



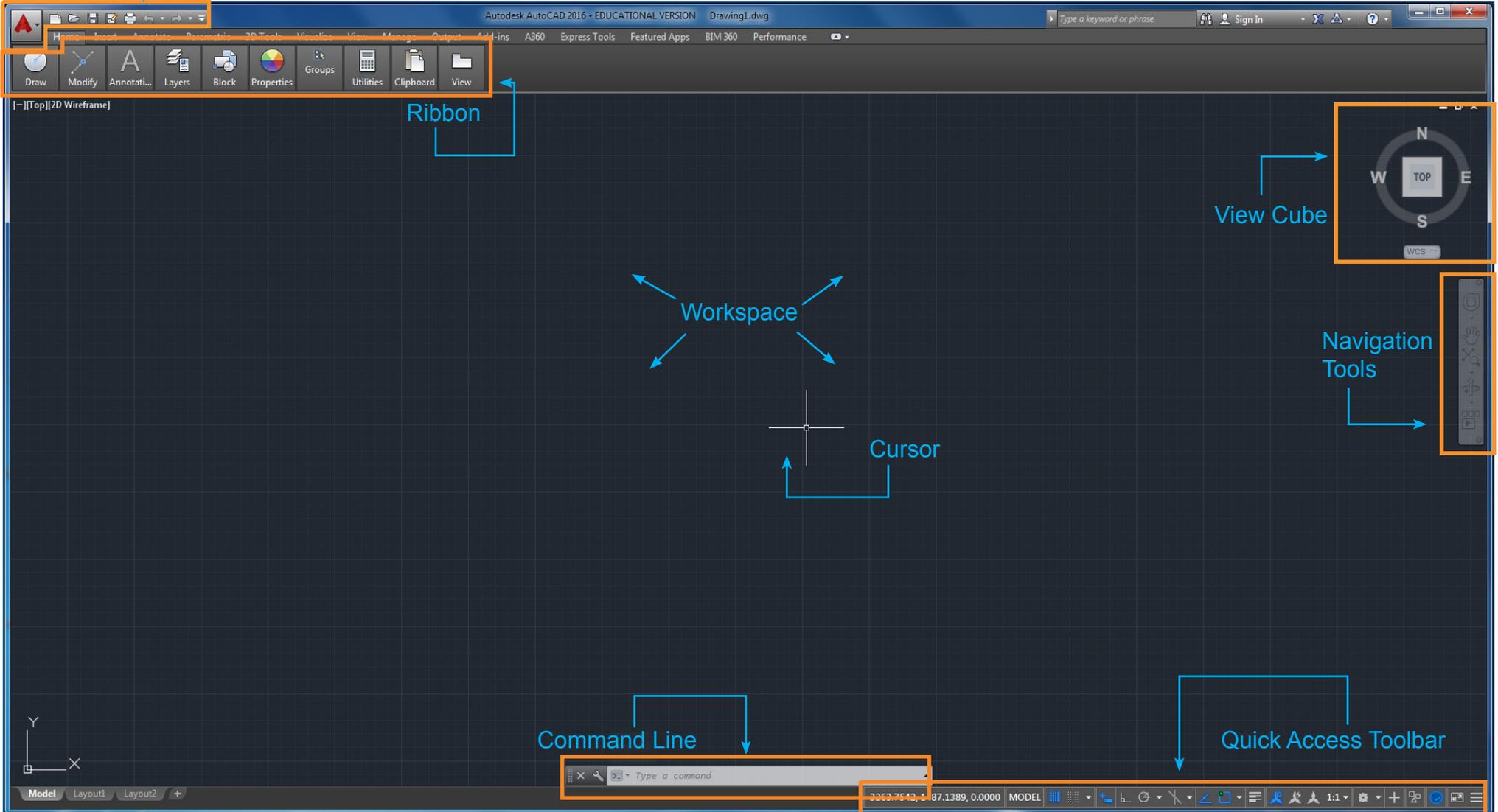
AUTODESK® AUTOCAD® 2015

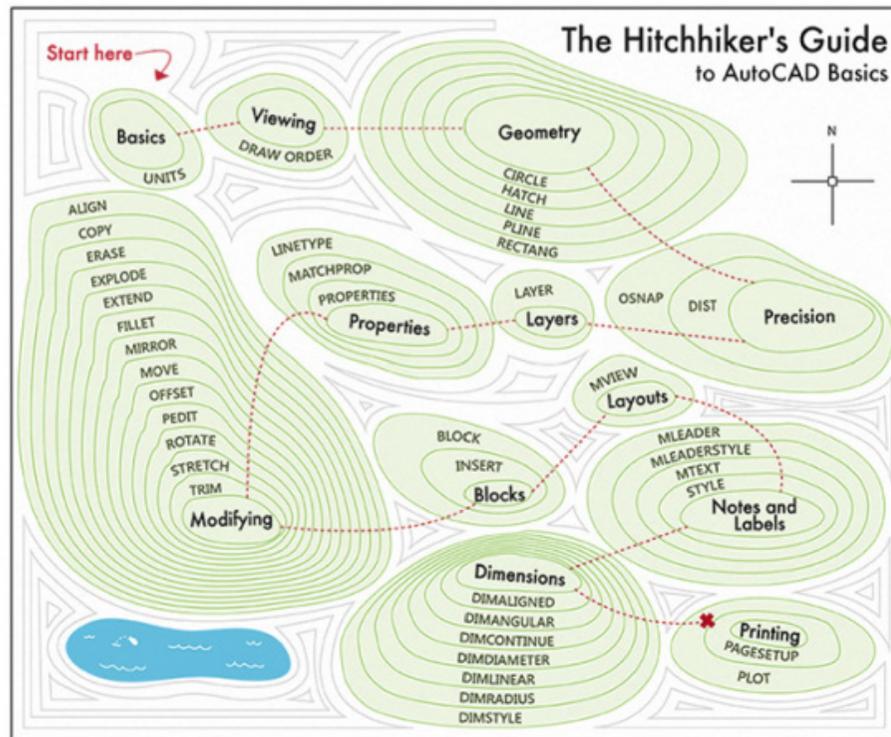
AutoCAD is a 2D and 3D computer-aided design (CAD) and drafting software



The native filetype is the .dwg (and also .dxf)
It is a vector graphic file which can be imported and exported to illustrator
It can also contain 3D information to be transferred to 3D software such as Rhino and 3ds Max

Menu Bar →

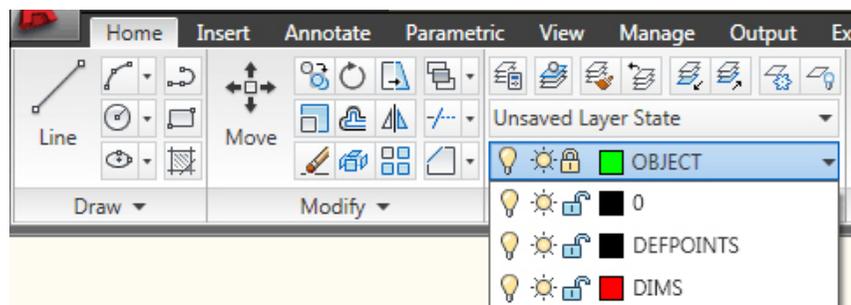




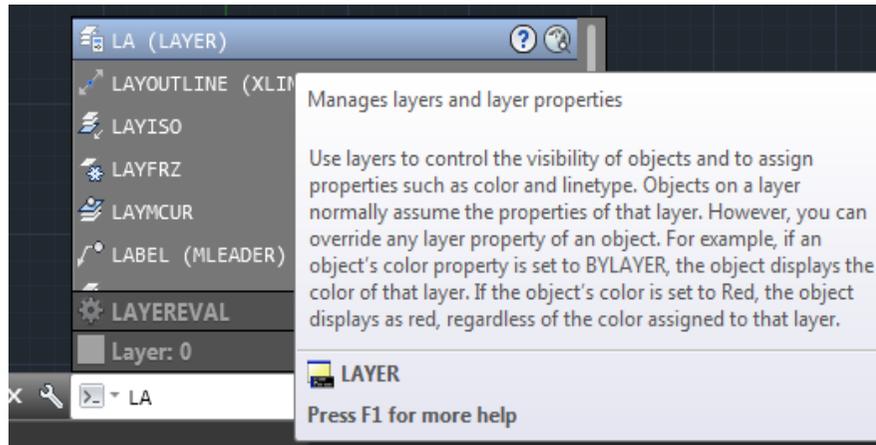
AutoCAD is a drawing program but it uses a virtual space. Therefore drawings can (and should) be drawn at full 1:1 scale.

Like all 3D software, there is an origin point which all vectors and geometry are drawn/created using 0,0,0 as a reference.

AutoCAD is a command based program so aside from buttons on the menu/toolbar/ribbon, tools and commands, can be executed by typing in instructions.



Layers can be used to manage drawings and organisation. Lineweights and colours can be matched to layers to save time.



Commands are the instructions that tell the program what to do.

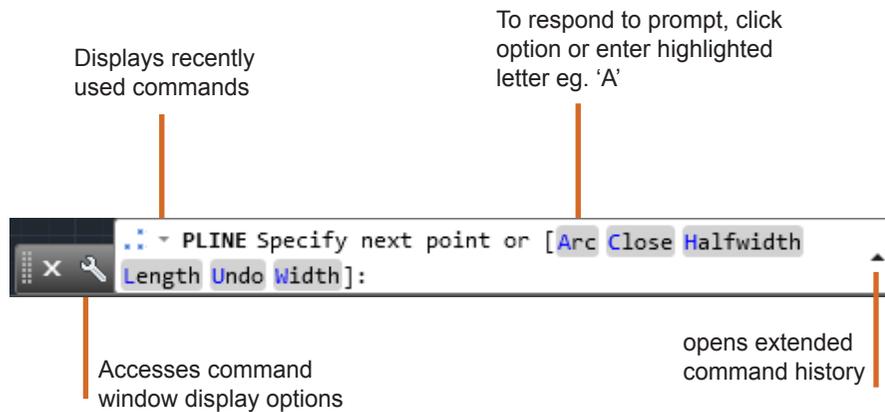
There are many ways to initiate a command:

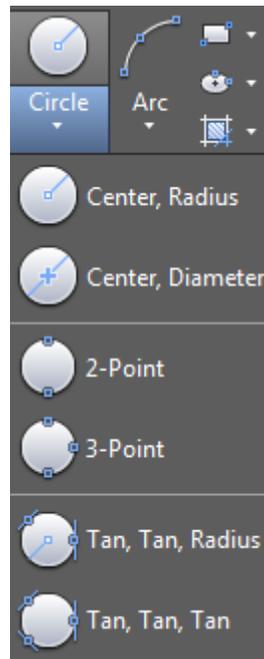
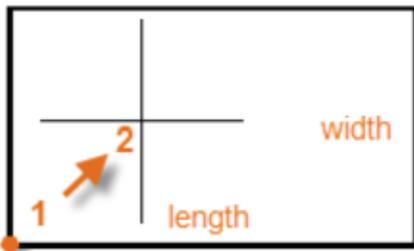
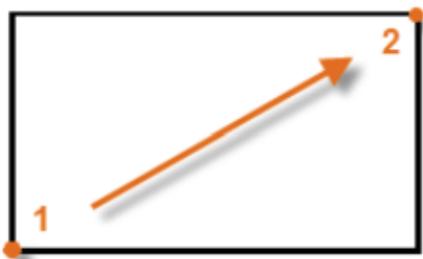
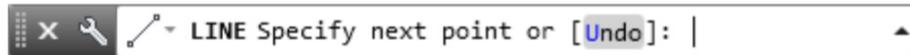
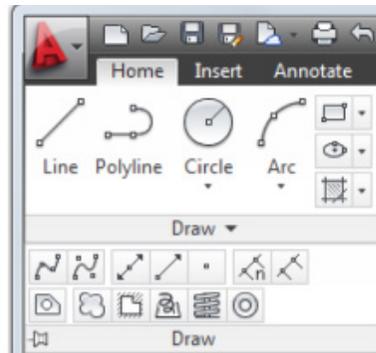
- Make a selection from the ribbon, toolbar or menu
 - Enter a command in a dynamic input tooltip
 - Enter a command in the command window
 - Drag a custom command from a tool palette
- Spacebar or Enter will confirm a command

Command aids help with entering commands:

- **Automatic completion:** completes name of a command or system variable as you type it
- **Command line suggestion list:** Displays a list of commands or system variables that match or contain the letters you have typed.
- **Automatic correction:** Commands that you frequently misspell.
- **Command cycling:** Cycling through commands you have already used in the current session when you press the arrow keys

After entering a command, you may see a series of prompts on the command line. These are options for the current command. e.g. when entering POLYGON, you will be asked for the number of sides for the polygon.





Drawing in AutoCAD is similar to Illustrator (since they are both vector programs), using lines and shapes. Tools can be selected from the Ribbon along the top or executed as commands.

The line is the most basic and common object. A line can be one segment or a series of successive segments. Each line segment is a separate object. To draw a line, click the Line tool or execute the command using LINE or just 'l' and it will ask you to specify first point and then the second point.

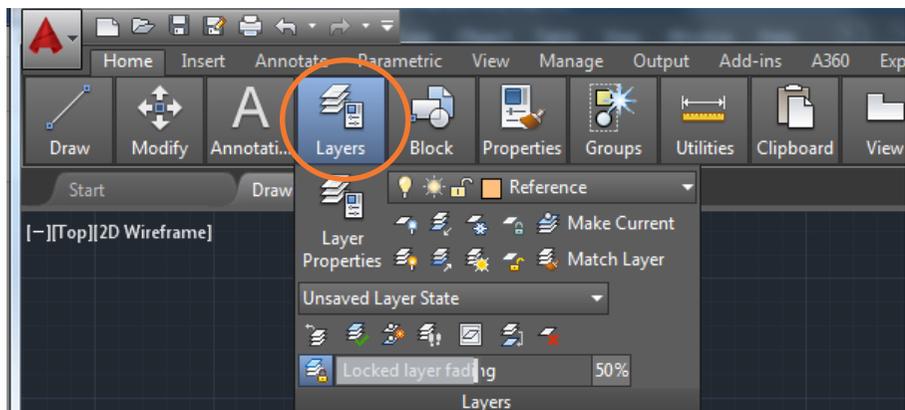
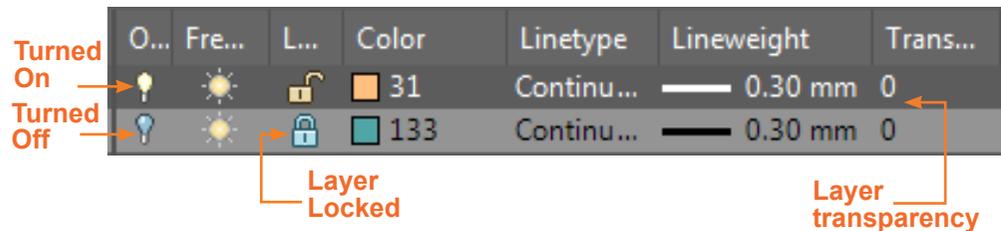
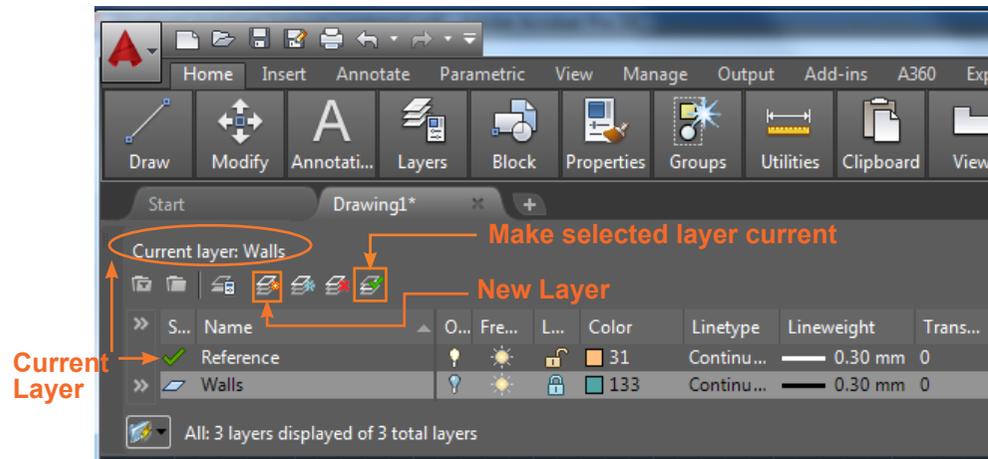
Lines can be a specific length by typing the dimension eg. '10' and clicking enter or spacebar.

A polyline is a connected sequence of line or arc segments that is created as a single object. (PLINE)

Individual lines can be turned into a polyline by using the command BOUNDARY.

Rectangle are 4 enclosed polylines (RECTANGLE or REC)

Circles (CIRCLE or C) can be drawn in various ways. The default is using a centre point and then typing the radius, but there can be other methods like using diameter or tangents.



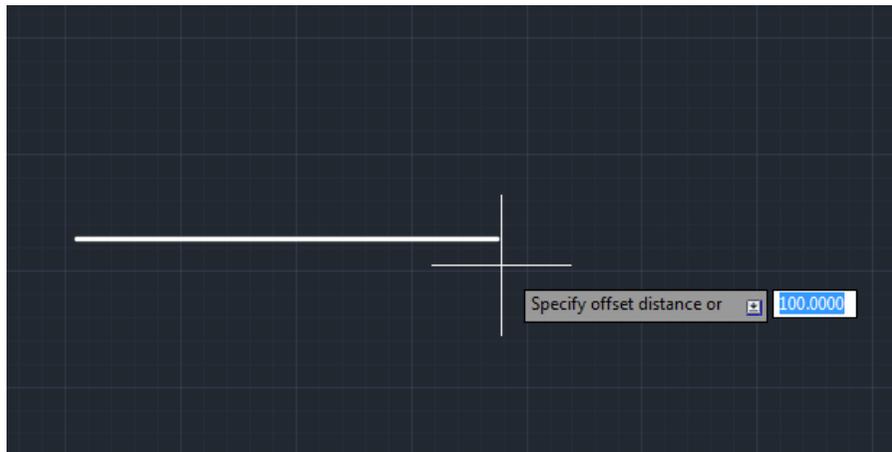
A drawing can (and should) be organised into layers in order to make it easier to manage. It allows the option to turn layers on and off as well as lock layers to prevent accidental selection of editing.

Layers can also be assigned colours and lineweights which saves time assigning those properties manually to each line/shape individually.

Some recommended methods of using layers:

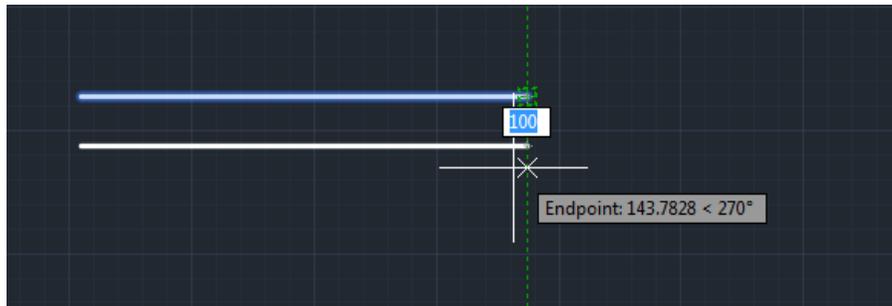
- Layer 0 is the default layer that exists in all drawings and has some special properties. Experienced AutoCAD users will tell you not to use this layer.
- Any drawing that contains at least one dimension object automatically includes a reserved layer named Defpoints. Do not use this layer either.
- Create a layer for any behind-the-scenes construction geometry, reference geometry and notes that you usually do not need to see or print.
- Create a layer for layout viewports.
- Create a layer for all hatches and fills. This lets you turn them all on or off in one action.

There is a panel on the ribbon which has quick access to the layers.



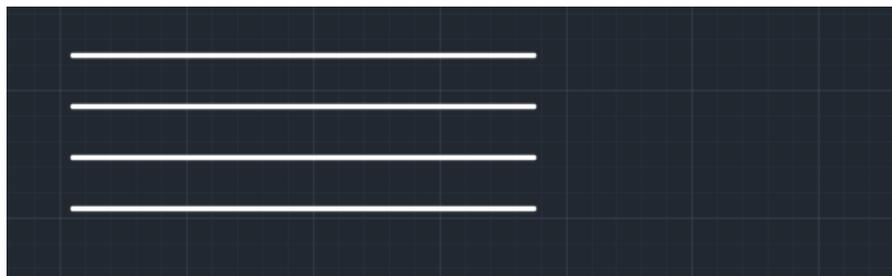
Offset is a very useful tool for creating copies of objects at specific distances apart (e.g. for wall thickness). It can also be used to create temporary guidelines for creating other objects.

Execute Offset (OFFSET or O) then select the line or shape you want to use.

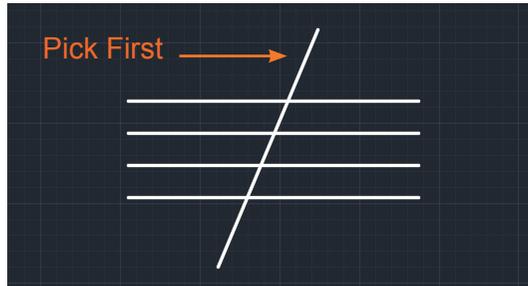


Type in the distance you want to create the copy. eg. '100'

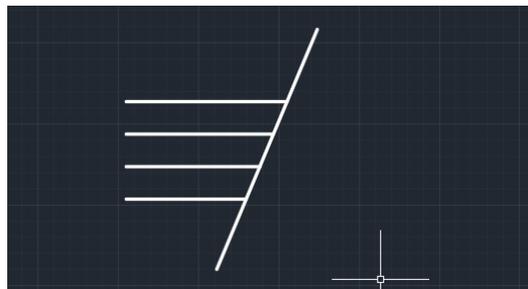
Click on the side that you want the new copy to be created on.



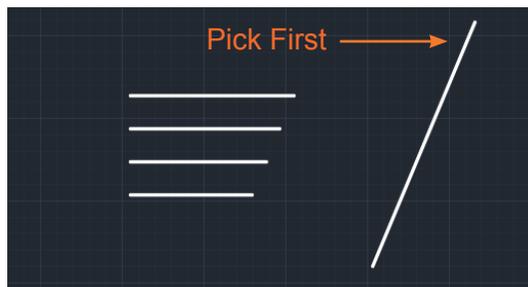
You can keep repeating the command and the offset distance will be remembered which can be useful for creating steps of a staircase.



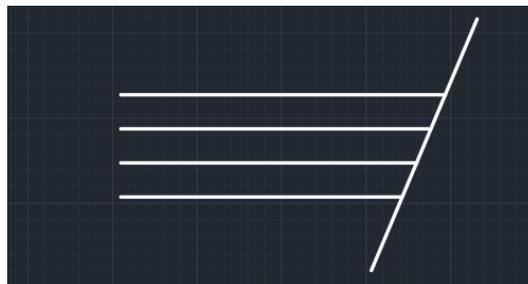
TRIM



TRIM



EXTEND



EXTEND

Trim (TRIM or TR) and Extend (EXTEND or EX) are common tools for modifying the drawing. Both tools are executed in a similar way.

TRIM/

To use the TRIM tool, select the line(s) you are using to trim first (i.e what will be used as the 'trimmer').

Press 'spacebar' or 'enter'.

Then choose the parts of the line(s) that you want to trim.

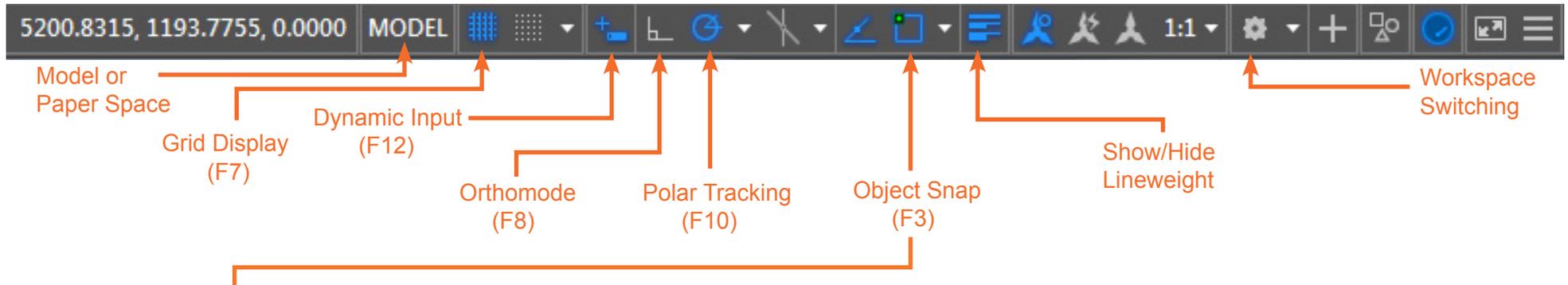
EXTEND/

To use the EXTEND tool, select the line(s) that you want to extend to first (i.e where you want your lines to join up to).

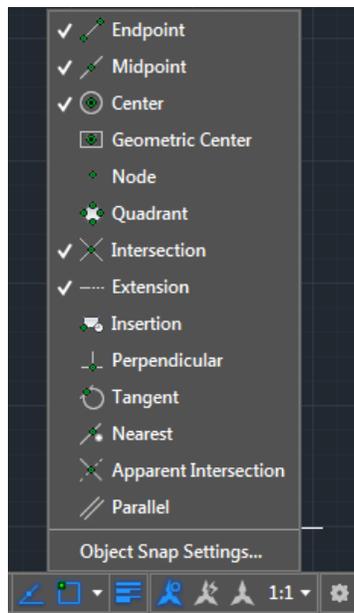
Press 'spacebar' or 'enter'.

Then choose the line(s) that you want to extend

The quick toggles bar along the bottom of the interface contains a number of buttons for turning features on and off quickly. Most of the ones on the left are to do with improving the precision/accuracy of drawing. Most have keyboard shortcuts for saving time. The most useful ones are shown below:



Right Clicking on this button will lead to other options to which the cursor can snap to as shown below:



Grid Display/ Turns on and off a grid in the background.

Dynamic Input/ Enables a mini input box which makes it easier to type and see measurements.

Orthomode/ Constrains drawing to vertical and horizontal which is useful for drawing at right angles.

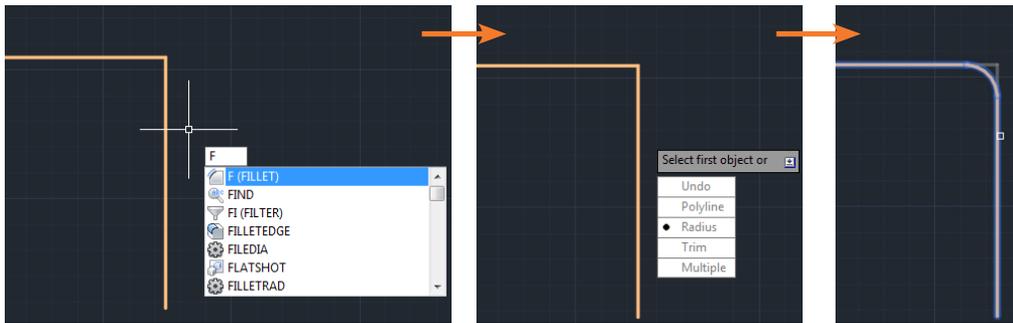
Polar Tracking/ Snaps and indicates certain angled guidelines when drawing

Object Snap/ Allows snapping to certain points which can be customised by right clicking the 'Object Snap' button - as shown on the left.

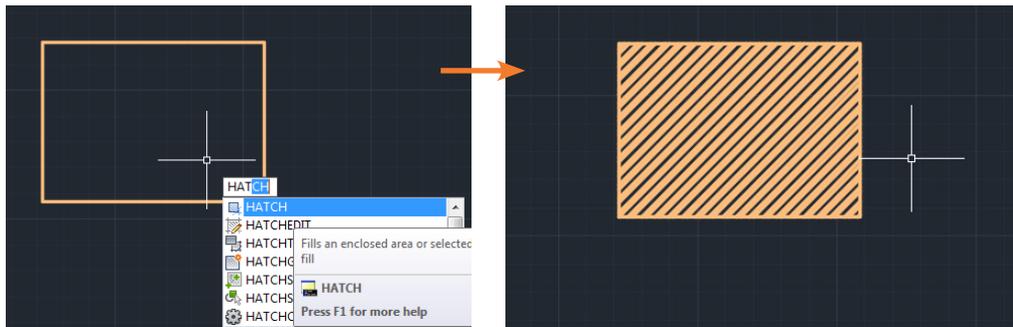
Show/Hide Lineweights/ Allows different thicknesses/lineweights to display on screen.

Model or Paper Space/ Used during the printing stage - checking what drawings will look like one paper

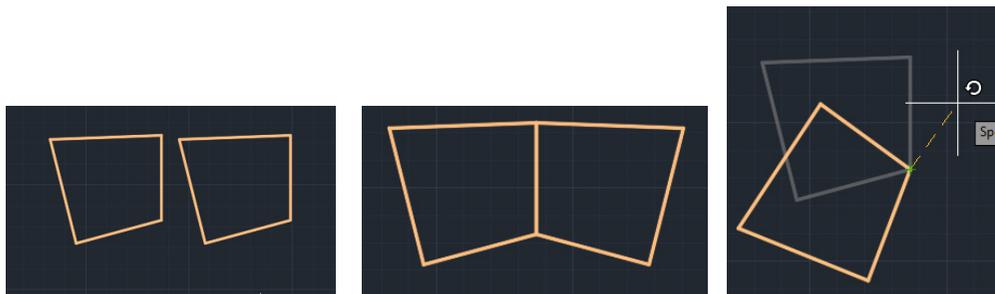
Workspace Switching/ Changes the workspace and panels into different modes (such as 3D Modelling)



(FILLET or F) - This tool can be used for rounding/ curving existing corners with a specific radius. Type 'F' then press the 'down arrow' button. Select 'Radius' and type the radius measurement you want. Press Enter. Then click the lines where you want the corner to be rounded.



(HATCH or H) - By executing this command and clicking the centre of a shape, a hatched texture is created. Useful for distinguishing different surfaces/textures



DUPLICATE

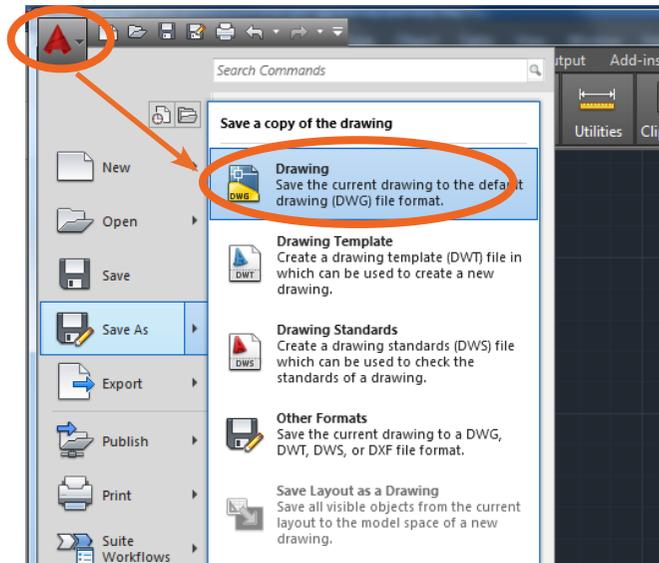
MIRROR

ROTATE

(COPY or CO) - allows you to copy and paste objects

(MIRROR or MI) - allows you to duplicate and mirror an existing object/lines

(ROTATE or RO) - allows you to rotate an existing object/ lines

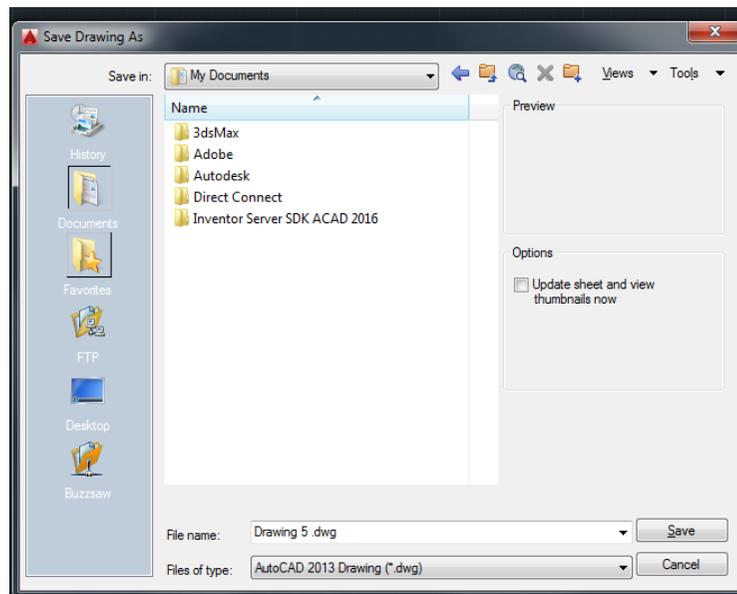


To save your drawings as a dwg. file:

Go to the autocad icon in the top left corner.

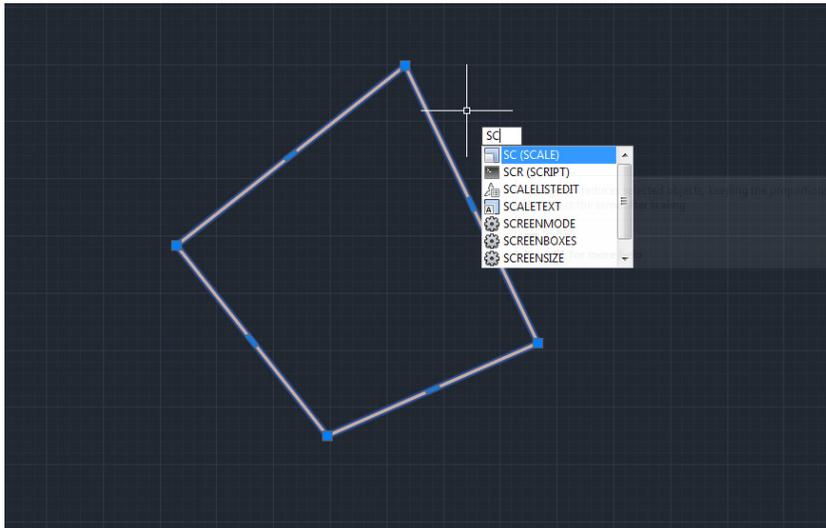
Then 'Save As'

'Then 'Drawing'

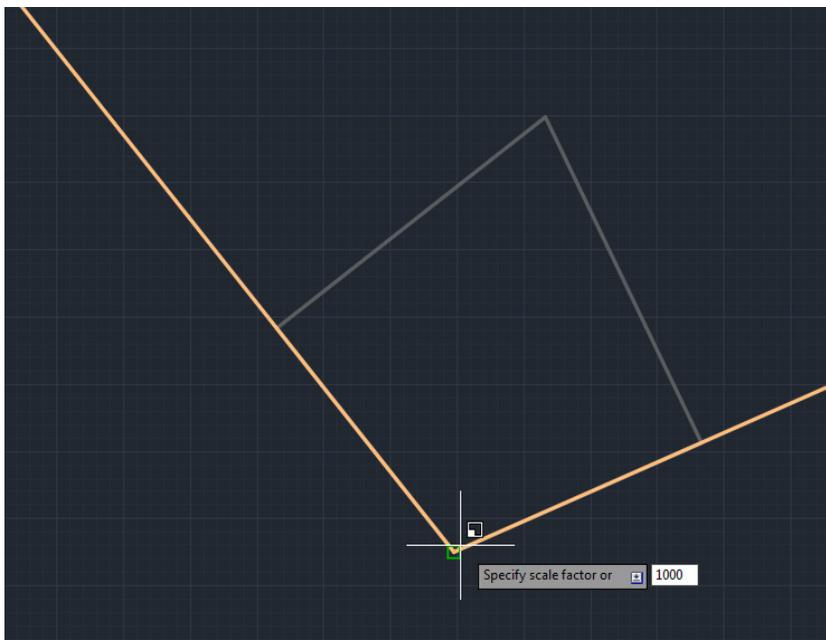


Label your drawing as something you can distinguish it as.

Then 'Save'



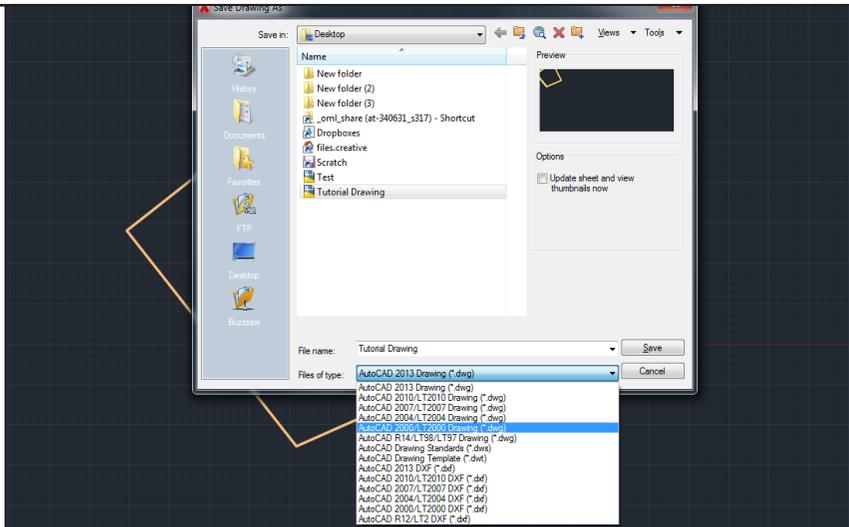
Before you can take the drawing into illustrator or printing you have to convert the drawing into millimetres. Since you probably drew your drawing in metres you simply have to scale the drawing up 1000 times (since 1 metre is 1000 millimetres)



Select the whole drawing (ctrl+a).
Scale (SC).
Select base point.
Scale Factor is 1000.

After scaling you may find the drawing is now too big to zoom:
Zoom (Z)
Extents (E)
That should zoom out to make the drawing fill the screen.

The drawing should now be in millimetres (for this example the roughly 200 by 250 shape is now 200,000 by 250,000)



Save your AutoCAD drawing as the native dwg format but make sure it is in the older dwg2000 version (AutoCAD 2000/LT2000 Drawing). This is because the newer versions of dwg contain 3D information which causes problems when transferring to Illustrator.

Because AutoCAD drawings are vectors and Illustrator drawings are also vectors, dwg files can be opened directly in Illustrator. You do need to take note of the scale when opening

When you open a dwg in Illustrator a window of options will appear.

For Artwork scale set it to 'Original Size'

For Scale you need to input the scale you want the drawing to be in. e.g:

For **1:500** set the scale as **500 units = 1 millimeters**
 For **1:2000** set the scale as **2000 units = 1 millimeters (etc...)**

Note: Make sure it says millimeters in the unit box.

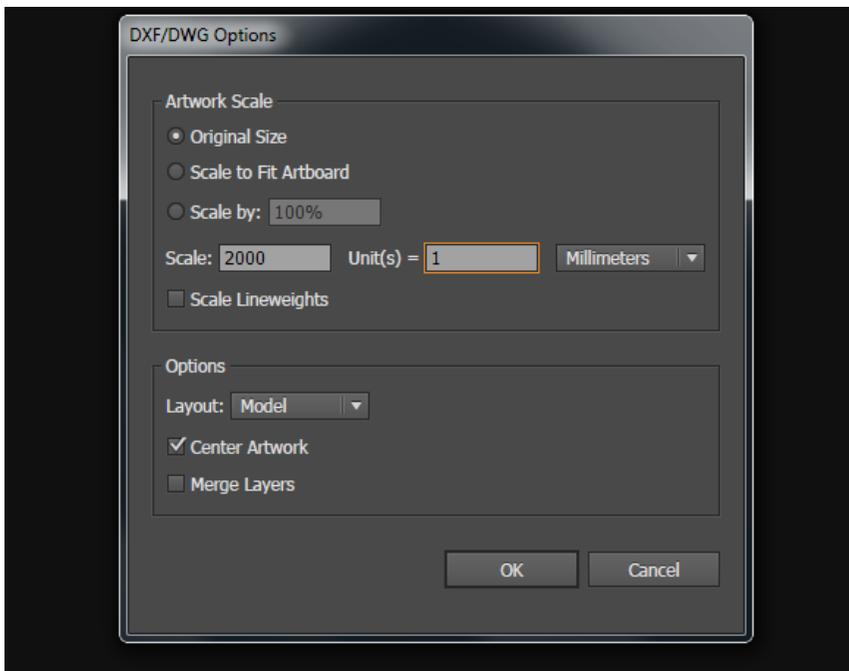
Don't worry about Lineweights since you can edit/change them through Illustrator.

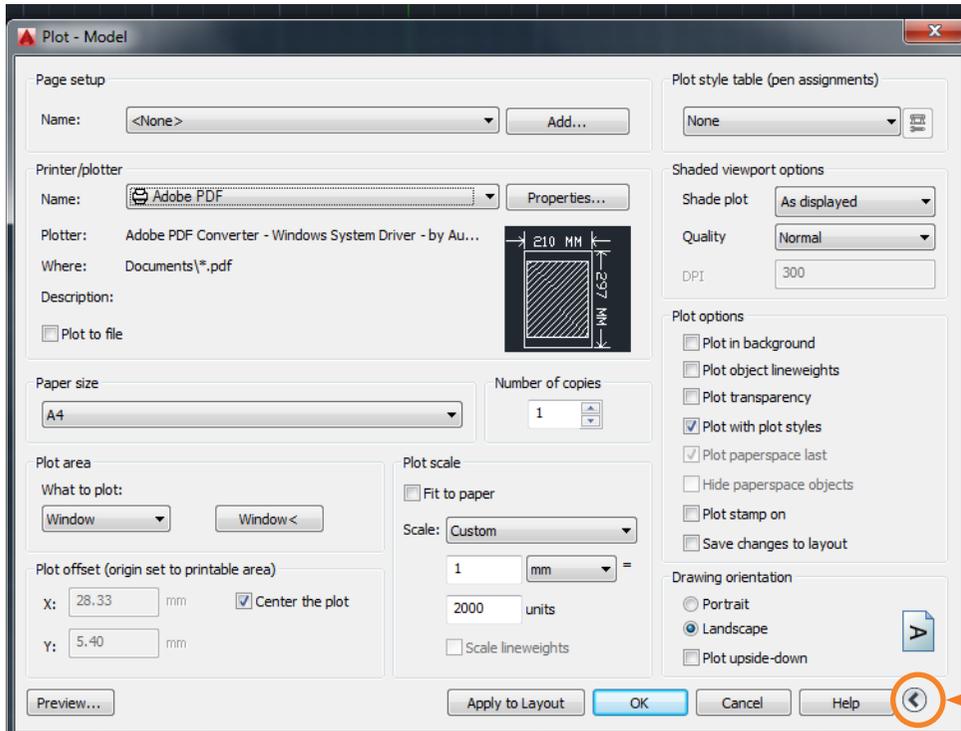
'Centre Artwork' will place the drawing in the centre of the artboard.

If you had different layers in AutoCAD (e.g. for walls/or for different levels) then don't check 'Merge Layers'. This option will flatten the drawing into one layer.

Your drawing should now be in the right scale in Illustrator. You can now set up lineweights, stroke colours and fills and patterns.

Saving as an Illustrator file(ai) then allows layout in InDesign.





In AutoCAD plotting is used in place of printing.

Type 'Plot' then press space or enter.

The plot window shows all the options for printing.

First set up printer and paper size.

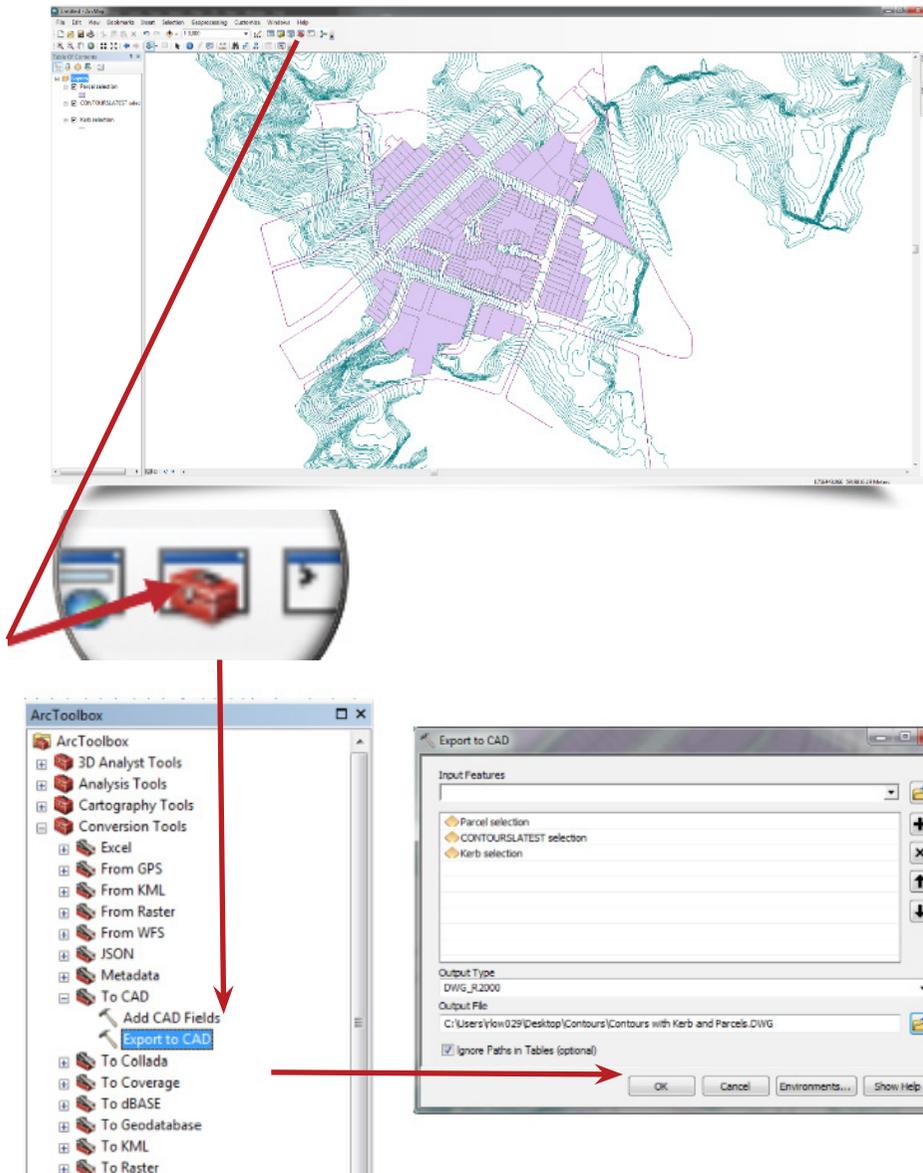
In the Plot Area under what to plot select '**Window**' from the dropdown menu. This option will let you draw a frame around the part of the drawing you want to print.

Plot offset should be checked to '**Centre the Plot**'

Plot scale is where you can type in the scale you want to print at. Uncheck fit to paper and just type in the scale.

The Right Arrow button in the bottom right corner, allows more for more options such as paper orientation and plot styles.

If you plot using Adobe PDF you can create a pdf of the drawing at the specified scale which can be emailed or opening in Illustrator. Drawings can be printed for hand tracing or physical modelling



In ArcMap:

Have contours of your area isolated in ArcMap by selecting them and creating a new layer. You can also have kerblines and parcels to help identify the site.

Export to CAD:

Go into ArcToolbox (the red toolbox button on the main toolbar) This toolbox has a collection of tools for use in ArcMap.

Expand 'Conversion Tools'

Expand 'To CAD'

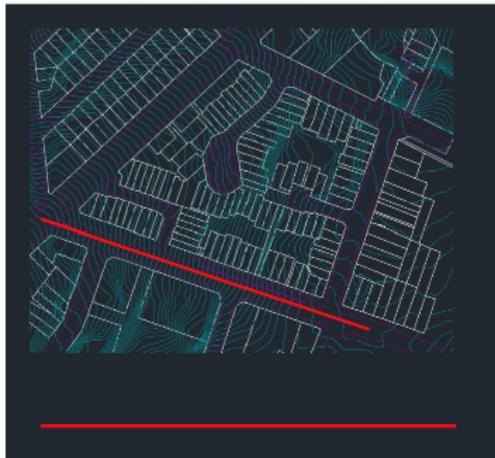
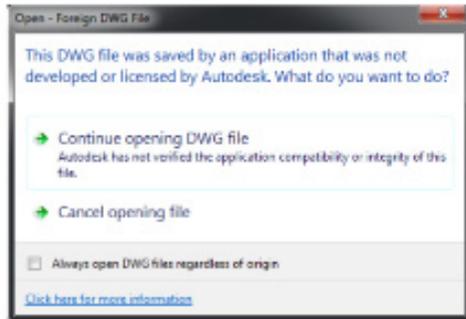
Double click 'Export to CAD'

In the next window add all the layers you want to export under 'Input Features'.

For 'Output Type' it's recommended to use an older version .dwg so select DWG2000.

Choose folder location where you want to export the .dwg.

Click 'Ok' to confirm export. It may take a while depending on the complexity of the site.



Open CAD:

Opening the file in AutoCAD you will receive a message saying file was not made with an Autodesk product.

Continue opening the file.

Because the contour line are joined in segments they will extend beyond the site

Draw a rectangle around the site that you want and trim the contours (and kerb/parcels) with the rectangle.

Depending on the complexity of the contours, it may slow down AutoCAD when deleting extra contour lines outside of the rectangle

Try using the erase tool (ERASE) rather than selecting and deleting.

Section Line:

Draw a section line across the drawing according to where you want to cut the section

Then draw a horizontal line underneath (length doesn't matter) the drawing Turning on Ortho Mode (F8) will help with drawing the the line perfectly horizontal.

**Align Drawing:**

Use align (AL) to rotate the drawing and section line in the horizontal orientation.

Select all the contours, kerb, parcels and the section line but not the horizontal line.

Type AL or use the align button/

1st source point pick the start point of the section line
1st destination point pick the start point of the horizontal line.

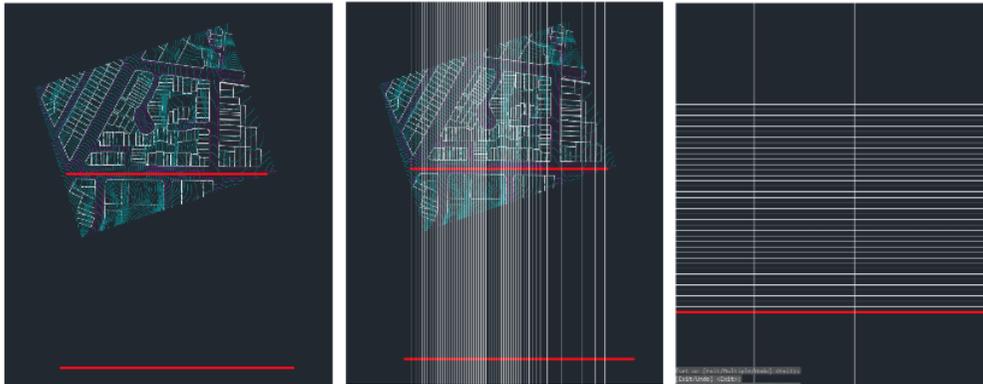
2nd source point, pick the end of the section line.

2nd destination point, pick the end of the horizontal line.

There is no 3rd source in this case so just press space/enter to skip.

It will ask if you want to scale the objects, make sure to pick 'No'

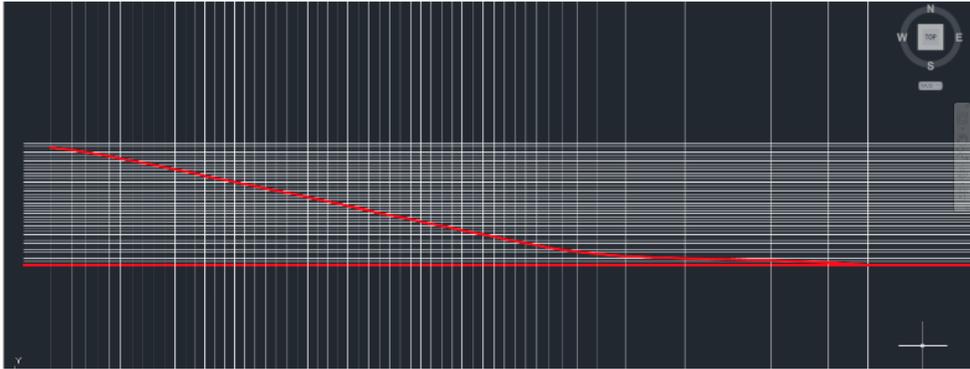
it will shift and align the contours, kerb and parcels on the horizontal line

**Construction Lines:**

Draw another horizontal line underneath the drawing which will be the base of the section.

Draw construction lines (XL) which are lines that extend infinitely in both directions at the intersection of the section line and the contours. Turning on "Apparent Intersections" for 'Object Snap' setting will help with this.

Then set a series of horizontal lines 1 metre apart above the bottom horizontal line. You need as many as there are contours being cut.

**Draw the Section:**

Using the grid formed by these 2 sets of lines you can start to draw the section of the land being cut along the section line. You can start from the top or bottom of the slope, just have the horizontal lines set above or below the starting line.

**Finish the Section:**

You can delete the construction lines (or hide them if they are on their own layer).

The shape can be hatched with a pattern or solid colour (this can be done in Illustrator).

Buildings can be drawn in elevation since this section was cut along the street.

If the section is cutting through a building you can make more construction lines to add the walls of the cut building as well.