Using Joinery with Adobe Illustrator

Joinery (https://clementzheng.github.io/joinery/) is an online tool that allows various jointing methods to be applied to an .svg file so that a design can be laser cut and fitted together. Joinery has some requirements for the file so that it can calculate the relationships between paths. This guide will explain how to prepare an Illustrator design for Joinery.

For more information on how to use Joinery, please see the documentation found here: https://clementzheng.github.io/joinery/help/help.html

It is wise to apply some forethought to a design with regard to which edges are jointed. Jointed edges must be approximately the same length and must exist as separate paths in the file.

Joinery 101 – The Cube

For example, a cube consists of six equal sides, each of which has joints along its four edges. To create a cube design, it is necessary to create six equally sized squares using the rectangle tool [**m**].
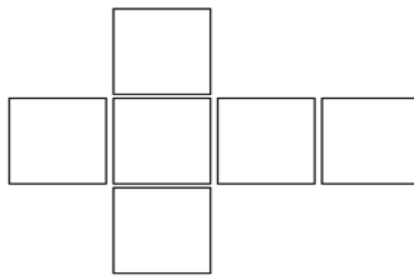

Figure 1. Six equally sided squares that will join together to form a cube

However, Joinery will interpret each cube as one continuous path and will not be able to make the association between two sides on two cubes. It is necessary to split the design into its component lines. The easiest way to do this is to use the Direct Selection Tool [**a**] (white arrow) to select a point and then click the ***Cut Path at Selected Anchor Points*** tool in the top menu bar.
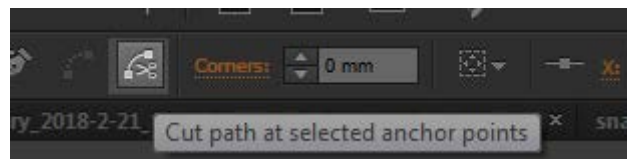

Figure 2. The "Cut Path at Selected Anchor Points" tool (highlighted).

The operation creates two points - one on top of the other. Do this for all the points on a single cube to create four lines.
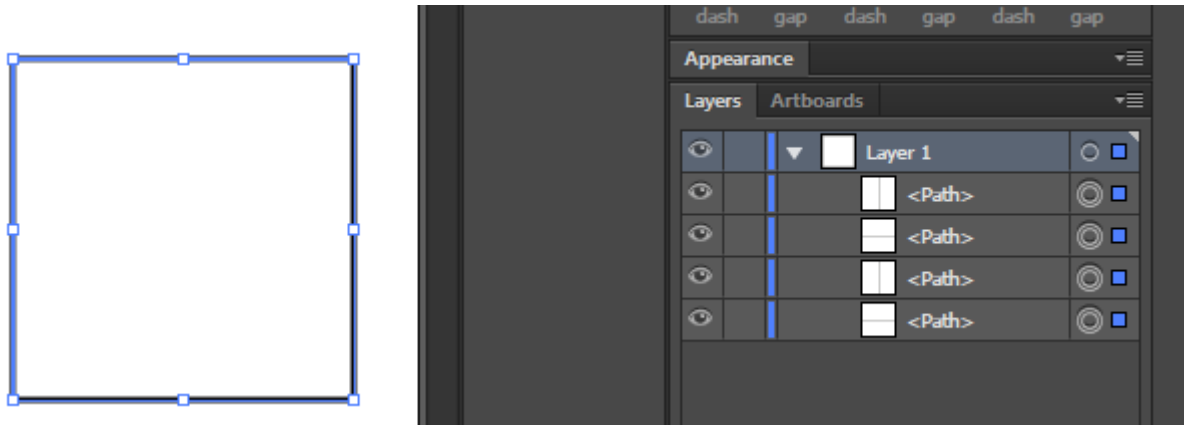

Figure 3. Closed path turned into four separate paths

Copy the single four-path square to form the cube design for importing into Joinery. Note that Joinery cannot handled grouped objects, so make sure that the hierarchy is *flat*.

Choose Export > [select SVG as Type] Name the file > uncheck *Responsive* > OK. The svg is ready for import into Joinery.

Joinery 102 – The Irregular Cup-Type Object

This section will explain how to calculate the length of sections for an irregular cup shape. Again, it is necessary to apply forethought to the assembly of the design, e.g. make sure there are no details that will cause flaps etc. to intersect.

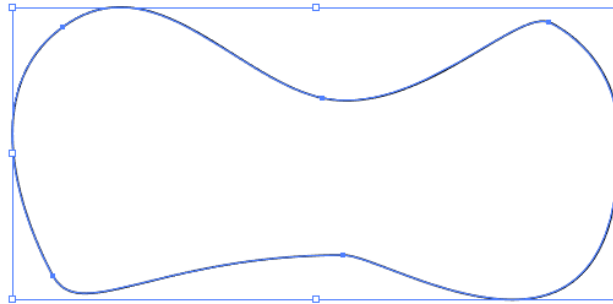This example uses an arbitrary non-symmetrical shape as a base for the cup.

Figure 4. Irregular shape used as the base of the cup design

To fit a vertical wall around the perimeter of the shape, we need to know its length. This is found hidden away in the **Document Info** panel (Window > Document Info) as the top entry in the panel.
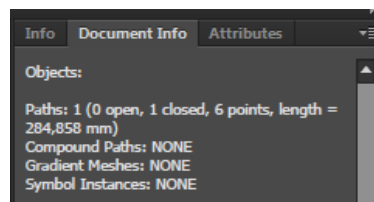

Figure 5. The Document Info panel, showing the length of the path

It is again necessary to split the closed path into an open one at one point using the **Cut Path at Selected Anchor Points** tool.

Now side of the cup is created using the perimeter length as the width of the rectangle. The height will determine the height of the cup.

Figure 6. Cup base and sides

Split the rectangle into four paths.

Joinery 103 – The Irregular Cup-Type Object with 45-degree Angled Sides

To make an object with a flat base and angled sides, the side section must be made of two concentric semi-circles (a "rainbow" shape).

Taking the same base shape as the previous example, find the length of the path as before. This length must be half of the circumference of the bottom edge of the side design. As Illustrator expects the circle dimension to be the diameter, it is necessary to do some math.

The circle must have a circumference of 2 * perimeter length (as it will be cut into a semi-circle).

$$C = 2\pi r \quad r = \frac{C}{2\pi}$$

The perimeter length of the base is 285mm, therefore the radius is (285 * 2) / 2π = 90.76, so multiply by two to get the diameter.

Make a circle of this diameter, then make another with the same centre point and offset the diameter by the required height of the cup. Then draw a line exactly through the centre point and use the Pathfinder to split the shapes up.

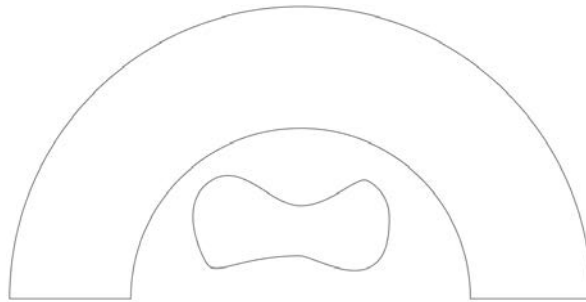Ungroup and delete the extra parts and you should have this:

Figure 7. Cup design with 45-degree sides

Split the sides path into four separate paths as before.

Joinery 104 – The Irregular Cup-Type Object with Arbitrarily Angled Sides

The angle of the sides depends on how far away from horizontal the edges of the cup are. Zero deviation from horizontal makes vertical edges. Mapping the edge to a semi-circle makes 45-degree edges. So all curves from zero to semi-circle will map from vertical to 45-degree edges.

Draw a shallow curve using the grid to keep it symmetrical. Alternatively cut the top of a circle using e.g. the Pathfinder and a line. Find the length and then use the scale tool to scale it to the correct length (scale ratio = current length / target length).

Copy the line, scale it up and align the two lines on their centre points using the **Align** panel. Connect the two sets of left and right endpoints by selected them and choosing **Object > Path > Join (Ctrl + J)**.

Split the shape as before.