

Introduction to AutoCAD

Video Lecture for ME119

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<http://www.autodesk.com/education/free-software/autocad>

Acknowledgement: Prof. Tanmay Bhandakkar, Prof. Salil Kulkarni

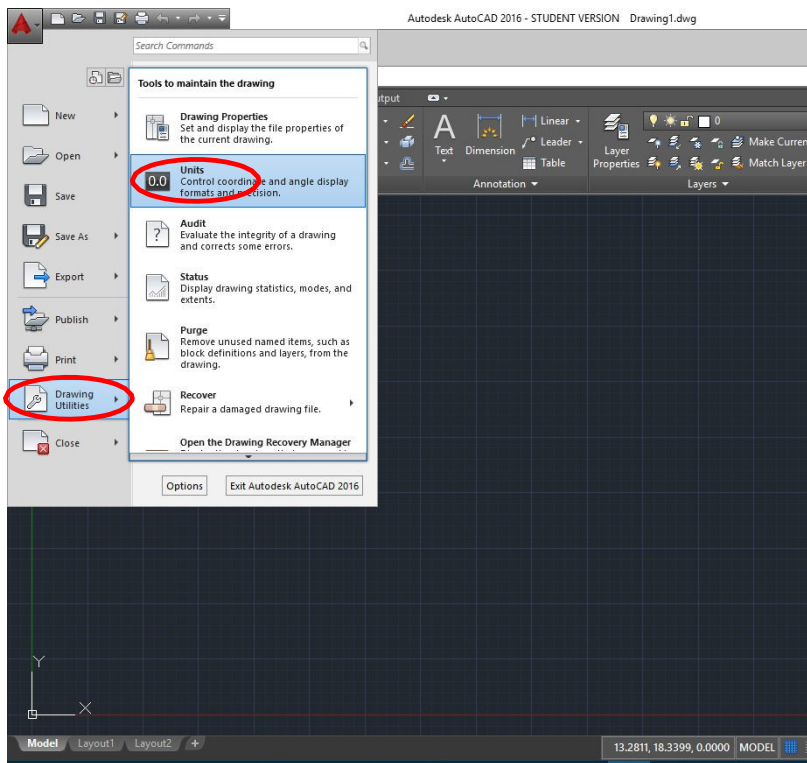
Computer Aided Drawing (CAD)

- ❑ *Computer aided drafting (CAD)* is a process of constructing drawing computer screen with the help of specially developed software
- ❑ Advantages: Accurate, time saving, standardization, easily shared, easy to edit
- ❑ Widely used commercial softwares:
 - *AutoCAD*
 - *Pro/Engineer*
 - *Catia*
 - *SolidWorks*
 - *NX Unigraphics*

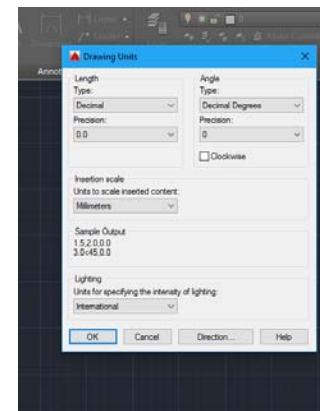
Setting Units

- In this course, the units for drawing objects will usually be in mm
 - If nothing is mentioned then units are in mm
- AutoCAD does not use mm by default
 - This may cause issues while printing/saving as pdf
 - Becomes difficult to define other properties like line thickness, etc
- We will first ensure that the units are in mm
 - Also a good idea to set the precision to single decimal place

Setting Units

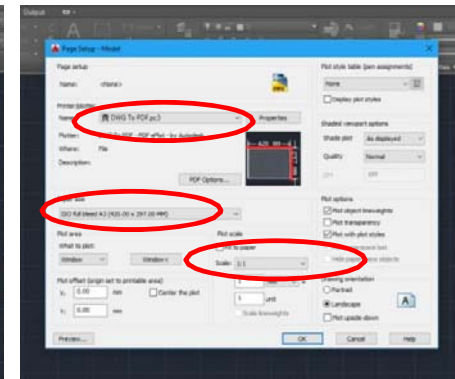
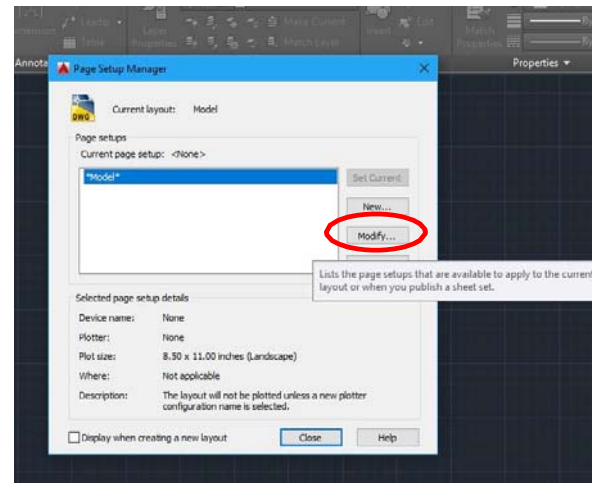
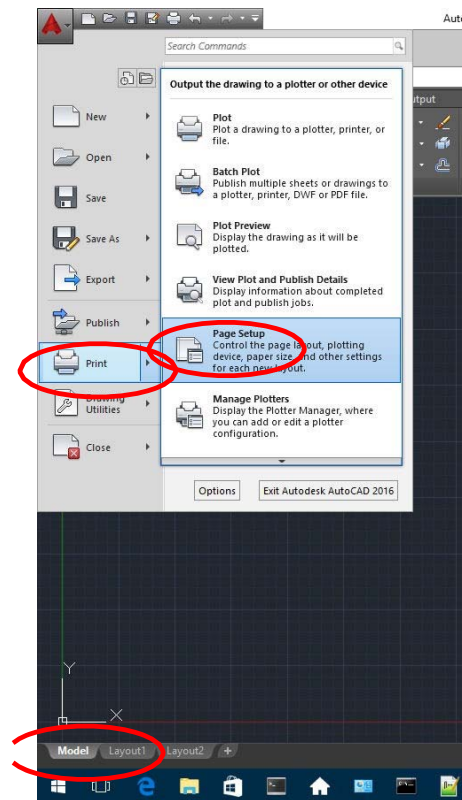


A



B

Page Setup : Model

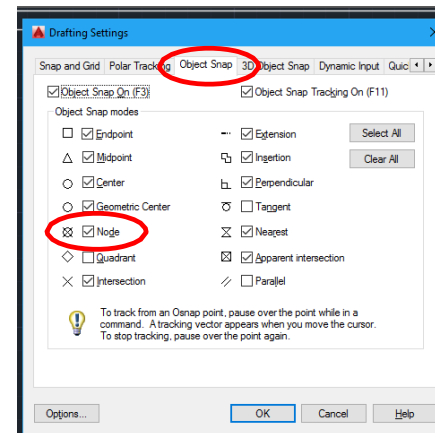
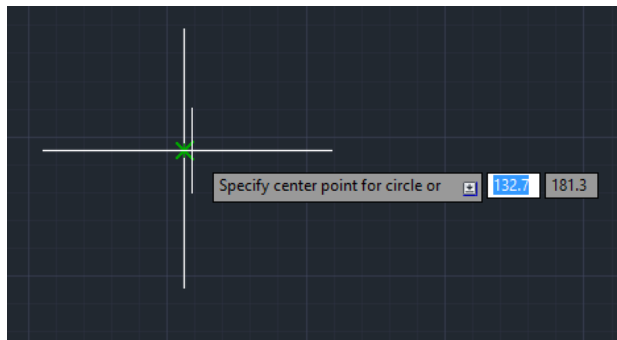


Printer name: DWG to PDF
Paper size: ISO full bleed A3 (420x297 mm)
Scale: 1:1

- Choose “dwg to pdf” for printer name
- Choose “ISO Full Bleed A3 (420x297 mm)” under paper size
- We won’t really worry about the page setup for “Layout” tabs

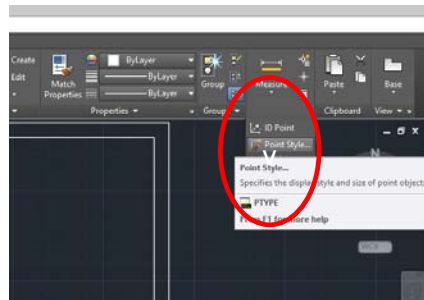
Object Snap (OSNAP Command)

- While hovering cursor, AutoCAD will automatically select intersections, midpoints etc.
- OSNAP command can be used to set which points should be chosen

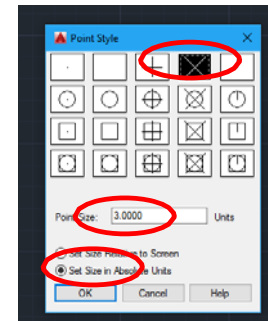


Make Nodes/Points Visible

- Sometimes we mark intersections/divisions using nodes/points
- We have to make these intersections visible using markers

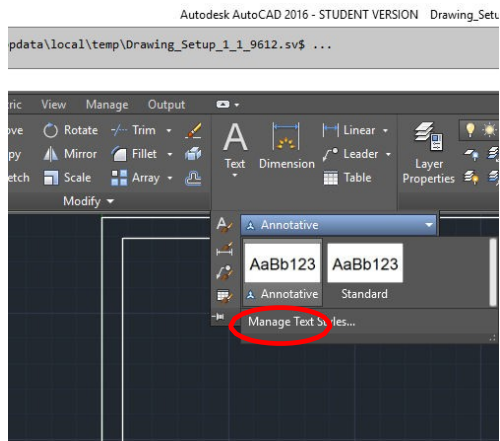


Utilities -> Point Style

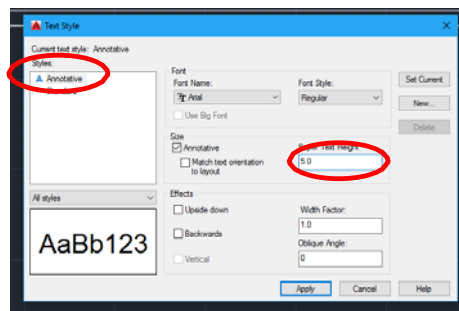


Setting Up Text Style

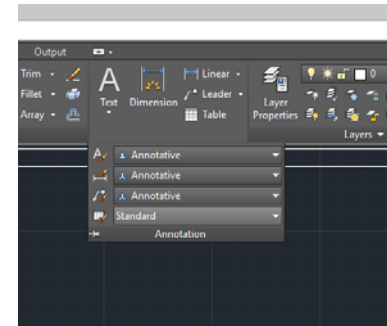
- Text size should not be too large/small compared to figures
 - Always test your settings



Annotation → Text Style → Manage text styles

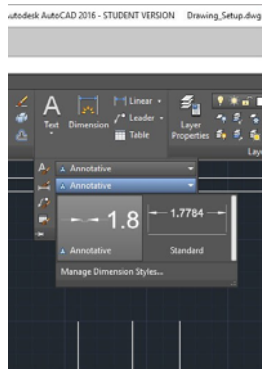


Select annotative



Annotation – Select Annotative for text, dimensions and multi-leader style

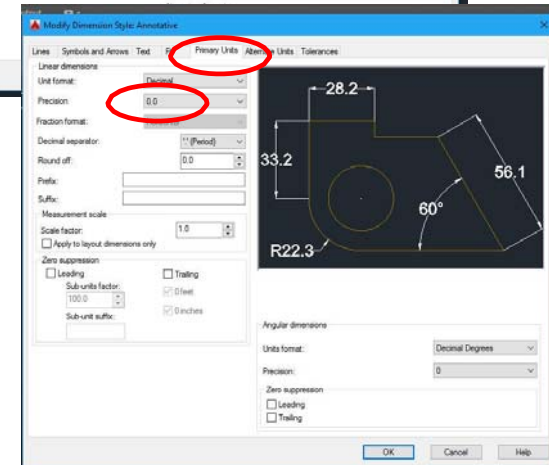
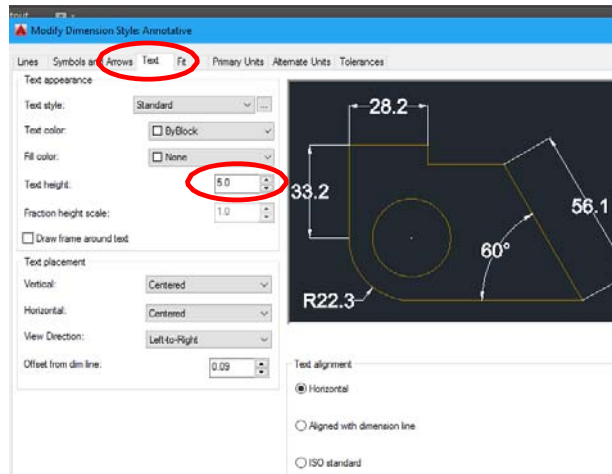
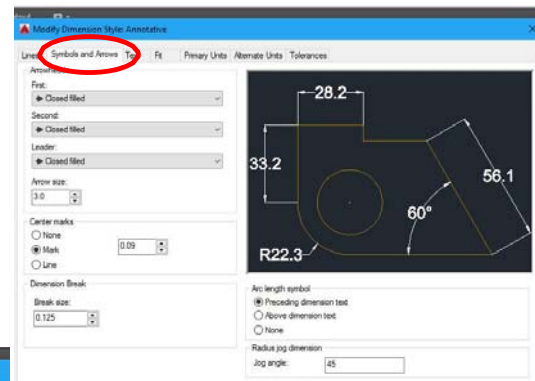
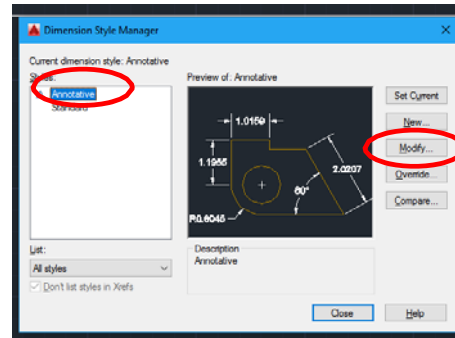
Dimensioning Style



Annotation →
Dimension Style →
Manage text styles

OR

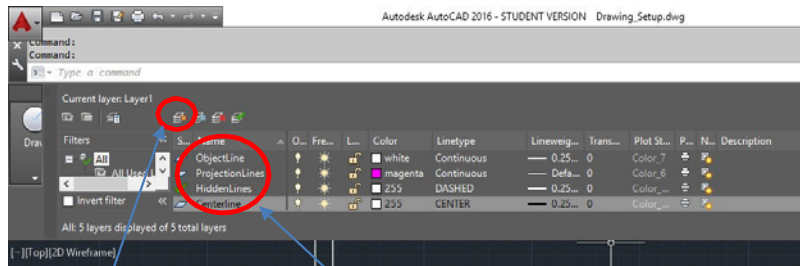
Command: DIMSTY



Make sure that size of text and arrows are not too large/small
Again – test your settings

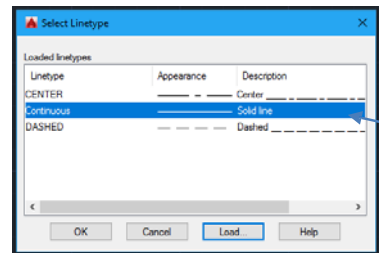
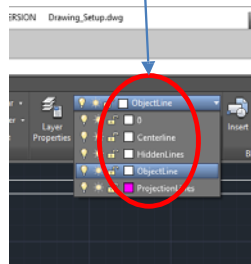
LAYER Command

Layer manager



Add new layer New layers created using the layer manager

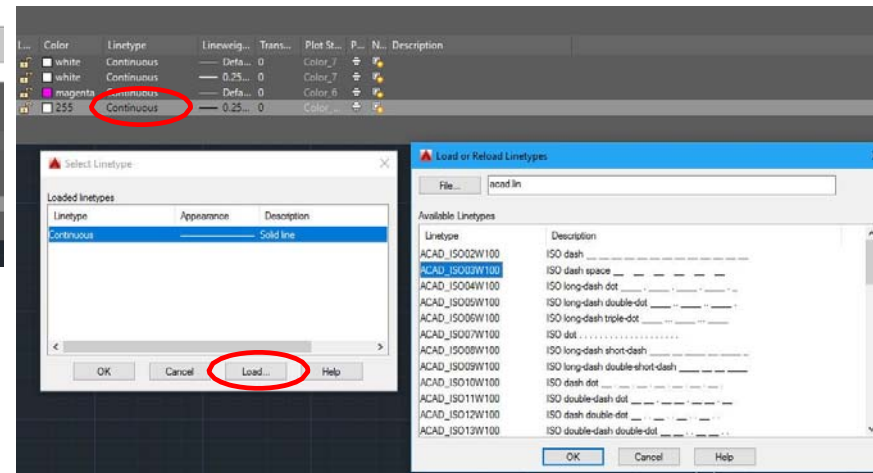
To activate a layer in the drawing



Now select the loaded line type.

You may use different colors for layers. Set all layers to white color before exporting to pdf.

NEVER use the defpoints layer



To change the line type of a layer, click on the current line type, then load, then select appropriate line type to load.

Using the layer manager you can add/delete layers, change linetypes, colour and freeze and thaw layers

Summary of Settings

- Units (to mm)
- Page setup (420x297 mm)
- Object snap settings (OSNAP)
- Make nodes visible
- Set text size
- Set dimensioning style
- Set Layer properties

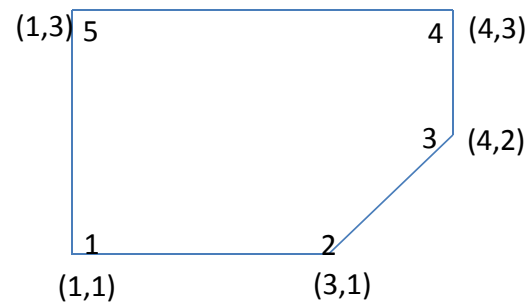
COPY/MOVE

- Make a circle (CIRCLE command)



- Enter COPY command->select object (left-click)->right click (select base point)->drag object->right click (repeat if needed)
- Press Esc once you are finished copying
- MOVE command is very similar

PLINE: Different ways of creating polygons



Relative Cartesian coordinates

Command: PLINE

1st point: 1,1

2nd point: 2,0

3rd point: 1,1

4th point: 0,1

5th point: -2,0

6th point: c

Relative Polar coordinates

Command: PLINE

1st point: 1,1

2nd point: 2<0

3rd point: 1.414<45

4th point: 1<90

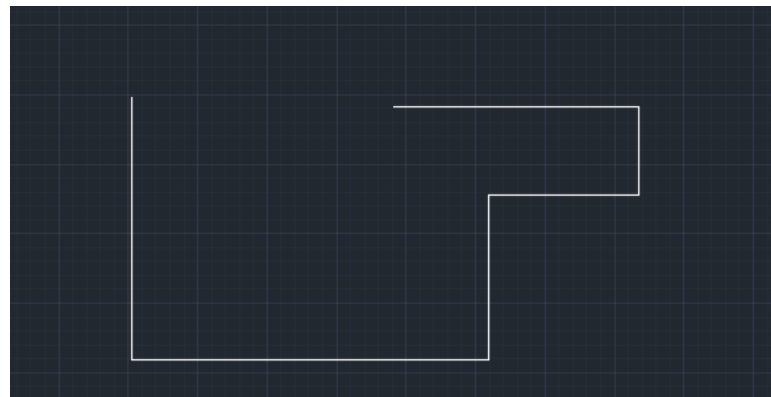
5th point: 3<180

6th point: c

Other important shapes: CIRCLE, SPLINE

ORTHO Mode

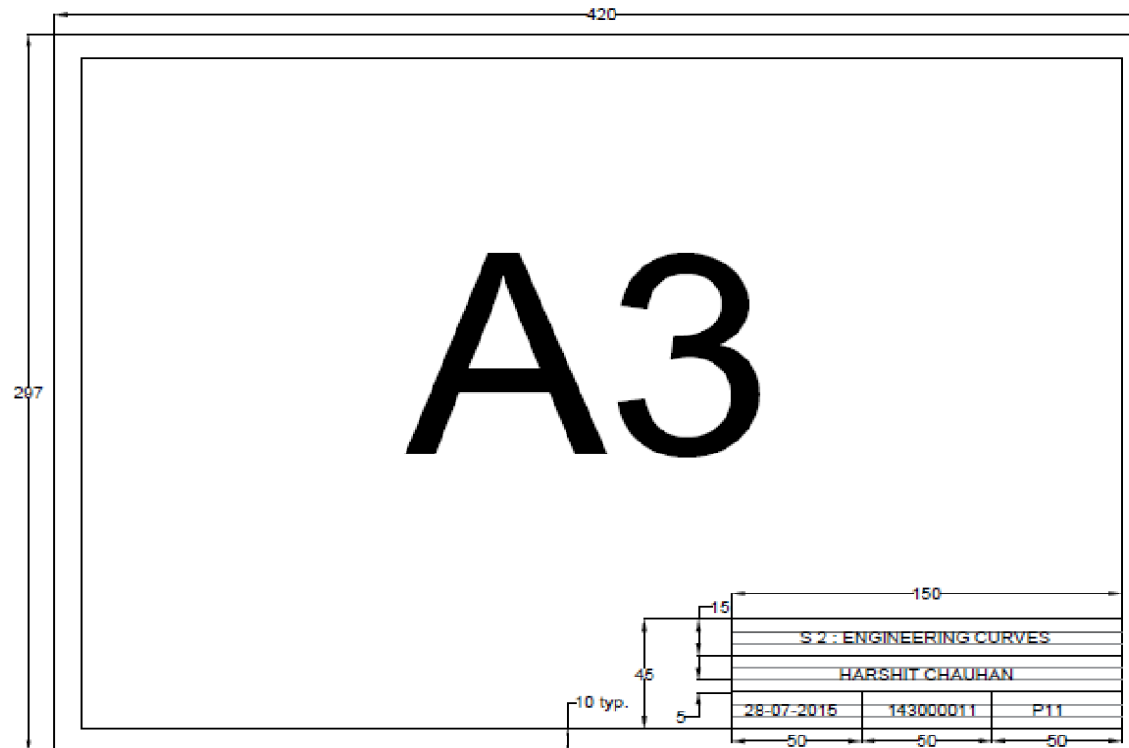
- ORTHO mode ON helps us draw lines that are exactly parallel to axes
- Turn ORTHO OFF if line needs to be drawn at an angle



Template to be used for all the AutoCAD sheets

□ Paper, margins and name plate:

- *Size of sheet is A3 (Width = 420 mm, Height = 297 mm)*
- *10 mm margin on all sides*
- *Name plate (Size: 150 mm x 45 mm) should appear in the right bottom corner as follows*



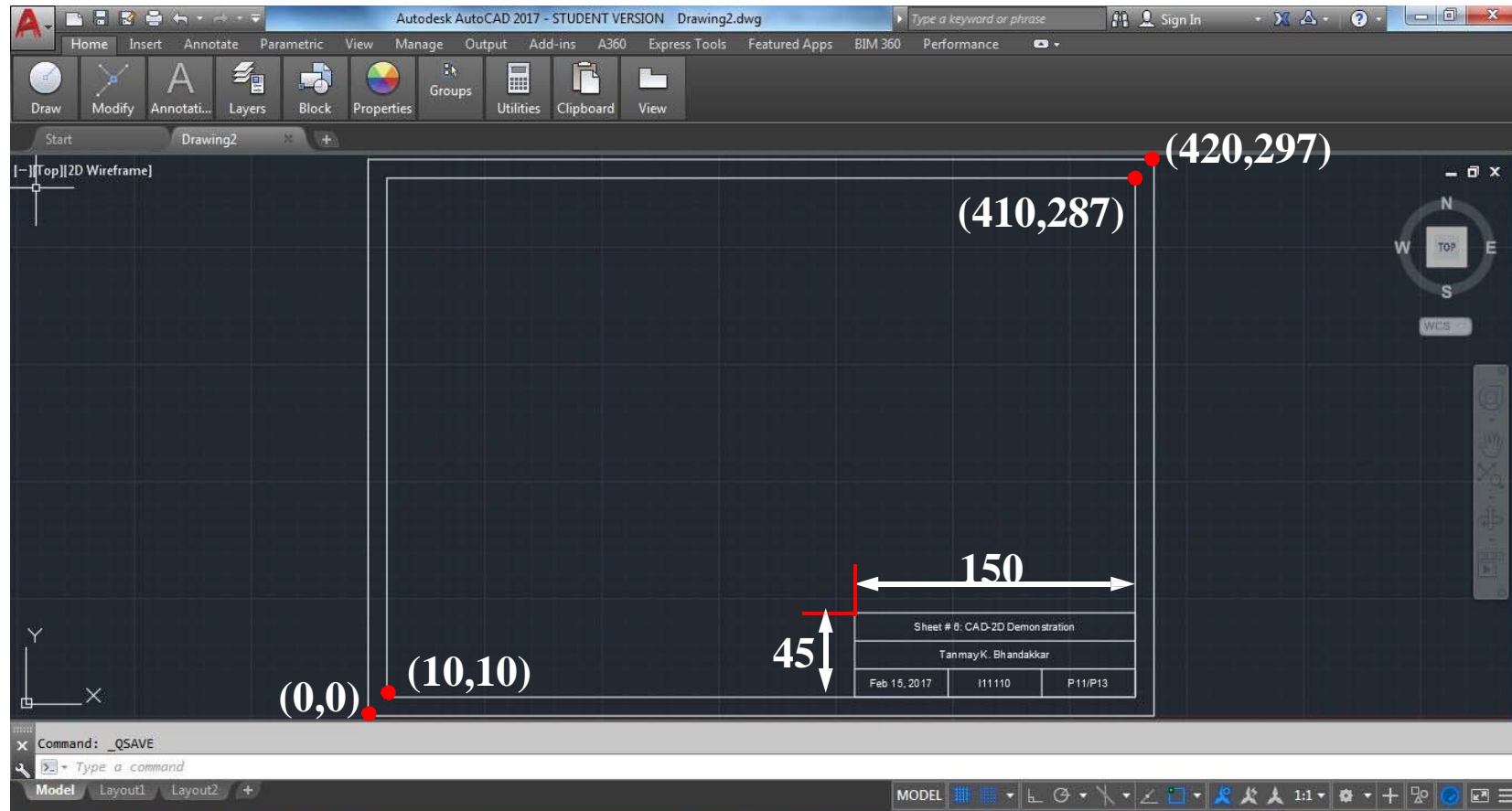
Steps to generate the template

- (1) Use "*rectangle*" command with corner co-ordinates (0,0) and (420,297) to generate "A3" size drawing area.
- (2) Use "*rectangle*" command with corner co-ordinates (10,10) and (410,287) to generate border with a gap of 10 mm. Other option is "*offset*" command or *relative co-ordinates @*.
- (3) For name-plate, again "*rectangle*" command can be used with appropriate co-ordinates.
- (4) Other option is move the "*ucs*" to the right bottom corner of the inner rectangle. Use "*rectangle*" command with corner co-ordinates (0,0) and (-150,45). Move the "*ucs*" back to the left corner of the outer rectangle.
- (5) For Name plate, the innermost smaller rectangle in the right corner is to be divided into three equal parts. Switch on the ORTHO mode (F8). See the right corner of the computer screen.
- (6) Draw line to coincide with the horizontal edge of the smallest rectangle.
- (7) "*Move*" the line along $-y$ direction by 15 units w.r.t original location.
- (8) "*Copy*" this line and move the new line relative to the 2nd line further by 15 units in the $-y$ direction.
- (9) In the bottommost rectangle of the name plate, use "Move" and "*Copy*" to further divide the rectangle into three move parts. Keep both the ORTHOMODE and SNAPON mode active.

Steps to generate the template

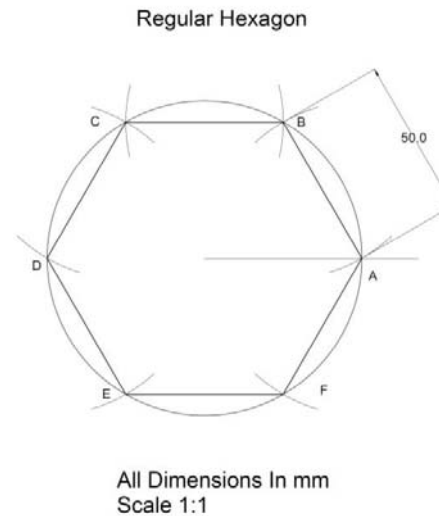
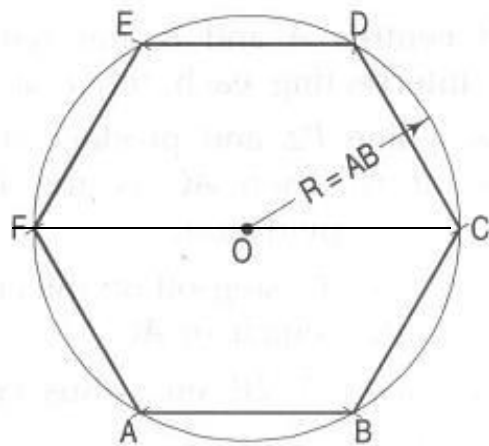
- 10) Add text using "*text*" command. The text should appear at the centre of the rectangular boxes of the rectangles of the name plate. It's a good idea to turn off "Object Snap" (OSNAP), since the text placement can get constrained.
- 11) With TEXT command, you can always enter multiple text lines. Press CTRL-ENTER to stop entering the text.

Snapshot of the template to be used for all the AutoCAD sheets



Example: Drawing a Hexagon

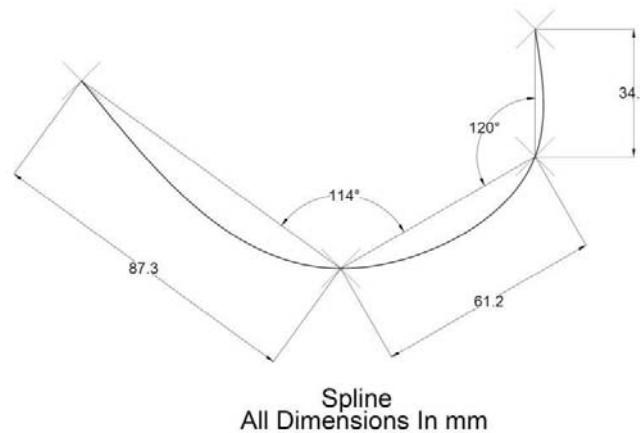
- Draw a hexagon with side 50 mm



Commands used: CIRCLE, LAYER, TRIM, TEXT, DIMALI

Example: Drawing a Spline

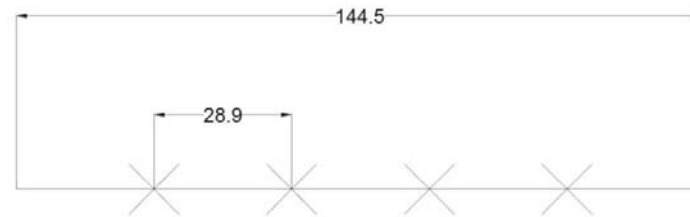
- Draw a polyline, connect the vertices with a curve



Commands used: PLINE, POINT, LAYER, DIMALI, DIMANG

Example: Divide a Line

- Divide a line into 5 equal parts



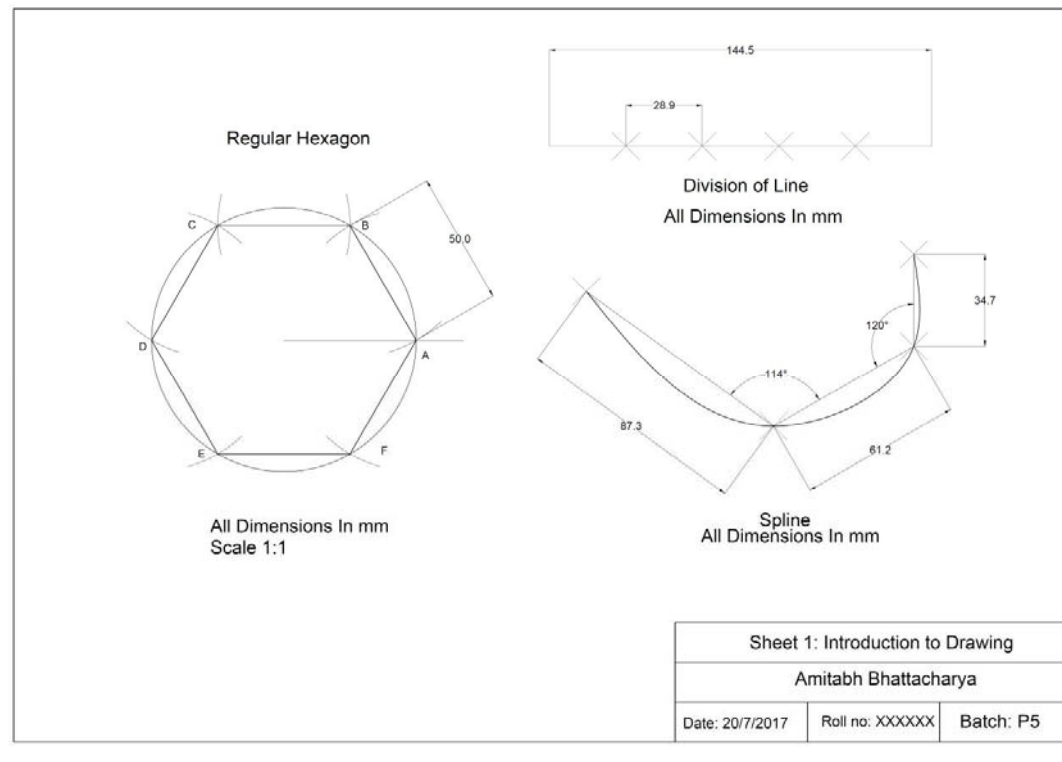
Division of Line
All Dimensions In mm

Commands used: PLINE, DIVIDE, POINT, DIMALI,

- Use MEASURE command to verify distance between divisions

Example: Final Sheet

- Use export->pdf to print
- Always check print->plot preview



Dimensioning for Scaled Objects

- Say actual square has dimensions 500mm, but I want to show it with a square of 100 mm
 - Scale is 1:5
- Use DIMLFAC statement
 - Set DIMLFAC=5



Scale 1:1
DIMLFAC=1



Scale 5:1
DIMLFAC=0.2



Scale 1:5
DIMLFAC=5

LTSCALE: Adjusting Dashed/Dash-Dot Lines

- Dashed/Dash-dot lines will have default spacing between the dashes and dots
- LTSCALE can be used to set this spacing
- Usually LTSCALE value of between 0.1 and 1 is used

EXTEND: Extending Lines

- Construction lines may sometimes need to be extended
- A reference line needs to be chosen, which intersects the trace of the original line
- The original line is then extended by the **EXTEND** statement
 - Reference line can then be deleted

TRIM: Trimming Construction Lines and Arcs

- Circles and long lines are sometimes used for construction, and need trimming
- A reference curve (e.g. circle, line..) needs to be chosen which intersects the construction line/circle
- TRIM statement can then be used to trim the construction line

Isometric Drawing

- 1. To draw isometric views, use the ISODRAFT command
 - <https://knowledge.autodesk.com/support/autocad/learn-explore/caas/CloudHelp/cloudhelp/2018/ENU/AutoCAD-Core/files/GUID-37463F74-0B06-46E2-8791-6C5B852A069D-htm.html>
- 2. To draw isometric view of circle, use ELLIPSE command after using ISODRAFT command
 - <https://knowledge.autodesk.com/support/autocad/learn-explore/caas/CloudHelp/cloudhelp/2018/ENU/AutoCAD-Core/files/GUID-B46904E8-F414-43D8-AA74-E06B0D9E83FB-htm.html>
- 3. To dimension isometric drawings in AutoCAD, use the aligned dimensions, along with the DIMEDIT and DIMTEDIT commands
 - <https://www.thesourcecad.com/how-to-make-isometric-dimension-and-text-in-autocad/>

List of important AutoCAD commands

(Details at knowledge.autodesk.com)

ARC	EXTEND
AREA	LAYER
ARRAY	LINE
BLOCK	MOVE
CIRCLE	OFFSET
COPY	PLINE
CYLINDER	POLYGON
DIM	QLEAD
DIMALINGNED	RECTANG
DIMANGULAR	REDRAW
DIMCENTER	ROTATE
DIMDIAMETER	SAVE
DIMLFAC	SCALE
DIMSTYLE	TRIM
DIVIDE	U
ELLIPSE	UCS
ERASE	ZOOM