21MES102L
Engineering Graphics and Design
School of Mechanical Engineering

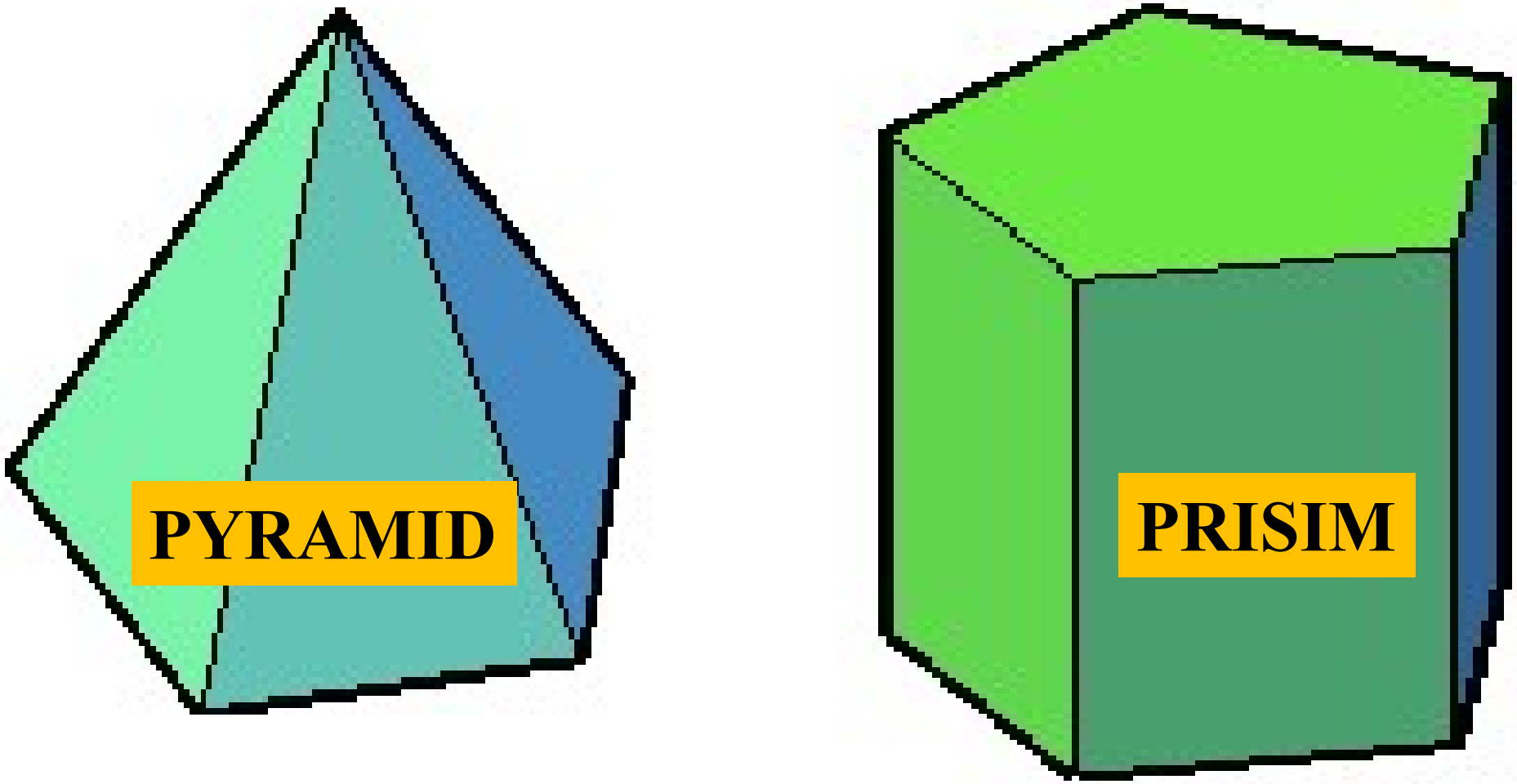
Dr.R.SANTHANAKRISHANAN M.E., Ph.D.,
Associate Professor,
Department of Mechanical Engineering,
SRM IST, Kattankulathur.

Disclaimer

The content prepared in the presentation are from various sources, only used for education purpose. Thanks to all the sources.

21MES102L
Engineering Graphics and Design

E6 Orthographic Projection Of Polyhedron



Topics Covered

- Projection of Polyhedrons with its Axis Inclined to one Principal Plane and Parallel to other Plane

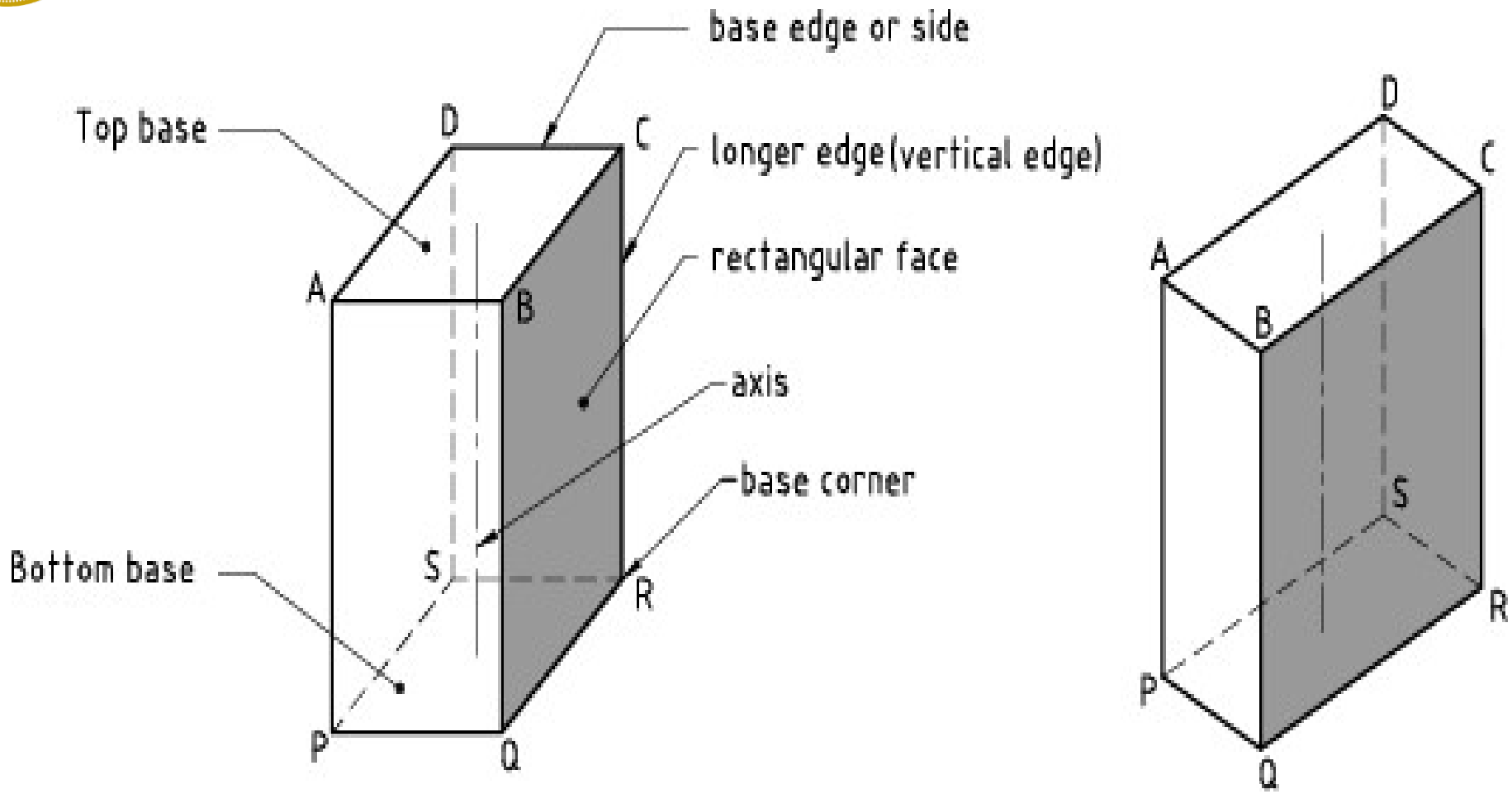
Solids

Polyhedra

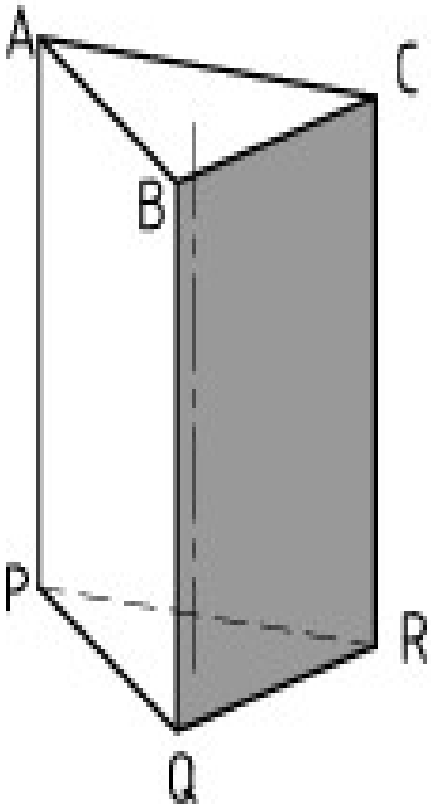
- Tetrahedron
- Cube
- Prisims
- Pyramids

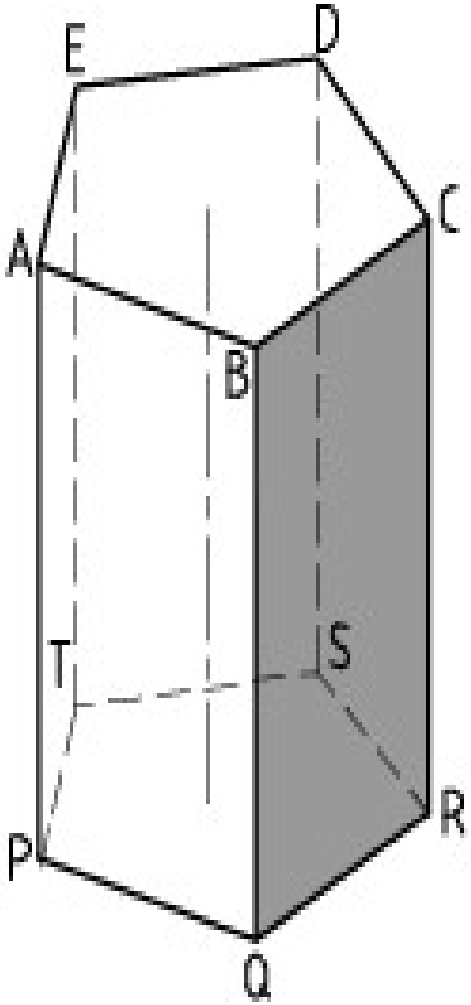
Solids of Revolution

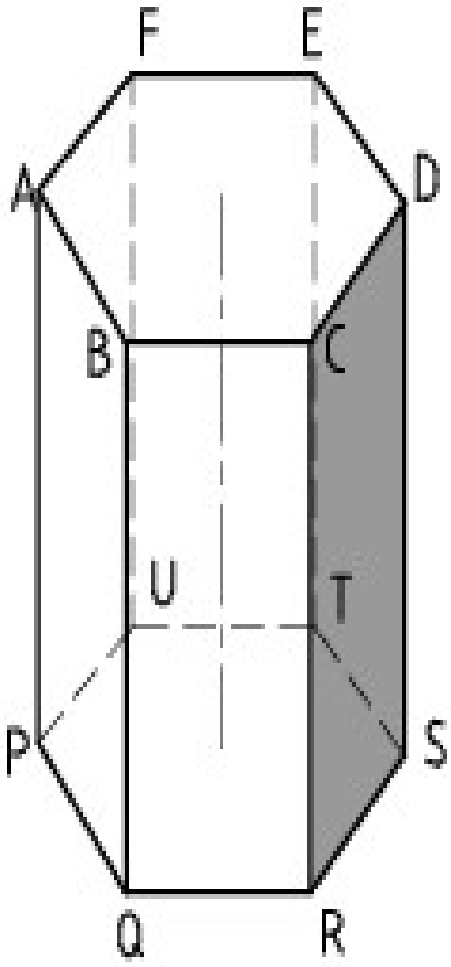
- Cylinder
- Cone
- Sphere



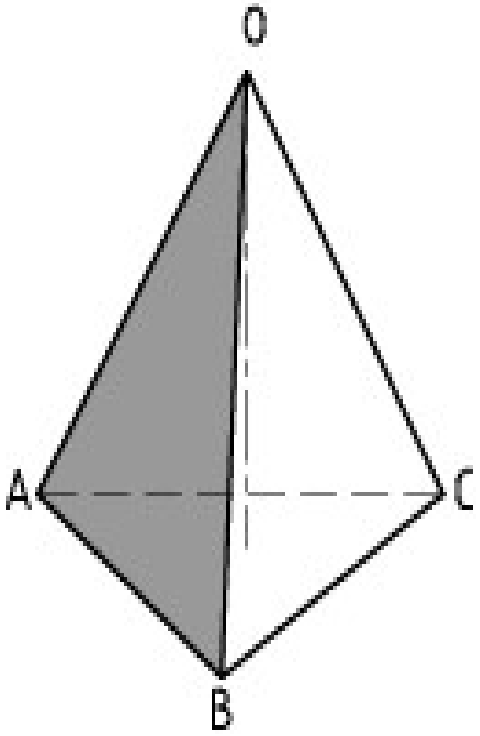
Rectangular Prisim



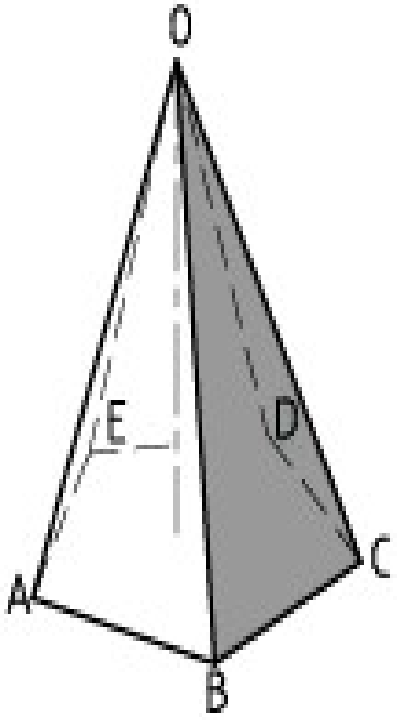




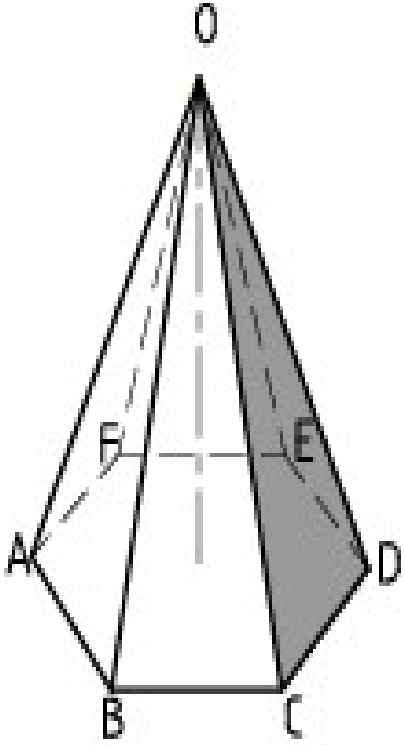
Triangular Prisim **Pentagonal Prisim** **Hexagonal Prisim**



Triangular Pyramid

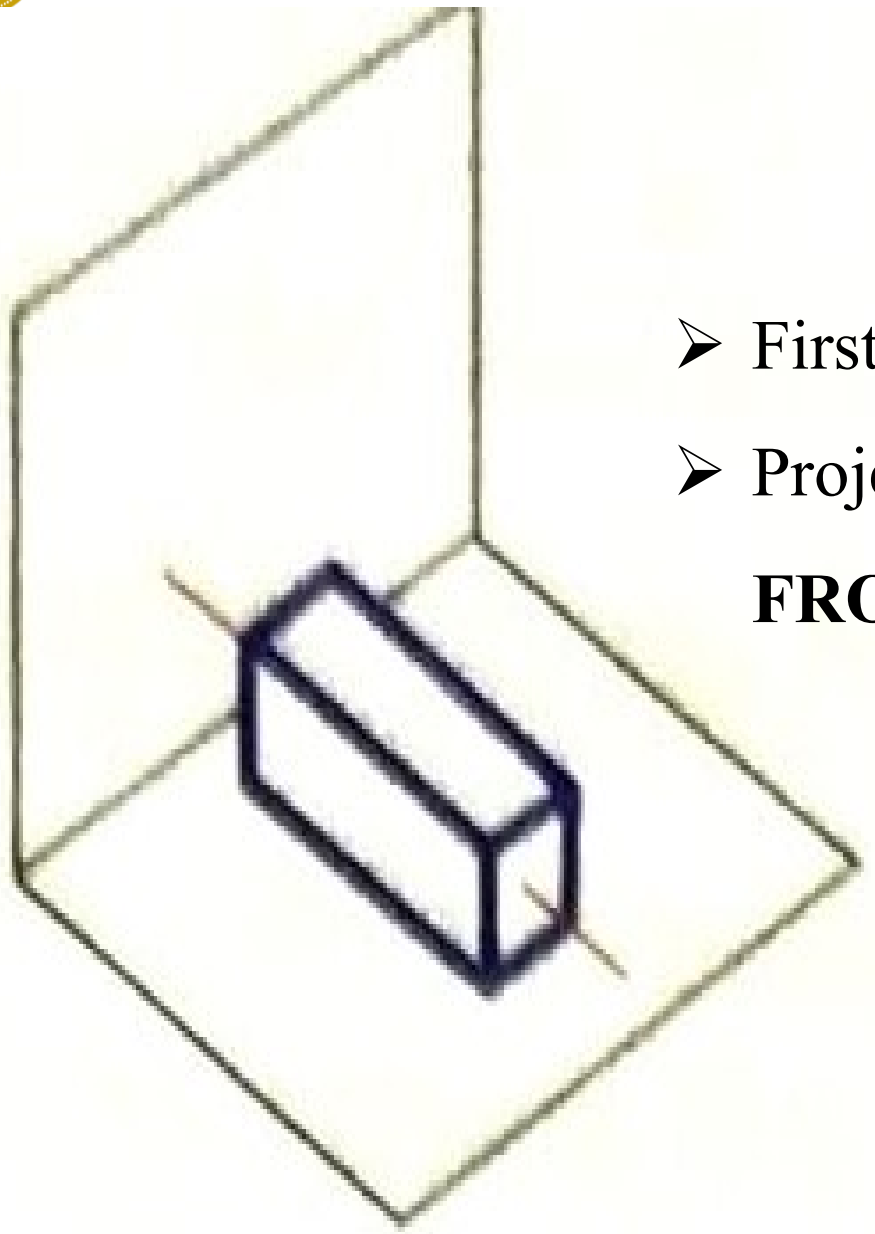


Pentagonal Pyramid



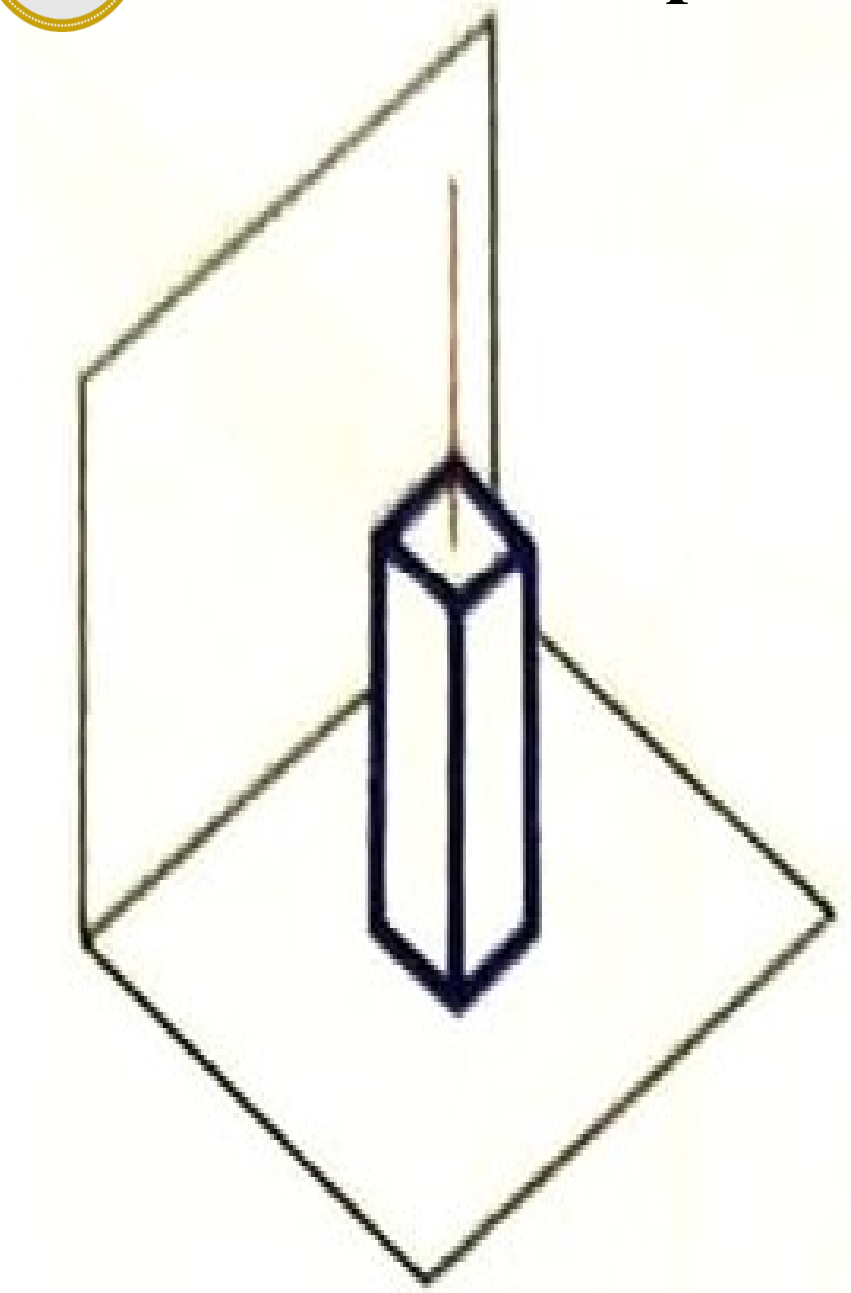
Hexagonal Pyramid

Axis Parallel to HP & Perpendicular to VP



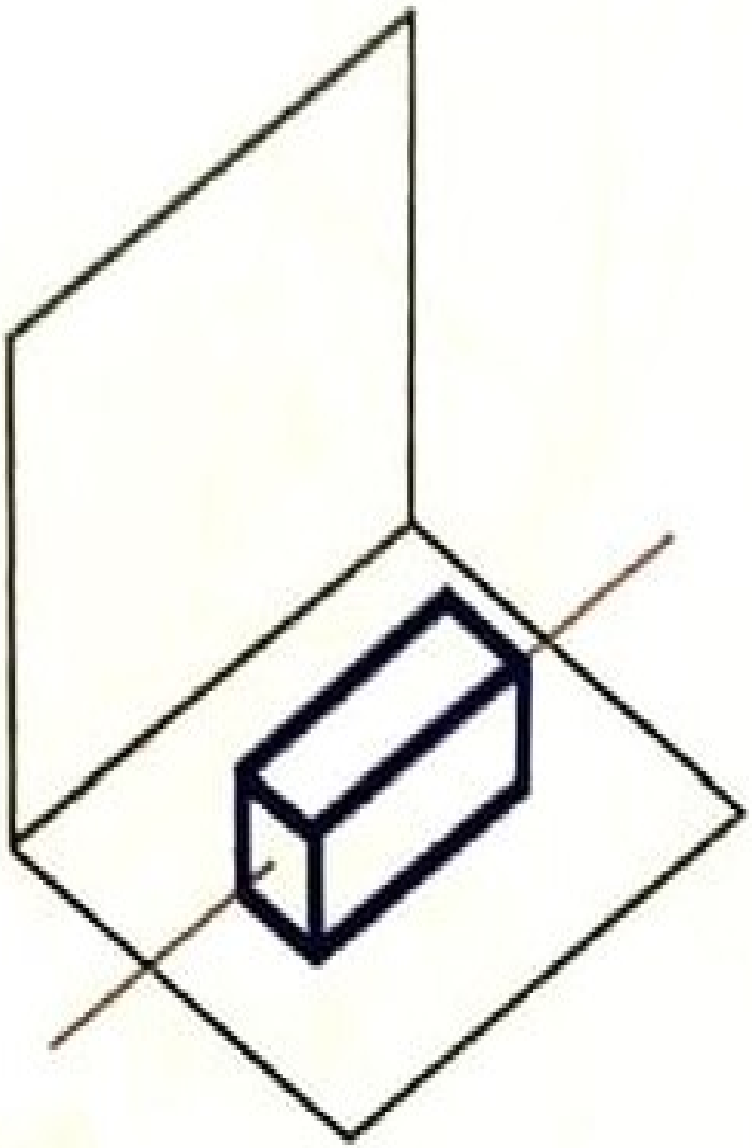
- First start with **FRONT** view
- Project the **TOP** view from the **FRONT** view

Axis Perpendicular to HP & to Parallel VP



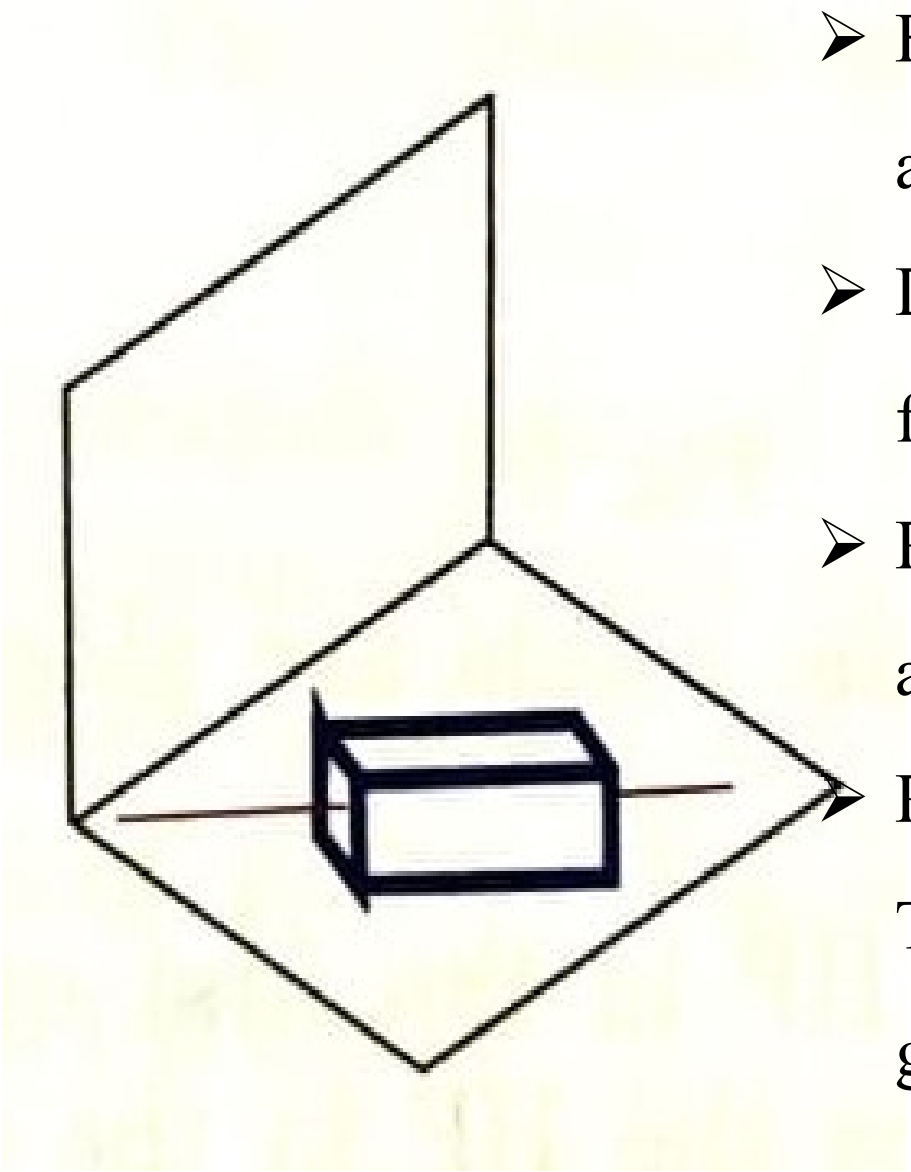
- First start with **TOP** view
- Project the **FRONT** view from the **TOP** view

Axis Parallel to Both HP & VP



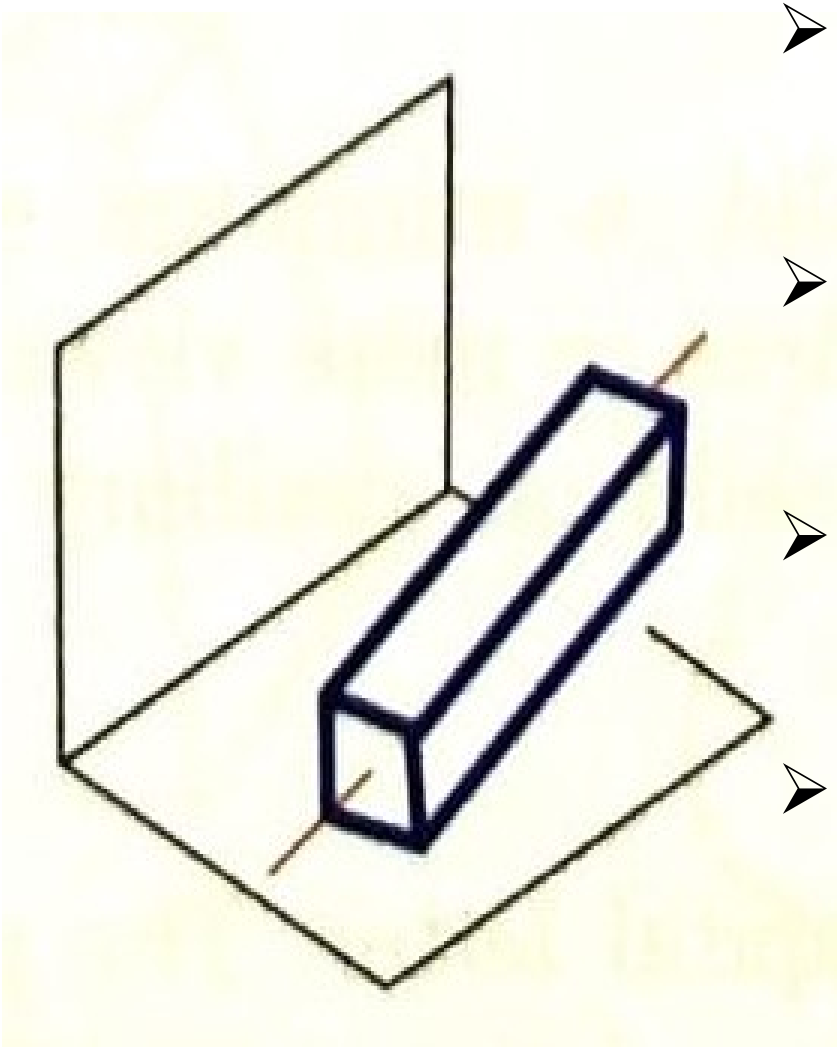
- First start with **SIDE** view
- Project **FRONT** the view from the **SIDE** view
- Project **TOP** the view from the **FRONT** view

Axis Parallel to HP & Inclined to VP

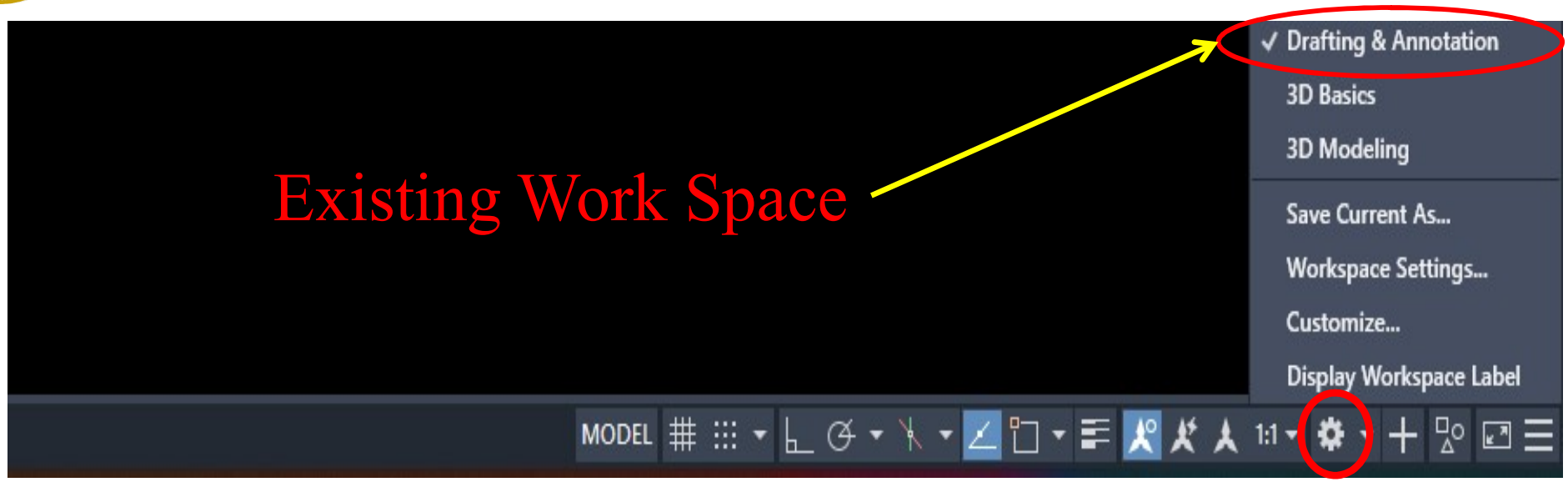


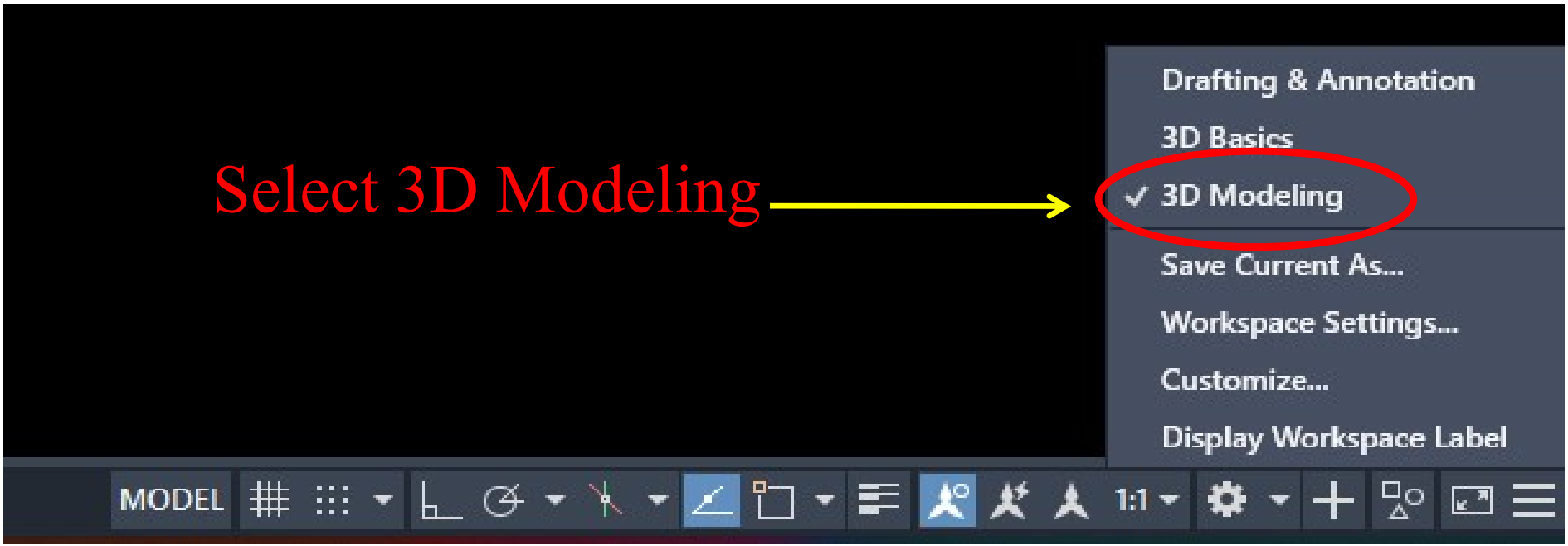
- First start with simple position with axis Perpendicular to **VP**
- Draw the **FRONT** view & **TOP** view for the simple position.
- Rotate the solid for given inclination angle with respect to **VP**
- Project the views from simple position **TOP** view & Tilted **FRONT** view to get the final **TOP** view.

Axis Parallel to VP & Inclined to HP

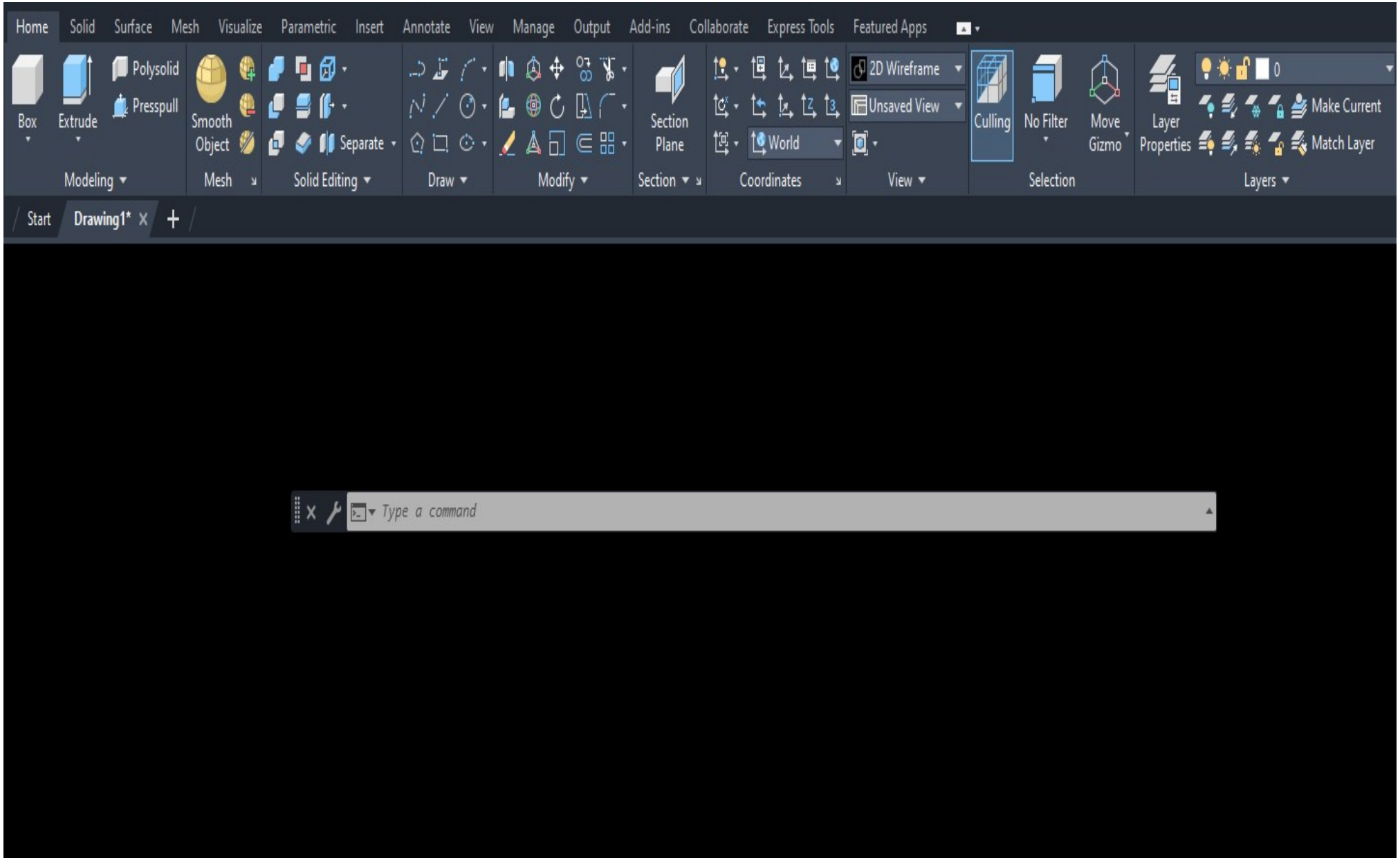


- First start with simple position with axis perpendicular to **HP**
- Draw the **TOP** view & **FRONT** view for the simple position.
- Rotate the solid for given inclination angle with respect to **HP**
- Project the views from simple position **FRONT** view & Tilted **TOP** view to get the final **FRONT** view.

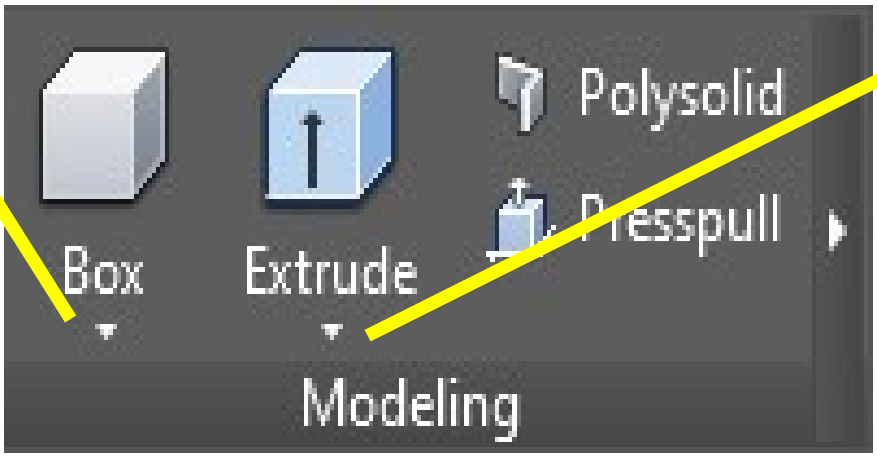

Existing Work Space
✓ Drafting & Annotation
3D Basics
3D Modeling
Save Current As...
Workspace Settings...
Customize...
Display Workspace Label
MODEL
1:1


Select 3D Modeling
Drafting & Annotation
3D Basics
✓ 3D Modeling
Save Current As...
Workspace Settings...
Customize...
Display Workspace Label
MODEL
1:1

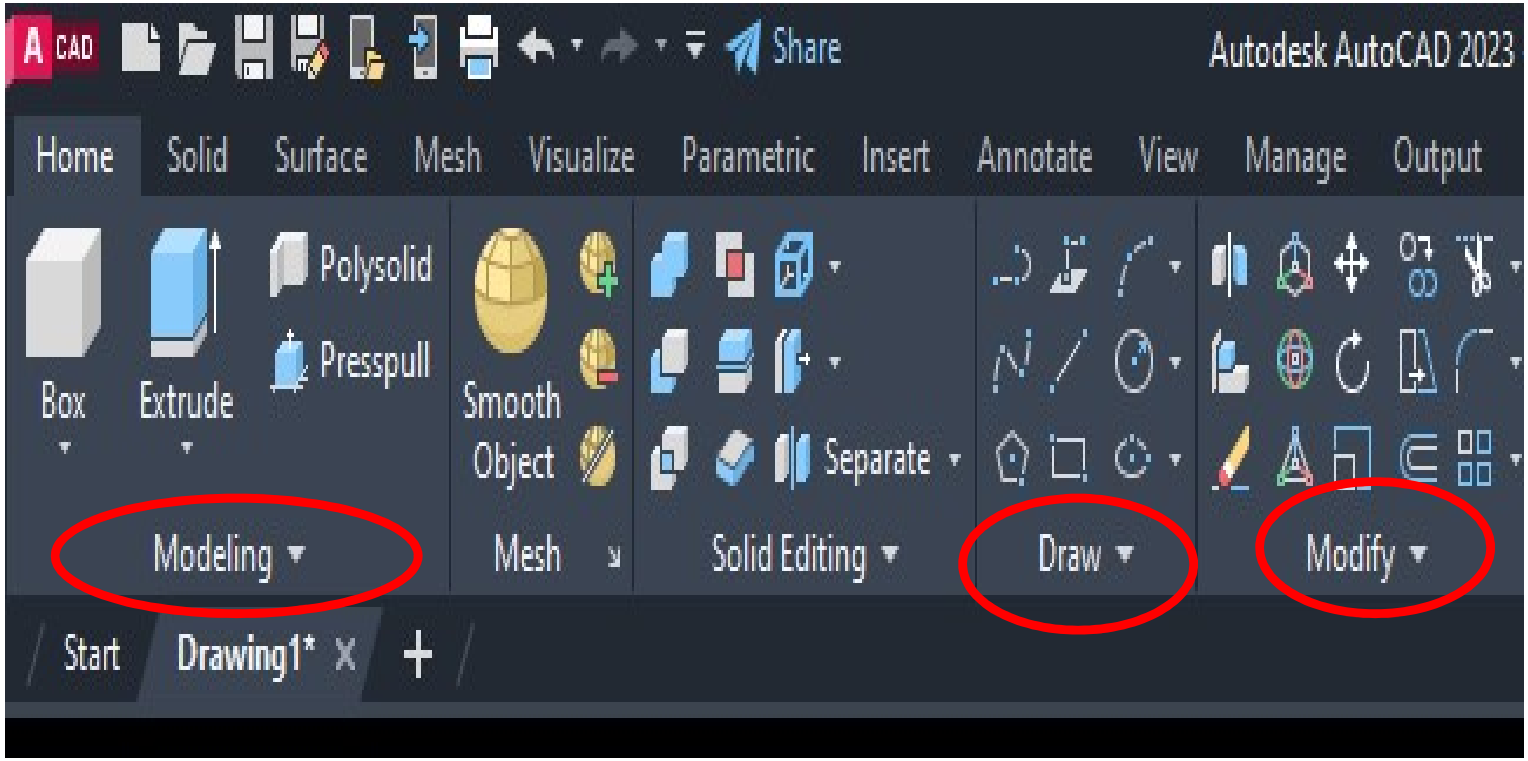
Auto Cad 2023 3D Modeling Work Space



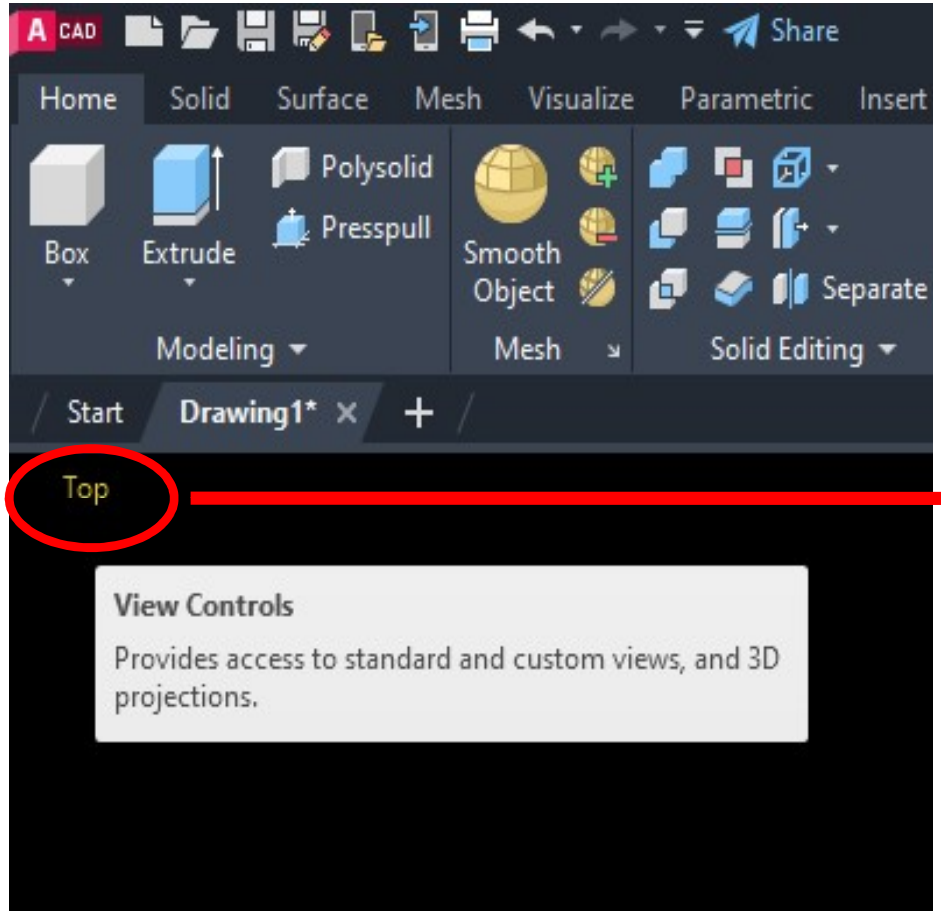
Modeling Tool bar Used to CREATE 3D SOLIDS

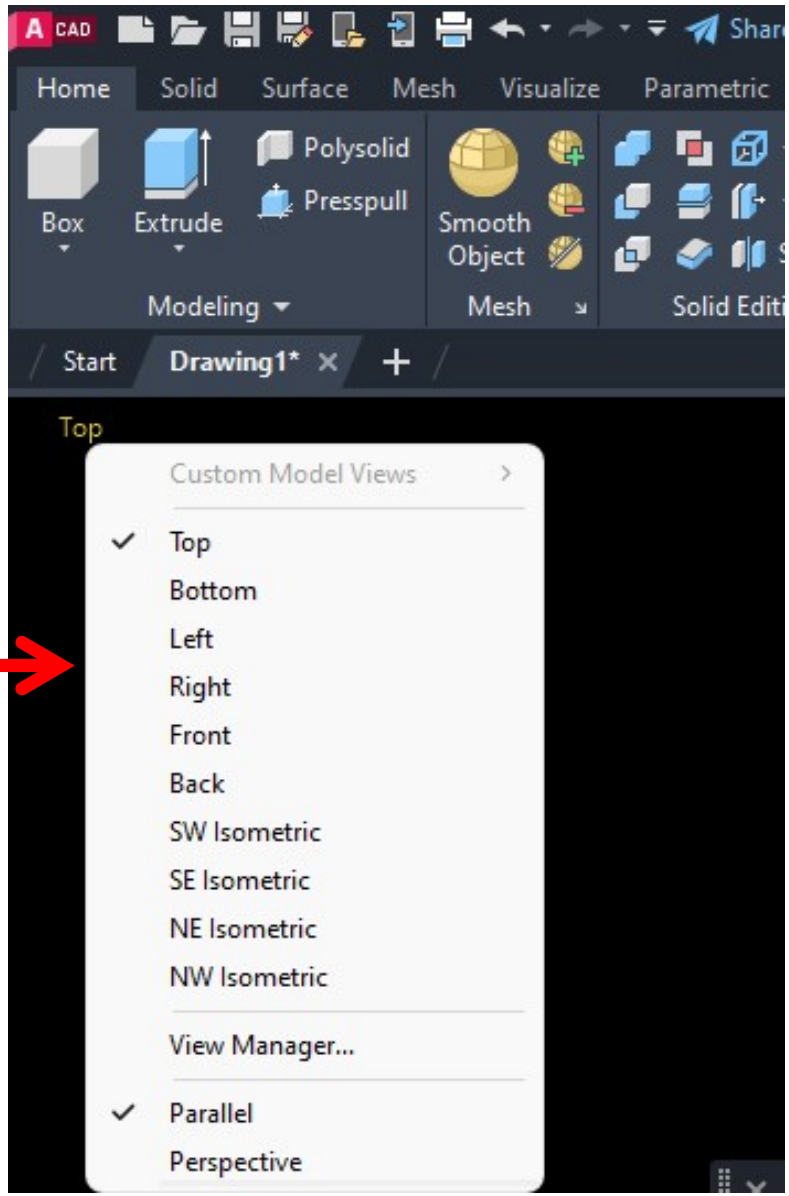


The pull downs facilitates the user to create the Tailor made 3D Solids

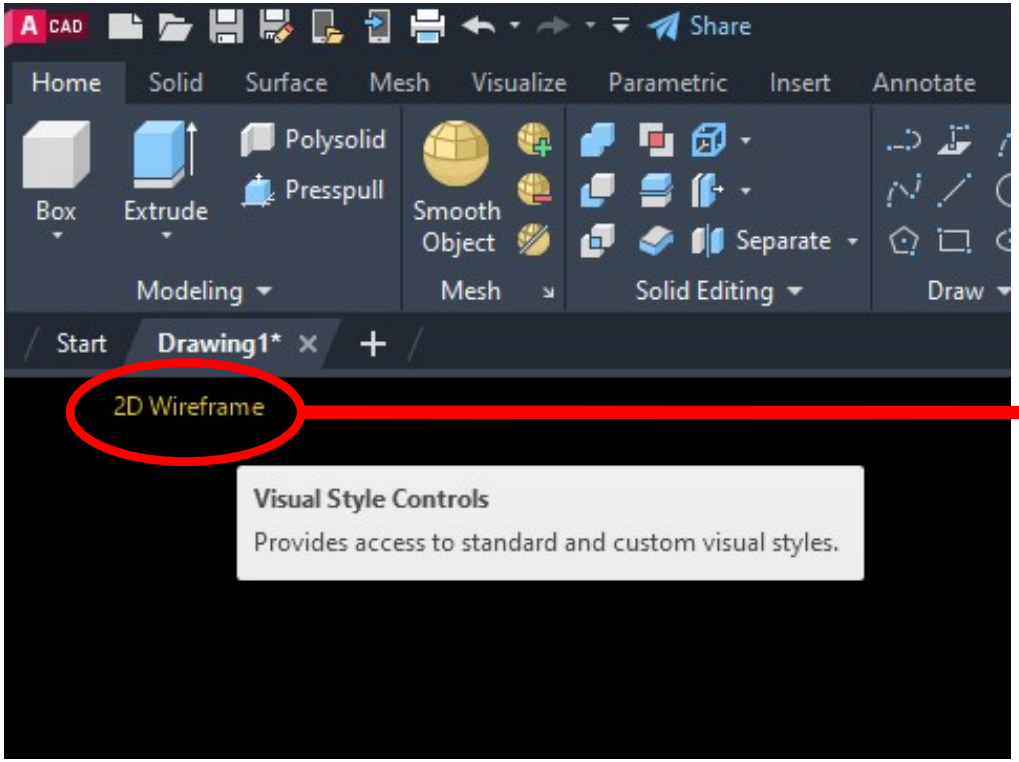


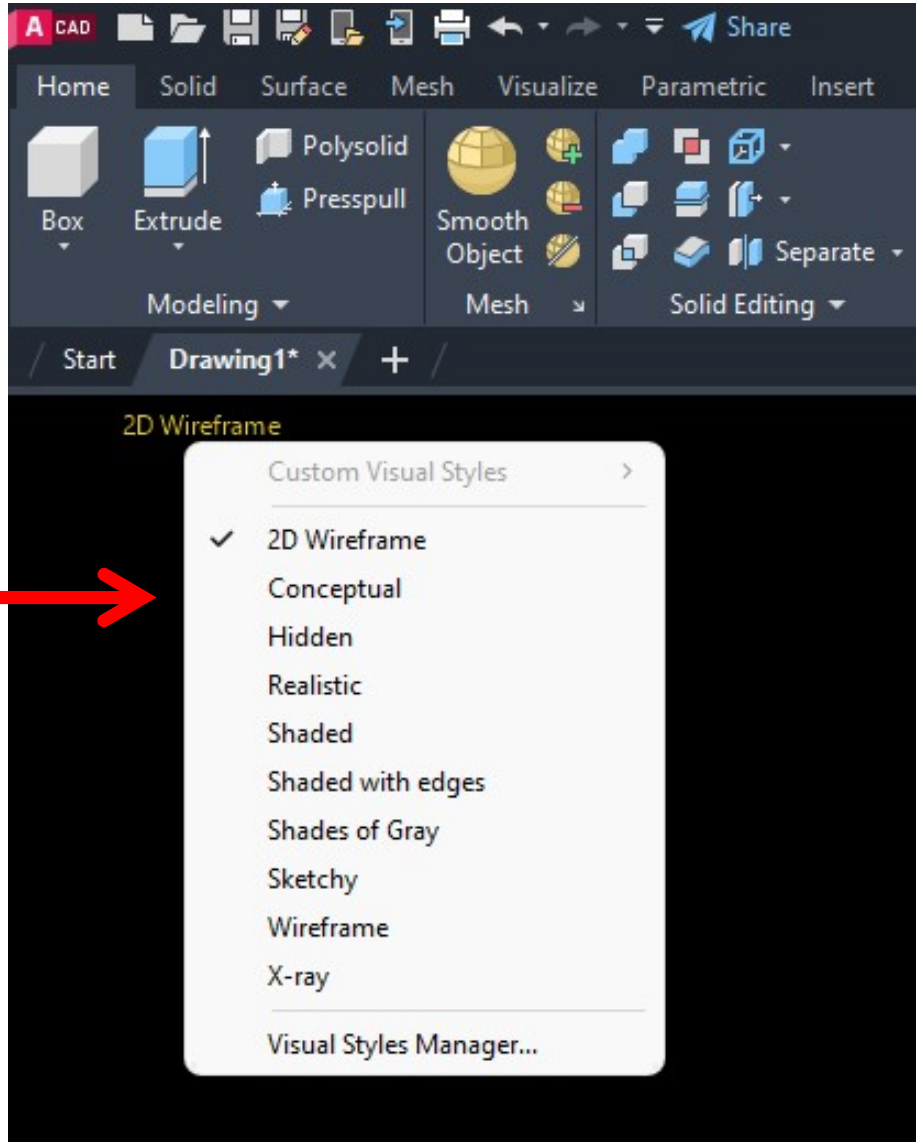
DRAW Tool bar & MODIFY Tool bar is Incorporated in 3D modeling Work Space



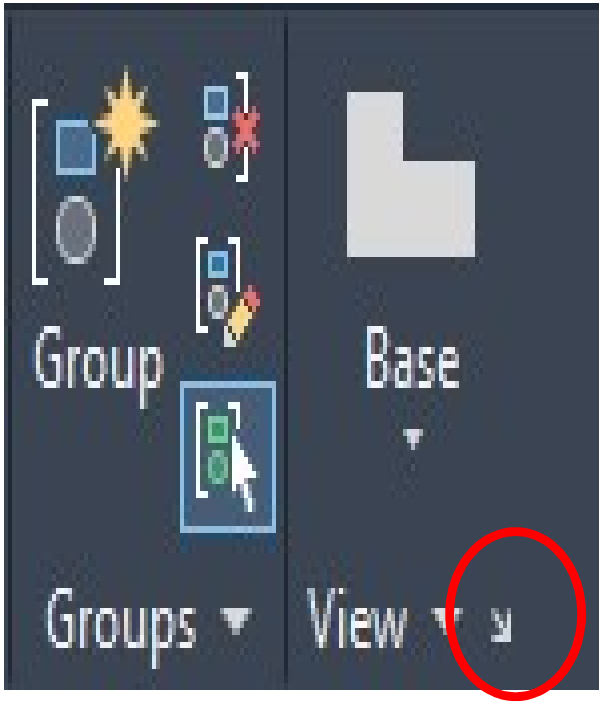


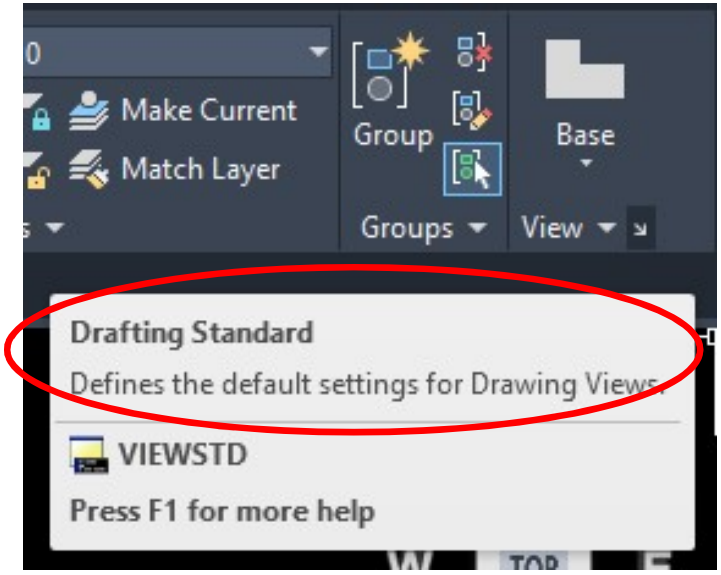
Plane Preferences Availability in View Controls

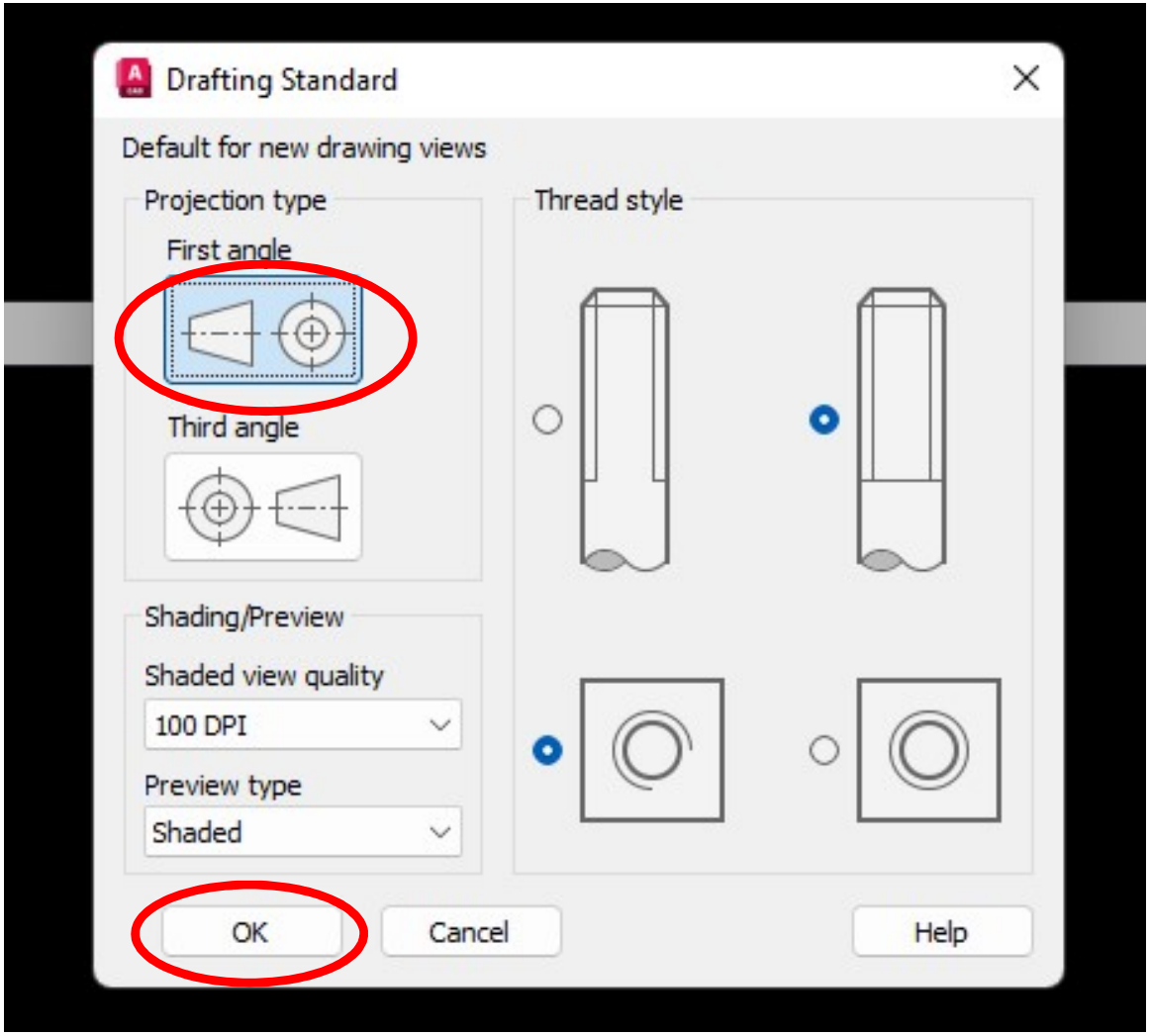




Visual Styles Availability in Visual Style Controls



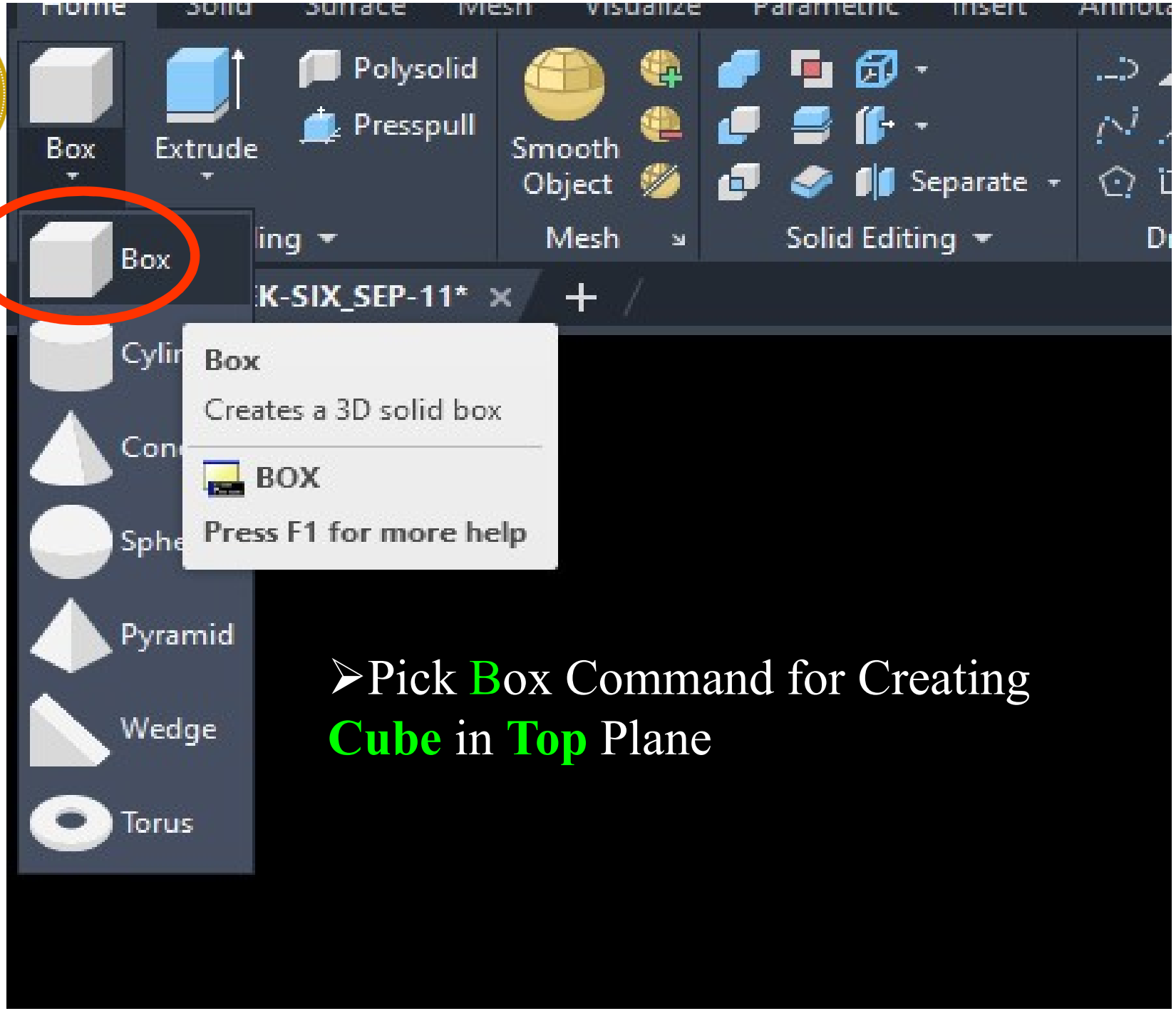




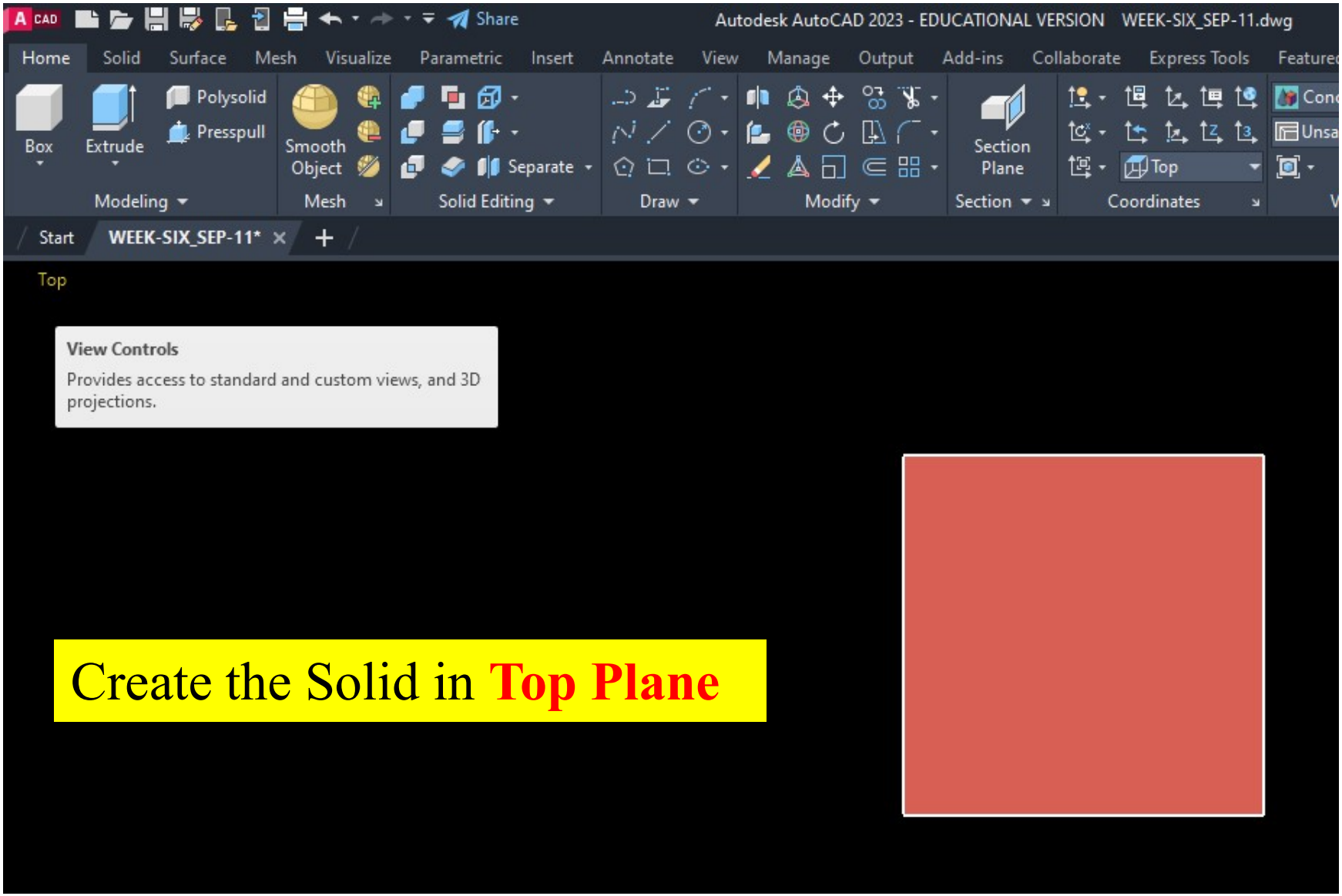
Setting of First Angle Projection

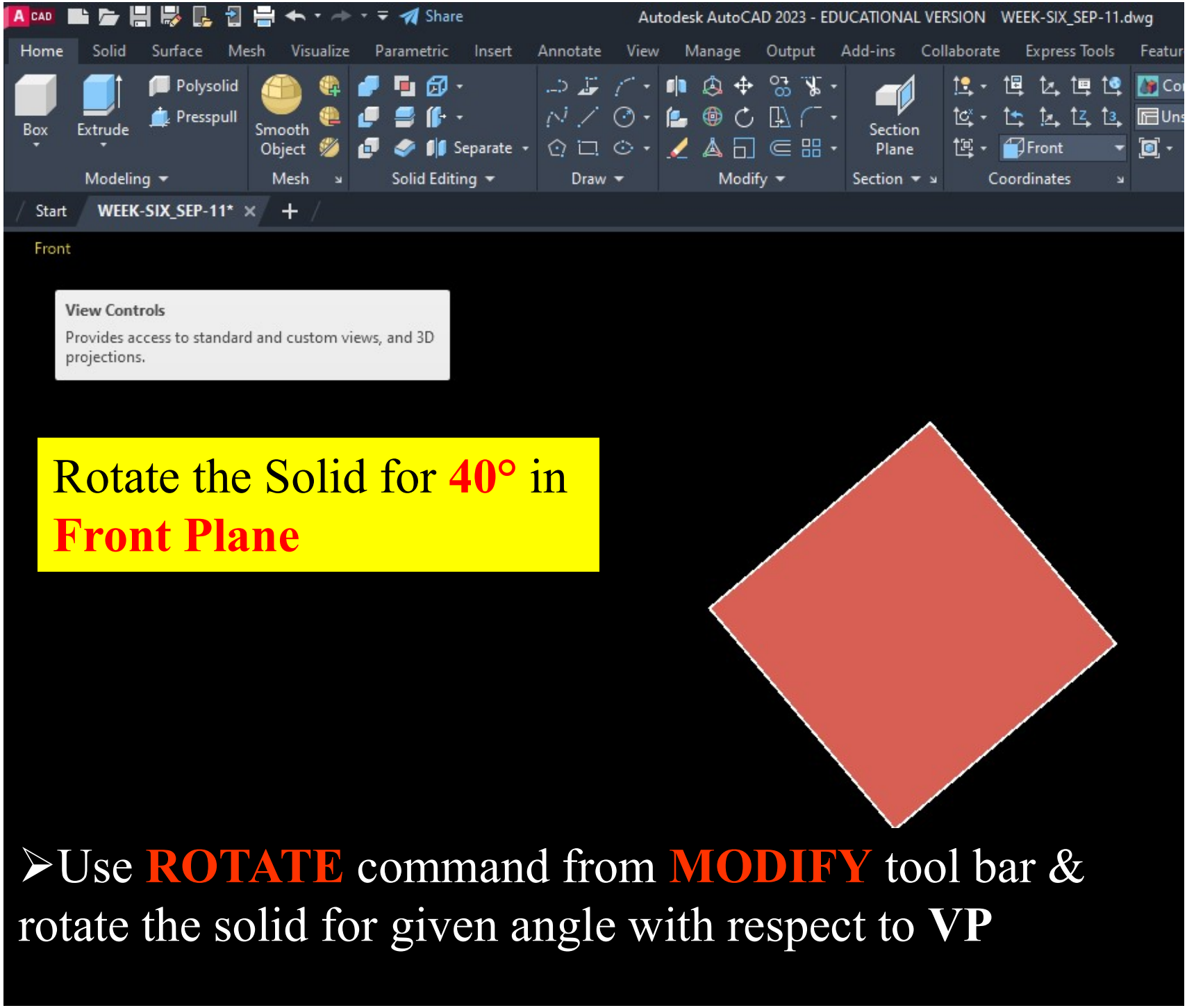
A cube of side 40 mm rests on the HP on one of its ends with a vertical face inclined at 40° to the VP. Draw its projections.

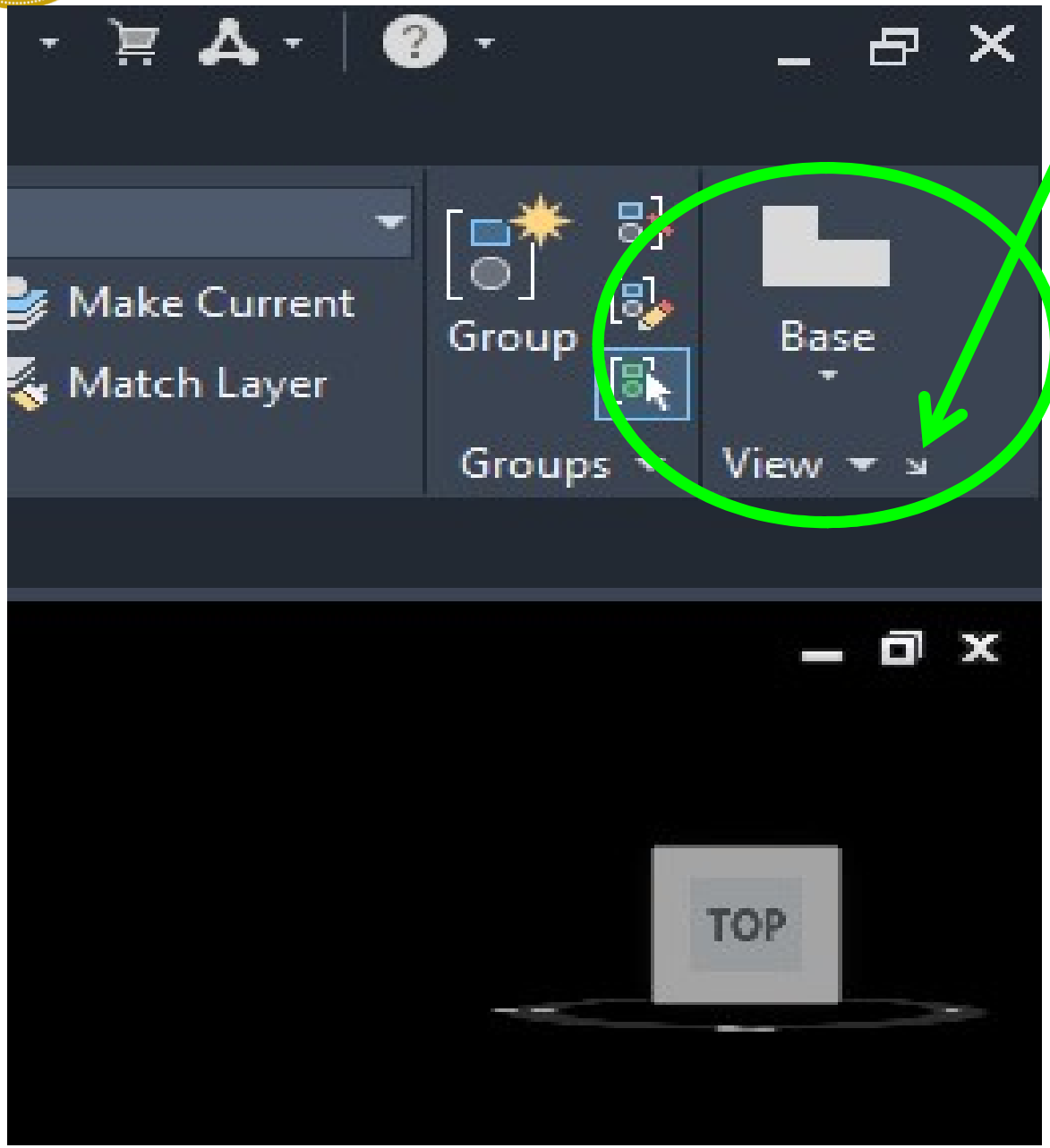
- Change the work space environment to **3D Modeling** (**WORKSPACE SWITCHING**)
- Complete the Preliminary steps (setting **UNITS** & **LIMITS**)
- Set the **TOP** plane in **VIEW CONTROLS**
- Start with **TOP** view (since **True Shape** of the Solid is visible in **TOP** view)
- Use **BOX** command from **MODELLING** tool bar to create the solid for the given dimension.



➢Pick Box Command for Creating **Cube** in **Top** Plane

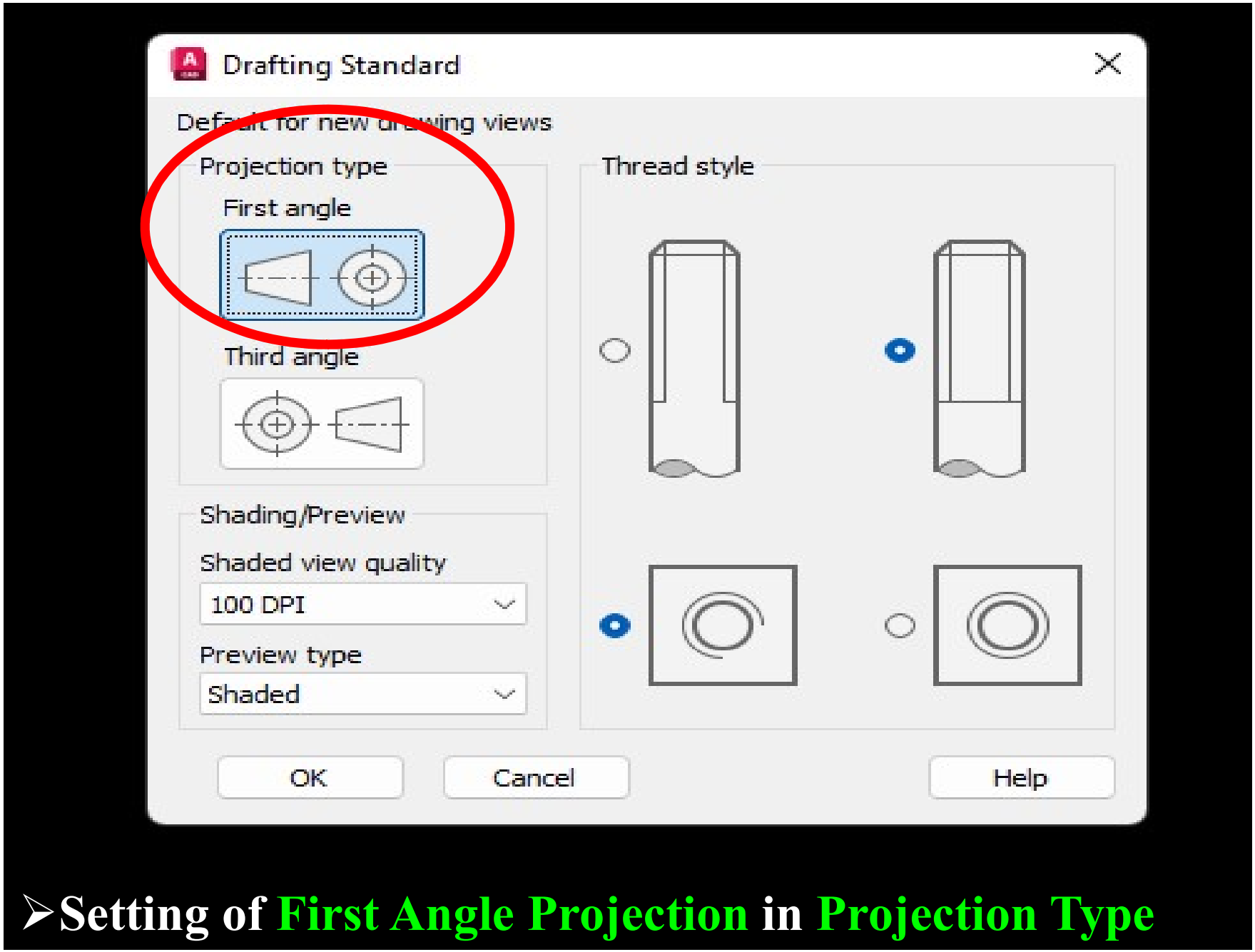

Autodesk AutoCAD 2023 - EDUCATIONAL VERSION WEEK-SIX_SEP-11.dwg
Home
Solid
Surface
Mesh
Visualize
Parametric
Insert
Annotate
View
Manage
Output
Add-ins
Collaborate
Express Tools
Box
Extrude
Polysolid
Presspull
Smooth Object
Separate
Section Plane
Top
Modeling
Mesh
Solid Editing
Draw
Modify
Section
Coordinates
Start
WEEK-SIX_SEP-11*
Top
View Controls
Provides access to standard and custom views, and 3D projections.
Create the Solid in Top Plane


Share
Autodesk AutoCAD 2023 - EDUCATIONAL VERSION WEEK-SIX_SEP-11.dwg
Home
Solid
Surface
Mesh
Visualize
Parametric
Insert
Annotate
View
Manage
Output
Add-ins
Collaborate
Express Tools
Box
Extrude
Polysolid
Presspull
Smooth Object
Separate
Section Plane
Front
Modeling
Mesh
Solid Editing
Draw
Modify
Section
Coordinates
Start
WEEK-SIX_SEP-11*
Front
View Controls
Provides access to standard and custom views, and 3D projections.
Rotate the Solid for 40° in Front Plane
➢Use ROTATE command from MODIFY tool bar & rotate the solid for given angle with respect to VP

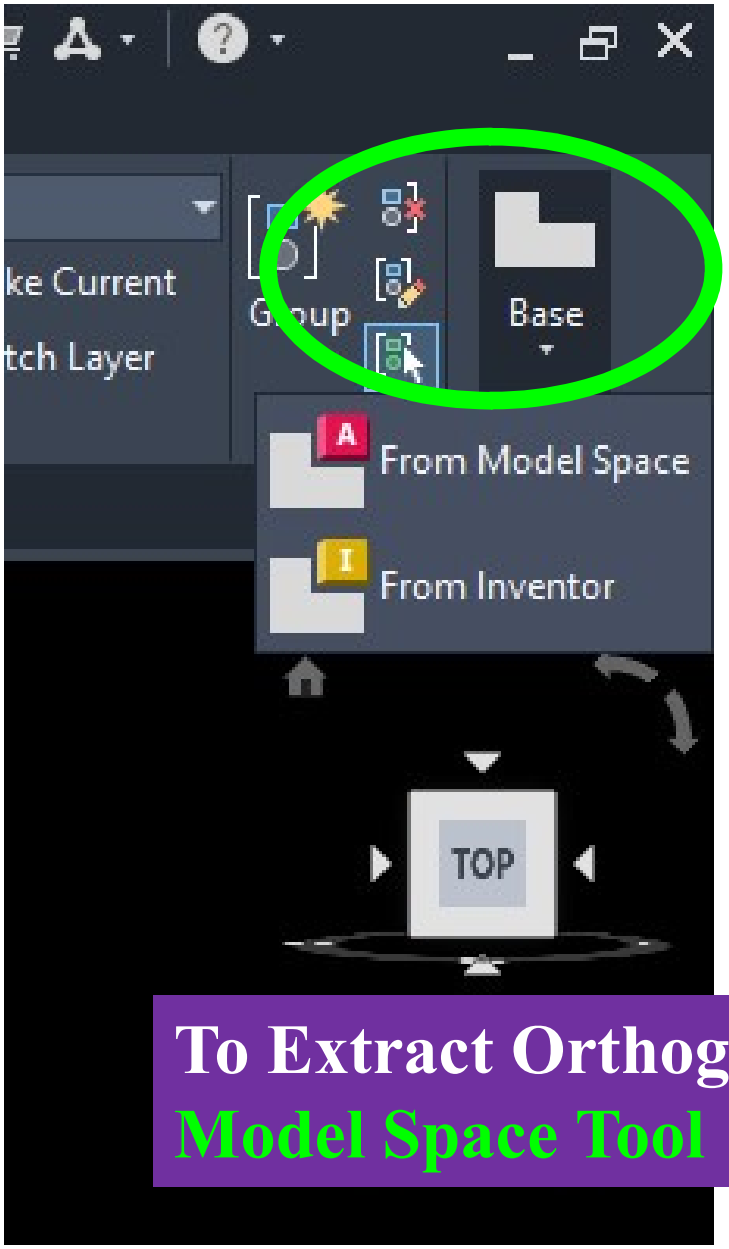


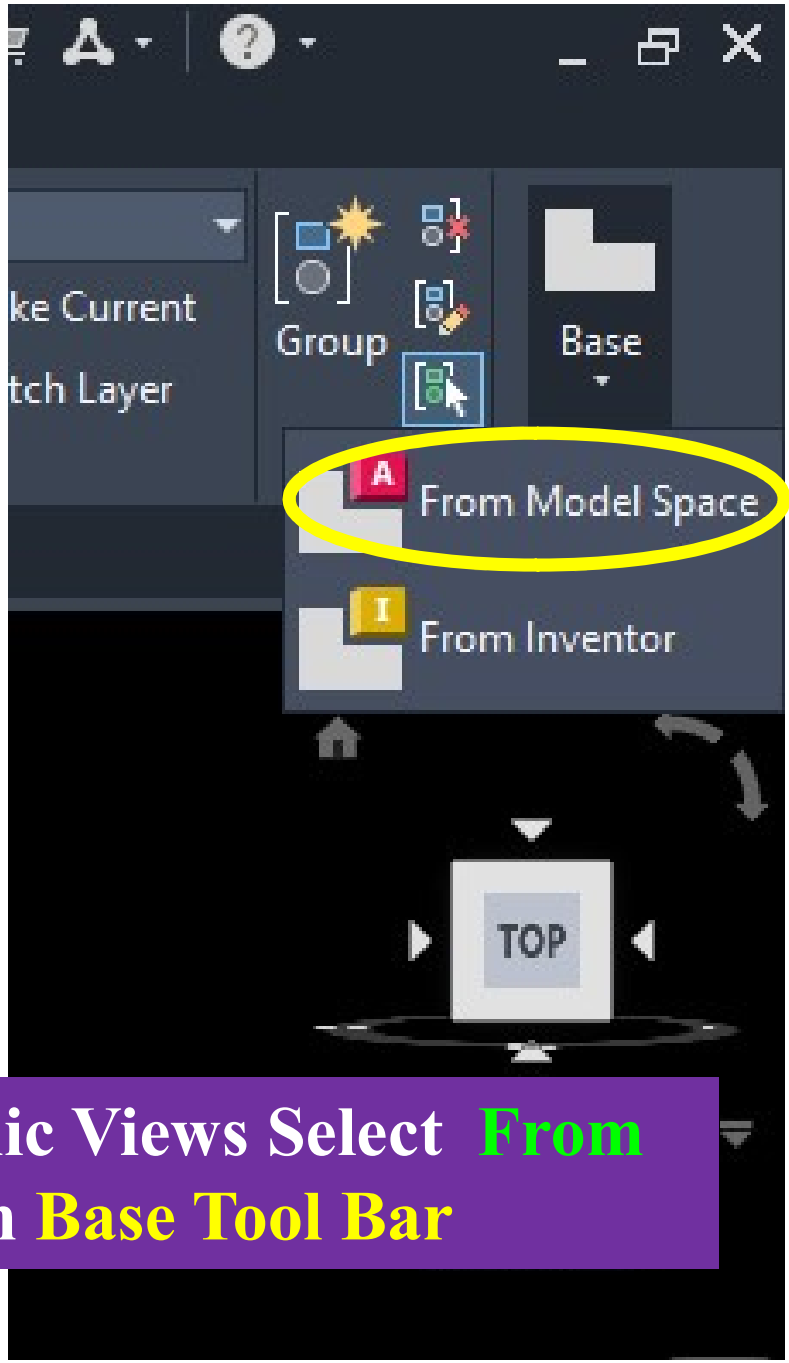
➢Click on this **Right Pointed Arrow** for Setting the **Drafting Standard**

➢Use **DRAFTING STANDARD** from **VIEW BASE** tool bar for setting the **FIRST ANGLE** of projection.

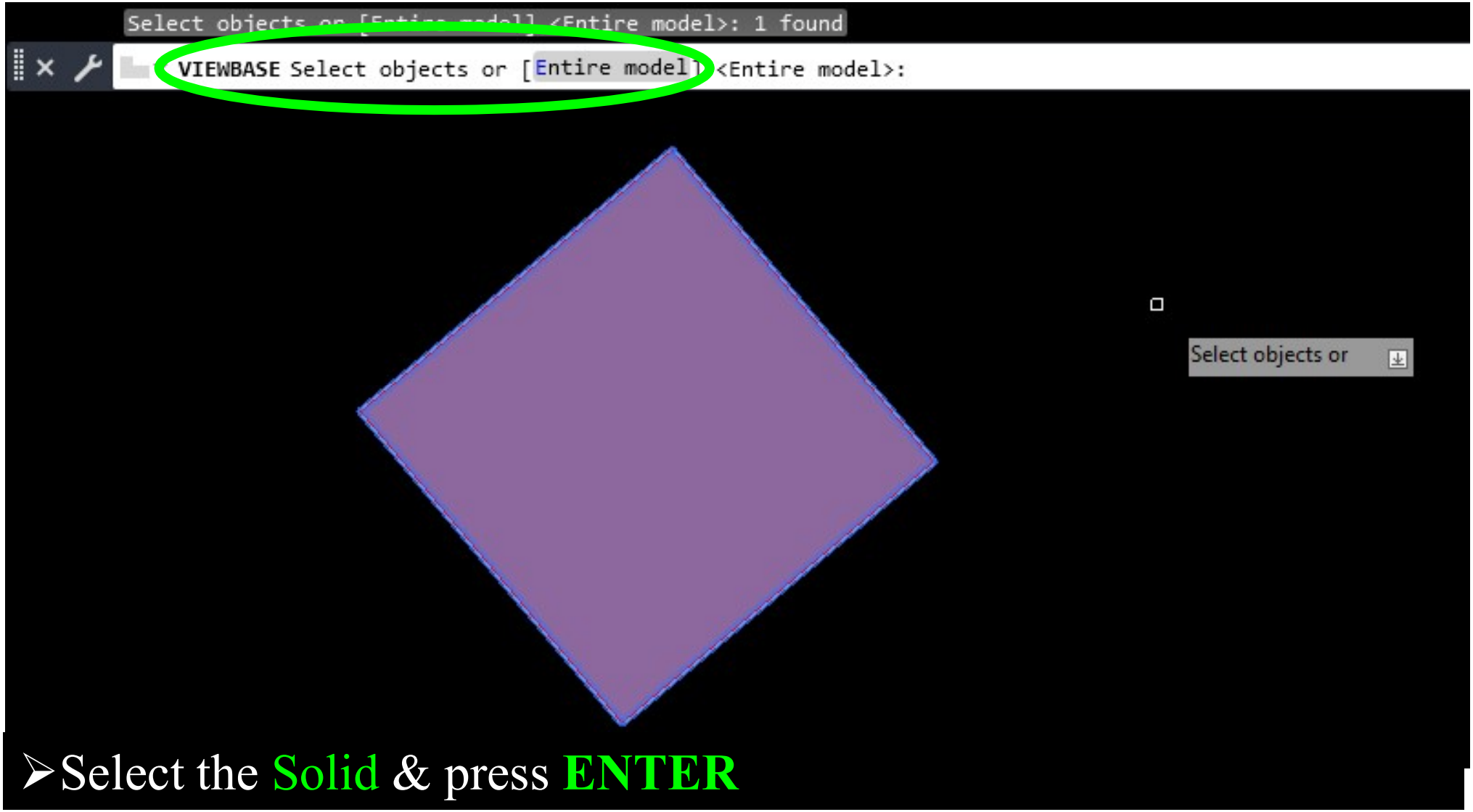


➢Setting of **First Angle Projection** in **Projection Type**



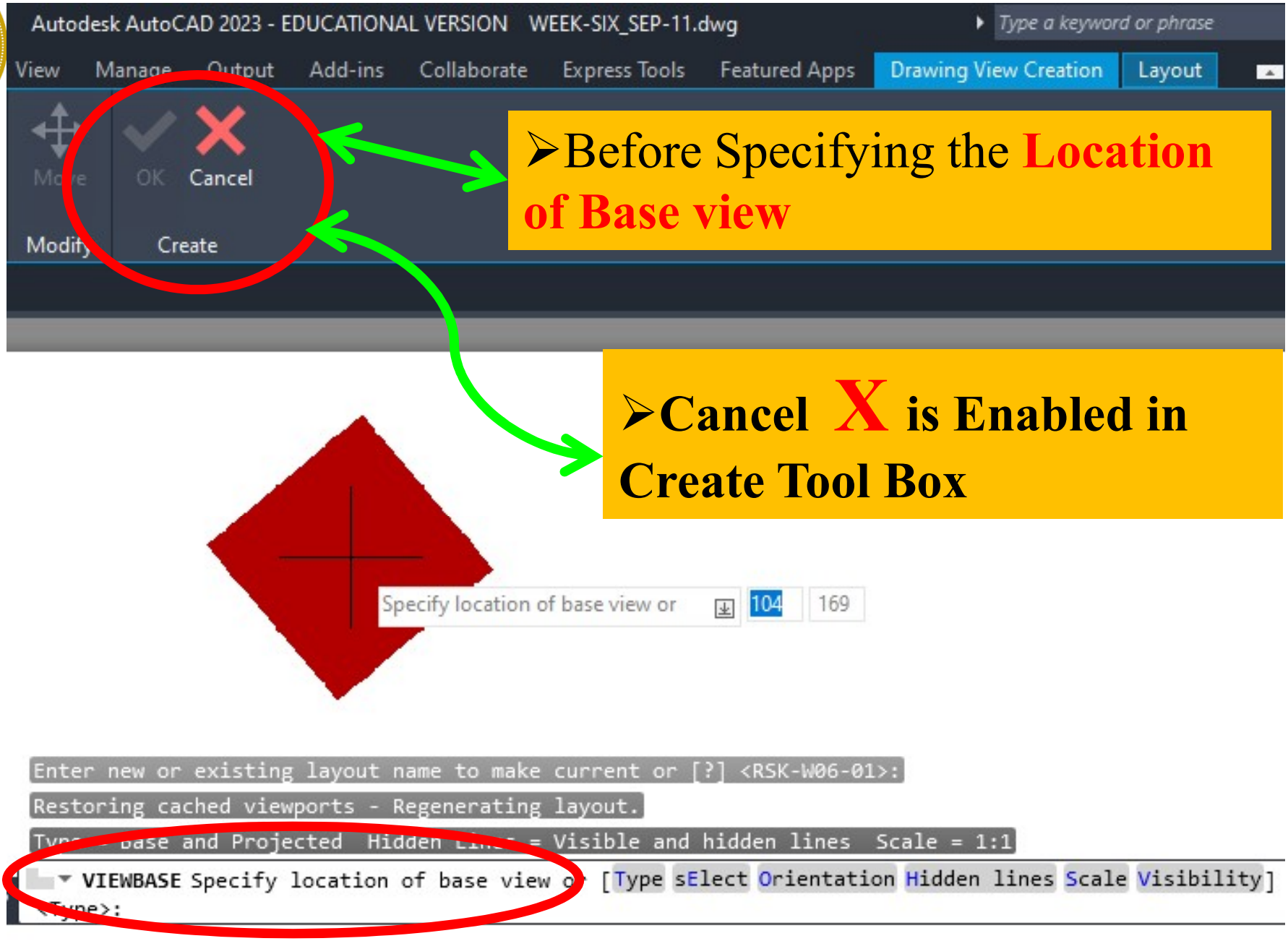


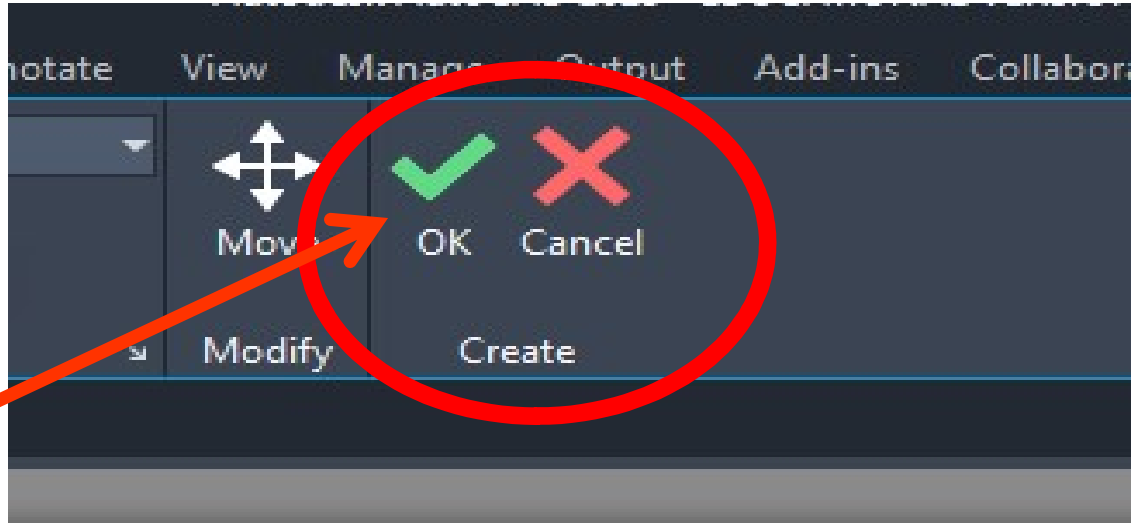
To Extract Orthographic Views Select From Model Space Tool from Base Tool Bar



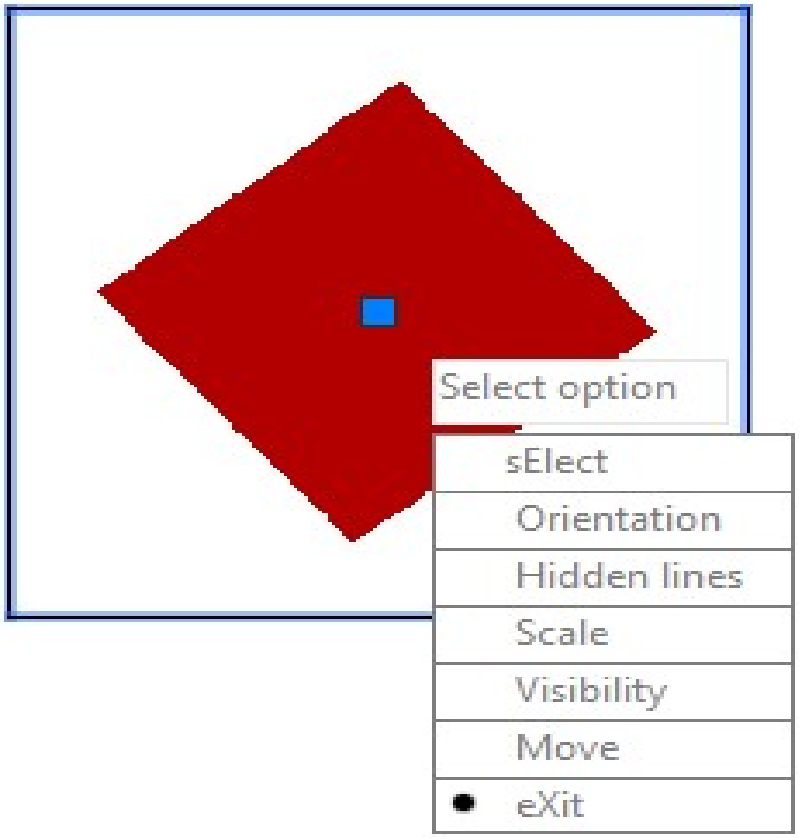
➢Select the Solid & press **ENTER**

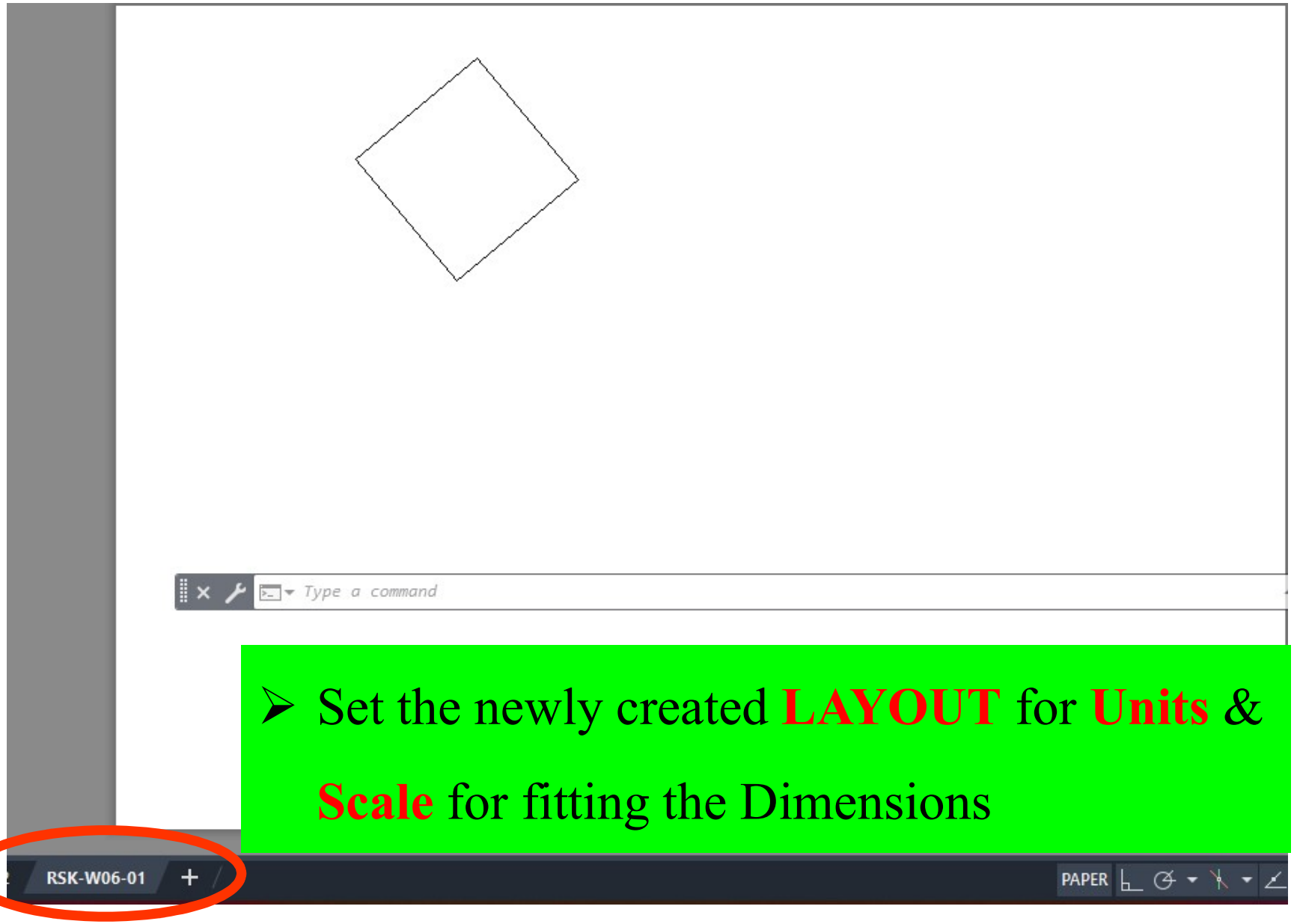
➢Assign the **LAYOUT NAME** & press **Enter**.


Autodesk AutoCAD 2023 - EDUCATIONAL VERSION WEEK-SIX_SEP-11.dwg
Type a keyword or phrase
View
Manage
Output
Add-ins
Collaborate
Express Tools
Featured Apps
Drawing View Creation
Layout
OK
Cancel
Modify
Create
➢Before Specifying the Location of Base view
➢Cancel X is Enabled in Create Tool Box
Specify location of base view or
104
169
Enter new or existing layout name to make current or [?] <RSK-W06-01>:
Restoring cached viewports - Regenerating layout.
Base and Projected Hidden = Visible and hidden lines Scale = 1:1
VIEWBASE Specify location of base view o [Type sElect Orientation Hidden lines Scale Visibility]
Type>:

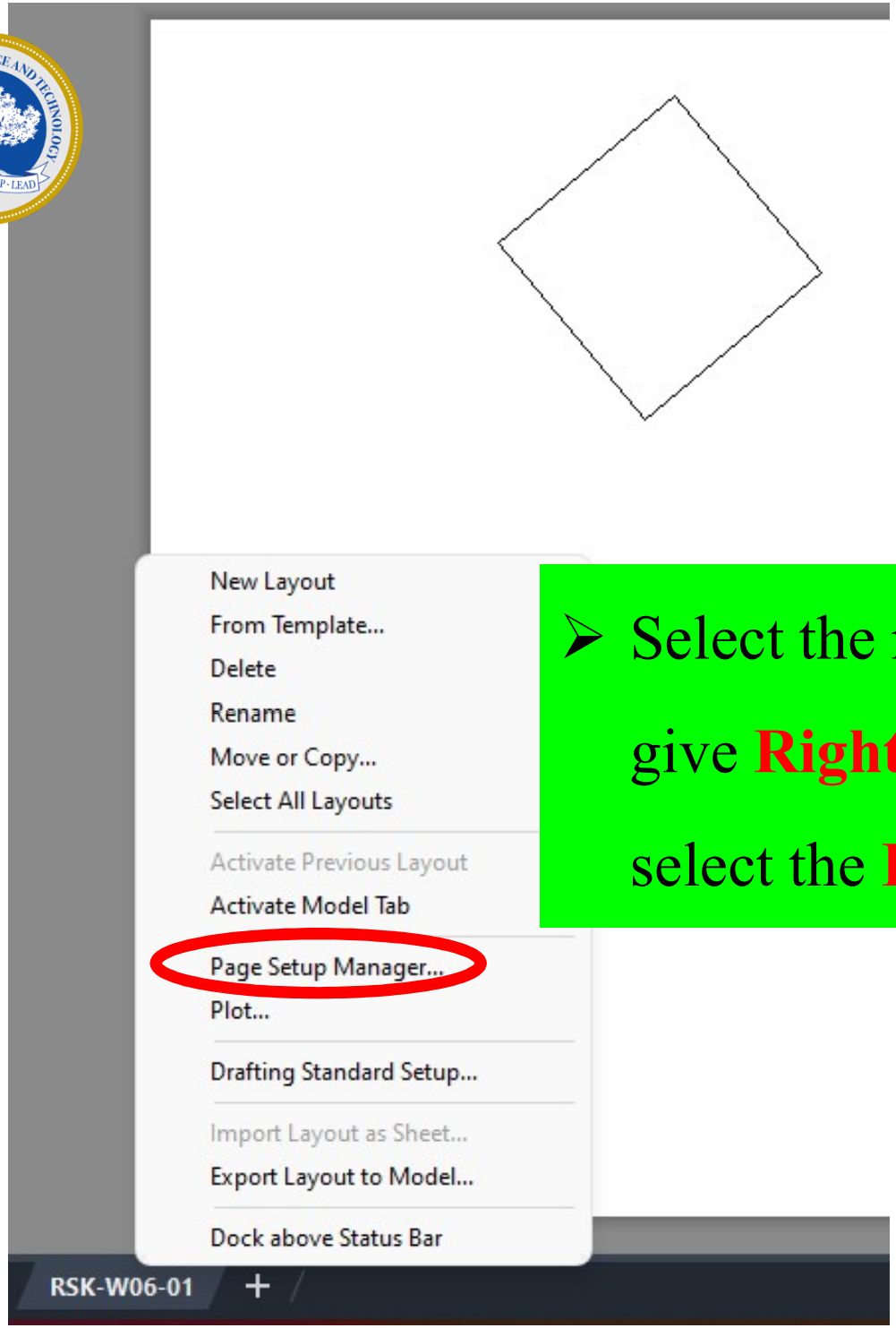


➢After Specifying the **Location of Base** view give a **Click** on the **Green Tick** to get the **Front View** of the Solid & press Double Enter.

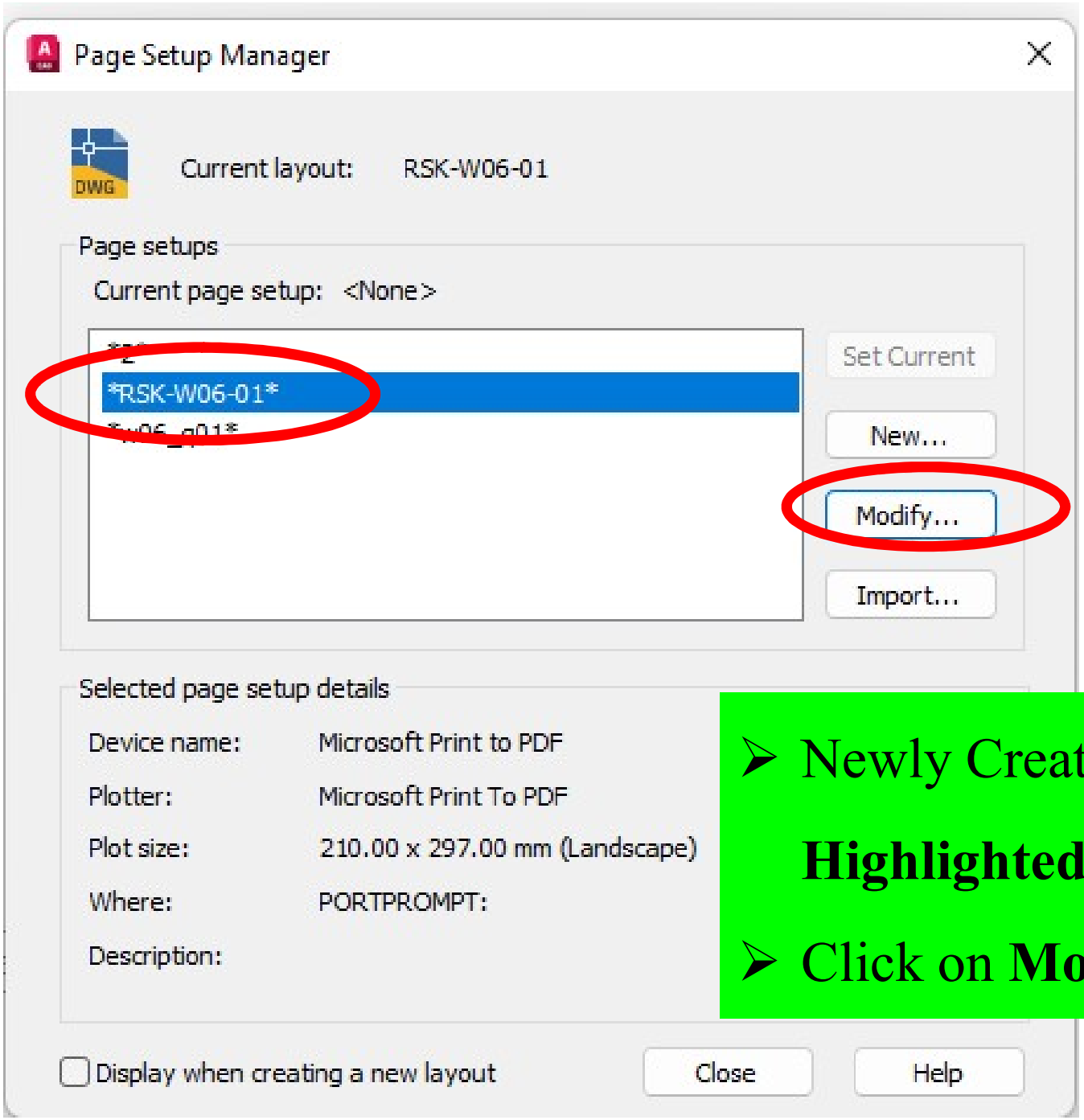




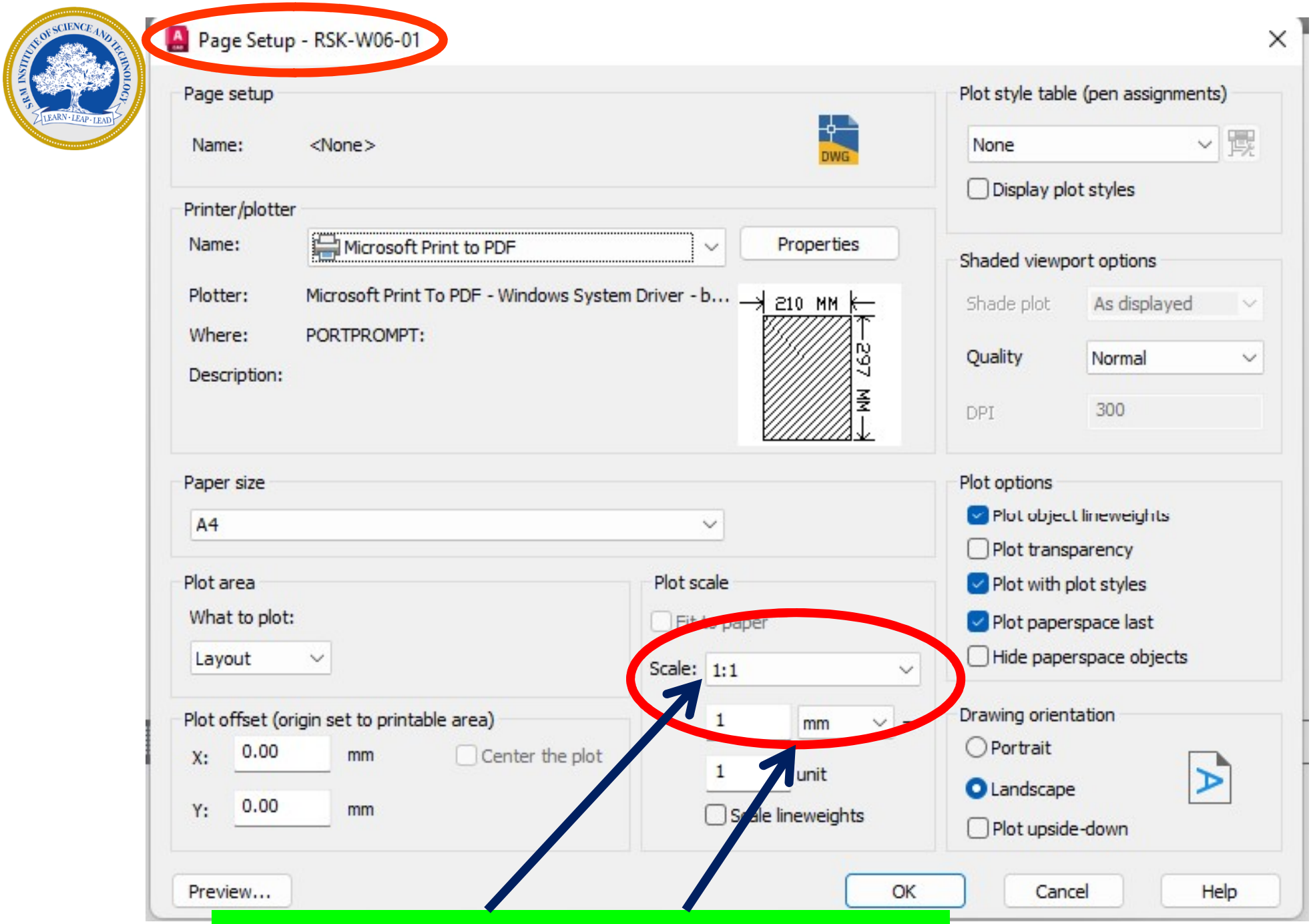
- Set the newly created **LAYOUT** for **Units** & **Scale** for fitting the Dimensions



- Select the newly created **LAYOUT** & give **Right click** to see the options & select the **PAGE SETUP MANGER**



- Newly Created Layout is **Highlighted** by Default
- Click on **Modify**



➢ Set the Scale **1:1** & Units in **mm**

➢After Modifying Enable the Box

Page Setup Manager

Current layout: RSK-W06-01

Page setups

Current page setup: <None>

2
RSK-W06-01
w06_q01

Set Current
New...
Modify...
Import...

Selected page setup details

Device name: Microsoft Print to PDF
Plotter: Microsoft Print To PDF
Plot size: 210.00 x 297.00 mm (Landscape)
Where: PORTPROMPT:
Description:

Display when creating a new layout

Close
Help

- After Enableing
- Click on Close

Page Setup Manager

Current layout: RSK-W06-01

Page setups

Current page setup: <None>

2
RSK-W06-01
w06_q01

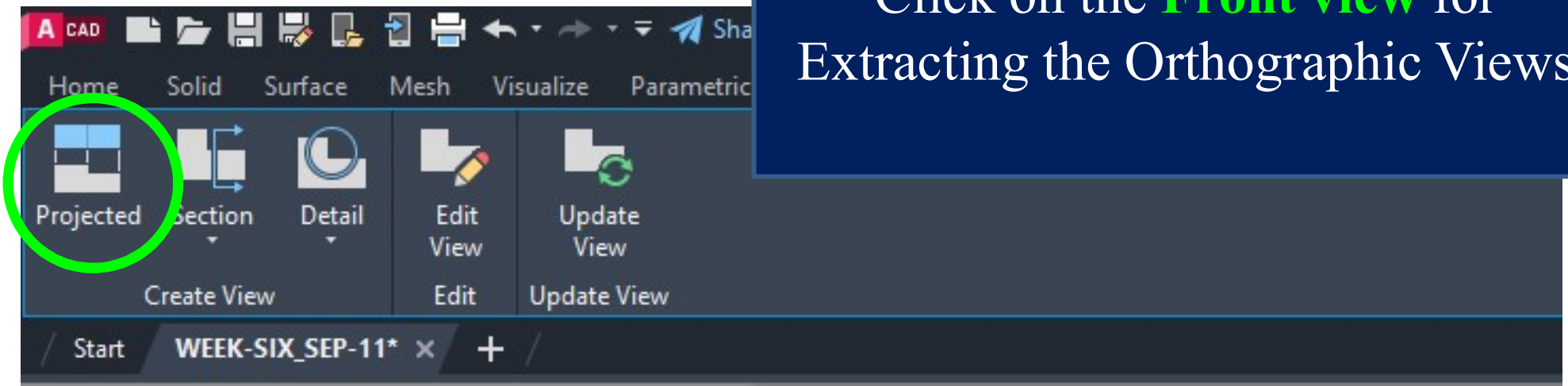
Set Current
New...
Modify...
Import...

Selected page setup details

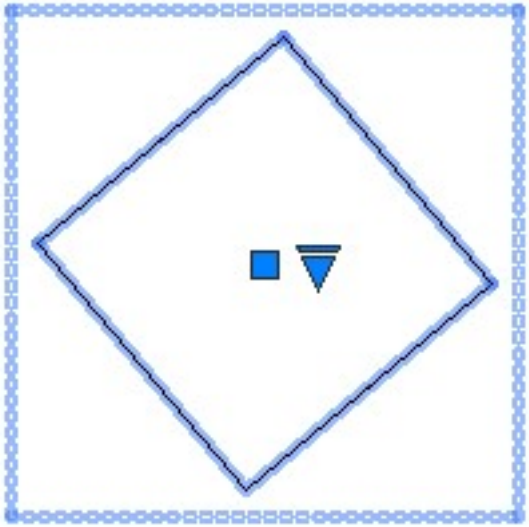
Device name: Microsoft Print to PDF
Plotter: Microsoft Print To PDF
Plot size: 210.00 x 297.00 mm (Landscape)
Where: PORTPROMPT:
Description:

Display when creating a new layout
Close
Help

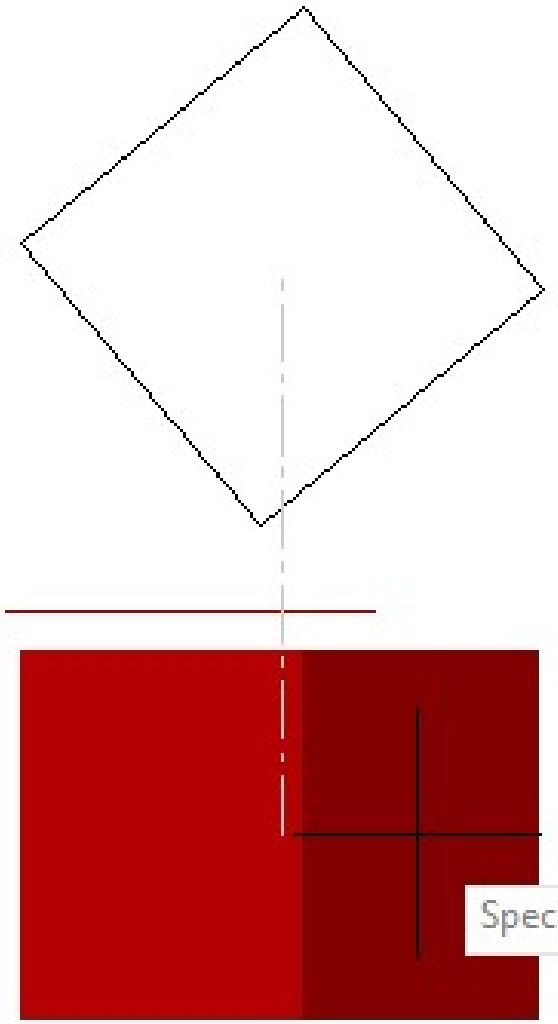
① Click on the **Front view** for Extracting the Orthographic Views



② Click on the **Projected** icon in **Create View** Tool bar & **Drag** Down & Press Enter for **Top View** projection



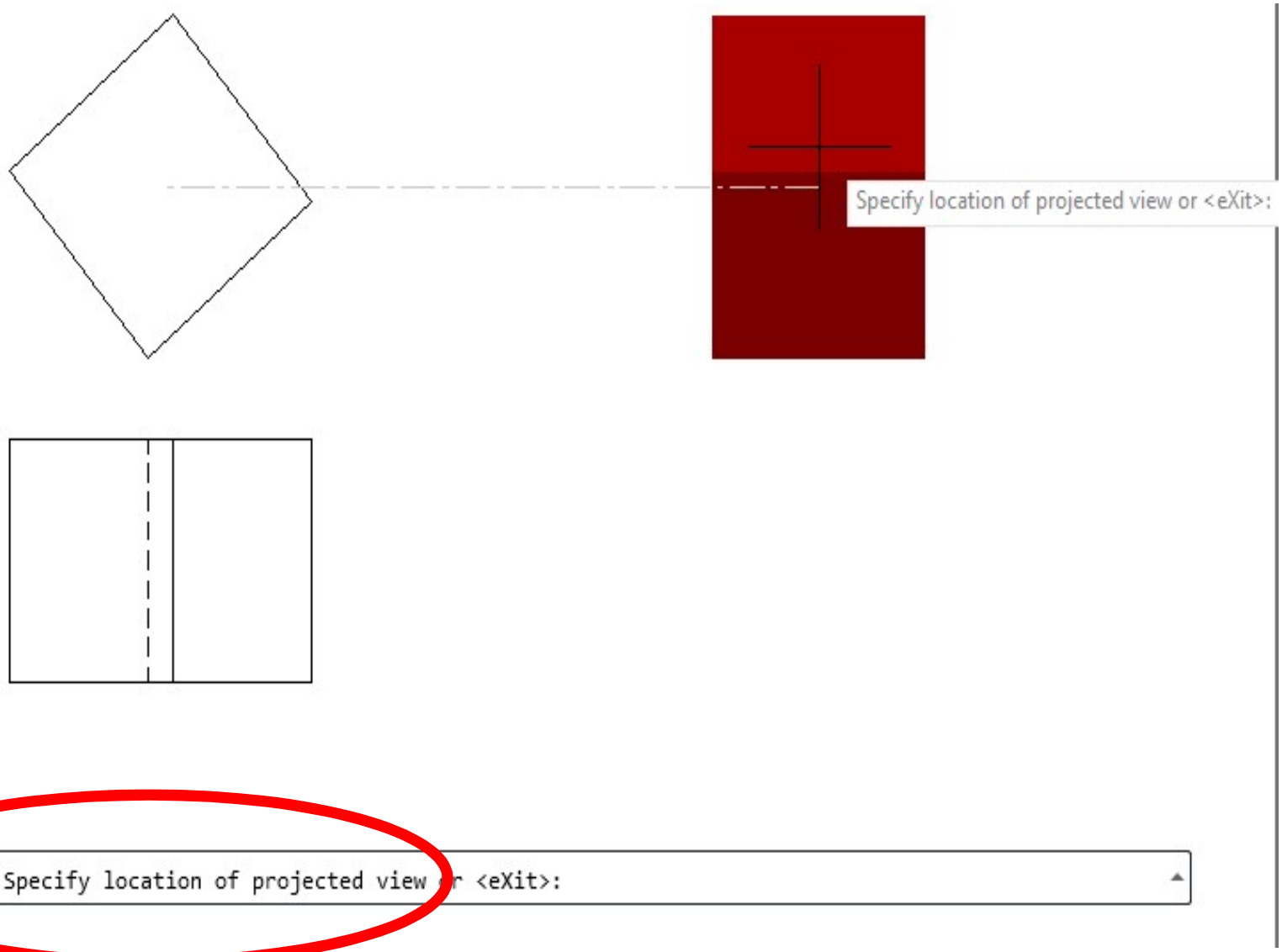
Front view



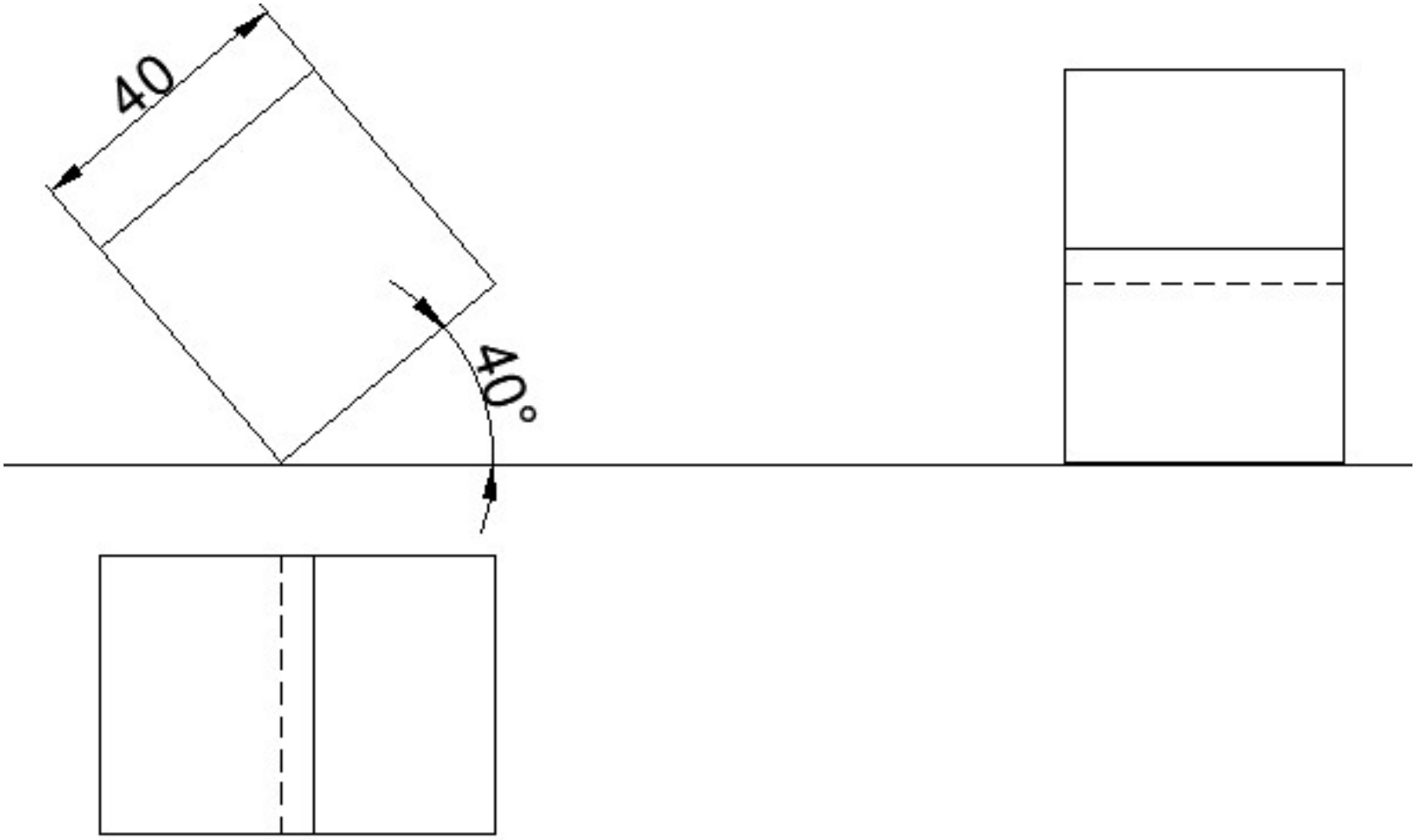
➢**Drag** the Cursor Down & Press Enter for **Top View**

Specify location of projected view or <eXit>:

VIEWPROJ Specify location of projected view or [Undo eXit] <eXit>:



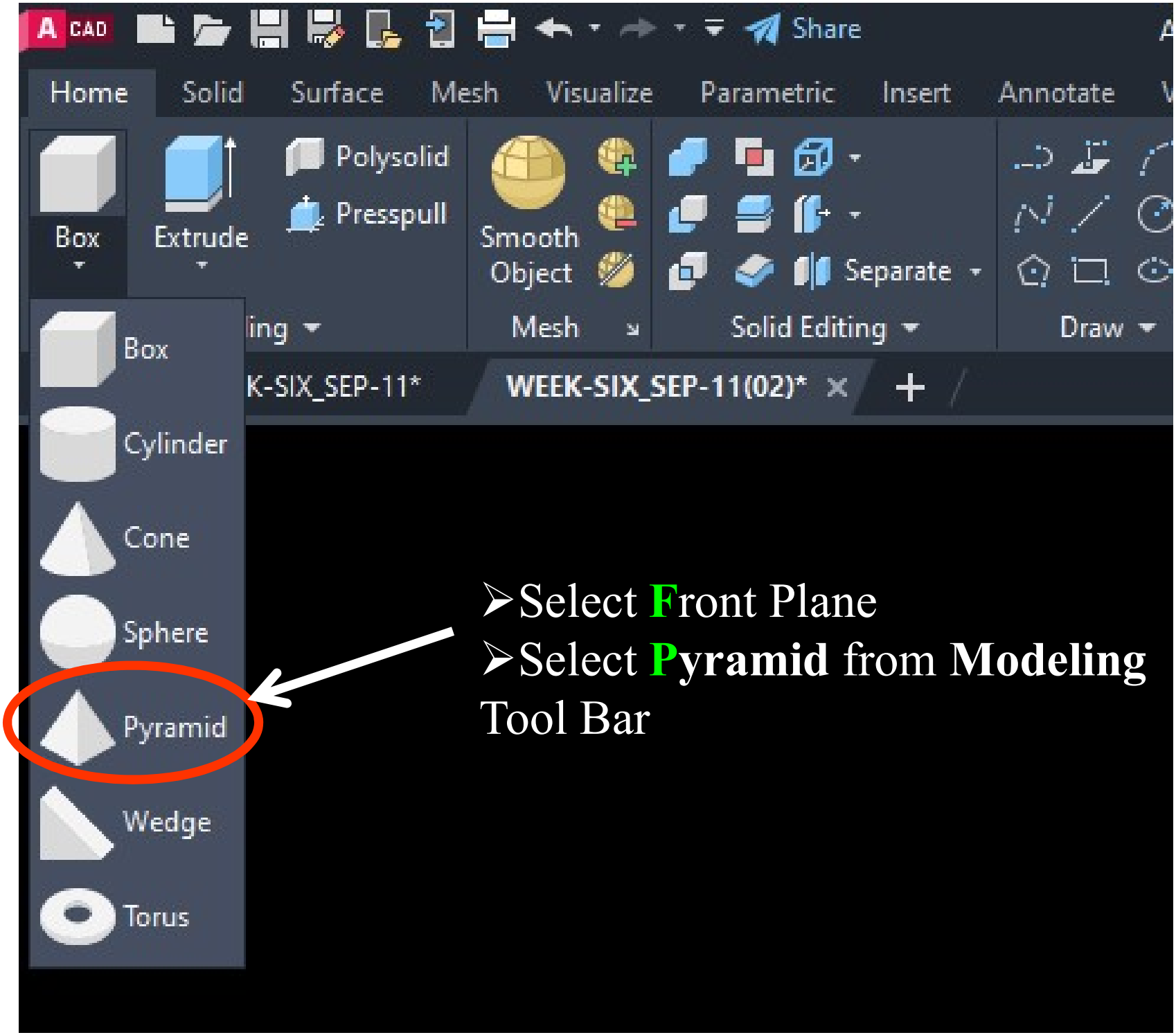
➢**Drag** Right hand side & Press Enter for **Side View**

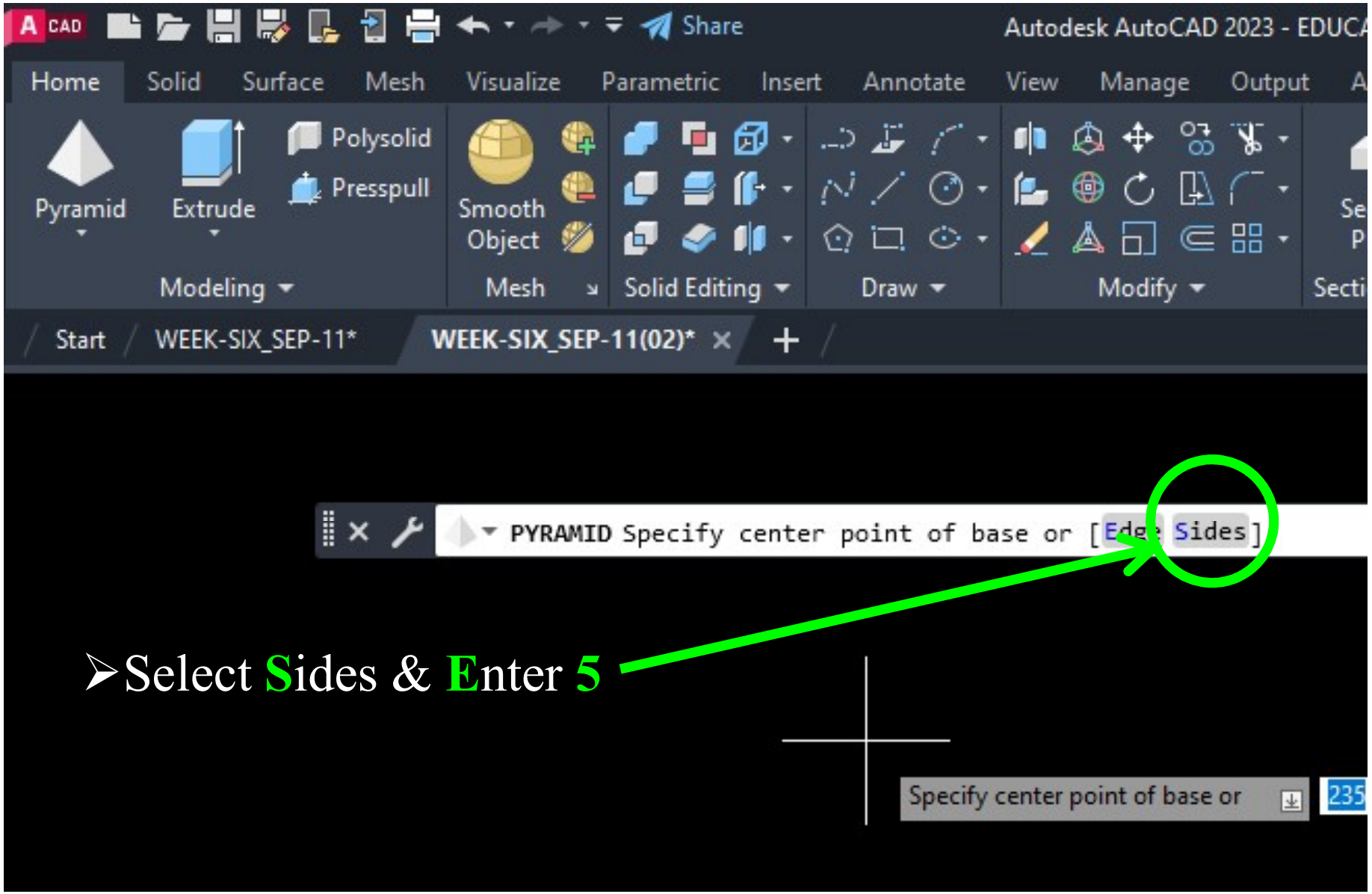


➢Draw Horizontal Line & Mark the Relevant Dimensions

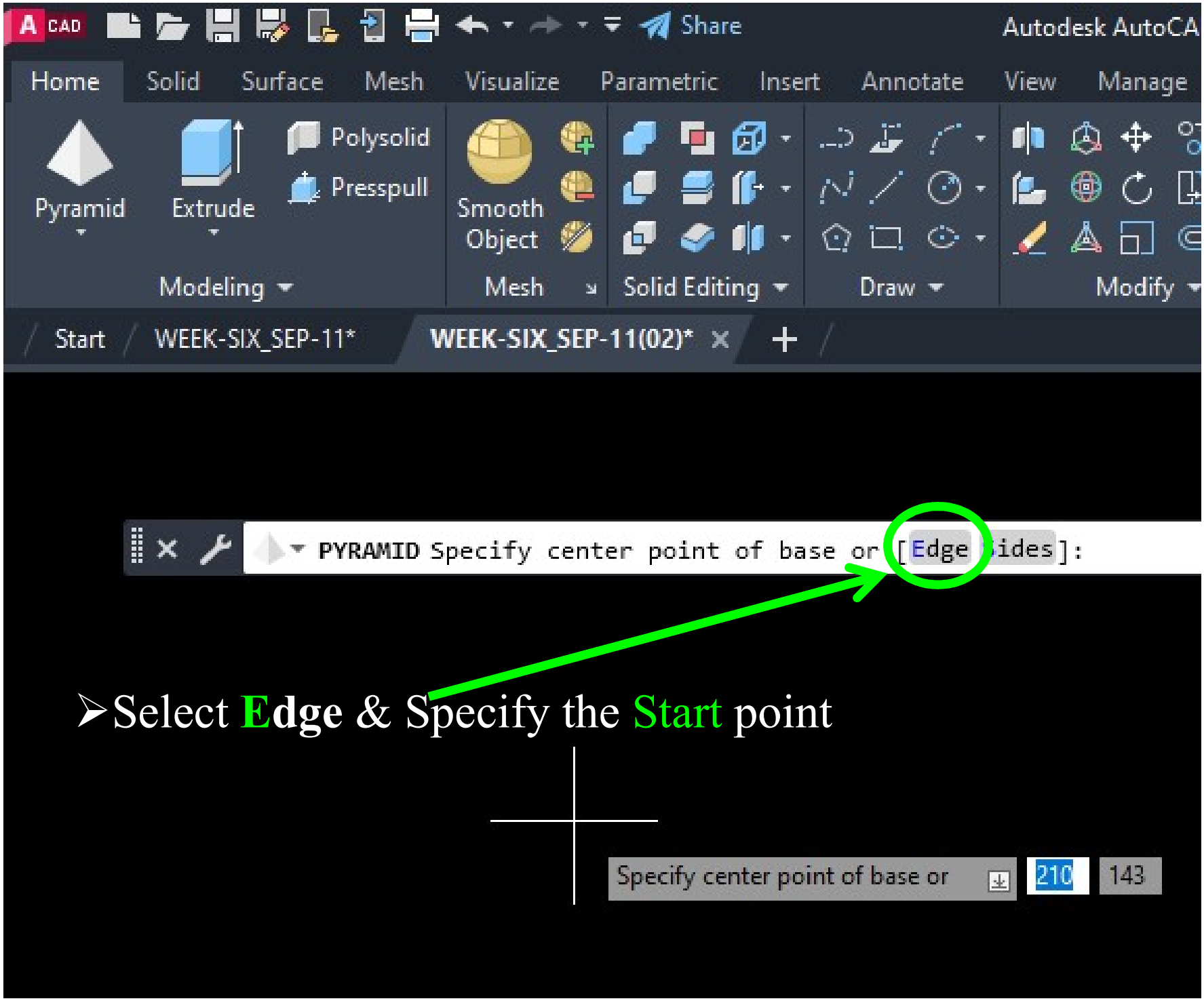
Pentagonal Pyramid of axis perpendicular to VP with its one of the corner resting on HP and base edges are inclined 40° to HP

- Change the work space environment to 3D Modeling (**WORKSPACE SWITCHING**)
- Complete the Preliminary steps (setting **UNITS** & **LIMITS**)
- Set the **FRONT** plane in **VIEW CONTROLS**
- Start with **FRONT** view (since **True** shape of the Solid is visible in **FRONT** view)
- Use **Pyramid** command from **MODELLING** tool bar to create the solid for the given dimension.

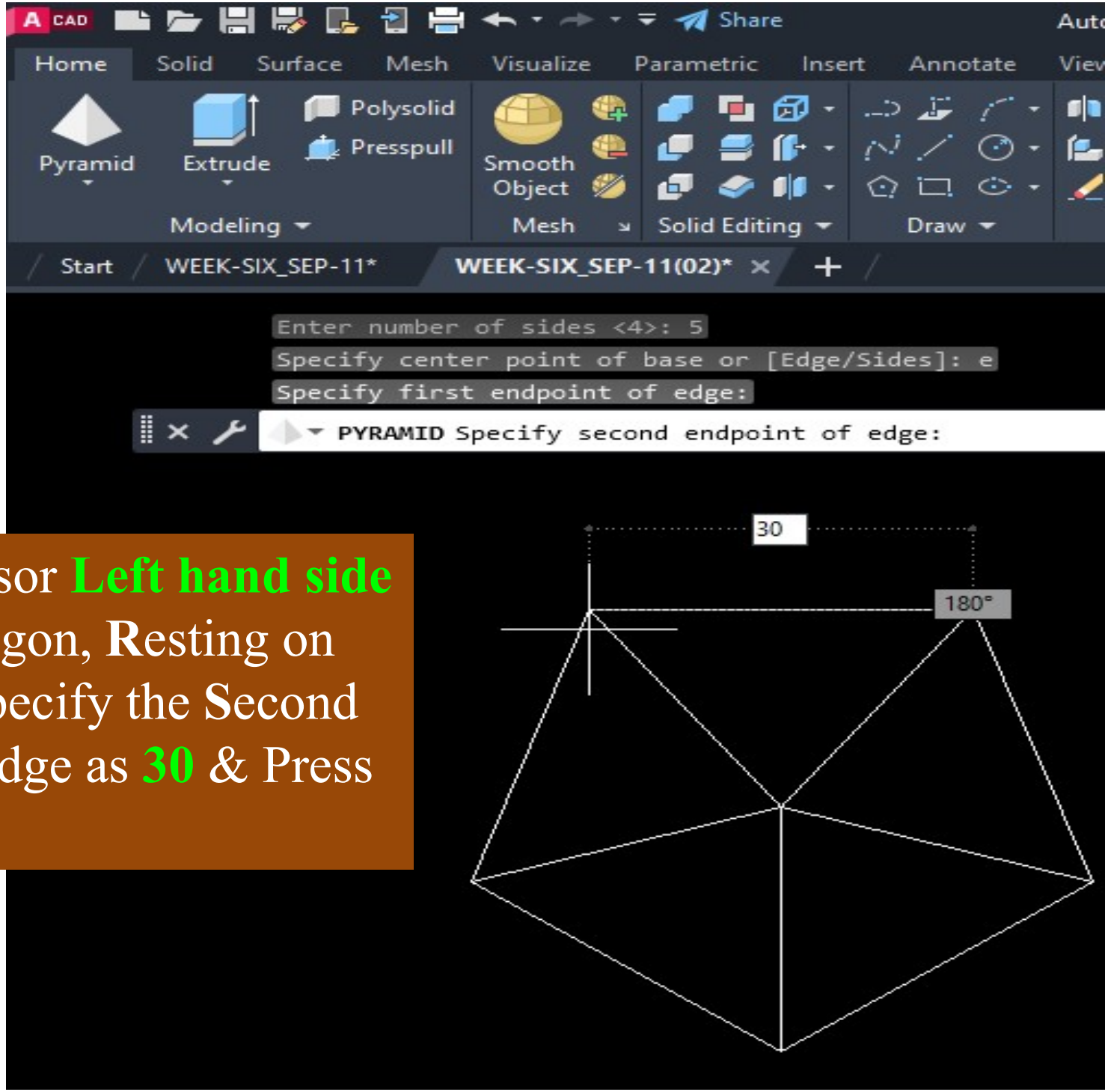

CAD
Share
Home
Solid
Surface
Mesh
Visualize
Parametric
Insert
Annotate
Box
Extrude
Polysolid
Presspull
Smooth Object
Separate
Mesh
Solid Editing
Draw
K-SIX_SEP-11*
WEEK-SIX_SEP-11(02)*
Box
Cylinder
Cone
Sphere
Pyramid
Wedge
Torus
➢Select Front Plane
➢Select Pyramid from Modeling Tool Bar



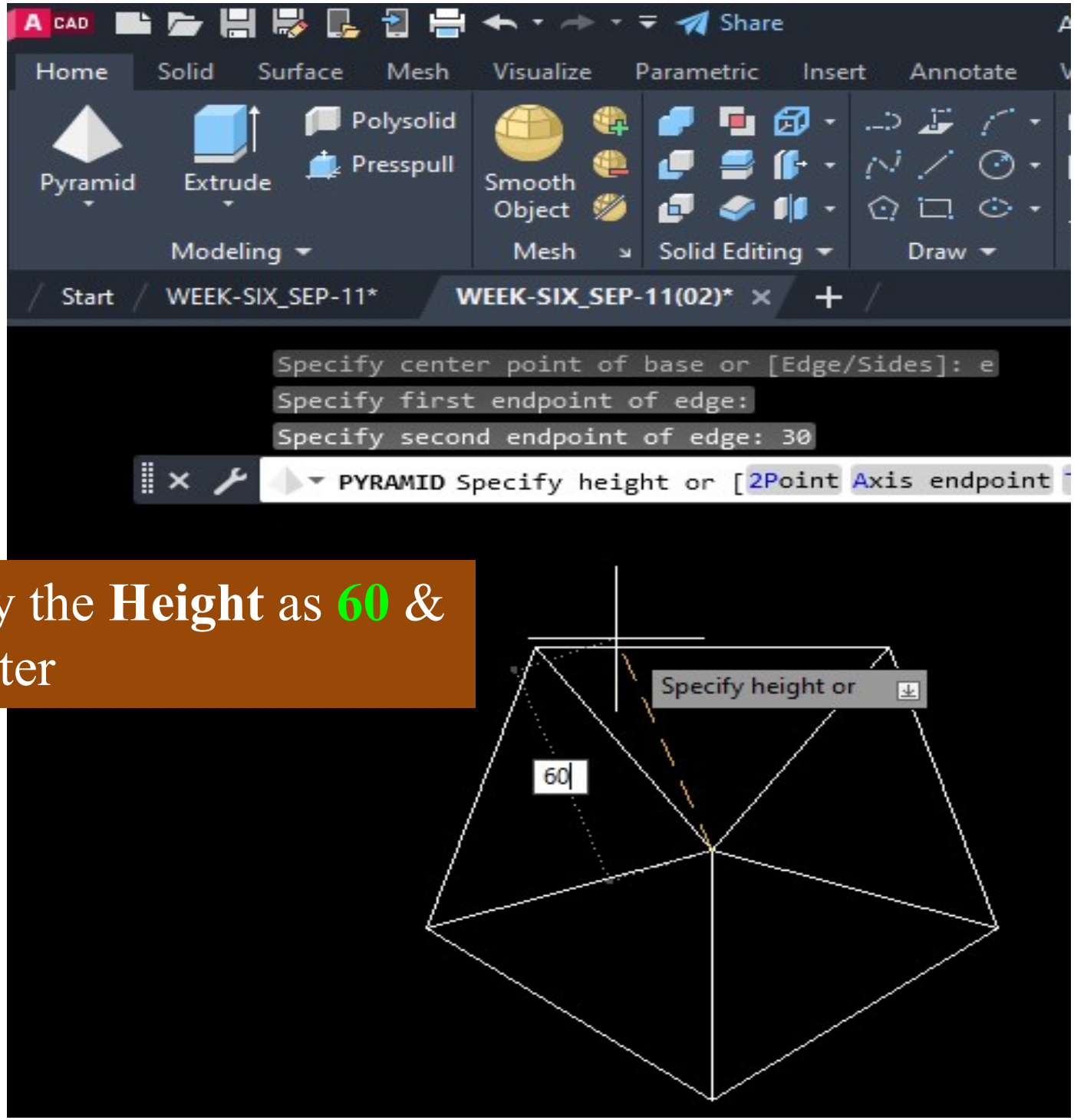
➢Select **S**ides & **E**nter **5**



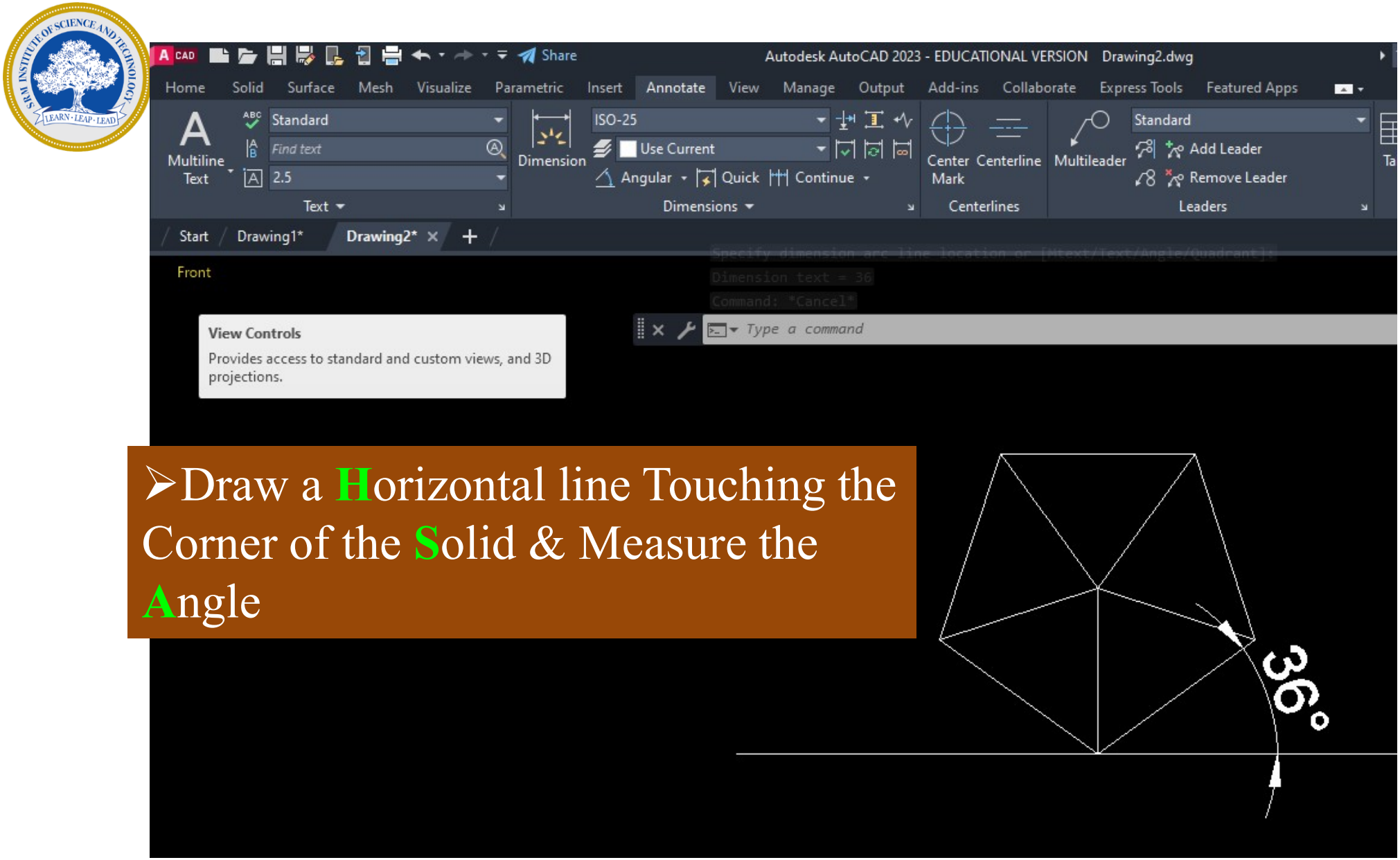
➢Select **Edge** & Specify the Start point



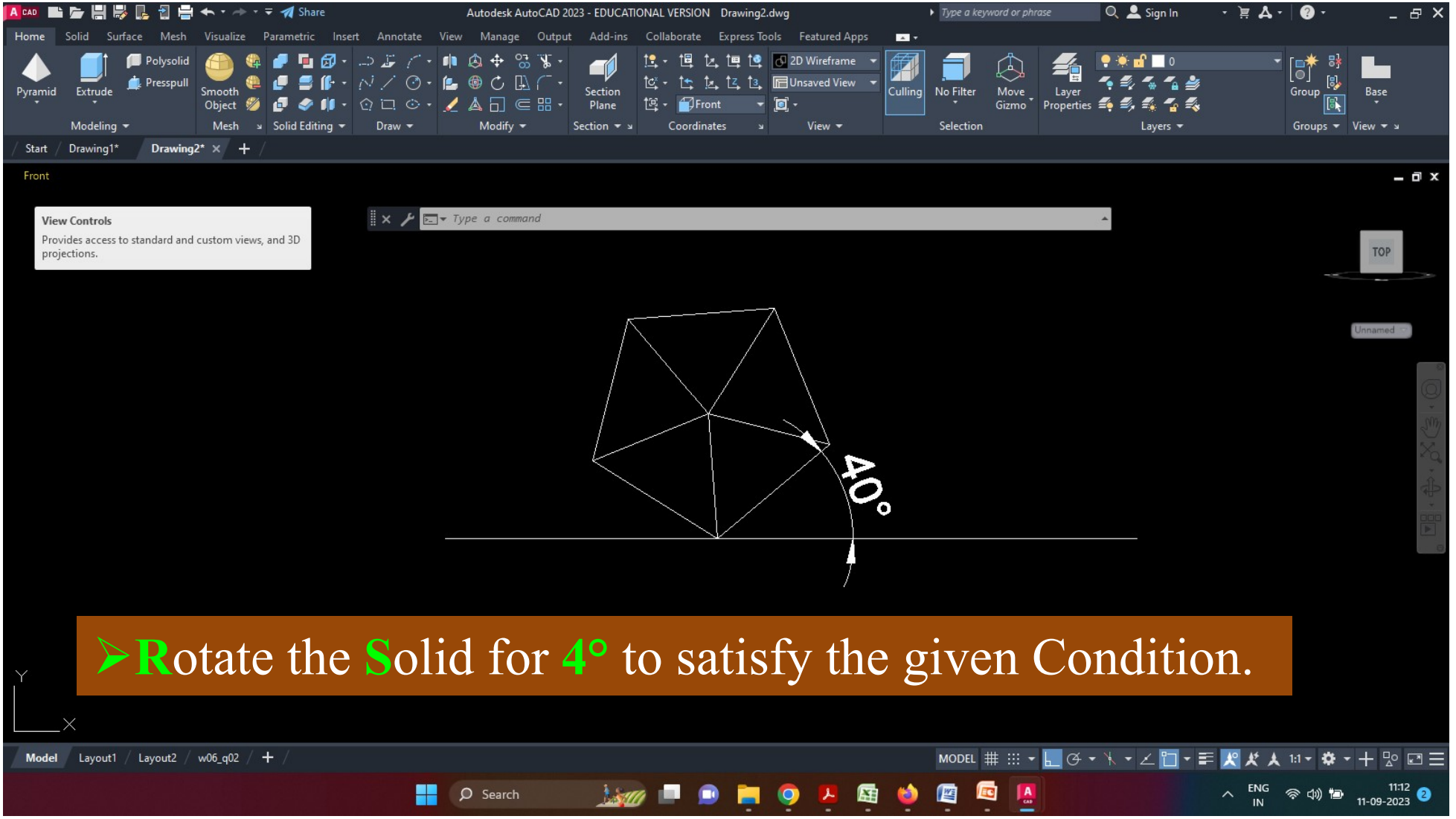
➢Drag the Cursor **Left hand side** to Create **P**entagon, **R**esting on its Corner & Specify the **S**econd end Point of edge as **30** & Press Enter.

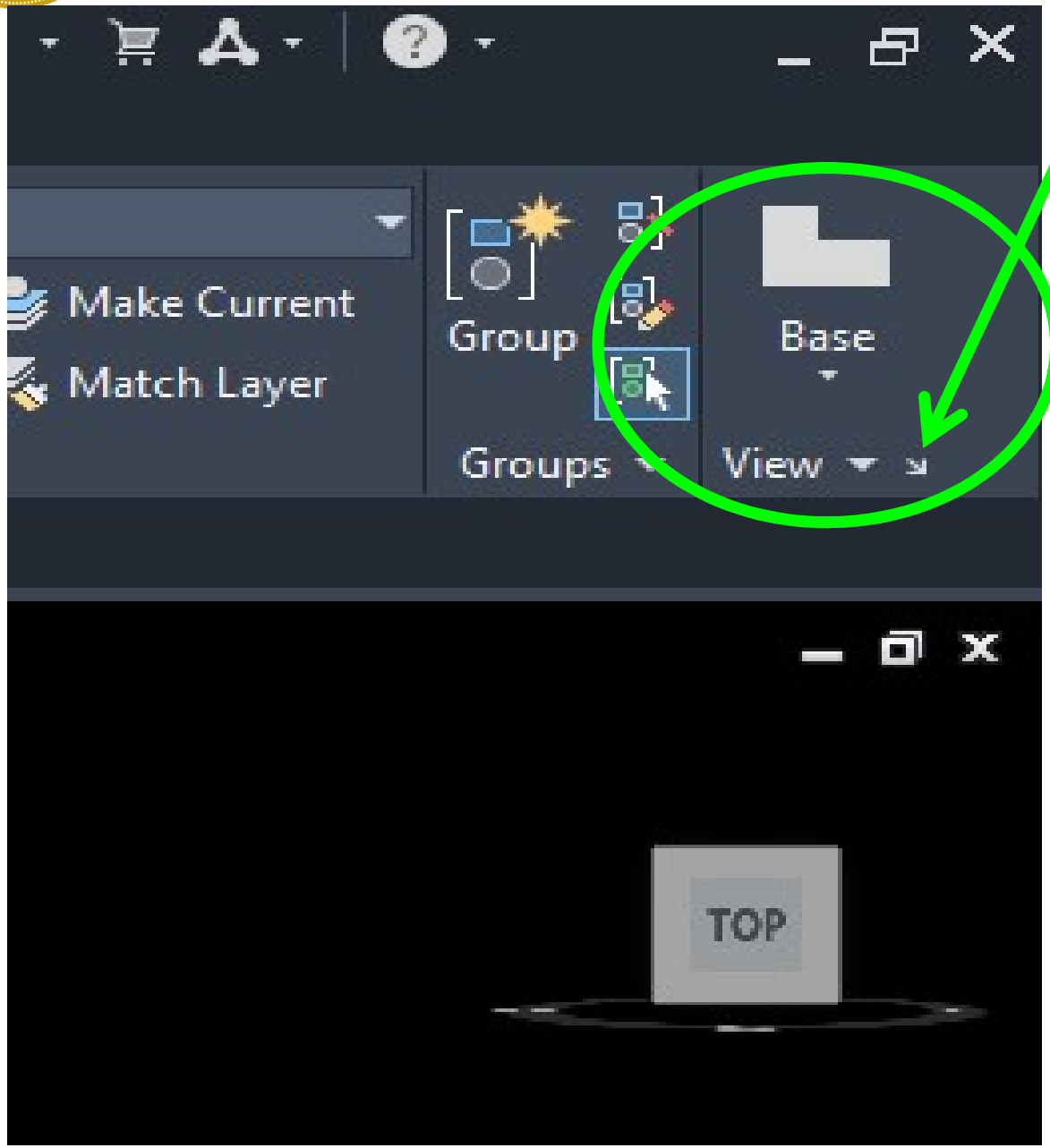


➢Specify the **Height** as **60** & Press **Enter**



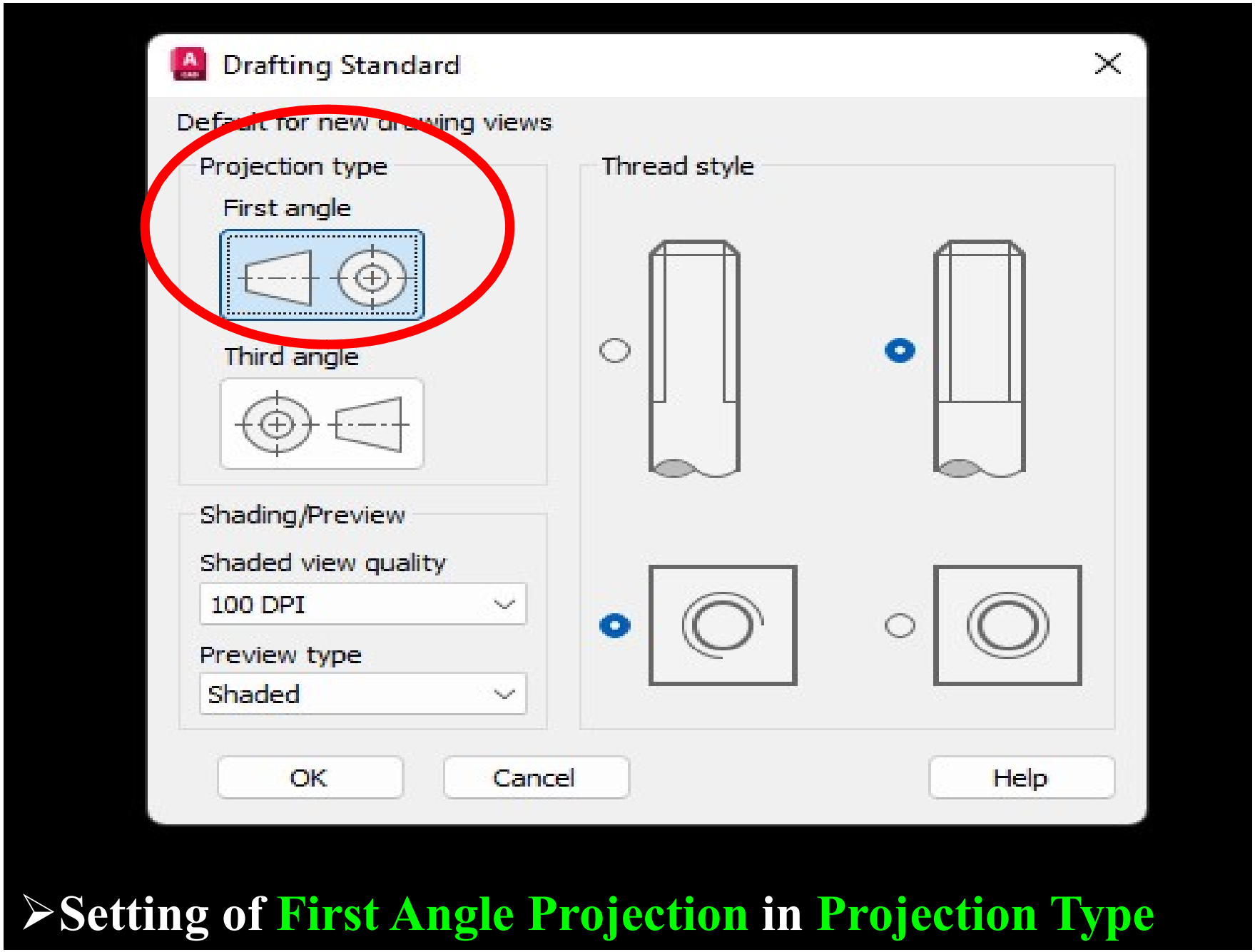
➢Draw a **H**orizontal line Touching the Corner of the **S**olid & Measure the **A**ngle


Autodesk AutoCAD 2023 - EDUCATIONAL VERSION Drawing2.dwg
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins Collaborate Express Tools Featured Apps
Pyramid Extrude Polysolid Presspull Smooth Object Section Plane 2D Wireframe Unsaved View Culling No Filter Move Gizmo Layer Properties Group Base
Modeling Mesh Solid Editing Draw Modify Section Coordinates View Selection Layers Groups View
Start Drawing1* Drawing2*
Front
View Controls
Provides access to standard and custom views, and 3D projections.
Type a command
TOP
Unnamed
40°
Rotate the Solid for 4° to satisfy the given Condition.
Model Layout1 Layout2 w06_q02
MODEL
Search
ENG IN
11:12 11-09-2023

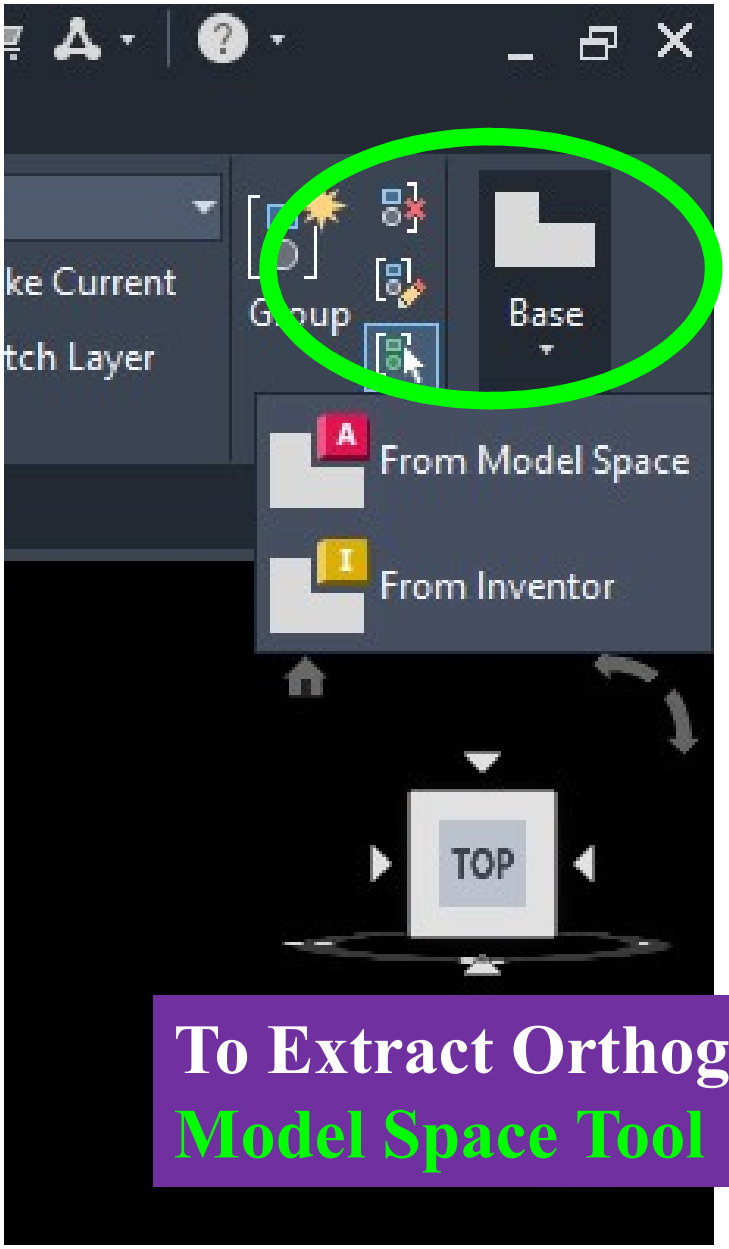


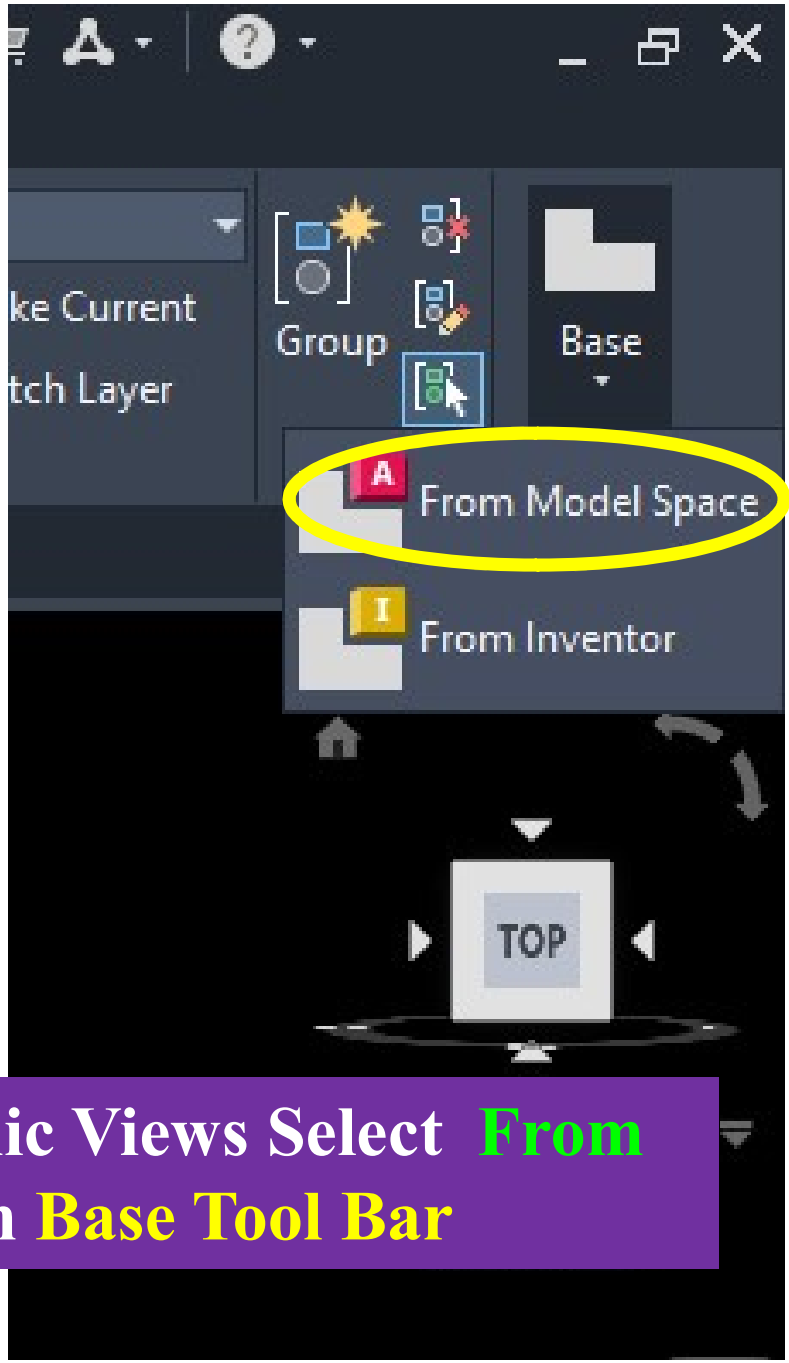
➢Click on this **Right Pointed Arrow** for Setting the **Drafting Standard**

➢Use **Drafting Standard** from **View Base** tool bar for setting the **First Angle** of projection.

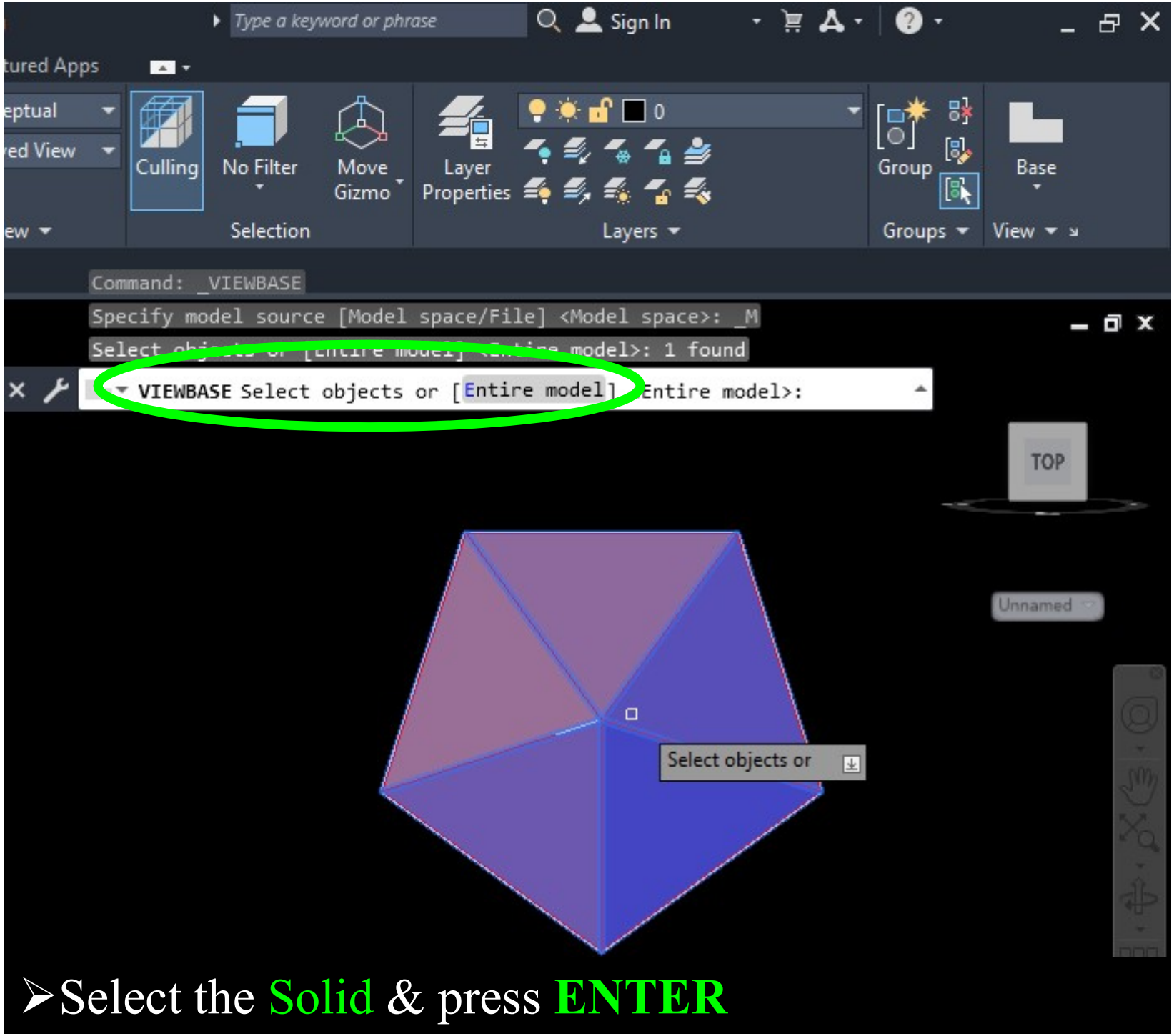


➢Setting of **First Angle Projection** in **Projection Type**

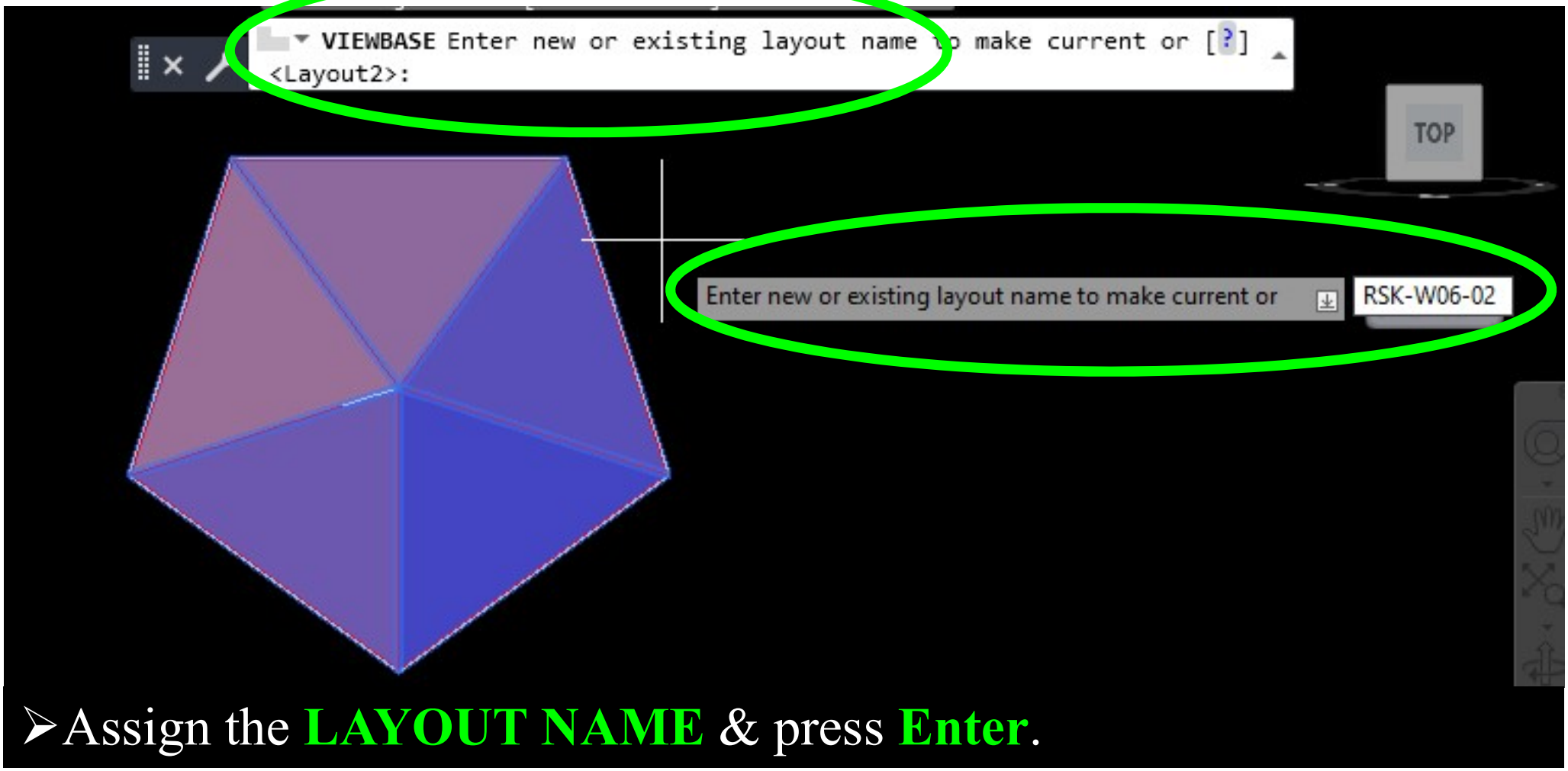




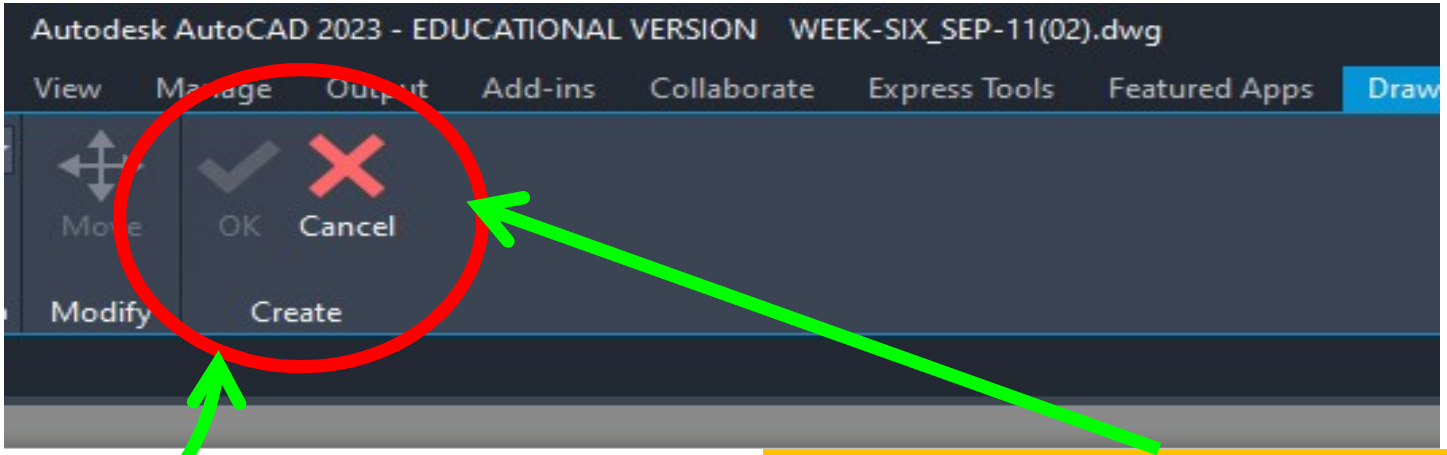
To Extract Orthographic Views Select From Model Space Tool from Base Tool Bar



➢Select the Solid & press **ENTER**

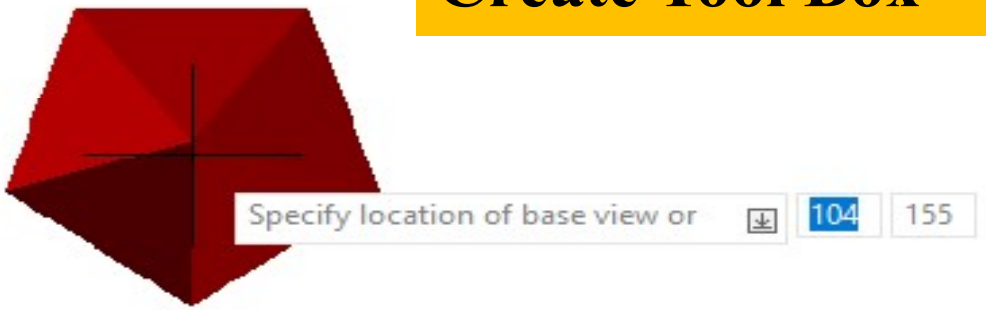


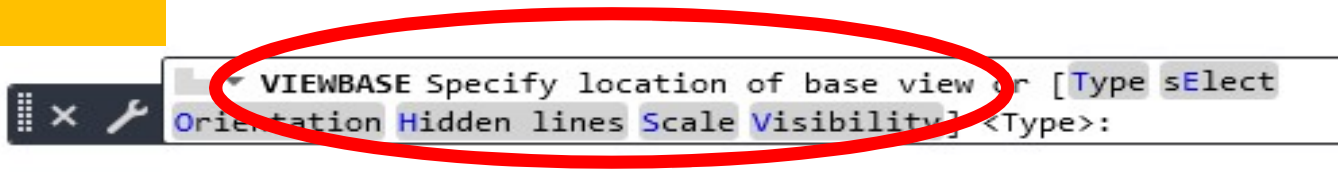
➢Assign the **LAYOUT NAME** & press **Enter**.

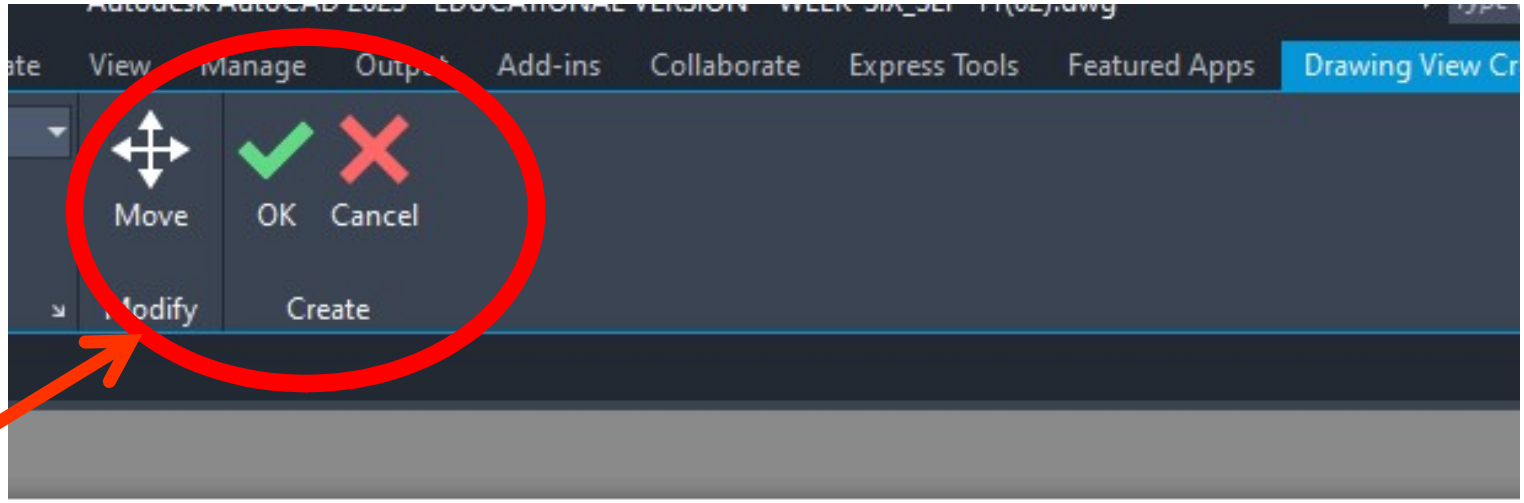


➢Cancel X is Enabled in Create Tool Box

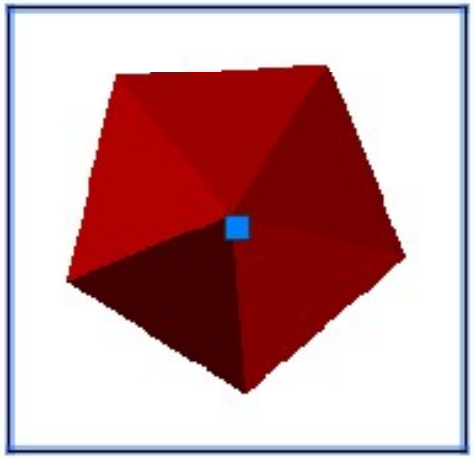
➢Before Specifying the **Location of Base view**

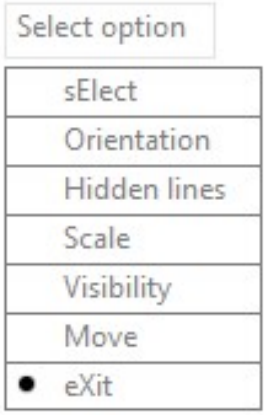


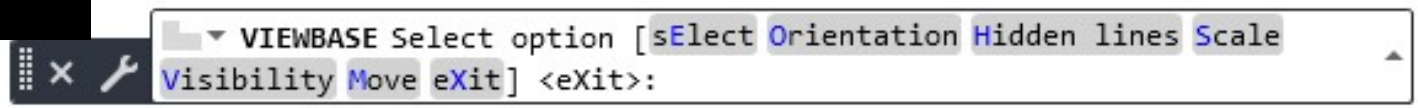




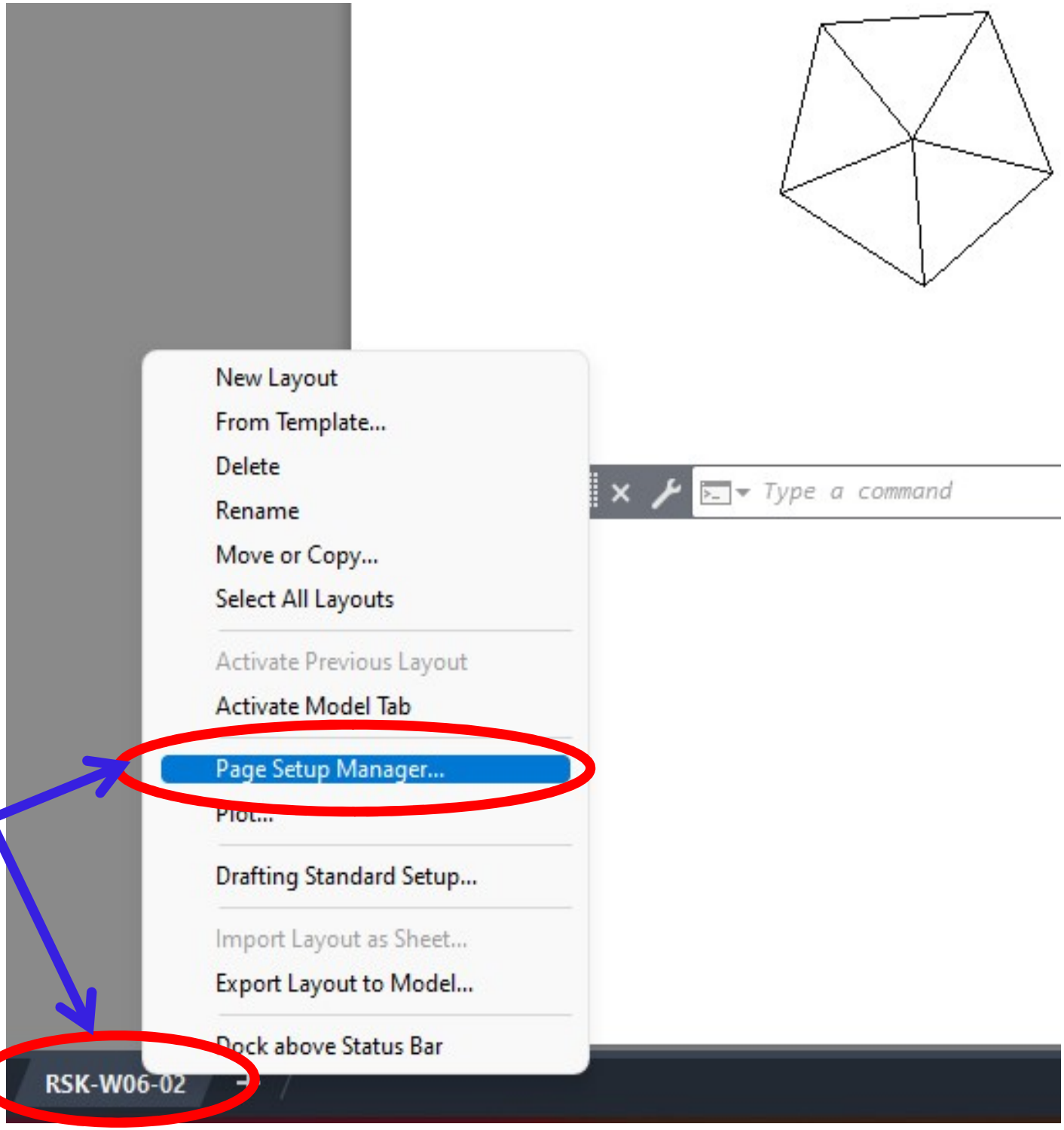
➢After Specifying the **Location of Base** view give a **Click** on the **Green Tick** to get the **Front View** of the Solid & press Double Enter.



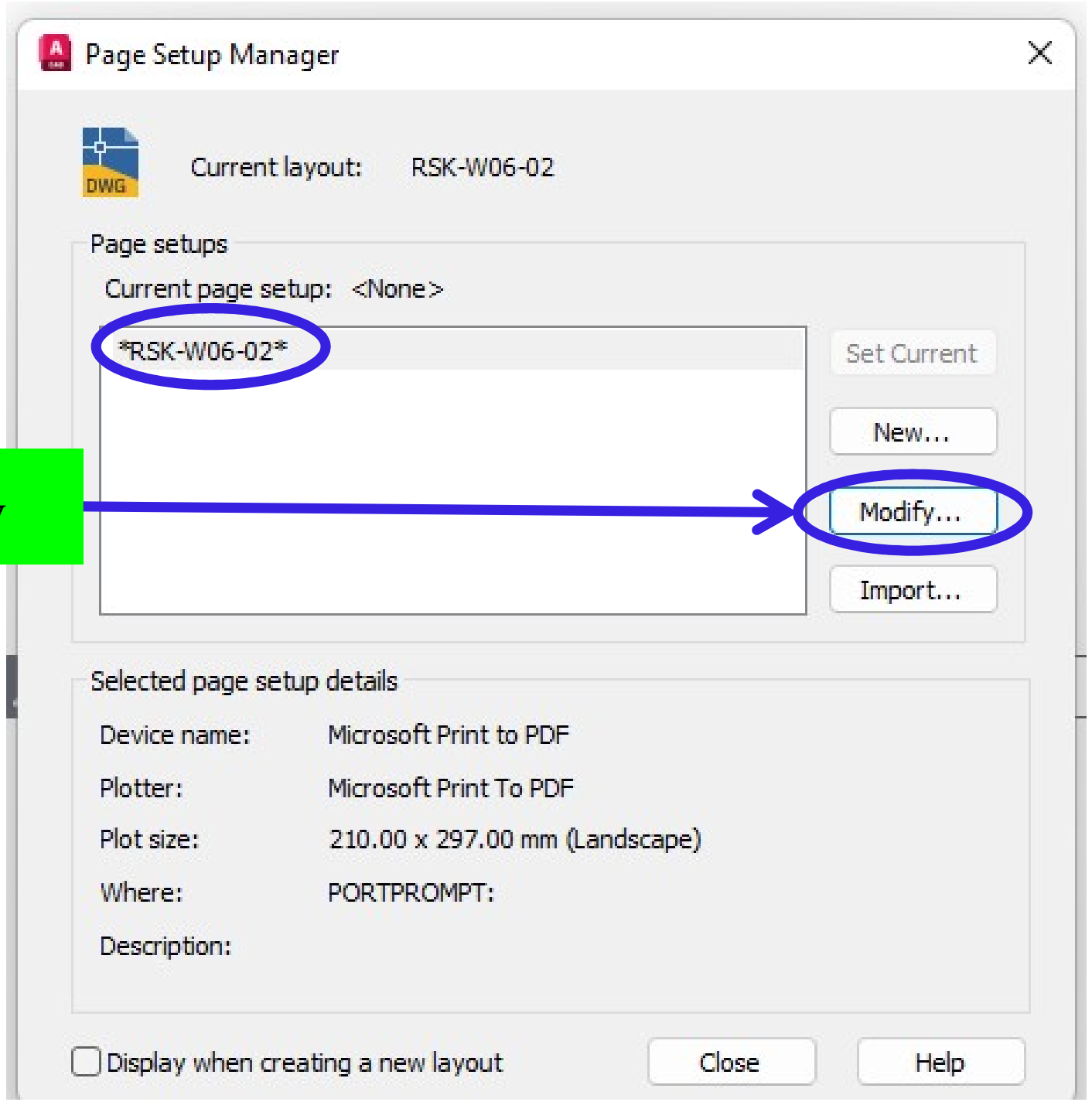


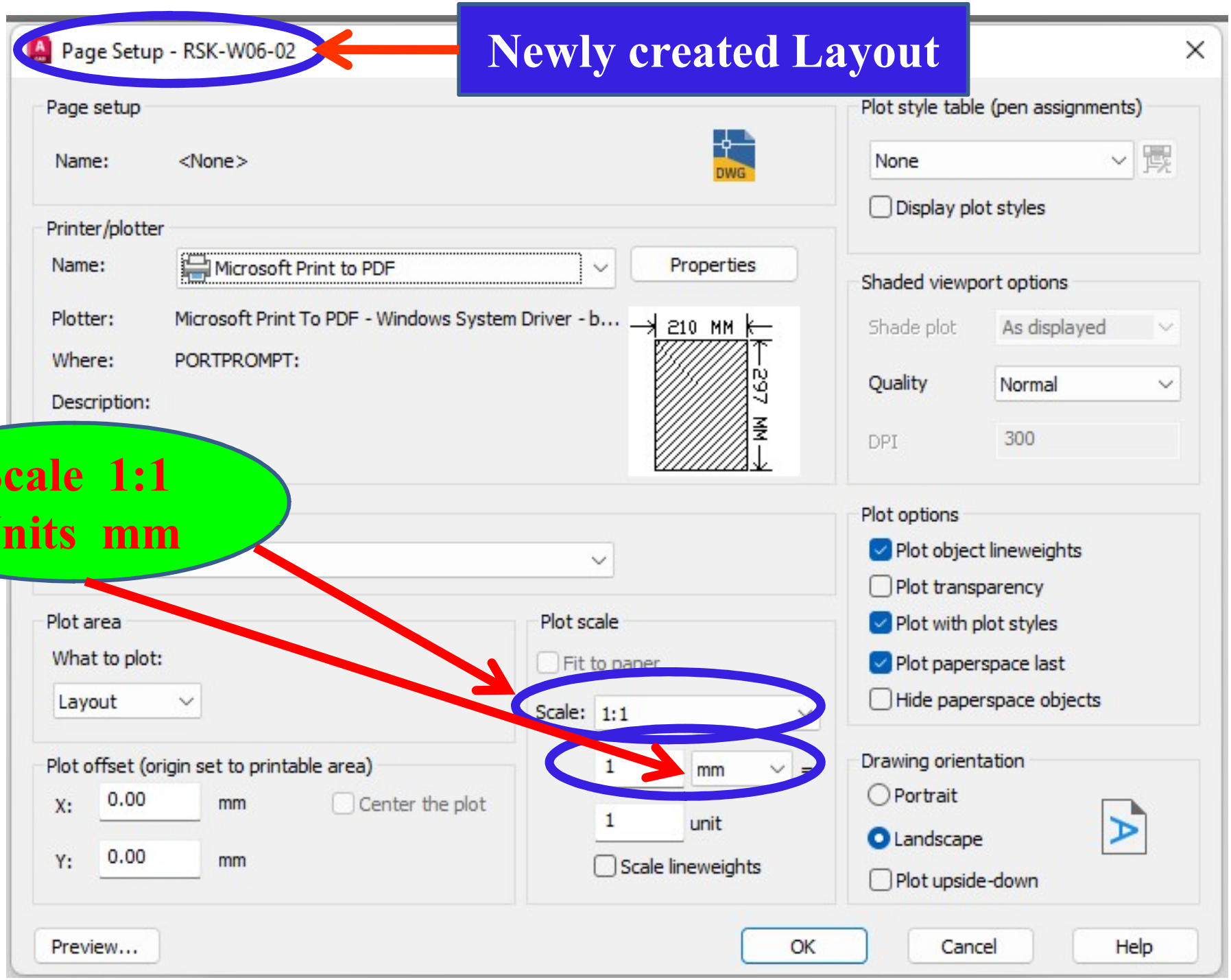


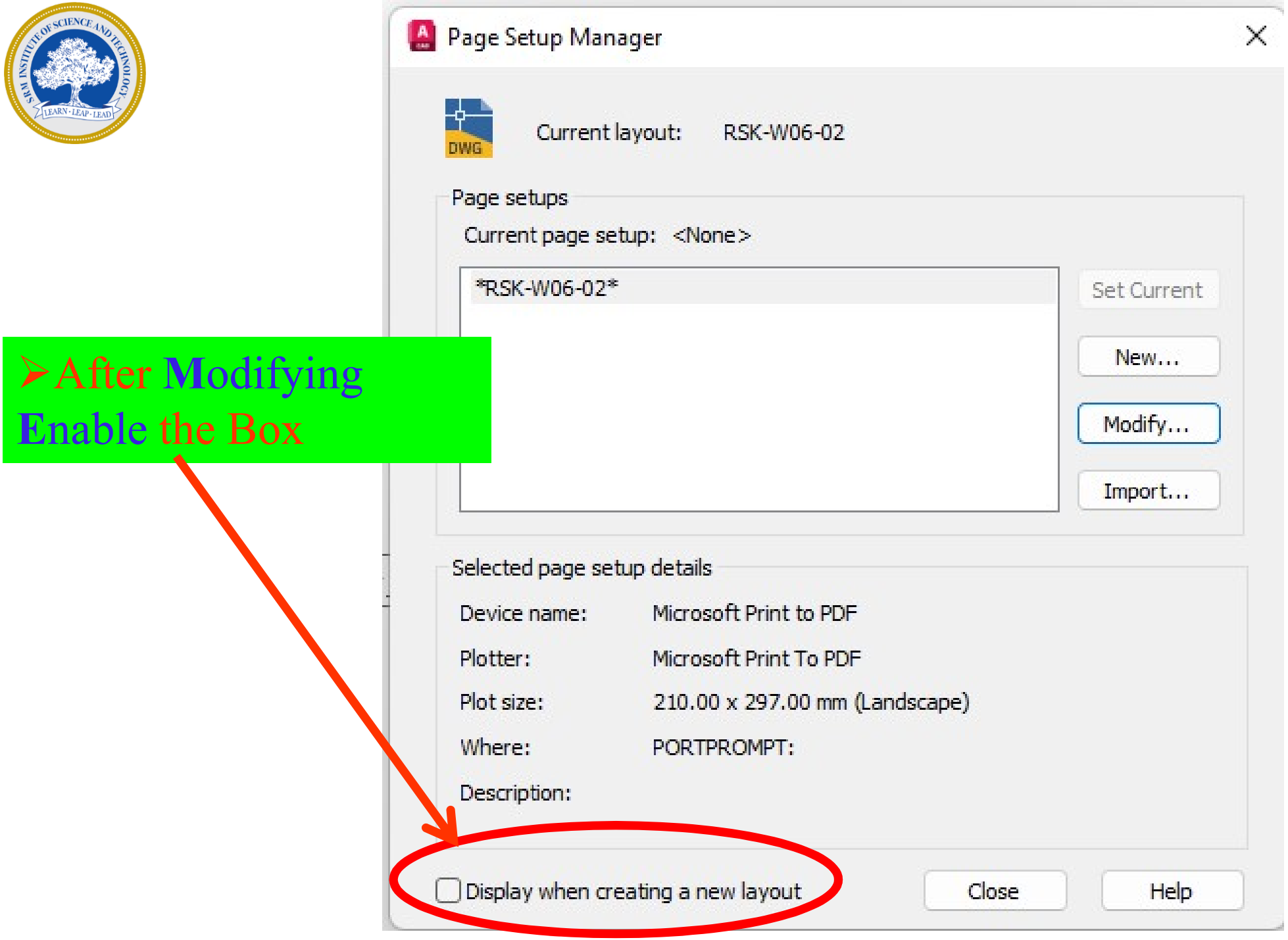
- Select the newly created **LAYOUT** & give **Right click** to see the options & select the **PAGE SETUP MANGER**

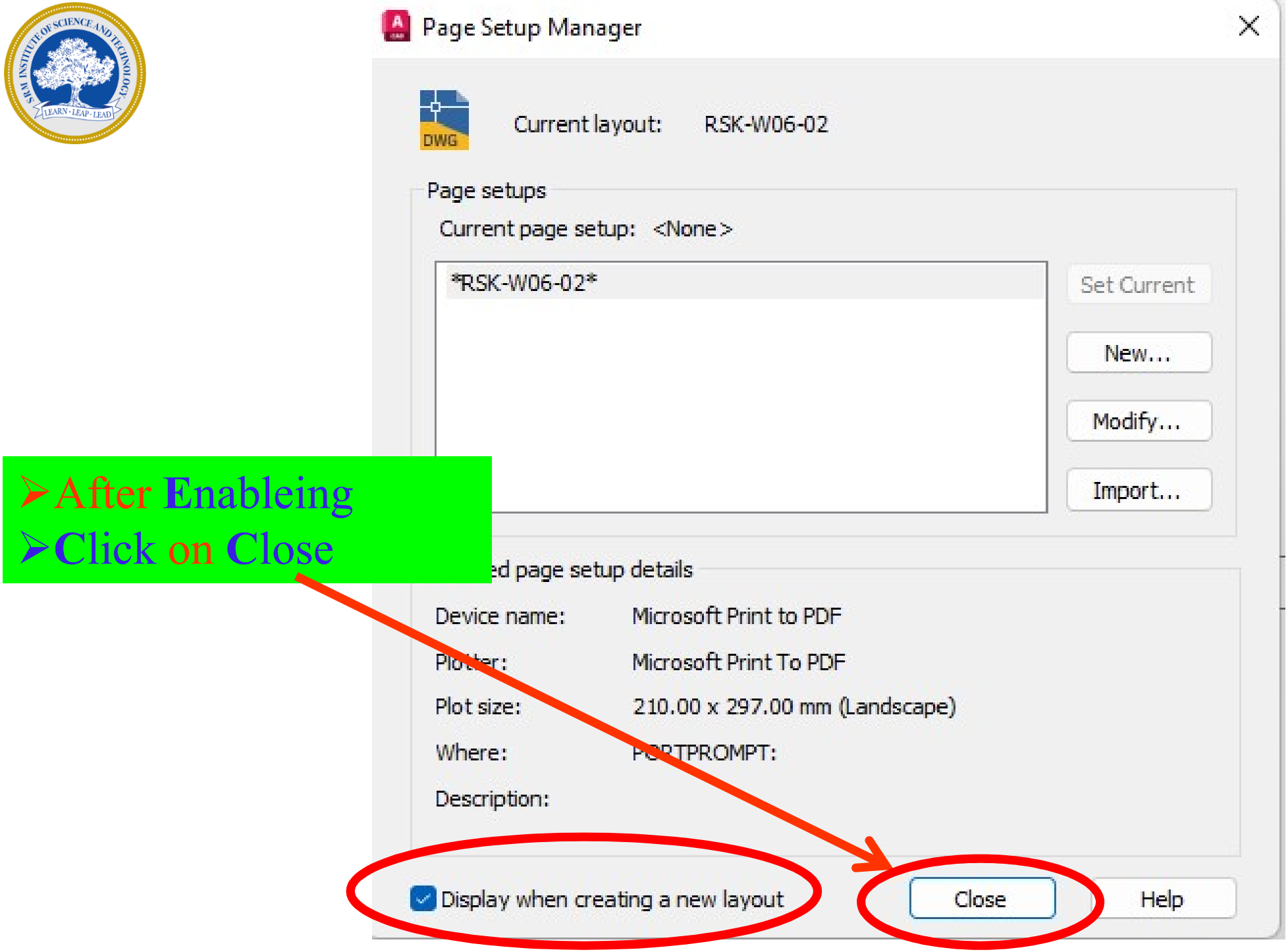


➢ Click on **Modify**

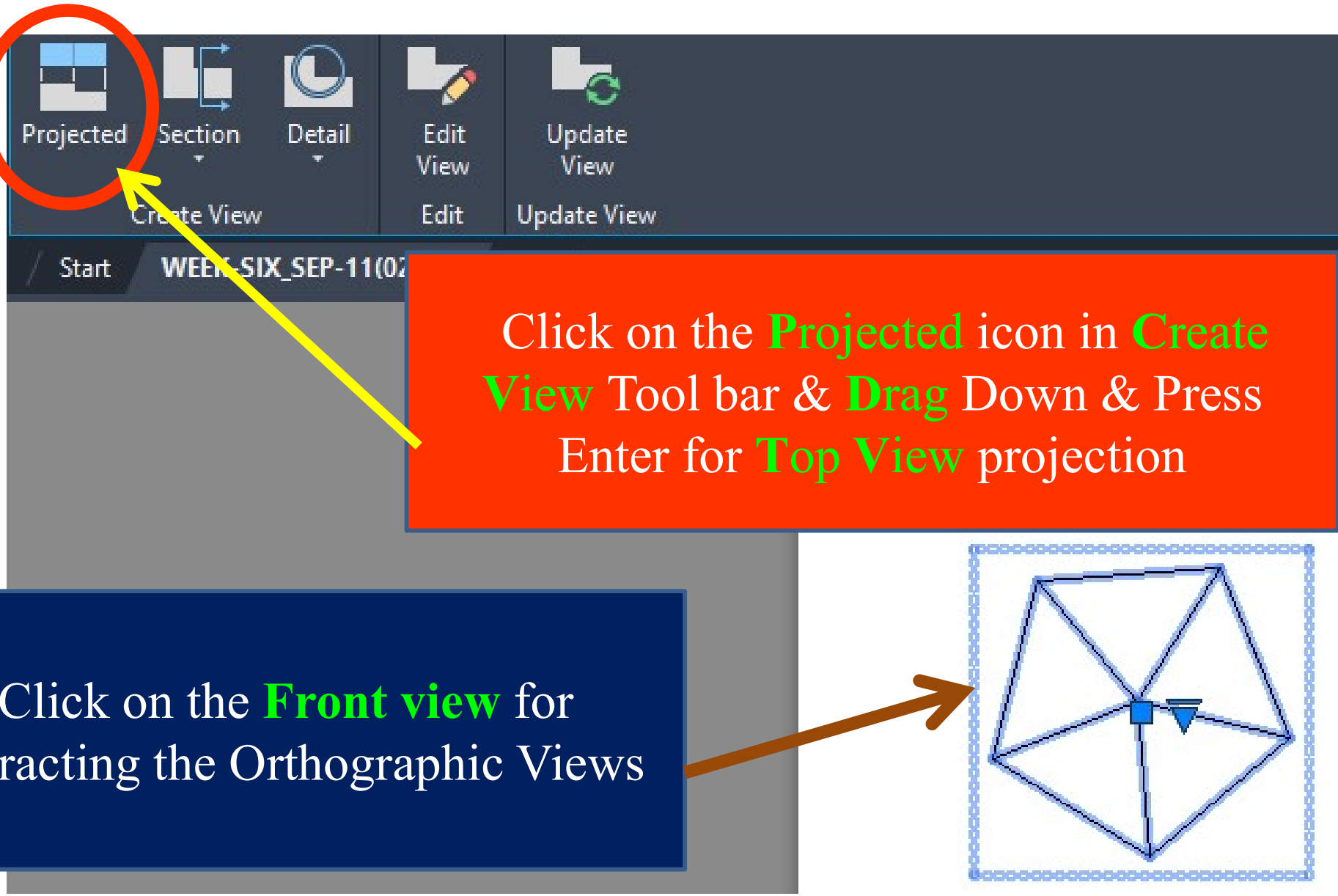



Page Setup - RSK-W06-02
Newly created Layout
Page setup
Name: <None>
Printer/plotter
Name: Microsoft Print to PDF
Properties
Plotter: Microsoft Print To PDF - Windows System Driver - b...
Where: PORTPROMPT:
Description:
210 MM
297 MM
Scale 1:1
Units mm
Plot area
What to plot:
Layout
Plot offset (origin set to printable area)
X: 0.00 mm
Center the plot
Y: 0.00 mm
Plot scale
Fit to paper
Scale: 1:1
1 mm
1 unit
Scale lineweights
Plot style table (pen assignments)
None
Display plot styles
Shaded viewport options
Shade plot As displayed
Quality Normal
DPI 300
Plot options
Plot object lineweights
Plot transparency
Plot with plot styles
Plot paperspace last
Hide paperspace objects
Drawing orientation
Portrait
Landscape
Plot upside-down
Preview...
OK
Cancel
Help

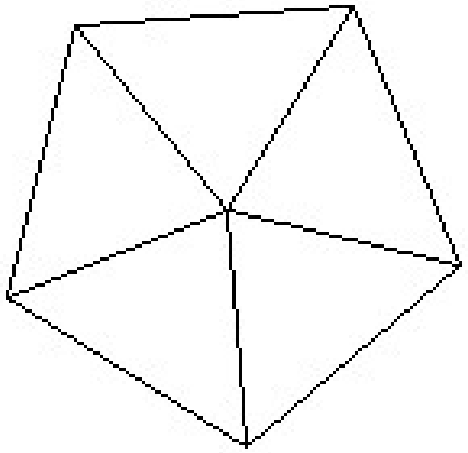

Page Setup Manager
Current layout: RSK-W06-02
Page setups
Current page setup: <None>
RSK-W06-02
Set Current
New...
Modify...
Import...
Selected page setup details
Device name: Microsoft Print to PDF
Plotter: Microsoft Print To PDF
Plot size: 210.00 x 297.00 mm (Landscape)
Where: PORTPROMPT:
Description:
Display when creating a new layout
Close
Help
➢After Modifying
Enable the Box

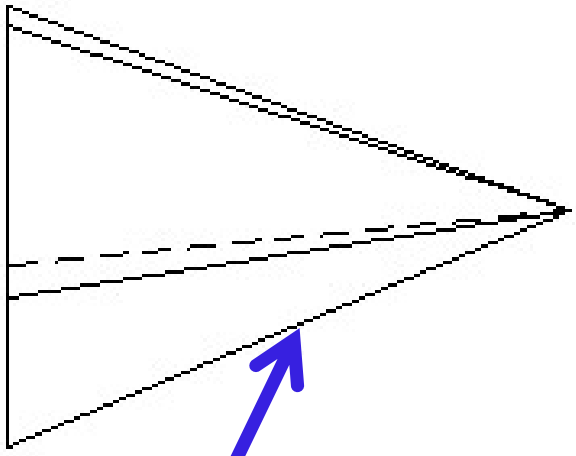


- After Enableing
- Click on Close

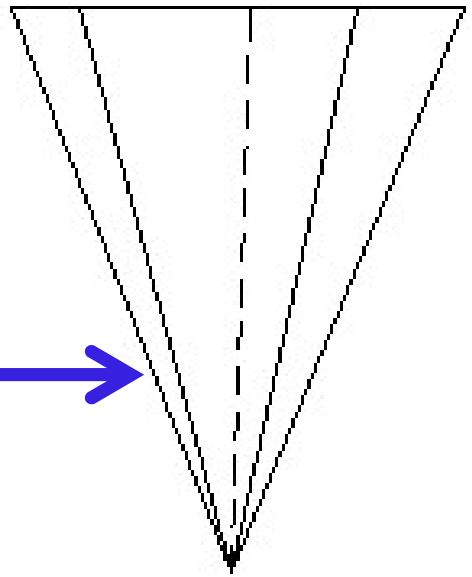

Projected
Section
Detail
Edit View
Update View
Create View
Edit
Update View
Start
Click on the Projected icon in Create View Tool bar & Drag Down & Press Enter for Top View projection
Click on the Front view for Extracting the Orthographic Views

Front view

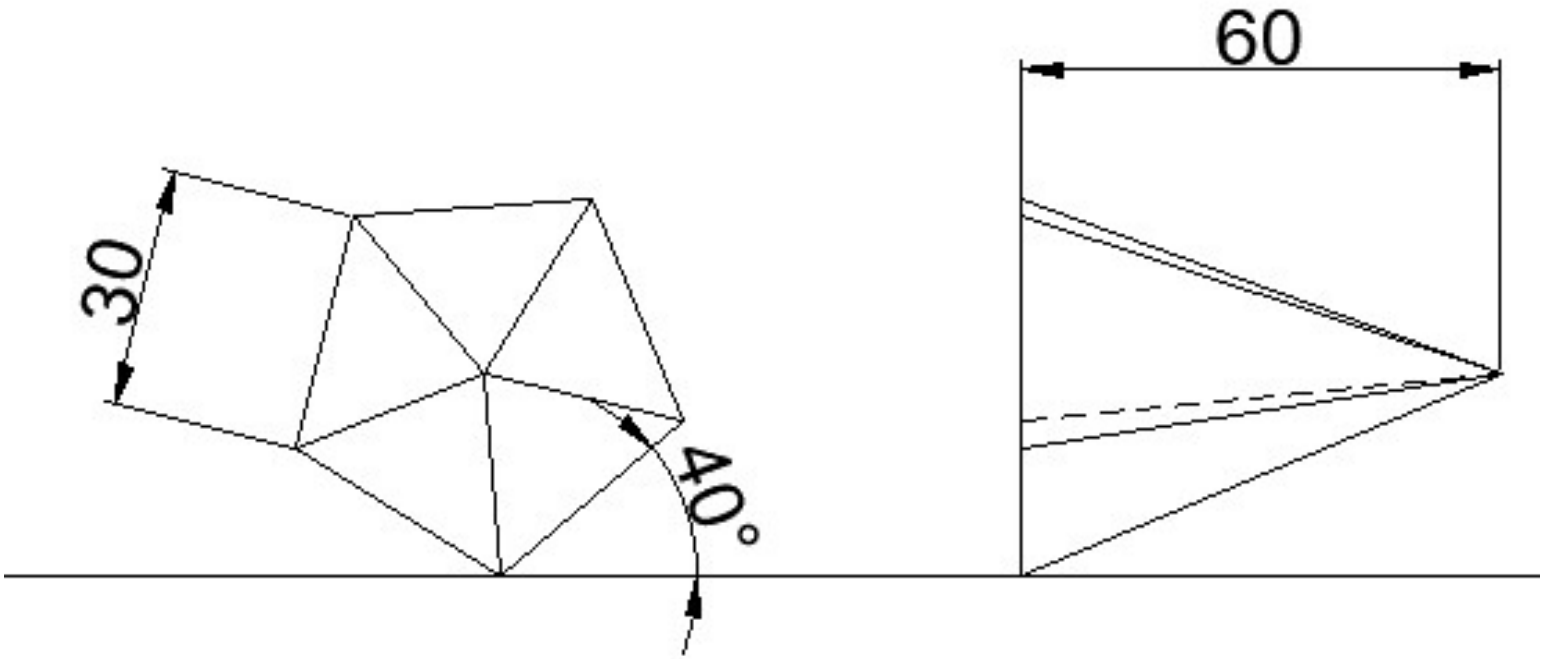


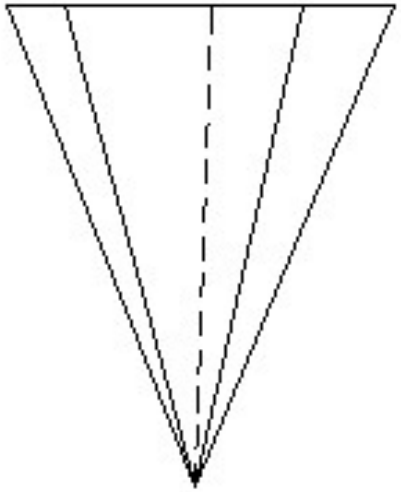


➢**Drag** the Cursor Down & Press Enter for **Top View**



➢**Drag** the Cursor Right Hand side & Press Enter for **Side View**

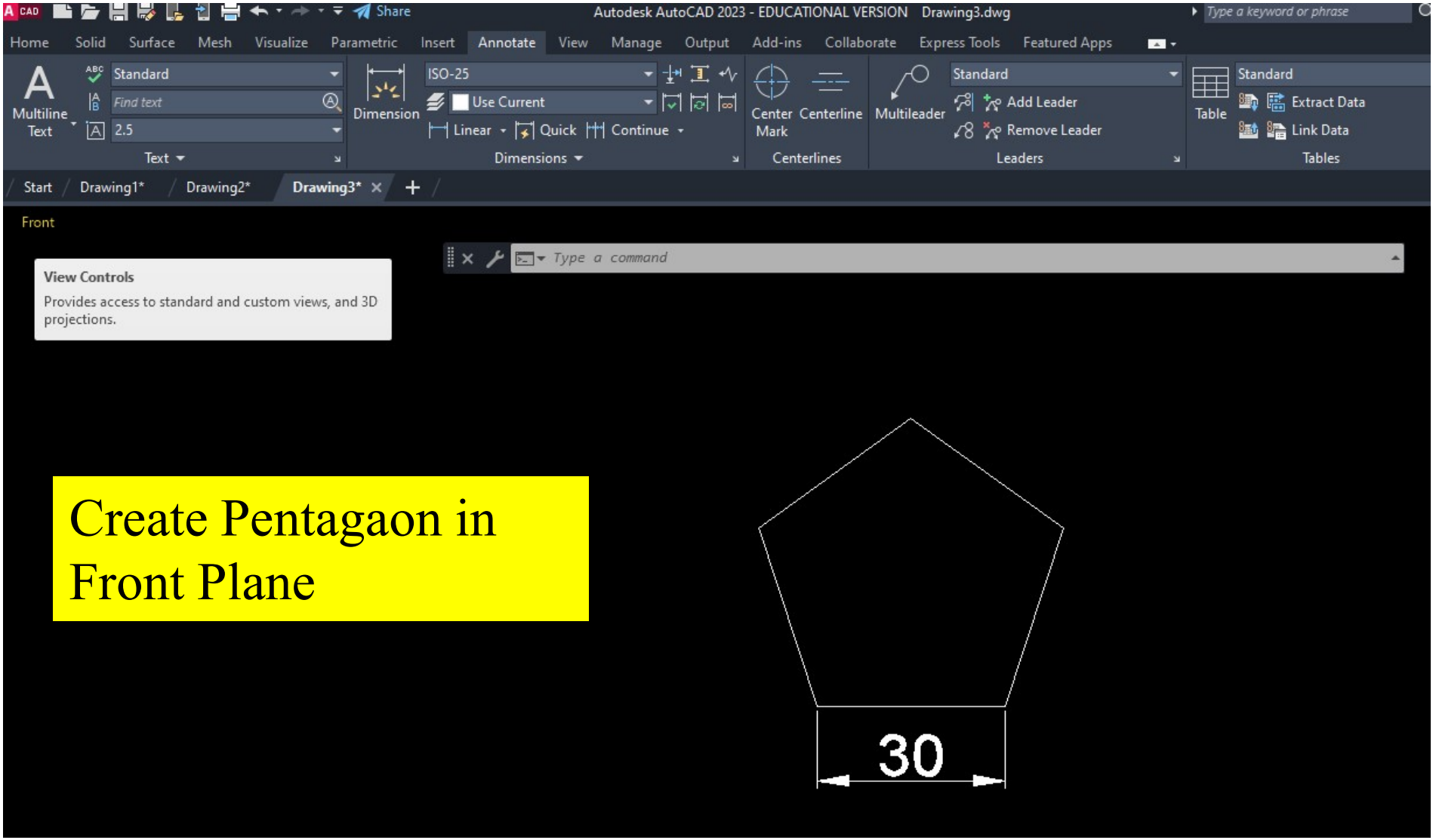


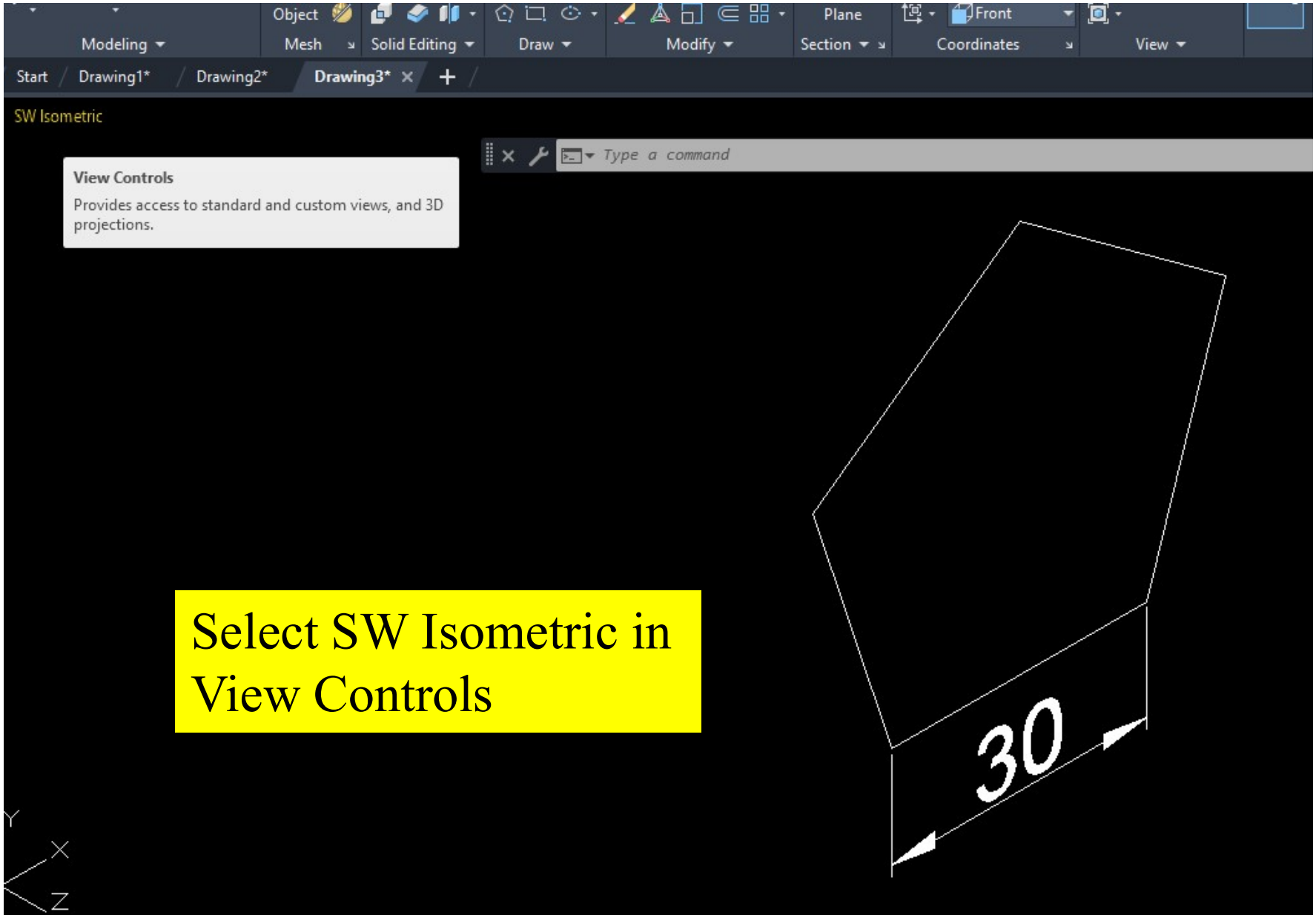


➢**D**raw **H**orizontal **L**ine & **M**ark the **R**elevant **D**imensions

Pentagonal Prism of axis perpendicular to VP with one of the Rectangular face resting on HP

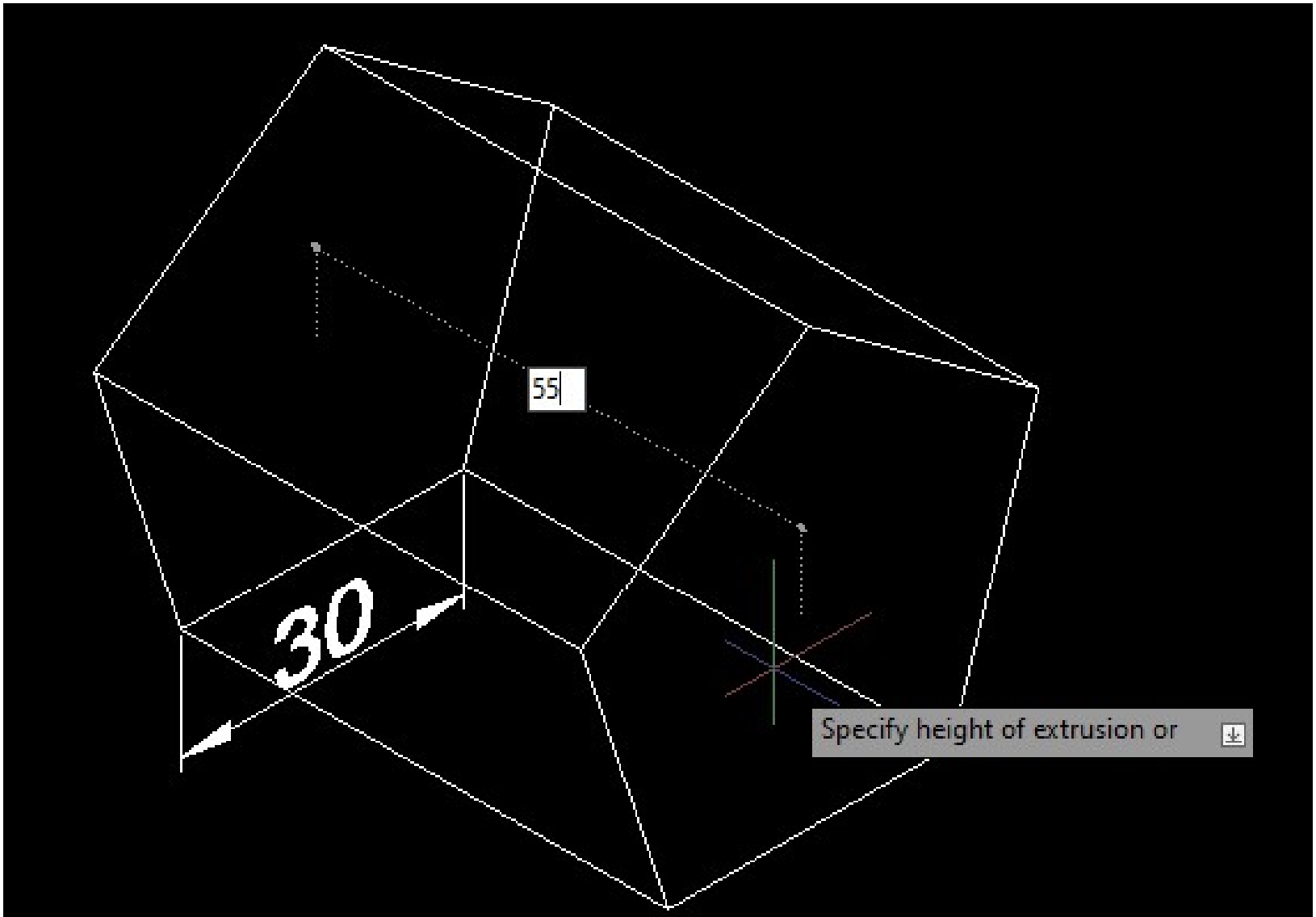
- Change the work space environment to 3D Modeling (**WORKSPACE SWITCHING**)
- Complete the Preliminary steps (setting **UNITS** & **LIMITS**)
- Set the **FRONT** plane in **VIEW CONTROLS**
- Start with **FRONT** view (since **True** shape of the Solid is visible in **FRONT** view)
- Use **Polygon** command from **DRAW** tool bar to create the Pentagon with one of the base side in horizontal position (Parallel to **HP**) for the given dimension.


Autodesk AutoCAD 2023 - EDUCATIONAL VERSION Drawing3.dwg
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins Collaborate Express Tools Featured Apps
Multiline Text
Standard
Find text
2.5
Text
Dimension
ISO-25
Use Current
Linear Quick Continue
Dimensions
Center Mark
Centerline
Centerlines
Multileader
Add Leader
Remove Leader
Leaders
Table
Standard
Extract Data
Link Data
Tables
Start Drawing1* Drawing2* Drawing3*
Front
View Controls
Provides access to standard and custom views, and 3D projections.
Type a command
Create Pentagaon in Front Plane
30



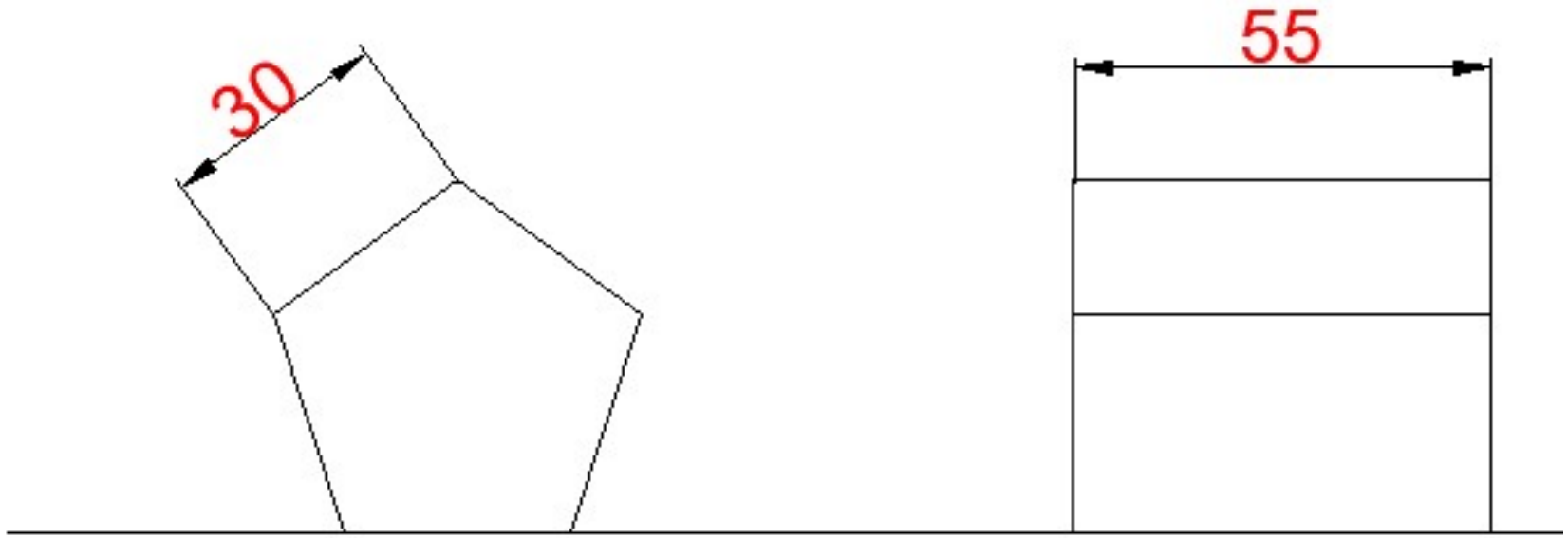
Select SW Isometric in View Controls

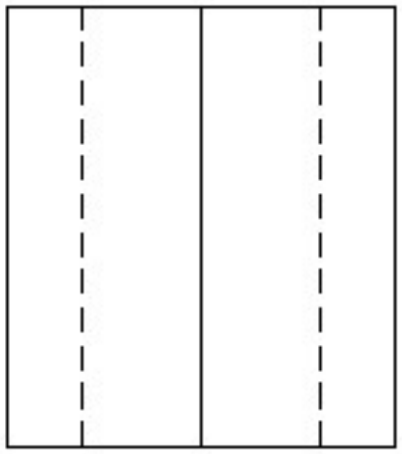
- Use **Extrude** command from **MODELLING** tool bar & extrude the pentagon for given length
- Use **DRAFTING STANDARD** from **VIEW BASE** tool bar for setting the **FIRST ANGLE** of projection.
- Use **BASE** command from **VIEW BASE** tool bar & select the command **FROM MODEL SPACE** to the select solid & press **ENTER** & assign the **LAYOUT NAME** & press enter.



➢Select **Extrude** to Give **55** mm **Height** of the **Prism**.

- Select the **LAYOUT** newly created & give Right click to see the options & select the **PAGE SETUP MANGER** to modify the **PAGE SETUP** (to change the scale) in the newly created **LAYOUT**.
- Set the **SCALE** for **1:1** & the **UNITS** in mm. & give **OK** & **CLOSE** for **PAGE SETUP MANAGER**.





- Use **LINE** command from **DRAW** tool bar & draw the reference line **XY**
- Use **DIMENSION** tool from **ANNOTATION** tool bar & mark the relevant dimensions

REFERENCE BOOKS

- JEYAPOOVAN T, “ENGINEERING GRAPHICS AND DESIGN”, 2023, Vikas Publishing House Pvt Ltd,
- K.V.NATARAJAN, “Engineering Graphics”, 2015, Dhanalakshmi Publishers.