Digital Research Hub

AutoCAD tutorial

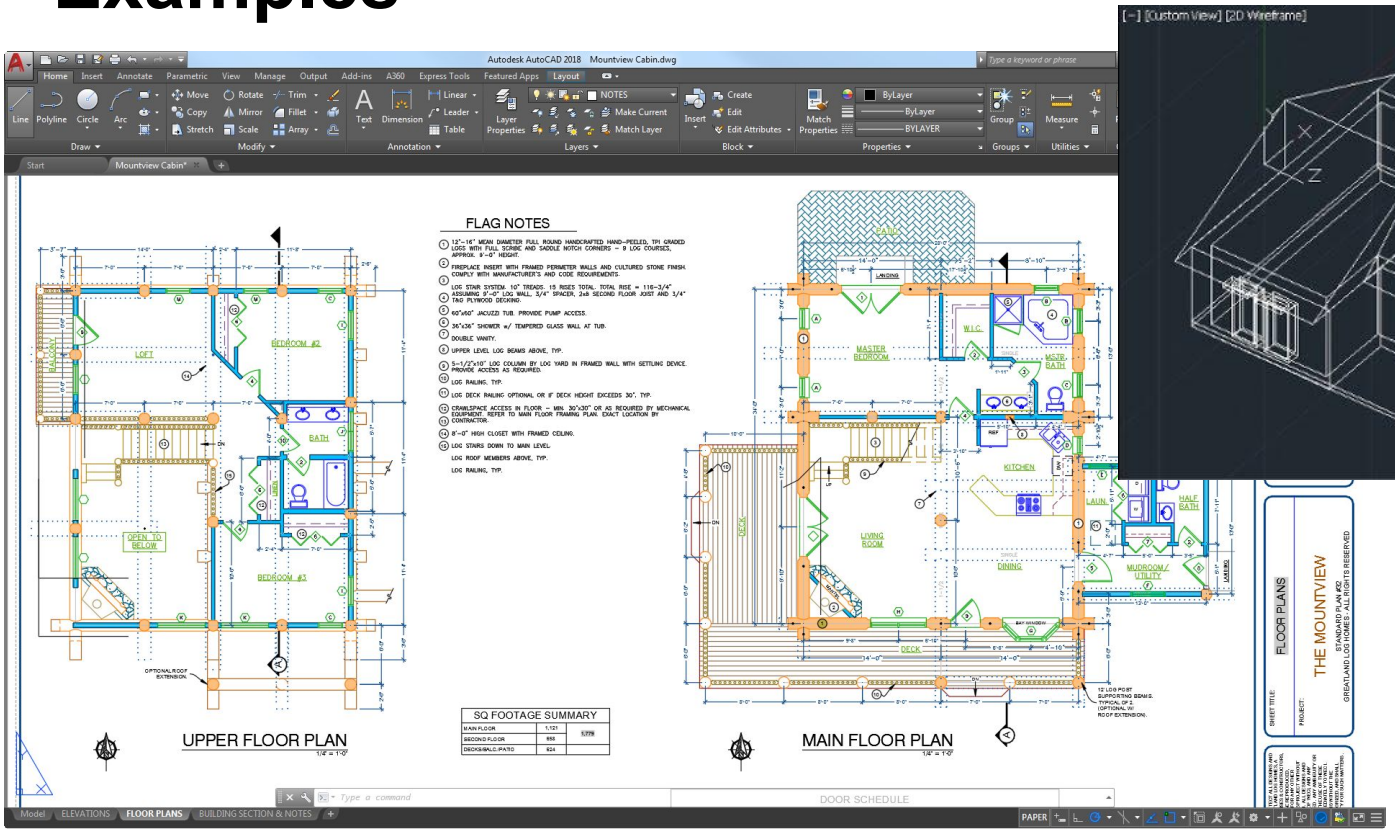
Tutorial aims

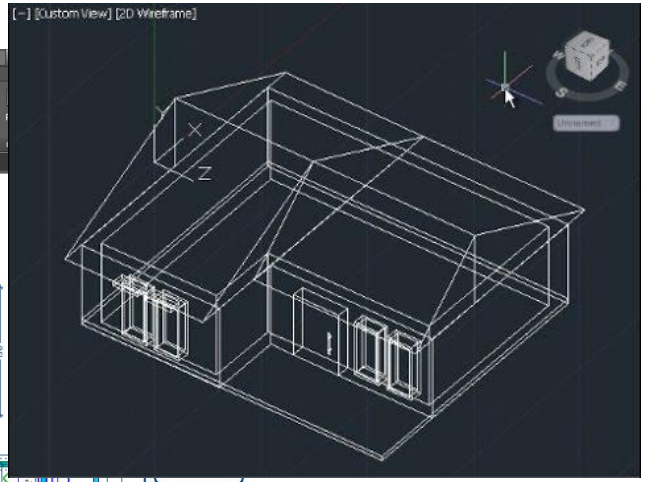
- What is AutoCAD?
- AutoCAD interface
- Walkthrough: how to create drawings in AutoCAD
- Different commands - **tip: make note of the commands!**
- One-on-one questions

AutoCAD

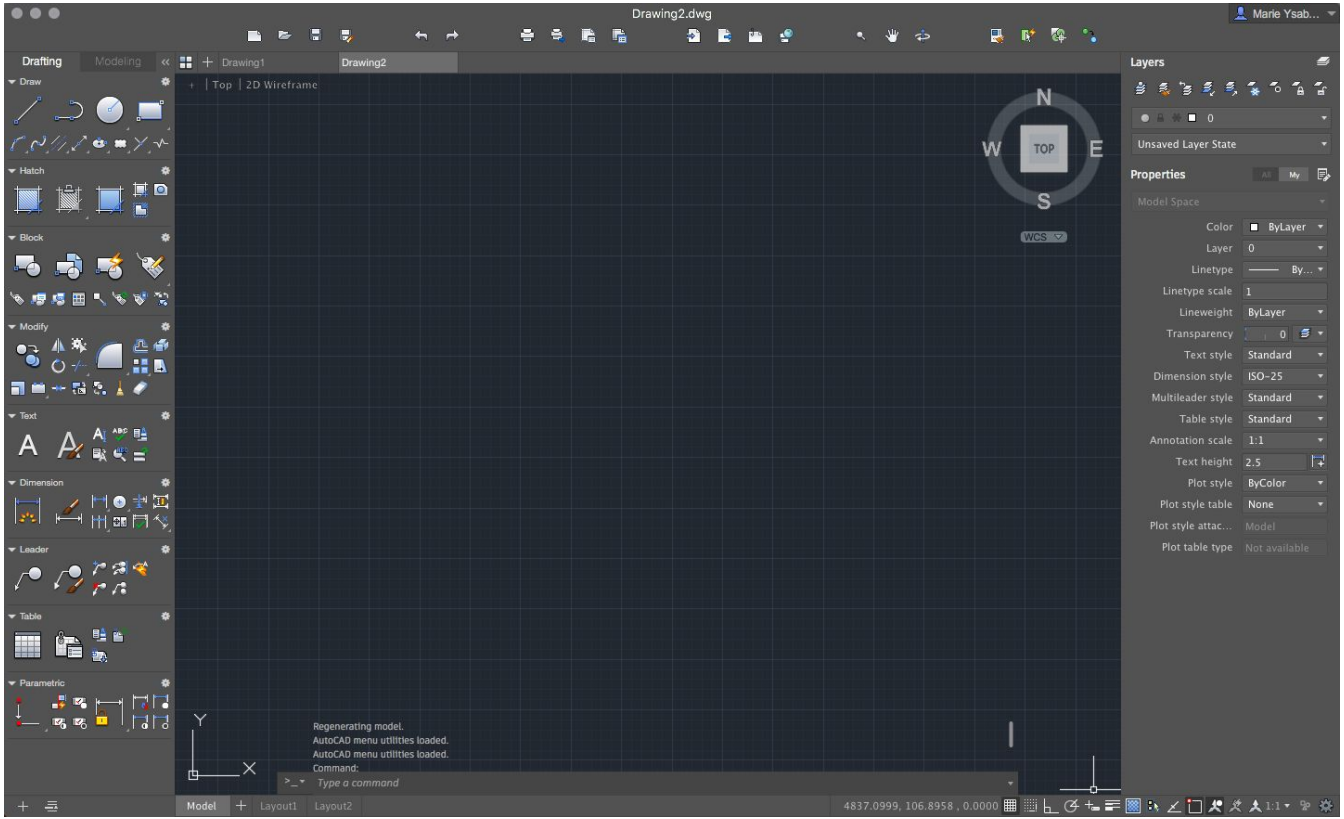
- Computer-aided design (CAD) and drafting software
- Has been used by architects and designers for many years
- Files made with AutoCAD have **.dwg** extension
- **Use AutoCAD for:**
  - Creating accurate drawings, site plans, floor plans, building cross-sections and elevations;
  - Creating 3D models (but other software may be more appropriate);
  - Creating anything that needs exact and accurate measurements.

Examples


Autodesk AutoCAD 2018 Mountview Cabin.dwg
FLAG NOTES
UPPER FLOOR PLAN
MAIN FLOOR PLAN
SQ FOOTAGE SUMMARY
FLOOR PLANS
THE MOUNTVIEW

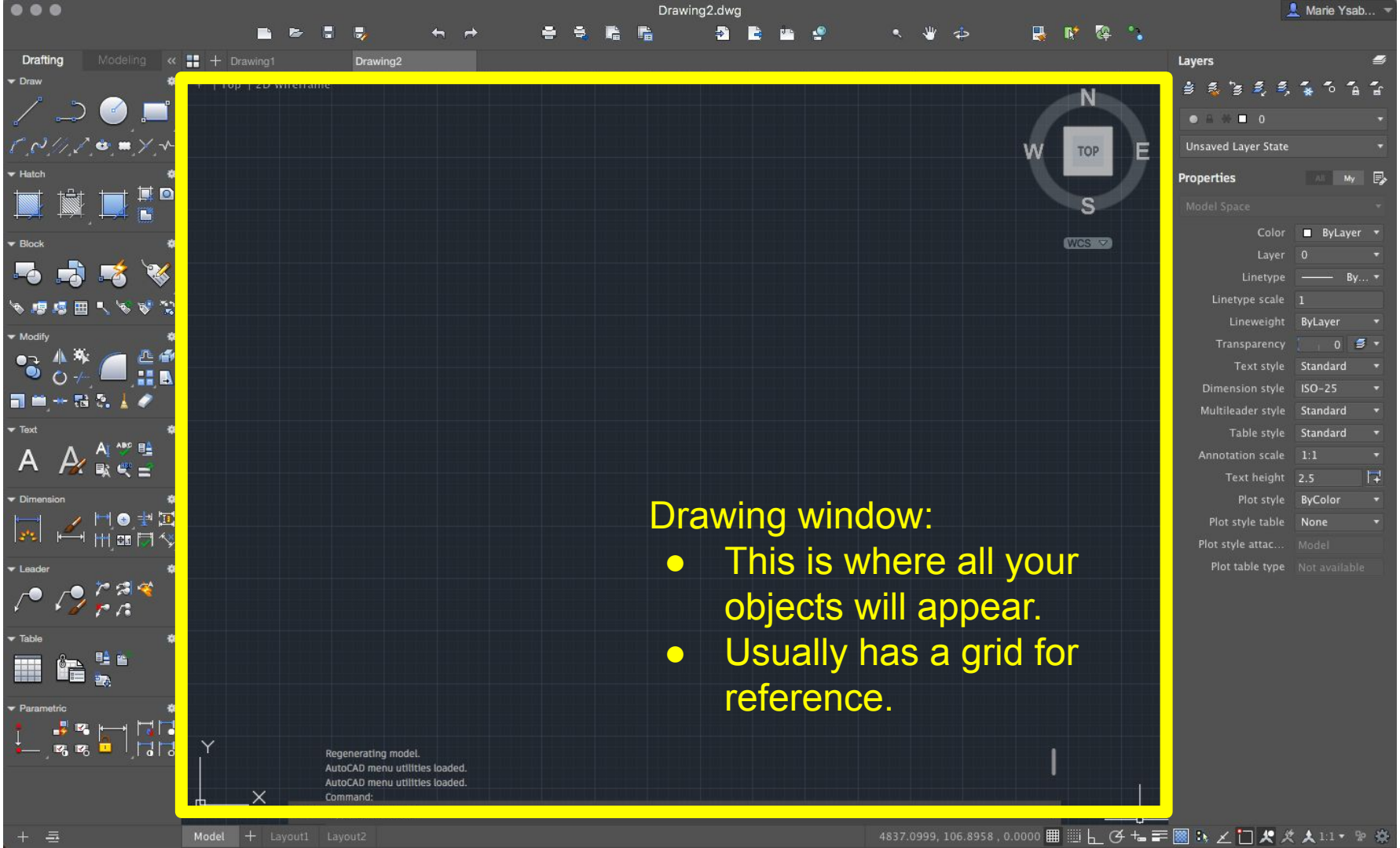

[-] [Custom View] [2D Wireframe]

AutoCAD interface



Interface can vary slightly between operating systems; desktop and laptop; and version of AutoCAD.

Image: AutoCAD on Macbook.


Drawing2.dwg
Marie Ysab...
Drafting
Modeling
Drawing1
Drawing2
Draw
Hatch
Block
Modify
Text
Dimension
Leader
Table
Parametric
Layers
Unsaved Layer State
Properties
Model Space
Color ByLayer
Layer 0
Linetype By...
Linetype scale 1
Lineweight ByLayer
Transparency 0
Text style Standard
Dimension style ISO-25
Multileader style Standard
Table style Standard
Annotation scale 1:1
Text height 2.5
Plot style ByColor
Plot style table None
Plot style attac... Model
Plot table type Not available
N
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TOP
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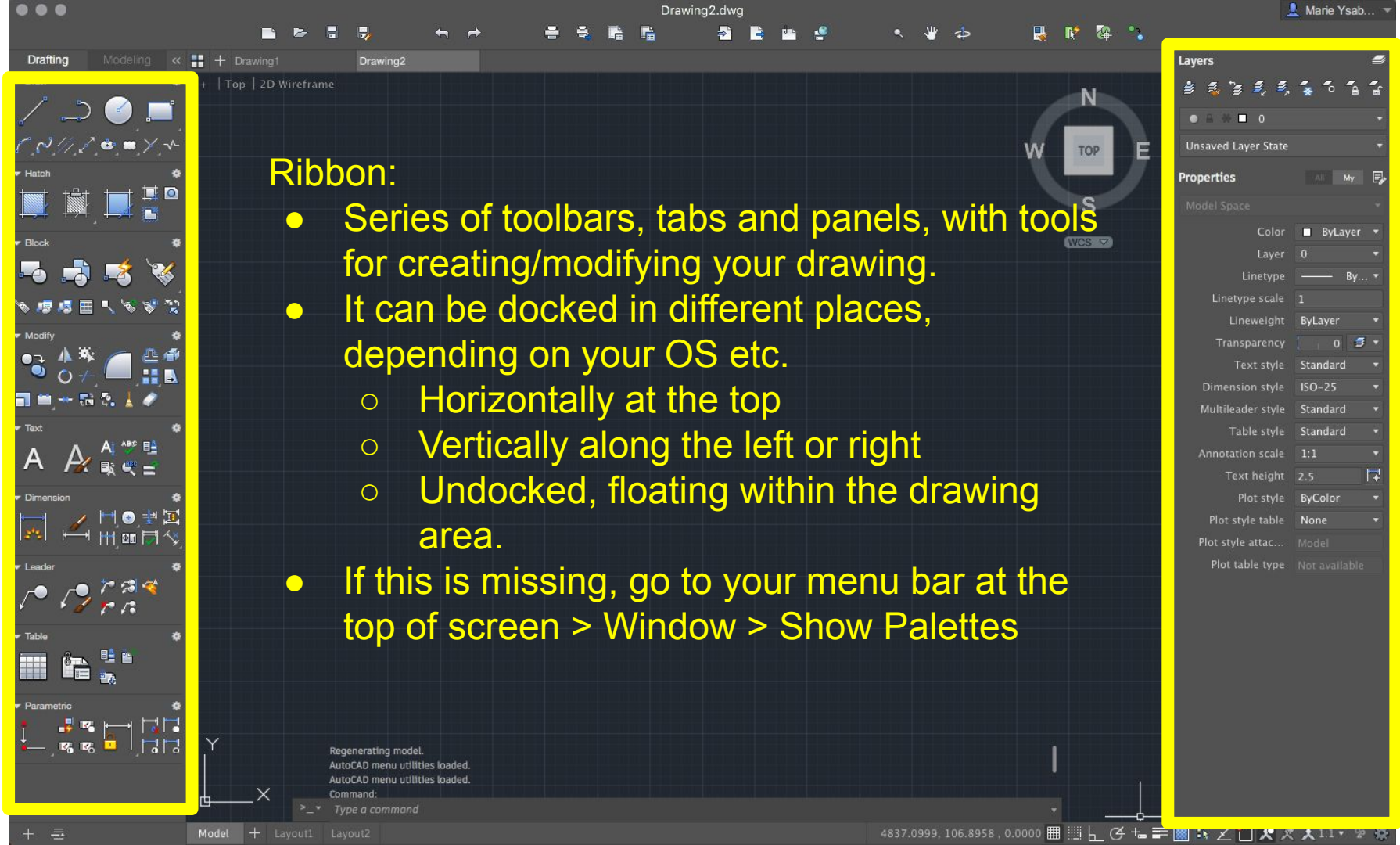
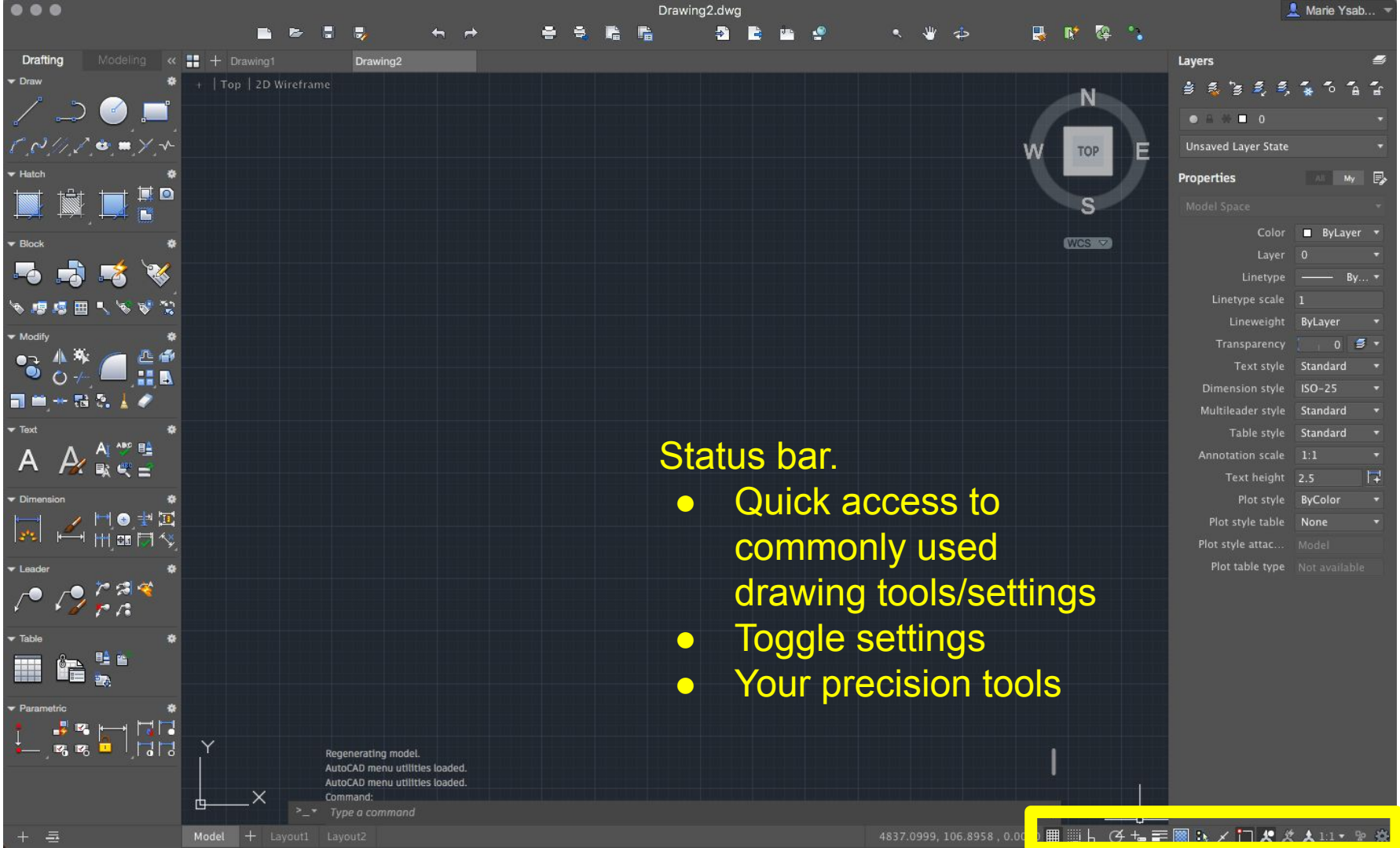
WCS
Drawing window:
This is where all your objects will appear.
Usually has a grid for reference.
Regenerating model.
AutoCAD menu utilities loaded.
AutoCAD menu utilities loaded.
Command:
Model
Layout1
Layout2
4837.0999, 106.8958 , 0.0000



Ribbon:

- Series of toolbars, tabs and panels, with tools for creating/modifying your drawing.
- It can be docked in different places, depending on your OS etc.
  - Horizontally at the top
  - Vertically along the left or right
  - Undocked, floating within the drawing area.
- If this is missing, go to your menu bar at the top of screen > Window > Show Palettes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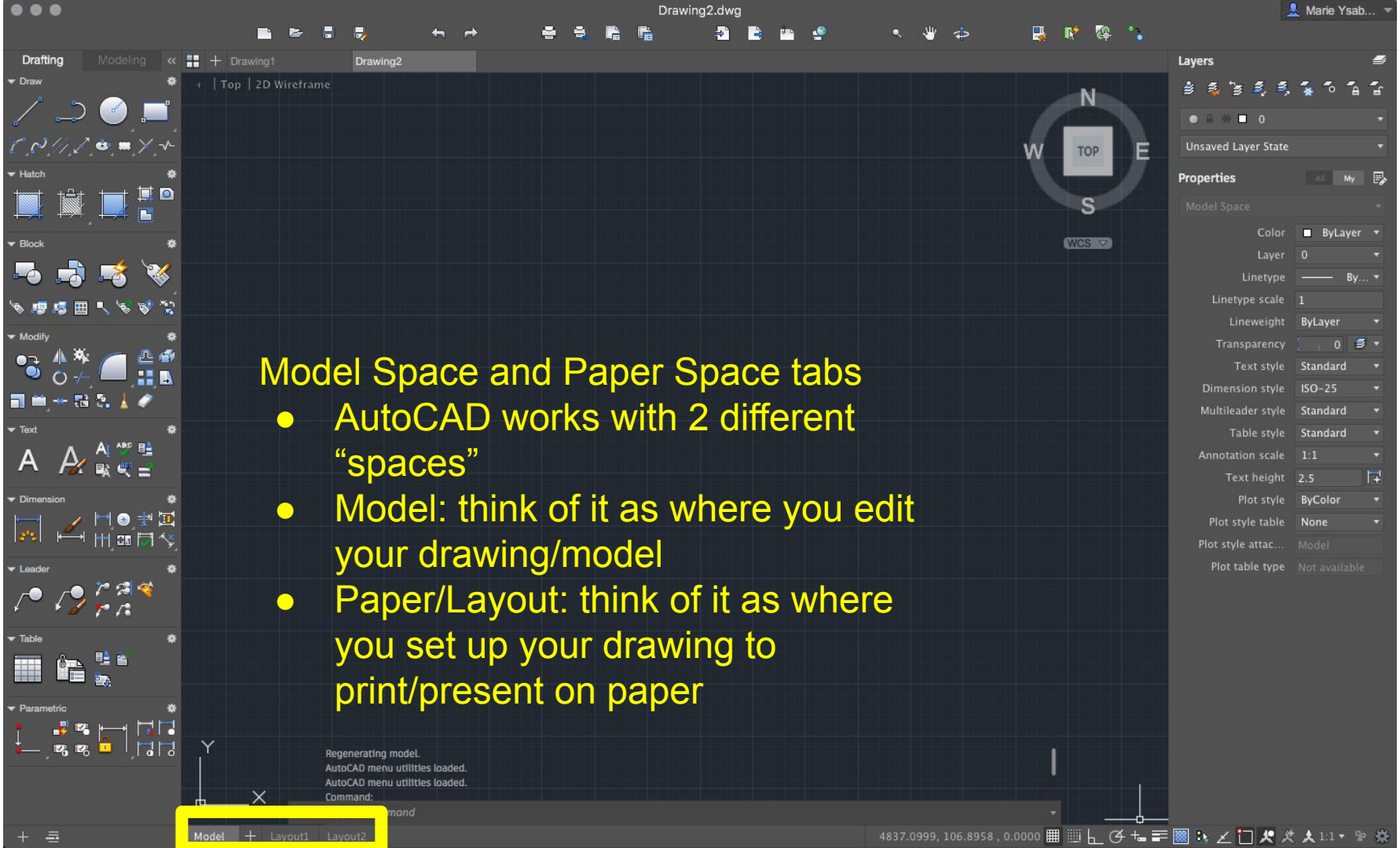
Linetype By...
Linetype scale 1
Lineweight ByLayer
Transparency 0
Text style Standard
Dimension style ISO-25
Multileader style Standard
Table style Standard
Annotation scale 1:1
Text height 2.5
Plot style ByColor
Plot style table None
Plot style attac... Model
Plot table type Not available
Status bar.
Quick access to commonly used drawing tools/settings
Toggle settings
Your precision tools
Regenerating model.
AutoCAD menu utilities loaded.
AutoCAD menu utilities loaded.
Command:
Type a command
Model
Layout1
Layout2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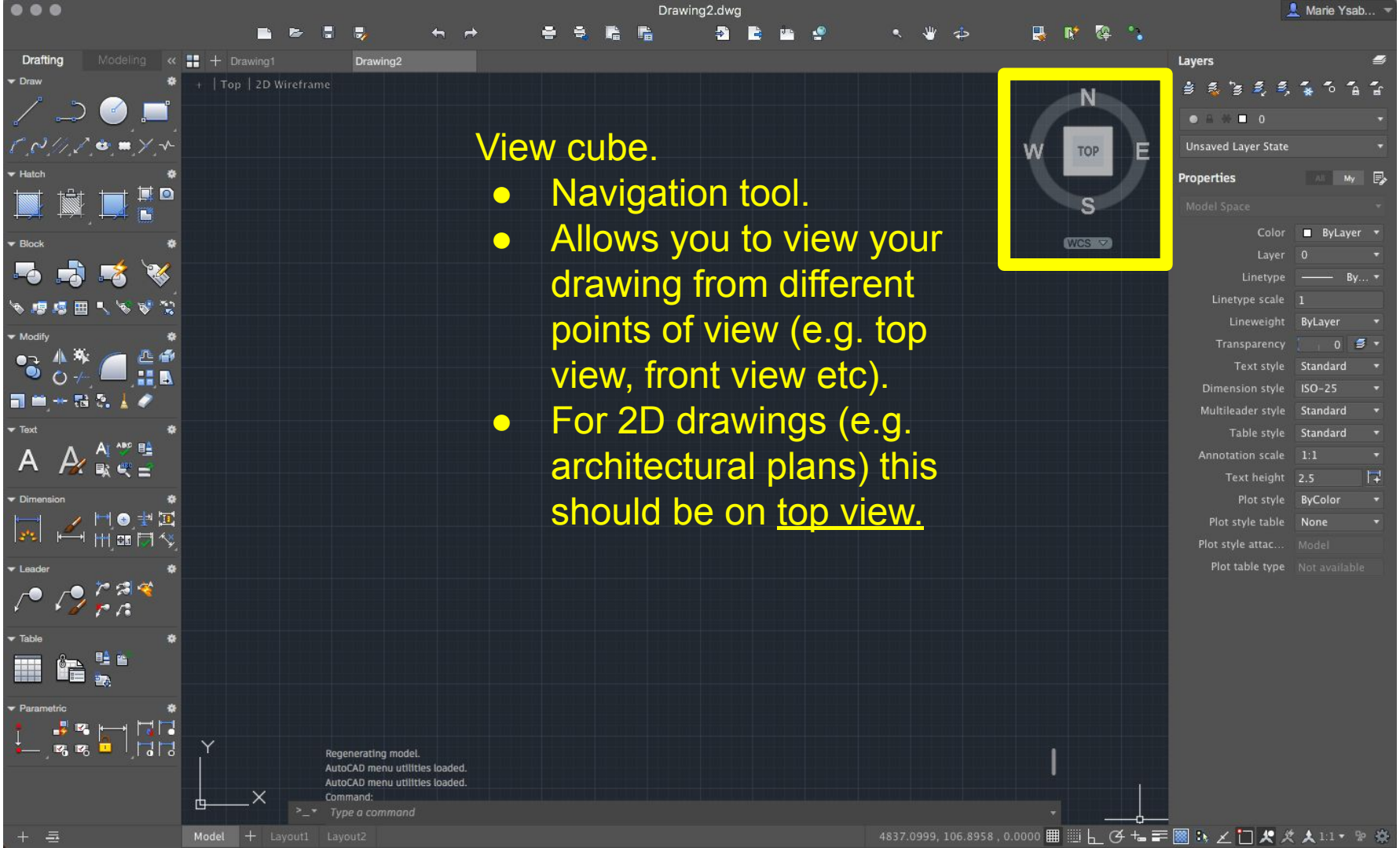
Model Space
Color ByLayer
Layer 0
Linetype By...
Linetype scale 1
Lineweight ByLayer
Transparency 0
Text style Standard
Dimension style ISO-25
Multileader style Standard
Table style Standard
Annotation scale 1:1
Text height 2.5
Plot style ByColor
Plot style table None
Plot style attac... Model
Plot table type Not available
Model Space and Paper Space tabs
AutoCAD works with 2 different "spaces"
Model: think of it as where you edit your drawing/model
Paper/Layout: think of it as where you set up your drawing to print/present on paper
Regenerating model.
AutoCAD menu utilities loaded.
AutoCAD menu utilities loaded.
Command:
Model
Layout1
Layout2
4837.0999, 106.8958 , 0.0000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Model Space
Color ByLayer
Layer 0
Linetype By...
Linetype scale 1
Lineweight ByLayer
Transparency 0
Text style Standard
Dimension style ISO-25
Multileader style Standard
Table style Standard
Annotation scale 1:1
Text height 2.5
Plot style ByColor
Plot style table None
Plot style attac... Model
Plot table type Not available
View cube.
Navigation tool.
Allows you to view your drawing from different points of view (e.g. top view, front view etc).
For 2D drawings (e.g. architectural plans) this should be on top view.
Regenerating model.
AutoCAD menu utilities loaded.
AutoCAD menu utilities loaded.
Command:
Type a command
Model
Layout1
Layout2
4837.0999, 106.8958 , 0.0000

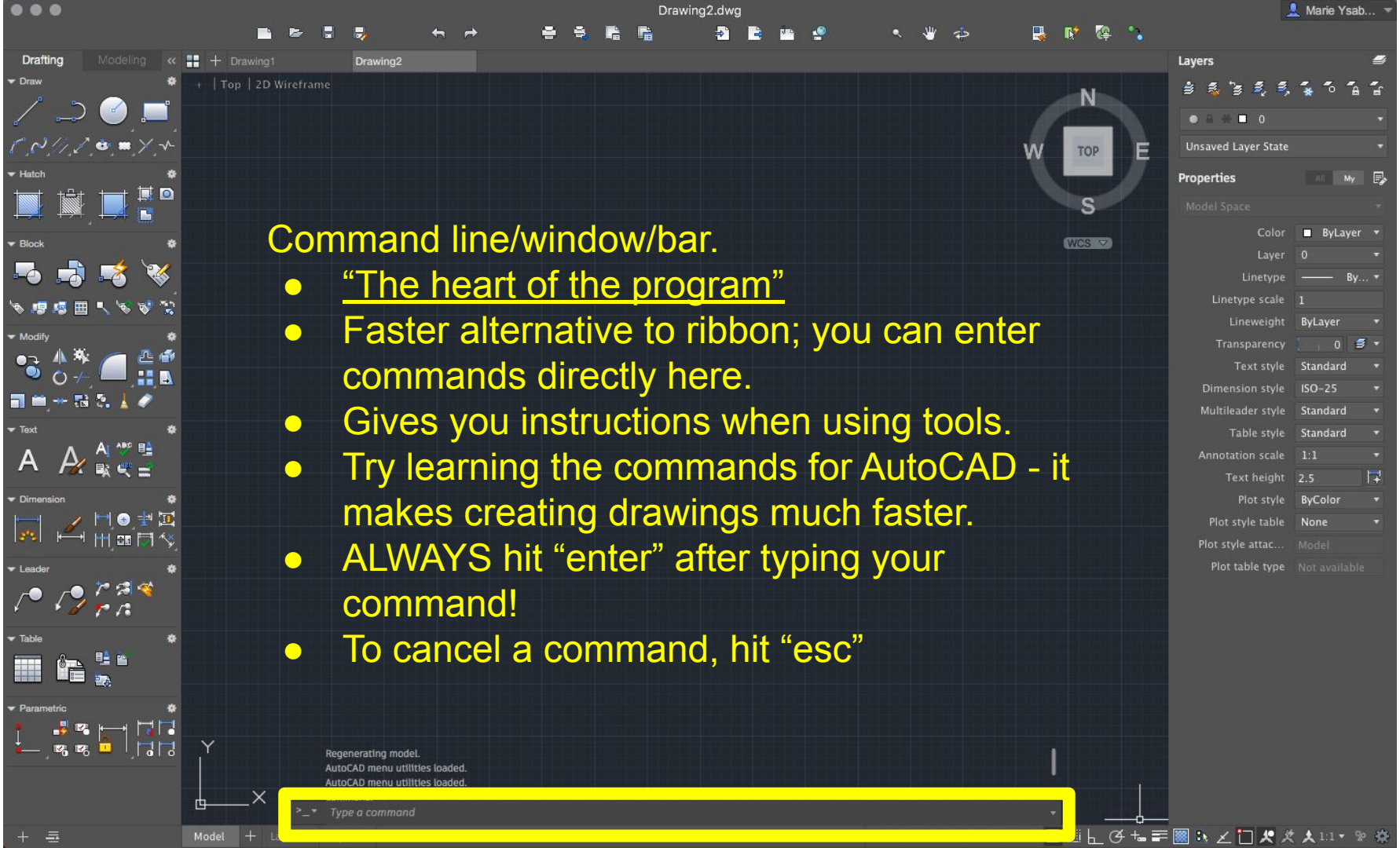
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Table style Standard
Annotation scale 1:1
Text height 2.5
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Plot style table None
Plot style attac... Model
Plot table type Not available
N
W
TOP
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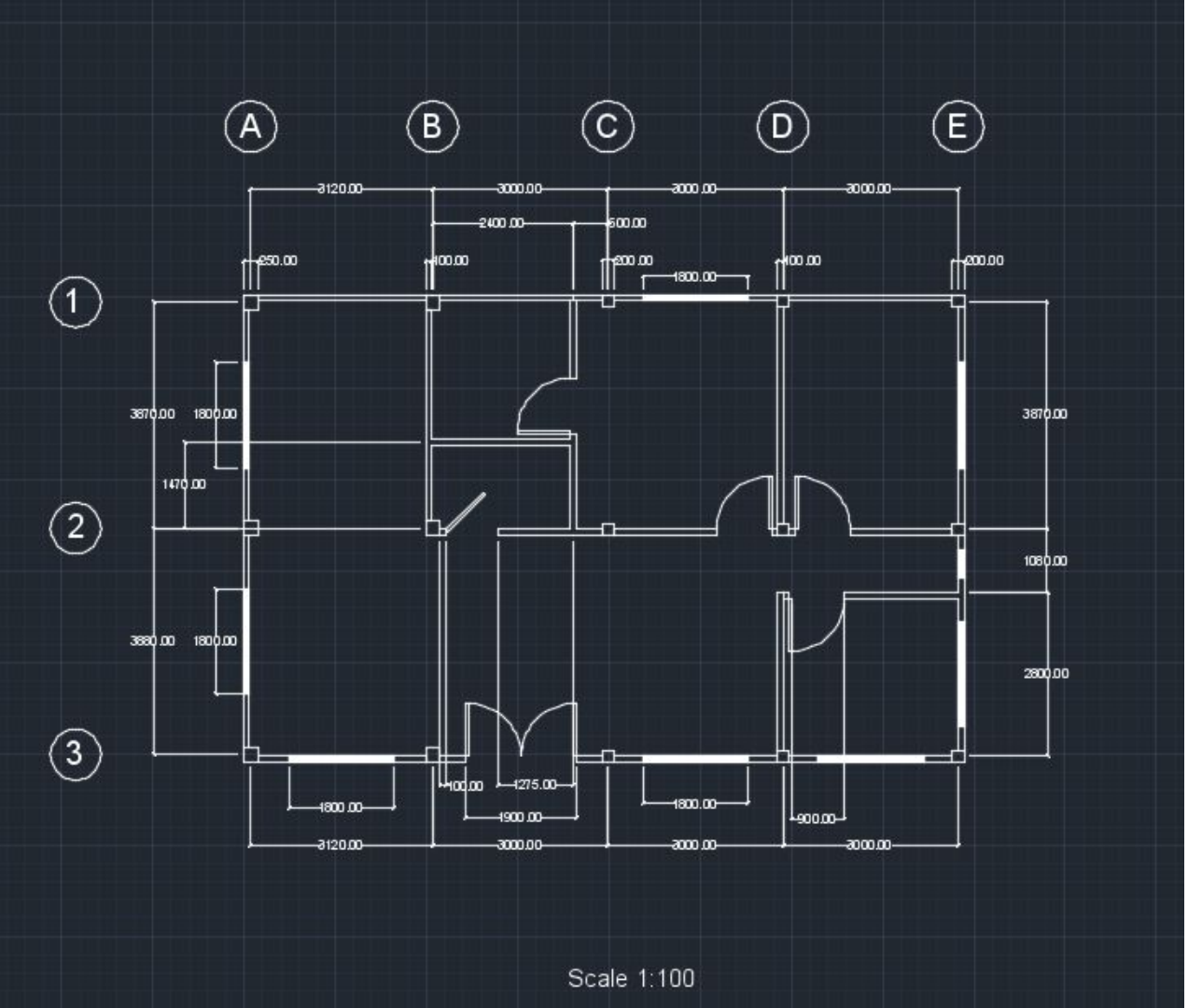
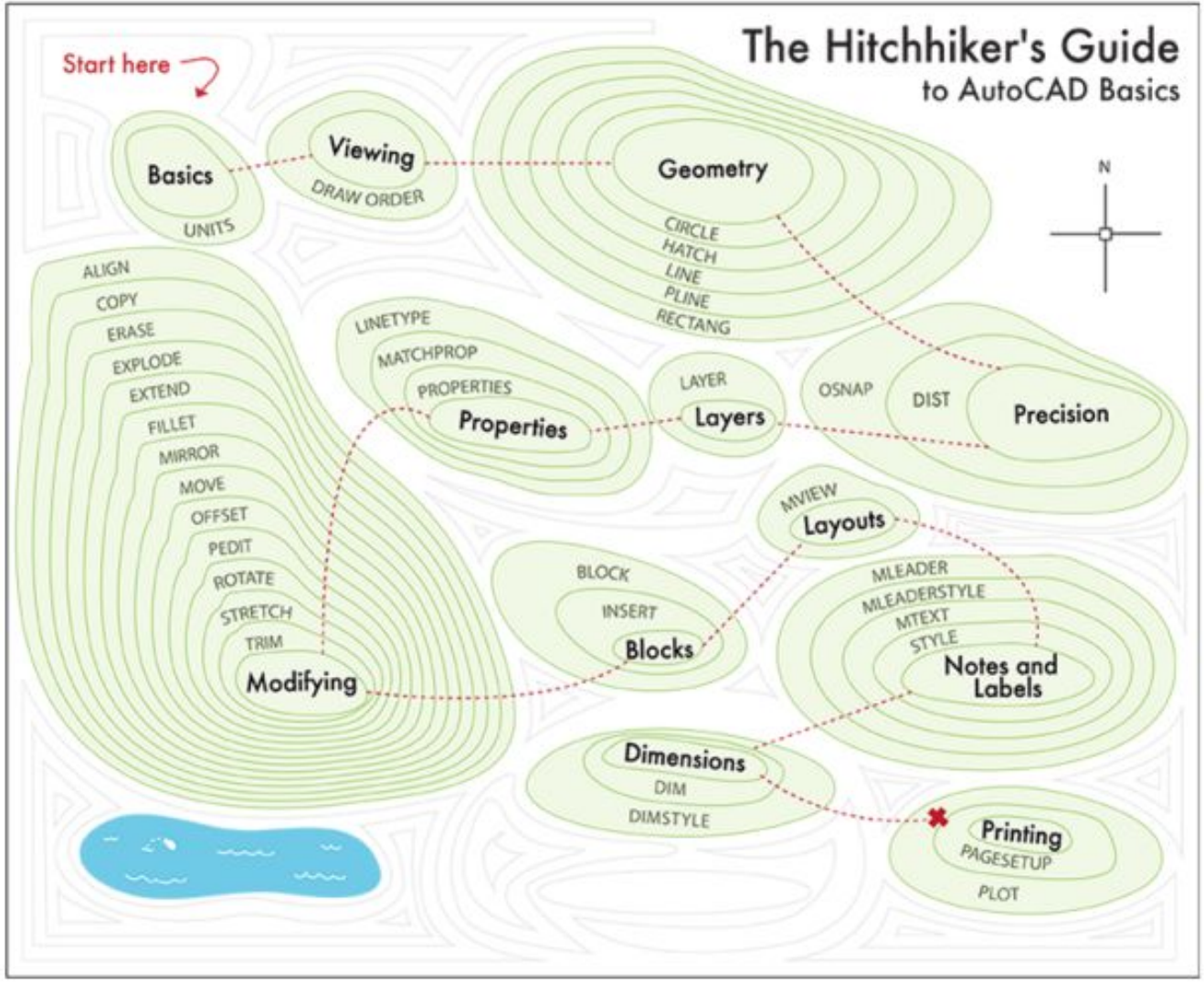
S
WCS
Command line/window/bar.
"The heart of the program"
Faster alternative to ribbon; you can enter commands directly here.
Gives you instructions when using tools.
Try learning the commands for AutoCAD - it makes creating drawings much faster.
ALWAYS hit "enter" after typing your command!
To cancel a command, hit "esc"
Regenerating model.
AutoCAD menu utilities loaded.
AutoCAD menu utilities loaded.
Type a command
Model



How to create an architectural plan/drawing on AutoCAD



One way to explain the process of creating a drawing on AutoCAD.

Source: The Hitchhiker's Guide to AutoCAD Basics, Autodesk Knowledge Network.

How to create drawings in AutoCAD

1) Basic setup
2) Viewing/navigation
3) Layers
4) Geometry
5) Precision
6) Additional features

1) Basic setup

- **Starting a new file:**

  *After launching AutoCAD, click **New/Start Drawing.***

- **Selecting a template**:

  *Choose **acadiso.dwt***

  - This template is for 2D drawings with metric units.

1) Basic setup (Cont.)

Units:

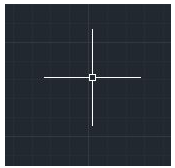
AutoCAD is used for **accurate drawings**, so when you first start a drawing, you must decide what the length of one unit represents.

Command: UNITS > *Enter > a window should pop up.*

Under 'Length': *Type = decimal, Precision = how many decimal places*

'Insertion scale': *Insertion scale units = typically mm for architectural drawings*

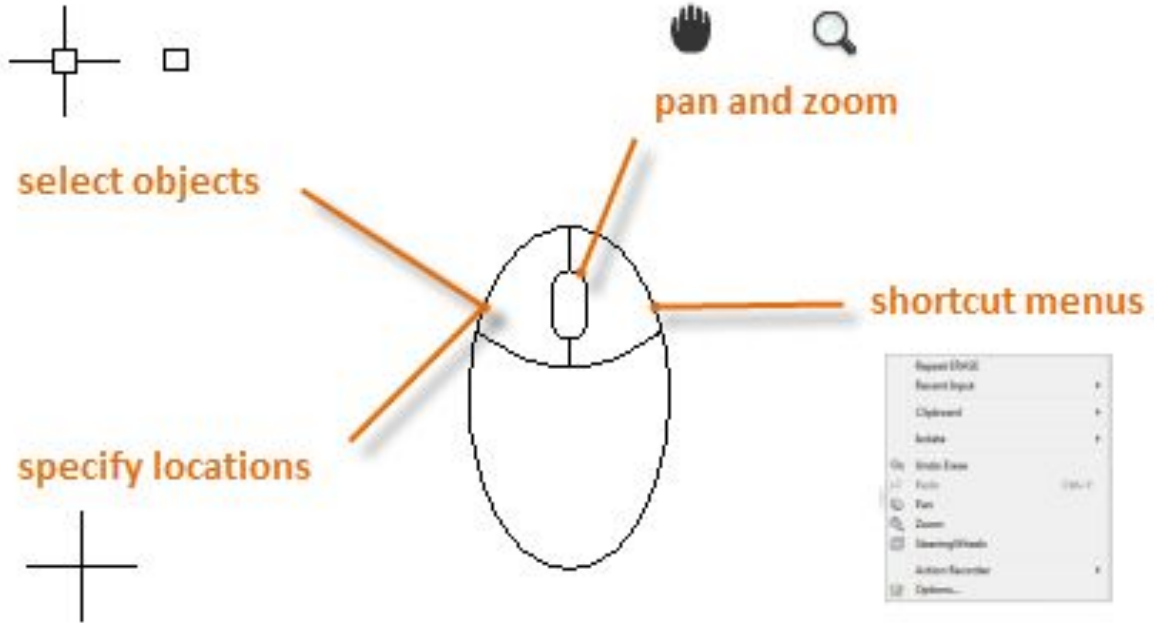
2) Viewing/navigation



- **Select**
  - *Default tool (see image to left)*
- **Zoom in/out**
  - *By rolling the wheel of your mouse*
  - *Find the zoom tool in the toolbar (see image to left)*
  - ***Command: ZOOM***

- **Zoom to the extents of your drawing** *by clicking the mouse wheel twice*
- **Pan (like dragging across your drawing)**
  - *by holding the wheel down and moving your mouse*
  - *Find the pan tool in the toolbar (see image to left)*
  - ***Command: PAN***

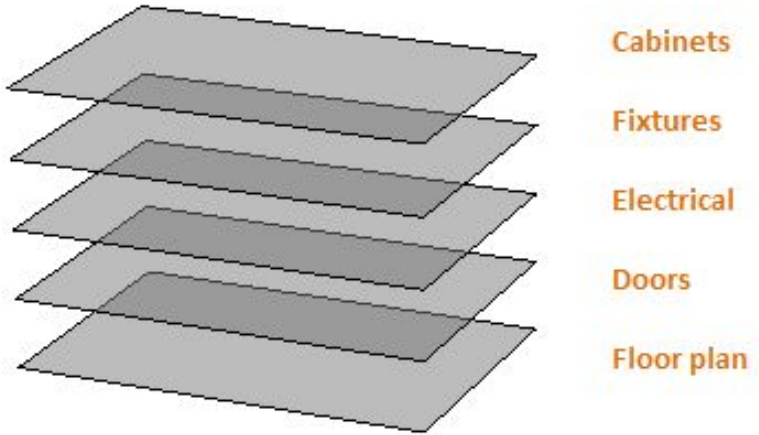
2) Viewing/navigation – The Mouse



- **Highly recommend using a mouse when using AutoCAD.**
- For first time users, learning on a desktop is generally easier.

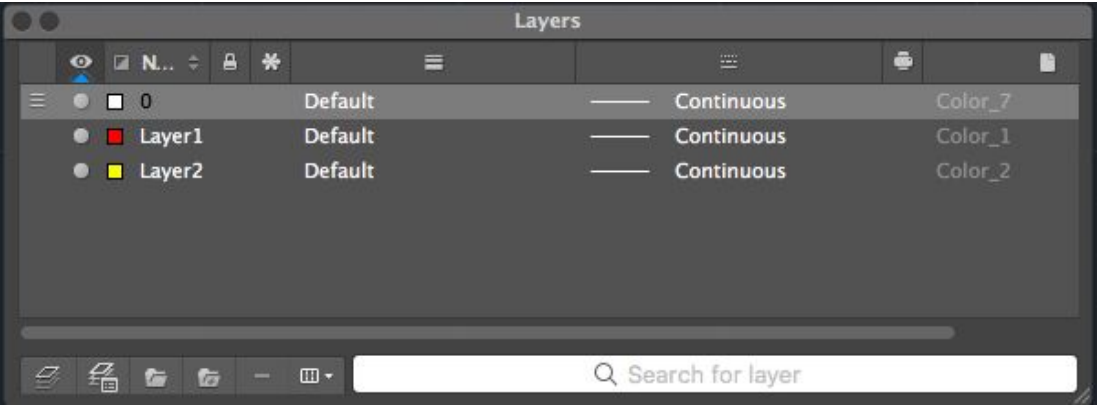
Source: Getting Started > Basics, Autodesk Knowledge Network.

3) Layers



- **Very important organisation tool**
- Organise your objects through layers.
- You can hide objects you don’t need - which is useful for visually complex designs.
- Think of the layers as clear plastic sheets (see diagram).

3) Layers



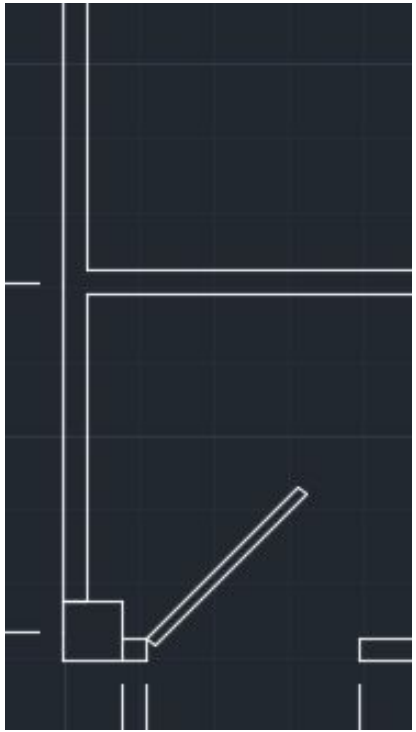
Above: Layer Properties Manager.

- To organise your layers, find **Layer Properties Manager.**
  - ***Command: LAYER or LA***
  - *Find the Layers panel.*
- You can assign each layer a colour, name, linetype, line thickness etc.

4) Geometry

- Architectural drawings use basic geometric objects.
- **Important basic geometric shapes for drawings:**
    - Line
    - Xline
    - Circle
    - Arc
    - Rectangles

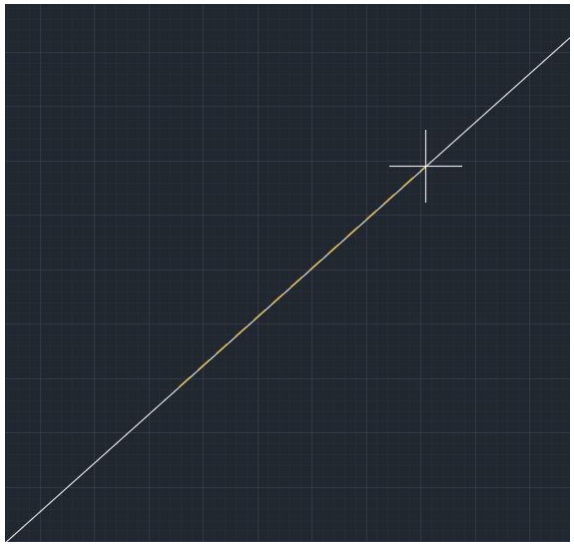
4) Geometry - Line



For creating walls, windows, columns, straight-edged objects.

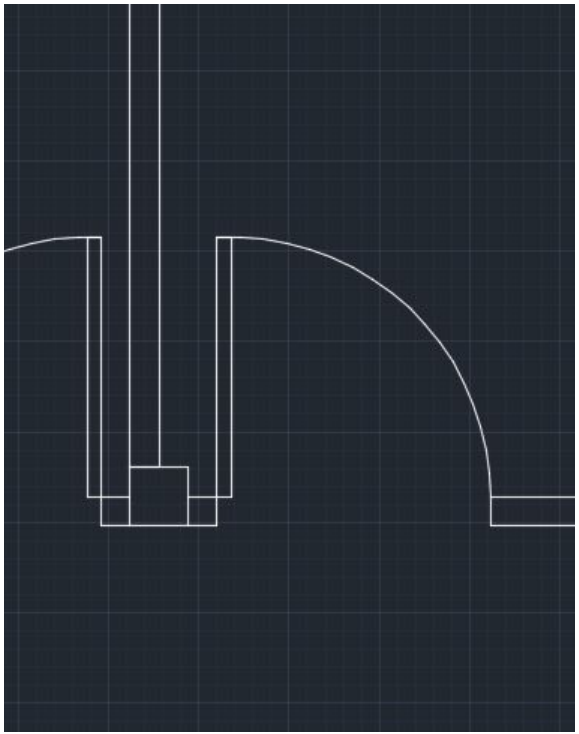
- **Single line:**
  - ***Command: LINE***
- **Multiple connected lines and polygons:**
  - ***Command: PLINE***

4) Geometry - Xline



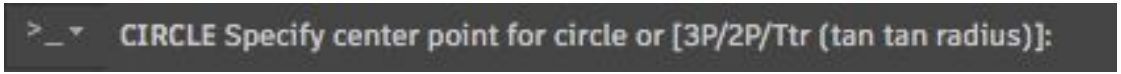
- Xlines are infinite lines
- Useful for creating construction and reference lines, and for trimming boundaries.
- ***Command: XL***
  - *Select two points to set Xline - follow command line instructions*

4) Geometry - Circle

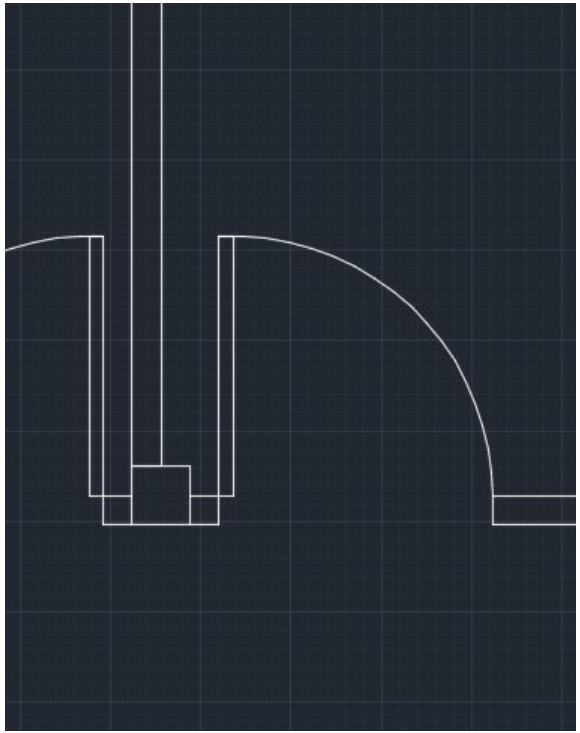


Useful for creating doors.

- ***Command: CIRCLE***
  - *Then follow instructions:*



4) Geometry - Arc

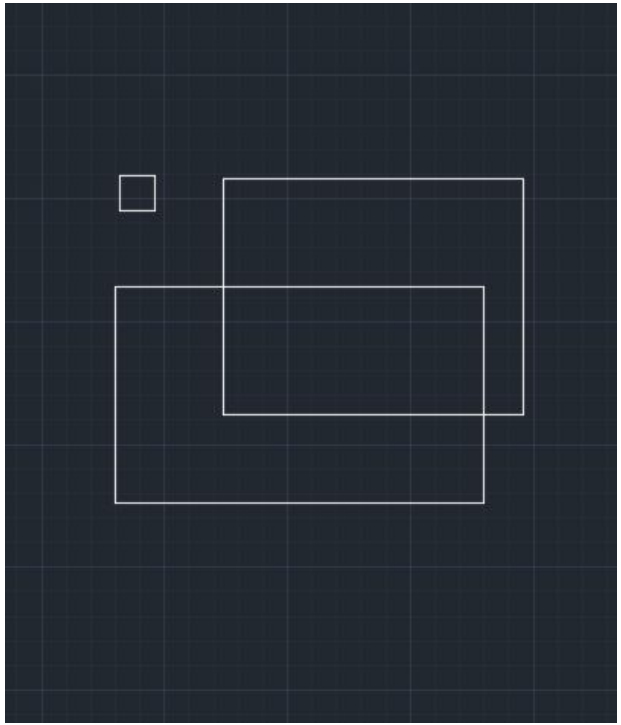


Also useful for creating doors.

- ***Command: ARC***
  - *Then follow instructions:*

```
>_ ARC Specify start point of arc or [Center]:
>_ ARC Specify second point of arc or [Center/End]:
>_ ARC Specify end point of arc:
```

4) Geometry - Rectangle



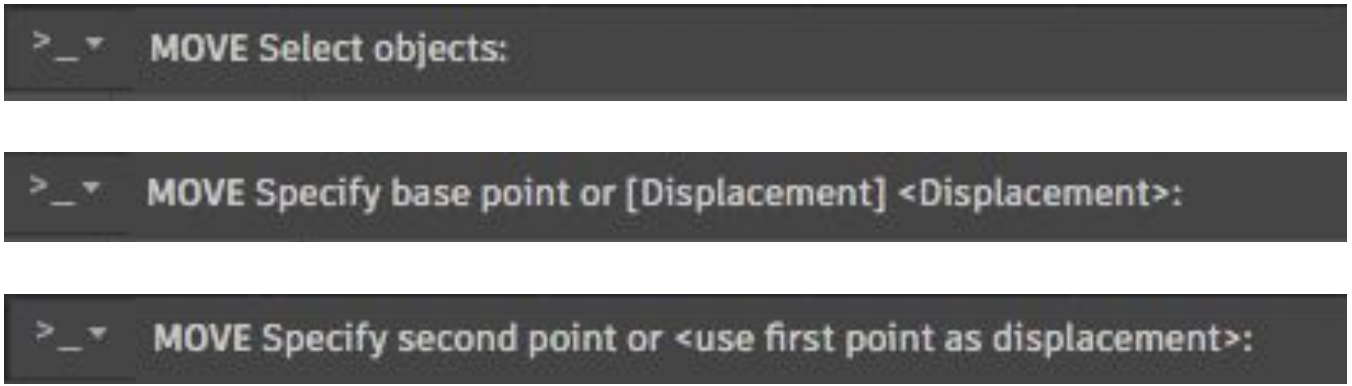
For creating boxes etc.

- ***Command: RECTANG***
- *Follow instructions*

```
>_ RECTANG Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]:
>_ RECTANG Specify other corner point or [Area/Dimensions/Rotation]:
```

4) Geometry – Moving objects

- To move objects, *type the* ***command MOVE.***
- The command line will give you the following instructions to follow.



4) Geometry – Copying objects

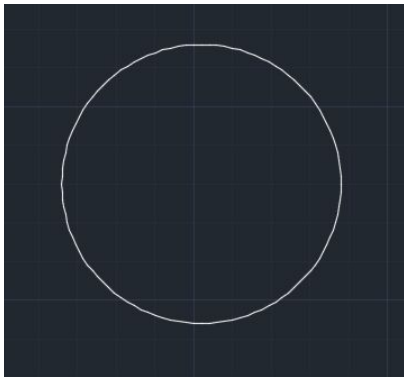
- To copy an object, ***command: COPY***
- To make a copy of an object <u>but at a certain distance from the original object</u>, *type the* ***command OFFSET.***
- Useful for making walls - to add thickness.
- The command line will give you the following instructions to follow:
    - Specify offset distance.
    - Select object you want to offset.

4) Geometry – Modifying objects

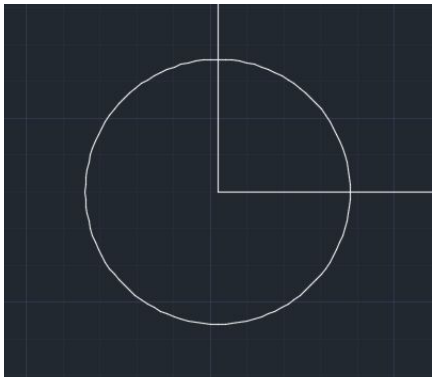
- To modify an object, you need to use more tools.
- ***Command: TRIM***
    - Trims objects.
    - Think of TRIM as using an object to trim or slice parts of another object.
    - Useful for making circles into doors.

4) Geometry – Modifying objects

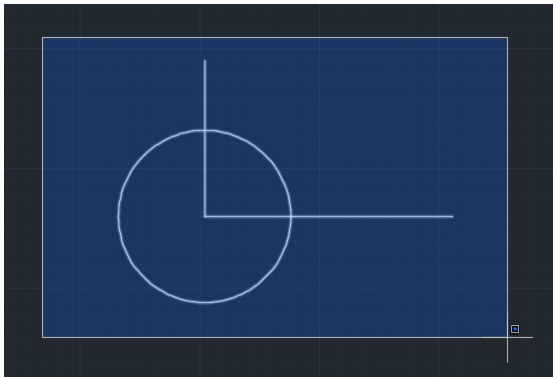
- Using ***TRIM*** to make a door:



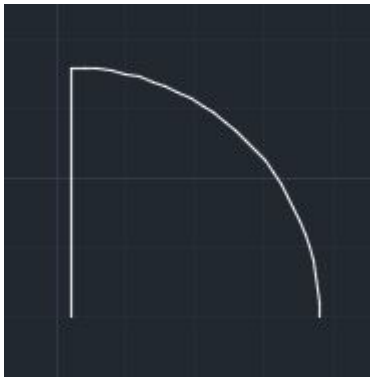
Create a circle.



Add lines from centre of circle.



Select all objects.

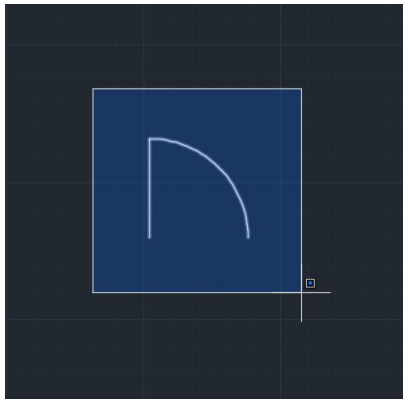


Select parts you want to delete.

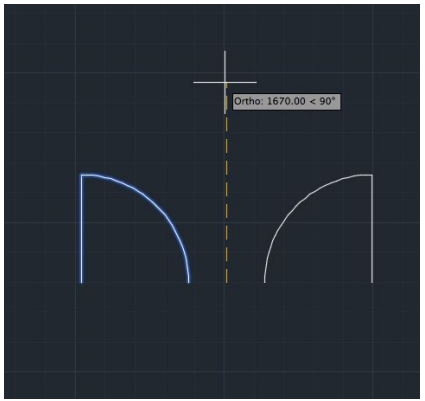
4) Geometry – Modifying objects

- ***Command: MIRROR***
  - Creates a mirrored copy of an object.

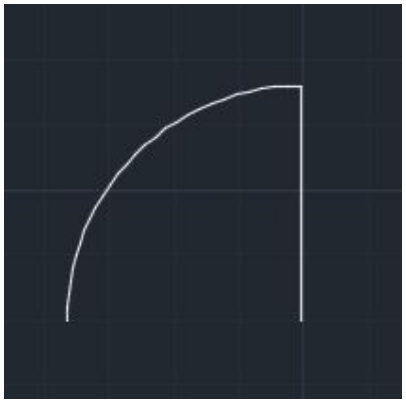
Identify object.



Select object.



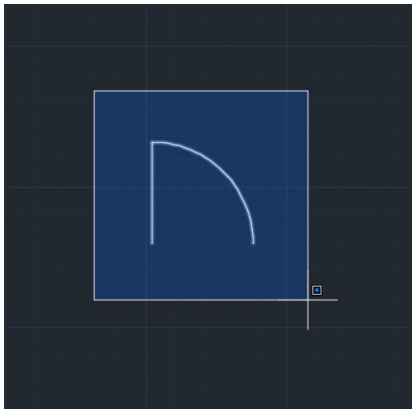
Identify mirror line.



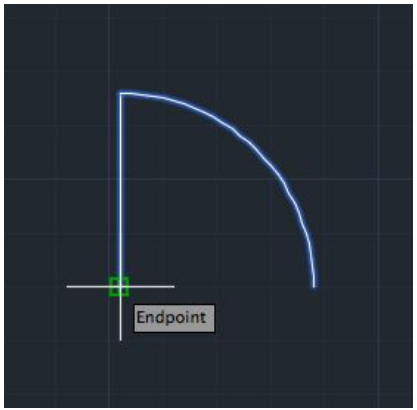
Mirrored object.

4) Geometry – Modifying objects

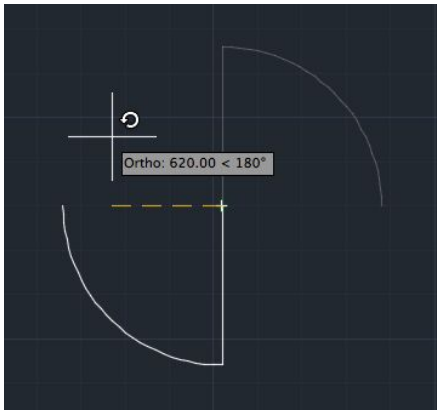
- ***Command: ROTATE***
  - Rotates an object.



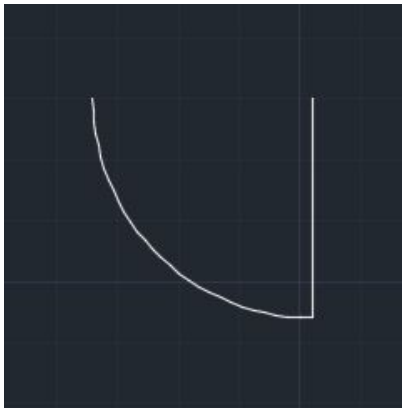
Select object.



Select base point.



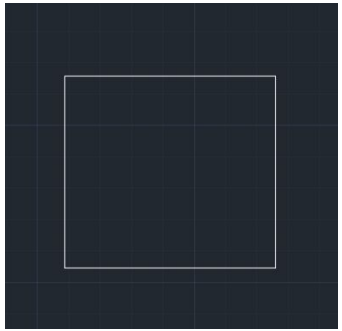
Decide rotation.



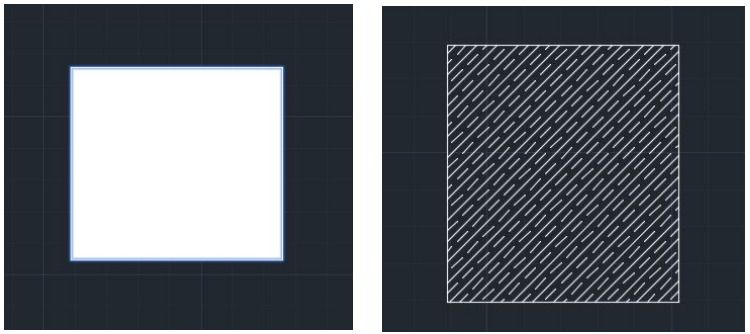
Rotated object.

4) Geometry – Modifying objects

- ***Command: HATCH***
  - “Hatches” are used in architectural drawings to represent solid masses and materials to be used.
  - Think of *hatch* as adding texture or fill inside a shape.



Without hatch pattern



With fill / hatch pattern

5) Precision

- Accuracy and precision is required for architectural drawings.
- **A line may look like it is at 90°, but it could actually be at 89.7°!**
- To make sure your drawings are precise, use precision tools.

5) Precision – Tools

- **Polar tracking:** Guides the movement of your cursor in certain directions (horizontal 0° or vertical 90°)
    - *Status bar:* 
- **Locking angles:** Draw lines at a specific angle
    - ***Command: LINE*** *> type the angle you want "<ANGLE"* ***e.g. <45***
    - *<u>OR</u> lock lines at 0° or 90° with* ***Command: ORTHO***
- **Object snaps:** Automatically connect your line to particular points on other objects.
    - *Status bar:* 
    - ***Command: OSNAP***
    - *Hit F3 button*

5) Precision – Tools

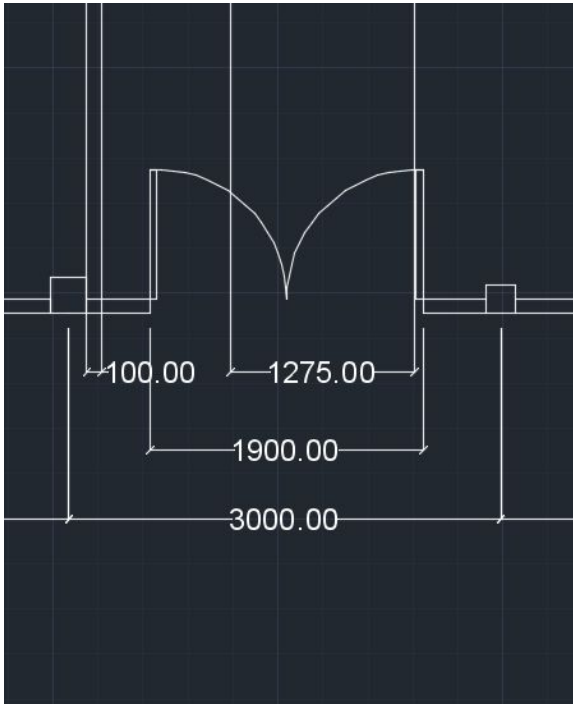
- It is also important to check the accuracy of your objects and lines.
- To do this, use the ***command: DIST***
  - Measures the distance between two points
  - *Follow instructions in the command bar*

6) Additional features

By this point you would have created all the basic shapes on your drawing. However, architectural drawings need more features. You can add these by using a variety of tools, which you can find in the ribbon or by using **commands**:

- **Properties:** colour, line type, line weight ***(Command: PROP)***
- **Blocks:** insert downloadable symbols and details (e.g. trees, beds) into your drawings
- **Layout:** arrange your drawing to print ***(Layout tab bottom of screen)***
- **Notes and labels:** add text, callouts, annotations ***(Command: TEXT)***
- **Dimensions:** show the length of a line

6) Additional feature – Dimensions



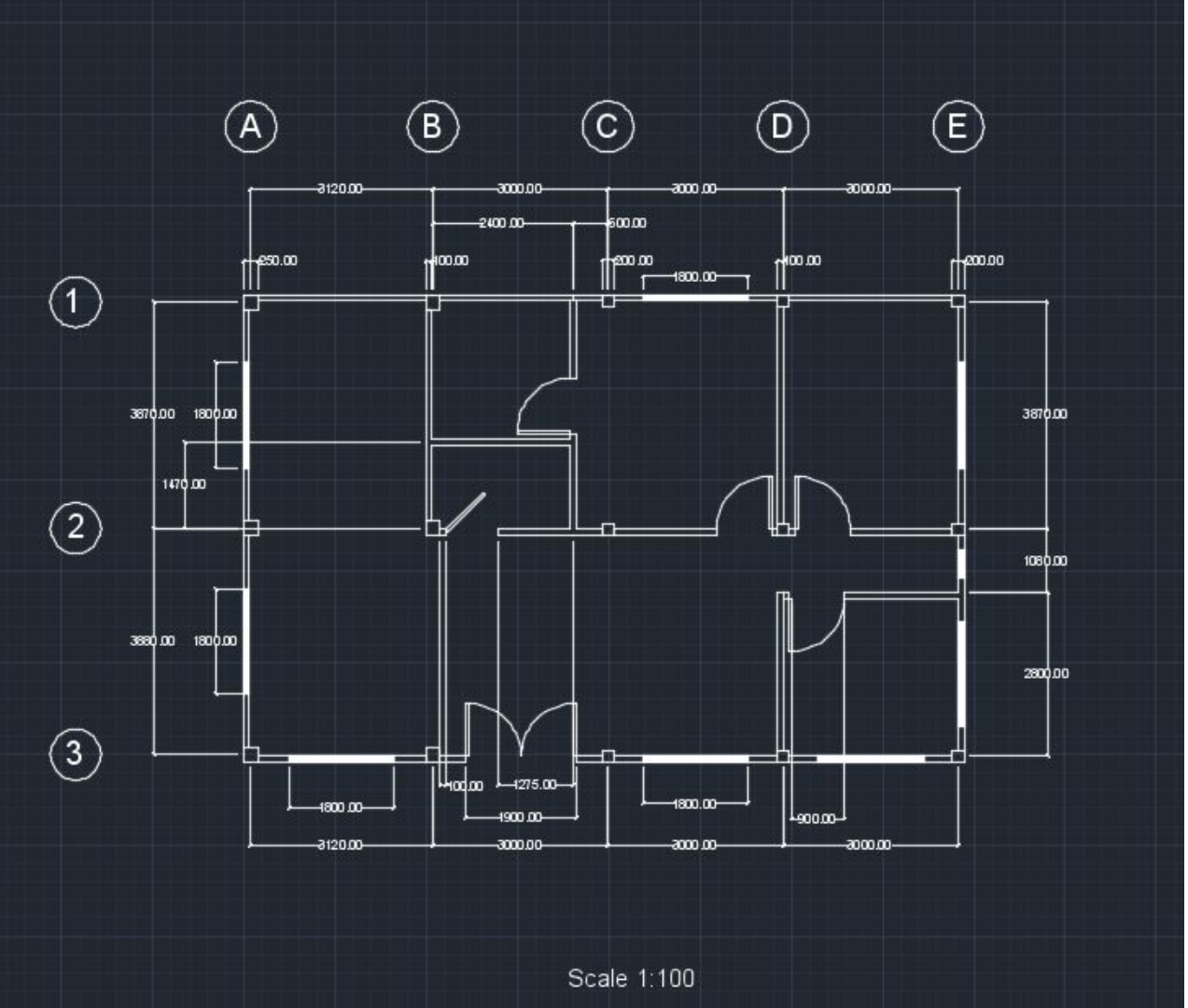
All architectural drawings should have dimensions. **Dimensions** show exact measurements of lines.

- ***Command: DIM***
  - *Select the two endpoints of the line which will be measured.*
- ***Command: DIMSTYLE***
  - *Allows you to edit the style of dimensions: font, size, placement etc.*

What should you have on your architectural drawing?

Once you have finished creating your drawing on AutoCAD, it should typically have the following features:

- ❑ Accurate, scaled objects and lines
- ❑ Dimensions
- ❑ Hatches
- ❑ Labels
- ❑ Scale
- ❑ Title



An example of an architectural plan on AutoCAD

Recap: AutoCAD interface

FEATURE	DESCRIPTION
Command bar	“The heart of the program”
Status Bar	Displays commonly used tools, especially **precision tools**
Model & Layout/Paper	2 spaces that AutoCAD works in
Ribbon	Series of toolbars, panels containing the tools we use

Recap: AutoCAD commands

COMMAND	DESCRIPTION
UNITS	Sets up units of measurement for the drawing
HATCH	Adds texture/fill inside an object/shape
LAYER / LA	Opens **Layer Properties Manager.**
DIMSTYLE	To set the dimension style; font, size, etc.
DIST	Measures distance between two points

Recap: AutoCAD commands

COMMAND	DESCRIPTION
OFFSET	Makes a copy of an object at a certain distance from the original object.
ORTHO	Locks lines at 0° or 90°
OSNAP	Automatically connect your line to particular points on other objects.
PAN	Navigation tool; like dragging across your drawing.

Tips & how to master AutoCAD

- Practice makes perfect.
- Follow tutorials while simultaneously working on AutoCAD.
- The command line explains what to do – follow its instructions.
- **LEARN THE COMMANDS!**

Accessing AutoCAD

- AutoCAD is available on all the computers in the ArchPlan building; studios, Level 5 labs etc.
- UoA students can also download AutoCAD for free.
- **How to download AutoCAD:**
  - https://www.autodesk.com/education/free-software/autocad
  - Sign in using your University of Auckland email.
  - Free for 3 years.
  - Can be downloaded on up to 2 devices.

More resources

- For more help, here are some helpful links:
  - https://knowledge.autodesk.com/support/autocad
  - **The Hitchhiker's Guide to AutoCAD Basics ⇒**
  - **https://knowledge.autodesk.com/support/autocad/getting-started/caas/CloudHelp/cloudhelp/2018/ENU/AutoCAD-Core/files/GUID-2AA12FC5-FBB2-4ABE-9024-90D41FEB1AC3-htm.html?v=2018**
- For a list of AutoCAD commands/shortcuts:
  - https://www.autodesk.com/shortcuts/autocad
  - https://damassets.autodesk.net/content/dam/autodesk/www/shortcuts/autocad/AutoCAD-Shortcuts-Guide-Autodesk.pdf
- **For helpful AutoCAD tutorials:**
  - **https://www.lynda.com/**
  - AutoCAD Tips and Tricks: https://www.lynda.com/AutoCAD-tutorials/AutoCAD-Tips-Tricks/496946-2.html
- **Timelapse: creating an AutoCAD floor plan**
  - https://www.youtube.com/watch?v=YsQXbMjfKRE (13 mins)
  - https://www.youtube.com/watch?v=2_5pH1GFGAo (3 mins)

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