

AutoCAD Fundamentals

Class 4: Annotations & Text Mastery

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1 Understanding Annotations in AutoCAD

What are Annotations? Annotations are non-geometric objects that add information to drawings. They include text, dimensions, leaders, tables, and symbols that communicate design intent, specifications, and notes.

★ Importance in Engineering:

- **Communication:** Convey design specifications and requirements
- **Documentation:** Create professional, complete technical drawings
- **Standards Compliance:** Meet industry standards (ISO, ANSI, DIN, BS)
- **Legal Protection:** Provide clear, documented design intent
- **Manufacturing Guidance:** Give fabricators exact specifications

⚠ Critical Principle: Annotations must scale correctly for plotting! A drawing printed at 1:100 should show text at the same readable size as one printed at 1:50. This is where **Annotative Styles** become essential.

2 Text Styles & Fonts

A Command: `STYLE` or `ST` (opens Text Style dialog)

⚙ What is a Text Style?

A Text Style is a saved configuration that controls text appearance:

- **Font:** Typeface (Arial, Romans, txt.shx)
- **Height:** Fixed or variable text height
- **Width Factor:** Text compression/expansion (default 1.0)
- **Oblique Angle:** Slant angle in degrees (italic effect)
- **Effects:** Backwards, Upside-down, Vertical text options

📄 Font Types in AutoCAD:

1. TrueType Fonts (.ttf)

- **Examples:** Arial, Times New Roman, Calibri
- **Advantages:** Smooth curves, filled shapes, WYSIWYG (What You See Is What You Get)
- **Disadvantages:** Larger file size, slower regeneration
- **Best for:** Presentation drawings, title blocks, general notes

2. SHX Fonts (Shape Compiled)

- **Examples:** txt.shx, romans.shx, simplex.shx, complex.shx
- **Advantages:** Faster regeneration, smaller file size, simpler geometry
- **Disadvantages:** Limited character sets, basic appearance
- **Best for:** Technical drawings, dimensions, construction documents
- **Industry Standard:** Romans.shx (single-stroke Roman font)

✂ Creating a Text Style:

Step-by-Step Process:

1. Type **STYLE** → Text Style dialog opens
2. Click **New** → Enter style name (e.g., “Standard_Notes”)
3. Select **Font Name** (e.g., romans.shx or Arial)
4. Set **Height** (0 = variable, 2.5mm = fixed height)
5. Set **Width Factor** (0.8-1.2 typical, 1.0 = standard)
6. Set **Oblique Angle** (0° = normal, 15° = slanted)
7. Check effects if needed (rarely used in technical drawing)
8. Click **Apply** → **Set Current** → **Close**

💡 **Pro Tip:** Set text height to **0** in the style definition! This allows dynamic height control when placing text. Fixed heights limit flexibility and often cause problems when scaling drawings.

📖 Recommended Text Styles for Technical Drawings:

- **Standard:** romans.shx, height 0, width 1.0 (general text)
- **Title:** Arial Bold, height 0, width 1.0 (title blocks)
- **Notes:** romans.shx, height 0, width 0.85 (compact notes)
- **Dimensions:** romans.shx, height 0, width 0.9 (dimension text)

3 Single Line Text (TEXT)

≡ **Command:** `TEXT` or `DT` (Dynamic Text)

How Single Line Text Works:

Single Line Text creates individual text objects, one line at a time.

Workflow:

1. Type `TEXT` or `DT`
2. Specify **start point** (click where text begins)
3. Specify **height** (e.g., 2.5mm for standard text)
4. Specify **rotation angle** (0° = horizontal, 90° = vertical)
5. Type your text → Press **Enter** to go to next line
6. Press **Enter** again (on empty line) to finish command

≡ **Justification Options:**


Before specifying the start point, you can change justification by typing:

- **J** → Opens justification options menu
- **TL:** Top Left (default)
- **TC:** Top Center
- **TR:** Top Right
- **ML:** Middle Left
- **MC:** Middle Center (most common for centered labels)
- **MR:** Middle Right
- **BL:** Bottom Left
- **BC:** Bottom Center
- **BR:** Bottom Right

The justification point determines where AutoCAD anchors the text.

Editing Single Line Text:

- **Double-click** on text → Edit in-place
- **DDEDIT** command → Select text to edit
- **Properties Panel:** Select text → Modify in properties (height, layer, color, justification)

 **When to Use Single Line Text:** Short labels, simple callouts, quick notes, or when each line needs to be a separate object. For longer paragraphs or formatted text, use Multiline Text instead.

 **Command:** MTEXT or MT or T

What is Multiline Text?

Multiline Text (Mtext) creates a single text object containing multiple lines, similar to a word processor paragraph. It supports rich formatting, columns, bullets, and complex layouts.

Advantages over Single Line Text:

- **Paragraph formatting:** Line spacing, indentation, alignment
- **Rich text features:** Bold, italic, underline, color, stacking
- **Better management:** One object for entire paragraph
- **Dynamic width:** Text flows within defined boundary
- **Advanced features:** Columns, bullets, numbered lists, symbols

Creating Multiline Text:

Workflow:

1. Type MTEXT , MT , or T
2. Specify **first corner** of text boundary box
3. Specify **opposite corner** (defines text width)
4. **Text Editor** opens with formatting ribbon
5. Type your text (press Enter for new paragraphs)
6. Format as needed using Text Editor ribbon
7. Click outside text box or press **Ctrl+Enter** to close editor

Text Editor Ribbon Features:

Style Panel:

- **Text Style:** Select predefined style
- **Font:** Override style font temporarily
- **Text Height:** Set height for selected text
- **Bold/Italic/Underline:** Standard formatting (Ctrl+B, Ctrl+I, Ctrl+U)
- **Color:** Change text color (ByLayer recommended)

Formatting Panel:

- **Bullets and Numbering:** Create lists
- **Columns:** Multi-column text layout
- **Line Spacing:** Adjust spacing between lines (1.0x, 1.5x, 2.0x)
- **Justification:** Left, Center, Right, Justified, Distributed

Paragraph Panel:

Paragraph Panel

- **Paragraph Alignment:** Top, Middle, Bottom
- **Paragraph Spacing:** Before/after paragraph spacing
- **Indentation:** First line and hanging indents

Insert Panel:

- **Symbol:** Insert special characters (Ø, °, ±, etc.)
- **Field:** Insert dynamic fields (date, filename, plot scale)

Special Characters & Formatting Codes:

Common Symbols (Type in Text Editor):

- %%d: Degree symbol (°)
- %%p: Plus/minus symbol (±)
- %%c: Diameter symbol (Ø)
- %%u: Toggle underline on/off
- %%o: Toggle overline on/off
- ^2: Superscript (e.g., m²) – Select text, right-click → Stack
- _2: Subscript (e.g., H₂O) – Select text, right-click → Stack

Modern AutoCAD also supports direct symbol insertion via Insert → Symbol menu.


Editing Multiline Text:

- **Double-click** text → Opens Text Editor
- **DDEDIT** command → Select Mtext to edit
- **Grip editing:** Click text → Drag grips to resize boundary box
- **Properties:** Change height, width, rotation, justification

★ **Best Practice:** Use Mtext for all paragraphs, specifications, general notes, and multi-line descriptions. Reserve Single Line Text for short labels and callouts only.

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Dimensions

 **What are Dimensions?** Dimensions are annotations that measure and display the size of objects. They consist of dimension lines, extension lines, arrowheads, and dimension text.

Dimension Components:

- **Dimension Line:** Line with arrowheads showing measured distance

Dimension Components (continued):

- **Extension Lines:** Lines extending from object to dimension line
- **Arrowheads:** Symbols at ends of dimension line (arrows, ticks, dots)
- **Dimension Text:** Measured value (e.g., 150.00)
- **Center Marks:** Marks showing centers of circles/arcs

Dimension Styles:

Command: `DIMSTYLE` or `D`

A **Dimension Style** controls all aspects of dimension appearance:

- **Lines:** Color, lineweight, extension beyond dimension line
- **Symbols & Arrows:** Arrowhead type, size, center marks
- **Text:** Text style, height, color, placement, alignment
- **Fit:** How AutoCAD handles tight spaces
- **Primary Units:** Unit format, precision, prefix/suffix
- **Alternate Units:** Dual dimensioning (mm and inches)
- **Tolerances:** Geometric tolerancing symbols and formats

Creating/Modifying Dimension Styles:

1. Type `DIMSTYLE` → Dimension Style Manager opens
2. Click **New** → Name style (e.g., “Mechanical_ISO”)
3. Configure tabs: Lines, Symbols, Text, Fit, Primary Units, Tolerances
4. Click **OK** → **Set Current** → **Close**

Common Dimension Commands:

Linear Dimensions:

- `DIMLINEAR` or `DLI` : Linear dimension (horizontal/vertical)
- `DIMALIGNED` or `DAL` : Aligned with two points
- `DIMBASELINE` or `DBA` : Baseline dimensions from common origin
- `DIMCONTINUE` or `DCO` : Continue dimension from previous

Radial Dimensions:

- `DIMRADIUS` or `DRA` : Radius of circle/arc
- `DIMDIAMETER` or `DDI` : Diameter of circle/arc
- `DIMCENTER` : Center mark for circles/arcs

Angular Dimensions:

- `DIMANGULAR` or `DAN` : Angle between two lines or three points

Advanced Dimensions:


- **DIMORDINATE**: Ordinate (datum) dimensions for coordinate systems
- **DIMARC**: Arc length dimension
- **DIMJOGGED**: Jogged radius for large radii

Editing Dimensions:

- **Grips**: Select dimension → Drag grips to reposition text/lines
- **DIMEDIT**: Edit dimension text (add prefix/suffix, rotate text)
- **DIMTEDIT**: Move/rotate dimension text only
- **Properties**: Modify text override, precision, arrow types
- **MATCHPROP**: Copy dimension style from one dimension to another

Critical Dimension Rules:

- **Associative Dimensions**: Ensure **DIMASSOC** = 2 (dimensions update when geometry changes)
- **Never explode dimensions**: Loses associativity and intelligence
- **Don't manually override text**: Use dimension style settings instead
- **Use annotation scale**: For proper scaling in different viewports
- **Follow standards**: ISO, ANSI, or company-specific standards

 **Pro Tip**: Create dimension styles that match your industry standards (ISO, ANSI, DIN, BS). Save them in template files. Consistency across drawings is essential for professional work.

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Leaders & Multileaders

→ **What are Leaders?** Leaders are annotation objects with an arrow or dot pointing to a feature, connected to text, blocks, or symbols explaining that feature.

Leader Components:

- **Arrowhead**: Points to feature (arrow, dot, slash, etc.)
- **Leader Line**: Connects arrowhead to annotation
- **Landing (Shoulder)**: Horizontal line at end of leader
- **Content**: Mtext, block, or tolerance symbol

Multileader Command:

Command: `MLEADER` or `MLD`

Modern Multileader (Recommended):

1. Type `MLEADER` or `MLD`
2. Specify **arrowhead location** (click on feature)
3. Specify **landing location** (where horizontal line ends)
4. Type text in editor → Close editor (Ctrl+Enter or click outside)

Legacy Leader: `LEADER` (older command, less flexible)

⚙️ Multileader Styles:

Command: `MLEADERSTYLE` or `MLS`

Multileader Styles control leader appearance:

Leader Format Tab:

- **Type:** Straight, Spline
- **Color, Linetype, Lineweight:** Leader line properties
- **Arrowhead:** Symbol type and size
- **Break Size:** Gap size when leaders cross dimensions

Leader Structure Tab:

- **Maximum Leader Points:** Number of vertices allowed
- **First/Second Segment Angle:** Constrain leader angles (0°, 15°, 30°, 45°, 90°)
- **Landing Settings:** Enable/disable horizontal landing, set landing distance

Content Tab:

- **Multileader Type:** Mtext, Block, None (leader only)
- **Text Style:** Which text style to use
- **Text Height:** Default text height
- **Text Alignment:** Left, Center, Right justified
- **Landing Gap:** Space between landing and text

📌 Common Leader Applications:

- **Callouts:** Identify parts, materials, or components
- **Notes:** Point to specific features with explanations
- **Welding Symbols:** Attach welding specifications (use blocks)
- **Surface Finish:** Show surface roughness requirements
- **Revision Clouds:** Indicate drawing changes
- **Detail References:** Point to detailed views

✏️ Editing Multileaders:

- **Double-click text:** Edit text content
- **Grip editing:** Move arrowhead, vertices, or landing
- **MLEADEREDIT:** Add/remove leader lines (multiple leaders to same text)
- **MLEADERALIGN:** Align multiple leaders horizontally/vertically
- **MLEADERCOLLECT:** Combine multiple leaders into organized group

👍 **Best Practice:** Use Multileaders instead of legacy Leaders. They're more flexible, support multiple leader lines to one text block, and maintain better associativity.

7 Annotative Text Styles & Scaling

✂ The Annotation Scaling Problem:

Challenge: A building drawn at 1:100 scale needs 3mm high text on paper. The same building at 1:50 needs the same 3mm text, but at different drawing scale!

Traditional Solution: Manually calculate text heights for each scale:

- 1:100 scale → Text height = $3\text{mm} \times 100 = 300\text{mm}$ in model space
- 1:50 scale → Text height = $3\text{mm} \times 50 = 150\text{mm}$ in model space
- 1:200 scale → Text height = $3\text{mm} \times 200 = 600\text{mm}$ in model space

This becomes tedious and error-prone!

✂ Annotative Objects: The Modern Solution

What are Annotative Objects?

Annotative objects automatically scale based on the **Annotation Scale** of the viewport. You define the *paper height* once, and AutoCAD calculates the model space height for you!

Annotative Object Types:

- Text Styles (TEXT and MTEXT)
- Dimension Styles (all dimension types)
- Multileader Styles
- Hatch Patterns
- Blocks with Attributes

🔧 Creating Annotative Text Styles:

Step-by-Step:

1. Type **STYLE** → Text Style Manager opens
2. Click **New** → Name your style (e.g., "Annotative_Standard")
3. Select desired font (e.g., romans.shx)

Step-by-Step

4. Check the **Annotative** checkbox (critical!)
5. Set **Paper Text Height** (e.g., 2.5mm for final plot size)
6. Set Width Factor and other properties as needed
7. Click **Apply** → **Set Current** → **Close**

Now when you place text, it will automatically scale based on your current annotation scale!

Setting Annotation Scale:

Location: Status Bar (bottom-right corner) → Annotation Scale dropdown

Common Scales:

- 1:1 (Model space, full size)
- 1:10, 1:20, 1:50, 1:100 (Architectural/Civil)
- 1:2, 1:5, 1:10 (Mechanical details)
- 2:1, 5:1, 10:1 (Enlarged details)

How it Works:

- Set annotation scale to 1:100
- Place text with 2.5mm paper height
- AutoCAD creates text at 250mm in model space
- When plotted at 1:100, text appears as 2.5mm
- Change viewport to 1:50 → Text automatically adjusts!

Annotative Scale Representations:

Multiple Scale Support:

Annotative objects can support **multiple scales simultaneously!**

Example Scenario:

- Place text at 1:100 scale
- Create another viewport at 1:50 scale
- Text automatically appears in both viewports at correct size
- AutoCAD creates "scale representations" for each scale

Controlling Scale Representations:

- **OBJECTSCALE**: Add/remove scales from selected annotative objects
- **Annotation Visibility**: Toggle showing all scales vs. current scale only
- **Add Current Scale**: Automatically add current scale to selected objects

System Variables for Annotative Control:

- **ANNOAUTOSCALE:** Controls automatic scale addition
 - -4 = Add scales automatically to all annotative objects
 - -3 = Add to dimensions only
 - -2 = Add to text only
 - -1 = Add to hatches only
 - 0 = Do not add scales automatically (manual control)
- **ANNOALLVISIBLE:** Show objects for all scales (ON) or current only (OFF)
- **ANNOMONITOR:** Highlights non-annotative objects when placing annotative ones
- **SELECTIONANNODISPLAY:** Show all scale representations when object selected


Creating Annotative Dimension Styles:

Process:

1. Type `DIMSTYLE` → Dimension Style Manager
2. Click **New** → Name style (e.g., “ISO_Annotative”)
3. In **Fit** tab, check **Annotative**
4. Configure other dimension properties (arrows, text, units)
5. Dimensions will now scale automatically like text


Same principle applies to:

- Multileader Styles (`MLEADERSTYLE`)
- Hatch Patterns (check Annotative in Hatch Creation dialog)
- Blocks (define as Annotative in Block Definition)

 **Golden Rule: ALWAYS use Annotative styles for professional drawings!** They eliminate manual calculations, ensure consistency across scales, and save enormous time when creating multiple viewports.

Common Annotative Pitfalls:

- **Mixed Annotative/Non-Annotative:** Don't mix! Causes scaling chaos
- **Forgetting Paper Height:** Always set paper height in style, not model height
- **Wrong Annotation Scale:** Text disappears if scale representation doesn't exist
- **Viewport Scale Mismatch:** Ensure viewport scale matches annotation scale
- **Exploding Annotative Objects:** Loses annotative properties permanently

 **What are Fields?** Fields are dynamic text placeholders that automatically update based on drawing properties, system information, or object data.

Common Field Applications:

- **Date & Time:** Automatic timestamps (creation, modification, plot date)
- **File Information:** Filename, file path, file size
- **Drawing Properties:** Author, title, subject, keywords
- **Plot Information:** Plot scale, paper size, device name
- **Object Properties:** Area, length, layer name, color
- **Sheet Set Information:** Sheet number, sheet title, drawing set
- **Formula:** Calculate values using expressions

Inserting Fields:

Method 1: During Text Creation

1. Start **MTEXT** or **TEXT**
2. Right-click in text editor → **Insert Field**
3. Select **Field Category** (e.g., Date & Time, Document)
4. Select **Field Names** (e.g., SaveDate)
5. Choose **Format** and **Date Format**
6. Click **OK** → Field appears with gray background

Method 2: Direct Command

- Type **FIELD** → Field dialog opens
- Configure field → Click OK → Place as text object

Method 3: In Existing Text

- Double-click text to edit
- Position cursor where field should go
- Right-click → Insert Field

Updating Fields:

Fields update automatically in most cases, but can be manually updated:

- **UPDATEFIELD:** Updates selected fields
- **REGEN:** Regenerates drawing and updates all fields
- **Automatic Updates:** Fields update when:
 - Drawing is opened
 - Drawing is plotted

Automatic Field Updates

- Drawing is saved
- eTransmit is used


Practical Field Examples:

Title Block Fields (Most Common):

- **Drawing Name:** Field → Document → FileName (without path)
- **Date:** Field → Date & Time → SaveDate (format: dd/MM/yyyy)
- **Drawn By:** Field → Document → Author
- **Project Name:** Field → Document → Title
- **Sheet Number:** Field → SheetSet → CurrentSheetNumber
- **Total Sheets:** Field → SheetSet → NumberOfSheets
- **Scale:** Field → Document → Plot Scale (in Layout)

Object-Based Fields:

- **Area Calculation:** Field → Object → Select closed polyline → Area
- **Length:** Field → Object → Select line/polyline → Length
- **Block Attributes:** Field → Object → Select block → Attribute value

 **Pro Tip:** Create title block templates with fields pre-inserted. When you start a new drawing from the template, just update Drawing Properties (`DWGPROPS`), and all fields update automatically!

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Annotation Best Practices

✔ Professional Annotation Standards:

Text Guidelines:

- Use **Annotative** styles for all text and dimensions
- Maintain **consistent text heights**: 2.5mm (notes), 3.5mm (titles), 5mm (main titles)
- Use **romans.shx** for technical drawings, TrueType for presentations
- Keep text **horizontal** whenever possible (0° rotation)
- Use **MTEXT** for paragraphs, TEXT for short labels
- Place text on dedicated **ANNO** or **TEXT** layer
- Avoid text overlapping geometry

✔ Professional Annotation Standards:

Dimension Guidelines:

- Always use **associative dimensions** (DIMASSOC = 2)
- Follow industry standards (ISO 128, ANSI Y14.5, DIN 406)
- Use **baseline** or **continuous** dimensioning for multiple dimensions
- Dimension from **finished surfaces** or **datum references**
- Avoid **dimension stacking** (crowded dimensions)
- Never manually override dimension values (use tolerances instead)
- Place dimensions on **DIMS layer**, separate from geometry
- Use appropriate **decimal precision** (± 0.01 for general, ± 0.001 for precision)

Leader Guidelines:

- Use **multileaders** for flexibility and control
- Keep leader angles at **30°, 45°, or 60°** for clean appearance
- Avoid crossing leaders whenever possible
- Use **consistent arrowhead style** throughout drawing
- Place leaders on **ANNO or LEADERS layer**
- Group related callouts with aligned leaders

Layer Organization:

- TEXT layer: General text and notes
- DIMS layer: All dimensions
- LEADERS layer: Multileaders and callouts
- TITLE layer: Title block text
- Use color ByLayer (consistent colors per layer)

📏 Standard Text Heights for Plotting:

- **2.0mm:** Small notes, reference text
- **2.5mm:** General notes, dimensions (most common)
- **3.5mm:** Section titles, important labels
- **5.0mm:** Drawing titles, main headings
- **7.0mm:** Title block project name
- **10.0mm:** Cover sheet titles

*These are **paper heights** – use Annotative styles to handle model space automatically!*

✖ Common Annotation Mistakes to Avoid:

- Mixing annotative and non-annotative objects
- Exploding dimensions or text (loses intelligence)
- Manually typing dimension values (use measurement!)
- Inconsistent text heights within same drawing
- Poor layer organization for annotations
- Text overlapping geometry or other text
- Using unrealistic precision (e.g., 0.0000001mm)
- Ignoring drawing standards and conventions

10 Quick Command Reference

Essential Annotation Commands:

Text Commands:

- `STYLE / ST` – Text Style Manager
- `TEXT / DT` – Single Line Text
- `MTEXT / MT / T` – Multiline Text
- `DDEDIT` – Edit Text
- `SCALETEXT` – Scale Multiple Text
- `JUSTIFYTEXT` – Change Text Justification

Dimension Commands:

- `DIMSTYLE / D` – Dimension Style Manager
- `DIMLINEAR / DLI` – Linear Dimension
- `DIMALIGNED / DAL` – Aligned Dimension
- `DIMANGULAR / DAN` – Angular Dimension
- `DIMRADIUS / DRA` – Radius Dimension
- `DIMDIAMETER / DDI` – Diameter Dimension
- `DIMBASELINE / DBA` – Baseline Dimension
- `DIMCONTINUE / DCO` – Continue Dimension

Leader Commands:

- `MLEADER / MLD` – Multileader
- `MLEADERSTYLE / MLS` – Multileader Style
- `MLEADEREDIT` – Add/Remove Leaders
- `MLEADERALIGN` – Align Leaders
- `MLEADERCOLLECT` – Collect Leaders

Field & Scale Commands:

- `FIELD` – Insert Field
- `UPDATEFIELD` – Update Selected Fields
- `OBJECTSCALE` – Manage Object Scales
- `ANNORESET` – Reset Annotation Scale
- `ANNOAUTOSCALE` – Auto Scale Setting

Utility Commands:

- `MATCHPROP / MA` – Match Properties
- `DIMEDIT` – Edit Dimension Text
- `DIMTEDIT` – Move/Rotate Dim Text
- `QSELECT` – Quick Select Annotations

1. Create three Text Styles:
 - Standard (romans.shx, Annotative, 2.5mm paper height)
 - Title (Arial Bold, Annotative, 5mm paper height)
 - Notes (romans.shx, Annotative, 2mm paper height, width 0.85)
2. Practice text commands:
 - Create single line text with different justifications (TL, MC, BR)
 - Create multiline text with bullets, underline, and special symbols (°, ±, Ø)
 - Insert fields showing current date, filename, and author
3. Create an Annotative Dimension Style:
 - Name: “ISO_Mechanical”
 - Arrows: Closed filled, 2.5mm size
 - Text: romans.shx, 2.5mm height, centered above dimension line
 - Primary Units: Decimal, 2 decimal precision
 - Make it Annotative!
4. Draw a simple rectangle (100×50 units) and add:
 - Linear dimensions on all four sides
 - Baseline dimensions from one corner
 - A diagonal dimension
 - Two multileaders with callout text
5. Test Annotative Scaling:
 - Change annotation scale to 1:1, 1:2, 1:5, 1:10
 - Observe how text and dimensions automatically resize
 - Add multiple scale representations to one text object
6. Create a basic title block with fields for:
 - Drawing name (filename)
 - Current date
 - Author name
 - Scale (as field)
7. Challenge: Create a dimension style matching your country’s standard (ISO, ANSI, DIN, or BS)

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Next class: Layer Management