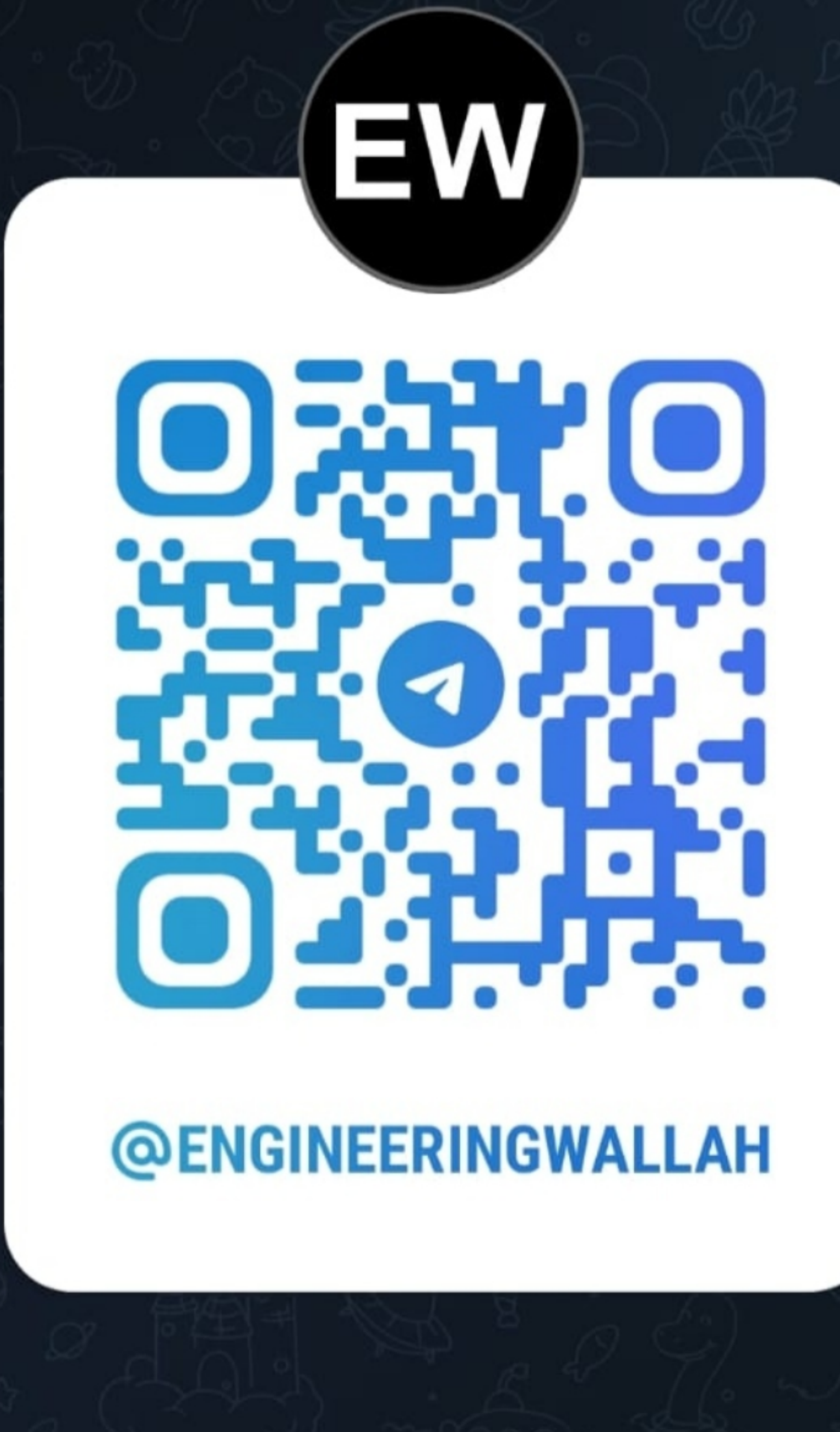
EW
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ENGINEERING GRAPHICS – 102012

F. E. - Semester II

Department of Mechanical Engineering

SCOE, Vadgaon

Unit 2

Introduction to 2D and 3D

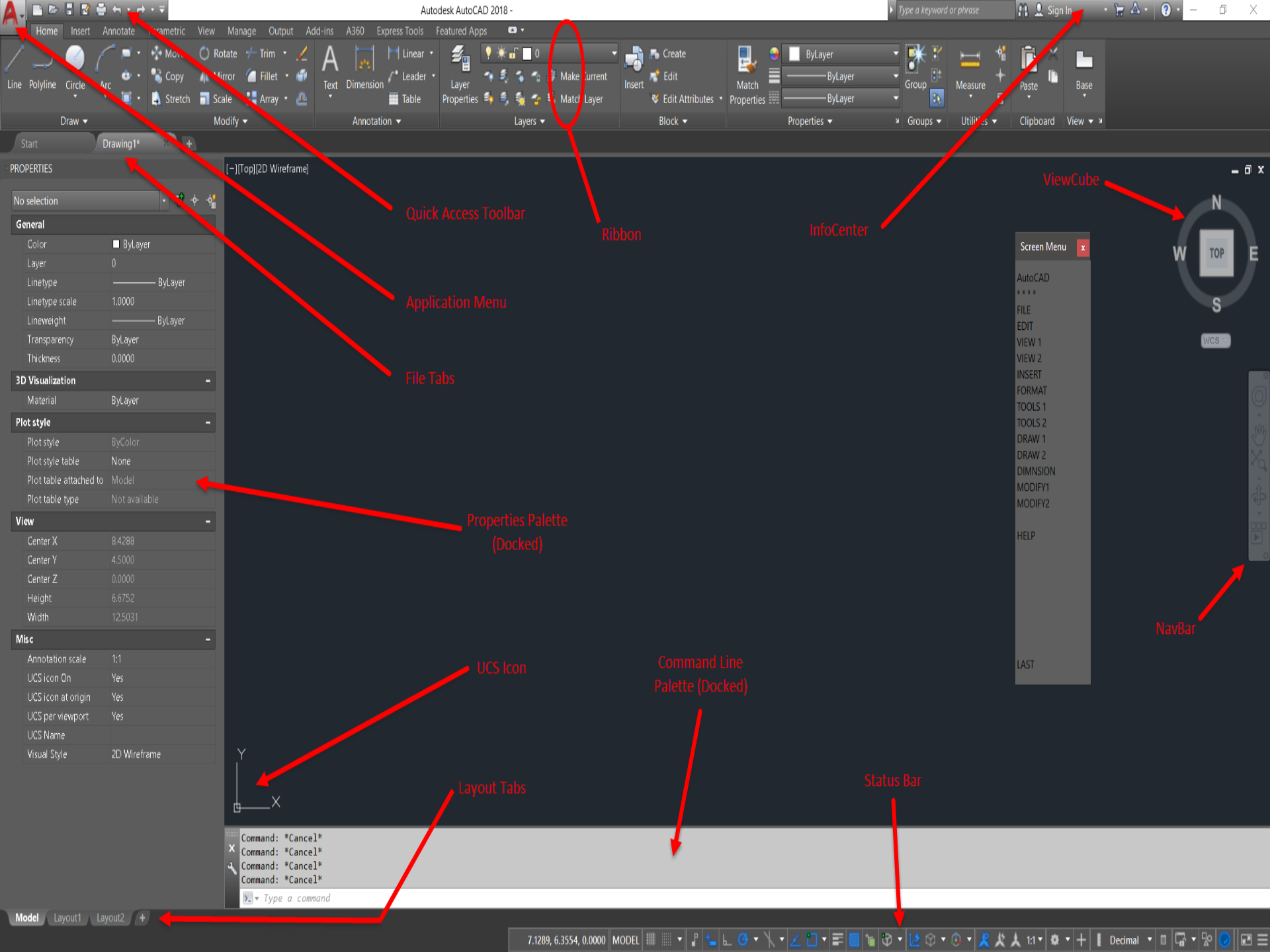
computer aided drafting packages

Auto CAD

- The computer-aided drafting program, AutoCAD, is the most common such program. It has many, many aids to drawing construction plans and detail drawings. If changes are later made in the design, it is quick and easy to change the drawing in AutoCAD.
- a considerable amount of time and money as compared to traditional prototyping, as well as facilitating communication and testing.
- **Drawing is the language of engineers**

- The AutoCAD or computer aided design machine has been a great help to engineers and also for several architectures that are finding it impossible to deal with drawings and plans of the project engineering work and the bring on the verge of perfection.
- Autocad or commonly known as computer aided design is a software application for writing and design 2D and 3D.

- AutoCAD is a software application for both 2D and 3D computer-aided design (CAD) and drafting — available since 1982 as a desktop application and since 2010 as a mobile web- and cloud-based app, currently marketed as Autocad 360.
- Developed and marketed by Autodesk, Inc., Autocad was first released in December 1982 — having been purchased a year prior in its original form by Autodesk founder John Walker. The software is currently marketed in its eighteenth generation.


Autodesk AutoCAD 2018 -
Type a keyword or phrase
Sign In
Home
Insert
Annotate
Parametric
View
Manage
Output
Add-ins
A360
Express Tools
Featured Apps
Line
Polyline
Circle
Arc
Move
Rotate
Trim
Copy
Mirror
Fillet
Stretch
Scale
Array
Text
Dimension
Linear
Leader
Table
Layer Properties
Make Current
Match Layer
Insert
Create
Edit
Edit Attributes
Match Properties
ByLayer
Group
Measure
Paste
Base
Draw
Modify
Annotation
Layers
Block
Properties
Groups
Utilities
Clipboard
View
Start
Drawing1*
PROPERTIES
No selection
General
Color
Layer
Linetype
Linetype scale
Lineweight
Transparency
Thickness
3D Visualization
Material
Plot style
Plot style table
Plot table attached to
Plot table type
View
Center X
Center Y
Center Z
Height
Width
Misc
Annotation scale
UCS icon On
UCS icon at origin
UCS per viewport
UCS Name
Visual Style
[−][Top][2D Wireframe]
Screen Menu
AutoCAD
FILE
EDIT
VIEW 1
VIEW 2
INSERT
FORMAT
TOOLS 1
TOOLS 2
DRAW 1
DRAW 2
DIMNSION
MODIFY1
MODIFY2
HELP
LAST
N
W
TOP
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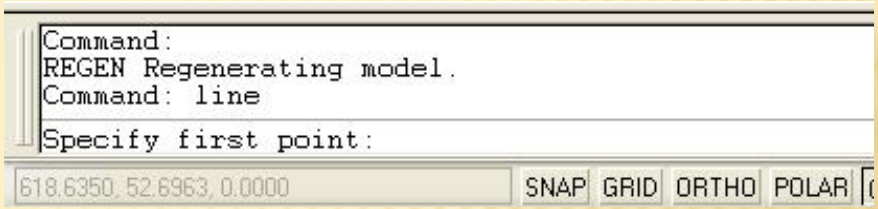
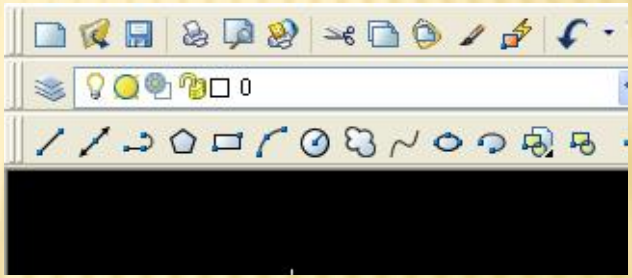
WCS
Command: *Cancel*
Command: *Cancel*
Command: *Cancel*
Command: *Cancel*
Type a command
Model
Layout1
Layout2
7.1289, 6.3554, 0.0000
MODEL
Decimal
Quick Access Toolbar
Application Menu
File Tabs
Ribbon
InfoCenter
ViewCube
Properties Palette (Docked)
NavBar
UCS Icon
Command Line Palette (Docked)
Layout Tabs
Status Bar

HOW DO WE GIVE A COMMAND?

- Command line



- Toolbars
  (view/Toolbars)



- Drop-down menus

You can pick any one(s) that you are comfortable with.

AutoCAD Commands

- Nearly every action you perform in AutoCAD is based on a **command**.
- You use commands to tell AutoCAD the actions you want it to perform, and AutoCAD responds with command **prompts**.
- Command prompts tell you the **status** of an action, or they give you options from which you must choose to complete a command.
- You can use any of the following to start **commands**:

AutoCAD **menus**

Toolbars

Shortcut menus

Command line

Accelerator **keys**

Useful Keyboard Keys

- **F1 key**, context-sensitive help
- **F2 key**, toggling the graphics windows and the text windows
- **F3 key**, turning running object snaps on/off
- **F5 key**, cycling through isometric planes
- **F6 key**, cycling through coordinate display types
- **F7 key**, toggling Grid mode
- **F8 key**, toggling Ortho mode
- **F9 key**, toggling Snap mode
- **F10 key**, toggling polar mode
- **Esc key**, exit any command
- **Enter key**, invoke the last-used command

Command Prompt

Regardless of how you start a command, the command prompts flow in the same way. AutoCAD either displays **prompts** on the command line or displays a **dialog box**. The prompt format is

current instruction or [options] <current value>:

The **current instruction** begins with one of **four verbs**. The verb communicates the action you can perform, as shown below:

Select Use the pointing device to select objects.

Enter Enter a value on the command line.

Specify Select a point on the screen or enter a coordinate.

Digitize Select a point on a digitizing tablet (TABLET command only).

Commands often have **options**, which are displayed within brackets.

AutoCAD Drawing Commands

Point
Line
Ray
Xline
Mline
Arc
Circle
Rectangle
Ellipse
Polygon
Spline
Pline

Basic Geometry symbols

Text Commands → Text, Mtext, Spell

Dimension Commands → Dim, Dim1

Hatch Commands → Hatch, Bhatch, Region

Command Point

Keystroke: POINT / PO

Icon 

Menu: Draw > Point >Single Point

Result: Draw a single point

System Variables

PDMODE specifies how point objects are displayed.

PDSIZE specifies the size of point objects.

Point Style dialog box

Command: DDPTYPE

Menu: Format > Point Style

Command Line

Keystroke: Line / L

Icon 

Menu: Draw > Line

Result: Draw a straight line segment from one point to the next

For example, the command sequence is

Command: **line**

Specify **first** point:

Specify **next** point or [Undo]:

Specify **next** point or [Undo]:

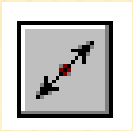
Specify **next** point or [Close or Undo]:

Ray

Creates a **semi-infinite line** commonly used as construction line. A ray has a finite starting point and extends to infinity.

Command: RAY Draw menu: Ray

Construction Line

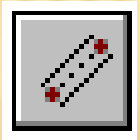


Creates an **infinite lines**, which are commonly used as construction lines.

Command: XLINE Draw menu: Construction Line

Multiline Creates multiple **parallel lines**:

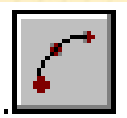
Command: MLINE



Draw menu: Multiline

Command Arc

Keystroke: Arc / a

Icon 

Menu: Draw > Arc

Result: Draws an arc based on three points

Notes

- You can create arcs in **many ways**.
- The default method is to specify **three points**—a start point, a second point on the arc, and an endpoint.
- By default, AutoCAD draws arcs **counterclockwise**.

Command Circle

Keystroke: Circle / C

Icon 

Menu: Draw > Circle

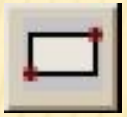
Result: Draws a circle based on a center point and radius

Notes

- You can create circles in several ways.
- The default method is to specify the center and radius.

Command **Rectangle**

Keystroke: **RECTANGLE /RECTANG/ REC**

Icon 

Menu: **Draw > Rectangle**

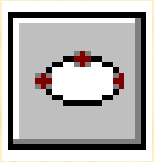
Result: Draws a rectangle after you enter one corner and then the second

Options:

Chamfer/Elevation/Fillet/Thickness/Width

Command **Ellipse**

Keystroke: **Ellipse/ EL**

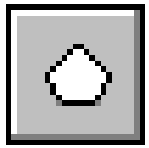
Icon 

Menu: **Draw > Ellipse**

Result: Draws an ellipse or an elliptical arc

Command **Polygon**

Keystroke: **POLYGON / POL**

Icon 

Menu: **Draw > Polygon**

Result: Creates an equilateral closed polyline

System Variables

POLYSIDES

It stores the current number of polygon sides.

The range is 3 to 1024.

Command SKETCH

Command line: **sketch**

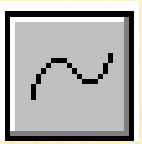
Result Creates a series of freehand line segments

Notes

- Drawing with the SKETCH command controls a screen-based pen with a **pointing device**.
- SKETCH is **useful** for entering map outlines, signatures, or other freehand drawings.
- Sketched lines are not **added** to the drawing until they are recorded.

Command **Spline**

Keystroke: **Spline / spl**

Icon 

Menu: **Draw > Spline**

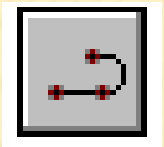
Result: Creates a quadratic or cubic spline curve

Notes:

- SPLINE fits a **smooth curve** to a sequence of points within a specified tolerance.
- AutoCAD uses **NURBS** (nonuniform rational B-splines) mathematics, which stores and defines a class of curve and surface data.

Command Polyline

Keystroke: PLINE / PL

Icon 

Menu: Draw > Polyline

Result: Creates two-dimensional polylines.

A polyline is a connected sequence of line or arc segments created as a single object. A rectangle is an example of a polyline.

Polylines have some unique qualities that make them very useful:

- They can have width (constant or varying)
- They can consist of arcs and lines.
- They can be edited
- They can be joined together.
- They can be exploded into individual segments

Drawing Editing Commands

The commands covered in this section are all concerned with editing and in some way manipulating existing graphics in a drawing.

They fall into four major groupings:

Deletion Operations;

Transformations;

Editing and Alteration; and

Administrative Activities.

Command **Erase**

Keystroke: **Erase / E**

Deletion Command

Icon 

Menu: **Modify > Erase**

Shortcut menu:

Select the objects to erase, right-click in the drawing area, and choose Erase.

Result: Erases an object**.**

Command: **OOPS**

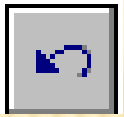
Command line: **oops**

Result: Restores objects erased by the last ERASE command.

Correcting Mistakes

- **U** reverses the effect of the previous command.

  Command line: **u** Edit menu: **Undo**

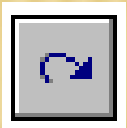
  Shortcut menu: right-click in the drawing area

- **UNDO** reverses the effect of multiple commands and provides control over the undo feature. This command is a more versatile version of the simplified U command.

  Command line: **undo**

- **REDO** reverses the effects of a single UNDO or U command.

  Command line: **Redo** Edit menu: **Redo**

  Shortcut menu: right-click in the drawing area

Selecting Objects

- Before you can edit objects, you need to create a **selection set** of the objects.
- A selection set can **consist** of a single object, or it can be a more complex grouping: for example, the set of objects of a certain color on a certain layer.
- You can create the selection set either **before** or **after** you choose an editing command.
- Use one of the following **methods** to create selection sets.

1. **Choose** an editing command. Then select the objects and press ENTER.
2. Enter **select**. Then select the objects and press ENTER.
3. Select the objects with the **pointing device**. Then choose an editing command.
4. **Define** groups.

Selecting Objects in AutoCAD

Using Selection Windows

Using Selection Fences

Selecting Objects that Are Close Together

Customizing Object Selection

Filtering Selection Sets

Selecting Windows

There are **two** very different types of windows you can use.

One is a **'crossing window'** and the other is a **box**.

If you create the window from **right to left**, you make a **crossing window**. This means that any object that crosses the border of the window is added to the selection set. This is shown as a **dotted line** on the screen.

If you create the window from **left to right**, you create a **box**. Using this method you'll add only the items that are completely within the box. This is shown as a **solid line** on the screen.

Selecting Objects

Command line: **select**

There are other ways to select objects and here a few of the more common ways.

LAST - by typing L when asked to select objects, AutoCAD will select the last object that you created.

PREVIOUS - by typing P when asked to select objects, AutoCAD will select the previous selection set.

ALL by typing ALL to select all object on layer.

FENCE - by typing F when asked to select objects, AutoCAD allows you to draw a series of lines (called a fence) to select objects.

CROSSING POLYGON - typing CP when you are selecting objects give the ability to create a crossing polygon for object selection. This is similar to a crossing box, but you can pick points on the screen to create a polygon.

Repeating Commands

You can repeat AutoCAD commands using one of several methods.

To repeat the last command

- Press ENTER or SPACEBAR, or right-click in the drawing area and choose Repeat.

To repeat one of the last six commands

1. Right-click in the command window or text window.
2. From the shortcut menu, choose Recent Commands, then choose one of the six most recently used commands.

To repeat the same command multiple times

1. At the Command prompt, enter **multiple**.
2. At the next prompt, **enter** the command you want to repeat.
3. AutoCAD **repeats** this command until you press ESC.

Canceling Commands

You can cancel any command by pressing **ESC**, the standard key to cancel actions in Windows programs.

You can change the cancel key to **CTRL+C**, which was used to cancel commands in previous AutoCAD releases.

To **change** the cancel key

1. From the **Tools menu**, choose **Options**.
2. In the Options dialog box, choose the **User Preferences** tab.
3. Under **Windows Standard Behavior**, clear Windows Standard Accelerator Keys.

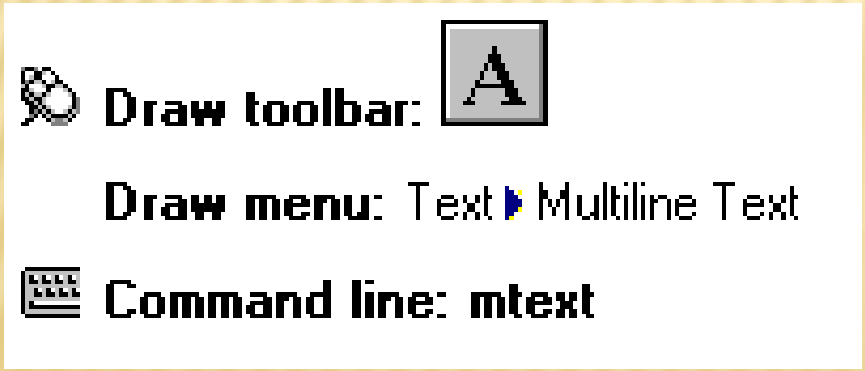
Text Commands

TEXT or DTEXT

Creates one or more lines of text and end each line when you press ENTER. Each text line is a separate object that you can relocate, reformat, or otherwise modify.

MTEXT

- Multiline Text Editor creates paragraphs that fit within a nonprinting text boundary.
- You create the text boundary to define the width of the paragraph.
- You can also specify the justification, style, height, rotation, width, color, spacing, and other text attributes using MTEXT.
- Each mtext object is a single object, regardless of the number of lines it contains.



Spell
Checks spelling in a drawing
Tools menu: **Spelling**
Command line: **spell** (or 'spell for transparent use)

Basic Utility Commands

REDRAW

This command forces AutoCAD to re-display the graphics on the screen. This has the effect of clearing away some extraneous graphics such as marker "blips" that are left behind by pointing operations. (Blipmode=on or off)

SAVE

Causes all editing changes to the current drawing to be saved to the disk file. Should be done regularly during a long drawing session.

END

Terminates the drawing editor, saves the current drawing to a disk file and returns to the main AutoCAD menu.

QUIT

Terminates the drawing editor without saving the changes made to the current drawing. Returns to the main AutoCAD menu.

WHAT IS OSNAP?

- Osnap (Object Snap) settings make it easier to select a 2d object's points
  - Endpoint
  - Midpoint
  - Perpendicular
  - Center
  - İntersection
- Osnap will be active when

AutoCAD is expecting you to

pick a point on the working area

- Type osnap on your

command window:

ZOOMİNG…

- You will need to zoom in and out while drawing with AutoCAD. This doesnt change your objects or UCS, only the way you see your working space. This can be done in many ways:
  1. Scroll bars
  2. Typing **z** or **zoom** in your command window.
     - All
     - Center
     - Dynamic
     - Extents
     - Previous
     - Scale
     - Window