

RHINO: Drawing in 2D

Basic

- **Open** your file in millimeters
- If unsure type **units** in the command line and change to millimeters
- Saving your file, make sure to **save** your Rhino file! This is a .3dm file, this is your mother file, give it a good name and save it to the cloud in your project folder.

Getting Started

- Always read what is below the command line; it is Rhino's way of communicating with you!
- You can use spacebar as "enter"; spacebar also ends a command and will redo the last command
- You never have to click in the command line, whatever you type in Rhino will appear there.
- To do another type of unit in the millimeter environment, use double quotes (") e.g., 2" for inches, single quotes (') e.g., 5' for feet and the abbreviation "cm" e.g. 9cm for centimeters
- If you are just doing 2D, use Top View
- The "ground" in Rhino is called the C Plane, and it lives at the coordinates 0,0,0, no matter what units you are in. You will be able to see the C Plane grid in Top View and Perspective View, but not in Right or Left.
- Layers are important. Use them to differentiate the parts of your model so that you can turn specific things on and off. Layers can also be locked, which means you can snap to them, but can't move them.

Exactness

- O-Snaps
 - End
 - Point
 - Center
 - Midpoint
 - Perpendicular
 - Intersection
- Only use Project if you are worried about snapping out of plane
- Ortho will help you draw at right angles
- Three ways to measuring and dimension:
 - **Len**
 - **Dim**
 - **Distance**

Drawing

- **Line** makes a single straight line
- **Polyline** makes as many straight lines as you want, all connected
- **Curve** makes a curved line
- Shapes
 - **Circle** the only option you need to consider here is vertical
 - **Polygon** options you need to worry about are: number of sides, edge (this means the origin of the shape will be from one of its edge points), starshaped, and vertical
 - **Rectangle** options for drawing are: vertical, 3point, center (rectangle is drawn around a center point), or rounded (rectangle is drawn with rounded edges)
- **Join** will join two touching lines, curves or surfaces into a single component.
- **Explode** will explode an object or line into its component parts.
- **Closecrv** will close an open shape.
- **Make 2D** will make a 2D version of your object. It will automatically place itself at the C Plane origin, which is (0,0,0).
- **Curve Boolean** will combine two shapes into one and/or clean up the outline of a single shape so that it is now one curve and not many. This is very useful when laser cutting.

Selection

- Selecting, if dragged from left to right you must encompass the entire object to select it, from right to left the marquee will select everything it touches
- To deselect an object, press command⌘ and leftclick
- To select everything in the project, press command⌘a
- To select multiple objects with leftclicking, press shift and leftclick

Copying

- **Copy** command should always be used with osnaps
- **Array** command arrays in a grid or linear arrangement, follow command line prompts!
- **ArrayPolar** arrays in circle, or part thereof
- **ArrayCrv** arrays along a curve
- **Mirror** can either make a copy (if the copy button is clicked on) or simply mirror the object

Moving

- **Rotate** will, well, rotate your object in 2D, and can also make a copy.
- **Rotate 3D** will rotate your object 3 dimensionally.
- **Move** will move your object, can also make a copy, use your snaps!
- **Offset** will offset your lines or curves by a specific distance in the direction of your choice.

Transforming

- **Scale** will scale your entire object
- **Scale 1D** will scale your object in one direction (for example: you can make your object taller while maintaining the same length and width)
- **Scale 2D** will scale your object in 2 directions (for example: you can make your object taller and wider, but maintain its length)
- **Stretch** is a fancier version of scaling with many more options for direction, magnitude, and angle
- **PointsOn** will show you the points on a curve or surface that were used to generate the shape. You can move them to manipulate the shape in specific places.
- **InsertControlPoint** will allow you to add another point on your curve or surface to manipulate your object.
- **Trim** will trim your object or shape at a specific point. You must have a "trim" line, surface, or object drawn where you want to trim your shape.
- **Extend** will extend a line or a curve to hit another line or curve.
- **Fillet** will create a curved line or arc between two existing lines (basically, a rounded edge). Pro tip: if radius is set to 0, this command can also be used to connect two lines where they meet in space
- **Split** will split a curve, line, or object with another curve, line or object.

Laser Cutter

- If you are concerned that you might have overlapping lines, use the **Make2D** command
- Select only what you want to export and use the **Join** command
- Keep in mind what material you using, and try to use an offcut if possible

Misc.

- To redo a command, press Enter or the Spacebar
- If you are unsure what type of object you are dealing with, click F3
- Use the **Hide** and **Show** commands to, well, hide and show objects
- Using Layers can be very useful
- To move an object to a different layer, right click on the layer name and chose **Move Objects to This Layer**
- Use **PictureFrame** and **BackgroundBitmap**

Things not to do!

- Draw two little lines that look like one long line
- Drag, just don't do it! Use the Move command with basepoints
- Leave drawing aids on that you aren't using. ex-Gumball, Smarttrack,