

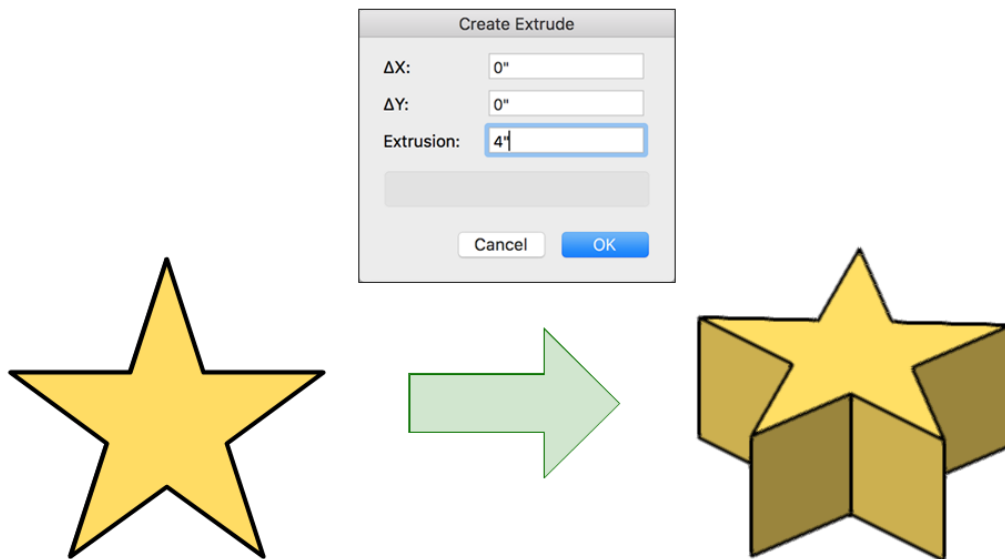
INTRODUCTION TO 3D MODELING: EXTRUDES, OPENGL, SCREEN PLANE / LAYER PLANE

Vectorworks Tutorial by [Andy Broomell](#) © 2020.
Green text indicates advanced or supplementary notes.

1

IN THE BEGINNING THERE WAS AN EXTRUDE


- Draw a **2D shape** such as a Rectangle, Circle, or closed Polyline. Give it a solid fill in the Attributes Palette.
- With the shape selected, hit **Cmd+E** (Mac) or **Ctrl+E** (Windows) to create an **Extrude**. Extrude is also a command under the Model menu at the top of the screen.
- In the Create Extrude dialogue box, enter the extrusion height (positive or negative) and hit Enter or click OK.



- Notice that the Object Info Palette (**OIP**) calls the new object an “Extrude” and its height can be adjusted at any time with the “Extr.” field.


2

VIEWING YOUR 3D OBJECT

- Click the button for the **Flyover tool**  (or use Shift+C), then click and drag around the screen to look at your object in 3D.


- Note which mode of the Flyover tool you are using.

The first mode  orbits around the center of the screen,

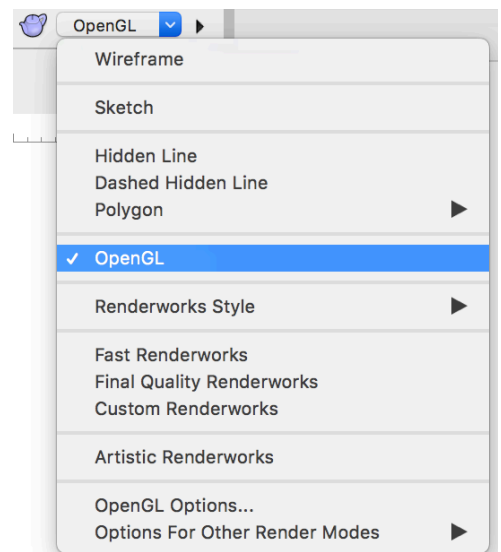
while the second mode  lets you click to define the anchor point first (shown as dashed black crosshairs).

- Click the “**Current Render Mode**” dropdown  Wireframe  (teapot).

The default render mode is **Wireframe**, meaning 3D objects are see-through with edges only. Switch to **OpenGL** mode to display fills for 3D objects. OpenGL is the standard “working” mode for 3D modeling (note the keyboard shortcut under View > Rendering).

- Depending on your Preferences setting , Vectorworks may automatically switch to OpenGL when in 3D views.

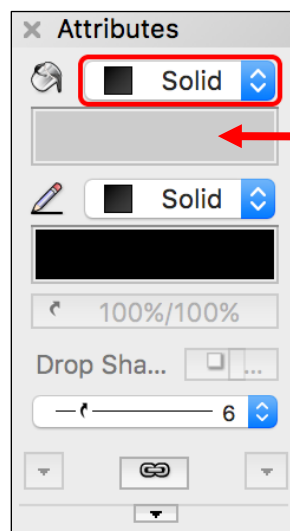
- Hidden Line is good for orthographic elevations, and Renderworks modes are used for photorealistic renderings.



3

3D FILLS

- 3D objects only accept two kinds of fills: “None” or “Solid”. Other types such as “Gradient” will be ignored.
 - A fill type of “None” will cause the 3D object to appear wireframe, even in OpenGL. Typically not recommended.
 - Normally you want 3D objects set to “**Solid**” fill.
 - “Class Style” also works as long as the object’s class is set to use a Solid fill.

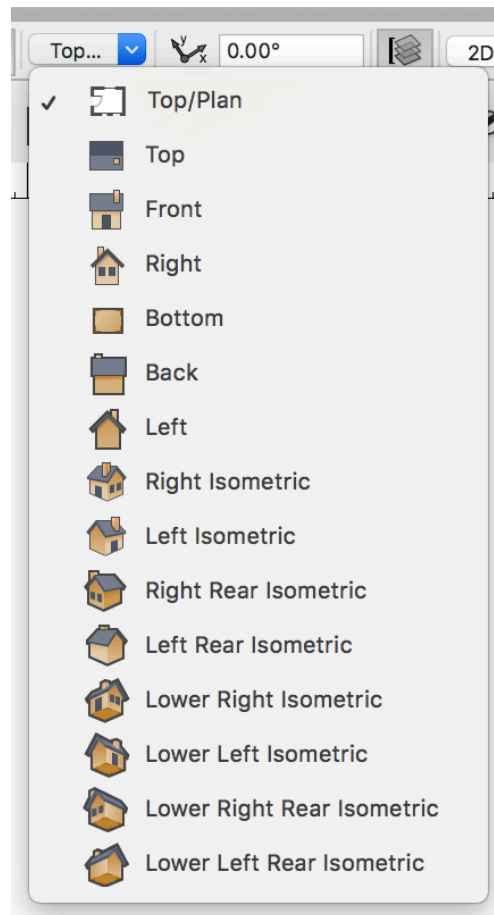


- 3D objects never display their fills in Top/Plan because Top/Plan is Wireframe (so you “see through” 3D objects).
 - For 3D objects to have a proper depiction in plan view, you’d utilize hybrid 2D/3D Symbols or Auto-Hybrid objects.
- Textures are a separate thing and are not covered here, but rely on the 3D object having a Solid Fill.

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“CURRENT VIEW” DROPDOWN

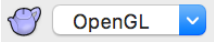
- To get back to **Top/Plan**, select it from the view dropdown, or use **Cmd+5** / **Ctrl+5**.
- You can also use this dropdown for **orthographic views** of your model (looking straight at a side), or **isometric views** (looking at a corner).



- When in any other view, this box will say “Custom View”.
- If your keyboard has a numeric keypad (right-hand side), these numbers can be used for view navigation as well.

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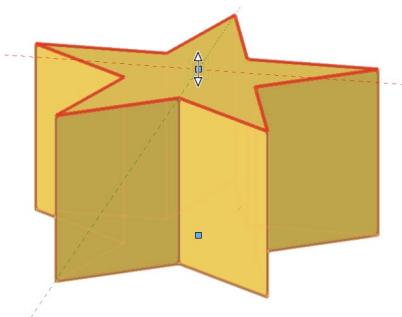
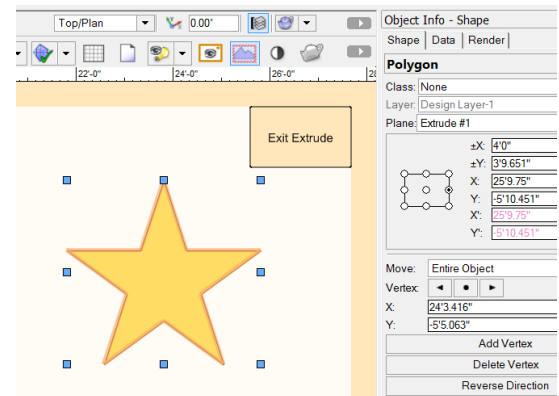
OPENGL OPTIONS


- To alter the settings of a render mode, click the render mode dropdown . Near the bottom click **“OpenGL Options”** (this menu changes depending on what render mode you are in). The bottom flyout lets you access options for the other modes.
 - **“Detail”** mainly controls how smooth or faceted curved objects look. If round things are looking jagged, then increase this quality setting. If your computer is lagging while trying to view a complex model, then decrease the quality. You should typically leave this set to “High”.
 - **“Use Textures”** allows you to turn the display of textures on and off. When textures are turned off, 3D objects display the fill color from the Attributes palette.
 - Unchecking **“Use Colors”** will display all 3D objects with white fills instead. Combined with Ambient Occlusion, this can create a nice white model effect.
 - **“Use Anti-Aliasing”** will help smooth out edges of things, though can slow down complex models.
 - **“Draw edges”** will display raster-based black lines along edges, which is often helpful when modeling. Note that this does not use the Pen colors from the Attributes Palette; all lines are black.
 - **“Use shadows”** is only applicable when there are Lights in your model.
- Remember that all of these options save into a Saved View, so if you’ve updated your OpenGL options you may need to update some of your existing Saved Views as well.
- OpenGL options are document-specific, and save into templates.

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EDITING AN EXISTING EXTRUDE

- An extrude acts like other **container** objects: you can **double click** it to edit its contents. Double clicking any extrude will allow you to edit the original 2D shape(s) inside. You can also hit **Cmd+[** or **Ctrl+[** with the extrude selected to enter edit mode.
- The shape(s) can be edited as you would any other 2D object. If you'd like to use the Reshape Tool on a polyline, double click the shape again.
- You can also copy and paste shapes into and out of the extrude.
- Once inside the extrude it can be helpful to switch to **Top/Plan** so you're looking straight at the 2D shape.
- When you are finished editing the 2D shape, click the "Exit Extrude" button in the upper right-hand corner (or Cmd+] / Ctrl+]).
- You can interactively change extrusion heights in any 3D view by

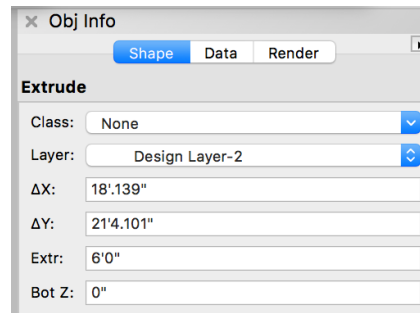
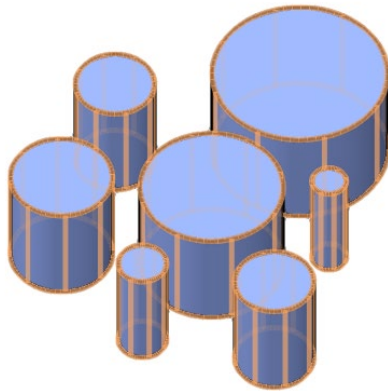


selecting the extrude then tapping the minus key to enter the **Reshape Tool** . This will make two blue handles appear for the top and bottom faces. (Hold "~" to suspend snapping if desired.)

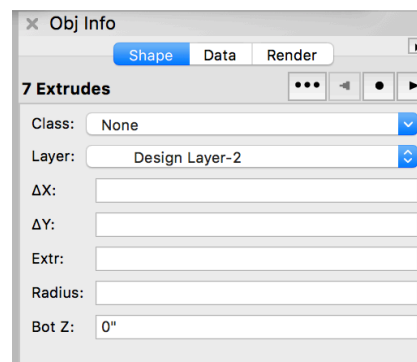
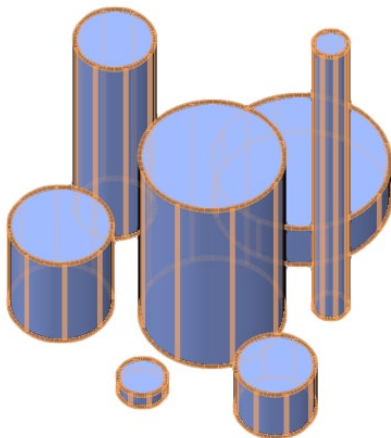
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EXTRUDE MULTIPLE SHAPES AS ONE EXTRUDE

- You can select **multiple 2D shapes** before running the Extrude command. When you do this, you will end up with **one Extrude object** which extrudes all of the shapes the same distance.



- If you later want to separate the single extrude into individual extrudes, you can **Ungroup** it (**Cmd+U** / **Ctrl+U**). This allows you to set different extrusion heights for each shape since they're now separate extrudes.

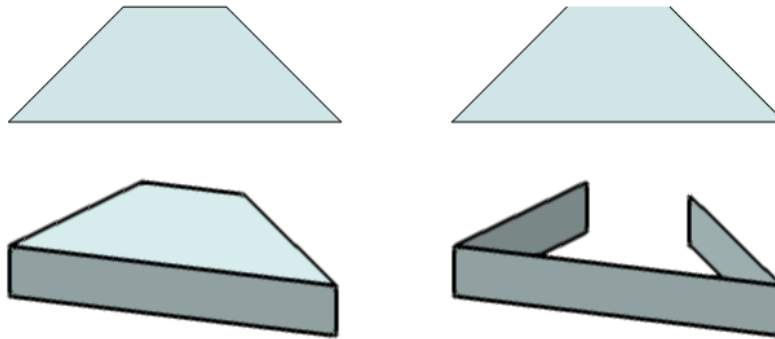


- Note that you cannot re-combine the extrudes back into a single extrude; the process is not reversible.

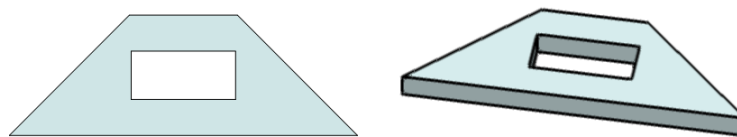
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ADDITIONAL FACTORS

- Most of the time you want to make sure the shapes you're extruding are **Closed** (for polygons and polylines, look at the checkbox in the OIP), otherwise you get incomplete solids:



- You can use the Modify > **Clip Surface** command to cut a hole into your **2D shape** to create a 3D object with a hole through it:

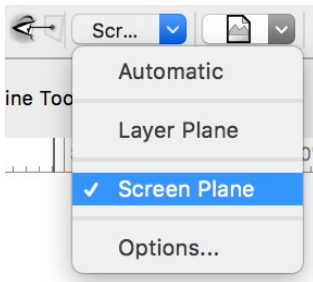


- You can extrude a line to get a vertical plane, such as a flat curtain.
- You can extrude a closed 2D shape to a height of 0", which results in a flat 3D plane. Useful for creating a floor plane when modeling.
- You cannot extrude groups, symbols, or locked objects.
- In addition to moving 3D objects with the Selection tool, the **Move 3D** command (Cmd+Opt+M / Ctrl+Alt+M) can be helpful.

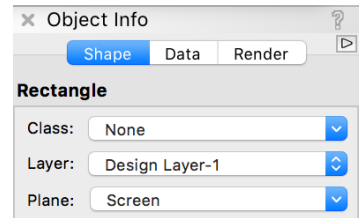
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SCREEN PLANE & LAYER PLANE

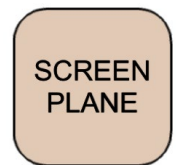
- 2D objects (a.k.a. planar objects) can be set to different “planes.” The view



bar’s **Active Plane Dropdown** (seen at left) determines what plane *future* objects will be drawn on, while *existing* objects display their plane in the **OIP** (seen at right).



- When a 2D shape is set to “**Screen Plane**” it will remain perpendicular to your computer screen regardless of your current 3D view.
- When a 2D shape is set to “**Layer Plane**” it behaves like a 3D object, meaning it will rotate in 3D space (when you use the Flyover tool, for example).



- You’ll also see the phrases “Automatic,” “Screen Aligned Plane,” “3D Plane,” and “Working Plane” – these are also 3D-based planes like “Layer Plane.” Think of it this way:
- There’s Screen Plane... and then there’s everything else!

- When you extrude a “Screen Plane” shape, it extrudes perpendicular to your computer screen into 3D space, based on the view you are in.
 - This is useful if you’ve drawn a shape in Plan view but want to extrude it on a different axis. Simply go to that view (the shape follows you) then extrude!
- Extruding any 2D shape results in a 3D object so planes are no longer relevant.

- Create a closed 2D shape with a Solid fill.
- Extrude it.
- View in OpenGL with Flyover tool.
- Double click an Extrude to edit original 2D shape.
- Use OpenGL Options to adjust settings.