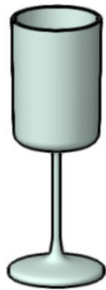


# INTRODUCTION TO 3D MODELING: 3D OBJECT CREATION

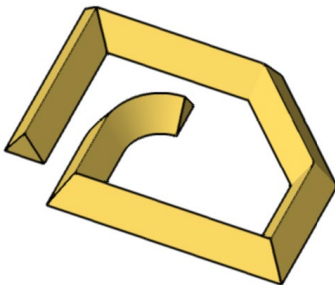
Vectorworks Tutorial by [Andy Broomell](#) © 2020.  
Green text indicates advanced or supplementary notes.

## 1

### OVERVIEW OF PAGES



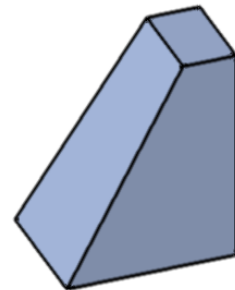
**2-3: SWEEPS**



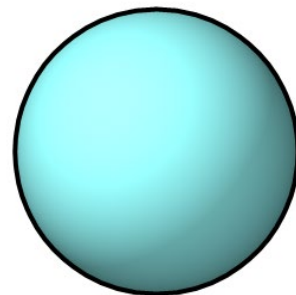
**4: EXTRUDE ALONG PATH**



**5: TAPERED EXTRUDES**



**6: MULTIPLE EXTRUDES**

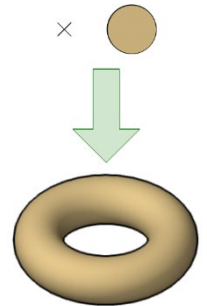
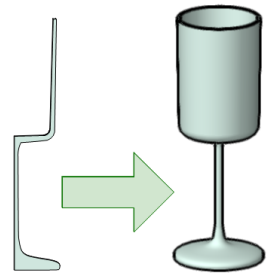


**7: 3D NATIVE SHAPES**

# 2

## CREATING A SWEEP

- A “**Sweep**” is a 3D object which takes a 2D shape and revolves it around an axis like a lathe. For example: a wine glass, a vase, or a spindle could all be created with the Sweep command.
- Begin by drawing the **right half** of the object you want to create. Make sure it has a solid fill. Usually a sweep is created with a single 2D shape, though you also can use multiple at once.
- The sweep command will “anchor” the rotation at the left-most part of the object. If you want the center of the sweep to be further away from the object (so that there’s a hole in the final object), place a **2D Locus** where you want the center of the sweep to be.
- Select the 2D shape (and Locus, if applicable), then go to **Model > Sweep**. Click OK. All the parameters can be adjusted in the OIP once the Sweep is created.
  - Take note of the view you’re in before creating the Sweep, as that will determine the orientation of the 3D object. For example, you may want to make sure your 2D shape is set to screen plane, then go to Front view before sweeping in order to create an upright object like a wine glass.
  - Sweeps with no Locus always go ‘towards’ to left side of the screen.
- As with other container objects, **double clicking** the Sweep will allow you to edit the original 2D shape(s).
  - You can also hit Cmd+[ or Ctrl+[ with the Sweep selected to edit it.



# 3

## SWEEP PARAMETERS

- When dealing with **Sweeps**, the main parameter to always check is “**Segment**” which determines how ‘smooth’ the Sweep is. The number determines the angle of each segment (and therefore affects the total number of segments in the sweep).

- Smaller segment angles create smoother sweeps, but also take up more memory and rendering time. Find the right balance so that the object looks good while using the fewest number of segments possible (larger segment angle = fewer segments). A good starting point is “20”.



**SEG: 10°**



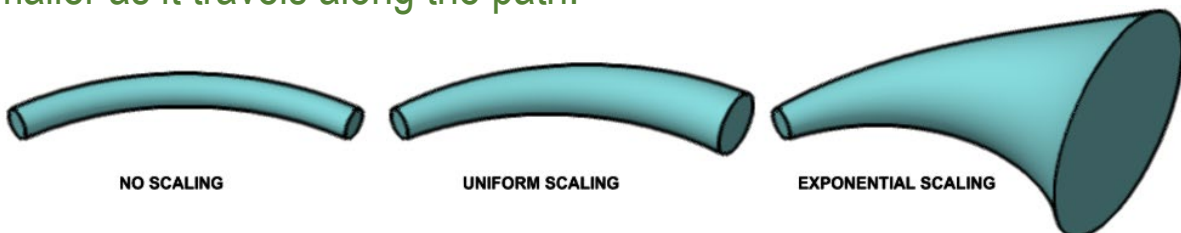
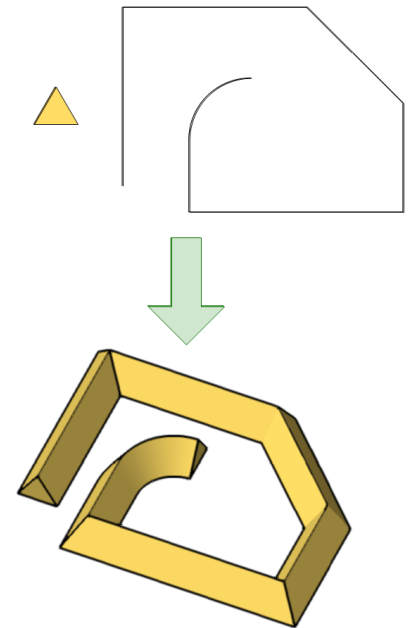
**SEG: 60°**

- “**Height**” and “**Radius**” can contract or expand the size of your object, effectively scaling the original profile’s width and height.
- “**Pitch**” indicates the distance each revolution spirals upwards or downwards, which can create helix-like 3D shapes.
- “**Sweep**” indicates how far around you’d like the profile to be swept. The most common is 360° which creates a fully turned shape. When using less than a full sweep, you can set where it begins with the “**Start**” parameter. The Sweep can also be greater than 360° (which is only useful when combined with “Pitch”).

# 4

## EXTRUDE ALONG PATH

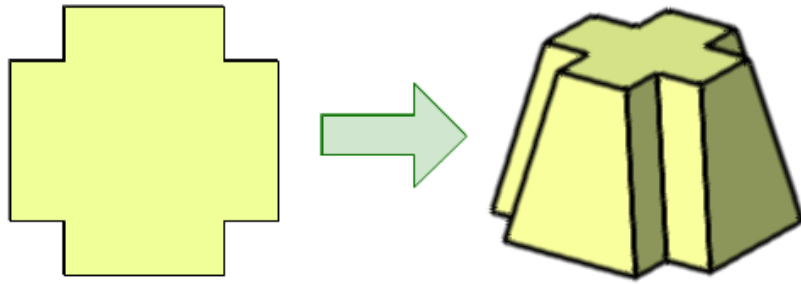
- To create an **Extrude Along Path** (EAP), you need at least two objects: one to be a **profile** and one to be a **path**. The profile(s) will be extruded along the path to create a 3D shape, such as moulding or a curved pipe.
- After drawing the two shapes, select both and go to **Model > Extrude Along Path**, or use **Cmd+Opt+X / Ctrl+Alt+X**.
  - Click the **Next** or **Prev** button to highlight the object that represents the **path**.
  - Check “**Fix Profile**” if you’ve pre-aligned the profile to the path in 3D (otherwise uncheck and it will auto-center the profile for you). Click OK.
- As with other container objects, **double-clicking** the EAP object will allow you to edit the profile or the path (choose which in the pop-up).
  - When not using the “Fix Profile” option, you’ll likely need to edit the profile and adjust where the shape is placed in relation to the path (0,0 origin point in profile edit mode).
- You can adjust the scaling in the OIP if you want the object to get bigger or smaller as it travels along the path:




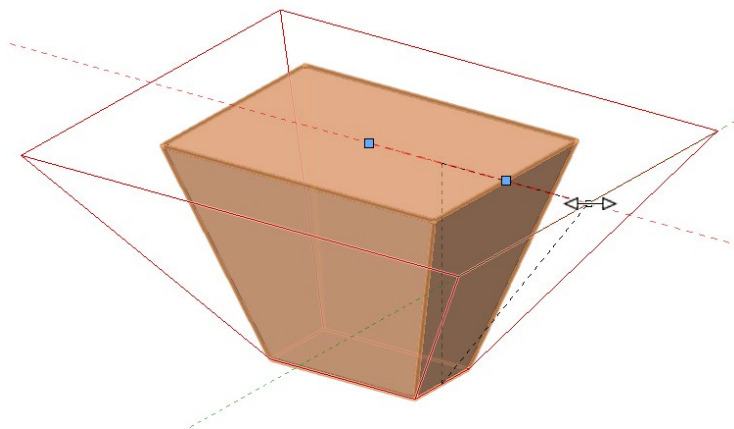
# 5

## TAPERED EXTRUDE

- A **Tapered Extrude** is very similar to a normal Extrude but it has an additional parameter “**Taper Angle**” which angles the sides of the shape inward or outward as it extrudes.



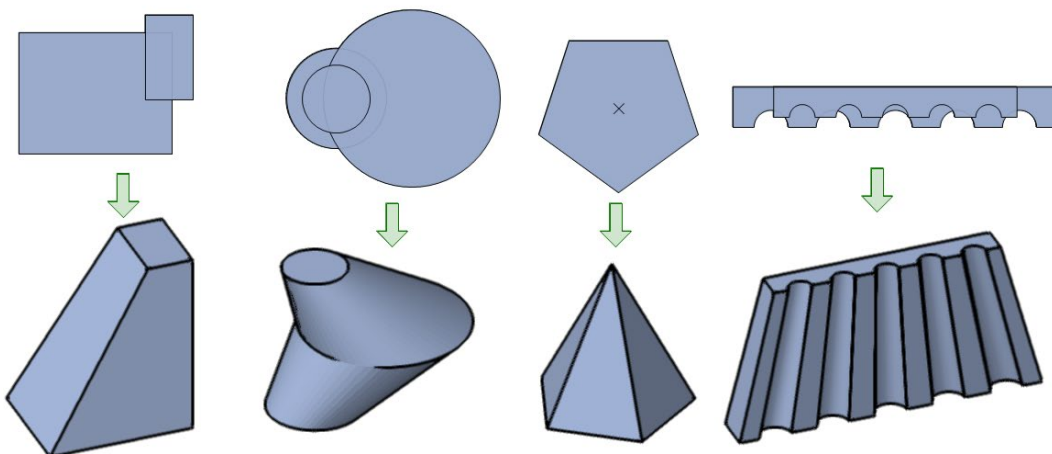
- The 2D shape used for the Tapered Extrude needs to be set to **Layer Plane**.
- With the object selected, go to **Model > Tapered Extrude**.
- Enter a Taper Angle (positive or negative) then click OK. This parameter can be adjusted in the OIP at any time, or you can modify the object with the **Reshape Tool**  (minus key) to interactively reshape the object with blue handles.



# 6


## MULTIPLE EXTRUDE

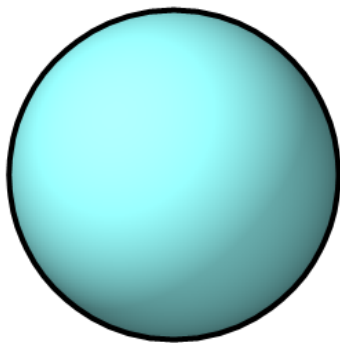
- The **Multiple Extrude** command allows you to draw two or more shapes which morph from one to the next to create the resulting 3D object.
- The order in which the shapes are used is determined by the **stacking order**. The back-most profile becomes the bottom of the 3D object.
- Select all the shapes and go to **Model > Multiple Extrude**. The “Extrusion” is the distance between the first and last profile.
  - When using more than two profiles, the extrusion is the **total** height. The profiles are equally spaced within that distance. If you need uneven spacing of profiles, try the Loft tool instead.
- Once the Multiple Extrude is created, the original profiles can be edited by **double-clicking** the object. You can also change the stacking order.
- The Multiple Extrude command sometimes creates unexpected results, especially when connecting dissimilar shapes. For best results, use shapes with the same number of vertices. Troubleshooting methods include rotating one of the profiles or clicking the “Reverse Direction” button in the OIP.
- You can use a locus to extrude to a point.



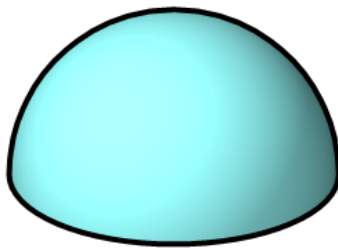
# 7

## 3D NATIVE SHAPES

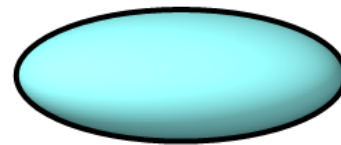
- The following objects can be created with built-in Vectorworks tools found within the 3D Modeling toolset . They are fairly self-explanatory; try inserting one of each of these shapes and adjusting the parameters in the OIP.



**SPHERE**



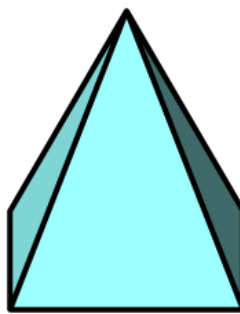
**HEMISPHERE**



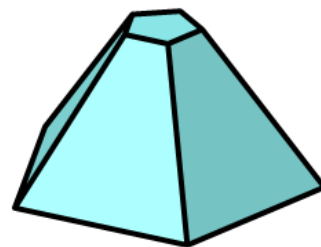
**ELLIPSOID**



**CONE**



**PYRAMID**



*(Note that the Ellipsoid and Pyramid tools might not be present in the default workspace, though they can be added with the Workspace Editor)*