

AutoCAD Fundamentals

Class 2: Drawing Toolbars & Essential Commands

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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.

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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.

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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!

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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.

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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!

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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!

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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!

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
- **XL** / **XL** – 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)

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Practice makes perfect – Speed comes from muscle memory.

Next class: Modify Commands & Object Editing.