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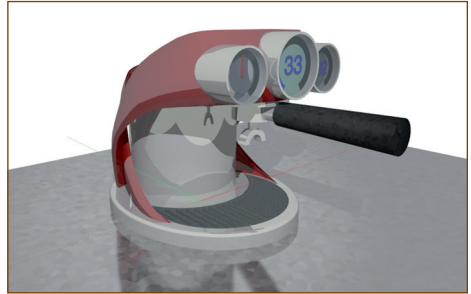
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# Introduction

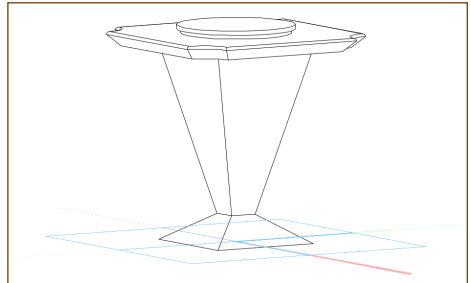
This manual covers one of the best parts of Vectorworks, creating 3D models. It is really fun and rewarding to create the forms you want and be able to move around them to view your work from different angles.

Here is an example from a first-time user of Vectorworks. The project was a high school graphics project and the user had not used Vectorworks before. The user was given an earlier edition of this manual and they worked through the exercises. Then with only a little guidance from an experienced trainer, the user was able to produce this model.

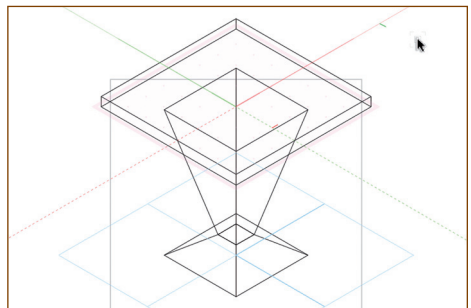


When you first look at this model, it seems so complex, you may wonder how it was made. There is a saying, “How do you eat an elephant? One bite at a time...” This can be applied to your models. How can you create this coffee machine? One part at a time. This coffee machine is mainly made from simple extruded objects with a couple of complex curves. When you bring them all together and the result is magic.

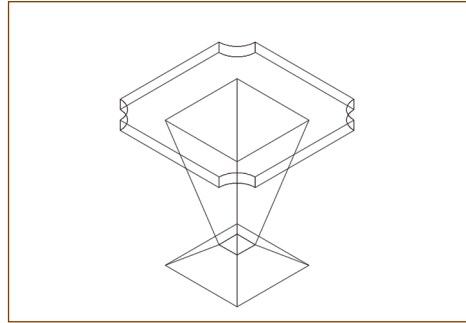
If you look at the top of this table, it looks like a complex form, but if you were to make this from a timber slab, how would you build it?



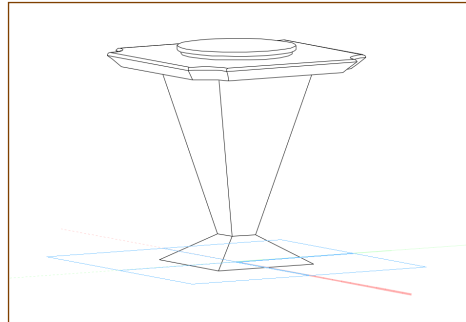
You would probably start with a solid slab of timber.



Then you could cut the corners out.



And then you can add the center piece, and edit the edges.



## 0.1 How to Use this Manual

This manual builds on the Vectorworks Essential manual. The Essential manual is designed to show you basic concepts of Vectorworks such as drawing, modeling, and basic file organization. If you are unfamiliar with these concepts, then you should get the Essential manual and complete it before you go any further.

Here are some ideas to help you to use this manual better:

Spend the time to work through the manual. The information in this manual will not find it's way into your head if you don't complete the exercises. Reading the manual is good, reading the manual and watching the movies is better, reading the manual, watching the movies and completing the exercises has the best results. Watch the movies, try the exercise and then play the movie again.

Comments and discussions are shown like this.

- Instructions for you to complete are shown like this.

*Tips: Useful tips are shown like this.*

Measurements for you to use are shown in both metric and imperial. Metric measurements are shown first, imperial measurements are shown second in brackets. If you are using metric, don't type in the imperial measurements; if you are using imperial, don't type in the metric measurements.

This manual comes as a hard copy with a CD-ROM.

There are two exercise folders on the CD. One is called "Imperial Modeling Exercises" and the other is called "Metric Modeling Exercises." Copy the exercise folder that you want to use to your computer. Place the exercise folder in a location to make it easy to find later, such as "My Documents."

Save any training files that you work on to your exercise folder.

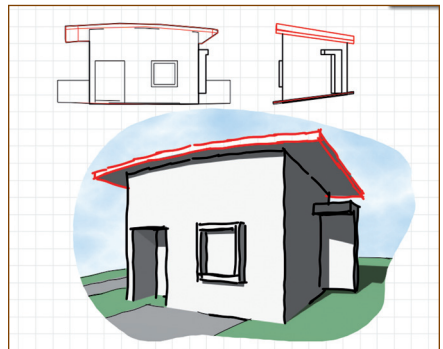
When you want to play a movie that is shown in the printed manual, insert the 3D Modeling Tutorial Manual CD into your computer's CD player. Right click on the file on the CD called **3D Modeling Tutorial Manual.pdf**, choose Open with... and choose Acrobat reader. This is your electronic copy of the manual, and it contains links to all the movies. To play a movie from the electronic copy of the manual,

move your cursor over the movie icon (the cursor will change shape) and click once. When the movie is finished, it will automatically close. If you are using a Macintosh, make sure the manual opens with Adobe Acrobat Reader, not Preview. Preview will not display the movie icons. When the movie is finished it will automatically close. Use Adobe Acrobat Reader to read the manual and play the movies; use Vectorworks to do the exercises.

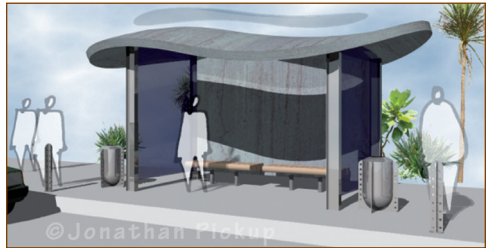
## 0.2 What's in This Manual

This manual starts with an introduction to modeling in Vectorworks. This section explains the basic concepts you need to create complex models effectively. There are a series of modeling exercises designed to show you how individual tools and commands work. Some of these exercises will use a few tools or commands together to show you the flow of work from a simple block to the final model.

Following the introduction, there is an architectural modeling exercise to bring several modeling tools, commands, and concepts together to develop a model and create drawings from it.



The final part of the manual is a bus stop exercise. The aim of this project is to work through a long series of exercises to create a final project. You will learn how to break the project down into small parts and model each of these. You will learn how to do more advanced modeling by making street furniture, how to use some of the advanced tools for creating curved 3D models, and how to move through a series of tools and commands to get the model that you want.



## 0.3 New Ways of Drawing

When you are drawing in Vectorworks, draw the objects to the correct real-world sizes regardless of the scale of the layer that you are working on.

It is much easier to maximize the potential of Vectorworks by using objects to draw with, as they can be easily edited (for example, doors, windows, rectangles, etc). You could say that Vectorworks is designed to draw with objects.

When you want to draw shapes, you may be tempted to use lines and arcs to draw the shape. Always try to draw with solid shapes, rectangles, and polygons. I have created a series of exercises that show you how to make complex shapes out of simple shapes by adding the shapes together or by clipping a portion of a simple shape away to make a complex shape.

It's very important that you use these new drawing methods to draw your buildings, landscapes, or models.

This manual is intended to be used with the standard Vectorworks workspace. After you have completed this manual, you can change back to your normal workspace and carry out the 3D modeling you want.

- Go to the **Menu bar**.
- Choose **Tools > Workspaces > Standard**.

# 1.0 Simple 3D Modeling

## 1.1 Working Planes

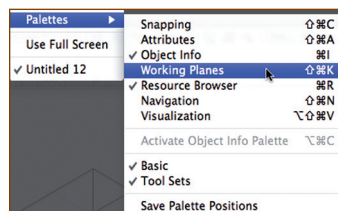
When you create extrusions and primitive shapes, they always start at zero on the working plane, when you want to create more complex shapes, working planes help you to change the active working plane to a position that suits. When you create planar objects, they are created on the working plane, so it is really important to learn how to create and manage working planes.



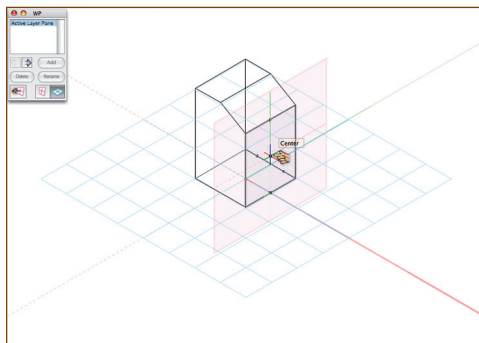
- Open the file **3D Model 1.sta** from the exercises folder.
- Go to the **3D Modeling** tool set.
- Select the **Set Working Plane** tool.
- Go to the **Tool bar**. Select the second mode.



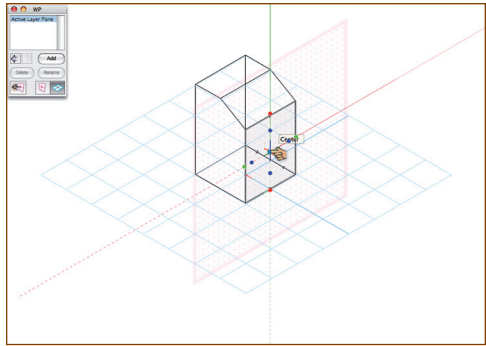
- Go to the **Menu bar**.
- Choose **Window > Palettes > Working Planes**. This opens a palette where you can save, edit, and recall working planes.



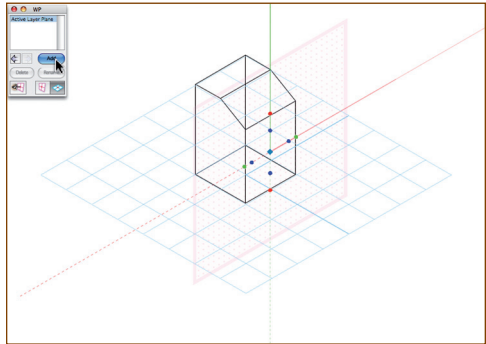
- Move the cursor to the face of the object. I've moved to the right side. Notice how the side of object high-lights.



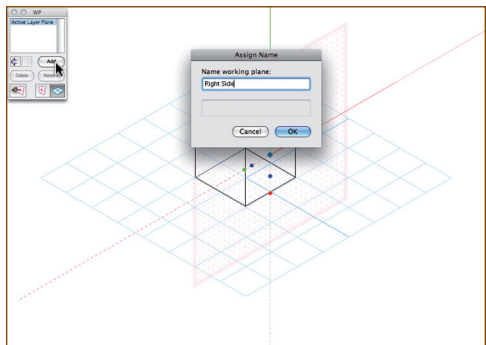
- Click once. This sets the working plane to the face of the object.



- Go to the Working Planes palette.
- Click on the **Add** button.



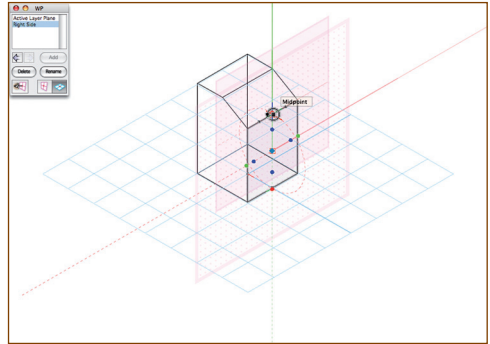
- Name the working plane.
- Click on the **OK** button.



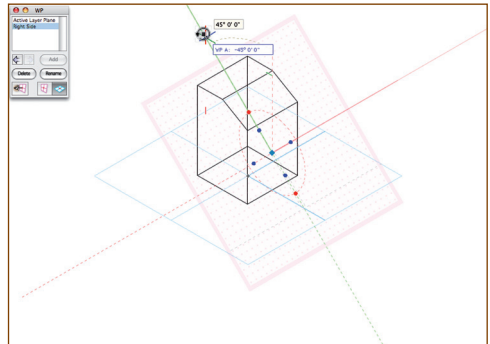


The working plane is added to the palette.

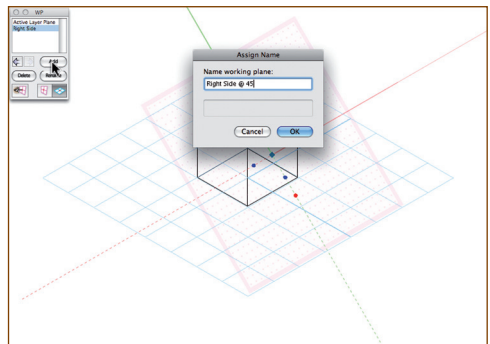
- Move your cursor to the red dot at the top of the working plane. These dots allow you to rotate the working plane. Each color rotates the working plane in a different direction. When you move to the dot, you will see an indication of the direction.



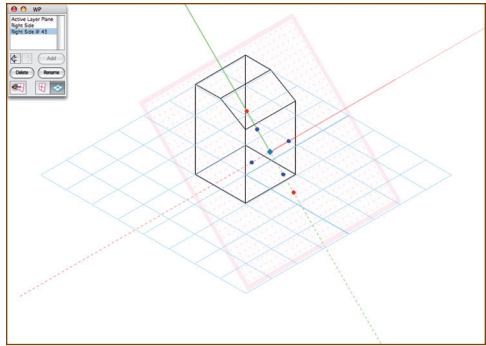
- Click once.
- Move your cursor to a new location. The Floating Data bar will tell you the offset angle. This is the angle from the working plane.
- Click once.
- Go to the Working Planes palette.
- Click on the **Add** button.



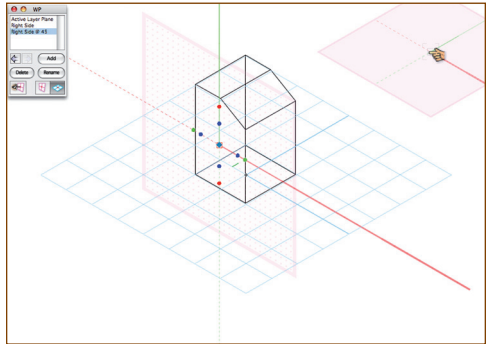
- Name the working plane.
- Click on the **OK** button.



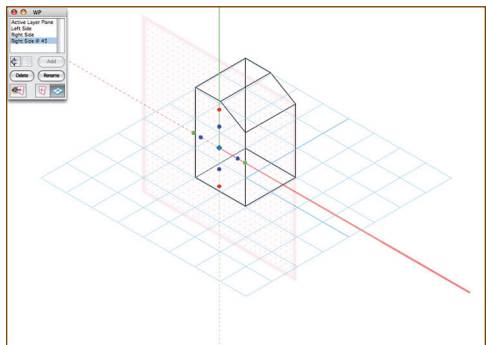
The working plane is added to the palette.



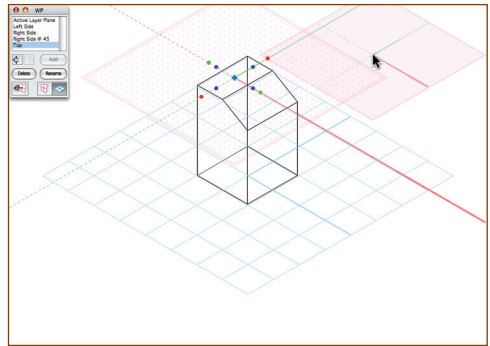
- Move to the next side of the object.
- Click once. This sets the working plane to the face of the object.
- Go to the Working Planes palette.
- Click on the **Add** button.
- Name the working plane.
- Click on the **OK** button.



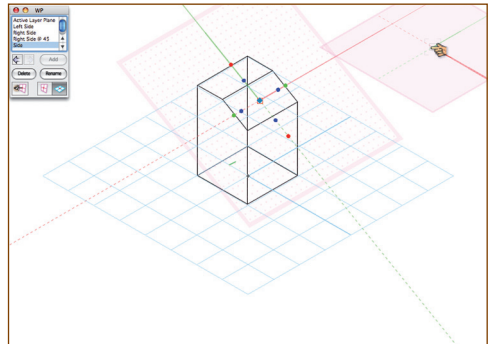
The working plane is added to the palette.



- Move to the top of the object.
- Click once. This sets the working plane to the face of the object
- Go to the Working Planes palette.
- Click on the **Add** button.
- Name the working plane.
- Click on the **OK** button.

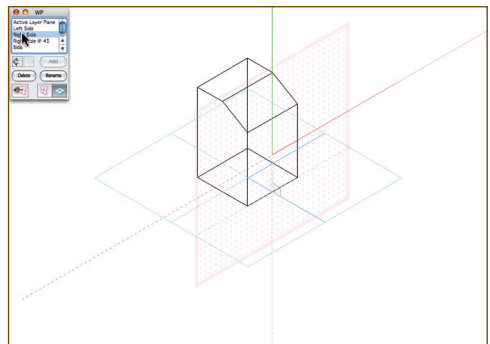


- Move to the cut side of the object.
- Click once.
- Go to the Working Planes palette.
- Click on the **Add** button.
- Name the working plane.
- Click on the **OK** button.

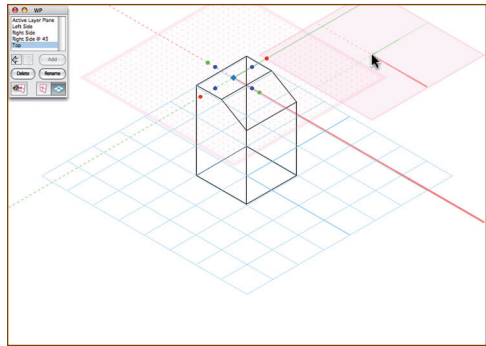


The working plane is added to the palette.

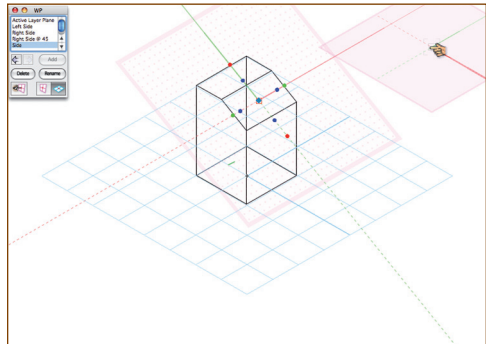
- Go to the Working Planes palette.
- Double click on the **Right** working plane.
- Vectorworks moves the working plane to the front.



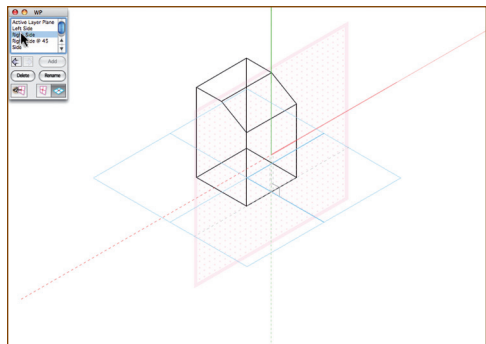
- Go to the Working Planes palette.
- Double click on the **Top** working plane.
- Vectorworks moves the working plane to the top face.



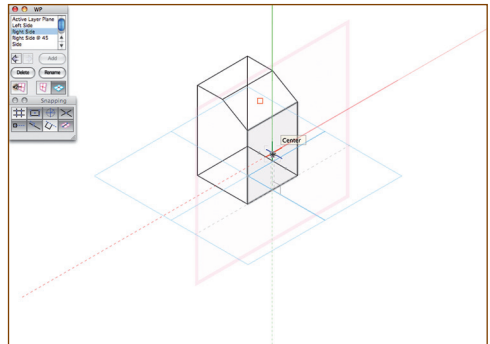
- Go to the Working Planes palette.
- Double click on the **Side** working plane.
- Vectorworks moves the working plane to the cut face.



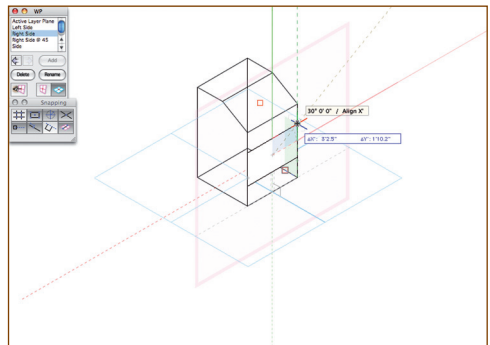
- Go to the Working Planes palette.
  - Double click on the **Right** working plane.
- Vectorworks moves the working plane to the right face.
- Go to the **Menu bar**.
  - Choose **Window > Palettes >...** Open the Snapping palette if it is not already open.



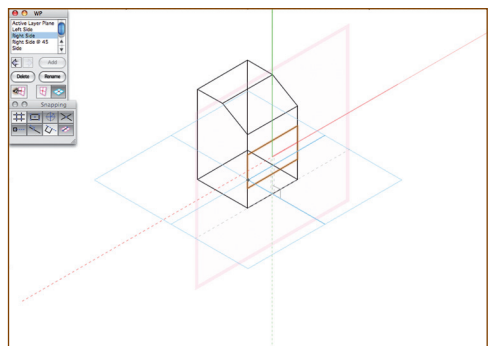
- Go to the **Snapping** palette.
- Ensure Snap to Working Plane is active (the bottom-right button).



- Go to the **Basic** tool palette.
- Choose the Rectangle tool.
- Draw a rectangle on the working plane.



The ability to have these objects projected on your model is called Planar graphics.

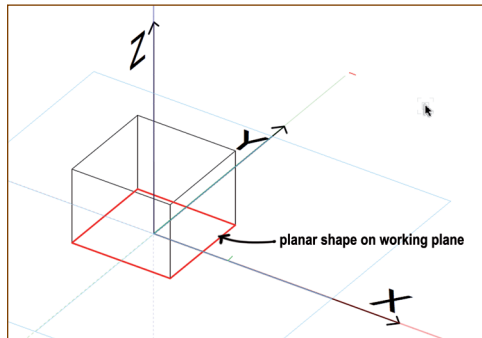


## 1.2 Extrusions

To create an extrusion, start with a solid planar element—for example, a rectangle, a circle, etc. If you want to render the object, it has to be a solid object before you extrude it. It can be a line, rectangle, polygon, or any planar object.

Extrusions follow a few rules:

1. Extrusions from objects drawn on the screen plane are based on the viewing plane. They seem to come out of the screen at you.
2. Extrusions from planar objects are always based on the working plane.
3. Extrusions always start at 0 on the working plane. If you haven't set a working plane, then the extrusion will start at  $Z=0$  on the current layer.
4. The extrusion is based on the planar object and this shape is stored by Vectorworks. You can use the command **Edit Extrude** from the Modify menu to edit the original shape and change the extrusion, or double click on the extrude to edit the original geometry.
5. You can edit the length of the extruded shape using the Object Info palette.
6. You can edit the location of the extruded shape using the Object Info palette.



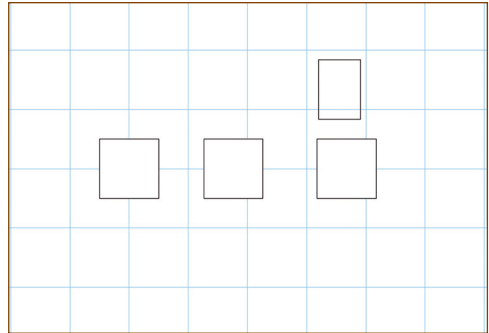
## Creating Extrusions

The first rule of extrusions is that objects drawn on the screen plane will always extrude toward you; objects drawn on the layer plane, or 3D plane, will extrude perpendicular to the plane. This means that you have to be aware of the view you are in, or the plane of the object, before you choose the extrude command.

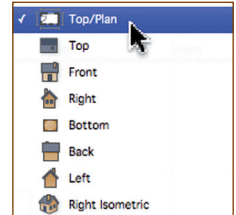


- Open the file **3D Model 2.sta** from the exercise folder.

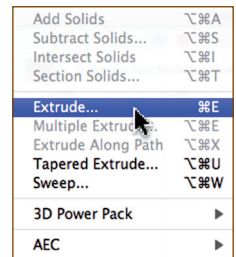
There are three equal rectangles in the middle of the drawing.



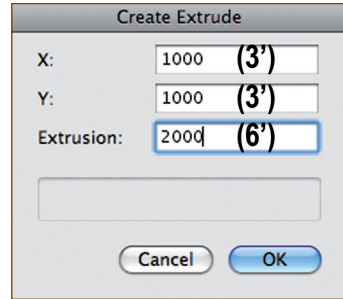
- Make sure that you are in a **Top/Plan** view.
- Go to the **View** bar.
- Click on the pop-up menu for the standard views.
- Choose **Top/Plan**.



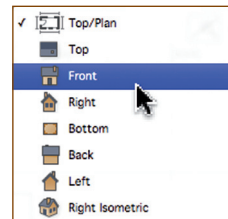
- Select the first (left-hand) rectangle. This object has been drawn on the screen plane.
- Go to the **Menu** bar.
- Choose **Model > Extrude...**



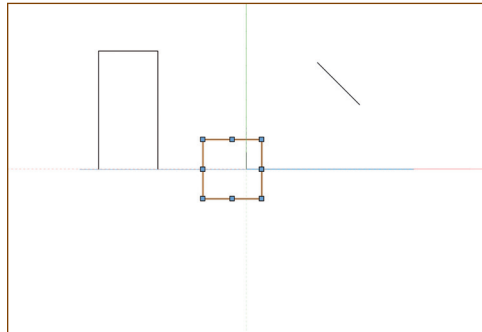
- Extrude this rectangle **2000mm (6')**. This rectangle has been extruded towards you, that is, it has been extruded up.



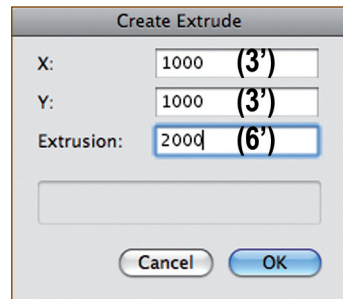
- Select the second (middle) rectangle. This object has been drawn on the screen plane.
- Go to the **View** bar.
- Click on the pop-up menu for the standard views.
- Choose **Front**.



In this view you can see how the first rectangle was extruded up in 3D.

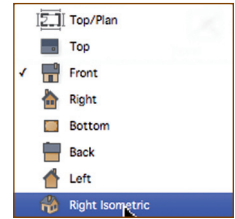


- Go to the **Menu** bar.
- Choose **Model > Extrude...**
- Extrude this rectangle **2000mm (6')**. This rectangle has been extruded toward you—in the front view.
- 

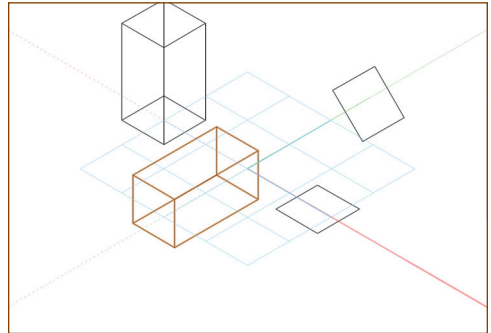




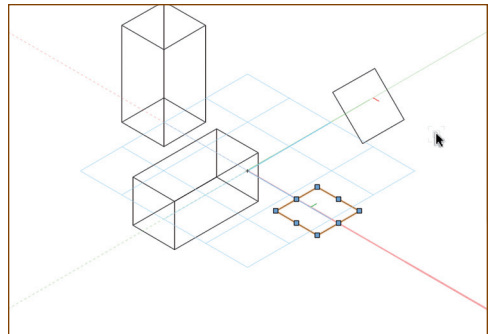
- Go to the **View** bar.
- Click on the pop-up menu for the standard views.
- Choose **Right Isometric**.



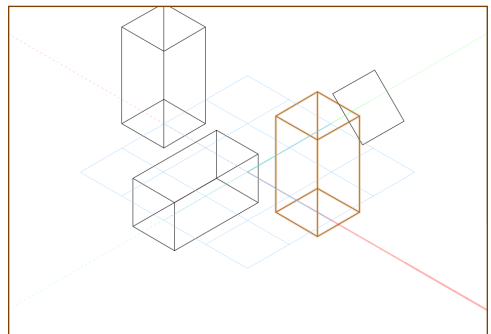
In this view you can see how the first rectangle was extruded up and the second rectangle was extruded towards the front.



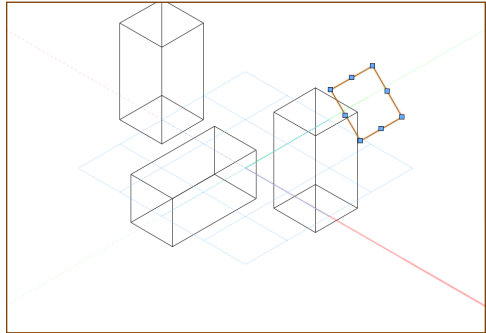
- Select the next rectangle. This object has been drawn on the layer plane.



- Go to the **Menu** bar.
- Choose **Model > Extrude...**
- Extrude this rectangle **2000mm (6')**. This rectangle has been extruded directly up, perpendicular to the way it was created.



- Select the last rectangle. This object has been drawn on a 3D plane.



- Go to the **Menu** bar.
- Choose **Model > Extrude...**
- Extrude this rectangle **2000mm (6')**.
- This rectangle has been extruded perpendicular to way it was created.

