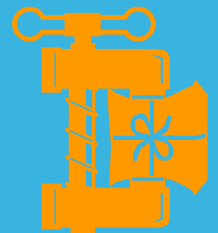


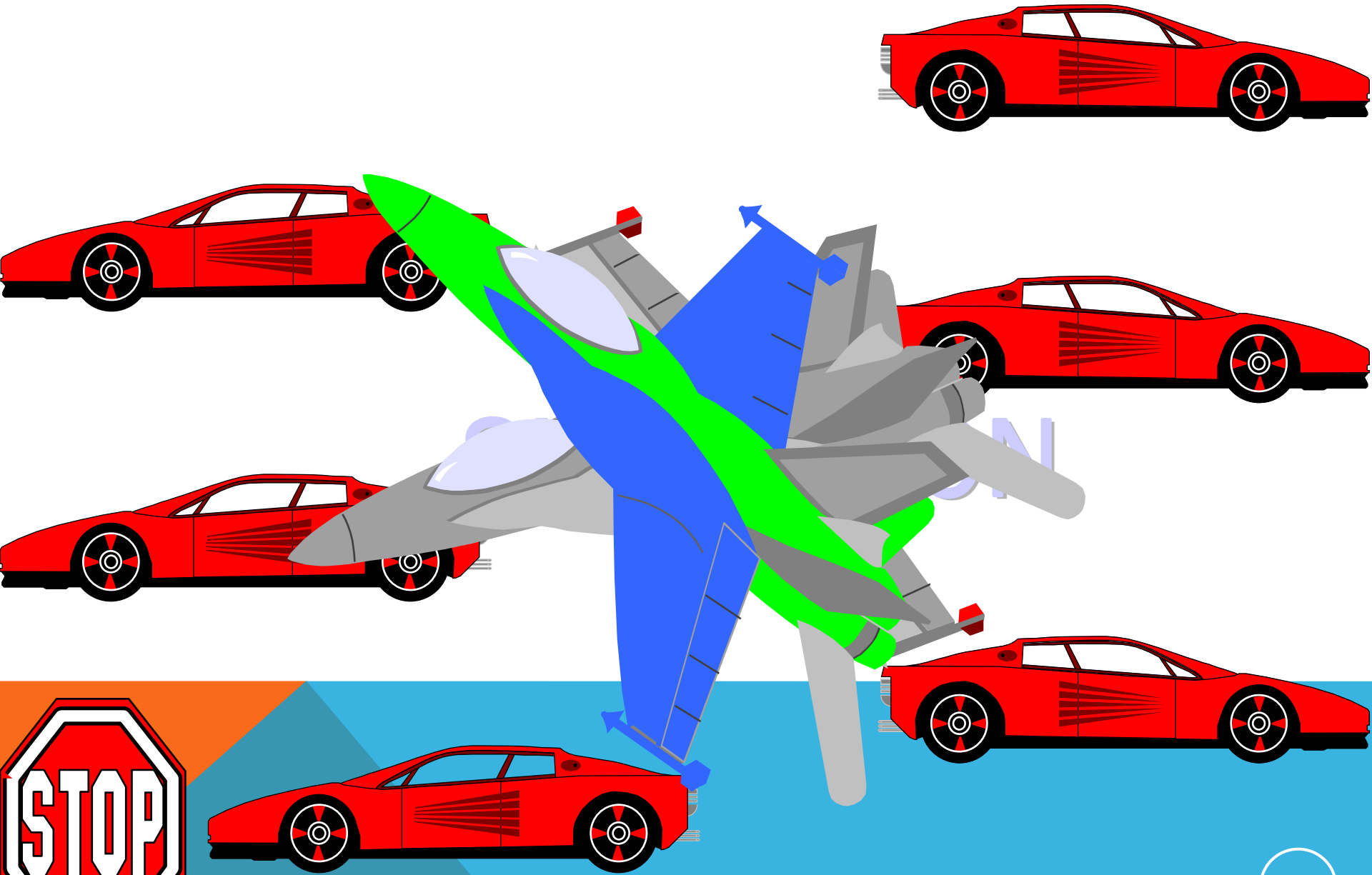
AutoCAD

Engr. Ali Haider

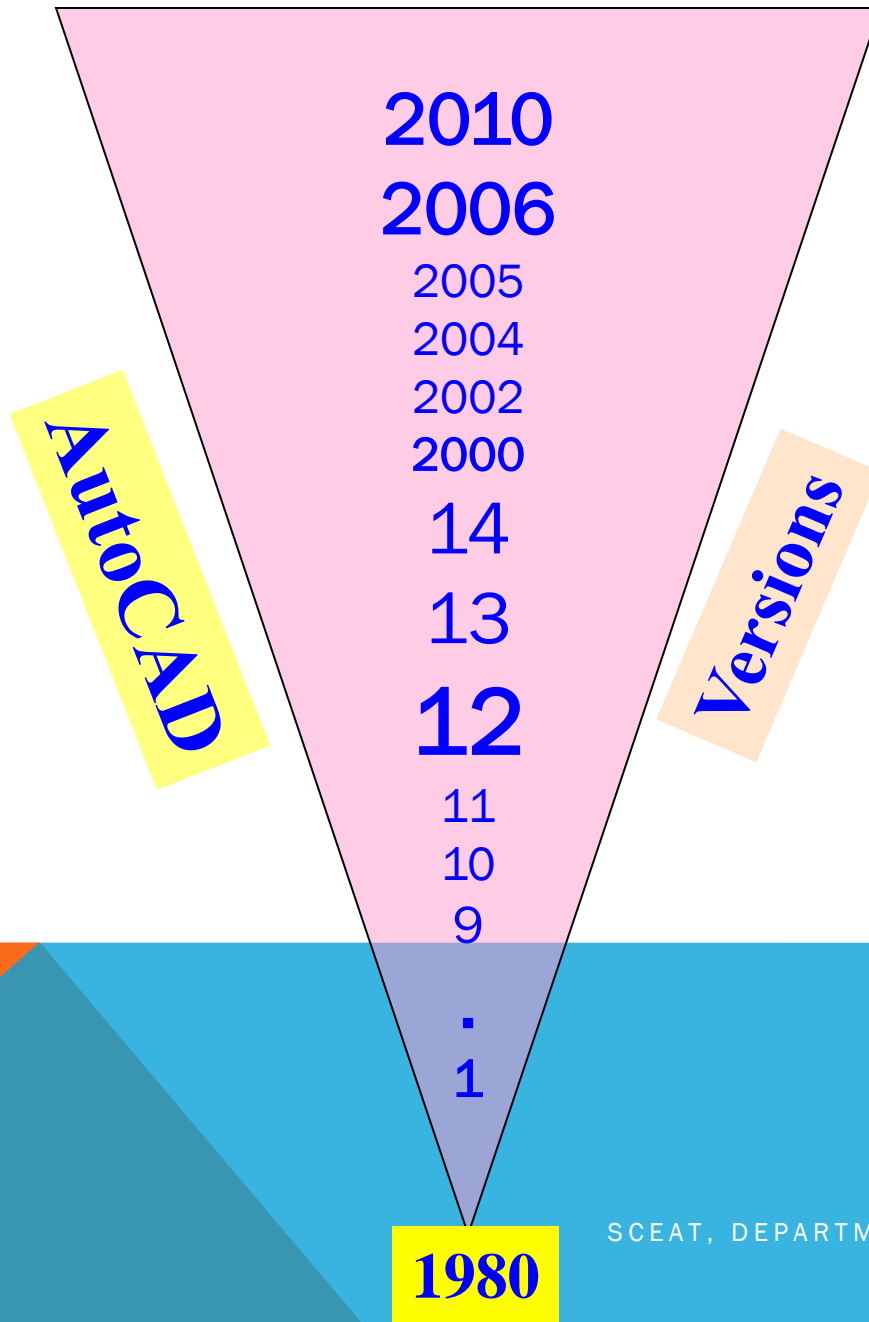


**Swedish College of Engineering
& Technology, Wah Cantt**









Drawing Basics

- The most **important difference** between CAD drawings and other computer graphics is the way the drawing is saved and used.
- Computer images (non CAD images) are **bitmaps**. Bitmaps are a grid made up of thousands of dots. Bitmap images lend themselves to computers because the monitor screens and printers already talk the language of bitmaps, *a map made up of tiny bits*.
- The CAD drawing, however, is like a pencil drawing made up of lots of lines. This is a **vector image**. Each line in the vector drawing is a **mathematical curve**.
- When you click the mouse to start and finish a line, the resulting line becomes a **mathematical formula** with a point of beginning, an end point, a thickness, a color, and a style (dashed, solid, dotted etc).

INTRODUCTION

- AutoCAD is a general purpose **computer aided drafting / design** application program.
- It was initially developed in the early 1980's by **Autodesk** Inc., California.
- AutoCAD is an **interactive** drawing system designed to permit a user to construct or edit a drawing on a graphics display screen.
- It is, by many estimations, the largest program in terms of **computer code** ever written for a personal computer.
- AutoCAD is a relatively **easy program** to use after you understand a **few basics**.
- AutoCAD provides a set of **entities** for constructing your drawing. An entity is a drawing element such as a line, circle, or text string.

- Up until **Release 10**, AutoCAD was essentially a two-dimensional **(2D)** drawing system.
- Following that release, it now supports a full three-dimensional **(3D)** database.
- This has had the effect that the features of AutoCAD that support two-dimensional drawing are fully self-contained and can still be used as a **2D system** without being concerned with its 3D features.
- From **release 11** onwards, AutoCAD has provided an extension package called **AME** (Advanced Modeling Extension) which provides 3D solid modeling capabilities - these allow you to form complex solid objects by adding, subtracting and intersecting a set of simple solid primitives (such as, boxes, cone, cylinders, spheres, etc.)
- In **this course** we will focus on the 2D drafting aspects of AutoCAD since that better reflects the way in which this system is generally used in practice at the present time.

INTRODUCTION TO AUTOCAD (CONT'D)

AutoCAD is a CAD (Computer Aided Design or Computer Aided Drafting) software for 2D and 3D design and drafting.

With AutoCAD you can:

- Quickly create designs**
- Improved quality over hand drafting**
- Can be customized to suit the individual's needs**
- Teaches a marketable skill**

The AutoCAD Interface

- Menu bar*** Contains the menus
- Toolbars*** Contain tools, represented by icons, that start commands
- Cursor menu*** Display a menu at cursor location.
- Crosshairs*** Controlled by pointing device (a mouse)

Drawing window

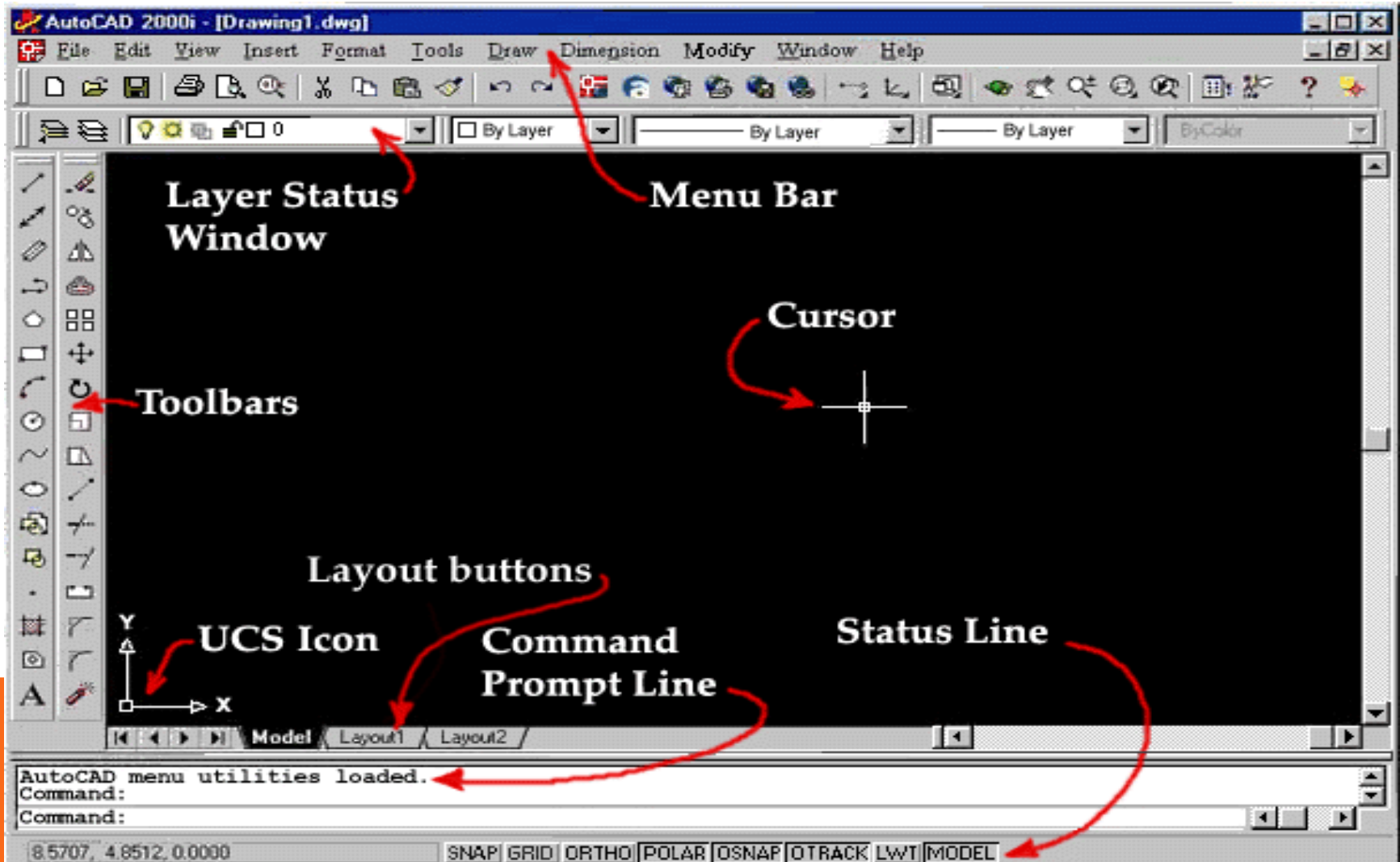
Where AutoCAD displays your drawing and where you work on your drawing

Command window

Where commands are entered from keyboard and AutoCAD displays prompts and messages.

- Text window*** Displays a history of the commands and options you have entered.
- Status bar*** Displays the coordinate location of your crosshairs and the current setting of grid, snap, and other drawing aids.

INTRODUCTION TO AUTOCAD INTERFACE



What's in an AutoCAD drawing

- An AutoCAD drawing is made up of **entities**.
- These can be either simple **graphic primitives** (such as lines, arcs, circles, text, and so on) or blocks (which are groups of entities).
- The graphic primitives are defined **geometrically** in terms of the normal Cartesian coordinate system (right-handed system with positive X-axis to the right, positive Y-axis up the screen and positive Z-axis coming out of the screen towards the user).
- For **example**, lines are defined by their end- point coordinates (x, y and z), while circles are defined by their centre coordinates and radius.
- Each entity also has **certain attributes** associated with it, such as line style, text font or colour.

Entities (Objects)

- Every object within an AutoCAD drawing is composed of one or more drawing **entities**.
- **Entities** are the basic parts from which all complex objects within a drawing are created.
- Each AutoCAD **drawing command** creates a specific entity type.
- The **modifying/editing commands** simply manipulate the entities that you have previously placed in the drawing, scaling them, copying them, or combining them to create a finished drawing.
- The AutoCAD program works with **17 different** entity types.
- All **objects** in a drawing consist of combinations of one or more of the following entities:
 - ◆ Arcs
 - ◆ Circles
 - ◆ Text
 - ◆ Points
 - ◆ Blocks
 - ◆ Attributes
 - ◆ Lines
 - ◆ Polylines
 - ◆ 3D
 - etc

AutoCAD Commands

Drawing Commands: Creates a specific entity type.

Point, Line, Circle, Arc, Polyline, Donut, Ellipse, Polygon, Rectangle, Text etc.

Modifying Commands: Manipulates the entities.

Select, Erase, Copy, Move, Undo, Rotate, Change, Scale, Break, Trim, Fillet, Chamfer, Offset etc.

System Commands:

New, Open, Save, Saveas, Plot, Config, About, Quit, Help, Shell, List, Status, Area, Cal, Setvar etc.

Command Entry

- AutoCAD allows you to have access to a large number of commands. The **general rule** is that you will use 20% of the commands 80% of the time.
- You can **enter** a command in any of the following ways:
 1. Menu bar
 2. Toolbars
 3. Keyboard
- To **enter** a command from the **keyboard**, simply type the command name and press either **spacebar**, **Enter**, **Tab** or the enter key on **mouse**.
- The important thing to remember is that AutoCAD will expect you give it information in a very **particular order**.
- The **command line** tells you what information AutoCAD requires to continue.

System Variables

- System variables are **internal** AutoCAD **variables** that control individual settings, modes, and parameters within AutoCAD.
- System variables have **abbreviated names** that are usually 6–10 characters long.
- Many system variables have **simple** on or off settings. For example, for GRIDMODE, entering 0, off, or false turns the grid off; entering 1, on, or true turns the grid on.
- You generally change system variables through **dialog box** entries. However, you can change system variables directly on the command line, which is quicker in certain situations.
- The **SETVAR** command is a means to observe and change the system variable values directly from AutoCAD's Command prompt.

WORKSPACE

- **It is the drafting board of AutoCAD where all the drawing and drafting activities are done.**
- **Its also called Model space**
- **Nice thing about this black portion is that it is infinite in size. That's why it eliminate the use of scales in our drawings (as opposed to limited space on papers or sheets)**

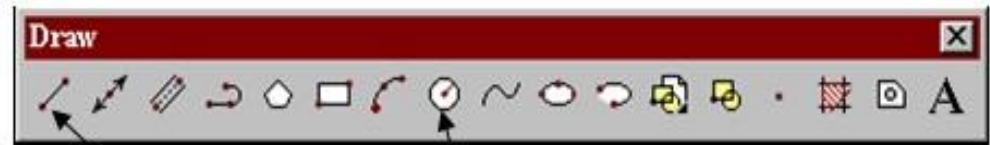
MENUS

- **To launch AutoCAD commands**
- **Similar to other windows applications**

TOOLBARS

ANOTHER WAY OF ENTERING COMMANDS

- Gives us the ability to customize our interface according to our needs
- It is the collection of icons where each of the icons represent a specific AutoCAD command
- Gives us convenient access to the commands we use most
- Toolbars can be moved wherever the user wants it to be, so that to assist us in drawings
- Toolbars can be turned on or off



Line

Circle



Erase

Trim

The **“Erase”** tool show a pencil eraser icon and is used to delete the entire entity. Make sure that you select the icon, then select the object, and hit **“Enter”** to delete the entity or entities.

The **“Trim”** works similar to Graphite. First select the tool, then select the boundary, hit **“Enter”** and select the part of the entity you wish to remove.

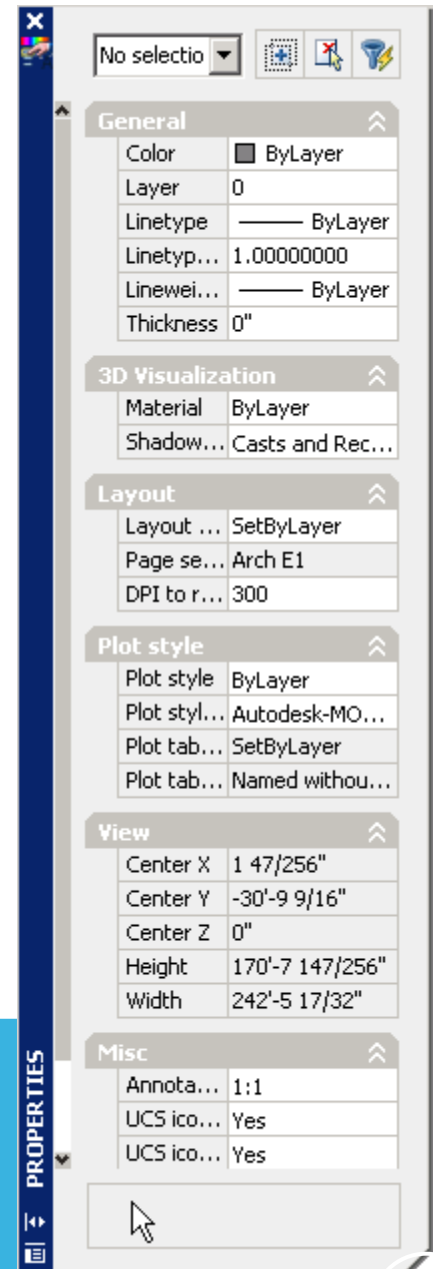
COMMAND LINE

ANOTHER WAY OF ENTERING COMMANDS

- **In command line everything must be entered through the keyboard**
- **After launching a command through any means command line will prompt you what next step should be taken to complete the command**

PALETTES

- A dialog box of features
- They combine the functionality of a dialog box with the flexibility of a toolbar



HOW TO ENTER COMMANDS

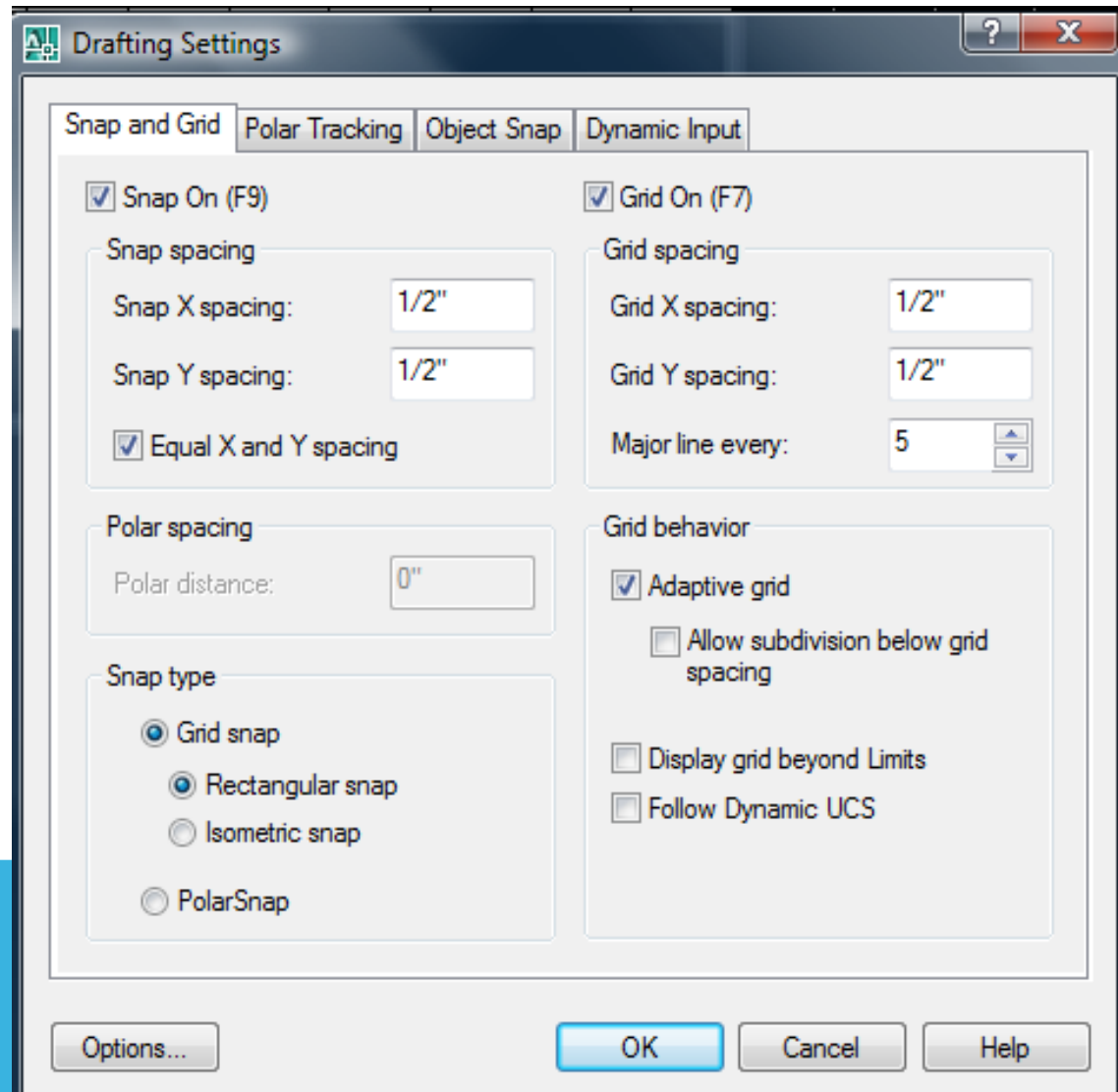
- **By clicking Menu item**
- **By clicking Toolbar icon**
- **By typing in Command line**

STATUS BAR

- **Provides information about the current status of our drawing, interface and our settings.**
- **At status bar you can see coordinates (location) of the cursor in the model space.**
- **The tab like buttons represents mode settings**

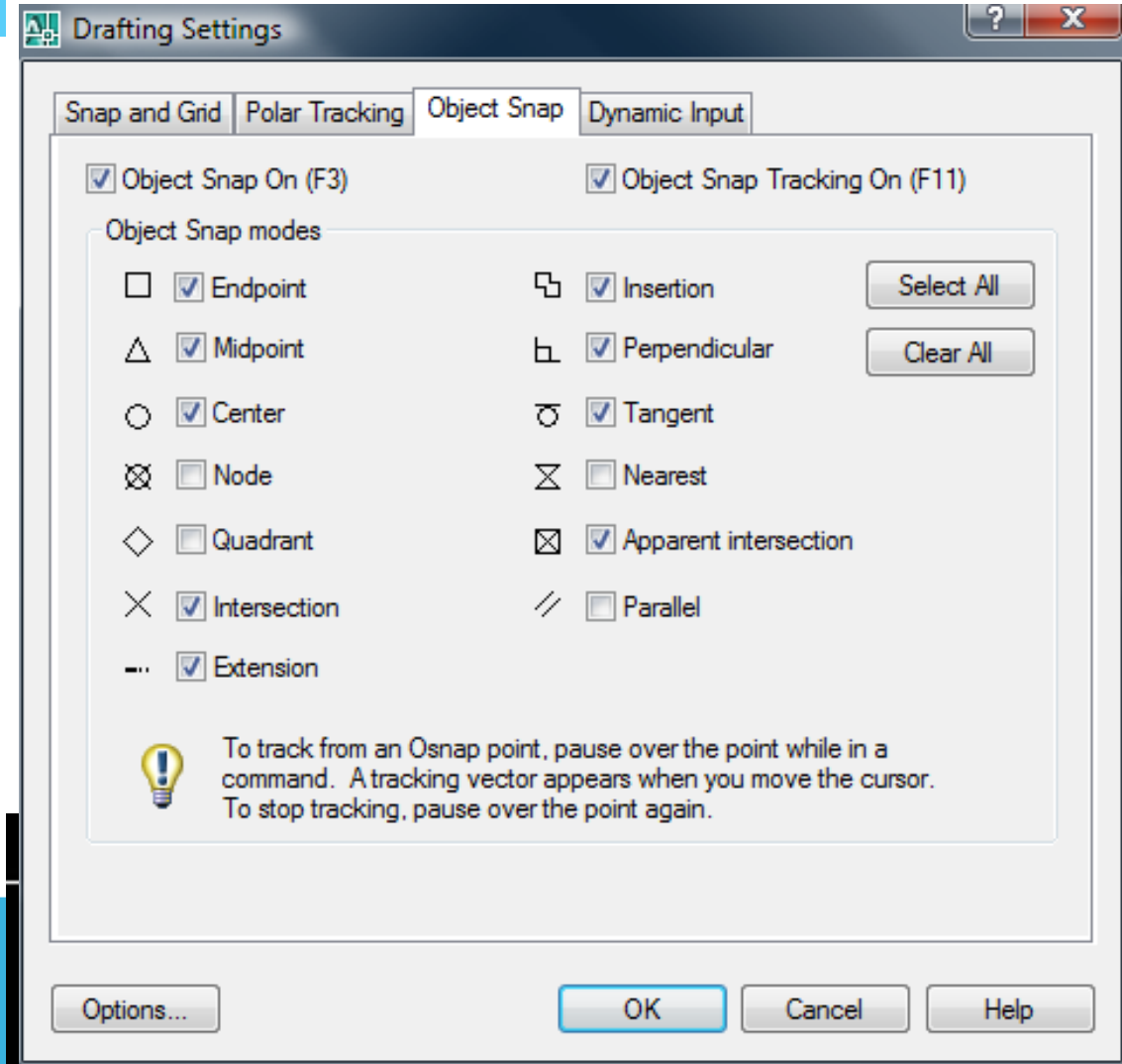
SNAP & GRID

- **Snap – Invisible Grid** that restricts the location of the cursor to predefined increments
- **Grid is a regular pattern of visible dots** that helps you estimate distances



OBJECT SNAP

- Activated by “OSNAP” button
- Allows you to snap to “key points” on existing lines and objects
 - i.e. midpoint, endpoint, center, tangent etc...

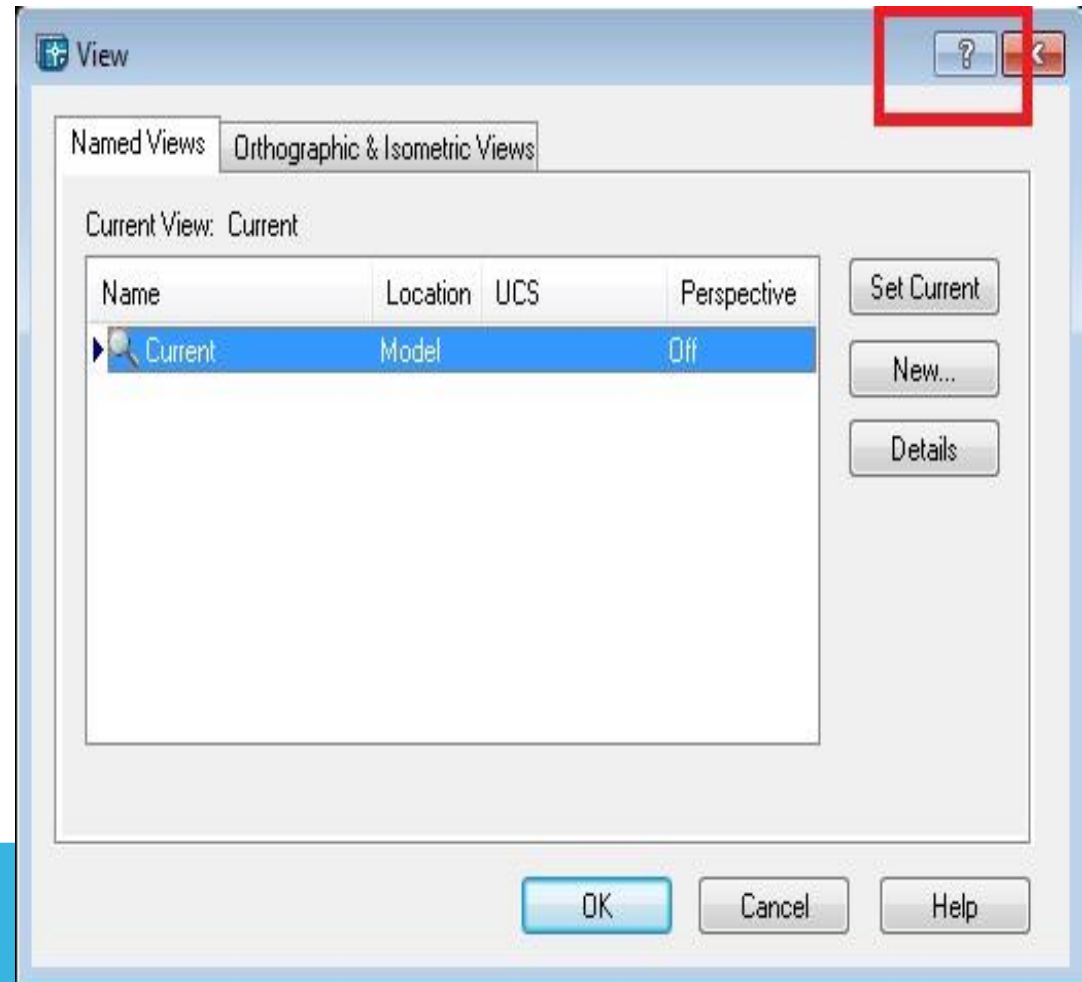


OPTIONS & SETTINGS

- **AutoCAD is a very flexible application**
- **You can change the name of the toolbars, menus, palettes, and even shortcuts of our own choice can be activated.**
- **The popup menu that comes up with the right click can also be customized.**

HOW TO USE AUTOCAD HELP

- **The nice feature of AutoCAD help is that it is CONTEXT SENSITIVE.**
- **Context sensitive means that you can get help for a command that you are currently using.**
- **Also a little question mark icon on dialog boxes can be used to know about help features.**



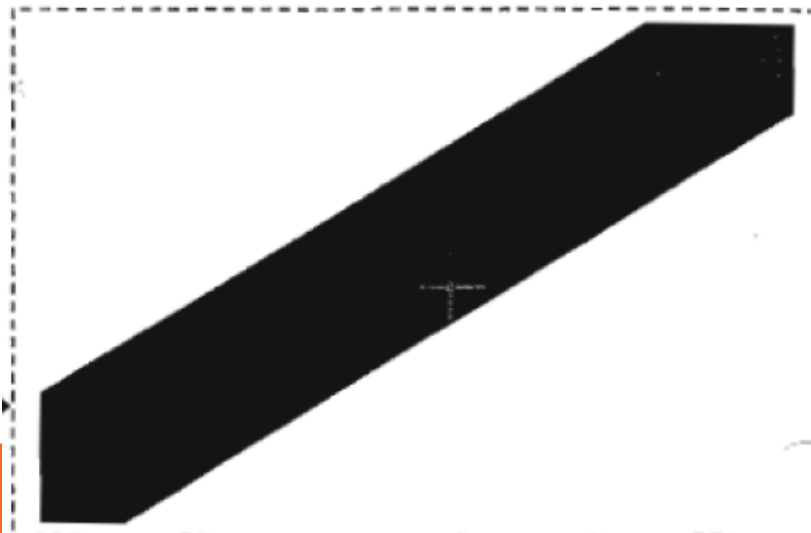
PIXEL VS. VECTOR

Pixel line

- Defined by many dots called pixels (ex. Adobe Photoshop)

Vector line is coordinate based

- Defined by coordinates of endpoints



Pixel line



Vector line

Q & A