

AutoCAD Fundamentals

Class 2: Drawing Toolbars & Essential Commands

Prepared by: Er. Ajay Bhattarai

1

Line Command

— **Command:** `LINE` or `L`

• **Purpose:** Creates straight line segments between two or more points. The most fundamental drawing command in AutoCAD.

Basic Usage:

1. Type `L` and press **Enter** (or **Space**)
2. Click first point or type coordinates (e.g., 0,0)
3. Click second point or specify distance (e.g., @100,0 for 100 units right)
4. Continue clicking for connected lines
5. Press **Enter** or **Space** to finish, or type `C` to close

Coordinate Entry Methods:

- **Absolute:** `100,50` – Exact X,Y from origin (0,0)
- **Relative:** `@50,30` – X,Y offset from last point
- **Polar:** `@100<45` – Distance and angle from last point
- **Direct Distance:** Type distance + move cursor direction (with Ortho F8)

• **Pro Tip:** **Enter** and **Space** are interchangeable! Space is faster. Use `C` (Close) to create perfect closed shapes. Right-click = Enter during commands.

2

Polyline Command

— **Command:** `POLYLINE` or `PLINE` or `PL`

• **Purpose:** Creates connected line segments as a single object. Unlike LINE, all segments form one entity.

Key Advantages Over LINE:

- Single selectable object (easier editing)
- Can have varying widths
- Can combine straight and curved segments
- Supports arc segments within same polyline
- Essential for calculating areas and perimeters

⚙️ Options During Command:

- **Arc (A):** Switch to arc mode
- **Line (L):** Switch back to line mode
- **Width (W):** Set starting and ending width
- **Halfwidth (H):** Set half the total width
- **Close (C):** Close the polyline
- **Undo (U):** Undo last segment

★ When to Use Polyline: Area calculations, boundaries, contours, roads, pipelines, or any shape needing uniform width. For simple sketches, LINE is faster.

3

Circle Command

● **Command:** CIRCLE or C

◎ **Purpose:** Creates perfect circular objects using various methods.

Circle Creation Methods:

1. **Center, Radius (default):** Click center → specify radius
2. **Center, Diameter (D):** Click center → type D → specify diameter
3. **2-Point (2P):** Define circle by two opposite points
4. **3-Point (3P):** Define circle passing through three points
5. **Tan, Tan, Radius (TTR):** Tangent to two objects with specified radius
6. **Tan, Tan, Tan (3T):** Tangent to three objects

Quick Method:

- Type `C` → **Enter** → Click center point
- Move cursor outward and type radius value (e.g., 50)
- **No need to type units** – just the number!

⚠ Common Mistake: Typing diameter when AutoCAD asks for radius (or vice versa). Always check command line prompt! Type `D` to switch to diameter mode.

4

Arc Command

Command: `ARC` or `A`

Purpose: Creates circular arc segments. AutoCAD offers 11 different methods!

Most Common Arc Methods:

1. **3-Point (default):** Start point → Second point → End point
2. **Start, Center, End (SCE):** Start → type C → Center → End
3. **Start, Center, Angle (SCA):** Start → C → Center → A → Angle
4. **Start, End, Radius (SER):** Start → E → End → R → Radius
5. **Center, Start, End (CSE):** Center first, then start and end
6. **Continue:** Creates arc tangent to last line/arc drawn

⌚ Direction: Arcs are drawn **counterclockwise** by default. For clockwise, specify negative angle values.

⚡ Expert Trick: After drawing a line, immediately type `ARC` → **Enter** → **Enter** again. This creates a tangent arc automatically! Ultimate speed technique.

5

Rectangle Command

Command: `RECTANGLE` or `RECTANG` or `REC`

Purpose: Creates a closed polyline rectangle using two opposite corners.

Basic Usage:

1. Type **REC** and press **Enter**
2. Click first corner point
3. Move cursor diagonally and click second corner
4. Or type dimensions: **@100,50** for 100×50 rectangle

❖ Advanced Options (before second corner):

- **Chamfer (C):** Set corner chamfer distances
- **Fillet (F):** Set rounded corner radius
- **Width (W):** Set polyline width/thickness
- **Area (A):** Specify area and length or width
- **Dimensions (D):** Specify exact length and width
- **Rotation (R):** Rotate rectangle at angle

☞ **Speed Technique:** **REC** → Click → Type **@100,75** → **Enter**. Creates perfect 100×75 rectangle in 2 seconds. No mouse movement needed for second corner!

6

Ellipse Command

○ **Command:** **ELLIPSE** or **EL**

Purpose: Creates elliptical shapes (stretched circles) or elliptical arcs.

Ellipse Creation Methods:

1. **Center (default):** Center point → End of first axis → Second axis distance
2. **Axis Endpoints:** First axis endpoint → Second endpoint → Half-length of second axis
3. **Rotation:** Creates ellipse by rotating circle around axis

● Understanding Ellipse Axes:

- **Major Axis:** Longest diameter of ellipse
- **Minor Axis:** Shortest diameter (perpendicular to major)
- AutoCAD asks for one full axis, then half the other axis
- For elliptical arcs, use **Arc (A)** option after defining ellipse

i Real-World Uses: Isometric circles appear as ellipses. Ellipses are essential for isometric drawing, holes in perspective, oval windows, and technical illustrations.

7

Polygon Command

 **Command:** `POLYGON` or `POL`

Purpose: Creates regular polygons (equal sides and angles) from 3 to 1024 sides.

Polygon Creation Steps:

1. Type `POL` and press **Enter**
2. Enter number of sides (e.g., 6 for hexagon, 8 for octagon)
3. Specify center point (or type **E** for Edge method)
4. Choose Inscribed (I) or Circumscribed (C) around circle
5. Specify radius of circle

Inscribed vs Circumscribed:

- **Inscribed (I):** Polygon vertices touch the circle (corners on circle)
- **Circumscribed (C):** Polygon sides are tangent to circle (sides touch circle)
- *Think:* Inscribed = inside circle; Circumscribed = outside circle

Edge Method:

Type **E** after entering number of sides. Then specify the two endpoints of one edge. AutoCAD completes the polygon automatically.

 **Common Polygons:** Triangle (3), Square (4), Pentagon (5), Hexagon (6), Octagon (8), Decagon (10). Remember: all polygons in AutoCAD are closed polylines!

8

Construction Lines (Xline & Ray)

 **Commands:** `XLINE` (infinite line) or `RAY` (semi-infinite line)

∞ XLINE - Infinite Construction Line:

- Extends infinitely in **both directions**
- Used for reference, alignment, and construction geometry
- Does not affect drawing extents (invisible boundaries)
- Create by: Point + Direction, Horizontal, Vertical, Angle, Bisector, Offset

Usage:

1. Type **XLINE** → **Enter**
2. Choose option (default is two-point method)
3. Click through point → Indicate direction → Continue or **Enter**

→ RAY - Semi-Infinite Line:

- Extends infinitely in **one direction only**
- Starts at a specific point, extends forever in one direction
- Useful for projection and radial constructions

Usage:

1. Type **RAY** → **Enter**
2. Specify start point
3. Specify through point (defines direction)

💡 Pro Workflow: Use XLINE/RAY on separate layer. Create construction geometry, draw actual objects, then freeze/delete construction layer. Essential for complex geometric constructions!

9

Hatch Command

↗ Command: **HATCH** or **H** or **BH** (Boundary Hatch)

█ Purpose: Fills enclosed areas with patterns (lines, dots, solids) for material representation, section cuts, or visual distinction.

Hatch Creation Process:

1. Type **H** and press **Enter** (opens Hatch Creation ribbon)
2. Select hatch pattern from panel or type pattern name
3. Adjust scale and angle if needed
4. Click **Pick Points** or **Select Boundary**
5. Click inside closed area(s) to hatch
6. Press **Enter** or click **Close Hatch Creation** on ribbon

Common Hatch Patterns:

- **SOLID:** Complete solid fill (most common)
- **ANSI31:** 45° angle lines (steel sections)
- **ANSI32:** Perpendicular lines (cast iron)
- **ANSI37:** Brick pattern (masonry)
- **AR-CONC:** Concrete pattern
- **EARTH:** Earth/soil sections
- **GRAVEL:** Gravel/aggregate

Key Hatch Properties:

- **Scale:** Adjusts pattern size (default = 1.0)
- **Angle:** Rotates pattern (0° to 360°)
- **Associative:** Hatch updates when boundary changes
- **Annotative:** Scales with annotation scale
- **Transparency:** Makes hatch semi-transparent
- **Draw Order:** Send to back/front relative to objects

Common Hatch Issues:

- **Not closed boundary:** Hatch won't work – close all gaps!
- **Pattern too small/large:** Adjust scale (try 0.5, 2, 10, 100)
- **Wrong layer:** Hatch on correct layer? Check properties
- **Overlapping boundaries:** Use Pick Points for complex areas

Expert Tip: Double-click existing hatch to edit. Right-click hatch → **Hatch Edit** for properties. Use **Match Properties (MA)** to copy hatch settings to other areas!

Mouse Best Practices:

- **Left Click:**

- Select objects (outside command)
- Specify points (during command)
- Always be precise – use Object Snaps (F3)!

- **Right Click:**

- During command: Acts as **Enter** (confirms/continues)
- Outside command: Opens context menu
- On selected object: Shows object-specific menu
- Holding **Shift + Right Click**: Opens Object Snap override menu

- **Scroll Wheel:**

- Scroll up/down: Zoom in/out at cursor position
- Click and drag: Pan (move view)
- Double-click: Zoom Extents (fits all objects)
- This is your primary navigation tool!

- **Middle Button (if separate from wheel):**

- Click: Opens Object Snap menu
- Hold and drag: Pan mode

Keyboard Efficiency Secrets:

- **Enter = Space Bar:** Completely interchangeable in AutoCAD

- Space is closer to left hand – faster!
- Use Space to confirm commands, repeat last command
- Professional CAD users rarely touch Enter

- **Repeat Last Command:**

- Press **Enter** or **Space** (no command active)
- Right-click in drawing area → **Repeat [Command]**
- Critical time-saver for repetitive tasks

- **Command Aliases:** Type shortcuts instead of full names

- **L** = LINE, **C** = CIRCLE, **A** = ARC
- **E** = ERASE, **M** = MOVE, **CO** = COPY
- **TR** = TRIM, **EX** = EXTEND, **O** = OFFSET
- Much faster than clicking ribbon buttons!

⚡ The Golden Workflow Pattern:

1. Type command alias (left hand on keyboard)
2. Press Space (confirm command)
3. Use mouse to specify points (right hand)
4. Press Space to finish (left hand)
5. Press Space again (repeat command if needed)

Example: L → Space → Click → Click → Click → Space → Space → (new line starts)

This rhythm becomes muscle memory. Expert users never look at keyboard or ribbon!

11

Essential Tips & Productivity Tricks

★ Command Line Mastery:

- Always watch the command line! It tells you what AutoCAD expects
- Command line shows options in [brackets] and CAPITALS
- Type the capital letter(s) to activate option
- Example: CIRCLE [3P/2P/Ttr/...] → Type 3P for 3-point circle
- If command line is hidden: Press Ctrl+9 to toggle

❖ Object Snap (OSNAP) - Your Best Friend:

- F3: Toggle Object Snap on/off
- Shift + Right-click: Override menu (temporary snap)
- Essential snaps to enable:
 - Endpoint: Snap to line/arc endpoints
 - Midpoint: Snap to midpoint of lines/arcs
 - Center: Snap to circle/arc centers
 - Intersection: Snap where objects cross
 - Perpendicular: Create perpendicular lines
 - Tangent: Tangent to circles/arcs
- Never "eyeball" intersections – always use OSNAP!
- Settings: Type OSNAP or right-click OSNAP button on status bar

■ Ortho Mode (F8) & Polar Tracking (F10):

- **Ortho (F8):** Restricts cursor to horizontal/vertical only
 - Perfect for creating perpendicular lines
 - Use with direct distance entry: Type distance, cursor shows direction
 - Example: `L` → Click → Move cursor right → Type `100` → Space
- **Polar Tracking (F10):** Snaps cursor to specified angles
 - Default: 90° increments (0°, 90°, 180°, 270°)
 - Can set custom angles: 45°, 30°, 15°, etc.
 - Shows tracking vectors with tooltip distances
 - More flexible than Ortho for angled work
- **Can't use both simultaneously** – they conflict!
- Most users prefer Polar Tracking for versatility

⌚ Undo & Redo Strategies:

- **Ctrl+Z:** Undo last action (unlimited undo levels!)
- **Ctrl+Y:** Redo (undo the undo)
- **U + Enter:** Command line undo (type `U`)
- **During commands:** Type `U` to undo last point (not entire command)
- Don't fear mistakes – AutoCAD remembers everything!
- Can undo back to file open, or use `UNDO` with options

✖ Canceling Commands:

- **Esc key:** Cancels current command immediately
- Press **Esc twice** if command doesn't cancel first time
- Also deselects all selected objects
- If stuck in a command: **Esc, Esc, Esc!**
- Check command line to verify you're at "Command:" prompt

Speed Techniques for Experts:

1. **Transparent Commands:** Type apostrophe before command to use during another command
 - Example: In middle of LINE command, type '`ZOOM`' to zoom without canceling
 - Works with: '`ZOOM`', '`PAN`', '`OSNAP`', etc.
2. **Dynamic Input (F12):** Shows dimensions at cursor
 - Type values directly at cursor (no command line needed)
 - Tab between length and angle fields
 - Lock angle: Type angle → Tab → Type length
3. **Selection Cycling:** When objects overlap
 - Hold **Shift** while clicking overlapped objects
 - Cycles through all objects under cursor
 - Status bar shows cycle mode indicator
4. **Quick Select:** Filter selections by properties
 - Command: `QSELECT`
 - Select all circles, all lines on a layer, all red objects, etc.
 - Massive time-saver for complex drawings
5. **Properties Palette (Ctrl+1):** Edit multiple objects simultaneously
 - Change layer, color, linetype for all selected objects
 - Shows common properties when multiple objects selected
 - Real-time editing – changes apply instantly

 **The Professional's Secret:** Command line typing is 3-5x faster than clicking buttons. Memorize 20 command aliases and you'll outpace ribbon clickers by miles. Your hands never leave keyboard and mouse!

13

Common Beginner Mistakes

⚠ Avoid These Pitfalls:

1. **Ignoring the command line** → You miss prompts and options
2. **Not using Object Snaps** → Inaccurate drawings, gaps, misalignments
3. **Clicking ribbon instead of typing** → 10x slower workflow
4. **Drawing without Ortho/Polar** → Crooked "horizontal" lines
5. **Not checking units before starting** → Wrong scale disasters
6. **Forgetting to save regularly** → Lost work (Ctrl+S every 5 minutes!)
7. **Using mouse wheel zoom aggressively** → Lose orientation in drawing
8. **Not closing polylines properly** → Open boundaries, hatch fails
9. **Exploding everything unnecessarily** → Lose object intelligence
10. **Working on Layer 0** → Organization nightmare for complex drawings

💡 Recovery Tip: If AutoCAD crashes, it auto-saves! Look for .sv\$ or .bak files in your drawing folder. Rename extension to .dwg to recover your work.

1. Draw a house floor plan using only LINE, RECTANGLE, and ARC commands
2. Create a mechanical part with 6 CIRCLES of different sizes (practice all circle methods)
3. Draw a perfect hexagon using POLYGON (both inscribed and circumscribed)
4. Create a closed boundary and fill it with 3 different HATCH patterns
5. Practice drawing 20 lines using only keyboard (no ribbon clicks):
 - Type **L** → Space → Click points → Space → Space (repeat)
6. Use XLINE to create a grid of construction lines, then draw objects aligned to grid
7. Draw a complex shape with POLYLINE including both straight and arc segments
8. Challenge: Create a complete geometric pattern using all commands learned (minimum 5 different command types)

⌚ Time Challenge: Can you create a rectangle, circle, and triangle using only command aliases in under 30 seconds? Master speed = master efficiency!

Quick Reference Card

Drawing Commands:

- `L / LINE` – Line segments
- `PL / PLINE` – Polyline
- `C / CIRCLE` – Circle
- `A / ARC` – Arc
- `REC / RECTANGLE` – Rectangle
- `EL / ELLIPSE` – Ellipse
- `POL / POLYGON` – Polygon
- `XLINE` – Infinite line
- `RAY` – Semi-infinite line
- `H / HATCH` – Fill pattern

Key Shortcuts:

- **F3** – Object Snap toggle
- **F8** – Ortho mode
- **F10** – Polar Tracking
- **F12** – Dynamic Input
- **Space/Enter** – Confirm
- **Esc** – Cancel command
- **Ctrl+Z** – Undo
- **Ctrl+S** – Save
- **Ctrl+1** – Properties
- **Ctrl+9** – Command Line

Mouse Actions: **Left** = Select/Point | **Right** = Enter/Menu | **Wheel** = Zoom/Pan |
Double-Wheel = Extents

Coordinate Entry: `100,50` (Absolute) | `@50,30` (Relative) | `@100<45` (Polar)

Er. Ajay Bhatarai | AutoCAD Fundamentals Course

Practice makes perfect – Speed comes from muscle memory.

Next class: Modify Commands & Object Editing.