AutoCad 3D

Lesson 3-4,5,6,7

Topics covered in this Lesson:

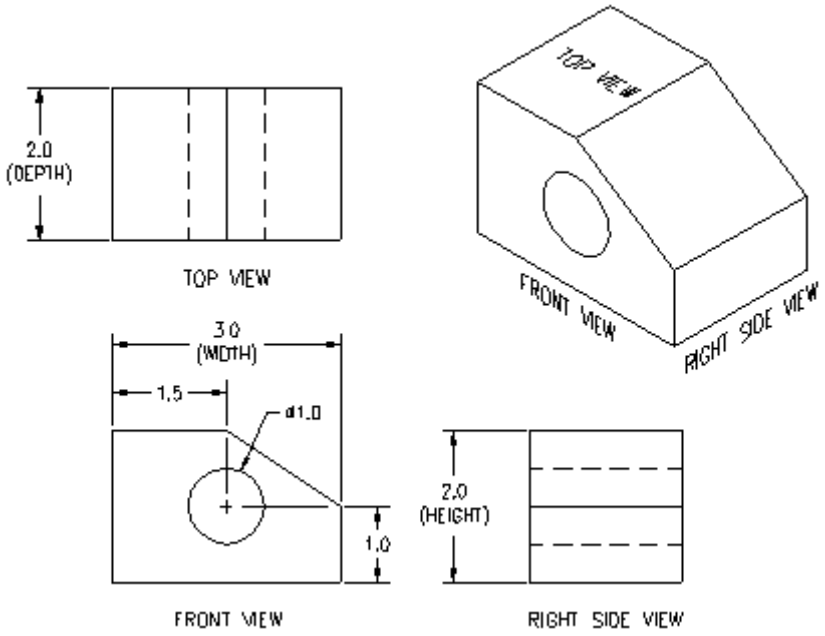
3D-Wireframe drawing techniques

Viewports| **Perspective Views**

Line Thickness drawing techniques

Regions | 3D Surfaces- Extrude command

There are several 3D drawing techniques. The most basic one is wire frame. This technique consists of drawing the an object in 2-D and copying it in the 3rd dimension.
In this lesson you will be learning the technique of 3-D wire frame drawing. You will be drawing two objects. First, you will draw the shape from the previous exercise.



. Then you will draw a simple chair using the same method. This exercise is good practice to work on the XYZ co-ordinate system. Wireframe models are the simplest form of true 3D drawings. They can be used for conversion to other programs or other simple uses.

This technique consists of using commands that you have always used in 2D to make a 2D frame, and copy the 2-D frame into the Z direction

Start a new drawing using the acad.dwt template.

Create a layer called **OBJECT** and give it a green color. Make this your current layer.

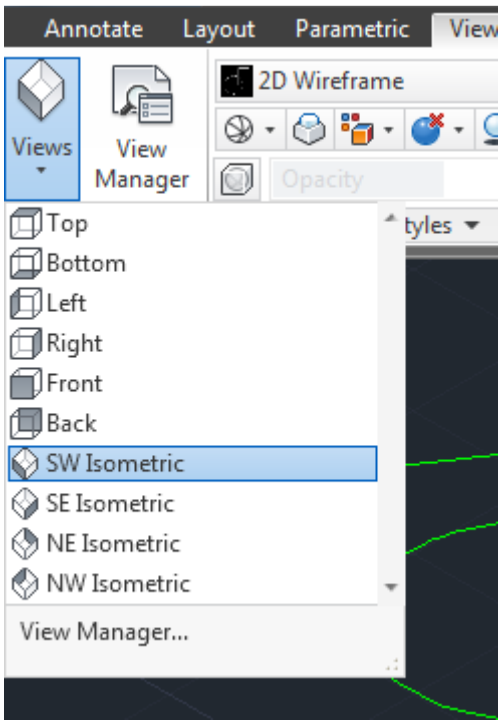
Using the **line** command, draw the 2 D outline of the front view placing the bottom left corner at **0,0,0** then draw the circle.

Copy the outline and circle 2" up in the Z-axis. When asked for the base point, select anywhere on the screen, and copy it relative to the base-point: **@0,0,2**

When you finish copying nothing seems to have happened, but do not worry.

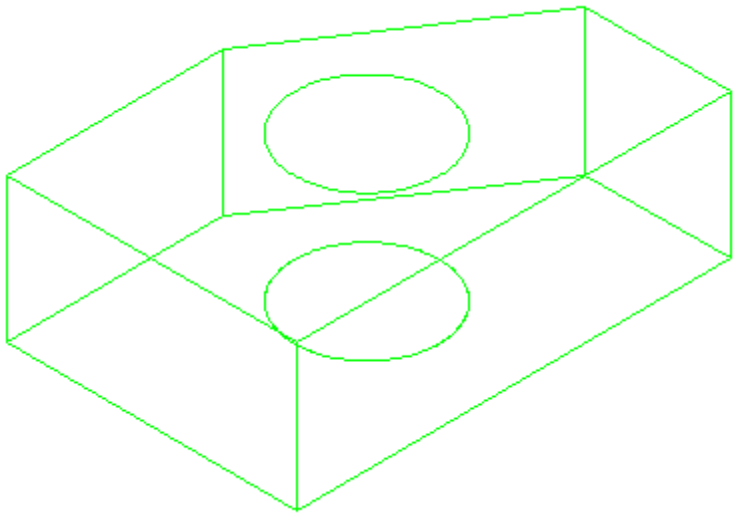
Switch your **view** to the SW Isometric view (Click on View --→ views→ SW isometric).

Or If the views tab is not available type “view” in the command window. You will get a views manager window. Expand the preset views tab and select SW view, then click on set current, then apply



Notice that you have the front and the back drawn now. Using your endpoint Osnap, connect the corners of the object.

Your drawing should look like this:



Pick any line and snap to an endpoint grip. Look at the co-ordinate display on the left of your status bar and see if it makes sense to you. Try this at other points. What you have just done is created a simple object in 3D drawing space. It has length, depth and height. Get used to looking at it, and review what you did to create it.

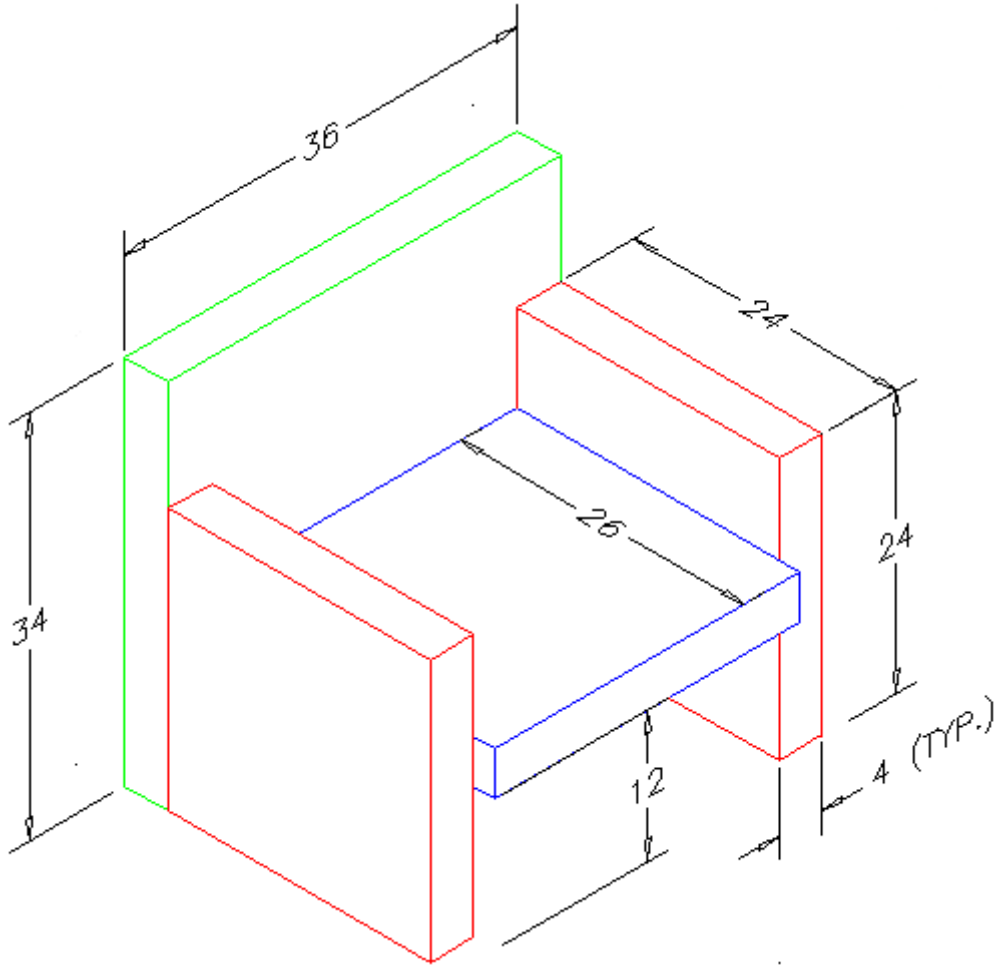
Save your drawing under the name wireframe1.dwg.

EXERCISE 2
Start a new drawing using the acad.dwt template.

Create 3 layers called **SIDES, SEAT,**and **BACK** and give them different colors as below. Make back your current layer. Multiple layers make your drawing easier to work with.

Look at the drawing below. This is the basic chair shape that you will be drawing using few different 3-D techniques in this course. For this lesson, you'll be using wireframe and rectangles and different 3-D

views. Switch to SE Isometric view. .



Start with the back. Make rectangle to define the plan view of the back of the chair. Pick or specify the first point (0,0,0) of the rectangle, and for the second point type @4,36. Notice that x, y coordinates were given only. Z distance is 0 by default

Copy it 34" . Pick a point and choose @0,0,34 for second point. in the Z-axis and then connect the corners with vertical lines.

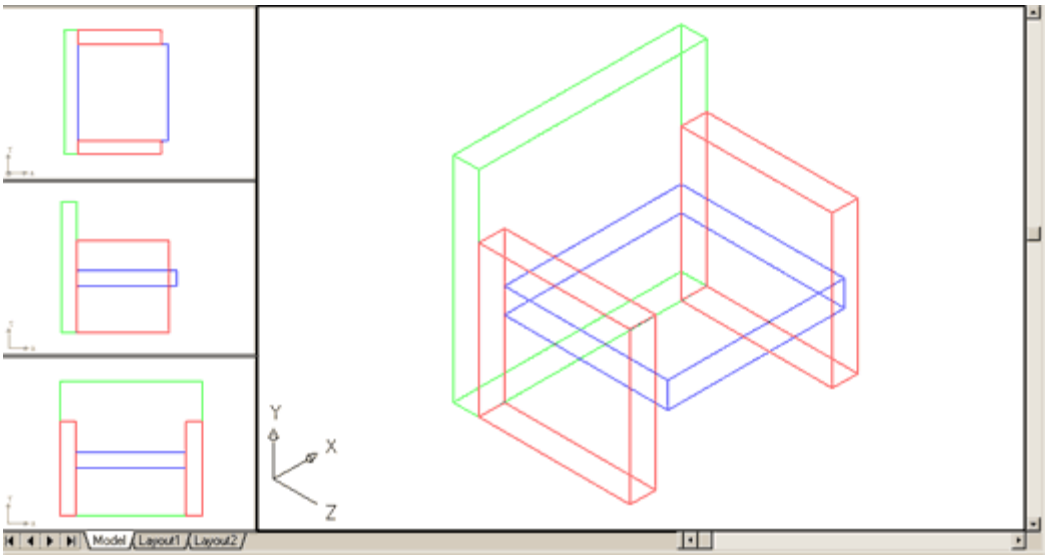
Next draw the sides (on the sides layer). Use the same method you used for drawing the back (except copy them up 24")

Once you have drawn one side, you can copy it to make the other side.

Finish up by drawing the seat. This will take a bit of thought as you have to make it fit between the sides. Start by drawing the rectangle for the seat in the X,Y location, then move it up 12" so that it is at the correct elevation. After that, copy it up 4" and connect the corners.

At this point the seat you created will be a wire frame (see through) where you can see all the lines.

Save the file as wirefame2.dwg in your CAD folder.



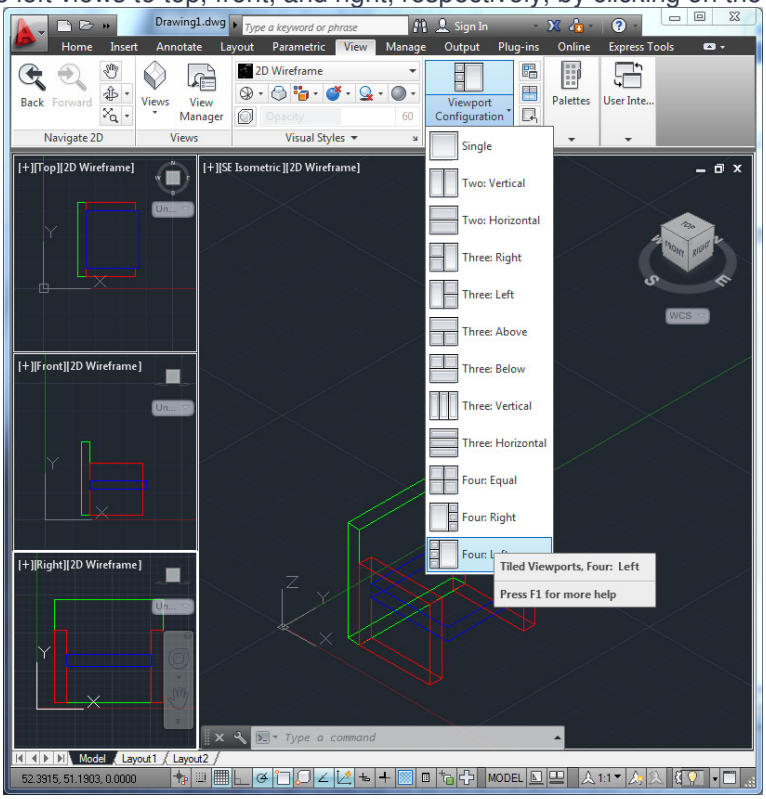
You don't need to dimension this drawing, but use the **DI** command to confirm that the sizes are correct.

When you are sure that your drawing is correct, save it again for later use.

Viewports | **Perspective Views**

Sometimes it is necessary to show more than one view of the object. To show different views of the chair above, click on the viewport configuration pull down menu under views tab, and choose (Four:left) at the

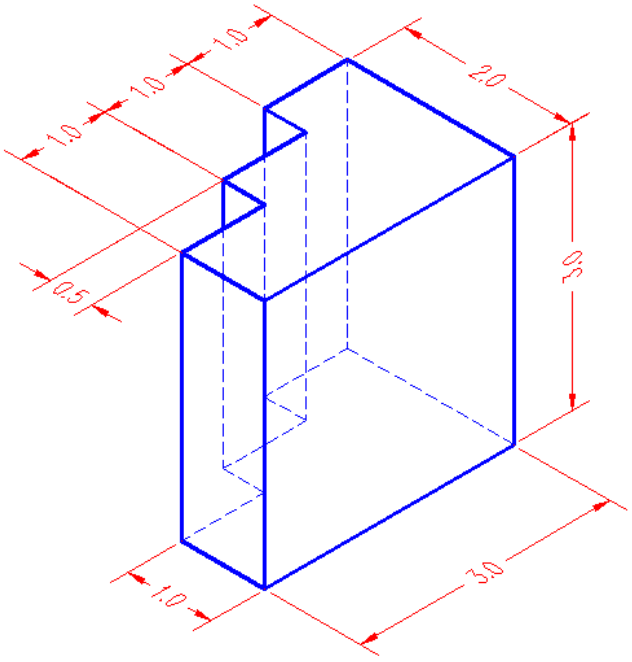
bottom of the list, and set the left views to top, front, and right, respectively, by clicking on the view



designation next to the [+].

From these simple exercises, you can see that the world of 3D in wire frame drawing isn't really different from 2D. You basically used the commands that you would drawing in a 2D world then added the Z co-ordinate to give your 2D 'height'. Once again, make sure you are familiar with what happened in this lesson before moving on to the next. Redo it if you have to, but get used to the concept of height.

Extra Practice: Create a 3D wireframe model of **this drawing**. Use the technique of wire frame used above. Draw the base and then copy it in the z direction, and connect the lines



Topics covered in this Lesson:

Line Thickness drawing techniques

In this lesson you'll create the same **chair** by drawing lines and then giving them ***thickness***. Think of thickness as the height of the line or how tall it is. This is different from the width of the line that you learned. This is a quick, simple way of achieving some degree of 3-D feel. Once again, remember that in some instances, simple concepts may do the job. This is also a good technique for AutoCAD LT users, who don't have the option to draw in true 3-D.

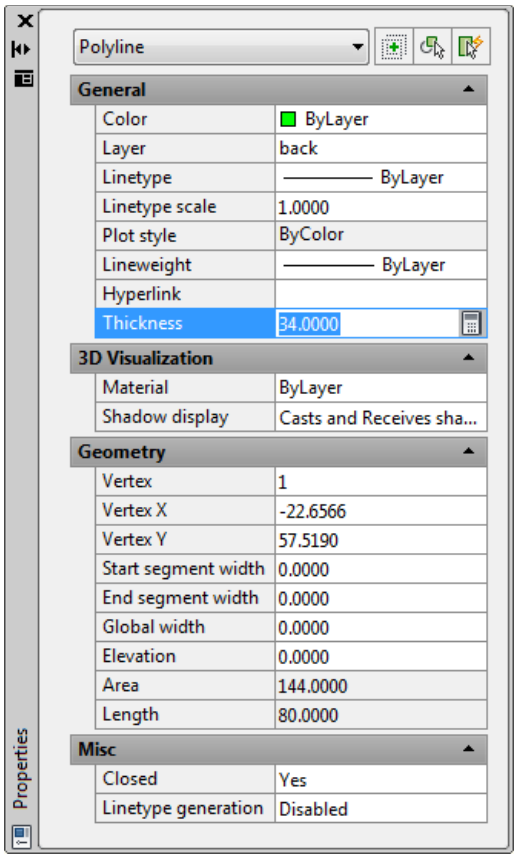
Start a new drawing using the acad.dwt template. Look at the drawing of the chair in the previous lesson.

Create 3 layers called **SIDES, SEAT, BACK** and give them different colors. Make back your current layer.

You can stay in the 2D top view. Draw rectangles to create the back Switch layers and draw sides and seat (as if you were drawing the top view). Do not worry about height, thickness or anything but the basic outline of the top view.

Type properties or select the **properties** icon. Select the polyline that will become the back of the chair.

You'll see the Modify Polyline dialog box pop up and it should look like the one below.

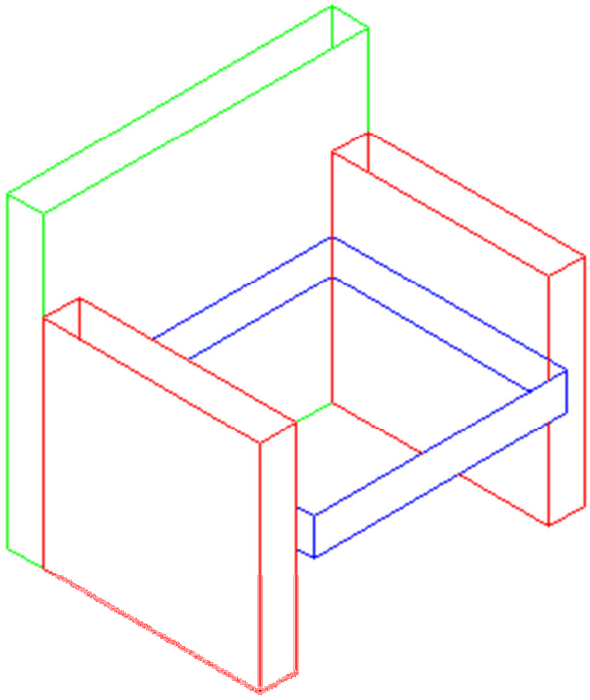


For this lesson, there are two important areas to look at. Make sure that your line is located at Z=0. From there you want to go into the **Thickness** text box and enter 34. This will give you a polyline that is based where you drew it and will be 34" thick, meaning that it will extend 34" in the positive Z-axis. (Entering a negative number will extend the thickness in the negative Z-axis.)

Then click on the (make sure to uncklick the back – Shift-click or hit escape) and change the properties of the sides and give them a thickness of 24".

Give the seat a thickness of 4 inches. The seat should be based on Z=0. To move it up to the correct location, enter the move command and give it a displacement of **`@0,0,12`**.

Look at your drawing in the SE isometric 3-D view and it should look like the one you drew in the wire-frame exercise. There is one major difference between the two models. As stated earlier, wire-frame models do not allow you to hide lines that you not see in the real world. With your cursor in the SW isometric viewport, enter the command **`HIDE`**. You should see that your chair now looks like the one below.



You'll see that it is now starting to look like a chair. It's not perfect yet. You can still see the sides through the seat and the tops of the sides and back are hollow.

Save the drawing under the name **chair_line_thickness.dwg** in your CAD folder (you'll use it in the next lesson).

So far you have learnt two ways to construct a 3-D-like object and still haven't learnt any new drawing commands. These methods use 2-D commands to achieve 3-D appearances. Another advantage of these methods is that they can be used in AutoCAD LT, which doesn't have any true 3-D capabilities at all.

Topics covered in this Lesson:

Regions | 3D Surfaces

In this lesson, you'll begin using true 3-D commands. First you will create a 2-D region and then extrude it into a 3-D solid. Then you will add 3-D surfaces to the tops of your previous drawing (line thickness) to close the back, sides and seat.

Begin a new drawing with the acad.dwt template. Stay in the 2D view.

Create 3 layers called **SIDES, SEAT,** and **BACK** and give them different colors.

Draw the outlines (using rectangles) of the back, sides and seat as you did before, but don't add line thickness. Use rectangles rather than lines to create the parts of the chair. The line command if not closed properly will not create regions later

You'll start by creating a region for the back of the chair. Make sure that back is your current layer. (Any region you create will be on the current layer, regardless of which layer the object was on when you selected it.) Start the region command by entering **REGION** (or **REG**) at the command line. Pick the polyline that will become the back of the chair and press enter. Your command line should look like this:

```
Command: REGION <ENTER>
Select objects: 1 found
Select objects:
1 loop extracted.
```

If the Region wasn't created, it usually means that you have a gap in the shape. Polylines must be closed to be used for Regions. Switch layers and repeat this for the other polylines representing the 2 arms and the seat, ensuring that you have the correct layer current.

At this point, you have four 2-D regions. The next step is to extrude them into 3-D solid objects. Make BACK the current layer and start the **EXTRUDE** command. Pick the region on the back layer. Look at the command line. You will be asked a few things:

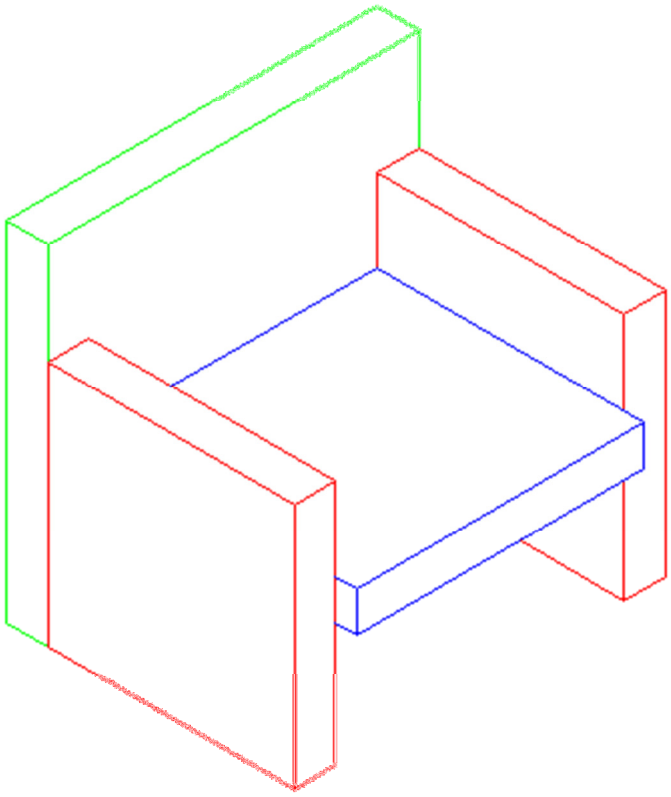
```
Command: EXT EXTRUDE
Current wire frame density: ISOLINES=4
Select objects: 1 found
Select objects: <ENTER>
Specify height of extrusion or [Path]: 34

Specify angle of taper for extrusion <0>:
```

The first thing that AutoCAD needs is the height of the extrusion. This is similar to the thickness that you gave the polylines in lesson 5. Remember that if you give a positive number, it will extrude in the positive Z-axis. If you give a negative number, it will extrude the region in the negative Z-axis. Then you are asked for the 'Extrusion Taper Angle'. In most cases this will be the default of zero. Press <enter> to accept the default.

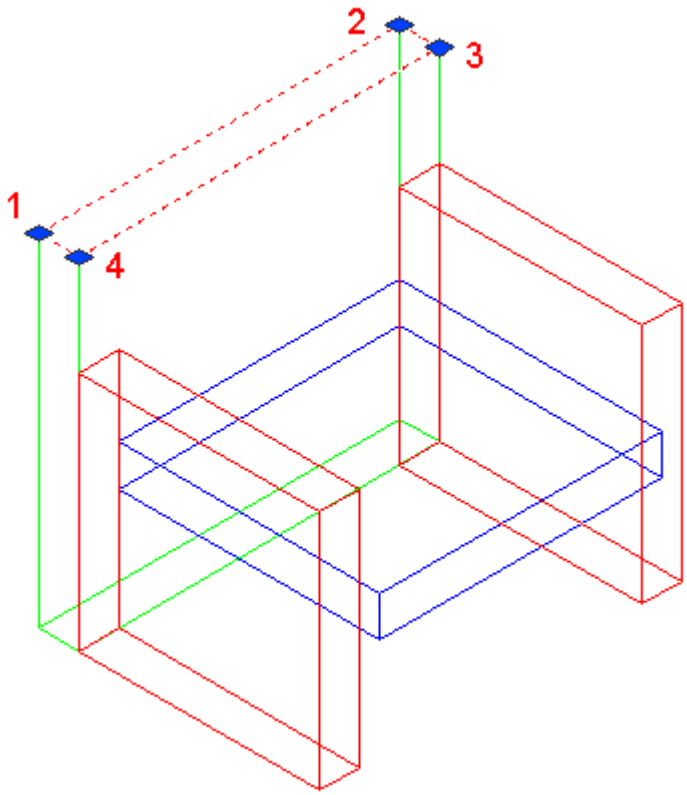
Note: You can also extrude directly from rectangles, circles and closed polylines, but I wanted to show you the Region command.

Extrude the sides and seat. Remember to move the seat up 12" if you haven't already. Check that the model is correct by viewing it in the SE isometric view. Type **HIDE** (**HI**)and you should see a solid chair like the one below.



Save your drawing under the name: **chair_extruded.dwg**

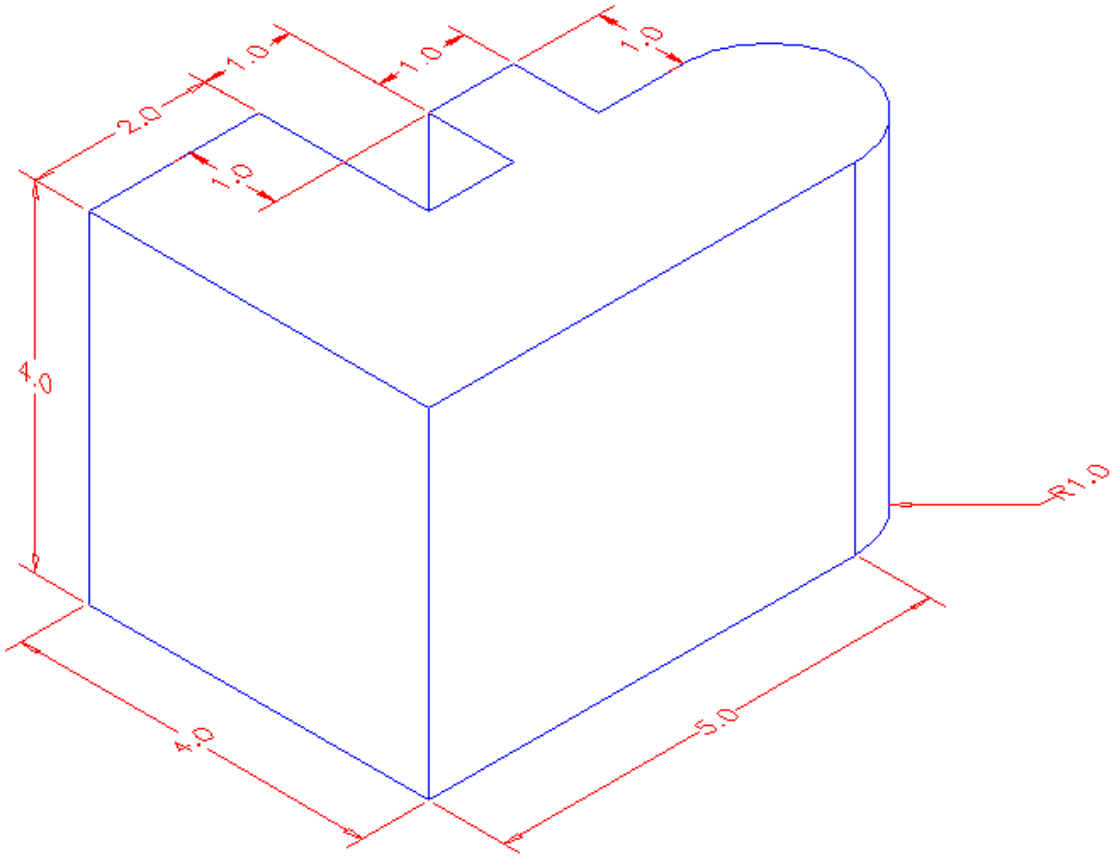
NEW PROJECT
Open your **chair_line_thickness.dwg** drawing and immediately save it under a new name: **chair_3D_face.dwg**
What you're going to do is add 3-D faces to the tops of the back, sides and sides. Begin by viewing your model in the SE Isometric view. Type **hide** to see where you need to cap off the extruded lines. Type **REGEN** or **RE** to regenerate your screen so you can see all the corners again.
Make sure that BACK is the current layer. Type **3DFACE** to begin the command. You will be asked to select some points. Make sure that your endpoint Osnaps are on.
When asked to pick the points, select them in the order as if you were drawing a rectangle. Do not go from one corner to an opposite one. After you have picked the fourth corner, press (enter). Your command line should look like this:
Command: 3dface Specify first point or [Invisible]: (Pick 1)
Specify second point or [Invisible]: (Pick 2)
Specify third point or [Invisible] <exit>: (Pick 3)
Specify fourth point or [Invisible] <create three-sided face>: (Pick 4)
Specify third point or [Invisible] <exit>: <ENTER>



Switch layers and repeat the command to add 3-D faces to the top of the sides and the seat. 3D faces are great for making odd shapes that include any four lines (or arcs) that are touching).
Enter the **HIDE** commands to check that it was done correctly. If it all worked, you should see an image identical to the solid model. You'll notice that the 3D face covers what would be the opening at the top of the arms and the back. If it was done incorrectly, there may be a line running down from the back corner of each piece.
Save the file.

To print hidden view, expand the printer menu by clicking on the bottom right corner arrow and chose "hidden" or "hidden legacy option" in the shade plot option.
Type "Regen" to get back your drawing if it looks different.

Now you have created some true 3-D objects. Take some time to think about how much work was involved in each method: Wireframe, line thickness and extruding. In some instances one might be better than the other. Review the methods that you have used so far:
Extra Practice: Create a 3D solid model of **this drawing**. Do not dimension it.


1.0
1.0
1.0
2.0
1.0
4.0
R1.0
4.0
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