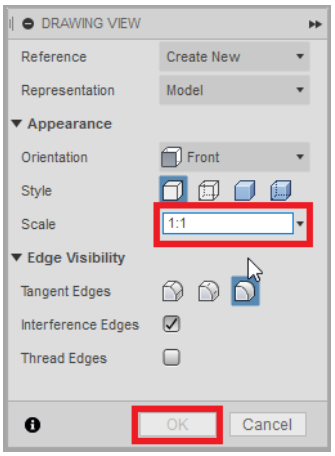
**Step 9.2** With the train design open, select 'New Drawing from Design'. You may be prompted to save your work. Click OK in the 'Create Drawing' window to continue.



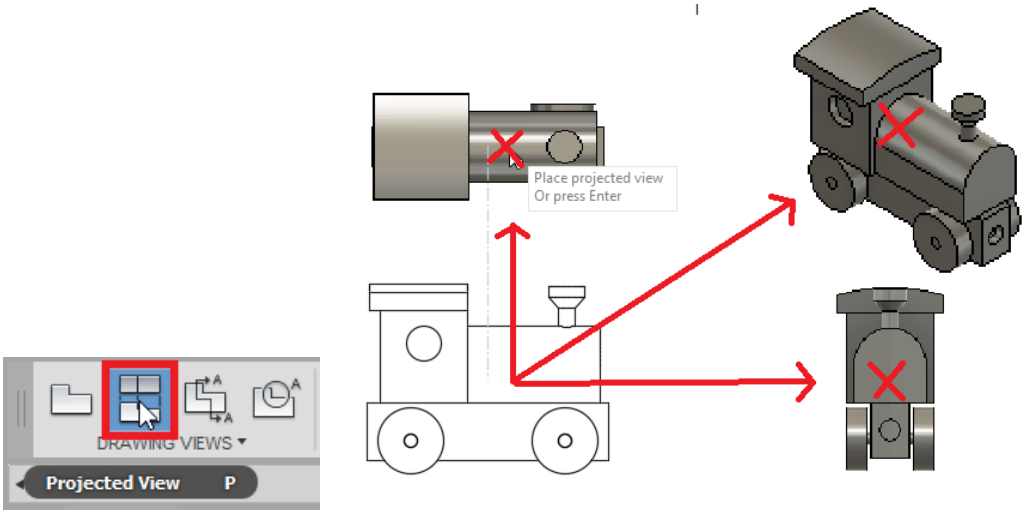



**Step 9.3** Click on the page to place the base view of the design. In the 'Drawing View' properties, set the drawing scale to '1:1' and click OK.

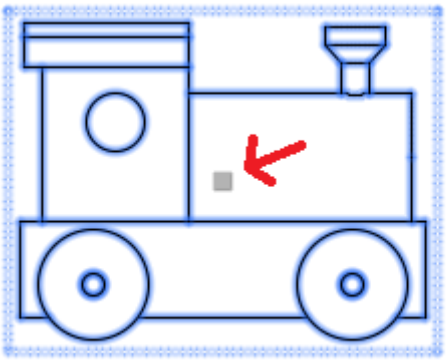


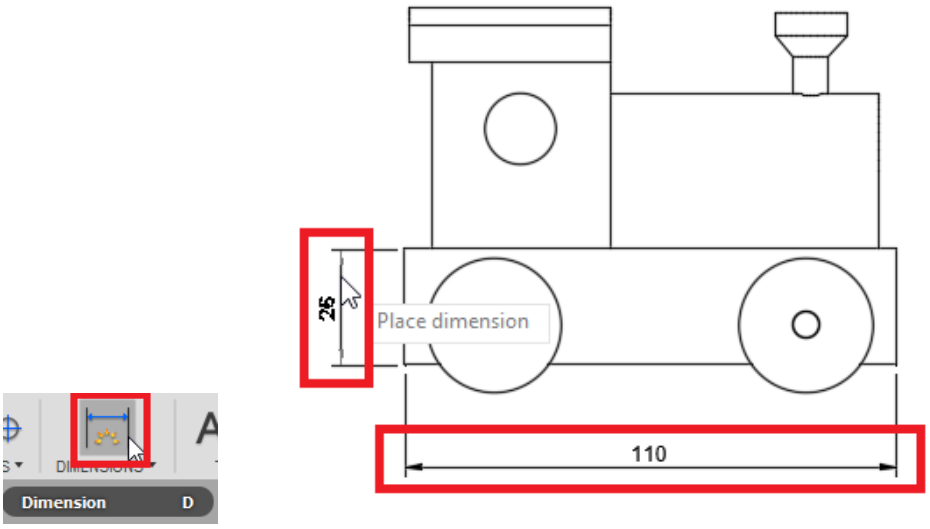

**Step 9.4** Click the 'Projected View' button to add front and 3D views as shown below. To add these views, click on the base view and move the mouse in the direction of the view. Click to place the view and press the Enter key to finish.



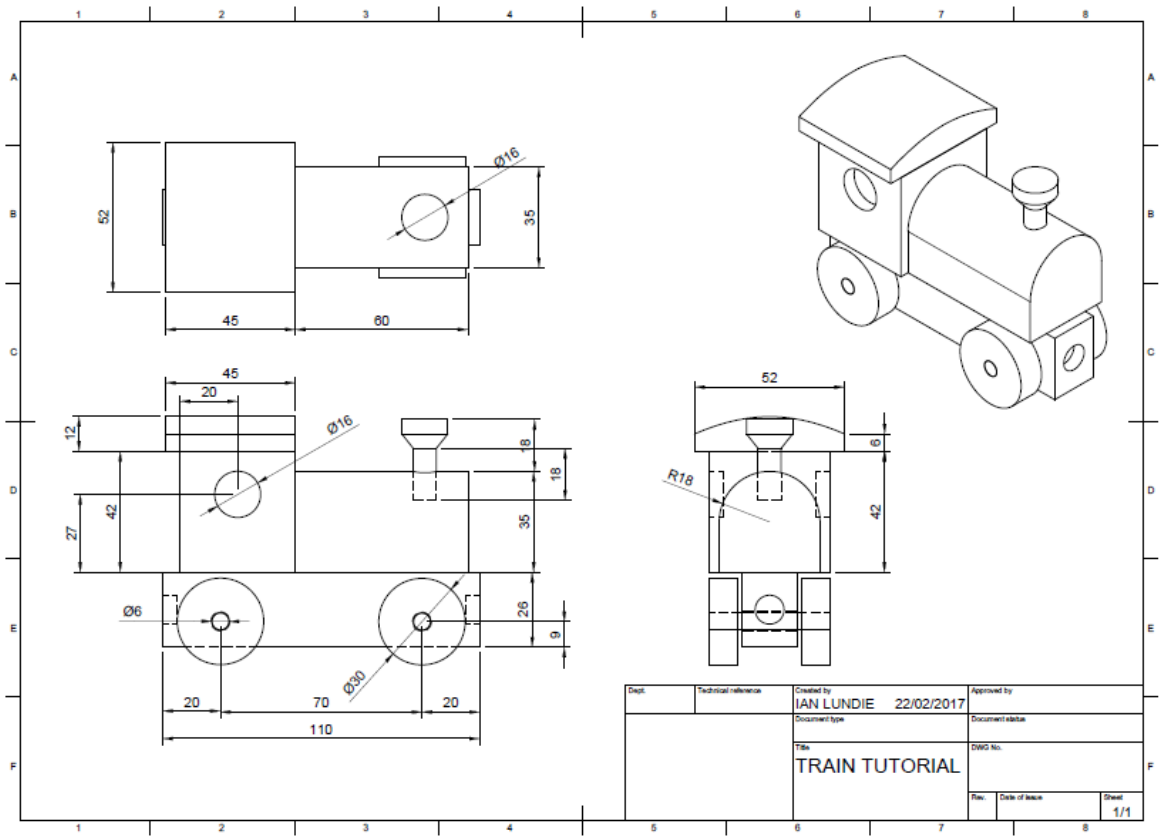

**Step 9.5** To move a view after it has been placed, first select the view and click on the small grey square in the center of the view.



**Step 9.6** Use the dimension tool to display dimensions on the drawing.




**Step 9.7** Use the dimension tool to add all the necessary dimensions as shown below:




**Step 9.8** Final Step! Your drawing can be output as a PDF for printing. Click the Output PDF button on the Output menu and select a convenient location to save it.