



F1 in Schools Car Design Beginner Tutorial

Abstract: After completing this tutorial, you gain a basic understanding of editing 3D models using Autodesk Inventor to quickly produce an F1 car using a different range of tools. You also output an engineering drawing from the model and add dimensions.

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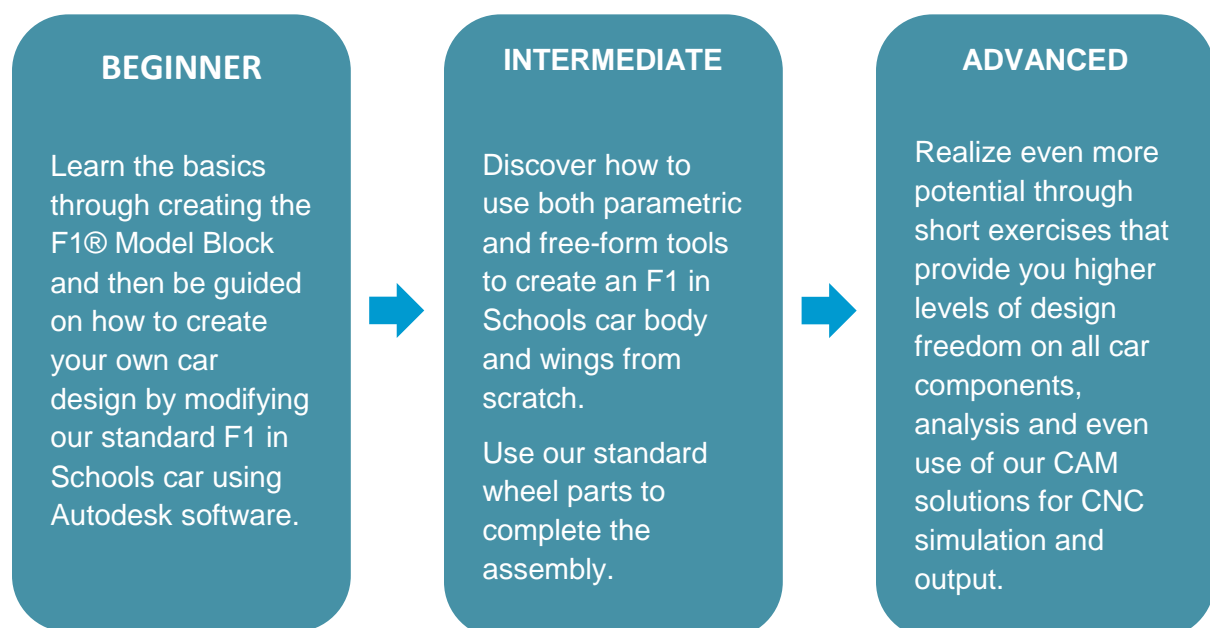
Introduction

Congratulations on choosing to work through the Autodesk Inventor F1 in Schools™ Car Design tutorials. Ideal for both first time F1 in Schools car designers and more seasoned car designers, these Autodesk Inventor tutorials are designed to get you up and running with the software quickly and effectively so you can have a car ready for manufacturing in record time. Start designing tomorrow's fastest F1 in Schools car now!

With these tutorials, you will:

- Get effective results faster – use the beginner tutorials to learn the software basics by simply modifying an existing car design to produce your own unique styling ready for manufacturing quickly and successfully.
- Understand the F1 in Schools car body manufacturing process and improve your designs accordingly. Design your car body ensuring it is suitable for CNC manufacturing.
- Save time by having access to a library of standard F1 in Schools car accessory part files, including the standard wheels, axle system and tether guides.
- Get tips for how to ensure your car body fits the dimensions of the official F1 Model Block.
- Design your car so it has separate front and rear wing parts, fully integrated with the body design, prepared ready to export for manufacturing on a 3D printer.
- Be reminded about F1 in Schools design regulations and how to check compliance as you are designing in 3D
- Extend your skills through quick tips and exercises in our advanced tutorials related to wheel design and other features, such as design mass calculation, designing in 3D from a hand sketch, and CAM using Autodesk solutions.
- Use our new Autodesk Flow Design tutorial to analyze the aerodynamic performance of your design in 3D and make tweaks during your design development stages.
- Be guided in the use of Autodesk Showcase to create stunning photorealistic renders of your final car assembly.

Tutorial Work Flow:



Getting Started

Downloading Autodesk Inventor

Autodesk® Inventor® is a mechanical design and 3D CAD software for creating 3D digital prototypes used in the design, visualization and simulation of products. As a student or educator, you can download a free license of Autodesk Inventor software for personal or educational purposes at www.autodesk.com/education.

Datasets

All project files that are required for the tutorial are provided in a dataset.zip file. Download the dataset file and extract the files to your computer. Do not modify the file structure of the dataset files.

Video Tutorials

Download the video tutorials supporting this tutorial. The video tutorials offer the same step-by-step software instruction for learners that prefer guidance through video format.

F1 in Schools Rules and Technical Regulations

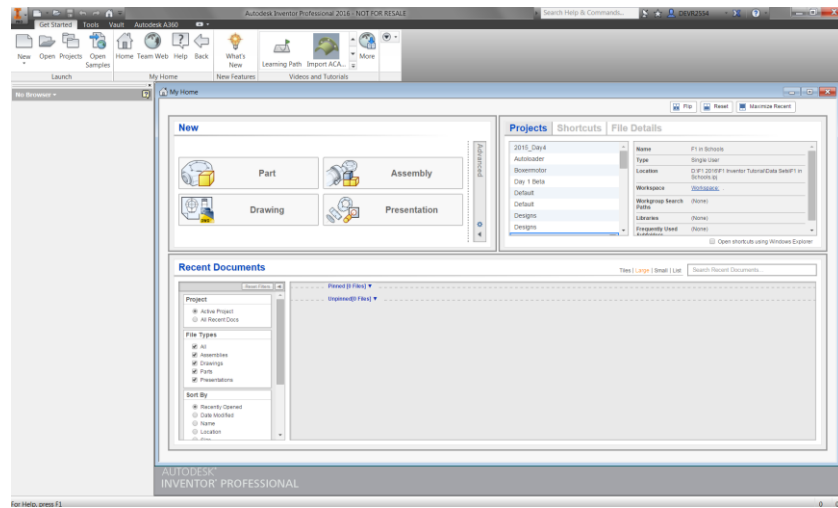
It is extremely important to that you design your car to comply with the current F1 in Schools rules and regulations. Each country has slightly different specifications that may change from year to year. It is critical that you download and review your country's F1 in Schools Rules and Regulations documentation and design your car to the outlined specifications.

Activities in this tutorial leverage F1 in Schools rules and regulations for 2015-2016 and may not apply to your country. Please confirm the F1 in Schools rules and regulations for your country and competition before getting started. Go to your local F1 website and download the F1 in Schools rules and regulations documentation <http://www.f1inschools.com/international-sites/>.

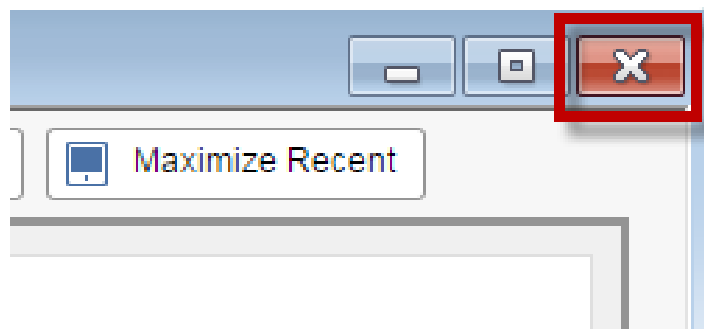
Activity 1: Starting Autodesk Inventor

After starting Autodesk Inventor, the My Home page is displayed. As you start to model parts, this page provides many tools to simplify and manage your data. To get started, we will close the page and focus on the major sections of the user interface. These include the application menu, quick access toolbar, ribbon interface, browser, and graphics window. To become familiar with the user interface, follow these steps:

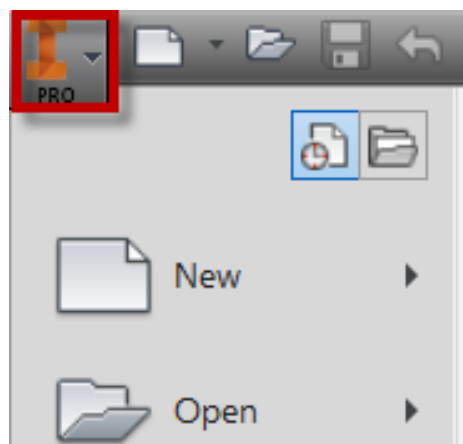
1. Start Autodesk Inventor.



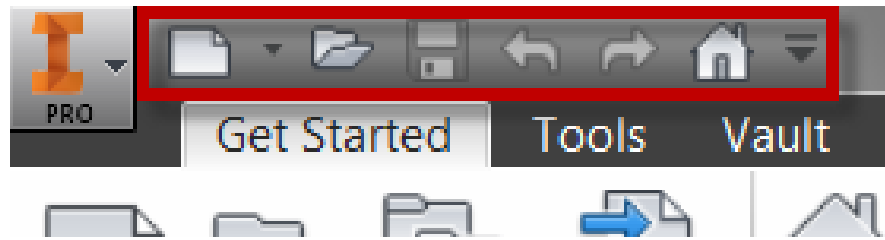
2. Close My Home.



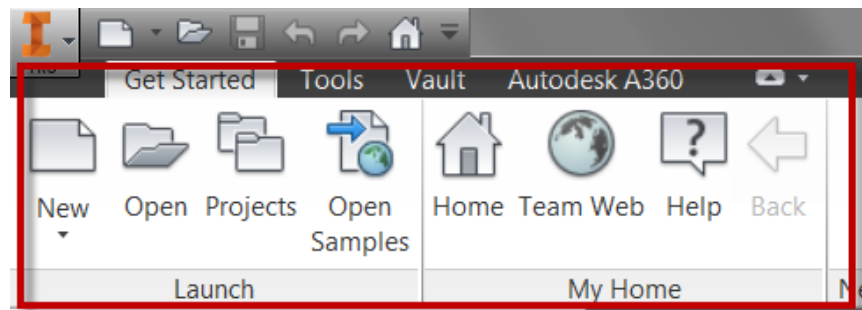
3. Click the large letter I in the top left of the screen to open the Application menu. This menu provides access to tools such as New, Open and Export.



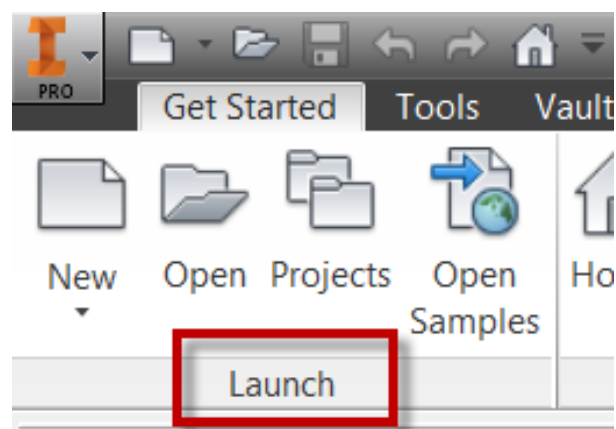
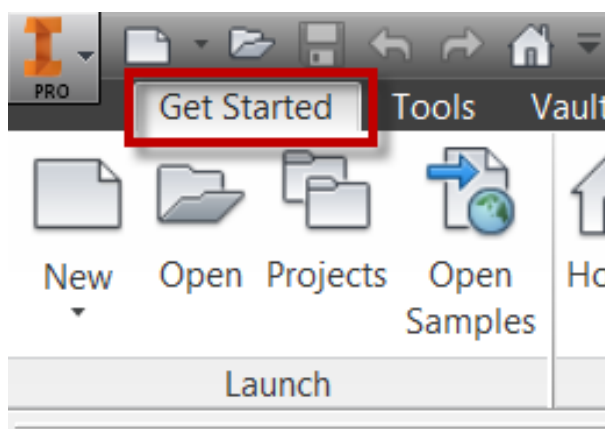
- Review the area to the right of the Application menu. This is the Quick Access Toolbar. It provides access to tools such as New, Open, and Save. It is customizable.



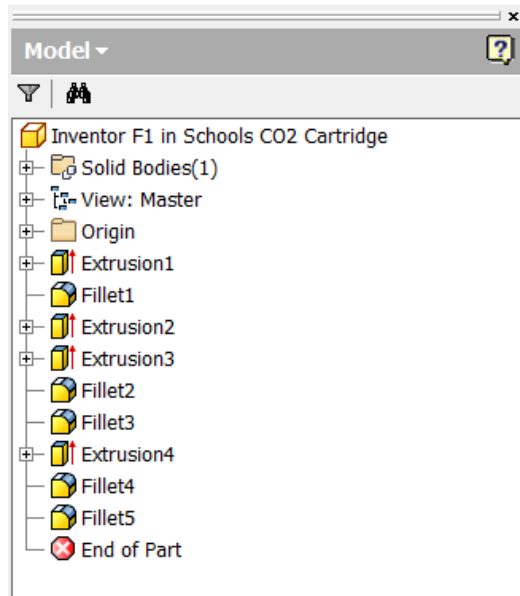
- Review the area below the Quick Access Toolbar. This is the ribbon interface. When you model the F1 car, the ribbon will change as you enter the part, assembly, and drawing environments.



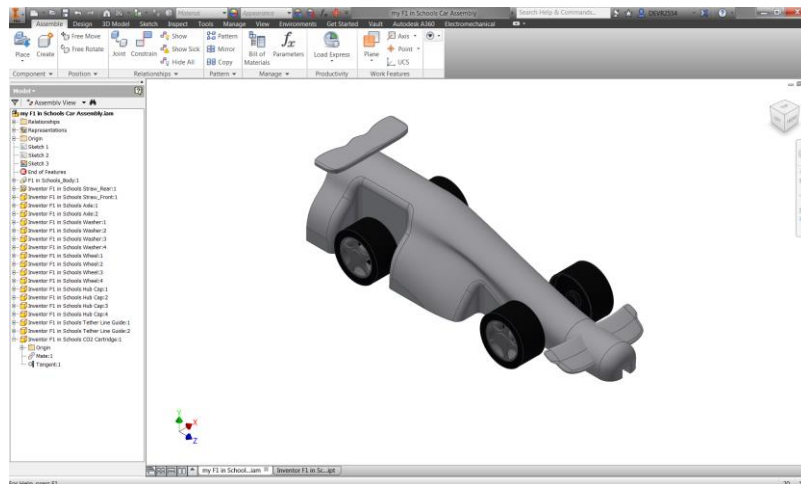
The ribbon has 2 components: tabs and panels. The Get Started tab has a number of panels including the Launch panel.



- Review the area below the Launch panel. This is the browser. When you design the F1 car, the browser will show the history of the design. An example of the browser with an F1 CO2 cartridge part file is shown for reference.



- Review the large area to the right of the browser. This is the graphics window. Your designs are displayed in this area. In this example, a completed assembly of an F1 in Schools car is displayed.



- Videos are available that provide a comprehensive overview of Autodesk Inventor. Ctrl+Click on the following link to view one of the videos provided by Autodesk. This video reviews the user interface and also covers topics such as file types.

[Autodesk Inventor 2016 Tutorial: User Interface](#)

In the next section of tutorial, you will model the F1 Model Block.

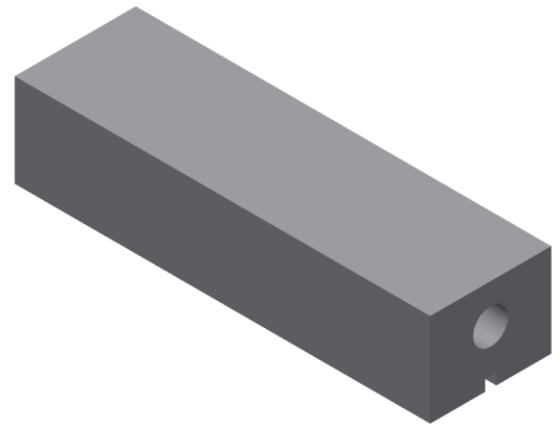
Activity 2: Model the F1 Model Block

In this section of the tutorial, you will learn the basics of Autodesk Inventor by modeling the F1 Model Block.

Note: Make sure to download and review the most current version of the F1 in Schools Rules and Regulations. For video instructional support, download the step-by-step video tutorials for this activity.

After completing this section of the tutorial, you will be able to:

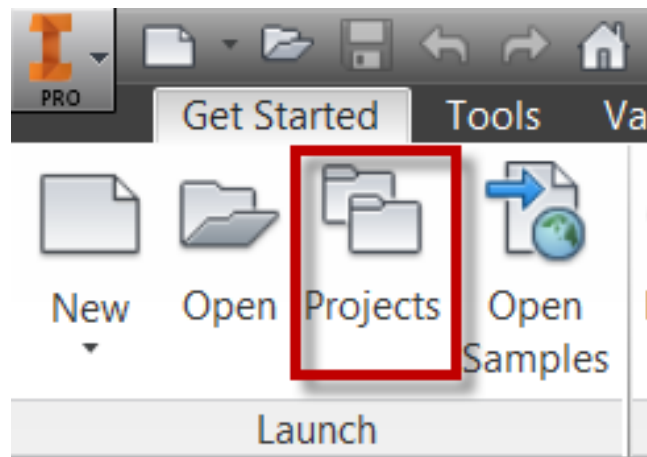
- Create a new part file.
- Sketch the profile of the F1 Model Block.
- Create the F1 Model Block.
- Create the cartridge chamber.
- Create the tether line slot.



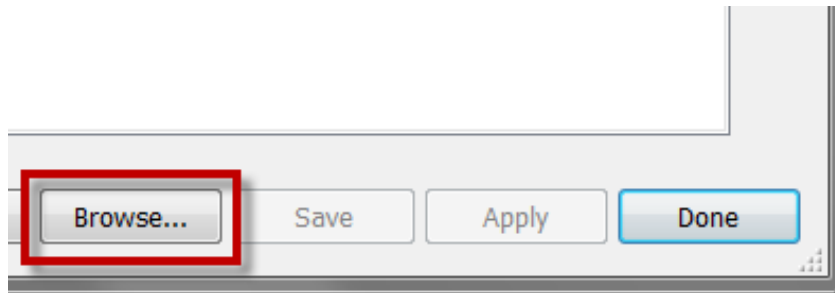
Step 1: Create a New Part File

Designers typically work on multiple projects. In Autodesk Inventor, you use project files to organize and access all files associated with a particular design job. A project file named *F1 in Schools Beginner.ipj* is provided for this tutorial.

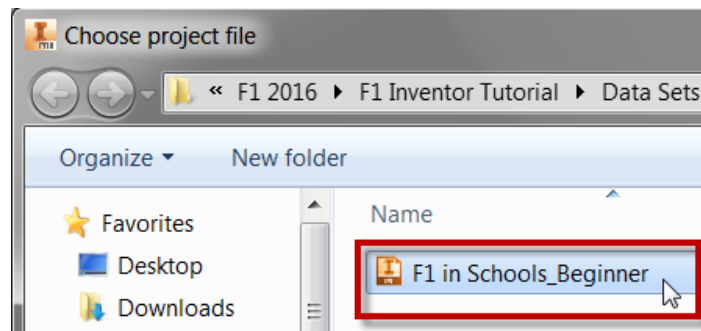
1. Start Autodesk Inventor.
2. On the Launch panel, click Projects.



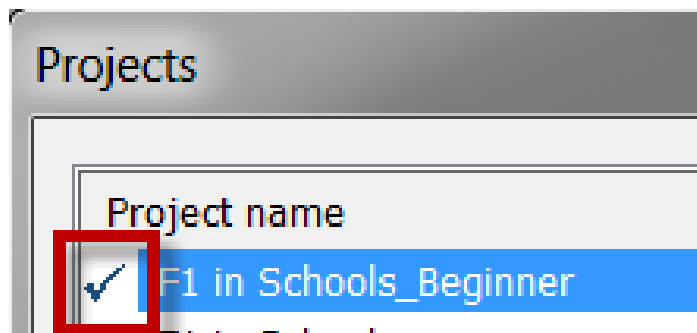
3. In the Projects dialog box, click Browse.



4. Navigate to the location of the project file. Select F1 in Schools Beginner, then click Open.

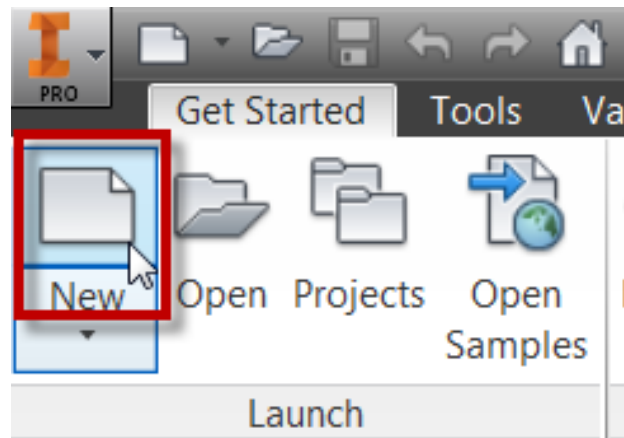


5. Review the Projects dialog box. The active project is indicated with a check mark.

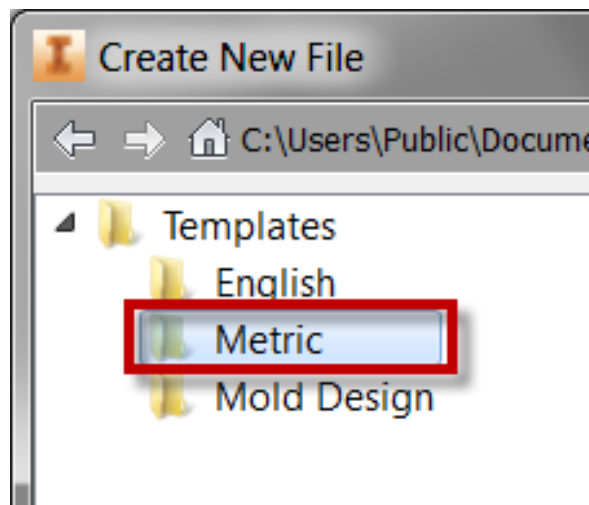


6. Click Done.

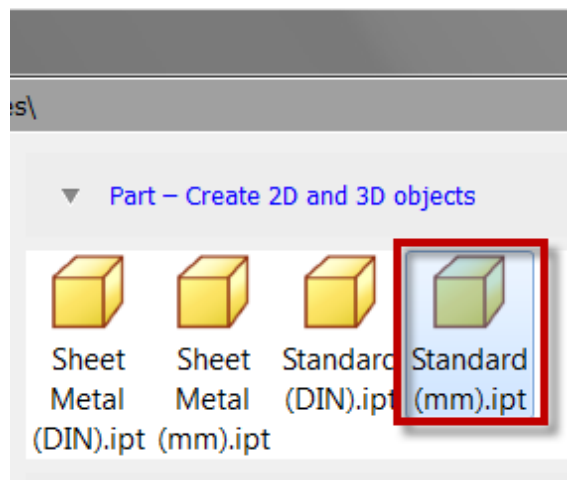
7. On the Launch panel, click New.



7. In the Create New File dialog box, under Templates, select Metric.



8. Under Part, select Standard (mm).ipt.



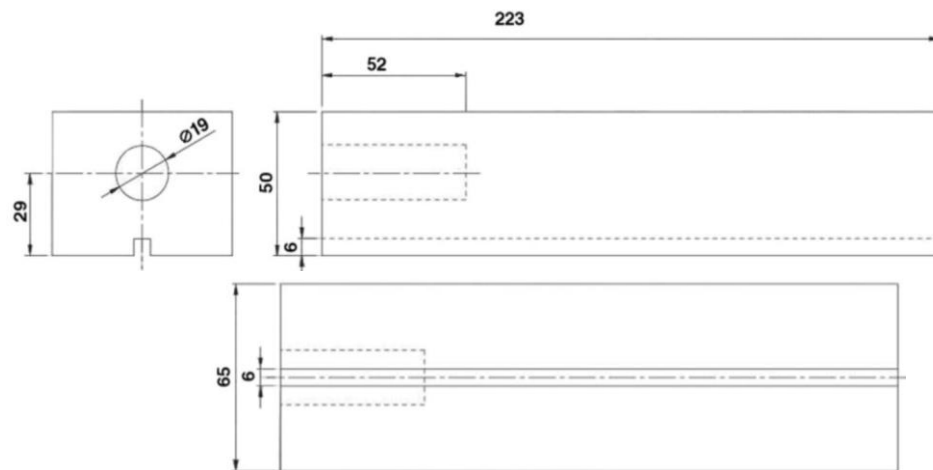
Note: A part file has an IPT file extension. This type of file contains a single part.

9. Click Create.

Note: *F1 in Schools* is an international event and uses the metric system for all engineering requirements.

Step 2: Sketch the profile of the F1 Block

The first step in modeling the F1 block is to review the dimensions of the official F1 Model Block as stated in the technical regulations (www.f1inschools.com). This is the block of medium density modeling foam that all F1 in Schools car bodies are CNC machined from.



To model the F1 Model Block, you create a sketch to define the feature profile. For this block, you will start by creating a rectangle. The rectangle's dimensions as stated in the technical regulations is **223 x 65**. Note: Consult the technical regulations to confirm current requirements.

Tip: Before starting this activity, review the videos “The ViewCube” and “How to use the ViewCube” to view your design.

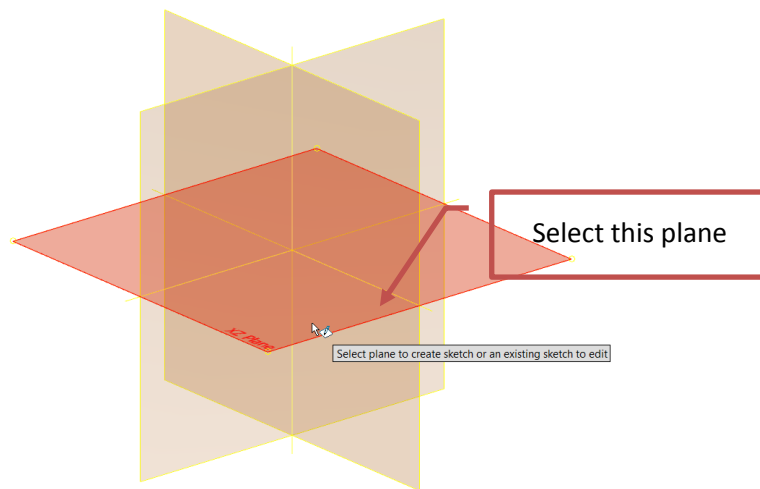
Ctrl+Click on the following link:

[Autodesk Inventor 2016 Tutorial: View Navigation](#)

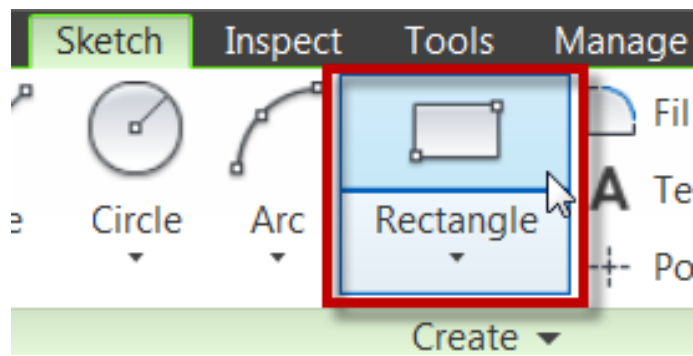
1. On the Sketch panel, click Start 2D Sketch.



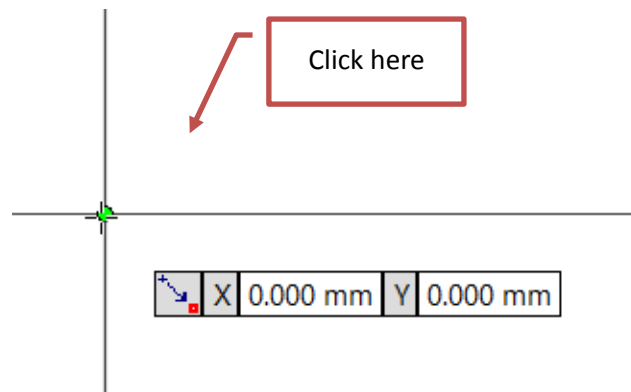
2. Select the XZ Plane.



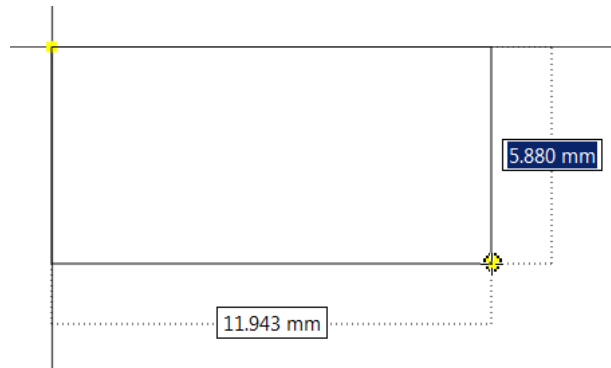
3. On the Create panel, click Rectangle.



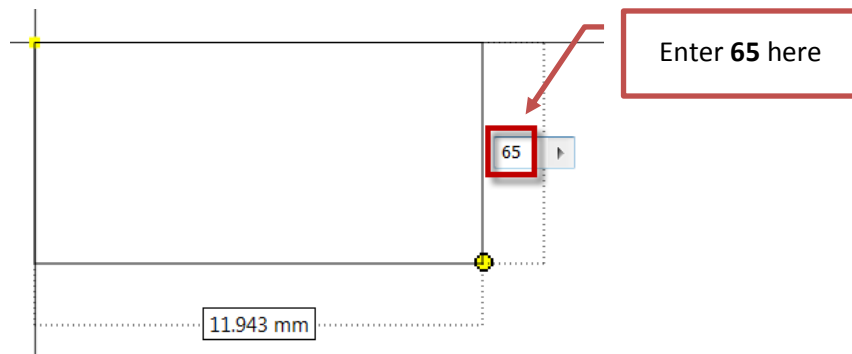
4. Click on the origin of the sketch.



5. Drag the cursor down and to the right.



6. Enter **65**.

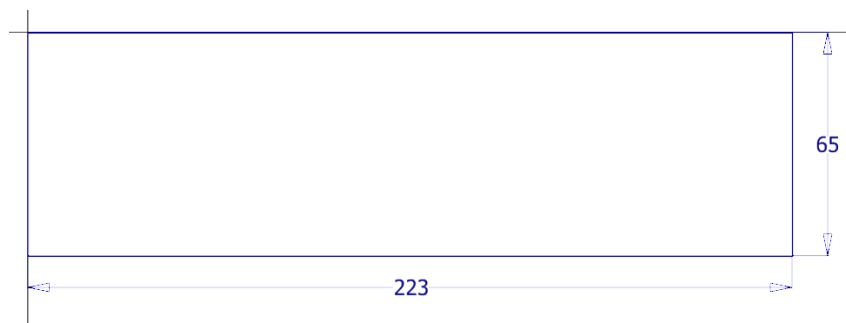


7. Press Tab, then enter **223**.
8. Press Enter, then right click and select OK.

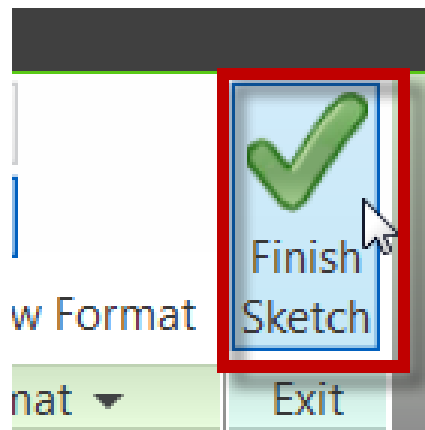
9. On the ViewCube, click Top.



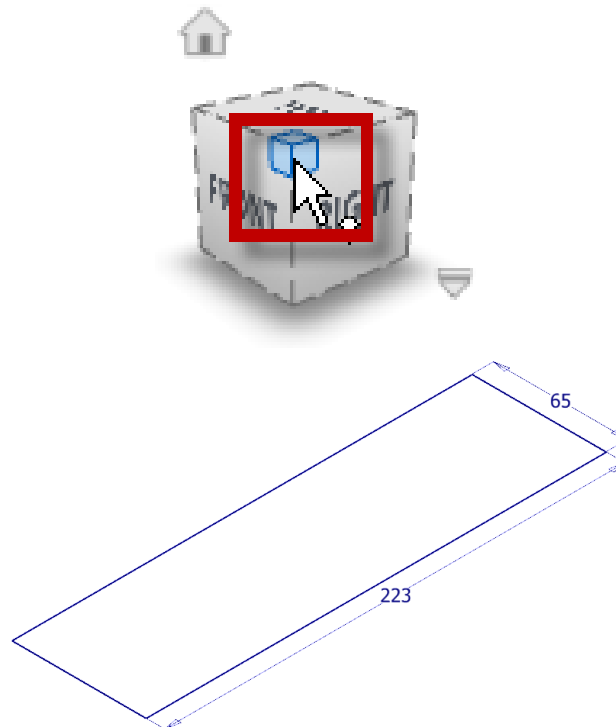
10. Review the rectangular sketch. The length is **223** and width is **65**.



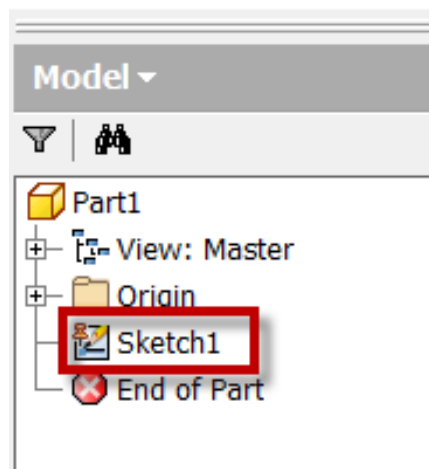
11. On the Exit panel, click Finish Sketch.



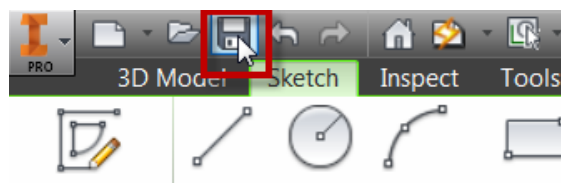
12. On the ViewCube, click the corner as shown.



13. Review the browser. The sketch is added to the part history.



14. On the Quick Access Toolbar, click Save.

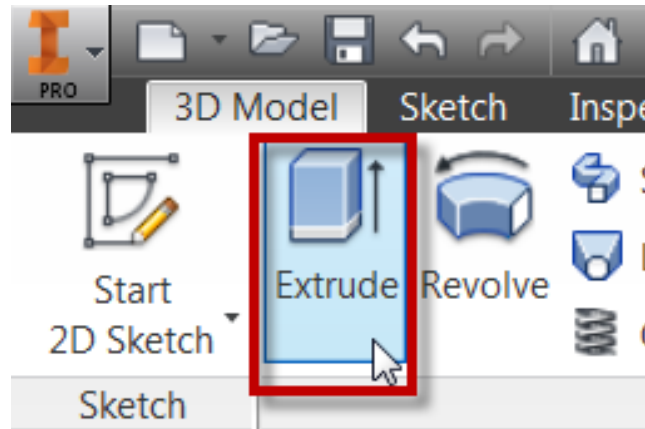


15. Save the file as **my_F1 Model Block**.

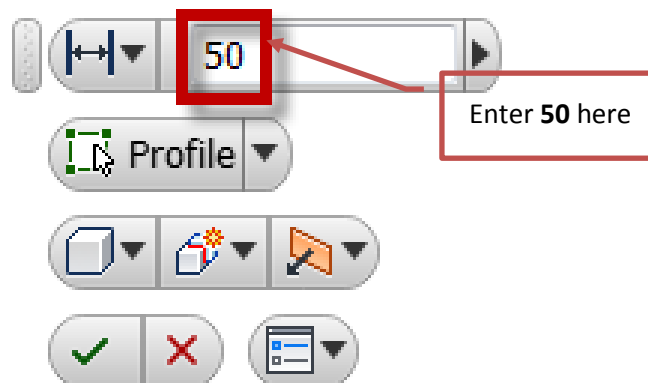
Step 3: Create the F1 Model Block

The height of the block as stated in the technical regulations is **50**.

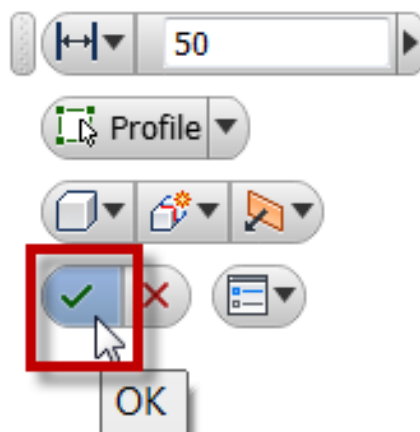
1. On the Create panel, click Extrude. An extruded feature adds depth to an open or closed profile, or a region. Extrusions are building blocks for creating and modifying solid bodies within a part.



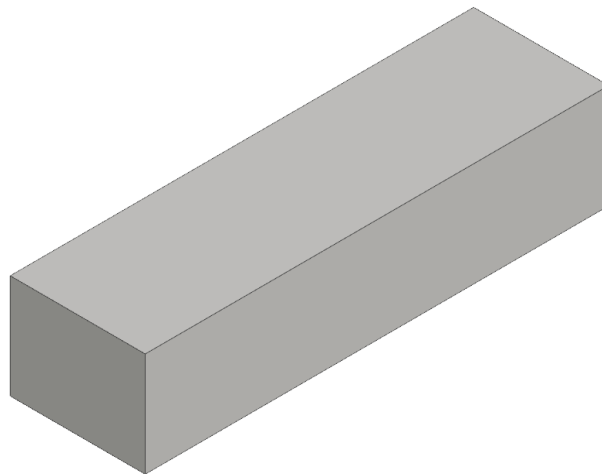
2. For Distance, enter **50**.



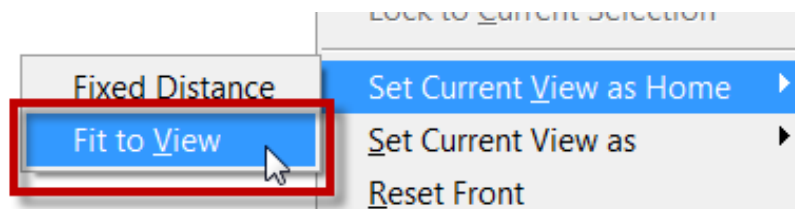
3. Click OK.



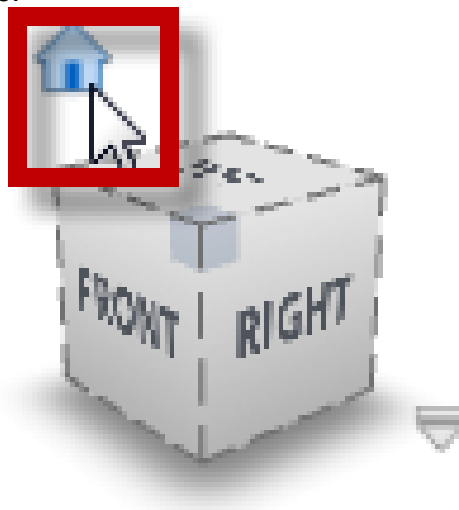
The extruded feature is displayed as shown.



4. On the ViewCube, right click and select Set Current View as Home > Fit to View.

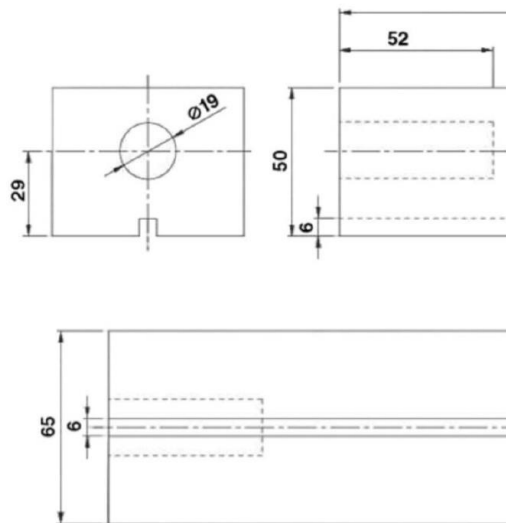


On the ViewCube, click Home.

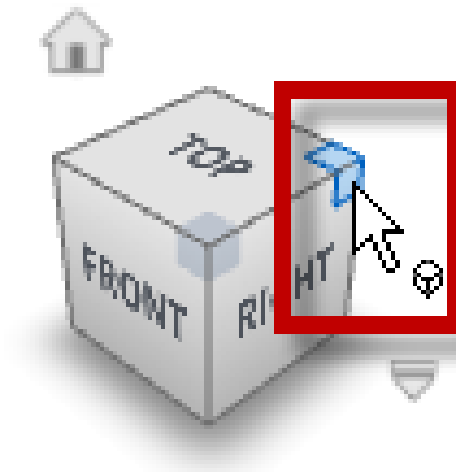


Step 4: Create the Cartridge Chamber

The dimensions for the cartridge chamber are documented in the technical regulations as shown.



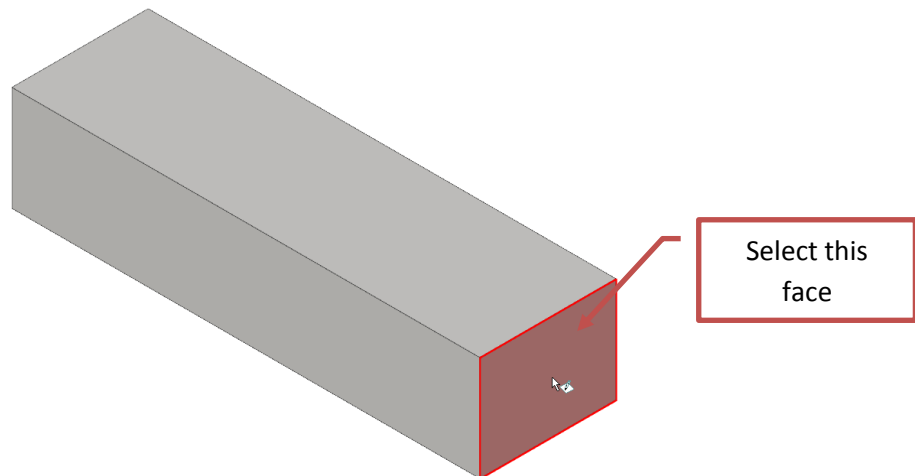
1. On the ViewCube, click the top-right corner.



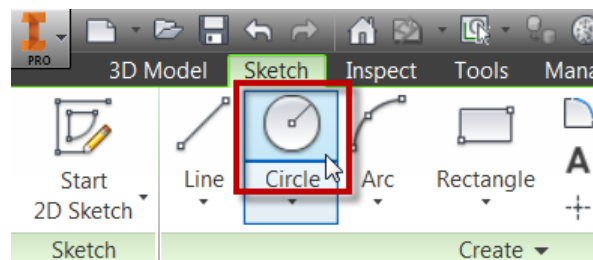
2. On the Sketch panel, click Start 2D Sketch.



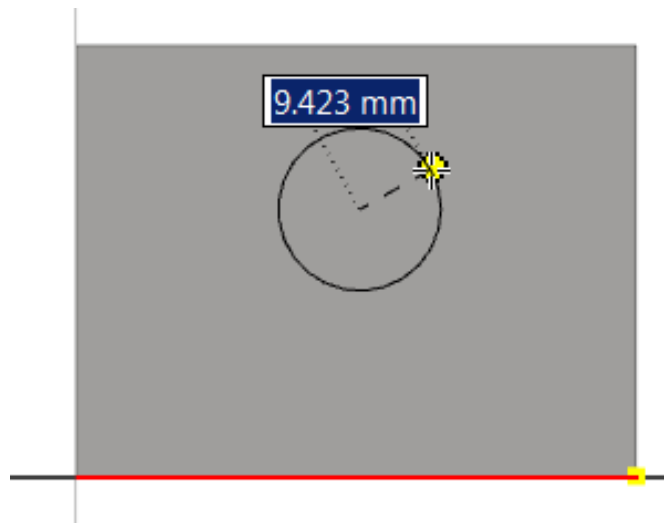
3. Select the end face of the Model Block.



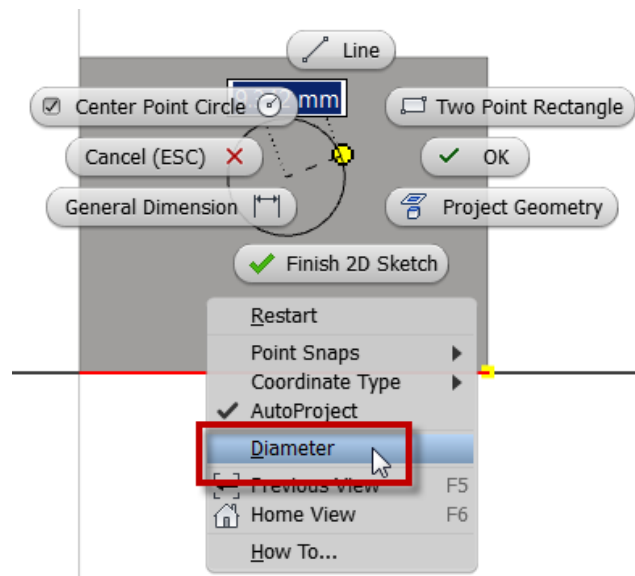
4. On the Create panel, click Circle.



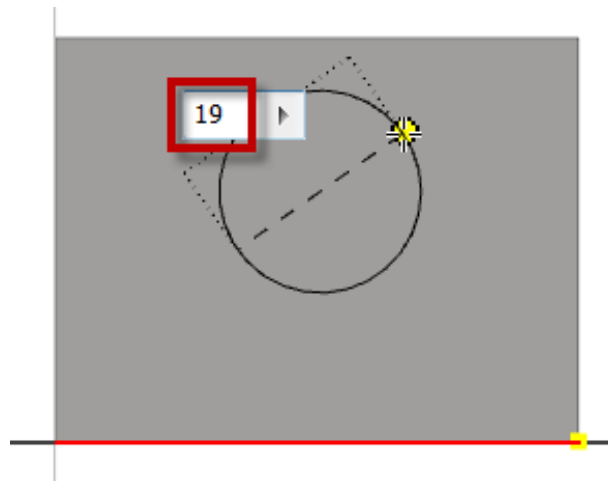
5. Click on the face to set the center point, then drag to preview the circle radius.



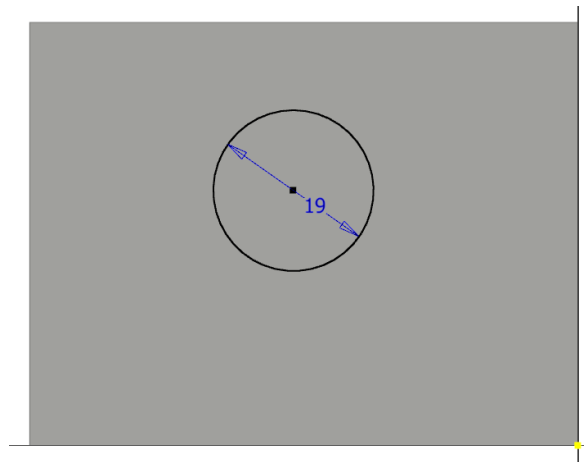
6. Right click, then select Diameter.



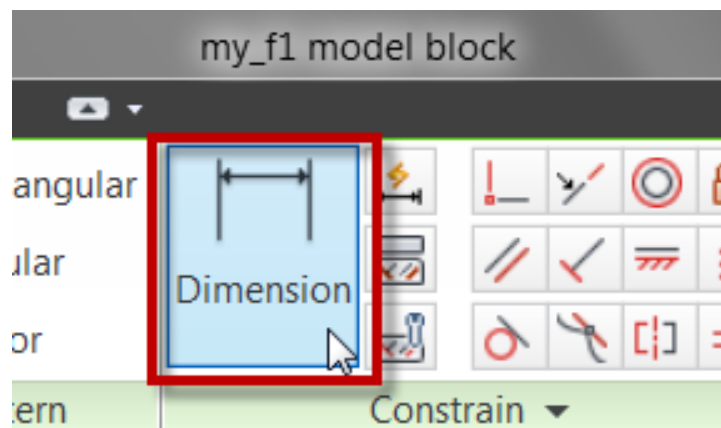
7. Enter **19**.



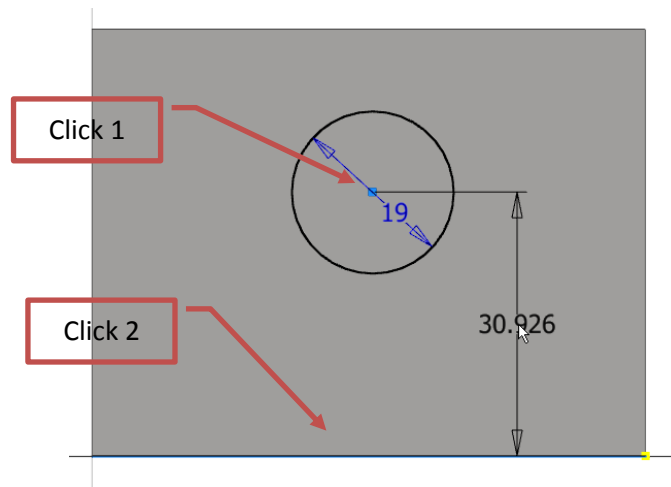
8. Press Enter, then right click and select OK.



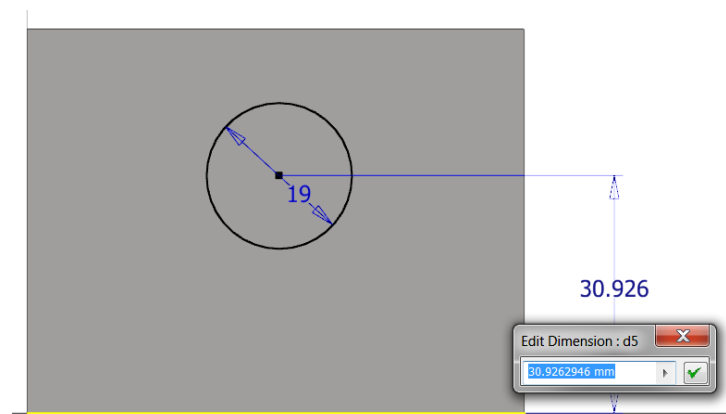
9. On the Constrain panel, click Dimension. When you add a dimension to a sketch, it defines the size and location of geometry in the sketch.



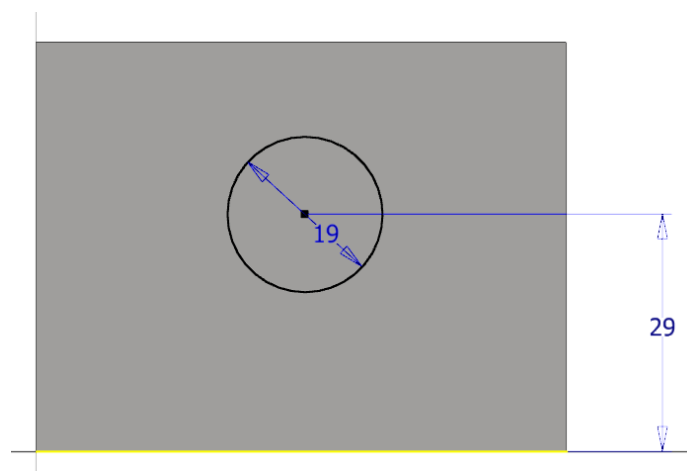
10. Click the center point on the circle (1) then the bottom edge (2).



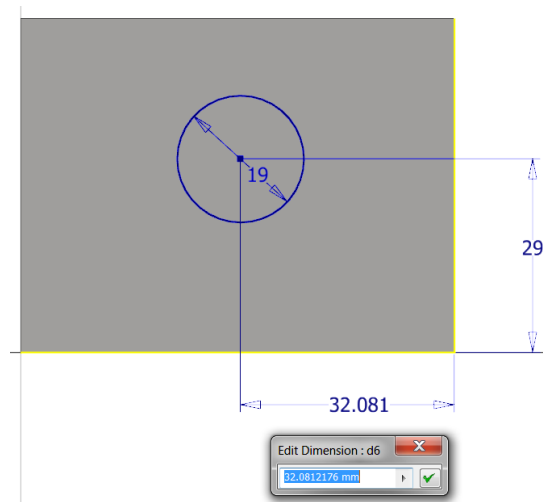
11. Drag the dimension to the right, then click to place the dimension



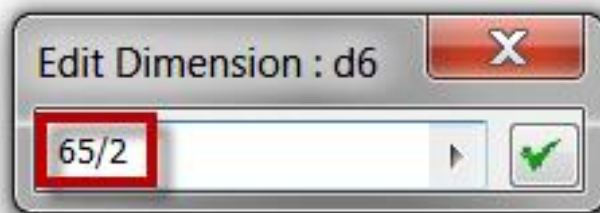
12. Enter **29**, then click OK (the check mark).



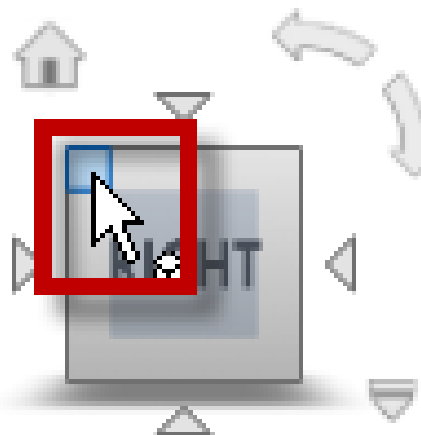
13. Click the center of the circle and the right edge, then drag the dimension below the block and click to place the dimension.



14. Enter **65/2** then click OK. This centers the hole about the 65mm width of the block.



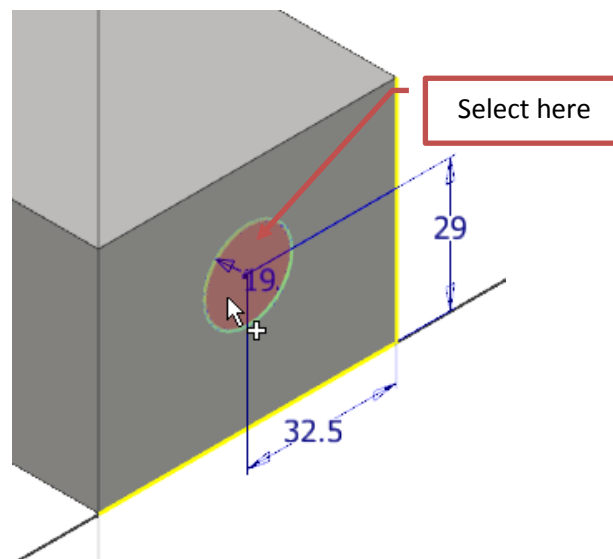
15. On the ViewCube, click the top left corner.



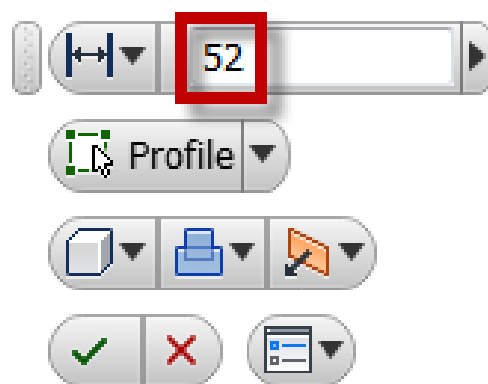
Note: To extrude the cartridge chamber, you use a keyboard shortcut to start the extrude tool.

16. Press **E**.

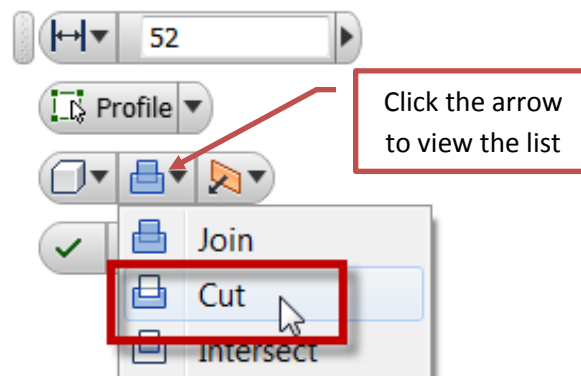
17. Select inside the circle.



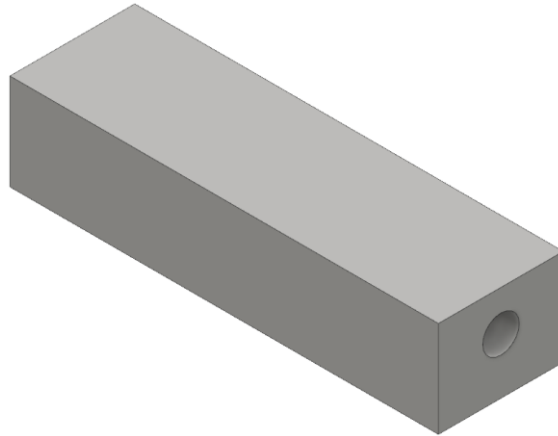
For Distance, enter **52**.



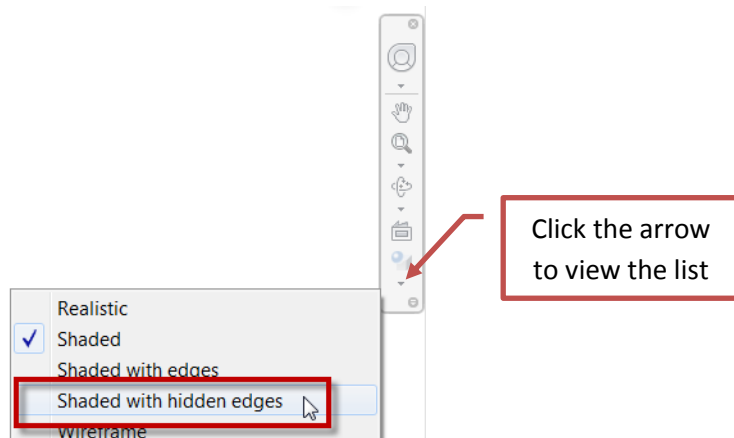
18. From the Operation list, select Cut.



19. Click OK.



20. On the Navigation toolbar, from the list, click Shaded with Hidden Edges.



21. Press and hold the F4 key. Hold down the mouse button, then drag to rotate your model.

Note: Review other view options on the navigation toolbar such as Wireframe with Hidden Edges

22. On the Navigation toolbar, from the list, click Shaded.

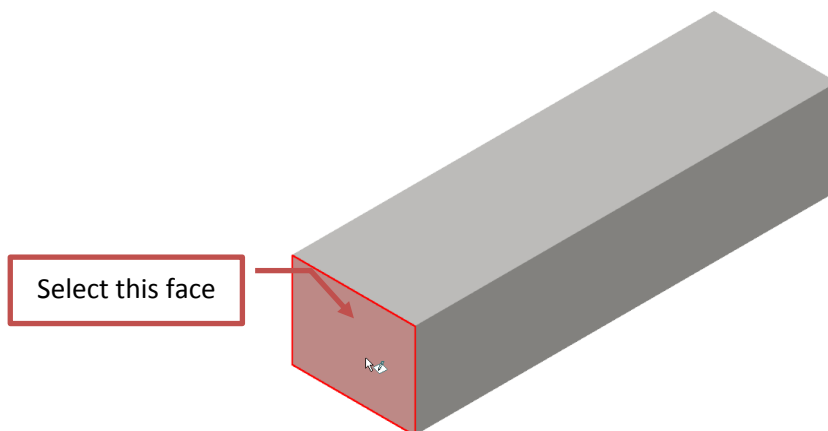
23. Press F6 to return to the Home view.

Step 5: Create the Tether Line Slot

1. On the Sketch panel, click Start 2D Sketch.

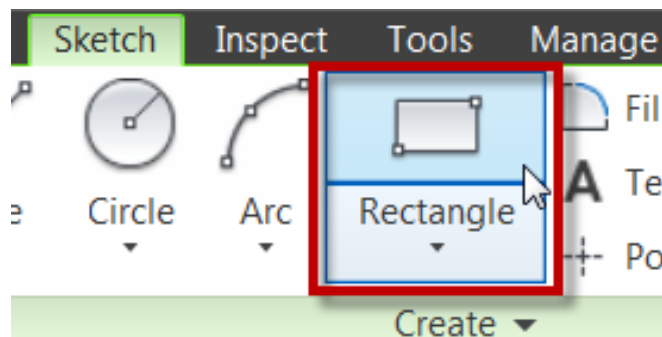


2. Select the end face of the Model Block.

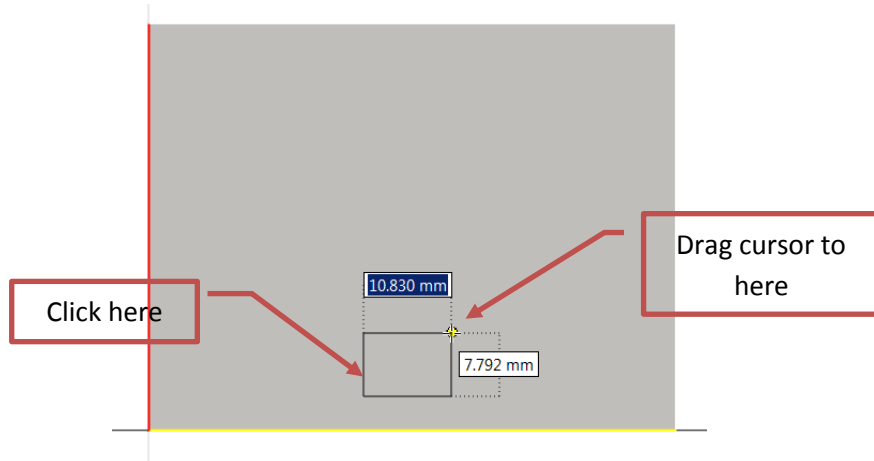


Note: The sketch for the tether line slot can be created on either end of the Model Block.

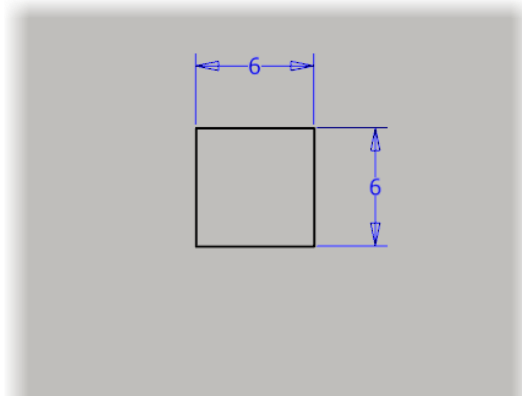
3. On the Create panel, click Rectangle.



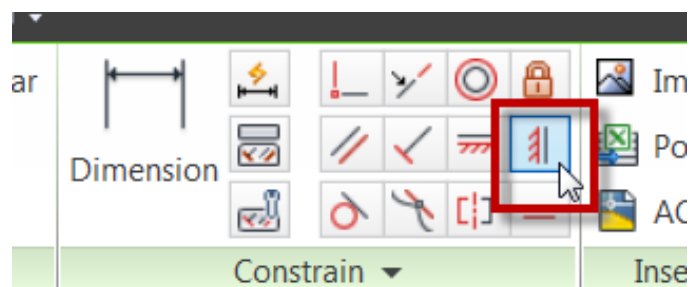
4. Click on the face, then drag up and to the right.



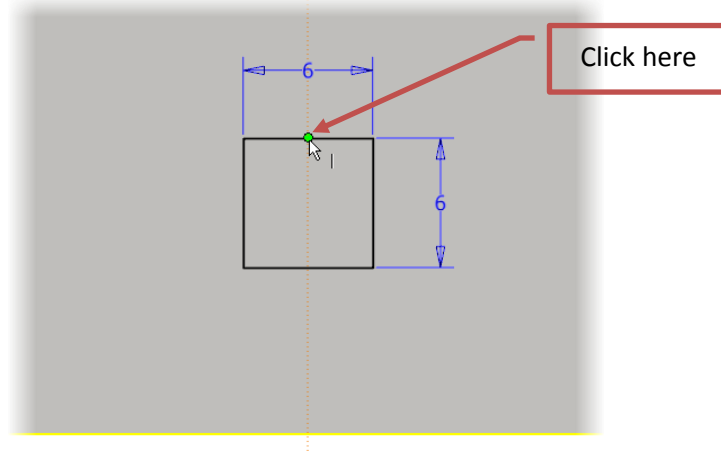
5. Enter **6**, then press Tab, and enter **6**. Press Enter, right click, then click OK.



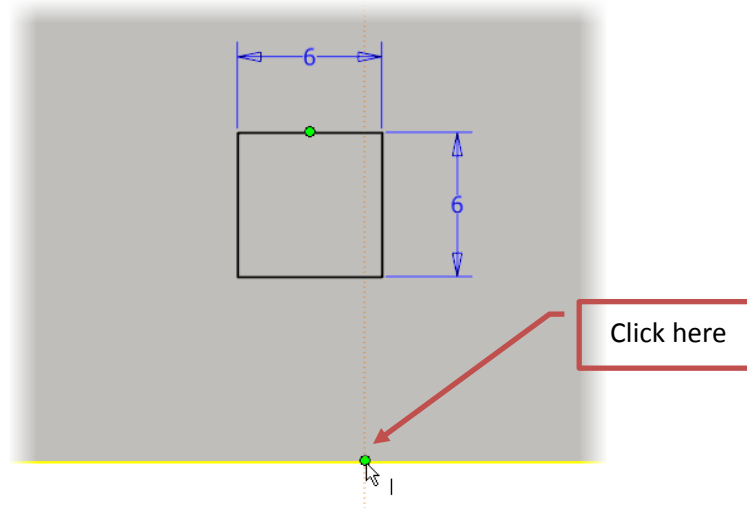
6. On the Constrain panel, click Vertical. Constraints limit changes and define the shape of a sketch.



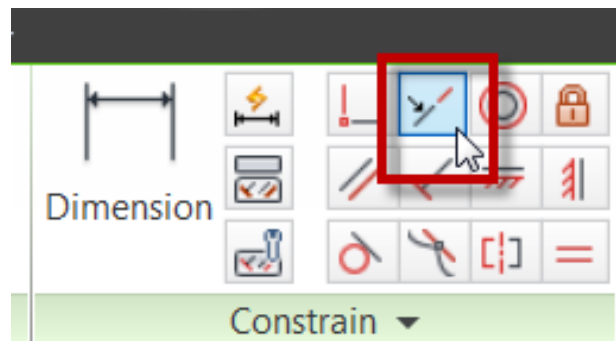
7. Click the midpoint on the upper edge of the rectangle.



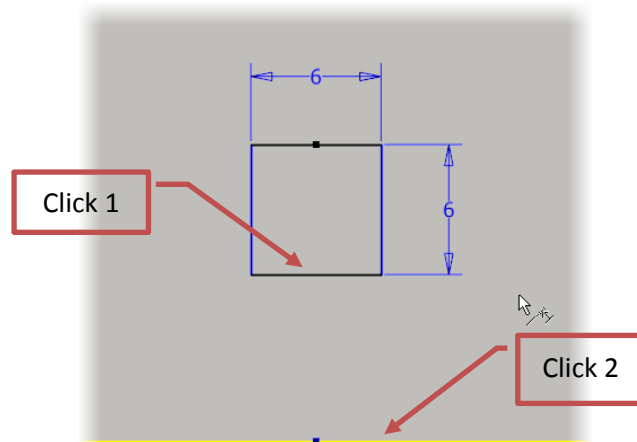
8. Click the midpoint of the lower edge of the block. It is indicated by a large dot.



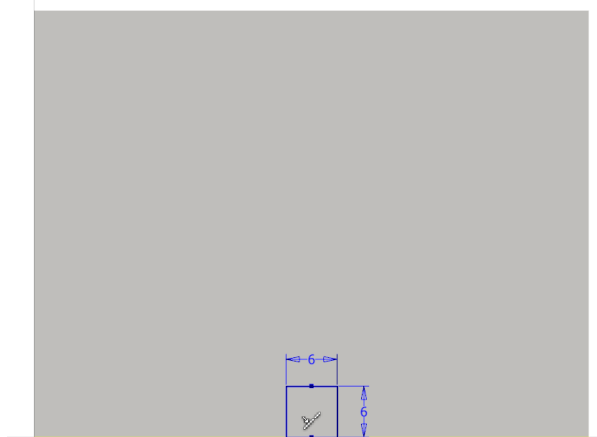
9. On the Constrain panel, click Colinear.



10. Click the bottom edge of the rectangle, (1), then the bottom edge of the block, (2).

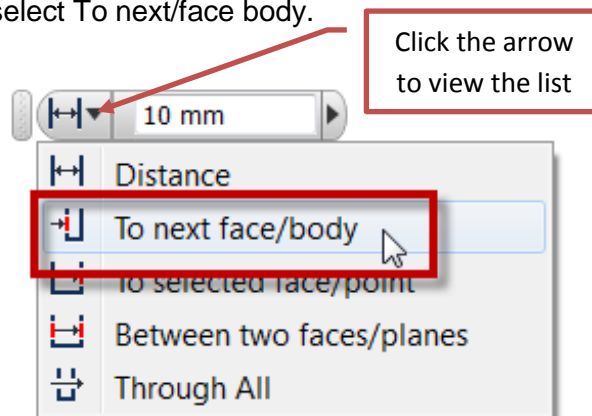


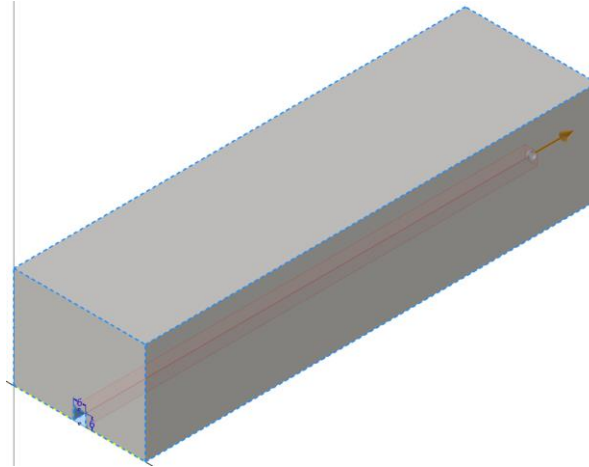
The rectangle is now dimensioned and located as stated in the technical regulations.



11. Press **E**.

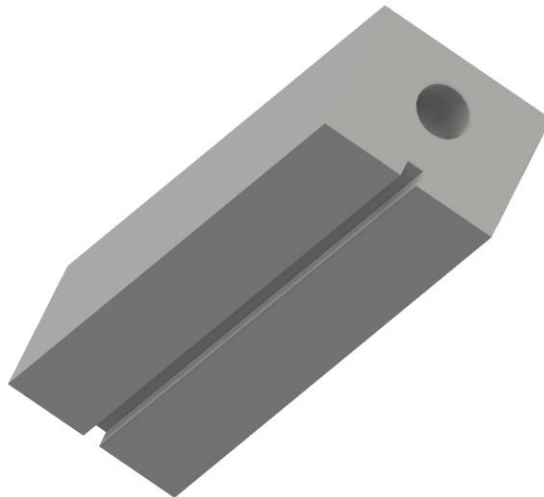
12. On the Extents list, select To next/face body.





13. Click OK.

14. Press and hold the F4 key. Hold down the mouse button, then drag to rotate your model to view the tether slot and cartridge chamber.



15. Press F6 to return to the Home view.

16. Save the file.

Activity 3: Modify an Existing F1 in Schools Car Design

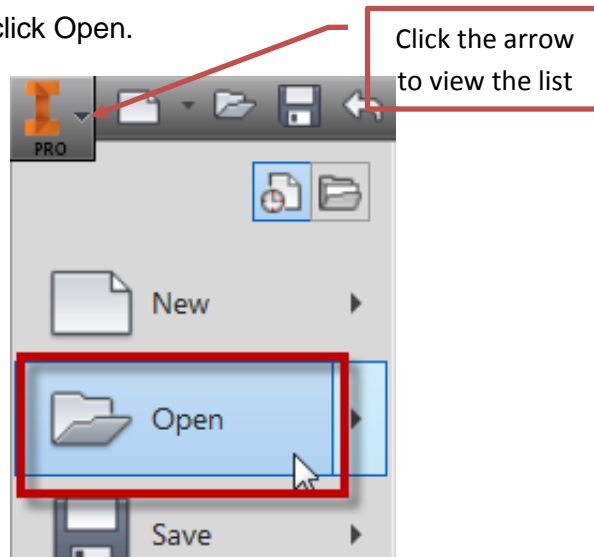
In this section of the tutorial, you open an existing assembly of an F1 car, then modify the front and rear wings and the body. For video instructional support, download the step-by-step video tutorials for this activity.

After completing this section of the tutorial, you will be able to:

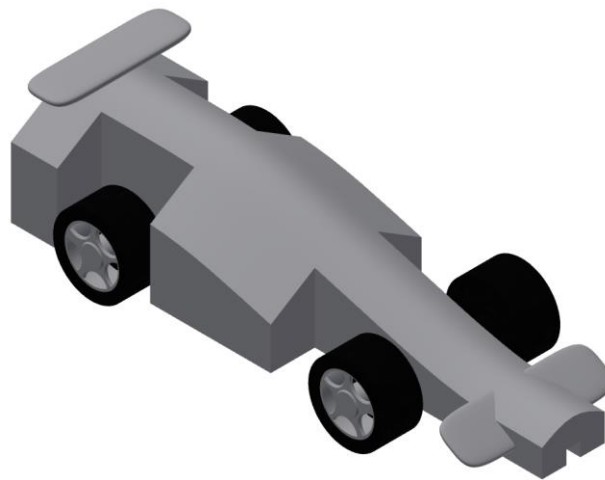
- Open an existing F1 car assembly.
- Modify the front and rear wings.
- Modify the body.

Step 1: Open an Assembly

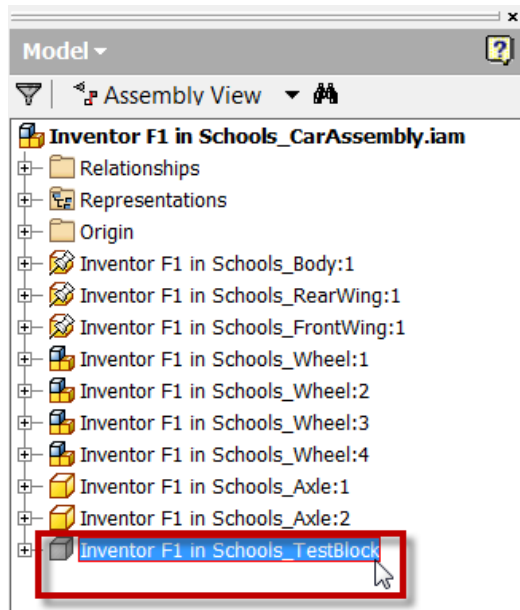
1. On the Application menu, click Open.



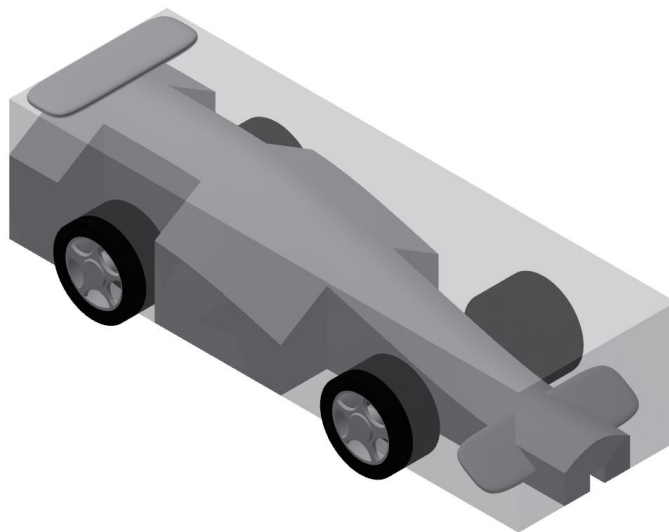
2. Open Inventor *F1 in Schools_CarAssembly.iam*. An assembly file is two or more components considered as a single model. In this design the car has a body, wings, wheels, and axles.



3. In the browser, right click Inventor F1 in Schools Test Block, then click Visibility.



4. Review the assembly. An F1 block with material set to clear is displayed. This shows the car body fits within this block. This is important as if it is any bigger than the block, it cannot be machined.



Note: The block has been shortened to 210mm from the original 223mm. This is the maximum size that can be machined due to the clamps that hold the block in the CNC router.

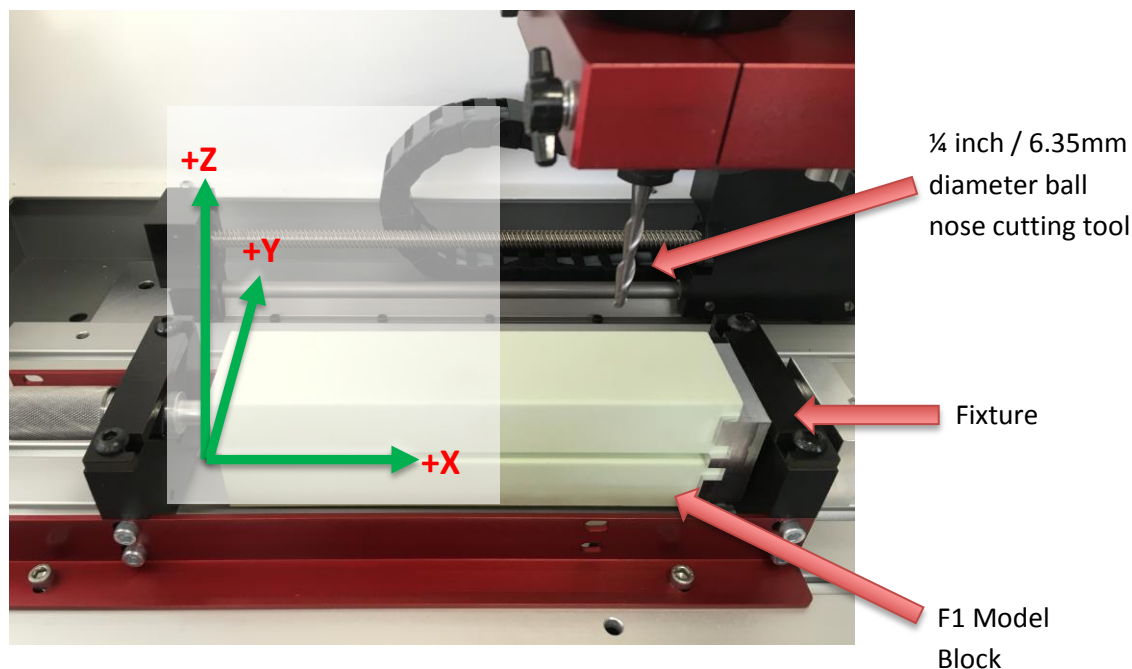
5. Turn off the visibility of Inventor F1 in Schools_TestBlock.

Step 2: Design for Manufacture Considerations

It is very important to have a basic understanding of how the car body will be manufactured in order to create a successful design. In industry, all products are designed with consideration given to any limitations that may exist due to the available or chosen manufacturing methods. An F1 in Schools car is no different. It is important to understand the manufacturing technology and process requirements so that the car designer can create a car body shape that is actually possible to manufacture by a CNC machining process.

CNC (Computer Numeric Control) machining is a very important and widely used manufacturing method in industry. This is why it is compulsory for F1 in Schools teams to manufacture their car bodies using a CNC machine. Many schools are equipped with 3 axis CNC machines, which is the minimum requirement for car body manufacture. High speed 3 Axis CNC Routers are ideal for making F1 in Schools car bodies. Autodesk F1 in Schools tutorials support manufacturing via a Denford 3 Axis CNC Router.

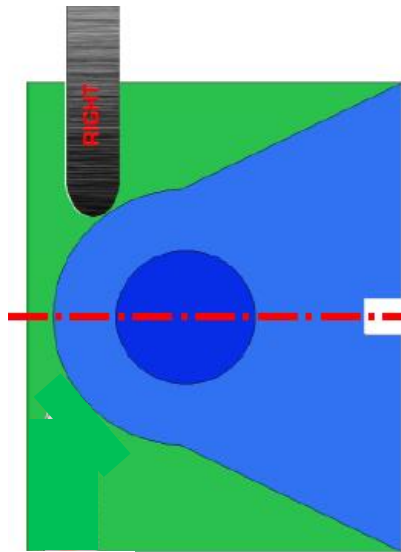
The recommended standard CNC machining method is to machine car bodies using two machining operations, one operation from the left side of the car, and one from the right side. For each operation the F1 Model Block is mounted on its side in the CNC machine via clamping in the special F1 in Schools Machining Fixture. This method provides for a wide range of car profile designs to be machined with a minimum amount of machining operations. The picture below illustrates this.



The green arrows above indicate the 3 axis direction system of the CNC machine. These are the 3 axes of direction that cutting tools move in, often simultaneously, in order to remove the excess Model Block material, revealing the profile of your F1 in Schools racer.

The standard method of manufacture is to machine the car body using two machining operations, one machining operation on each side of the car. The right side of the car is machined with the Model Block mounted as pictured above, the Model Block is then rotated 180 degrees about the x-axis to machine the left side of the car body. The left side machining operation is simply a mirror image of the right side.

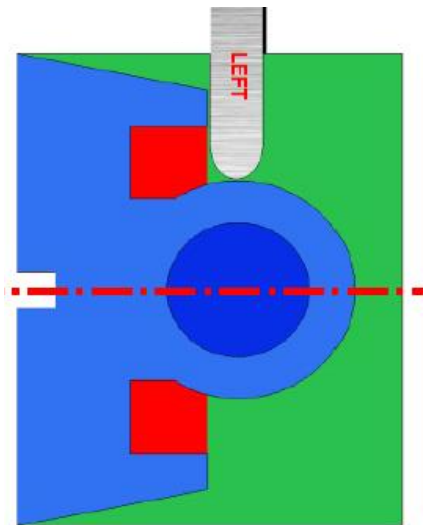
Due to there being only 3 axes, or directions of movement that the cutting tool can move in, some shapes or profiles may not be possible to machine. The diagrams below help explain this further.



The Model Block (green) and car profile (blue) are shown oriented on their side in the CNC machine. The dark blue circle is the CO2 canister hole in the Model Block.

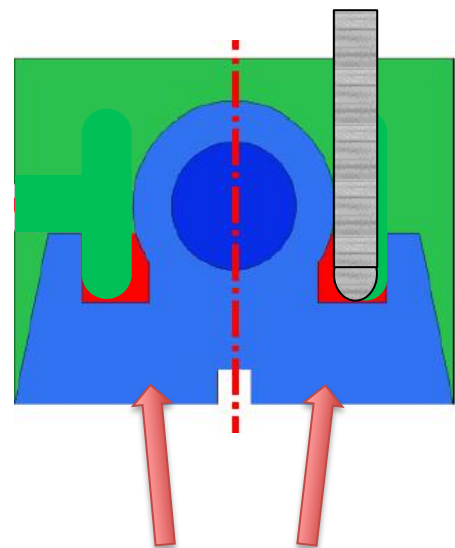
The cutting tool (shown in grey) can remove all of the material to produce the design (shown in blue) as it can be reached from left and right sides of the car.

The material shaded in red cannot be removed as the tool cannot reach this area from the left and right sides.



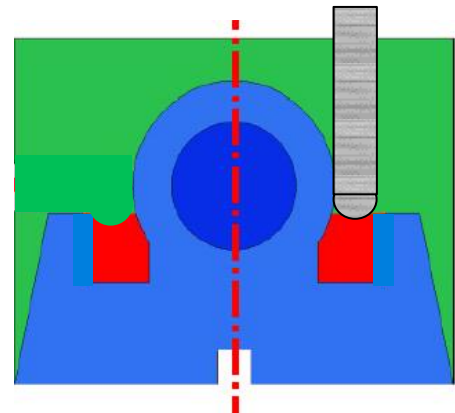
As pictured on the right, it is possible to mount the Model Block in the CNC Router oriented to allow for machining from the car body top. This can then also be inverted to allow for machining of the car body bottom if required. These would be additional machining processes, increasing complexity, time, and cost to machine the design. Note that with this design, there are still areas shown in red that the cutter cannot access, these areas are not possible to machine using any orientation.

Finally, the size and shape of the cutting tool needs to be considered. The standard machining process for F1 in Schools car bodies uses a ¼ inch (6.35mm) diameter ball nose shaped cutter. Looking at the diagram above, you will notice that a small radius / fillet of material (in red) remains where two edges meet at an internal sharp corner. This is due to the ball nose shape of the cutter tip.



ABOVE: Material remains in the sharp internal corners (shown in red) due to the ball nose shape of the cutter tip (shown in grey). Model Block material that will be machined away is indicated in green

The example to the right is a similar body profile to the above example, however, here the slot down next to the left and right sides of the CO2 canister housing is not as wide. The slot is narrower than ¼ inch / 6.35mm and therefore the cutter cannot access and remove the material in red. Any slot or groove features like this that are narrower than the diameter of the cutter cannot be machined.

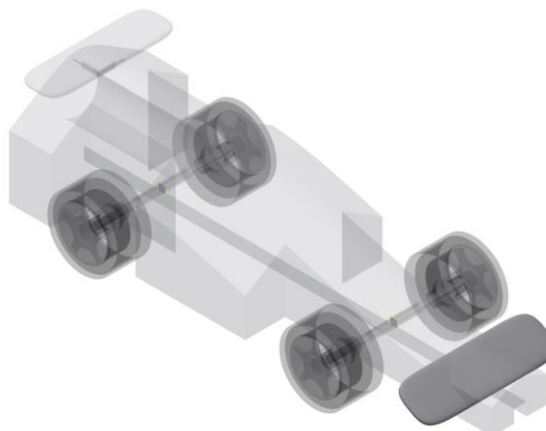
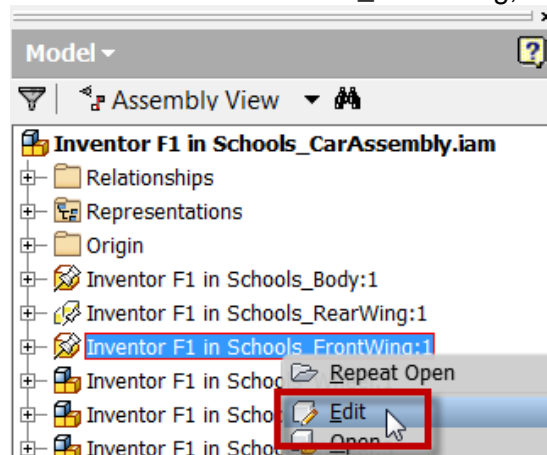


Hopefully now you have a better understanding of the CNC machining process used to manufacture F1 in Schools car bodies and the few limitations that this imposes. You should now keep these factors in mind as you unleash your creativity in designing your F1 in Schools racecar bodies.

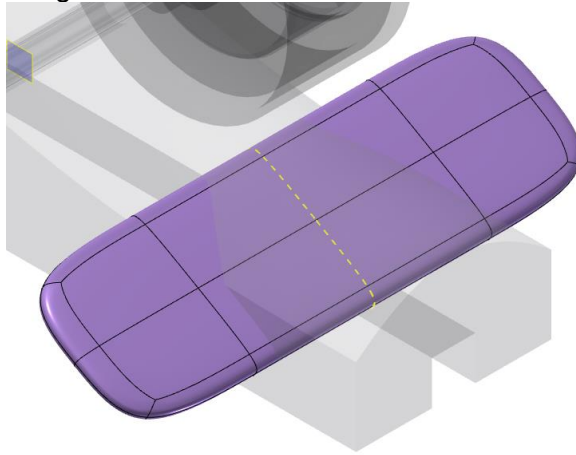
Step 3: Modify the Front Wing

The wing was modeled using freeform commands that allow you to enhance a part such as the car body or wing and create a more visually compelling design. The wing was created using the basic box freeform shape.

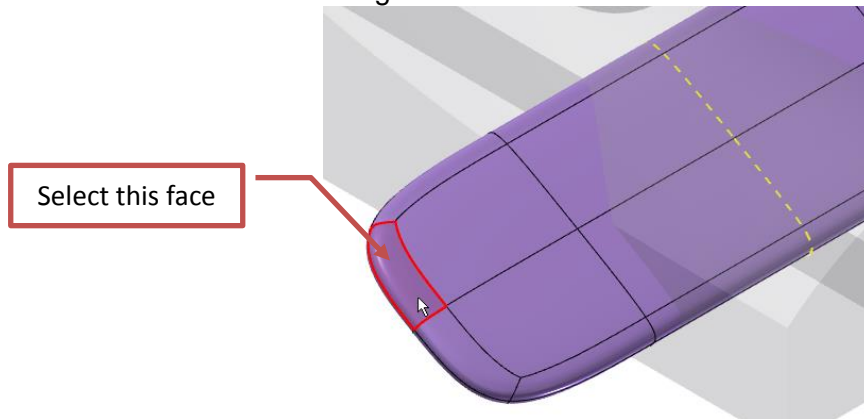
1. In the browser, right click **Inventor F1 in Schools_FrontWing**, then click **Edit**.



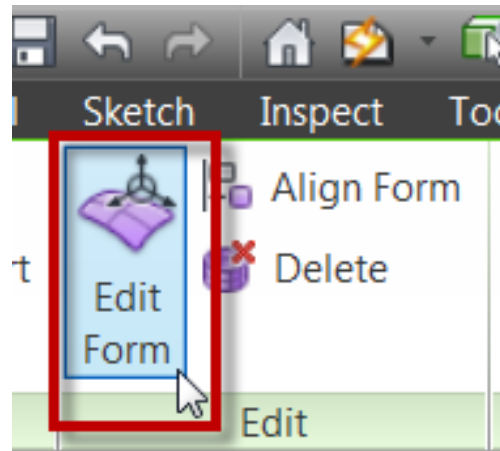
2. In the browser, right click Form1, then click Edit Freeform.
3. Zoom into the front wing.



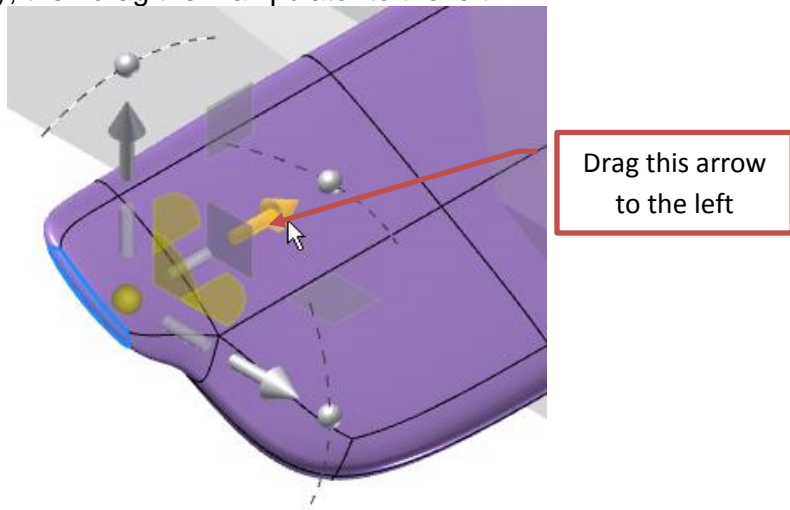
4. Select the face of the wing as shown.



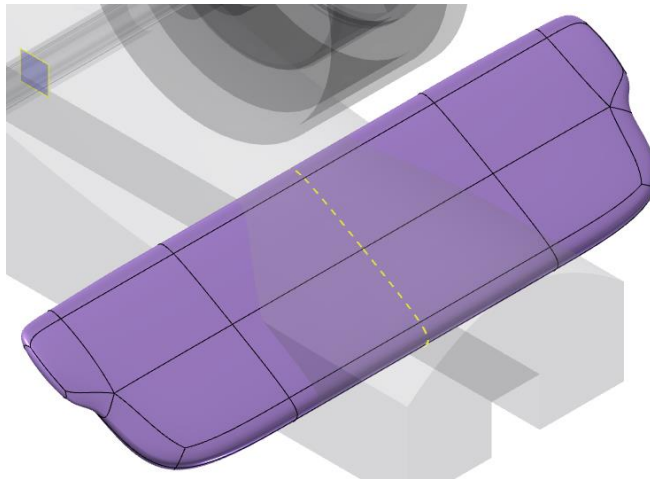
5. On the Edit panel, click Edit Form.



6. Hold down the Alt key, then drag the manipulator to the left.

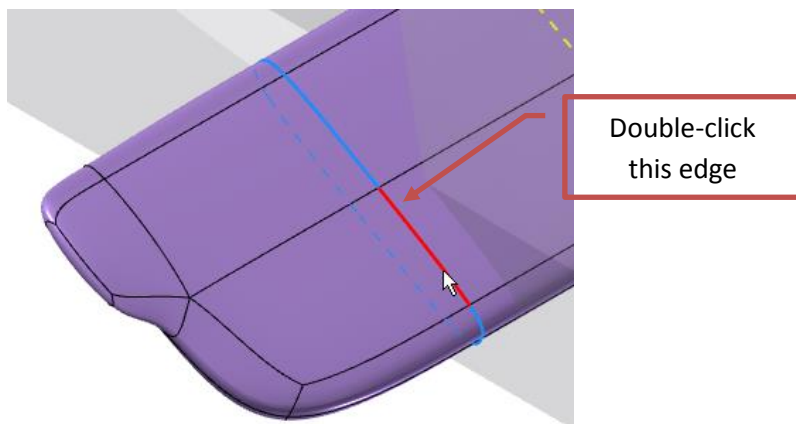


7. Enter -3.

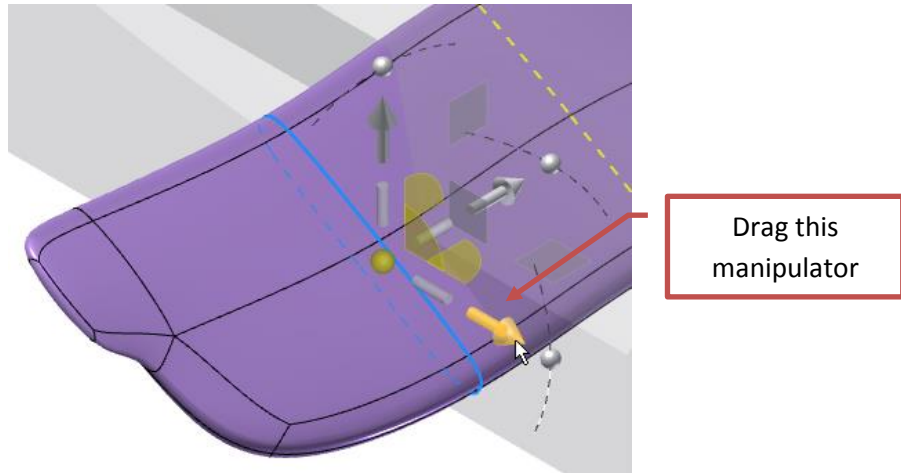


Note: The wing has a defined line of symmetry, so both sides of the wing are modified.

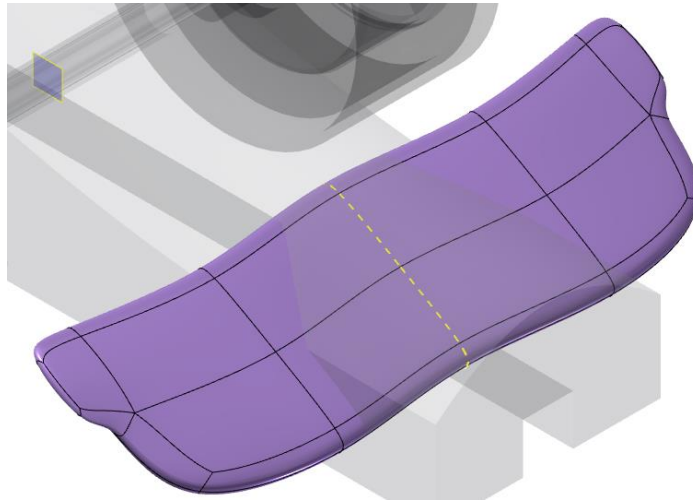
8. Double click the edge as shown. The entire edge should be selected.



9. Drag the manipulator forward.



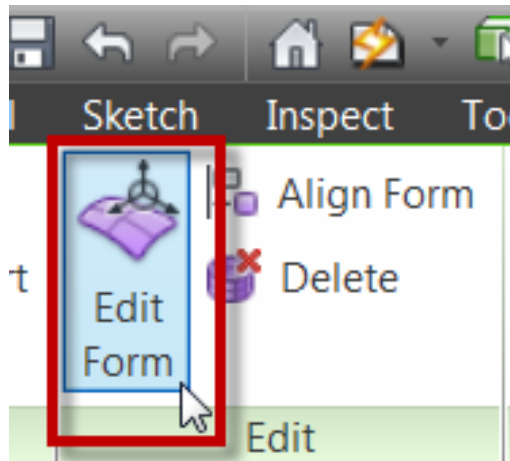
10. Enter 4. Click OK.



Note: Rule T8.6 states that the front wheels may only be obstructed to a height of 15mm from the track surface. Because of this you need to alter the positioning of the wing.

11. Double-click a face on the wing to select the complete wing.

12. On the Edit panel, click Edit Form.

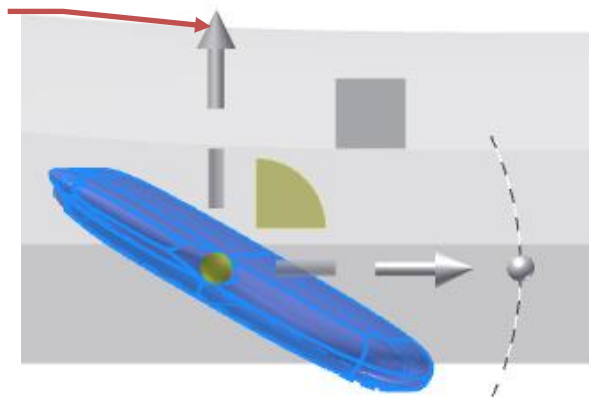


13. On the ViewCube, click Left.

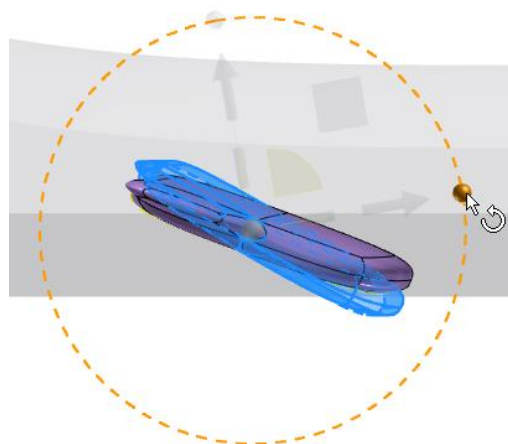


14. Drag the manipulator down approximately **6mm** so that the wing is below the top edge of the car body.

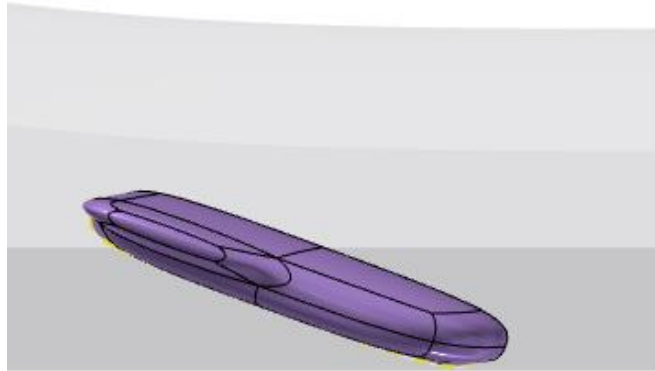
Drag this manipulator



15. Rotate the wing counter-clockwise approximately **10** degrees.



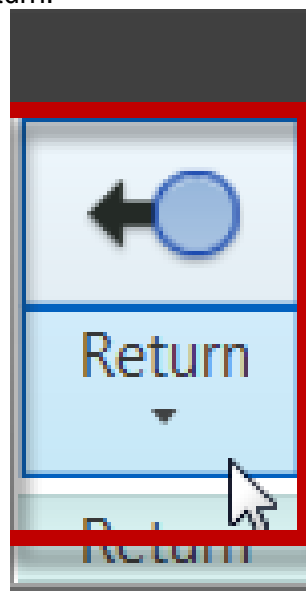
16. Click OK.



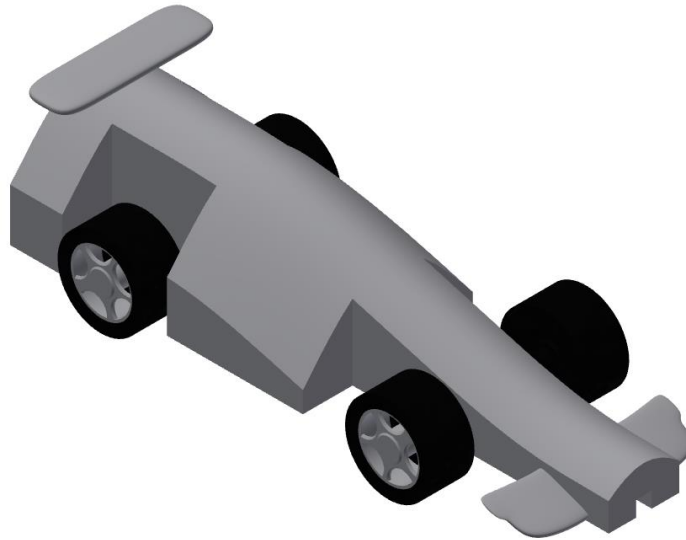
17. On the Exit panel, click Finish Freeform.



18. On the Return panel, click Return.

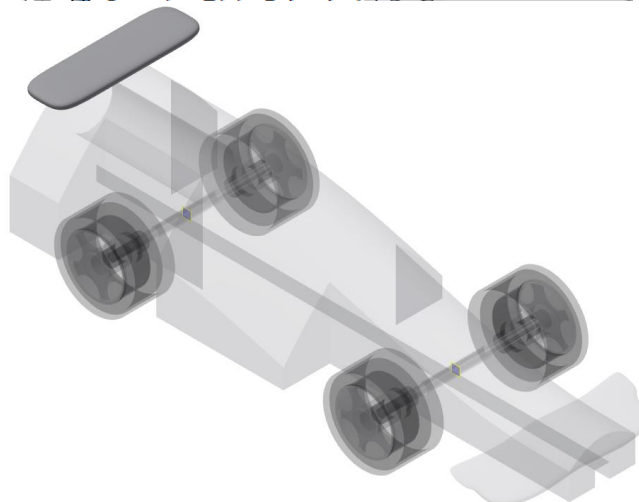
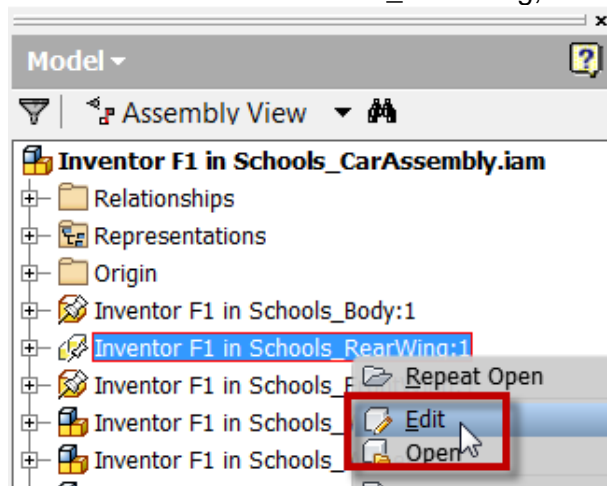


19. On the View Cube, click Home.

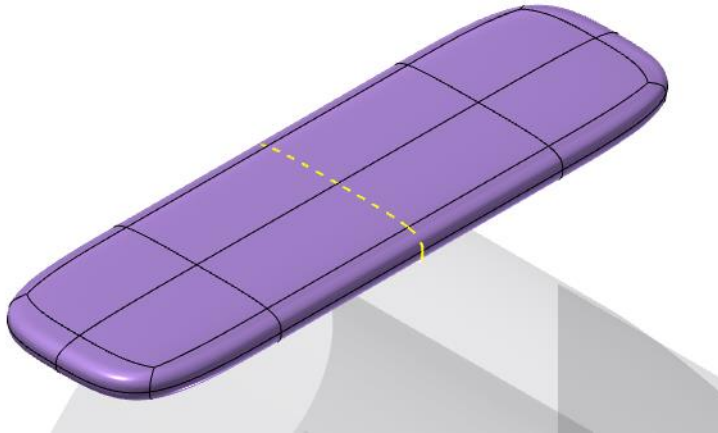


Step 4: Modify the Rear Wing

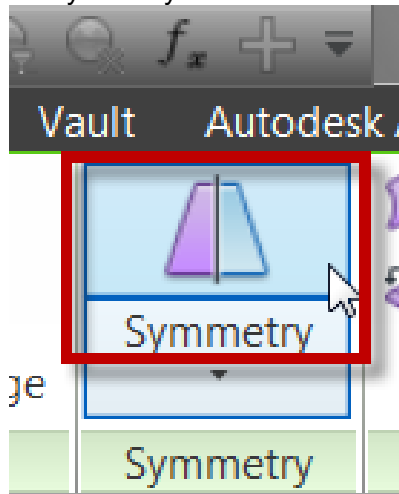
1. In the browser, right click Inventor F1 in Schools_RearWing, then click Edit.



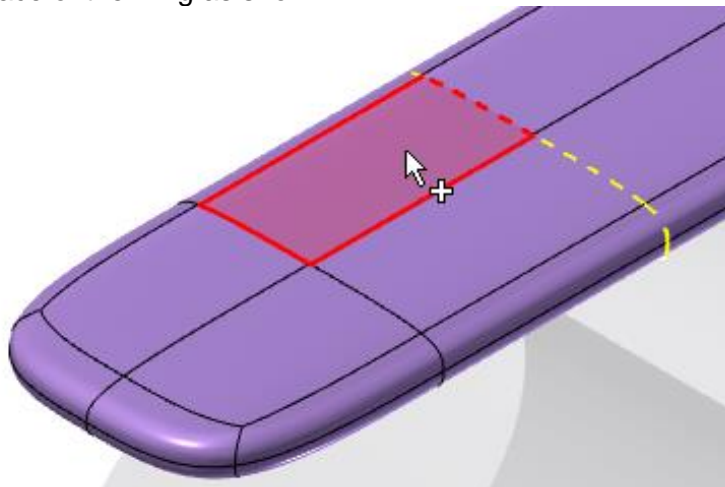
2. In the browser, right click Form1, then click Edit Freeform.
3. Zoom into the rear wing. The dotted line indicates a line of symmetry.



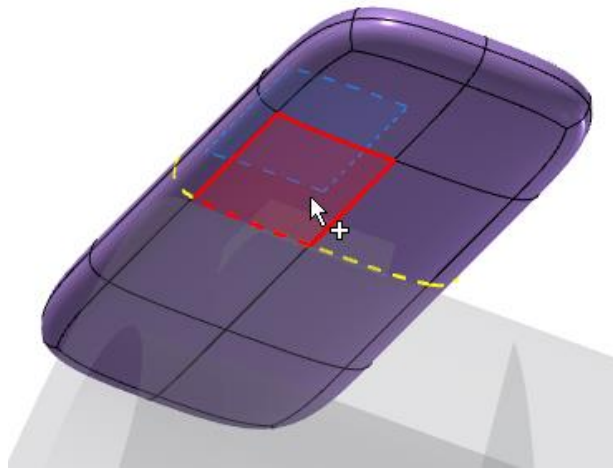
4. On the Symmetry panel, click Symmetry.



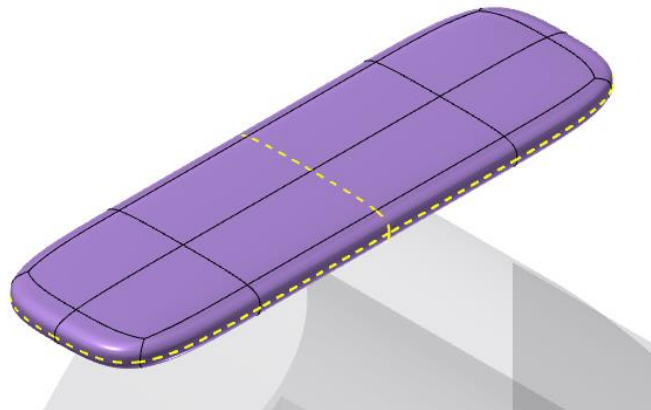
5. Select the top face of the wing as shown.



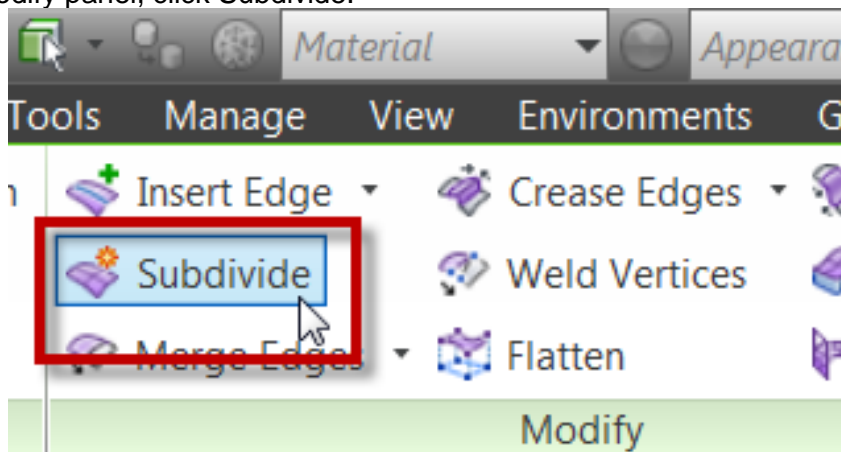
6. Rotate the wing to view the underside face then select the face directly underneath the first selection.



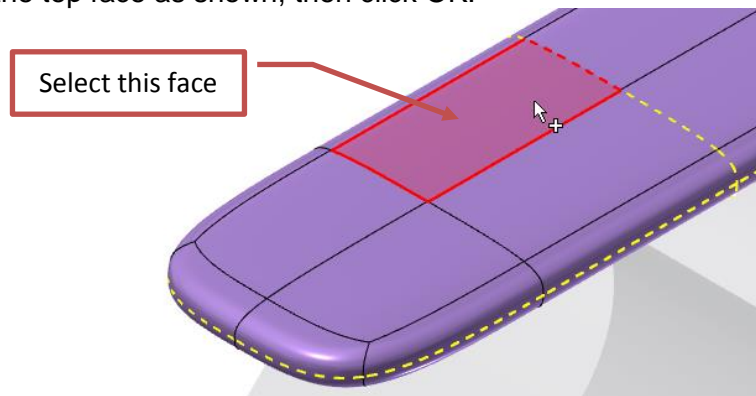
7. Click OK, then press F6 to return to the Home view. The dotted line indicates the line of symmetry.



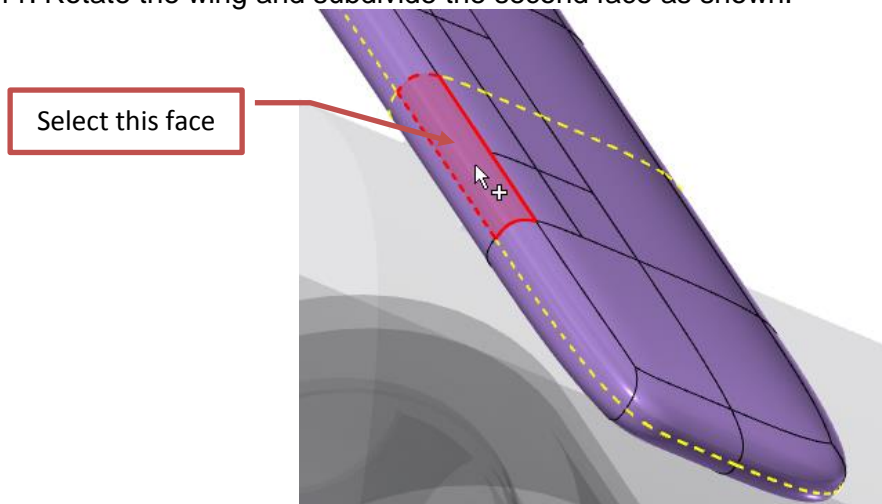
8. Zoom into the wing.
9. On the Modify panel, click Subdivide.



10. Select the top face as shown, then click OK.

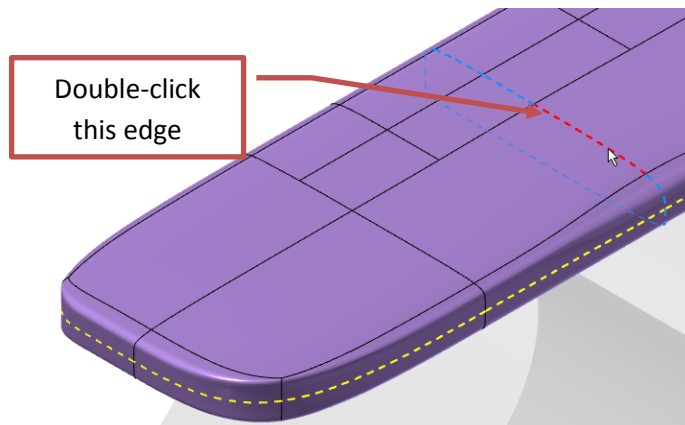


11. Rotate the wing and subdivide the second face as shown.



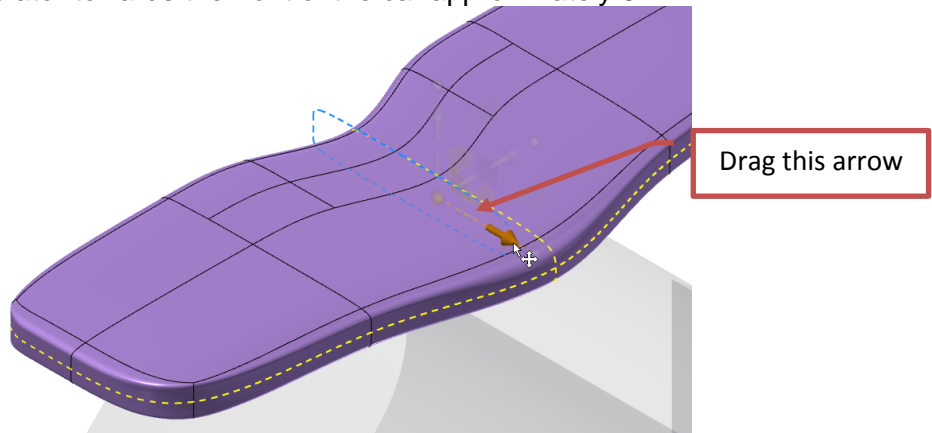
12. Return to the Home view.

13. Double-click the line of symmetry as shown. The complete line of symmetry should be selected.

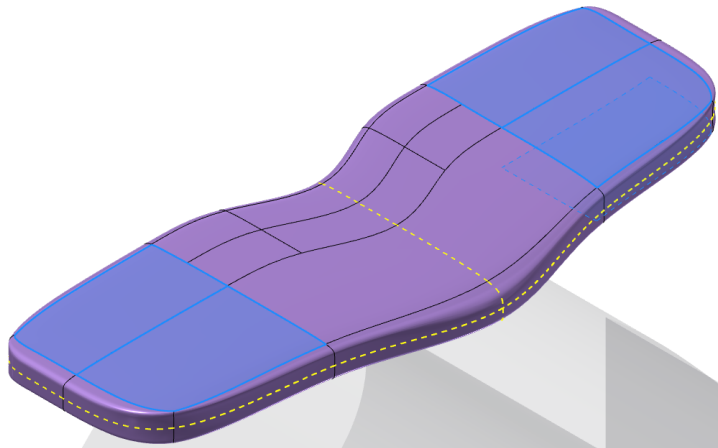


14. On the Edit panel, click Edit Form.

15. Drag the manipulator towards the front of the car approximately **5mm**.



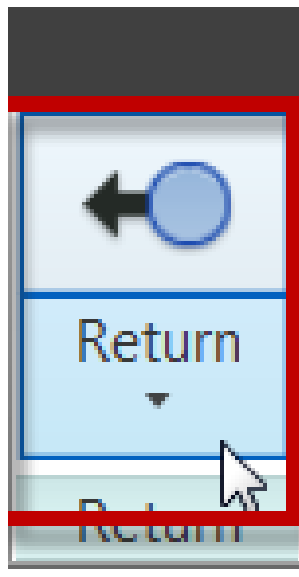
16. Select the end faces as shown, then use Edit Form to drag the faces down **0.8mm**.



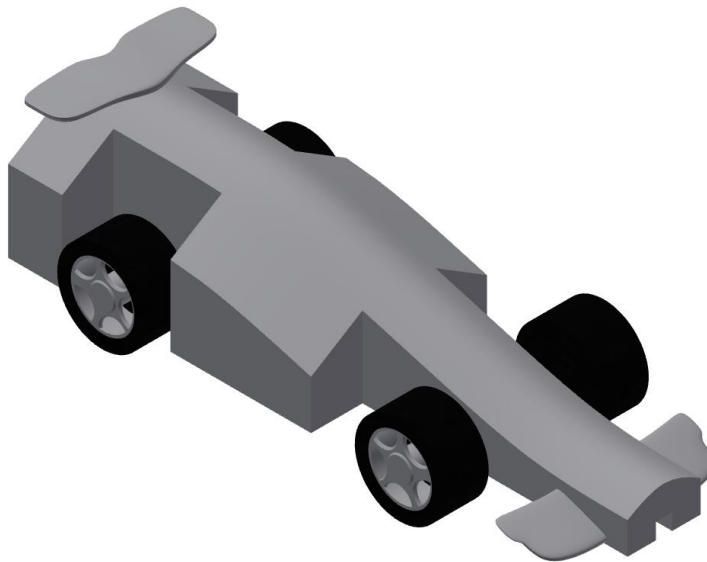
17. On the Exit panel, click Finish Freeform.



18. On the Return panel, click Return



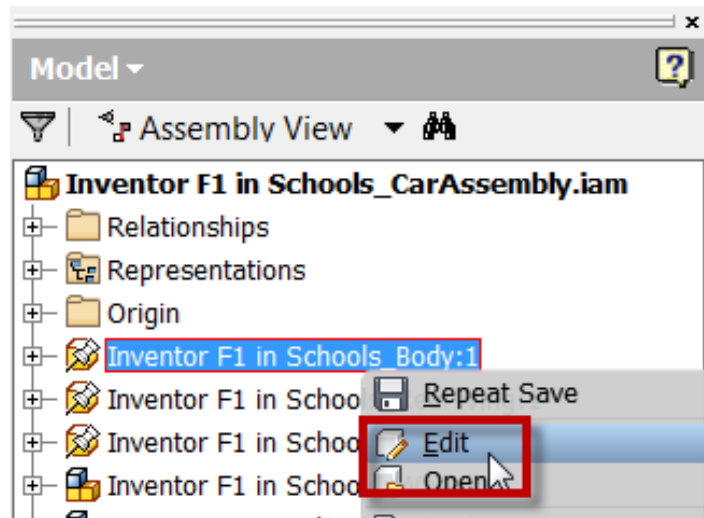
19. On the ViewCube, click Home.



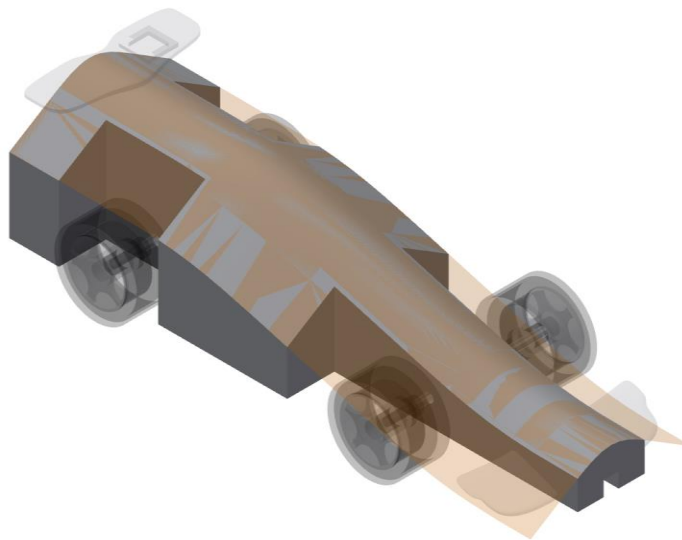
20. Save the file.

Step 5: Modify the Body

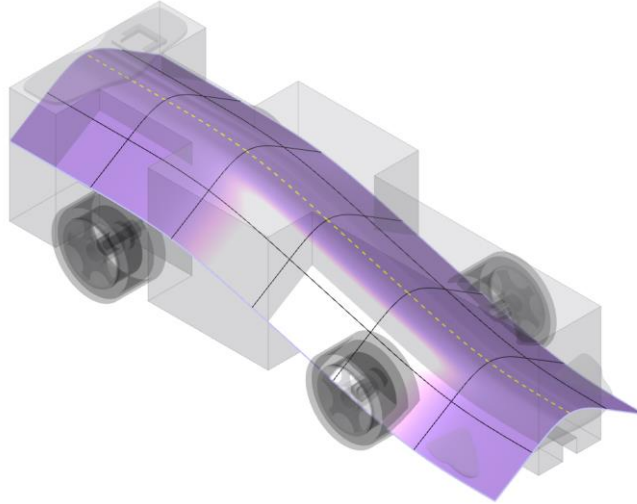
1. In the browser, right click Inventor F1 in Schools_Body, then click Edit.



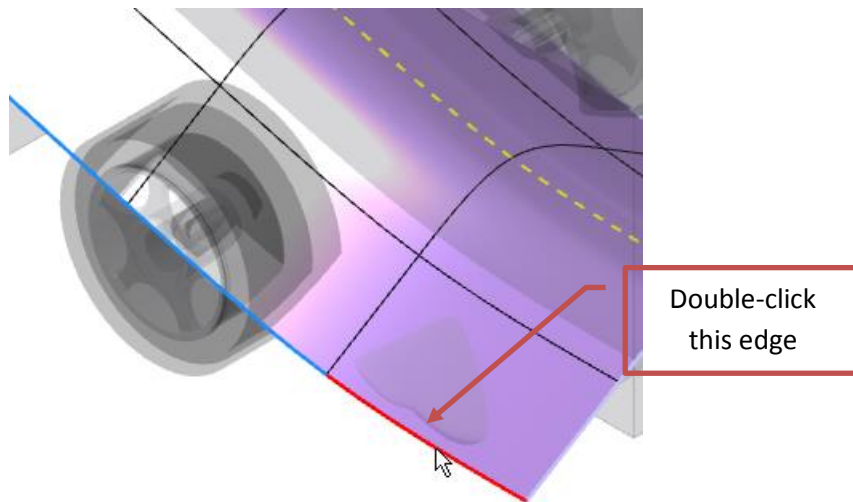
2. In the browser, right click Form1, then click Surface Visibility.



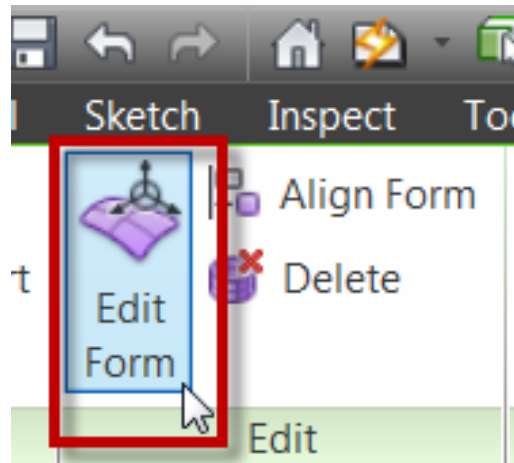
3. In the browser, right click Form1, then click Edit Freeform.



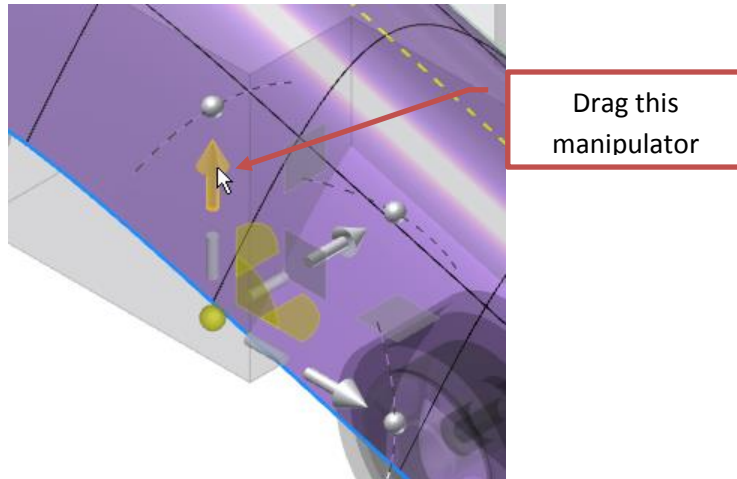
4. Double-click the edge as shown. The complete edge should be selected.



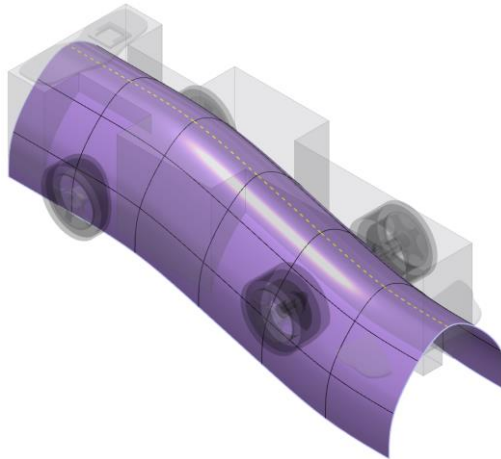
5. On the Edit panel, click Edit Form.



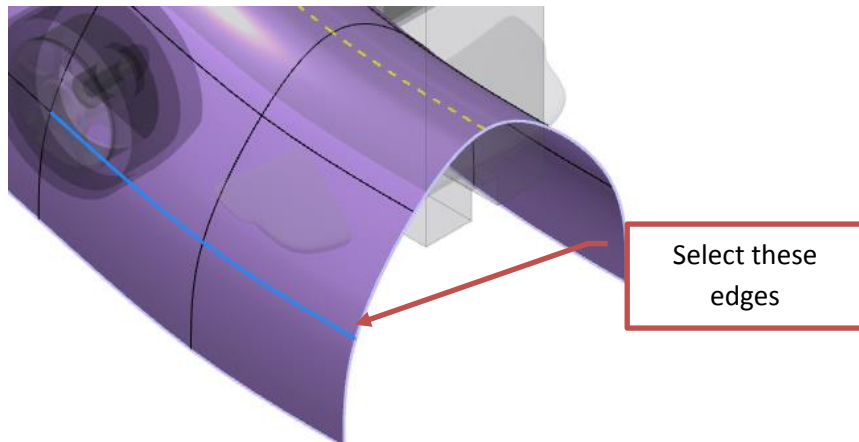
6. Drag the manipulator down **-10mm**. Click OK.



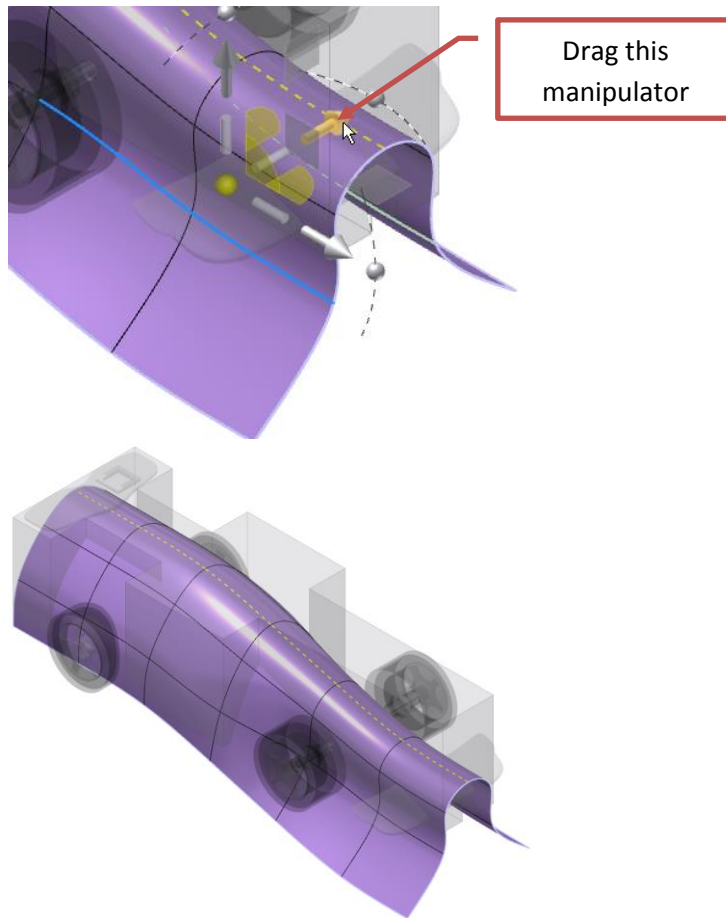
7. On the Edit panel, click Edit Form.
8. Select the same edge; hold down the Alt key, then drag the manipulator down **-20mm**. Using the Alt key adds material to the freeform shape.



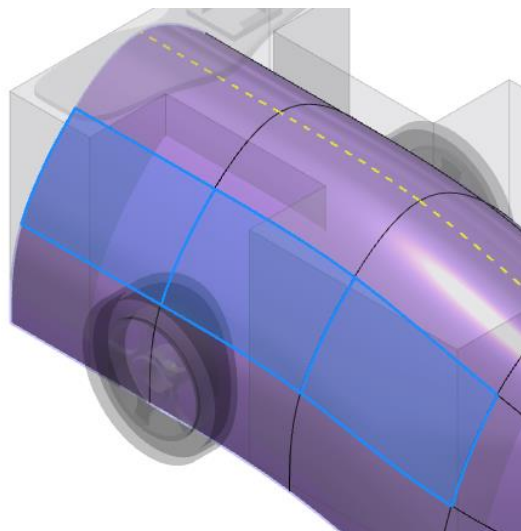
9. Select the 2 edges as shown.



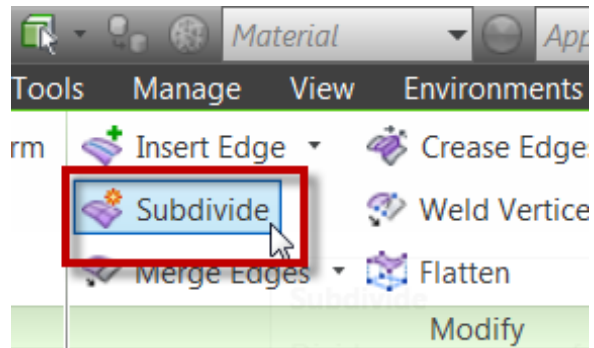
10. On the Edit panel, click Edit Form.
11. Drag the manipulator into the car **25mm**. Click OK.



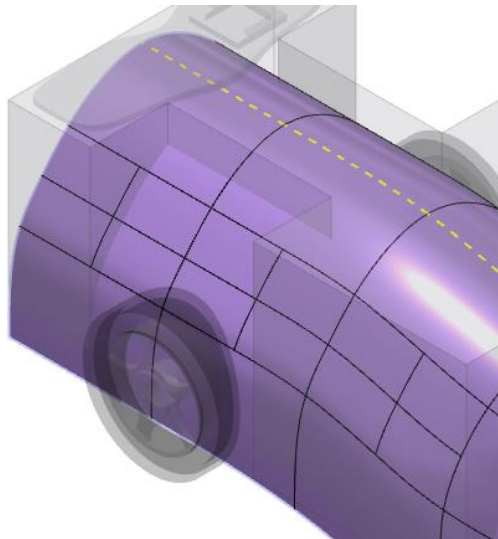
12. Select the faces as shown.



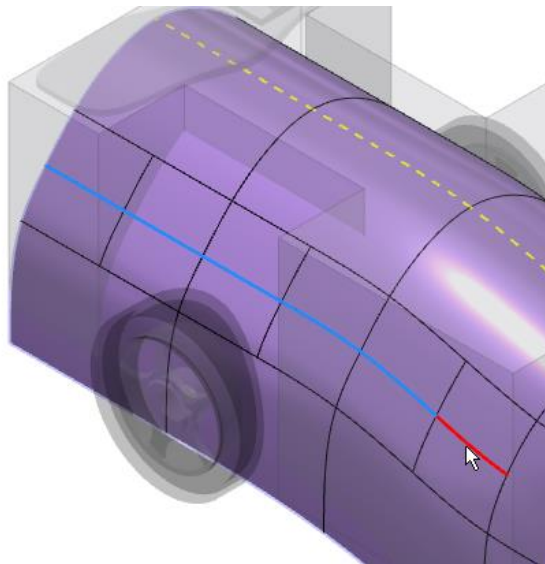
13. On the Modify panel, click Subdivide.



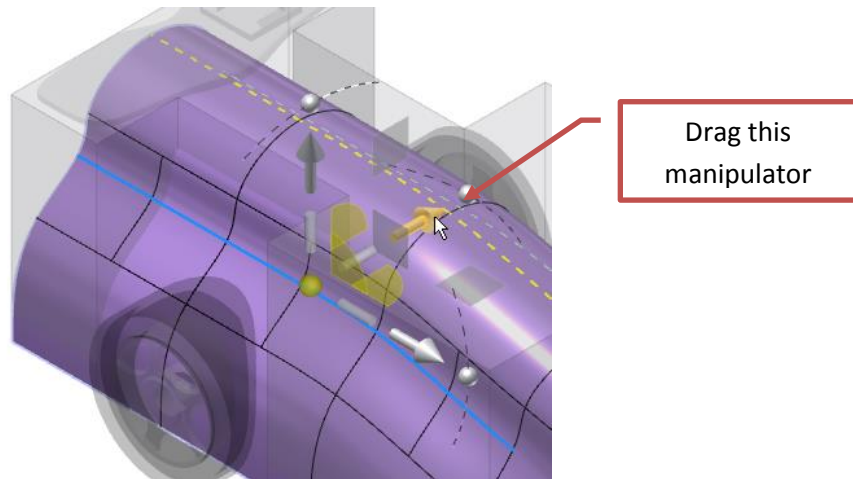
14. Click OK.



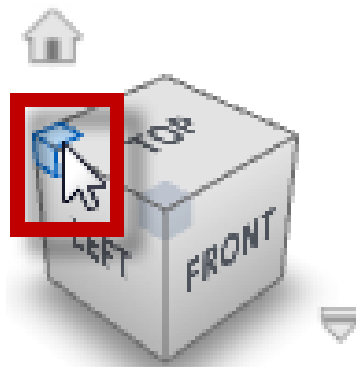
15. Double-click the edge as shown. The complete edge should be selected.



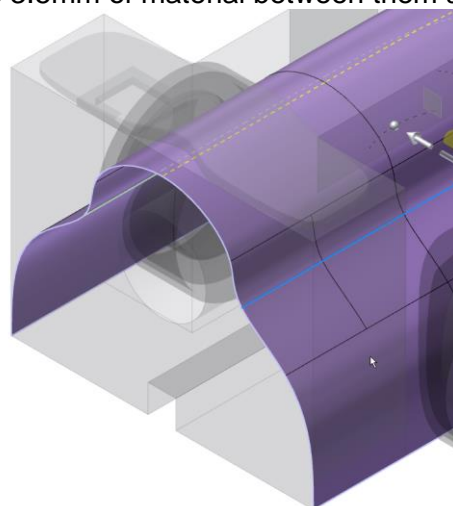
16. On the Edit panel, click Edit Form.
17. Drag the manipulator into the car **10mm**.



18. On the ViewCube, click the top left corner.

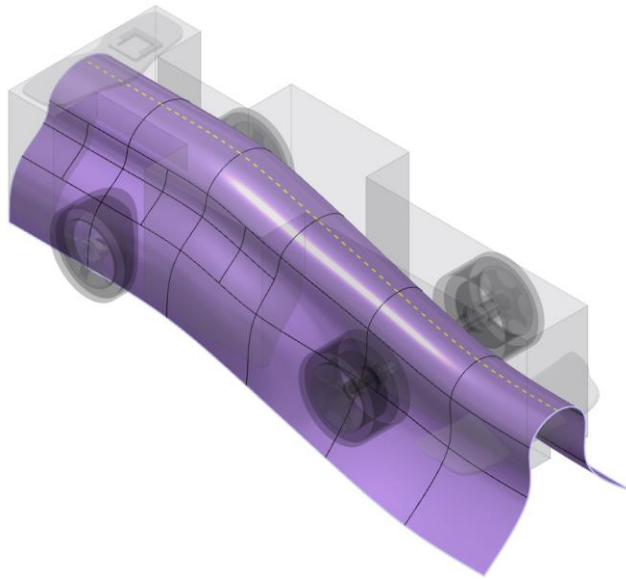


19. Review the distance between the cartridge chamber and the modification you just created. There must be 3.5mm of material between them as per Rule T5.4.



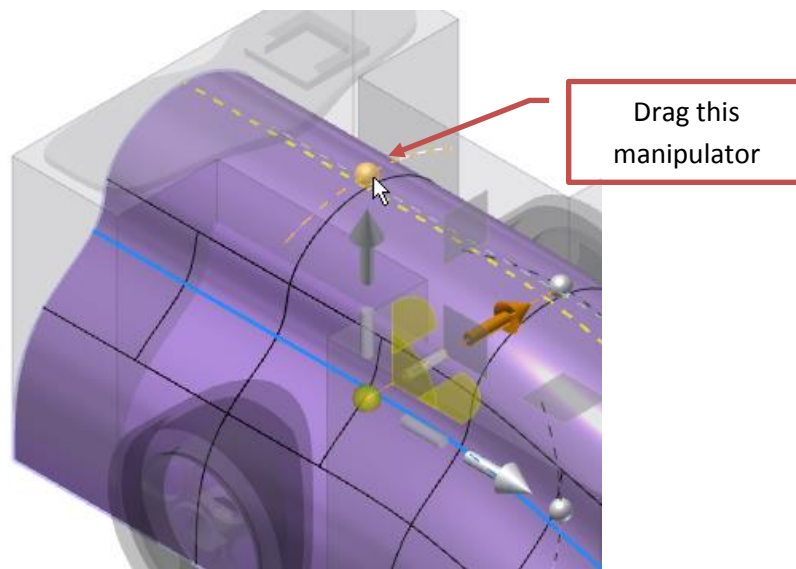
20. Click OK.

21. Return to the Home view.

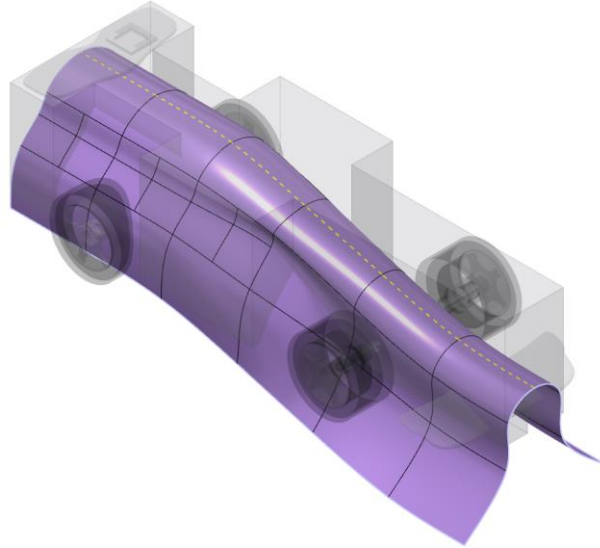


22. On the Edit panel, click Edit Form.

23. Double-click the same edge, then drag the rotation manipulator counter-clockwise **70** degrees.



24. Click OK.



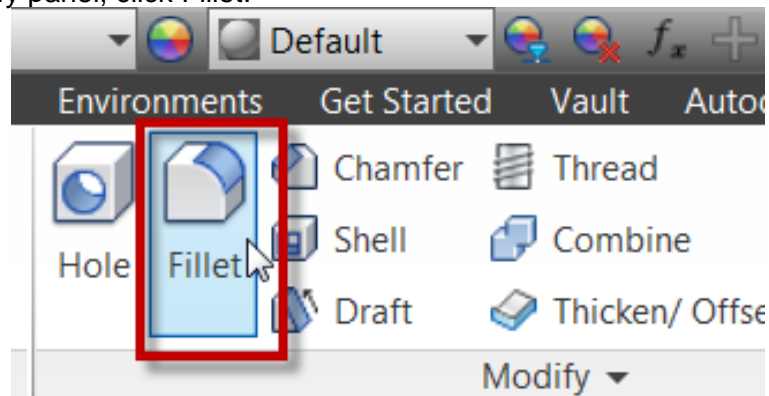
25. On the Exit panel, click Finish Freeform.



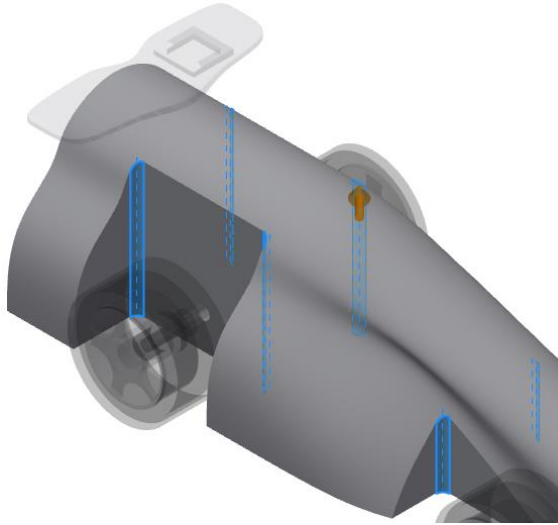
Note: The Split tool was used to remove the material defined by the freeform shape.

26. In the browser, right click Form1, then click Surface Visibility.

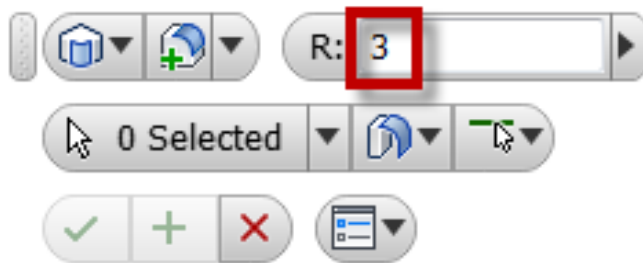
27. On the Modify panel, click Fillet.



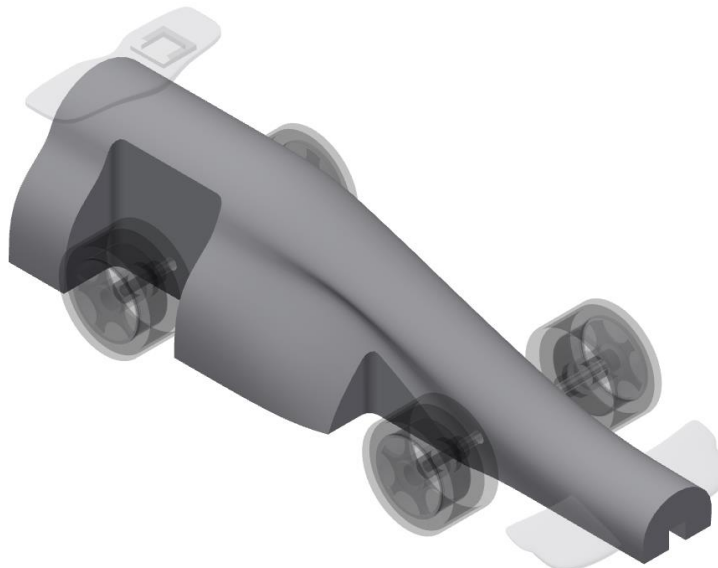
28. Select the 6 edges as shown.



29. For Radius, enter 3.

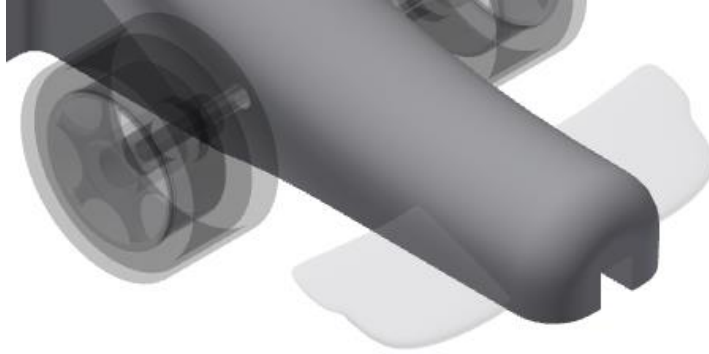


30. Click OK.

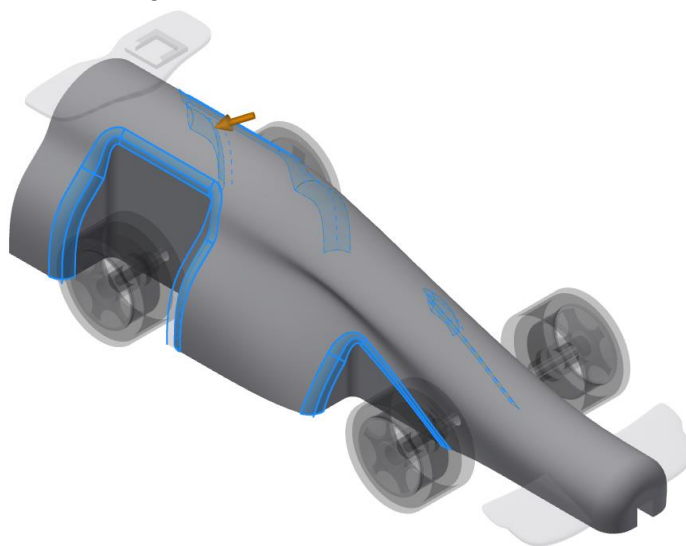


Note: These fillets are added to allow the CNC cutter to cut these corners.

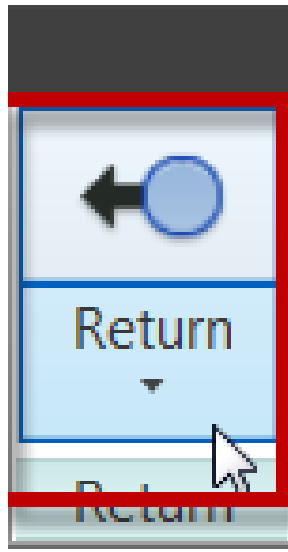
31. Add a **7mm** fillet to the nose of the car.

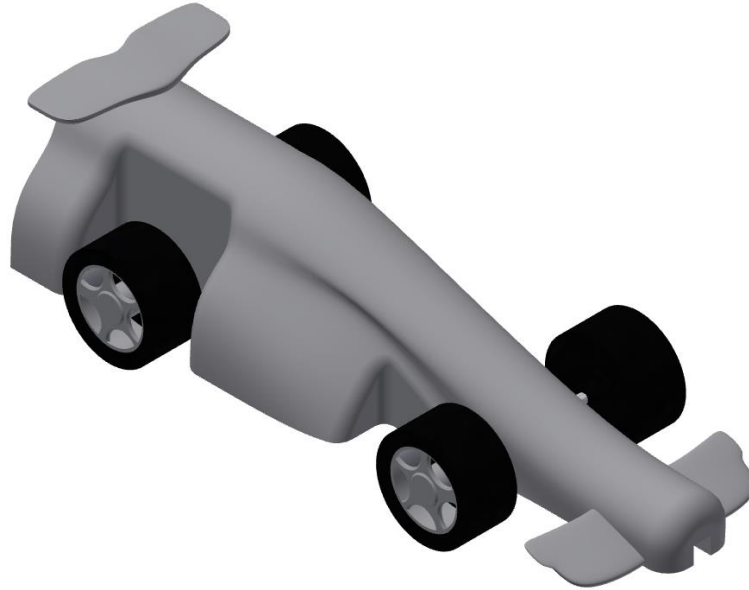


32. Add **5mm** fillets to the 4 edges as shown.



33. On the Return panel, click Return.





Activity 4: Checking Dimensions and Exporting as STL

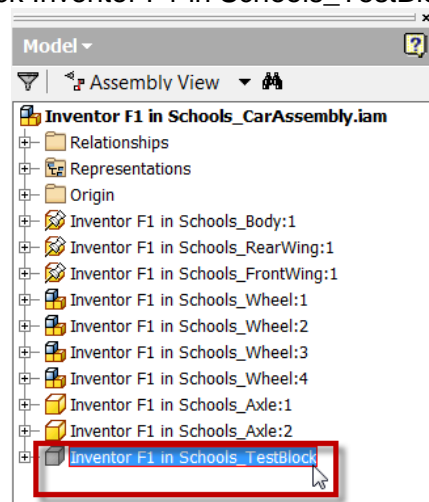
After designing your car, it is important to check whether your design is suitable for manufacturing. To do this, you need to check to see if the body of the car fits within the official F1 in Schools Model Block. You also need to save the parts in a format that the CNC router and 3D printers will recognize. For this project, you will save it in STL format. For video instructional support, download the step-by-step video tutorials for this activity.

After completing this section of the tutorial, you will be able to:

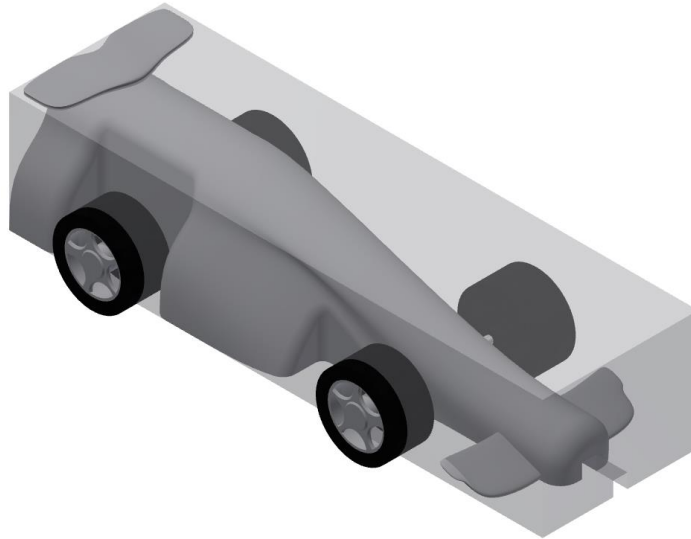
- Check the dimensions of the F1 car design.
- Save parts to an STL format.

Step 1: Check the Dimensions of the F1 Car Design

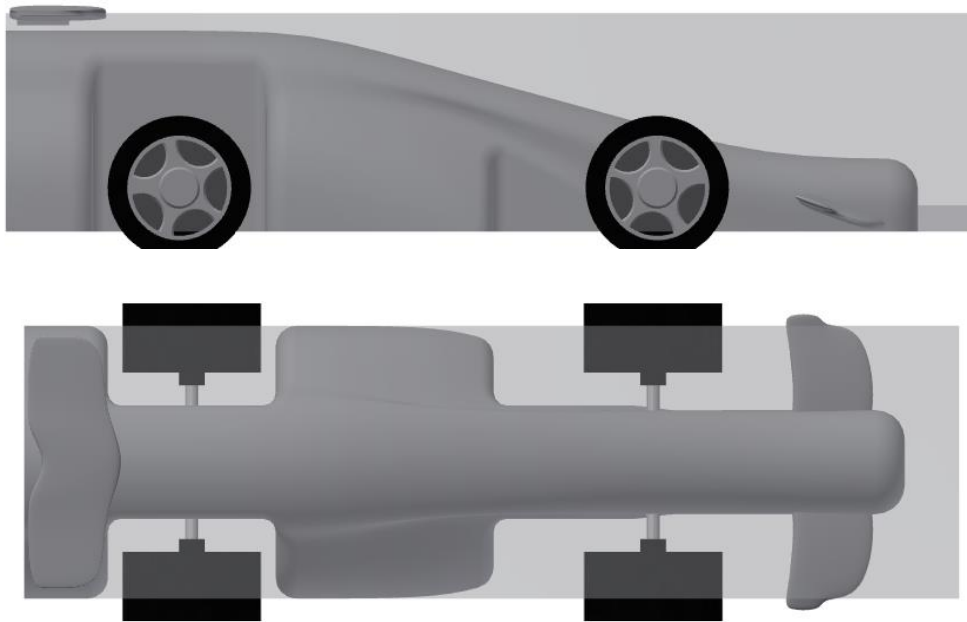
1. In the browser, right click **Inventor F1 in Schools_TestBlock**, then click **Visibility**.

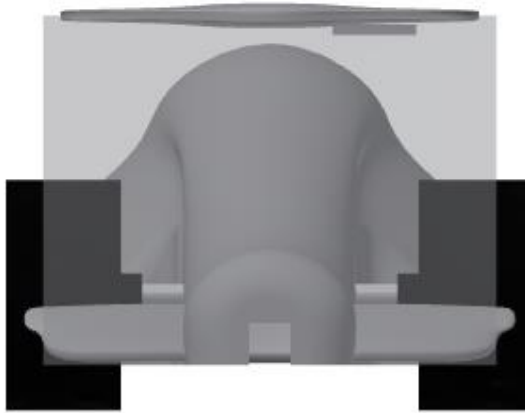


2. Review the assembly. An F1 block with material set to clear is displayed. This shows the car body fits within this block. This is important as if it is any bigger than the block, it cannot be machined.



3. Use the View Cube to review the design from different angles. The focus of this review is the car body. The wings can be outside of the test block.



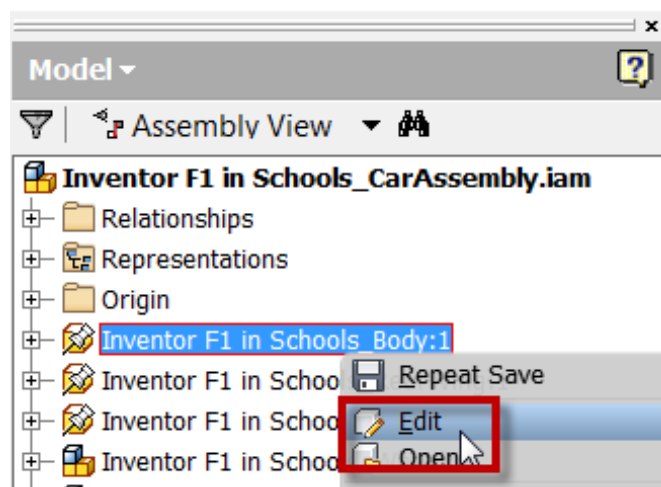


4. Turn off the visibility of Inventor F1 in Schools_TestBlock.
5. Return to the Home view.
6. Save the file.

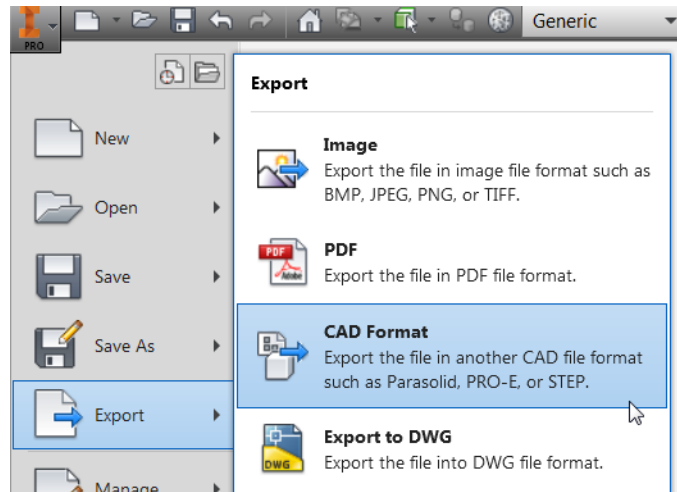
Step 2: Output the Parts in STL Format

The parts of the car need to be saved in STL format so they can be CNC machined and/or 3D printed.

1. In the browser, right click Inventor F1 in Schools_Body, then click Edit.



2. On the Application menu, click Export > CAD Format.



3. From the Save As Type list, select STL Files (*.stl).
4. For File Name, enter **my_carbody**.
5. Click Save.
6. On the Exit panel, click Exit.
7. Repeat this work flow for the rear wing and front wing. Those parts will be 3D printed.

Activity 5: Creating a Drawing of the F1 Car

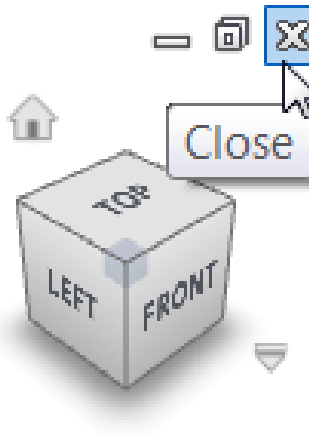
In this section of the tutorial you create orthographic drawings of the F1 car. In addition, you add dimensions and text. For video instructional support, download the step-by-step video tutorials for this activity.

After completing this section of the tutorial, you will be able to:

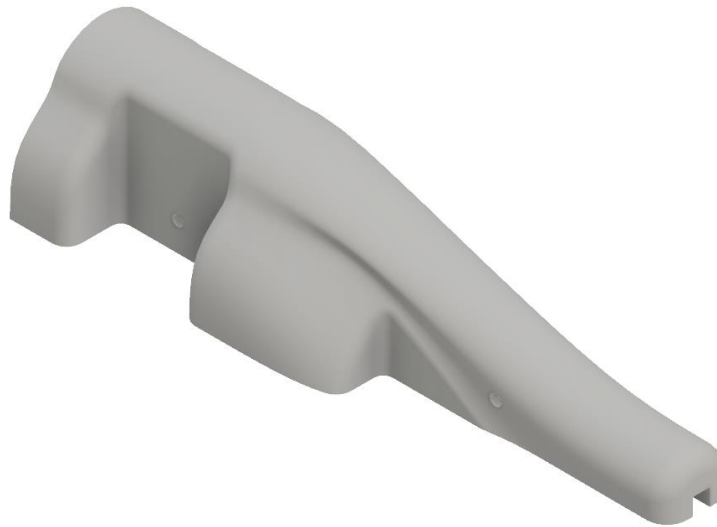
- Create orthographic drawings.
- Add dimensions.

Step 1: Create a New Drawing File

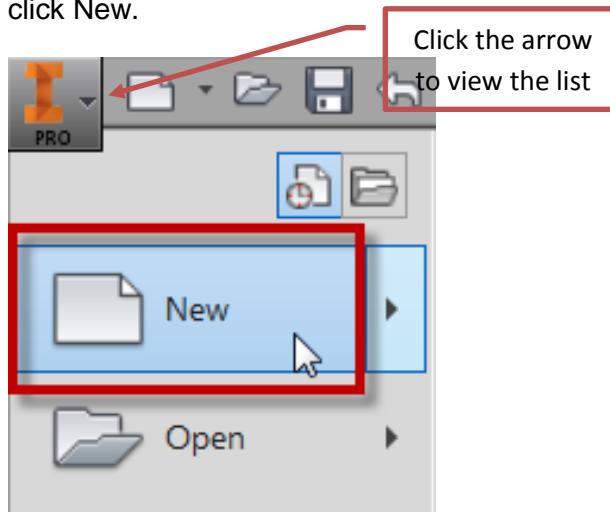
1. Close the car assembly.



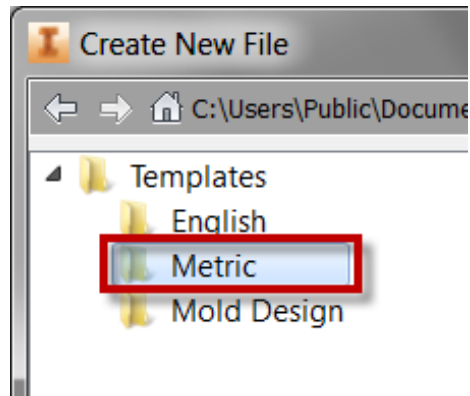
2. Open Inventor F1 in Schools_Body.



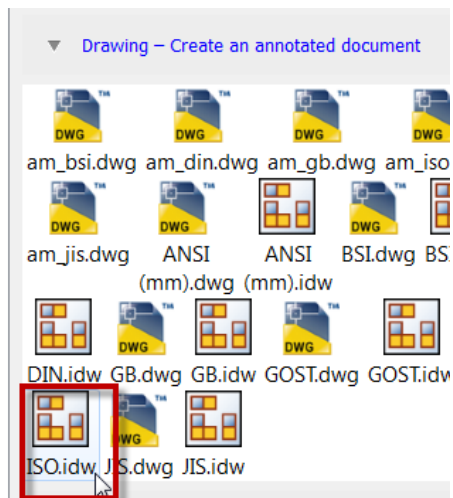
3. On the Application menu, click New.



4. In the Create New File dialog box, under Templates, select Metric.



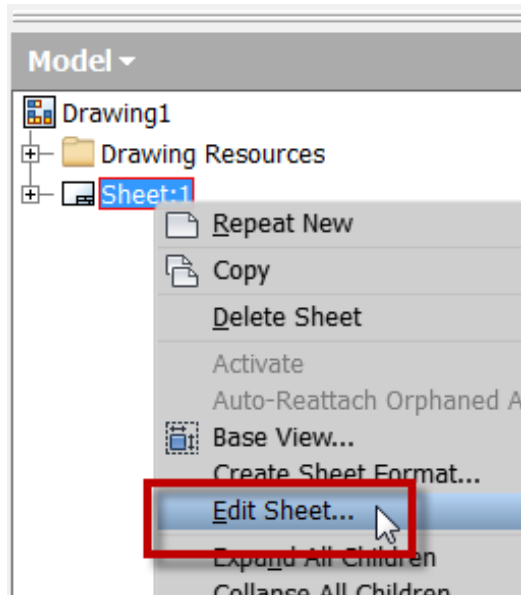
5. Under Drawing, select ISO.idw.



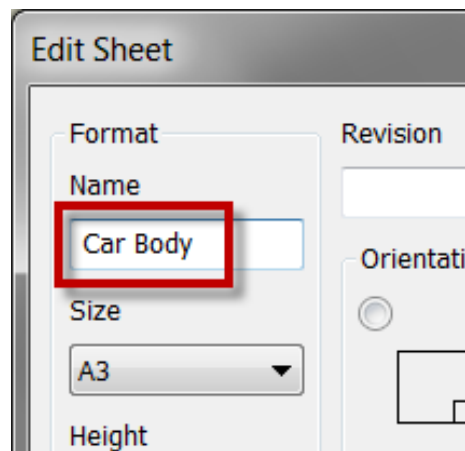
6. Click Create.

Note: A drawing is used to document a design. It consists of views and annotations such as dimensions and text.

7. Save the file as **my_F1 in Schools**.
8. In the browser, right click Sheet:1, then select Edit Sheet.



9. Review the sheet size. It is an A3 (420mm x 297mm).
10. For Name, enter **Car Body**.

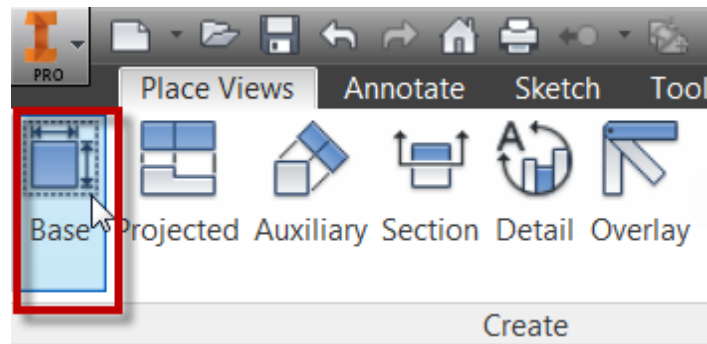


11. Click OK.

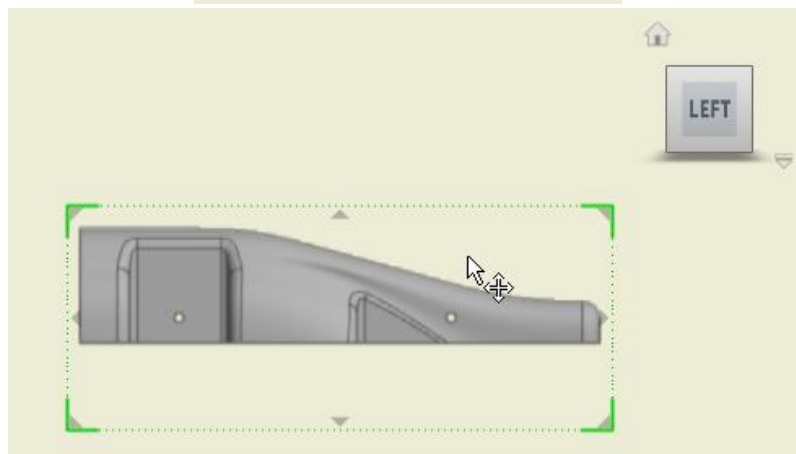
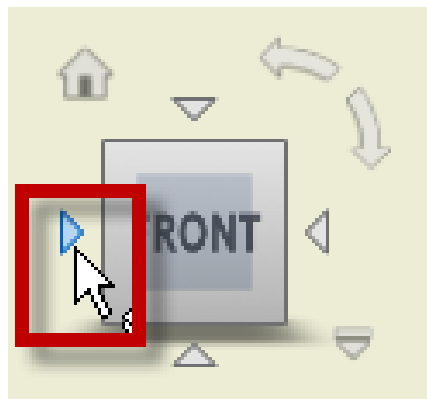
Step 2: Create Orthographic Views

A drawing view is a 2D representation of a 3D digital prototype that is placed on a drawing sheet. In this step, you create four views of the car body. The number of views required varies according to the complexity of the design.

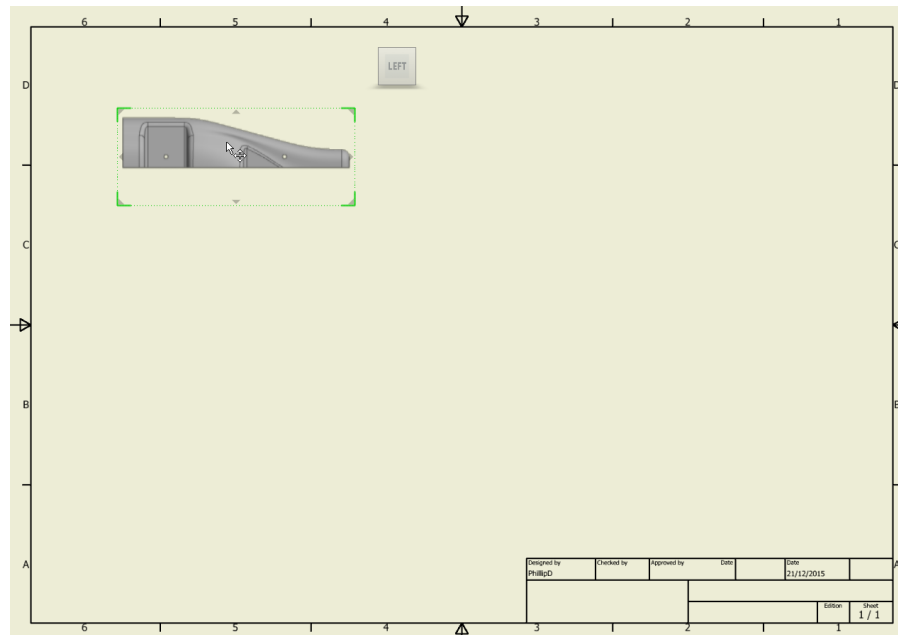
1. On the Create panel, click Base.



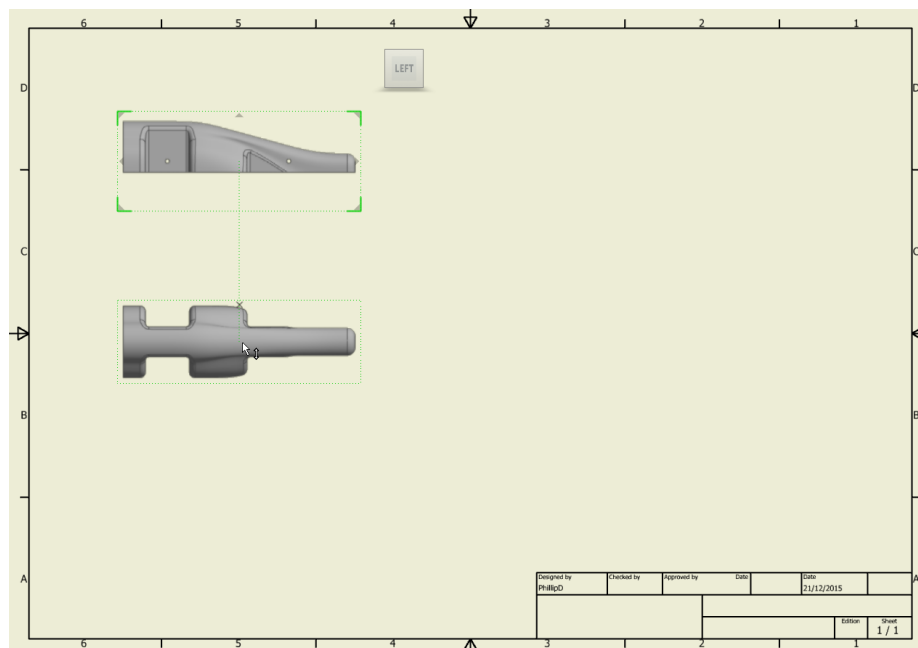
2. On the ViewCube, click the arrow on the left. The drawing preview changes.



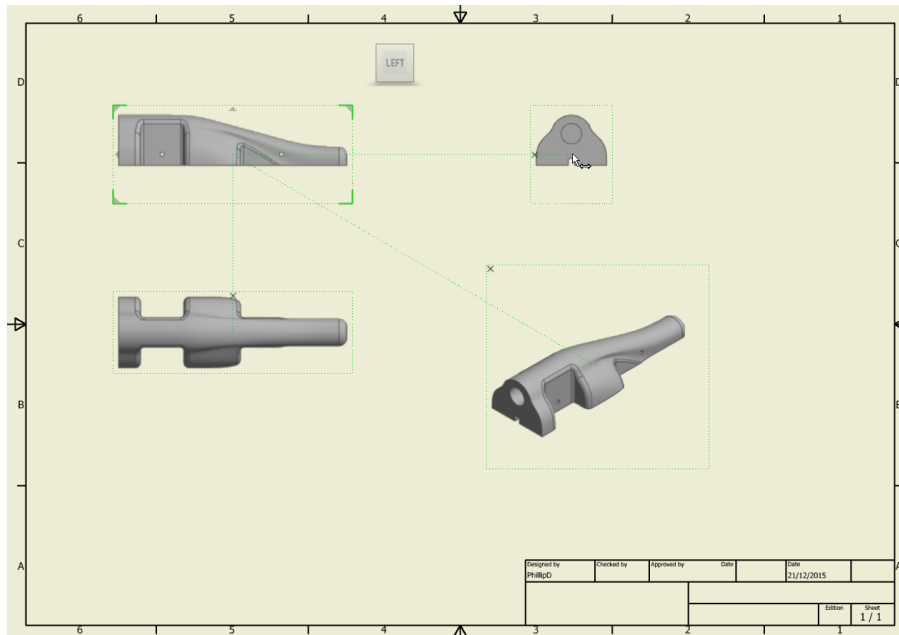
3. Drag the preview to the top left corner.



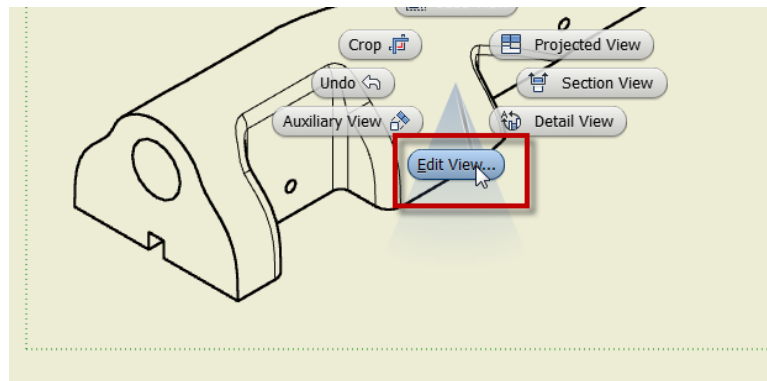
4. Move the cursor down then click to place a projected view.



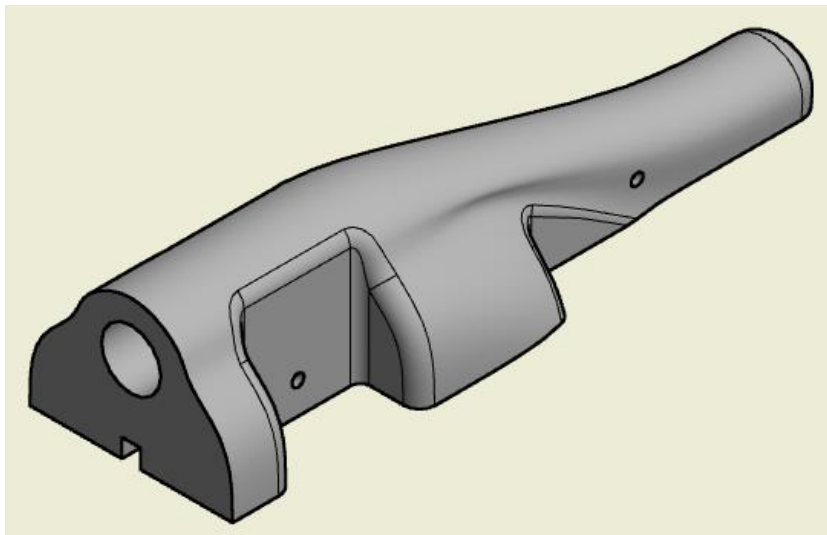
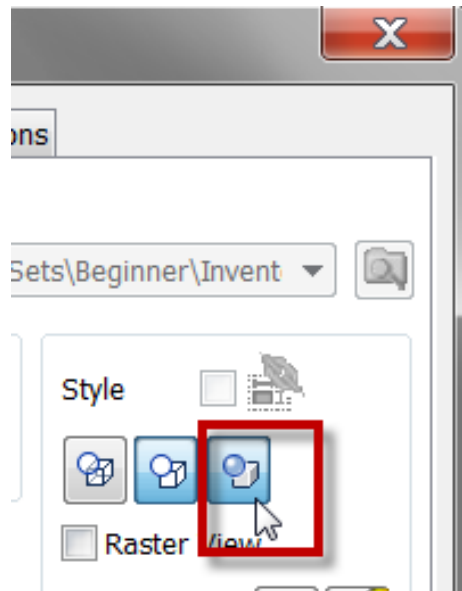
5. Repeat this process to place 2 more views as shown.



6. In the Drawing View dialog box, click OK. 4 views of the car body are created at a scale of 1:2.
7. Right-click the pictorial view then click Edit View.

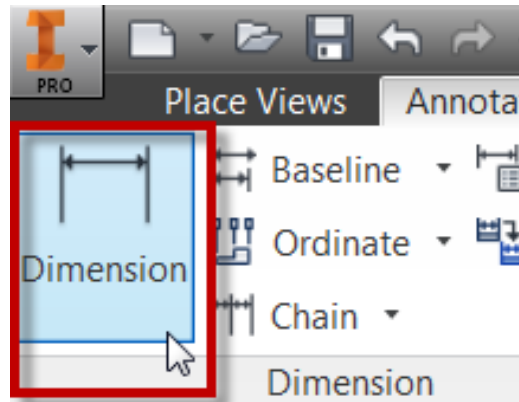


8. In the Drawing View dialog box, under Style, click Shaded, then click OK.

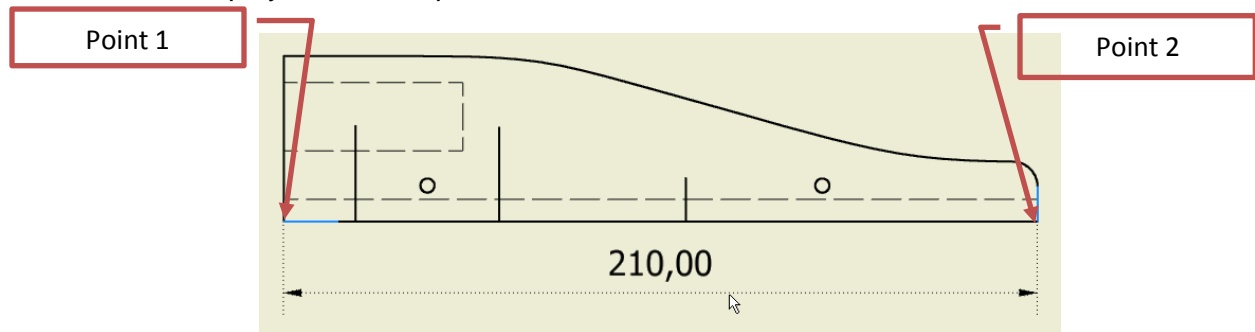


Step 3: Add Dimensions

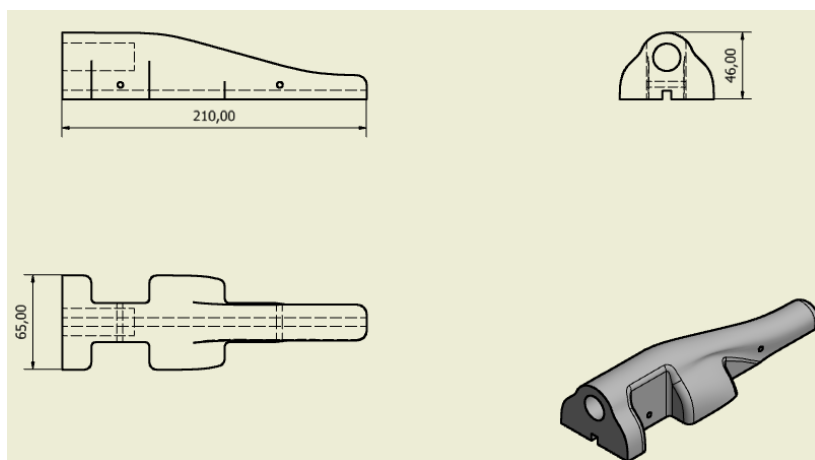
1. On the Annotate tab > Dimension panel, click Dimension.



2. Click point 1 and 2 as shown, then drag the dimension away from the view until a dotted line is displayed. Click to place the dimension.

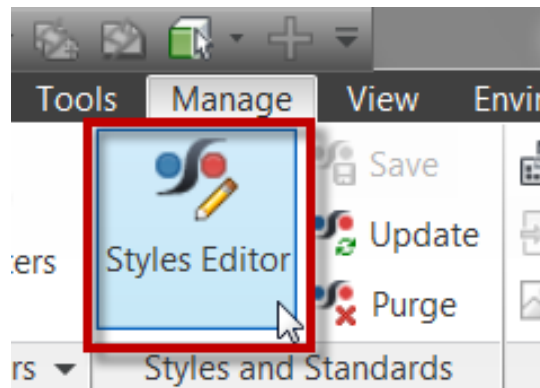


3. Repeat this process for 2 more dimensions. When the dimensions are placed, right click, then click OK.

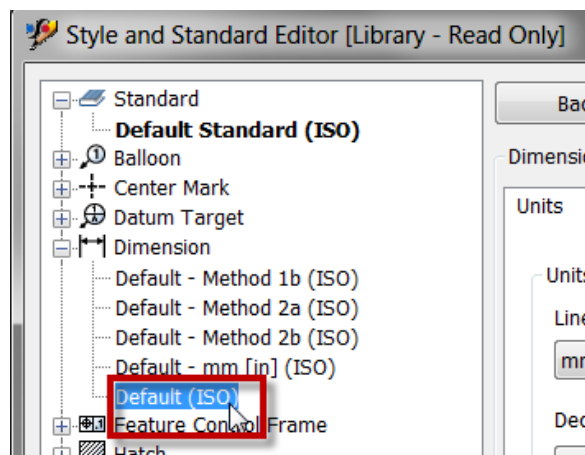


Note: The dimensions are displayed with a precision of 2 decimal places. You will change the dimension style to display zero decimal places.

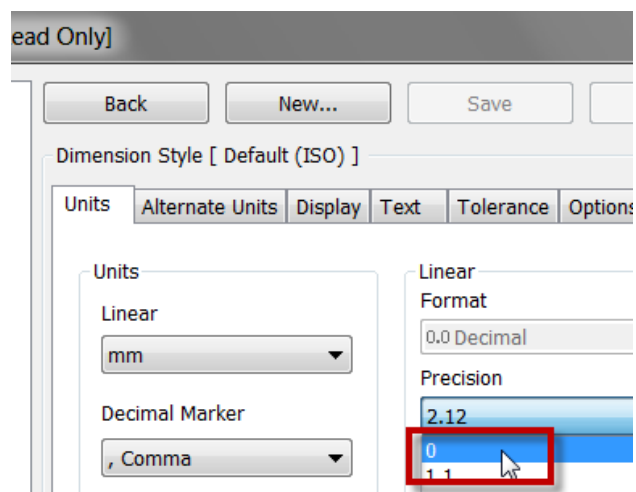
4. On the Manage tab > Styles and Standards, click Styles Editor.



5. In the left panel, expand Dimension, then click Default (ISO).



6. On the Units tab, under Linear, select 0 from the Precision list.



7. Click Save, then click Done. The dimensions are updated to the new style setting.
8. Save the file.

Next Steps

Congratulations, you have now successfully modeled an F1 Model Block and edited an F1 in Schools car so you can move on to the Intermediate tutorial. This will show you how to create your own car design from scratch and how to produce an assembly to include the wheels and show you how to join separate wing components.

Credits

Technical Lead/Author: Phil Dollan, Autodesk Technical Expert, Phil Dollan Consulting

Outline Author/Review Paul Bray, Schools Projects Manager and F1 in Schools Specialist, Yas Marina Circuit

Technical Lead/Reviewer: Anton Fedoseyev, Premium Support Technical Lead, Autodesk

Partner Manager: Lynn Austin, F1 in Schools Partner Manager, Autodesk

Content Development: Jessica Bendy, Content Development Manager, Autodesk