

The **Custom Image Project** facilitator guide serves as a companion to the project pages on The Additive Project website. It is intended to help facilitators lead participants through the project and debriefing the experience. This exercise is best offered following The Additive Project's **Box Project**, which provides several options for creating a multi-piece object and introduces shelling.

The **Custom Image Project** allows great latitude in creating an original object using all of the skills and tools mastered or practiced up to this point. This guide offers outlines of some of the paths participants are likely to take, but the project itself is much more free-form than previous ones. Facilitators may be called upon to interact at a deeper, one-on-one level with participants as issues and challenges arise.



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## LEARNING OBJECTIVES

- Learn Draw Tool
- Learn to Convert SVG
- Reinforce Import SVG into 123D Design
- Reinforce How to Extrude Objects
- Reinforce Shell Tool
- View Transparent
- Practice Free Design

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## PROJECT OVERVIEW

- Introduction
- Overview of Prototyping and Uses of Customization (Optional)
- Skills Lesson 1
- Project Work Round 1
- Skills Lesson 2
- Project Work Round 2
- Debrief + Class Summary

# SKILLS OVERVIEW

This project was developed for use with Adobe Illustrator + Autodesk 123D Design. Below are some of the skills that will be learned or reinforced through the introduction and/or repeated use of the relevant tools. Videos are available for view in the Tutorials + Tool Tips sections included in the step-by-step.

## PROGRAM BASICS

### ILLUSTRATOR

Preparing images in Illustrator for 123D Design

- Deleting anchor points to simplify images

### SVG FILES

Converting Illustrator files into SVG format

- Opening a 123D File

### DELETING ITEMS

Discard unwanted pieces from the workspace

- Deleting Objects

## VIEWING + MOVING

### CAMERA ROTATION TOOL

Make adjustments in the camera view.

- Using the Orientation Tool

### ZOOM

View objects close up or at a distance.

- Zoom Tool

### VIEWING + HIDING SKETCH

Choose to view a sketch template or hide it.

- Show/Hide Tool

# SUGGESTED PROCESS

## INTRODUCTION MODULE (OPTIONAL)

Play the video or show the slides related to logotypes and positive-negative space and present the associated talking points.

## PROJECT FACILITATION

Direct participants to the project website. Introduce or review the project page components they can use as reference, showing them the step-by-step instructions, the location of the Required Files (on their desktops if previously installed), and point out the Tool Tips + Tutorials section.

**NOTE:** The Custom Image Project offers several possible avenues for participants to explore. On the Projects page of TheAdditiveProject.org site, Module 1 is offered with all three (3) options as a project. Once participants have completed one of the options available in Module 1, they may choose either a Custom Box or Custom Keychain to create in Module 2. Both of these in turn have several options and are offered as separate projects on the Project page for convenience.

The path you chose in the first part of the lesson - whether the participants used the Illustrator option to import and modify SVG files, etc - may determine which options you choose here. If time allows, we recommend following Module 1 all the way through as it teaches the drawing tools and primitive shapes.

**OPTION 1:** With groups that do well independently, you may choose to begin the session by giving an overview of the Custom Image Project learning objectives, as well as the tools needed to complete the project. Additionally, you might identify the goals, play the Tutorials videos, and let participants follow the step-by-step on the site.

**OPTION 2:** Alternatively, you may also break the session up into smaller segments or Modules, which each include several steps involving particular skills and allow for break points to check in with participants and teach the following Module's new skills before progressing. Play Tool Tips videos and allow participants to follow the steps on the Additive site, play Tutorials videos, or demonstrate the steps to the class using projection.

There are additional learning modules that are called out within the project flow, which can be investigated or ignored depending upon the amount of time you have for the project as a whole. The Additive Project is interested in encouraging entrepreneurial thought, so in addition to a discussion of positive + negative space, we have included some basic concepts

# SUGGESTED PROCESS

of logo design and graphic design principles.

## MODULE 1: CREATING A CUSTOM SHAPE

**Option 1.** Steps 2-4. Drawing in 123D: Familiarize the participants with basic shapes (Primitives) and drawing tools available in 123D Design; explore how the program links shapes + the different functionality available in the drawing tools; drawing basic shapes.

**Option 2.** Steps 5-7. Find Image + Convert: Find an appropriate image online; reinforce convert to SVG.

**Option 3.** Steps 8-9. Find an SVG: Find an SVG online; download and import; logo design supplement; Steelmark logo example in Tutorials;

## MODULE 2: CREATE A CUSTOM OBJECT

We have tried to leave this open to the Facilitator or participants to choose what type of object is ultimately being created. The participants now have the skills to extrude text and shell an object for a box + lid. The image can be used as the shape of the keychain or box, or merged to or cut out from the keychain of box lid. Look through the videos to explore the different possibilities.

### MODULE 2: CUSTOM KEYCHAIN

**Option 1:** Custom Keychain Base

**Option 2:** Custom Keychain Detail

**Option 3:** Custom Keychain Base + Detail

### MODULE 2: CUSTOM BOX

**Option 1:** Custom Box Shape

**Option 2:** Custom Box Detail

**Option 3:** Custom Box Shape + Detail

# FACILITATOR STEP-BY-STEP

## INTRODUCTION MODULE

### TALKING POINTS

This project is designed to help you create a more customized pendant or box and lid. You have the option to learn drawing tools in 123D Design and expand your tools and skills for using SVG files. These tools help you begin thinking about the larger design process, including the most important elements of effective graphic imagery and the types of graphics best suited to 3D printing. You will be able to reference step-by-step instructions, tutorial videos, and Tool Tips on The Additive Project website.

## MODULE 1: CREATING A CUSTOM SHAPE

**GOAL:** Identify or Create an Image or Shape for a Custom Keychain or Box.

**NOTE:** If time permits, we recommend following Module 1 all the way through, as drawing, selecting + converting images, and selecting SVGs are all valuable skills moving forward.

### MODULE 1 - OPTION 1: CREATE A SKETCH

#### MEDIA:

- Play Tutorial: *Drawing Tool Basics in 123D*
- **OR** Demonstrate drawing tools and shapes

#### TALKING POINTS:

- 123D offers a number of tools for creating your own image directly in the 3D space.
- Adjust your view of the grid plane to Top View for sketching.
- On the top toolbar, find the Sketch Tool, which includes shapes like rectangles + circles, as well as a number of line tools.
- Together, these tools allow you to create almost any kind of shape.
- Select a tool and click on the grid plane to identify it as the surface on which you wish to draw. Your cursor will have a small cross target, allowing you to choose the point from which to plot your line or shape. Once you have begun drawing, you will see a small green check box. Use this or Escape to release your mouse from that shape's function.
- The rectangles and circles are fairly straight forward.
- Notice that the Polyline can create either straight lines by clicking to lay down a point, extending a line and clicking again.
- The Polyline can also create arcs and curves as you click + hold as you lay out the course of the line.
- The Spline tool is designed for creating flowing lines, while the Two Point Arc allows you to create clean, uniform arcs by mapping out a radius, and the Three Point Arc lets you plot the terminal point of your arc as well as its depth.

# FACILITATOR STEP-BY-STEP

- Play around with all of these tools and get a feel for how they work.

## MEDIA

- Play Tutorial: *Editing a Sketch + Creating a Complete Object*
- **OR** Demonstrate editing a sketch + creating a complete object

## TALKING POINTS

- Try to use these tools to create a finished sketch. For this exercise, try to think of images that are easily simplified and have relatively simple lines.
- Also, try to use as many of the tools as possible. After you insert the first component or segment of your sketch, select another tool from the drawing menu, and keep building.
- When selecting where to begin a new line, try to make sure your previous line is highlighted. This will provide continuity to the object. 123D will want to snap one line onto the endpoints of any existing lines.
- When you reach the end of the sketch make sure your last segment connects to the existing sketch at both ends.
- You will know you have closed the sketch when the interior area becomes tinted indicating it is a completed face.
- The shape must be closed for it to be able to extrude as a solid object, since a line by itself is too thin both for this program and to be printed.

## MEDIA

- Play Tutorial: *Create + Edit Your Shape*
- **OR** Demonstrate a completed shape and manipulating points

## TALKING POINTS

- Now that you know all the tools create a closed shape that you can use for the next steps of the project.
- One last tool you have is that you can when you select a sketch select any point and drag it to move it. This will allow you to make minor adjustments to your final sketch.

## MODULE 1 - OPTION 2: FIND AN SVG ONLINE

### MEDIA:

- Play Tutorial: *Find + Download an Image*
- **OR** Demonstrate a quick Google search for an image file + converting in Illustrator

### TALKING POINTS:

- Another option for finding an image that you like, is to convert it through Illustrator. This is particularly useful if you have already tried the SVG search and were unable to find that

# FACILITATOR STEP-BY-STEP

file format for what you were looking for.

- Google search your desired image and click on image tab for the search to see thumbnail images.
- Find an image that will work well for this project. Ideally look for big bold icons, symbols or logos as they are easier to manipulate in 3D.
- View the image and right click to download and make sure the file is in an easily accessible place on your computer.
- Open Adobe Illustrator and open the image file you found and downloaded.
- Select the image on the screen to highlight it. Find the Object tab on the toolbar at the top of the screen and select Image Trace. In the sub menu that appears, select Make and Expand.
- Or in the top bar of Adobe Illustrator you can select trace and select from the different options. If the image doesn't look as you would like after tracing command z to undo and select another option from the trace menu
- Select expand from the top menu if you traced from the top bar
- Open up the layers menu on the right of the screen and delete any unnecessary layers
- Select the anchor point delete tool and delete any unneeded points to simplify the image. Remember that Control + Z will undo any action if deleting a particular anchor point alters the image in an unwanted or unexpected way.
- Under the File menu at the top, select Save As and choose SVG from the drop down menu.
- Save the file in an easily accessible location on your computer.

## MODULE 1 - OPTION 3: IMPORT AN IMAGE BY CREATING AN SVG IN ILLUSTRATOR

### MEDIA:

- Play Tutorial: *Find SVG File to Import*
- **OR** Demonstrate a quick Google search for an SVG image

### TALKING POINTS:

- If you have an image in mind that you are interested in making into an element of a box or pendant, there is a fair chance you will be able to find it online.
- Using a google image search, you can search by name for an image you would like to use and add the search term SVG this will help return images in the format needed.
- Find an image that will work well for this project. Ideally look for big bold icons, symbols or logos as they are easier to manipulate in 3D.
- View the image and validate that the file extension is .SVG and right click to download
- Ensure you save it in an easily accessible place.
- Open Autodesk 123D and select import SVG as sketch and navigate to where you saved the downloaded SVG

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- View the imported SVG and determine if it is what you were expecting. Sometimes an SVG will import extra elements. If there are extra shapes that show up, you can usually simply delete them away.
- If deleting a line loses the tint of the whole image, it means you will be unable to extrude the shape since it has lost continuity.
- You can either reference the drawing tools and add new lines to complete the image or command (control) + z and see if there is another way to simplify the drawing without losing the shaded area.

## MEDIA:

- Play Tutorial: *Import SVG into Autodesk 123D*
- **OR** Demonstrate importing an SVG file

## TALKING POINTS:

- Open Autodesk 123D and select import SVG as sketch and navigate to where you saved the downloaded SVG.
- View the imported SVG and determine if it is what you were expecting. If there are extra shapes you can simply delete them away.
- View the imported SVG and determine if it is what you were expecting. Sometimes an SVG will import extra elements. If there are extra shapes that show up, you can usually simply delete them away.
- If deleting a line loses the tint of the whole image, it means you will be unable to extrude the shape since it has lost continuity.
- You can either reference the drawing tools and add new lines to complete the image or command (control) + z and see if there is another way to simplify the drawing without losing the shaded area.

## MODULE 2: CREATING A CUSTOM OBJECT

**GOAL:** Use the Custom Shape Created in Module 1 to Create a Unique Keychain, Pendant, or Box.

**NOTE:** Module 2 of this project is designed for the participants to choose from a number of options. The Projects page of [TheAdditiveProject.org](http://TheAdditiveProject.org) features **Module 2: Custom Keychain** and **Module 2: Custom Box** as stand alone sub-projects.

## TALKING POINTS

- At this stage, these are a number of options open to you. First of all, you can choose between making a Keychain or a Box + Lid. If you choose the Keychain, your options in-

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clude:

- To use the custom shape you created or downloaded as the shape of a Keychain or Pendant and add lettering or further design elements.
- To place the custom shape on a standard Keychain or Pendant shape, in which case you can have it protruding from the keychain, indented, or cut all the way through like a stencil.
- Or to use a custom shape for the Keychain base and another custom shape or image for the detail.
- Some points to remember as you decide which direction to go in:
- Images or shapes that include a lot of lettering can be tricky to make into a full cut out or the shape of a larger object.
- When cutting out a shape, floating objects will not be printed attached to the rest of the object, so look for images that do not have holes.
- Take some time to either finalize your drawing or finish up the SVG that will work for the project.
- Remember, images with a lot of interior negative space - in lettering, you can imagine the inside of an O or D - may not be great for all applications, particularly cut-outs or stencils.
- Also, keep in mind, that images with a lot of thin elements or filagree will also be more difficult to extrude and print.
- No matter which of the options you choose to go with, the first step common to all of them is to extrude your images.
- Always remember Ctrl (Cmd) + Z to undo anything that goes wrong.
- For images with multiple components, remember the Group Tool on the top toolbar. Grouping is not the same as merging, but will allow you to manipulate the elements of the image as a single unit.
- When moving an object in a side view, it is generally not possible to move the object away from the grid plane without the Move Tool. If you try to grab the object just with your cursor to move it off the grid, it will disappear; 123D simply places it on the corner of the grid plane and it can be easily accessed by returning to Home View.
- At this point, participants may be branching out into the various project options. Walk through the room and identify the path each participant has chosen. Refer them to the Additive Project site for step by step instructions and the Tool Tips videos. The following are points to watch for in different scenarios.

## MODULE 2: CUSTOM KEYCHAIN

This option for Module 2 of the Custom Image Project contains several ideas for the creating a Custom Keychain. In it, we present options for placing a custom image on a standard keychain or pendant base; creating a custom keychain or pendant base; and creating a

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custom box base with a custom image. It is designed to be flexible, letting participants enjoy the possibilities of the 3D design process. In this Module, participants will work with the tools learned in earlier projects to create a unique object.

## MEDIA

- Play Tutorial: *Option 1 Custom Keychain Base*
- **OR** Demonstrate extruding etc. with a custom shape

## TALKING POINTS

- If you are working from an SVG, access the main menu in 123D and import the SVG onto the grid plane.
- Both those working from an original drawing and anyone working from an imported image can select the image to prepare for extrusion.
- If your image has several components, you may need to take a moment to ensure all of them are highlighted before proceeding.
- Once everything is selected, find the pop up tool and choose Extrude. Extrude the image up to about 2mm for a Keychain base.
- Move up to the 123D drop down menu, choose insert and find the Keychain Template file from Additive's site. We are going to use the keyring cylinder shape as a cut out.
- Once the file is inserted, select one of the objects, hold shift and select the other standard bases and delete.
- Use the move tool to position the cylinder in an appropriate spot for the keyring cut out.
- Locate the Combine Tool and select Subtract.
- When using the subtract tool, remember that the first option selected—the Target Solid—is the target to be subtracted from, in this case the keychain. The Source is the object that represents the material to be taken away, the key ring opening cylinder. Select the keychain first, then the cylinder and hit enter to complete.

## MEDIA

- Play Tutorial: *Option 2 Custom Keychain Detail*
- **OR** Demonstrate extruding etc. with a custom shape and standard base

## TALKING POINTS

- Access the main menu in 123D and import your SVG onto the grid plane.
- Select the area(s) of the image you will be extruding. Use Shift + Click if you have multiple areas.
- Remember, even if you are going to cut the image out of the Keychain, you need to extrude into 3D to be able to subtract the material from the Keychain template.
- Once everything is highlighted, use the popup icon to locate the Extrude tool and use the arrow to extrude the object to the desired depth or type in a height. 2mm generally

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works well for combining the image and a base, 4 or 5 is good for subtracting the image as a cutout.

- Now that the image has been extruded, use the vertical toolbar on the right to hide sketches.
- If your object or image has multiple parts, like letters or areas that do not overlap, take a moment to select all components - dragging a box around the whole image to select all parts is the fastest method - and use the Grouping tool on the top toolbar to group everything together.
- Save the object in its current form as a file you can access again in the future should you wish.
- Move up to the 123D drop down menu, choose insert and find the Keychain Template file from Additive's site to use one of the simple keychain shapes there.
- Once the file is inserted and you have decided which base to use, select the other objects and delete.
- Use the move tool to position the cylinder in an appropriate spot for the keyring cut out. This will be easier when done by moving between side views to judge for depth, and home and top views to judge for the placement of the components relative to each other.
- Once the objects are aligned correctly, you may have to scale.
- When scaling the custom image or other elements on a keychain, remember that uniform scaling will change all dimensions of the object, while non-uniform scaling allows you to adjust the size of the element along the x (height), y (width) and z (depth) axes.
- When scaling objects in relation to other objects, it is often advisable to use non-uniform because you can avoid changing the depth and cutting through the bottom of the base object as you might with uniform scaling.
- Also when scaling, remember that once the dimensions of an object are altered, say to a factor of 0.9 (or 90%), the new size becomes the default. For example, if you adjusted to factor: 0.9 but realize you should have gone with a factor closer to 0.7, rescaling to that factor will be too small. (In this case a factor of 0.78 would get you closer, since 78% of 90% is roughly equal to 70% of 100%.)

## MEDIA

- Play Tutorial: *Option 3 Custom Base + Detail*
- **OR** Demonstrate extruding etc. with a custom base shape and custom detail

## TALKING POINTS

- Follow the steps for Option 1 to create the custom Keychain shape, and for Option 2 for placing the custom image, or detail, on the new Keychain.

## MODULE 2: CUSTOM BOX

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This option for Module 2 of the Custom Image Project contains several ideas for the creating a Custom Box. In it, we present options for placing a custom image on a simple box; creating a custom box base + matching lid; and creating a custom box base with a custom image on or cut out from the lid. Again, the Module is designed to be flexible, letting participants enjoy the possibilities of the 3D design process. In this Module, participants will work with the tools learned in earlier projects to create a unique object.

## MEDIA

- Play Tutorial: *Option 1 Custom Box Shape*
- **OR** Demonstrate extruding, shelling etc. with a custom shape

## TALKING POINTS

- Once you have an image or shape that is solid, relatively thick in all areas and simple, the first step toward making it into a custom box is to extrude it.
- Access the main menu in 123D and import your SVG onto the grid plane.
- Select the outline of the image you will be extruding.
- Once it is highlighted, use the popup icon to locate the Extrude tool and use the arrow to extrude the object to the desired depth or type in a height. Ten (10)mm generally works well for small, easily printable boxes.
- Now that the object has been extruded, we need to create the empty space of the interior. To do this, we will use the Shell tool, which essentially removes one face of the object, leaving the other sides in tact.
- Select the top face of the object. A green highlight around the face will ensure that only the face is selected as opposed to the whole object.
- Locate and select the Shell tool on the popup toolbar. The interior of the shape will be hollowed out, or shelled, from the face you selected, leaving the other sides in tact.
- You will see an arrow inside the shape, allowing you to drag to adjust thickness. Drag the arrow or type a thickness of 0.5mm.
- Write down the width that you choose to make the walls of the box, which you will need to reference this in a moment as you create the lid.
- Now that the box has been created, we need to make the lid.
- To do so, we will use the original sketch. Move the shelled object away from the sketch, then select the sketch and the Extrude Tool from the pop up menu.
- Drag the arrow upwards or to achieve the desired thickness. You can type in 2mm for this object if you chose to set the previous object at 10mm.
- Now you have the top of the box. In order to allow the lid to sit on the box without falling off, though, it needs a plug that lets it sit snugly. To make that, we'll use the Shell Tool in a different way.
- Select the top face of the new object and locate the Shell Tool again. Once the object

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has been shelled, enter a width the same or slightly larger than the width you chose for the sides of the box bottom by typing in the thickness. Increase the number you noted before by 0.1 or more depending on desired snugness (the larger this number, the looser the eventual fit).

- **Example:** if you set the wall thickness of the box bottom at 1 then set the thickness for this to 1.1.
- Select the inside face - the floor - of the object, making sure that only this face has its outline highlighted in green. On the popup menu, select Push/Pull from the pop up menu and Pull the arrow upwards to extrude the face above the shell. This extruded area now becomes the plug of the lid which will keep the lid in place.

## MEDIA

- Play Tutorial: *Option 2 Custom Box Detail*
- **OR** Demonstrate creating a box and a lid with a custom detail added

## TALKING POINTS

- Follow the steps above for creating the box and lid.
- If the box is a non-uniform shape, the lid should be rotated before proceeding with creating the plug element.
- When placing a custom image on the lid of a box, remember that the plug, or interior side, is facing upwards, so the lid has to be flipped to place the design on the exterior. Use the Move Tool, which includes a compass element, to rotate the object 180°.
- Use the same method for partially subtracting, or indenting, the image
- If you are cutting an image all the way through the lid, you can also simply flip the image before placing, scaling and subtracting.

## MEDIA

- Play Tutorial: *Option 3 Custom Box Shape + Detail*
- **OR** Demonstrate creating a custom box shape and lid with a custom detail added

## TALKING POINTS

- Follow the steps for Option 1 to create the custom box shape, and for Option 2 for placing the custom image, or detail, on the lid.

