

# Engineering Design Graphics

## Spring 2003

### DesignCAD 3D MAX Basics

This document is meant to help with some basic things that you will need to be able to do in DesignCAD. In particular this guide supplements DesignCAD "Help," and "Tutorials."

#### Computer Access

The computers in LAB HOH 153 and HOH 155 each have machines with DesignCAD (DCAD throughout this document) on them. You are welcome to use these machines to work on assignments or just to get a better understanding of DCAD. HOH 155 also serves as the lab for University Physical Science so there are many times it is not available, but HOH 153 is generally open during business hours throughout the week. If you do find the door shut, please come to the Physics and Engineering Office (HOH 221) and ask if the secretary can open the door for you. I will open the door any time I see it closed.

Logging on should be a simple matter... for HOH 153 the username and password are:

username: gp1student  
password:

For HOH 155 the username and password are:


username: upsstudent  
password:

Note you will need to save your drawings on a floppy disk. You will have to print your drawings in HOH 153.

#### Starting DCAD

There should be a shortcut to start DCAD on the desktop, but if not just go to "Start – Programs – DesignCAD 3D MAX - DesignCAD 3D MAX." This should start up the program for you. If you still cannot find DCAD, let me know and I will fix it or find it.

#### Using DCAD


When DCAD comes up it will automatically be set in 2D mode (the  button will be depressed). This is just fine for most of all the drawings you are going to complete initially.

Most of everything you will do at first will be drawing lines and arcs. This sounds easy, but making them look correct is challenging at first.

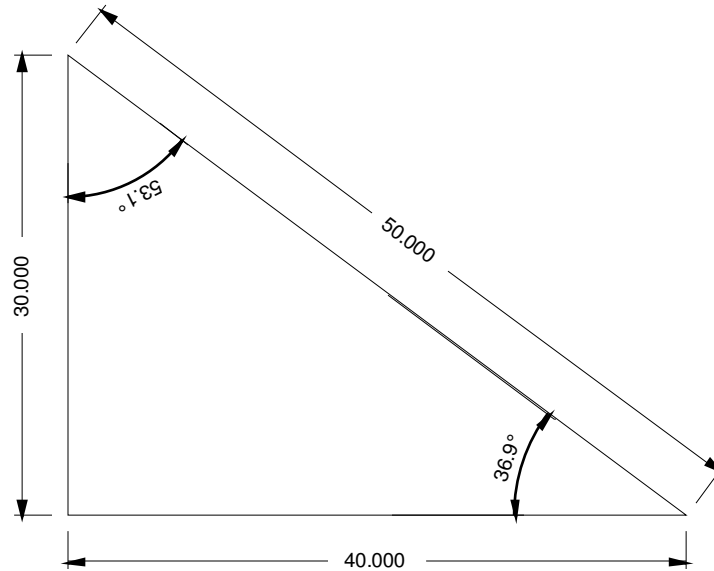
## Grids and Snapping

A two-dimensional grid may be shown on the DesignCAD *View* window. This is often convenient to use. By pressing Ctrl-G one may bring up the *Grid* tab of the *Options* dialog. By checking the *Snap Grid* check box and entering a value in the *Snap Grid Size* textbox you can make the pointer snap to a hidden grid while you are drawing in the *View* window. By checking the *Display Grid* checkbox and entering a value in the *Display Grid Size* textbox you can display a grid on the *View* window. You may use the *Snap Grid* and the *Display Grid* in tandem if you like. Now that you have the *Snap Grid* on every time you want to start or move an object, such as a line, you will automatically move from *Snap Grid* point to *Snap Grid* point. Sometimes this is desirable because it makes sure that spacings and sizes are correct or consistent. Other times you need more flexibility in placing objects, in which case you turn off the *Snap Grid*. Experiment with the settings for *Snap Grid* and *Display Grid*.

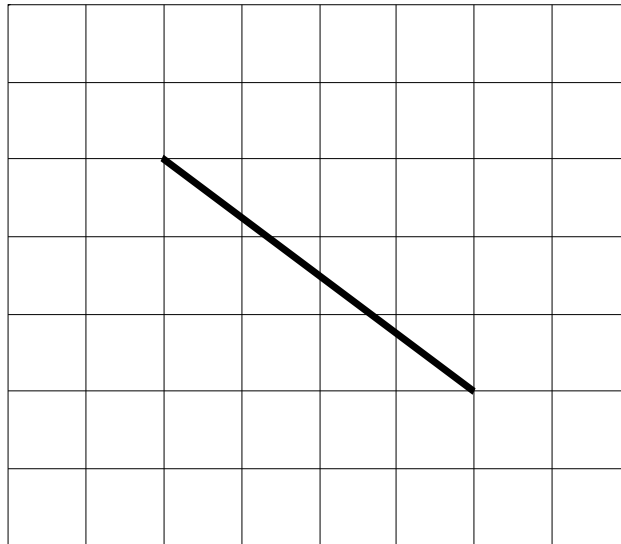
## Line Drawing

The *Line* toolbutton, , is in the *Main Toolbox* on the left side of the drawing page. To create a line just click on the *Line* toolbutton, then specify a starting point for your line by clicking in the *View* window. To extend the line just move your cursor. To specify a change in slope of the line just click your mouse. To specify the end-point of your line just double-click.

One can use the *Snap Grid* to make lines at convenient angles. For example, let's say you want to make a line at  $36.9^\circ$  below the horizontal. It turns out that this angle is part of a 3-4-5 triangle as shown in Figure One. So all you really need to do is set up a *Snap Grid* then draw a line that goes three grid units down and four grid units to the right and you have the line at the angle you need.



**Figure 1 A 3-4-5 triangle and shown with interior angles.**



**Figure 2 DCAD Drawing Window after making a line 36.9° below the horizontal. Note the grid is visible in the drawing window.**

Figure Two shows what the DCAD *View* window should look like after the angled line has been drawn. It is also pretty easy to produce the triangle shown in Figure One (it was produced in DCAD). To make the triangle you just start the *Line* tool, and click each of the three points of the triangle (you will have to go in order clockwise or counterclockwise) with the *Snap Grid* turned on. The result of drawing the triangle is shown in Figure Three.

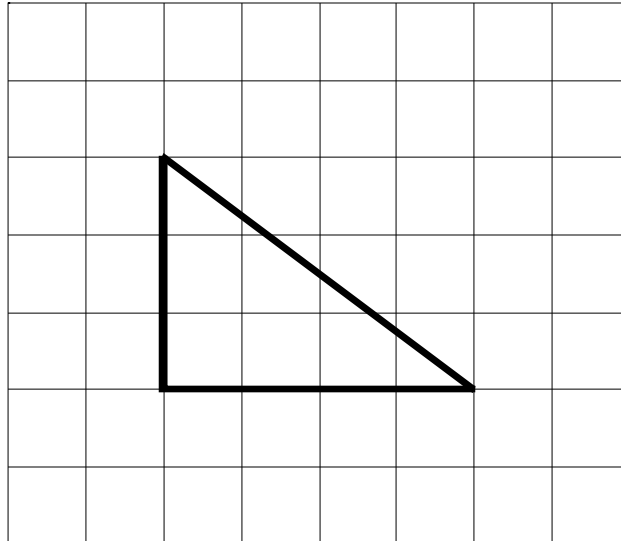



Figure 3 DCAD Drawing Window after using the line command to complete a 3-4-5 triangle.

### Line Dimensioning and More Snapping

As you might notice in Figure One there are several dimension lines shown. These are relatively easy to add to your drawing using the *Dimension* toolbutton, . Before you try to add a dimension line it is probably best to know a little more about snapping to objects or in this case an intersection of two lines. Consider the triangle drawn in Figure Three, which is redrawn now in Figure Four with labels for two intersections (note the gridlines are not shown for clarity).

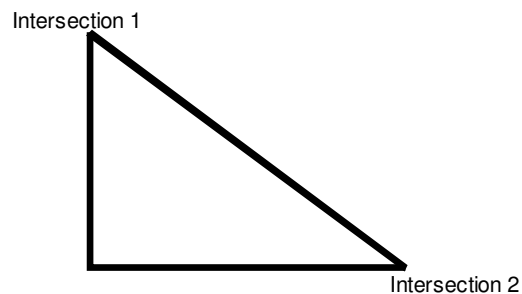

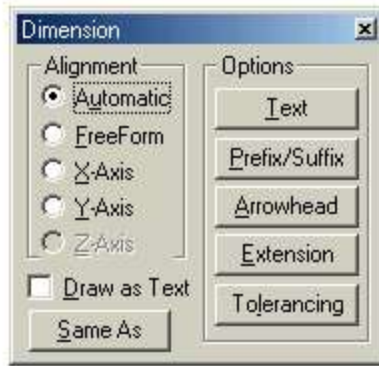



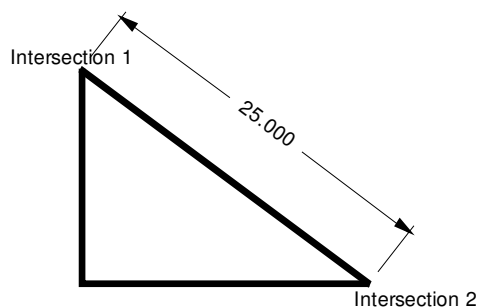
Figure 4 A 3-4-5 triangle with two intersections indicated.

If you want to dimension the hypotneuse of the triangle, the two intersections indicated in Figure Four may be used. First, select the *Dimension* toolbutton . The *Dimension* dialog box will appear as shown in Figure Five.



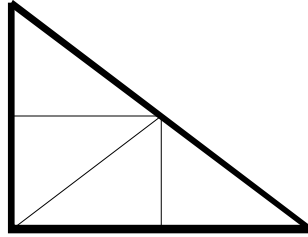
**Figure 5 The Dimension Dialog box.**

For the dimension you want to insert you will need to click the *FreeForm* Radio Button. Next you will need to indicate one of the points you want to dimension from; let's make this Intersection 1. To select this point it is suggested that you use the *Snap* toolbox (just to the right of the *Main* toolbox. Click on the *Intersect-1* toolbutton, , then move your mouse to Intersection 1 shown in Figure Four. As you move your mouse close to the intersection a small black rectangle will automatically select the intersection as the first point of your dimension line. When the rectangle appears around the intersection you can click. Now you are ready to select the second point. Move your mouse over to the *Snap* toolbox again and select the *Intersect-1* toolbutton. Now move your mouse back to the triangle's Intersection 2. Once again the intersection will automatically be selected once you click while the rectangle appears around Intersection 2. The next thing to do is to select the distance that the dimension line will be from the actual object. This is done by moving your mouse away from the object until the distance looks reasonable then clicking. The final result will appear as shown in Figure 6.




**Figure 6 A 3-4-5 Triangle with a dimension line for the hypotneuse.**


To learn another use of the *Snap* toolbox consider modifying the triangle by drawing additional lines so that it is made up of right triangles as shown in Figure 7.

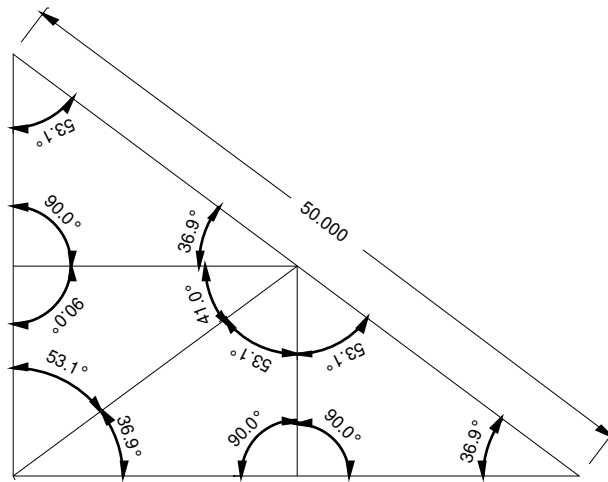


**Figure 7** The original 3-4-5 triangle sub-divided into four right triangles.

To make your triangle look as it does in Figure Seven do the following:

1. Click on the *Line* toolbutton, then click on the *Midpoint* toolbutton, , which is in the *Snap* toolbox,
2. Move your cursor towards the midpoint of the hypotenuse; when a small rectangle appears at the midpoint of the line click your mouse,
3. Move your cursor back to the over to the *Snap* toolbox and again select the *Midpoint* toolbutton,
4. Move your cursor back to the triangle near the midpoint of the horizontal side of the triangle; when the rectangle appears **double-click**,
5. Repeat steps 1-4 to make the line that goes from the midpoint of the hypotenuse to the midpoint of the vertical side of the triangle,
6. Repeat steps 1-2 to start a line from the midpoint of the hypotenuse,
7. Move your cursor back to the over to the *Snap* toolbox and again select the *Intersect-1* toolbutton,
8. Move your cursor back to the triangle near the vertex of the triangle (the lower-left corner); when the rectangle appears **double-click**.

You should now have a triangle like the one shown in Figure Seven. Now, to take it a step further try to reproduce Figure Eight. Note you will need to use the *Dimension Arc* command and use the *Line Snap* toolbutton, , in the *Snap* toolbox in addition to everything else you have learned.



**Figure 8 The 3-4-5 triangle of Figure 7 with all interior angles dimensioned.**