Compared to the MS Office drawing package, AutoCAD offers many additional features that aid in making exact, high quality drawings. The drawing package is usually adequate for professional communications, but AutoCAD is often the preferred medium for formal graphics communication in an engineering office. One AutoCAD feature that engineers find particularly useful is the ability to construct a 3-dimensional model that can be viewed from different perspectives.

In this project, we will construct a 3-D wire frame model and display an isometric view. This will introduce some of the working modes of AutoCAD. As a Windows application, AutoCAD retains much of its DOS command line entry interface. This is primarily because of the detailed options available on almost every command. If you are unfamiliar with AutoCAD, follow the instructions accurately. The interface is complex and the consequences of your actions can be very unclear.

Launch AutoCAD with the desktop icon or the Start/Programs menu. To set the modeling mode you will use, click the MODEL button at the bottom of the display. The command display will show that you are in Paper mode, click it again to change to Model mode. Click the GRID button to toggle the grid display on. Select Tools/Draft Settings to set the grid spacing to 0.5 and the X and Y Snap distance to 0.5. This means a click near a grid point will register as the exact grid point. Return to the bottom buttons and toggle the Snap on. Note that you have done so in the command display.

The User Coordinate System icon at the lower left indicates the coordinate system in effect. Operators (the users of AutoCAD) can establish different coordinate systems by defining their relation to the world coordinate system. We will create our model in world coordinates. The icon shows that we have the top view or plan view of the object. In world coordinates we are ready to draw on the Z = 0.0 plane. Move the cursor (mouse) and note the changing coordinate display.

Now we will draw the outer boundary of an object as a polygon. Click the Line button at the upper left, and to answer the prompt for the first point, we can type it in, or click with the mouse. Entering points both ways, start the line at (2,4) and continue to (5,2.5), to (8,4) and to (5,5.5). If you need to restart the command because of a misplaced point, use the Esc key. Otherwise, complete the command by typing “close” and the Enter key. Using the Circle button at the left to add the two circles of half unit radius, one at (3.5,4) and the other at (6.5,4). The center of the circle is one click, then the prompt for the radius can be answered by dragging the circle radius to about half, or typing in 0.5. Try it both ways. Note how the cursor changes when a command is in progress and when it is completed.

We now have the top or bottom surface of the object defined. AutoCAD does not support the direct entry of the z coordinate, so we cannot redraw the opposite surface directly. But objects can be moved or copied with a displacement in any direction. Type “copy” or “co” to start the copy command and select the entire object by dragging a rectangle over it. Press Enter to complete the selection. Respond to the displacement prompt with “0,0,1”. AutoCAD prompts for another point and will use the vector defined by the second point as the displacement. But if you press Enter on the second prompt, it takes the point you entered as the second point of a vector based at the origin (0,0,0).
Since the copy is directly over the original surface, we see no change. To get a different perspective, choose **View/3D Viewpoint/SE Isometric**. Now you can see the top and bottom surfaces. Figure out why this perspective is called the SE Isometric. Now predict which Isometric view would give us the standard isometric we have been using for sketching.

Now that we have part of the object in another plane, we can define lines between the planes by using the object snap feature of AutoCAD. Instead of snapping to a grid point we snap to points on the object. Select **Tools/Draft Settings** again, and check the object snap endpoints option. Now snap on the ends of the line segments to construct vertical lines between the corners of the top and bottom surfaces. You now have a wire frame model of the object.

The circles represent the ends of circular cylinders drilled through the object, but your wireframe does not show that very clearly. In AutoCAD, you can invoke a command to construct a ruled surface represented by many lines between the circles. To do this, return to the plan view, and select the two circles by dragging a rectangle to intersect both of them. Now delete the circles. We are really deleting the cylindrical holes through the object.

Now we will replace the circles on the top and bottom planes our object with cylindrical surfaces going through it, by adding thickness to the circles in one plane. Choose **Format/Thickness** and specify a new value of 1.0, the thickness of our object. Now redraw the circles at \((3.5, 4)\) and \((6.5,4)\). Go back to the isometric view of the object to see the resulting effect.

To print the isometric view, click the printer icon on the left. The hint says “plot” because AutoCAD refers to printing as plotting. This is tied up with its history. Expensive plotters were often used instead of printers in the days before laserjets. In the dialog box, it may not designate a plotting device. Choose HP Laserjet. The lab is set up to direct this output to the network printer.

Even this simple an exercise shows that using AutoCAD requires some investment in training time and regular use to keep your skills at an efficient level. As an engineer, your time will be better spent in creating and presenting designs, but a knowledge of AutoCAD will help in getting your drafting work done.