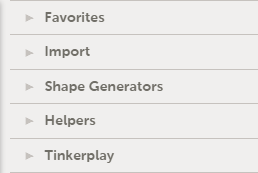
3D Printing

# Designing your object:

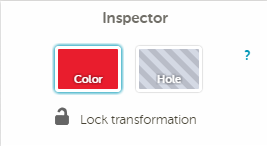
In order to 3D print an object, first you need to either design it or modify an existing design. The recommended tool for designing a model is [TINKERCAD](https://www.tinkercad.com/). TinkerCad has an easy tutorial, and is very self-explanatory. To create an account, hit **sign up** on [www.tinkercad.com](http://www.tinkercad.com). After this, TinkerCad will offer to walk you through a series of tutorials. The tutorials are helpful, and you can pause them to start creating your own object at any time. The TinkerCad interface is very straightforward, however, so usually won’t need the tutorials.

# Modifying an Object:

If you want to look for an existing design and modify it, [Thingiverse](https://www.thingiverse.com/) is a great place to look. It has a huge number of high quality, 3D printable objects. To download a file as a file that you can 3D print, be sure to **scroll down to the bottom of the page** and click on a **.STL** file to download it. You can also use [TINKERCAD](https://www.tinkercad.com/) to modify a downloaded file. To do this, click **import** in the toolbar. After this, click **choose file** to choose the **.STL** file that you downloaded. TinkerCad will import this into its interface.

# TinkerCad 101:

Select import to modify a downloaded object

In TinkerCad, everything is based on tabs. On the right-hand side, there is a list of expandable tabs. When designing or editing an object, the most important tabs is the **Geometric** tab. This provides basic, drag-and-droppable shapes that can be dragged onto the grid. Another key feature of TinkerCad is the ability to cut out pieces of shapes. If you drag a shape onto the grid and click on it, it will open up a section in the top right of the grid titled **Inspector**. In this panel, you can click **Hole** to set the object to cut out a piece of another object it’s placed on to. To download your object, go to the design dropdown in the top left and click on **Download for 3D Printing**. After this, it will bring up a dialog of which file format you want to download in. Click on **.STL**. TinkerCad also has a series of tutorials that are helpful if you wish to explore TinkerCad more.

Select **Hole** to set the object to be a hole

Drag and droppable objects are under the **Geometric** tab

# Printing your Object

 The 3D printer that is recommended for most students is the **MakerBot Replicator 2**. To print on this printer, you need to install [MakerBot Desktop](http://www.makerbot.com/desktop). To print your object, open MakerBot Desktop (MBD) and press **CTRL + O**. Then, navigate to the **.STL** file you downloaded and click on it. It will open up in MBD. Then, click on your object and hit move button. Then, click **On Platform** and **Center**. Then, click the **Export Print File** button in the top right of the page. Once it finishes processing your object, hit export now and save the object to an **SD card**. If you do not have one, the Tech Department has ones you can borrow. After this, eject the SD card and insert it into the 3D printer. Then, use the display to scroll down and select **Utilities**. If the display is not showing anything, then the 3D printer is not turned on. To turn it on, flip the power switch on the back of the printer. After selecting Utilities, select **Level build plate**. The 3D printer will then walk you through the process of calibrating it. If anything confuses you, ask the Tech Department for help. Once you have finished calibrating the 3D printer, press the left arrow **twice**. Then, select **Build from SD** from the dropdown menu. The printer will ask you to choose from the files saved on the SD card. Choose your object and press the large **M** button in the middle to print your object.

Move Button

Once your object is done printing, you may need to remove excess plastic from the object. A knife is very helpful for this.

Laser Cutting:

# Creating your Design:

In order to laser cut or etch, you need to use a **.SVG** file. To create a **.SVG** file, [Inkscape](https://inkscape.org/en/) is a great tool. You can download it at <https://inkscape.org/en/download/>. Before you begin to design your item, it’s helpful to look over the basic tutorial. Inkscape features several interactive tutorials. They can be accessed by going to the **Help** tab at the top of the screen and mousing over **Tutorials**.

Once you’ve gone through the tutorial, you can begin creating your design. Note that in order to create a line that will be cut, not etched by the laser cutter, you need to set two of that line’s properties (how to set object properties is described in the tutorial). First, the line or border’s **width must be 0.001 inches**. Also, the line or border must be **completely black** (RGB = (0, 0, 0), #000000). Finally, before you begin your design, press **CTRL+Shift+D**. This will open a dialog. In **Custom Size**, set the **Units** to **in**, the **Width** to **14.75**, and the **Height** to **11.75**.

# Saving your Design:

Once you’ve created your file, save it somewhere as a **.SVG**. Open the laser cutter drop box at [\\drives\students\make@eps](file:///\\drives\students\make@eps). You can also drag a copy of the drop box shortcut onto your own desktop to make this easier in the future. Save the file in the drop box as a **.PDF** file. After doing this, a window will pop up with what settings you want to use for the PDF conversion. Ignore this window, and just press OK.

# Cutting your Design:

Laser cutter is controlled by a separate computer, meaning that unlike 3D printing, you don’t need to download any software to control the laser cutter. However, you will need to go to the computer that controls the laser cutters. This computer sits right by the laser cutters. Then, double click the file in the laser drop box folder on that computer to open it up in Adobe Reader. Press **CTRL + P** to print it. Ensure that under **Size Options**, the size is set to **Actual size**. Then, press the **properties** button in the top-center of the print dialog. This will bring up the properties dialog on the right. First, ensure that the **Job Type** is set to **Combined**. Then, under **Piece Size**, set **Horizontal** to **14.75** and **Vertical** to **11.75**. Next, under both **Raster Setting** and **Vector Setting**, set the **Speed** to **100**. Then, under **Vector Setting**, set **Frequency** to **5000**. Finally, if you’re cutting cardboard, set **Power** in both **Vector Setting** and **Raster Setting** to **50**. Otherwise, set both **Power** settings to **100**.

Next, open up the laser cutter and insert a piece of cardboard or wood into it. Ensure that the cardboard or wood’s top left corner is in the top left corner of the laser cutter. Then, close the laser cutter’s lid and press **OK** on the computer. Then, hit **Print**. Adobe reader will complain and say there was nothing to print, in 2 different dialogs. That’s ok, it is not the truth.

Go into the Epilog manager and find your job in the list, select it, and hit the little print symbol on the upper right. The laser cutter display should be flashing and your job should appear in that display in a few seconds.

Finally, press the green **Go** button on the right of the laser cutter. Wait until the laser cutter beeps, and then open up the lid and take out your piece.

Vinyl Cutting:

# Installing the Software:

The vinyl cutter is run by a separate computer, so you don’t need to install any software onto your computer. However, you can use Inkscape (download link in above section) to create a design that will cut a little nicer.

# Creating a Design:

While you can use any image for vinyl cutting, the cutter will work much better if you choose a high contrast image with only one or two colors. This is not a problem if you choose to create your design in Inkscape, however.



# **Do (few colors, high contrast)** **Don’t (many colors, low contrast)**

[(Source)](http://pre06.deviantart.net/216a/th/pre/f/2014/298/2/a/destiny_logo_tricorn_vector_by_valencygraphics-d5yqbim.jpg) [(Source)](http://backup.cambridgeincolour.com/i51.tinypic.com/2rqneom.jpg)

# Setting up the Vinyl Cutter:

In order to set up the Vinyl cutter, first choose the color to cut your t-shirt in. Then, if that color is not already loaded into the Vinyl Cutter, [Add more info here later]

# Printing your Design: