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Topics covered in this Lesson:

Printing via layouts

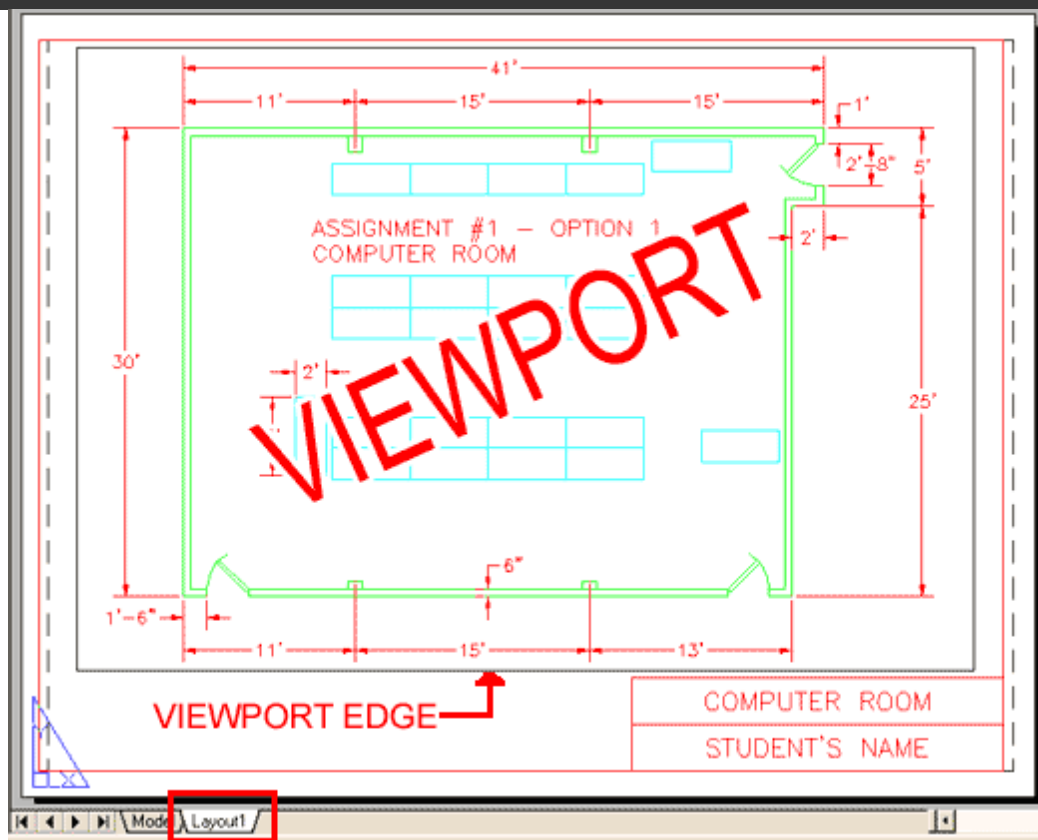
In [Level 1](#) you printed out your project using 'model space'. This lesson will show you the preferred way of plotting your drawings. In AutoCAD there are two different workspaces: model space and Layout / Paper Space. For now think of model space where you make your model, or draw. Think of the Layout Tabs as where you print your drawing from, or layout the final drawing complete with dimensions, notes, title block, etc. Look at the images below to see a visual explanation of the concept.

Note about the terminology in this Lesson:

After AutoCAD R14, the term "Paper Space" was replaced by "Layout". These terms are interchangeable. The release of AutoCAD 2000 brought other enhancements to this functionality. You can now have multiple layouts, you can name them, you can re-sequence them and more.

What is a Layout?

A layout is a page that allows you to set up a plot or printout of your drawing. Below is a sample of what a layout looks like (a really simple one).

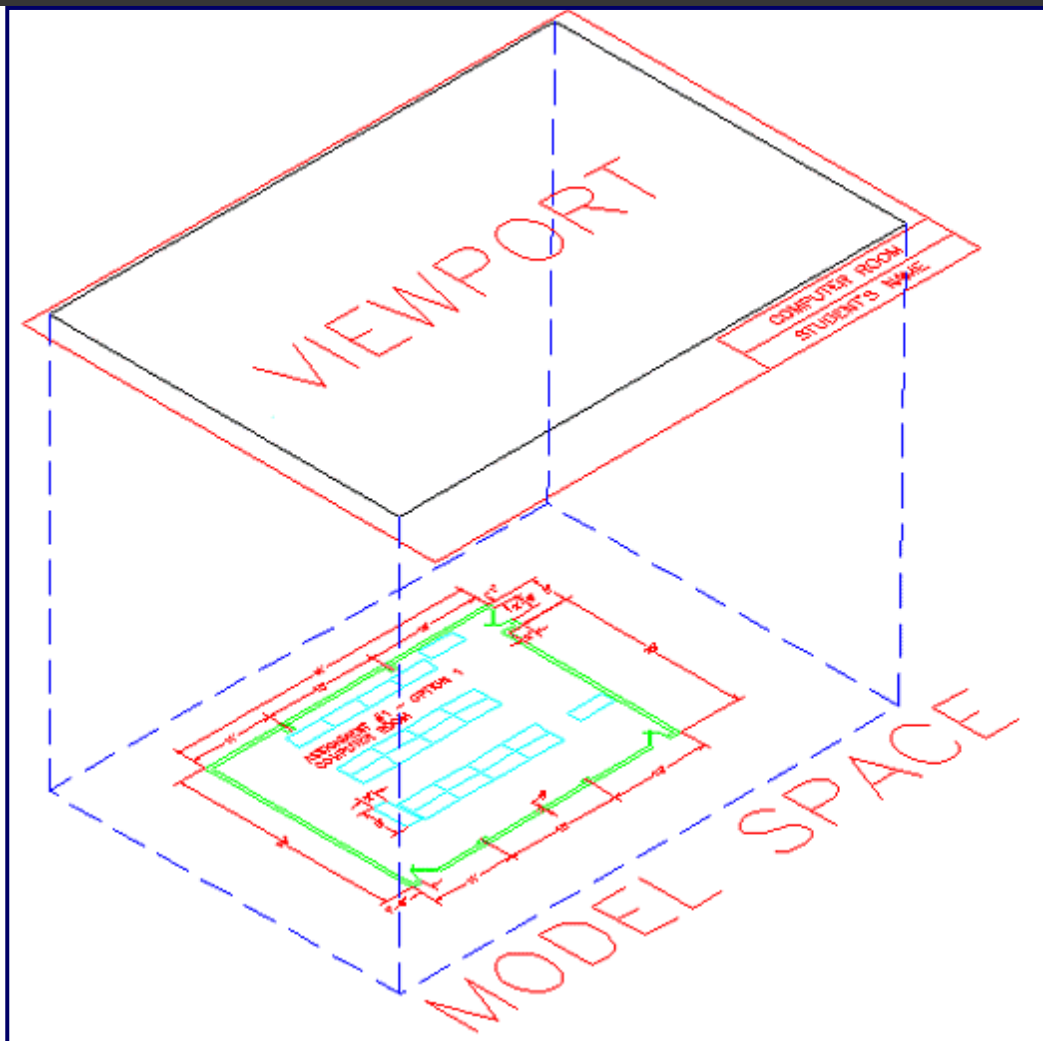


The floor plan and dimensions (above) were created in MODEL SPACE at a 1:1 scale. The walls were drawn to be 30' or more long.

The title block and viewport were created in a LAYOUT TAB / PAPER SPACE at a 1:1 scale. The title block is 8-1/2 x 11 inches.

The viewport is a window into "model space". In the image below, the the viewport is the black rectangle and the contents of the viewport are displayed inside it. The contents of the viewport are scaled to either fit the viewport or (preferably) to conform to a specific drafting scale (ie: 1"=1')


Below is a visual representation of a layout for a print to be plotted from a Layout tab.



This conceptual image shows the relationship between model space and a Layout.

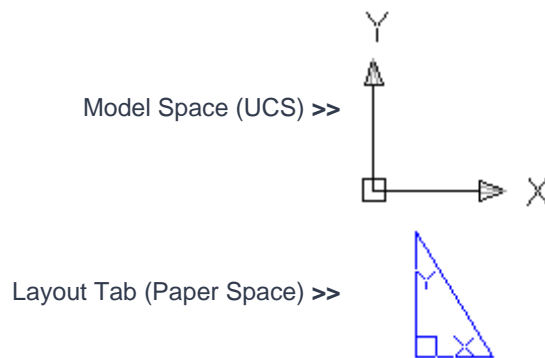
Think of paper space as being 'above' model space. To see through 'into' model space, you have to create a viewport (Make Viewport **MV** command). Think of a viewport as a window.

As soon as you create the viewport, the window is closed and the extents of your drawing are displayed. You can see through it, but you can not 'touch' anything in model space.

To have access to your objects in model space from paper space, you have to enter the viewport by typing **MS** <ENTER>. This 'opens the window' for access. Type in **PS** <ENTER> to 'close the window'. 

You may be wondering why you shouldn't just plot from model space. You can and many people do, but the advantage of plotting from paper space is that you can have many layouts from one drawing. You can even add detail views without having to copy and scale your geometry. This feature was radically changed in AutoCAD 2000 and is much more versatile. You now have multiple tabs to organize your plots (or 'sheets'). As a rule, unless you're working for a behind-the-times company with a confused CAD Manager, use Layouts.

To toggle between the two spaces, you can pick on one of the layout tabs and back to the Model tab. You can also enter the command **TILEMODE** and set it to **0** for paper space and **1** for model space. When you do this, you will notice that the UCS icon in the bottom left corner changed to a triangular icon. This new icon confirms that you are paper space.



When you are in paper space you can draw or insert a title block. In paper space you are still drawing at a 1:1 scale.

Start this exercise by drawing a simple title block like the one above in the tab called Layout 1. Make sure you draw it at 1:1 scale. Start with an 8-1/2"x11" rectangle and offset it 1/4" inside (erase the outer one). Make a couple of small rectangles for the text and add some text as shown in the sample above.

Once your title block is drawn, you can create a **floating viewport** . This is a 'window' into your model space. To create a viewport, type in **MV** (for Make Viewport) and then pick two points just as if you are drawing a rectangle. Use as much of your title block as possible.

As soon as your viewport is created, you will see all that you have drawn in model space appear to the extents of the viewport. The next thing you need to do is to scale your viewport for accurate plotting.

To do this, you have to 'enter' your viewport. Do this by either typing **MS** (for model space) or clicking on the square labeled **PAPER** (it will switch to Model) on the status bar. In newer versions of AutoCAD like 2005 you can also double-click in the viewport. You will notice that the familiar WCS icon appears in the bottom left corner of the viewport. If you have more than one viewport on the screen, left-click in the one that you want to scale or type **CTRL+R** to toggle through them to the one you want. To scale a viewport, you just use the **ZOOM** command. Type in **Z <ENTER>**

At the command prompt, you must tell AutoCAD what scale you want the viewport to be. This coincides with the scale that you will plot at.

PLOT SCALE	ENTER:
1/4" = 1'	1/48XP
3/4" = 1'	3/48XP
1/2" = 1'	1/24XP

The table above gives you some sample scales. Take 1/4" = 1' for example. First remember that 1'=12". If you cross-multiply the 12 by the 4, you get 48. Therefore this scale will be at a 1:48 scale (ratio), or in other terms, your model will be 1/48th the size of real life on paper. To get AutoCAD to scale the viewport, you must type in **Z <ENTER> 1/48XP <ENTER>**. This means 1/48th times (X) in relation to paper space (P).

Figuring out what scale you require takes some calculation (unless you are told which scale to use). You can see what your extents in model space are and then see what your viewport size is. You can also use trial and error to see what fits in your viewport. This can sometimes be quicker than calculating.


To sum this up, here are the basic steps required for using paper space layouts:

1. Finish your drawing (with dimensions) in model space.
2. Change to paper space. **TILEMODE** to **0** or click on the Layout tab
3. Add a title block.

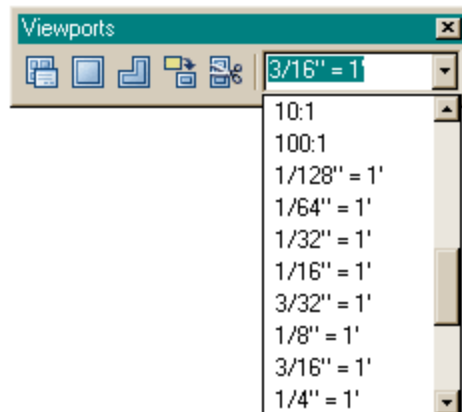
4. Create a viewport using the **MVIEW (MV)** command.
5. Enter your viewport by typing **MS** (or double-click in the viewport)
6. Zoom in using a specific ratio by typing in **Z <ENTER> ___/___XP <ENTER>**
7. Leave your viewport by typing **PS** and return to paper space.

One thing that is very important to remember is that you should use paper space only for plotting. **Do not modify your model in paper space.** One reason for this is that you could have layers turned off in your viewport that are related to the objects you are modifying in the viewport. Return to true model space for any editing that you need to do. Also, do not draw objects on the Layout screen that are part of the drawing.

To practice this concept, open up one of the drawings you did in [Lesson 2-1](#).

Change to paper space. Draw or insert a title block.  If you do not have one, you can find a good 11x17 (B size) title block in your AutoCAD support folder (filename: ANSI_B.DWG). Insert this and then create a viewport. Enter your viewport and scale as explained above. Return to paper space and print using the settings, EXTENTS / SCALE: 1=1.

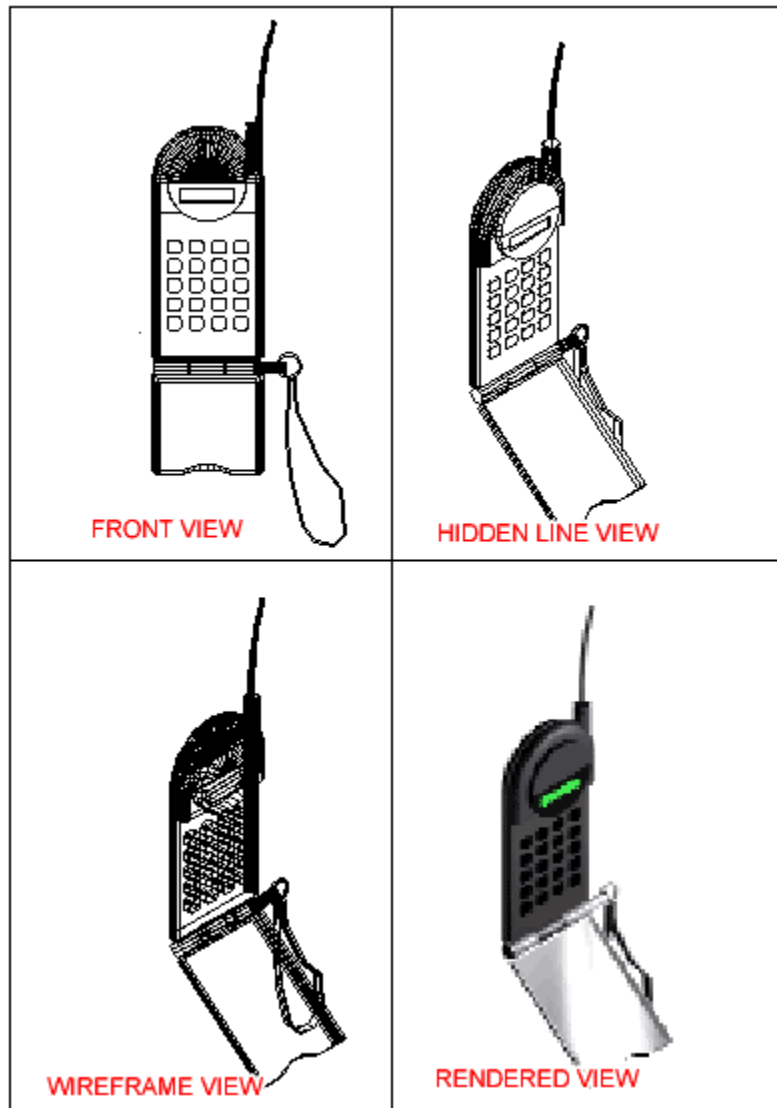
Alternately, you can turn on your Viewport Toolbar to define the scale. Select the viewport, and then select the scale from menu:



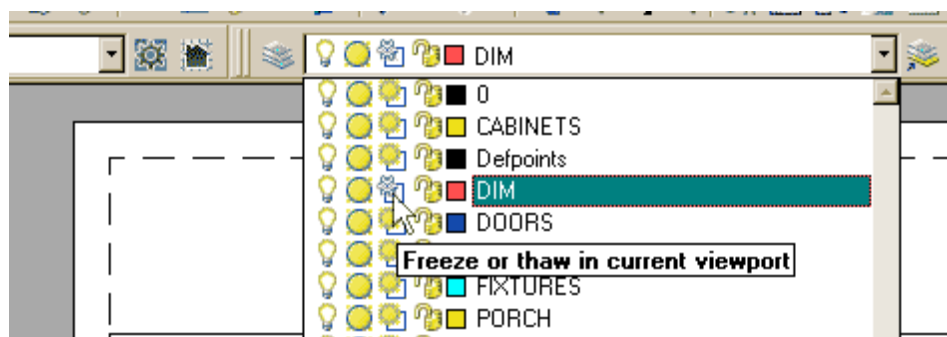
Top 10 Viewport Tips:

1. You can create new layout tabs by right-clicking on an existing tabs and choosing New Layout.
2. You can rename a tab by right-clicking and choosing rename.
3. You can create viewports of various shapes by creating the object and then using the MV command with the **Object** option.
4. You can also choose to dimension in the Layout. This can be very convenient in AutoCAD 2005. Your dimscale is 1 and all your dimensions are consistent. Try this out on a sample drawing. AutoCAD will scale the dimension to size of the object in the viewport.
5. You can resize viewports with regular modifying commands and grips.
6. Put viewports on the layer called DEFPOINTS (created by dimensions) and they won't plot or put them on a separate layer with the plot option turned off.
7. To quickly find the zoom factor of your viewport, use the **LIST** command on it.

8. You can lock and unlock viewports by using the **MV > L** option.
9. You can freeze (turn off) layers in any viewport. (See below)
10. You can now have your viewports plot for 3D drawings as wireframe, hidden line and rendered views when you plot - this is great! (See below)



To turn layers off in a viewport, you need to be on a Layout Tab and in Model Space of a viewport. In the viewport, then move your cursor to the layer droplist and select the layer you want off and hit the "Freeze in Viewport" icon for that layer, then click on the drawing area. You can also do this directly from the Layers Dialog.



To reverse this, use the same process which will "Thaw" the layer in that viewport.



[View the video about using Layout tabs in AutoCAD.](#)

Review: The ability to use viewports successfully leads to well organized drawings and print sets. From there, you can put together [sheet sets](#) for distributing to other people. When it comes to plotting 3D drawings, Layouts are essential to capture the views you need and put them on paper. It may take some time to master the concept and procedures, but the results will be well worth it.



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