



Section 15

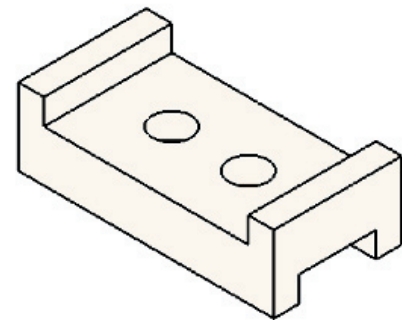
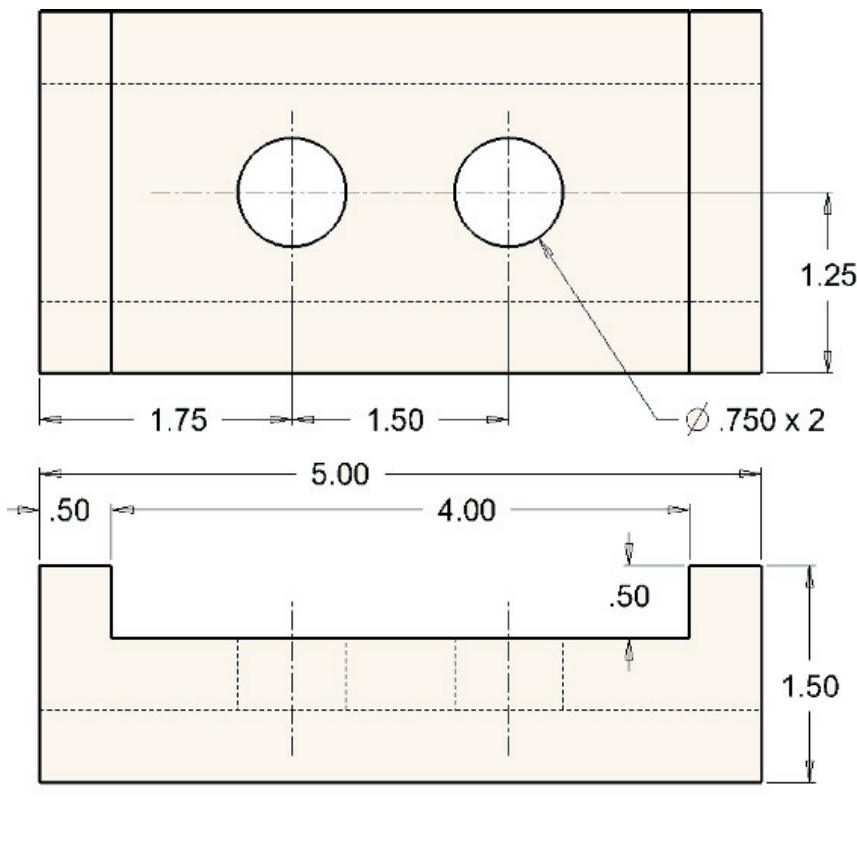
Drawing # 15

Solids: **Guide Block**



Objectives

- Use Multiple Viewports
- Use Delta Coordinates
- Create Blocks
- Create Cylinders



In this drawing, you will create a shape by starting with a piece of stock and removing parts, similar to the way a machinist or sculptor might work by removing pieces from a solid block of material. You will first create a solid object using the BLOCK command. You will also create entities that you will then use to remove the two slots from the original solid, using the Boolean commands like you did in the Solid Extrusion. Then you will create a pair of cylinders which you will use to "drill" holes in the block.

Setting Viewports

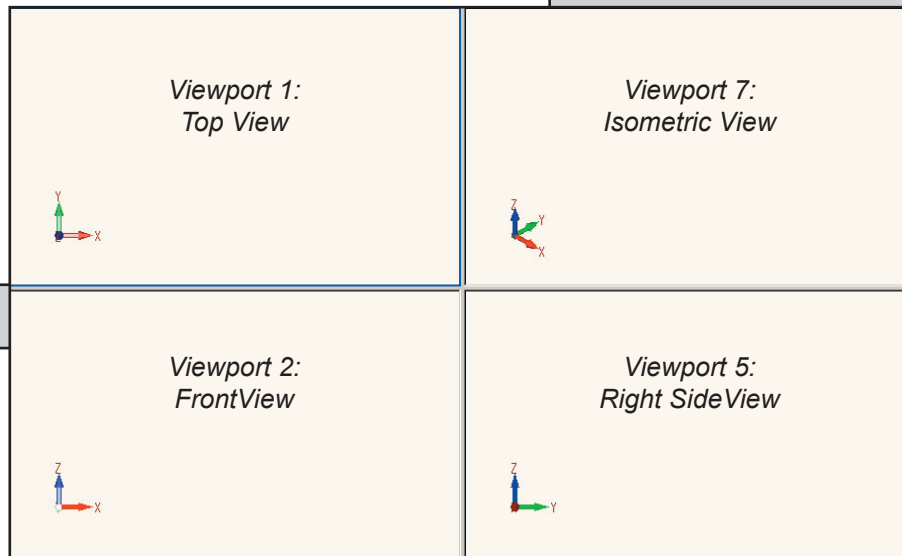
First, let's try another viewport setup.

 **View**

 **Viewport Layout.**

  **Quad** this time .

Your screen should now look like this:




Display View

Take a look in the status line and find the **DV=1** panel.

Now look at Viewport 1

(the top view) and find the blue line that surrounds the viewport. This is **Display View (DV)**, sort of the primary working view which, for this drawing, will be used to define the **Construction Plane (CP)**. The CP orients the direction for the program to work in on the model you are creating (*more on this later*).



 in one of the other viewports, and notice the change to the blue line and in the status bar. As you orient the program in the different viewports, the blue edge moves to that viewport, and the status bar will tell you that the DV equals that view.

Be sure to return the DV to the Top view, so the Status Bar reads **DV=1 again.**

Coordinate Systems

Before you go on, it will make this project a little easier if you make sure you are using World Coordinates. World Coordinates means the computer will read the X Y and Z axes from the gnomon in the bottom of the screen. The CPL setting would read the X axis as left to right on the screen, and the Y axis would run from the bottom to the top of the screen.

IF the box in the settings toolbar says **CPL**,

 the  toggle at the bottom of the screen.

This is what you want:

WLD

Primitives



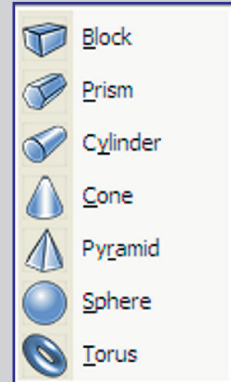
Creat



Primitive Solid

You should see a submenu that has these buttons.

This is the **CREATE** Menu for Solid Modelling. When you used the *Extrusion* and *Revolve* commands from this menu, you had to move a profile that you had already made. Now you are going to create shapes called **PRIMITIVES**. Primitives are shapes you can use like building blocks to make other objects, similar to the way you would use simple wooden blocks or LEGO® bricks to make more complex shapes. You can also cut parts out of them to create a shape. This is what you'll be doing here.



They include:



Block



Prism



Cylinder



Cone



Pyramid



Sphere



Torus (a donut-shape)

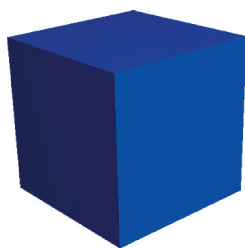
Platonic Polyhedra

Blocks, prisms and pyramids are all **POLYHEDRA**. A Polyhedron (*poly-many, hedron - face*) is a solid shape that has polygons as faces. In geometry, an important group of polyhedra are the **PLATONIC** solids. These are the only solids that are **regular** (all edges and angles are the same) polygons. In this case you can see they are all squares, triangles or pentagons. These faces are also all **congruent** (all the same size and shape). These solids so greatly impressed the ancient philosopher Plato, that he used them to describe his "theory of everything" in his treatise *Timaeus*.

Can you tell which of these polyhedra could be built from the primitives menu?



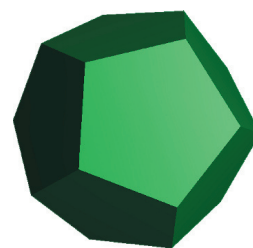
Tetrahedron



Hexahedron (cube)



Octahedron



Dodecahedron



Icosahedron

Building Blocks



Block

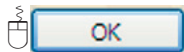
This command will create your stock block after you tell the computer its three main dimensions, it's orientation, and its placement on the screen. You will Key-In the position of the front left bottom corner of the block. We'll call this corner the **origin***

We call this the **ORIGIN corner, because most of your dimensions will be measured as coordinates from here. This method of giving measurements is used by many people in manufacturing to control machines used for milling, boring or cutting operations.*

To place your block correctly, you need 3 pieces of information:



SIZE:

 the measurements shown above.

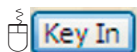



ORIENTATION:

IF the status bar says DV=1, go to the next step.

IF NOT, use the right mouse button to  **Viewport 1** & 
Make sure the status bar says DV=1 before you go on.

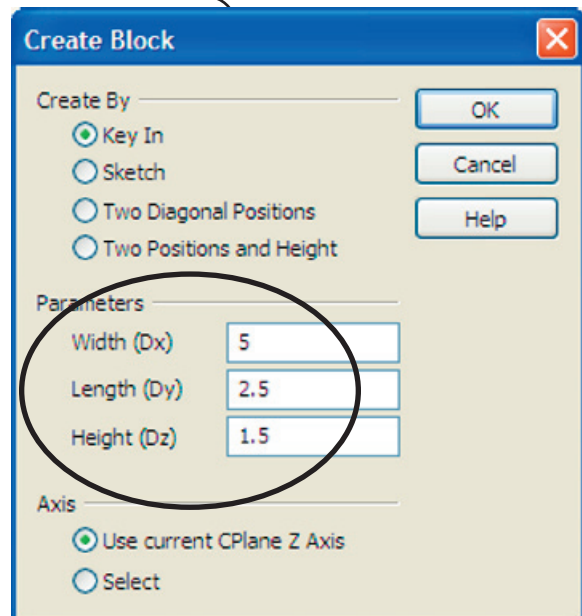
LOCATION:



 these coordinates:
X=0, Y=0, Z=0.

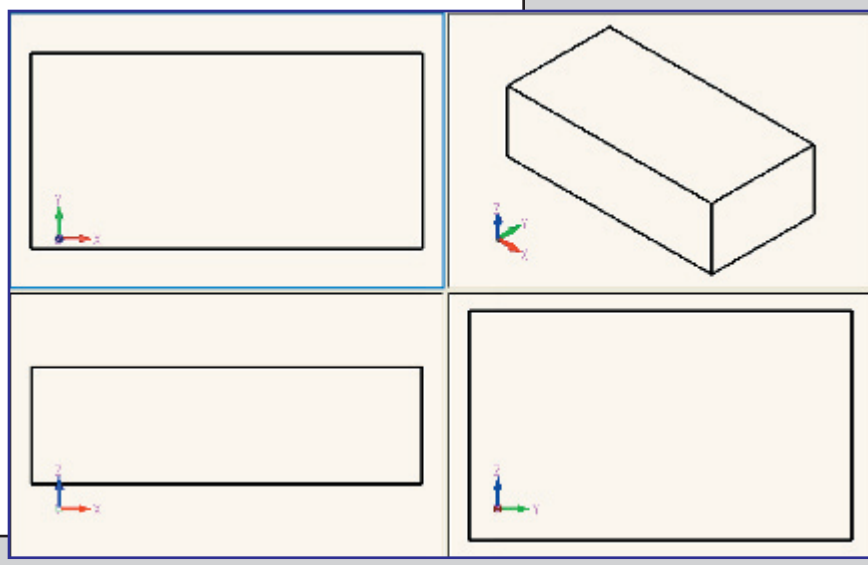
Autoscale the drawing.

Don't forget to .



Indicate the corner point

The viewport 1 outline should be blue



Change the Display



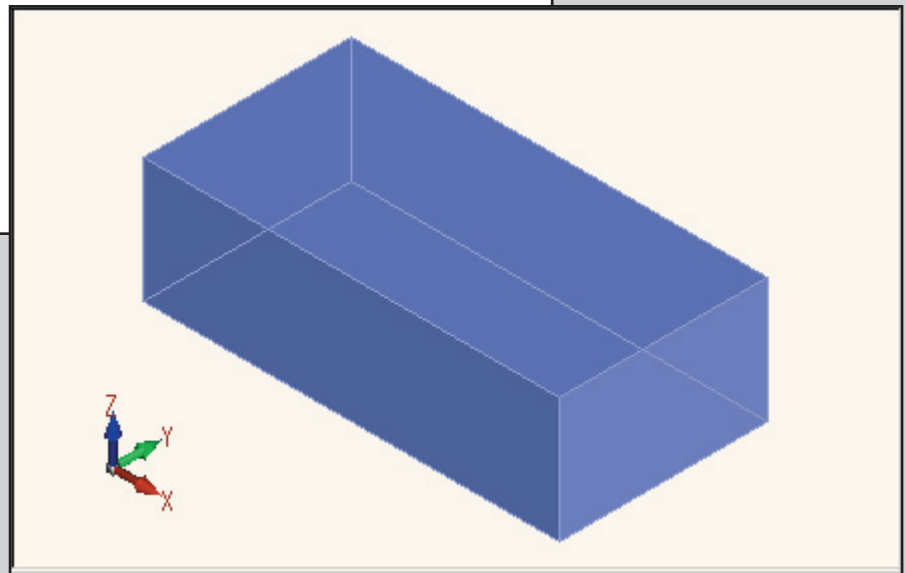
 Viewport 7 to change the way the Isometric view is rendered.



to rotate the view.

The easiest way to return to your original views when you are done is


to  View,  Viewport Layout, and   **Q**uad again.



Boxes for the Slots

  and **change your active color.**

This will make it easier to see the blocks you use to cut the slots.

  again.



SIZE:

Enter these measurements to create the top s

$X=4$ $Y=2.5$ $Z \geq$ any number greater than or equal to $.5$

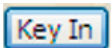
ORIENTATION:

Make sure the status bar reads DV=1.

If not, use the right mouse button to  viewport 1. 

The viewport outline should be blue.

PLACE:

 the location for the origin of this box at these coordinates:

$X=.5$ $Y=0$ $Z=1$

Don't worry if the solid render looks weird: the computer can't decide which color to put on top, so if you spin this view it will change around. Just check the other views to see if the block looks like it is the right size.

Now create the bottom slot:

SIZE:

$X=5$ $Y=1.5$ $Z=.5$

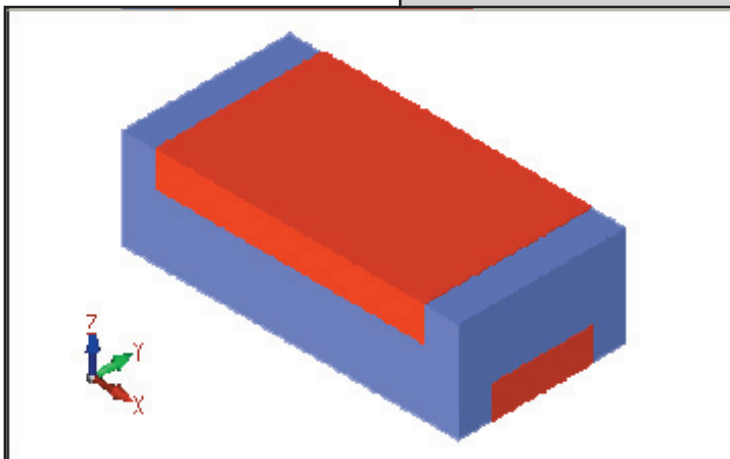
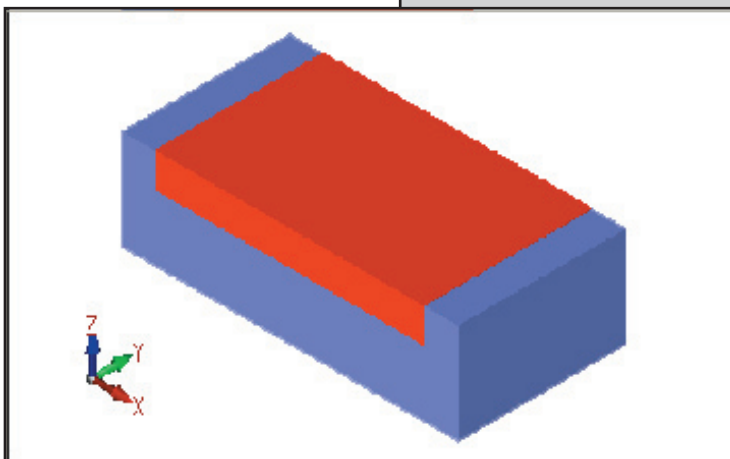
ORIENTATION:

Does DV=1?

PLACE:

The location of its origin is:

$X=0$ $Y=.5$ $Z=0$



Cutting the Slots



Modify



Boolean or **SHIFT** **B**



Subtract



the main part of the Guide Block stock.

This is the part you want to keep.

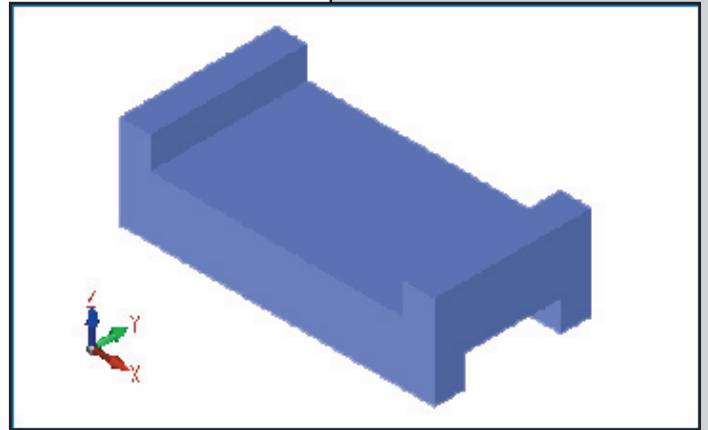


the two boxes that define the slots.

This is what will be chopped out.



Accept



Making Cylinders



Create



Primitive Solid or **SHIFT** **P**



Cylinder

SIZE:



the measurements shown here.



OK

ORIENTATION:

Which viewport outline should be highlighted?

PLACE:

Locate the center of the first circle at these coordinates:

$X = 1.75$ $Y = 1.25$ $Z = 0$

Create Cylinder

Create By

- Key In
- Select Base Arc
- Sketch
- Two Positions

Parameters

Major Radius
 Minor Radius
Height

Axis

- Use current CPlane Z Axis
- Select an Axis

OK

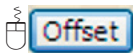
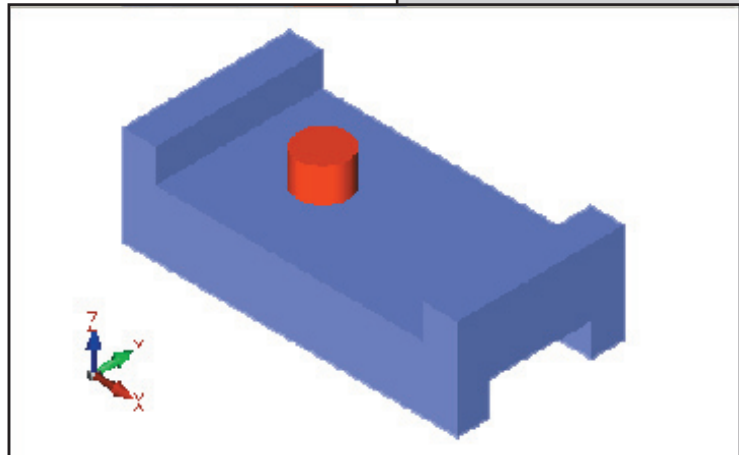
Cancel

Help

Making Cylinders (cont.)

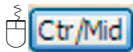
Your screen now looks like this.
You made the hole a little too tall, but that's OK. Extra material in the cutting tool isn't a big deal.

You will use a new command to locate the other hole.



This option is going to allow you to use relative coordinates again. It tells the computer you want to place the next hole a certain distance from another location. In this case, it is 1.5" away in the "X" direction from the center of the first cylinder you made.

Indicate Offset origin



You will tell the computer the location of the second cylinder by giving its coordinates from the first cylinder. The computer will measure the position of the new cylinder from the position you choose next.

the bottom of the first hole **IN VIEW 7!**

You may want to change the rendering of this viewport to  or 

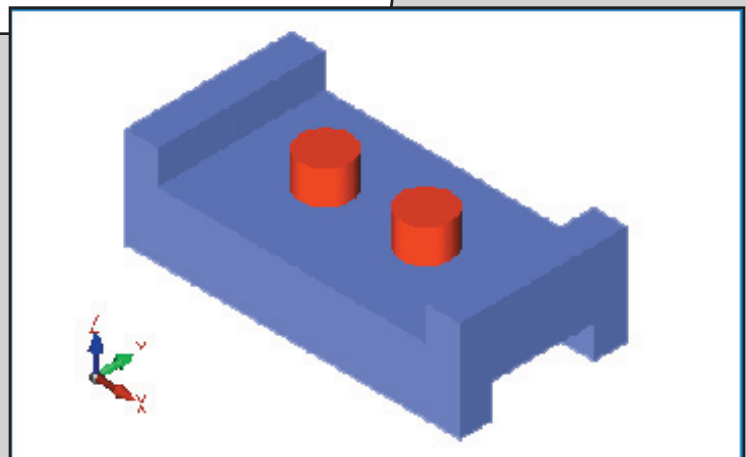
Viewport 1 make sure the status bar says DV=1.

 these coordinates: X= 1.5 Y= 0 Z= 0

It is 1.5" to the right of the first hole.

It lines up with the first hole in the Y direction.

It will sit on the bottom just like the first hole.



Drilling Holes



Modify



Boolean or **SHIFT B**



for the Difference/Subtract command again.



the main part of the Guide Block.



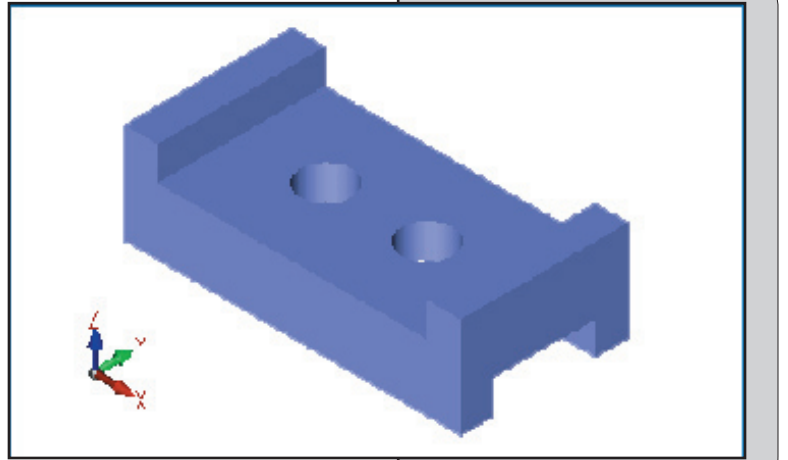
the two cylinders.



Accept

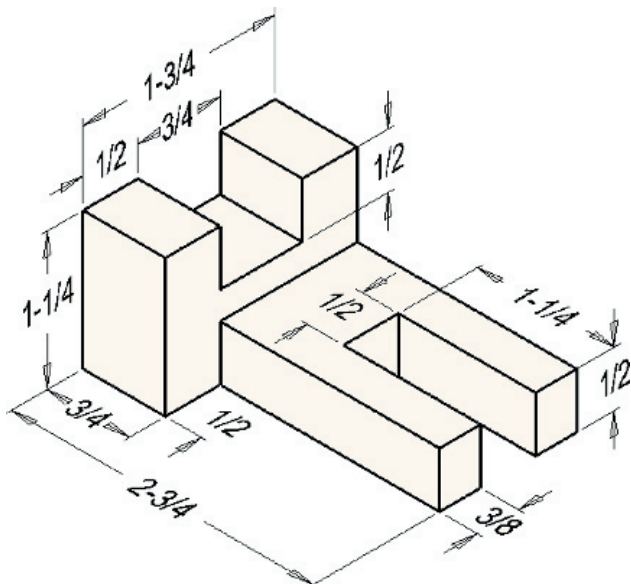
The geometry of the Guide Block is now complete.

Notice how the cylinders were too tall, but the holes are drilled correctly. You can now enter the details and print the part.

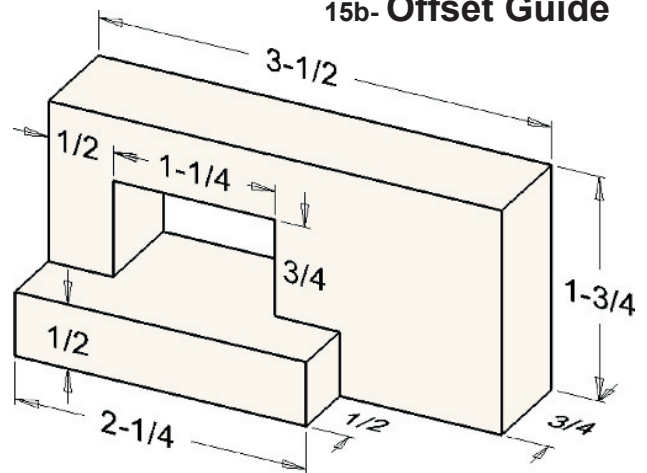


Extra Credit Challenge

15a- Double Lock



15b- Offset Guide



Try to create the geometry for some other shapes from your Technical Drawing textbooks.

