21MES102L
Engineering Graphics and Design
School of Mechanical Engineering

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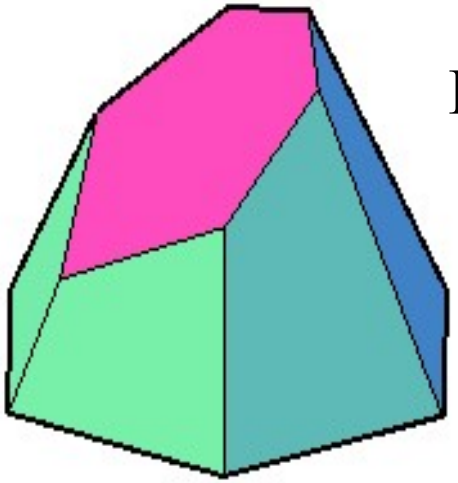
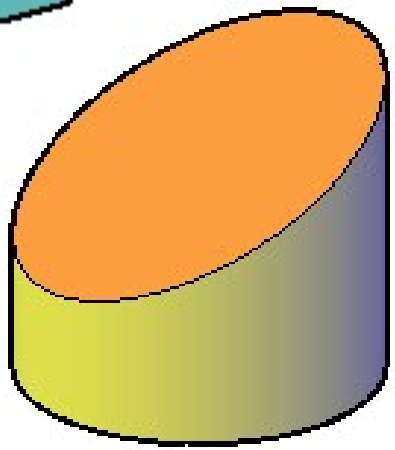
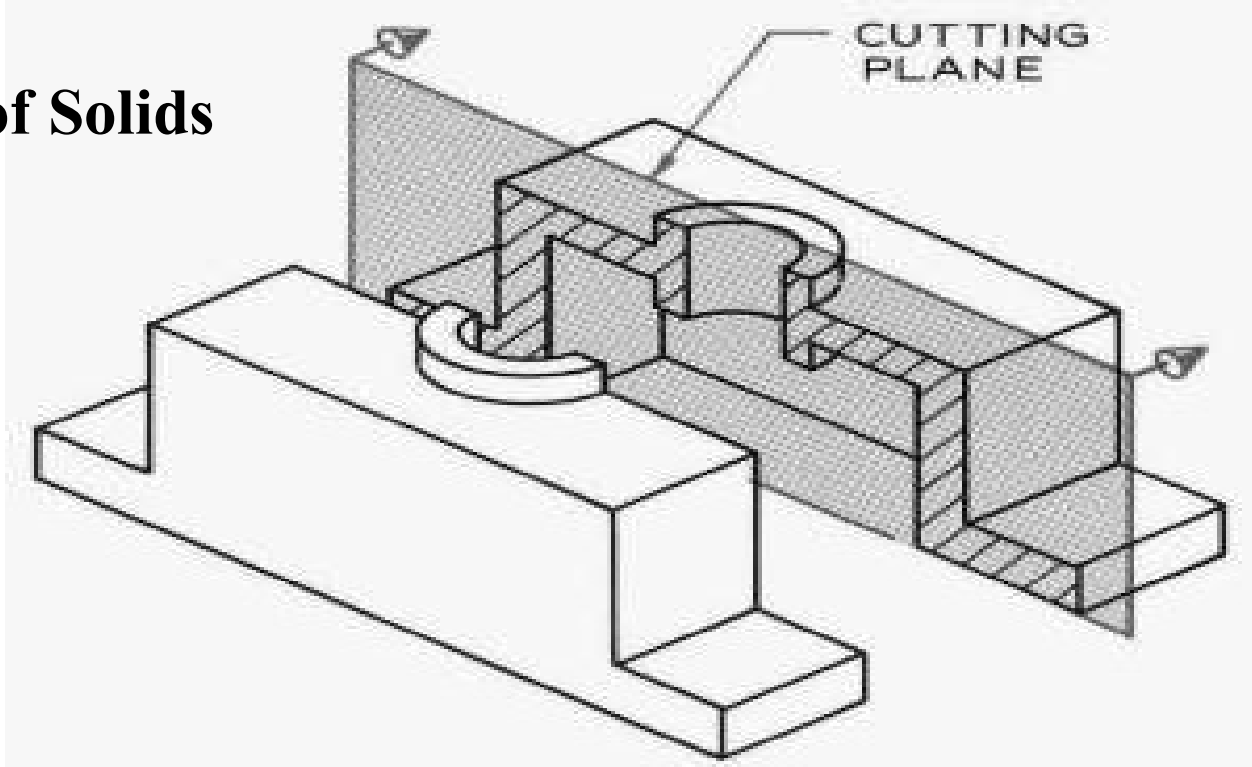
21MES102L
Engineering Graphics and Design

E8 Section of Solids







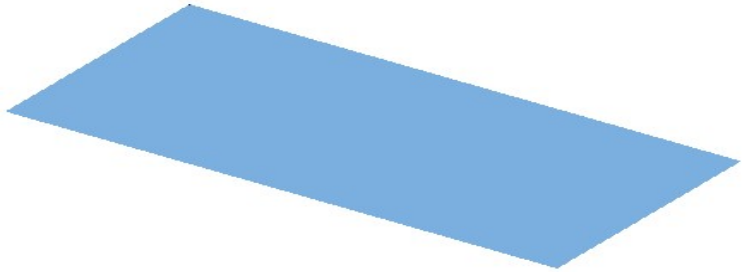
Sectioned Solids

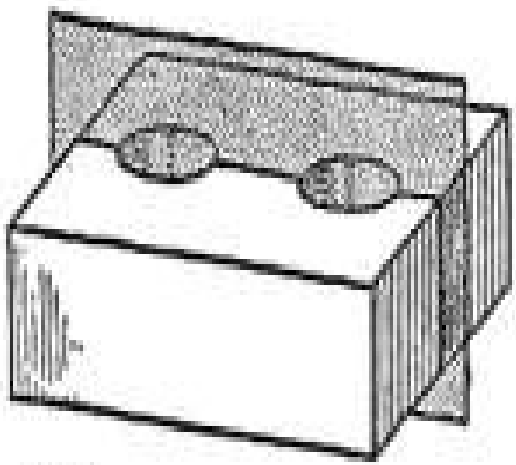
Topics Covered

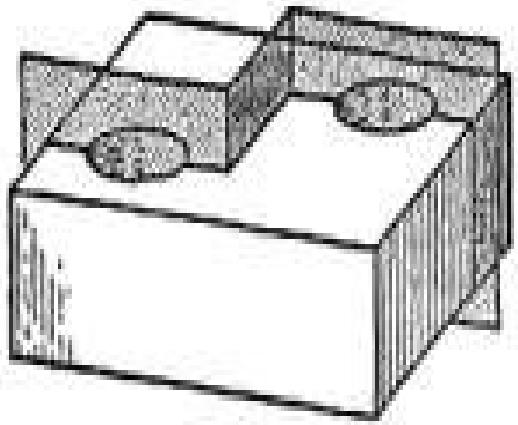
- Significance of Section of Solids
- Section of Solids when Section Plane Perpendicular to one Plane and Parallel to other Plane
- Section of Solids when Section Plane Perpendicular to one Plane and Inclined to other Plane

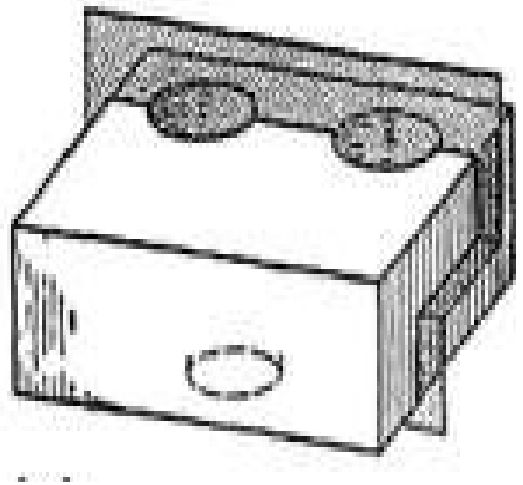
Plane

- A **PLANE** is a two dimensional object having Length and Breadth only.
- Its Thickness is always neglected.
- In order to show the inner details of a Machine Component, the object is imagined to be cut by a **CUTTING PLANE** and the **SECTION** is viewed after the removal of cut portion.

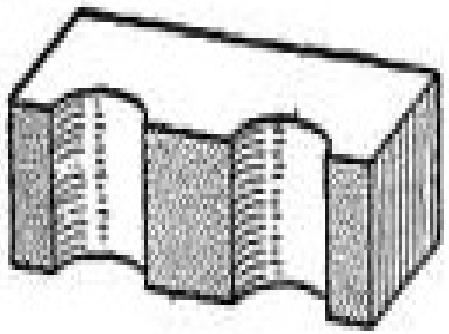


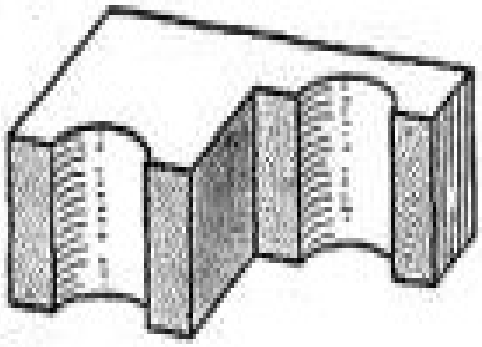


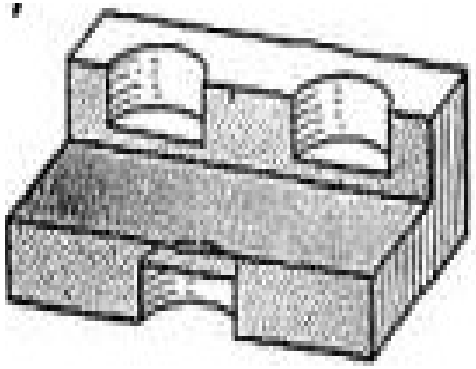




A **Section** is an imaginary cut taken through an object to expose the shape or interior







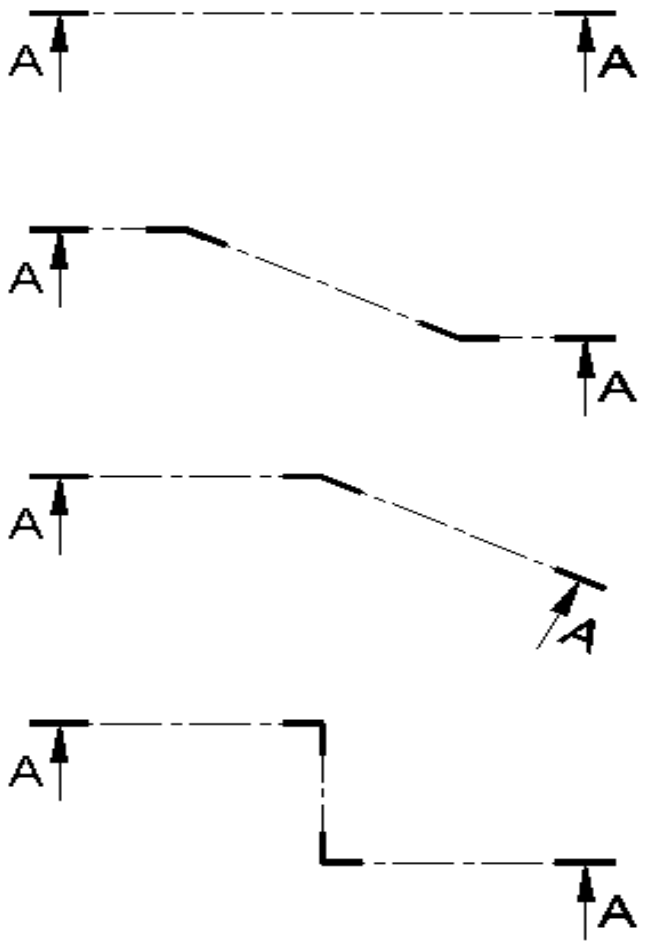
Sectioned Objects

Cutting Plane Orientation

- Cutting Plane Perpendicular to Ground and Parallel to Wall
- Cutting Plane Perpendicular to Wall and Parallel to Ground
- Cutting Plane Perpendicular to both Ground and Wall
- Cutting Plane Inclined to Ground and Perpendicular to Wall
- Cutting Plane Inclined to Wall and Perpendicular to Ground

Cutting Plane Representation

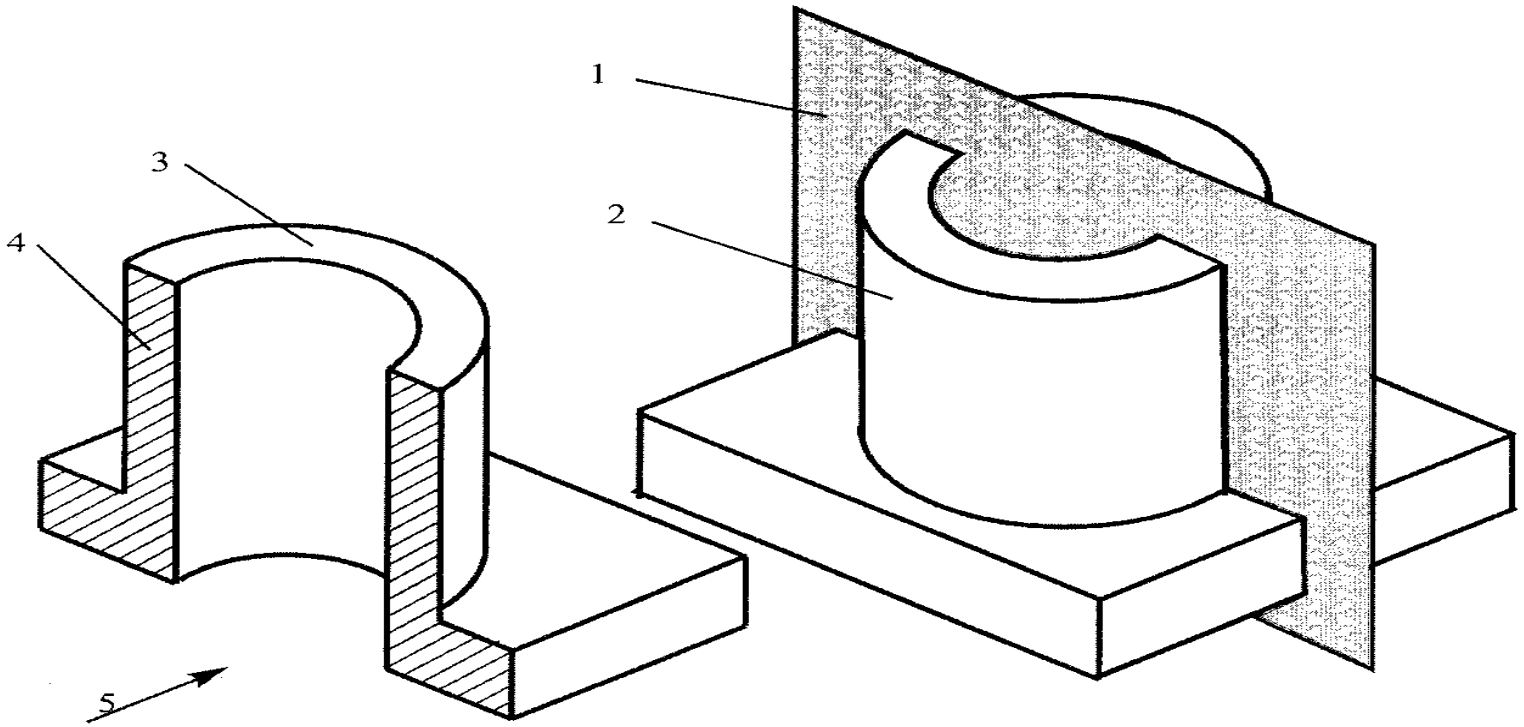
- The cutting plane line is **an imaginary plane** passing through an object at the place where a section is to be made.
- This imaginary line is identified with **reference letters along with arrows to show the direction in** which the sectional view is taken.
- The beginning and end styles of cutting plane lines are **made bold. This is also done at the** portions where the cutting plane is offset.



Elements of Sectional View

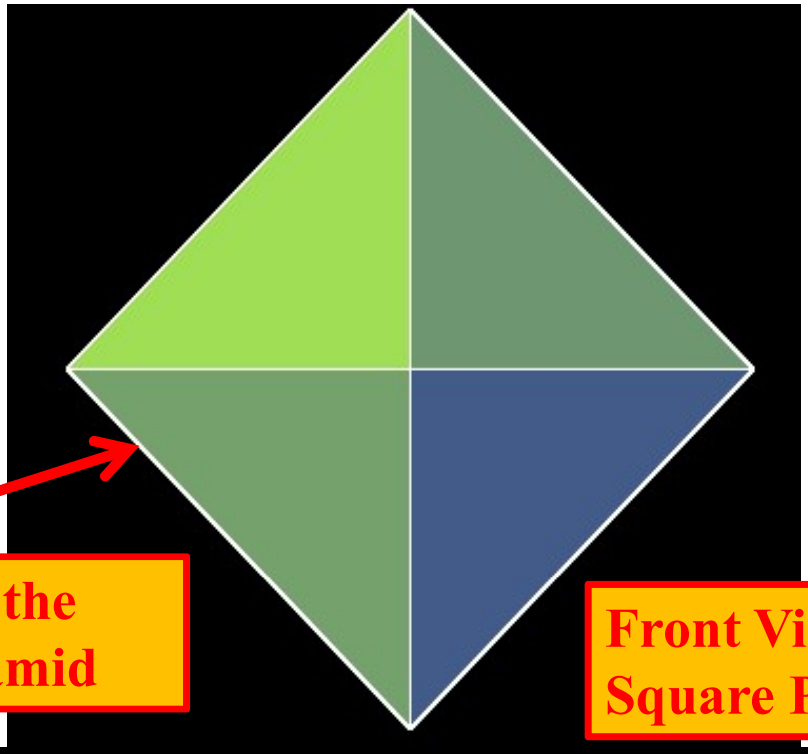
1, Cutting Plane 2. Portion of the part to be removed

3. Sectioned pat 4. Sectional Lines 5. Direction of Viewing

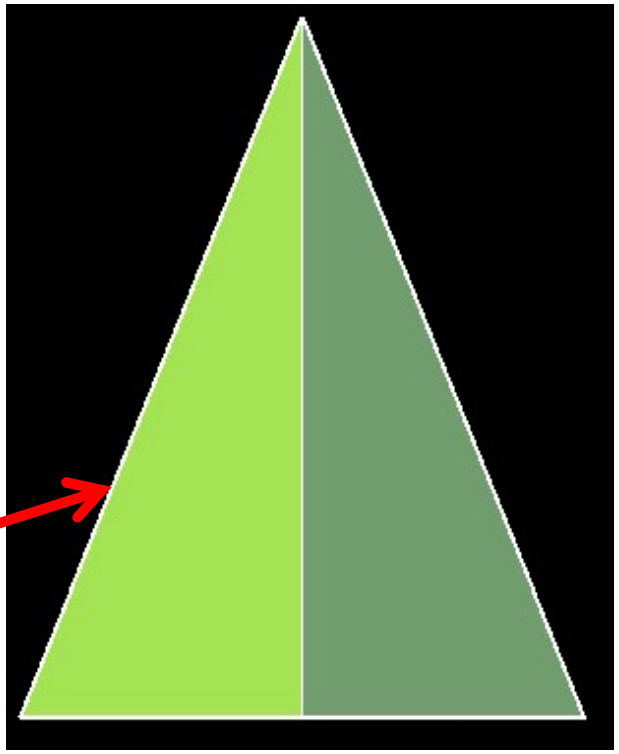


A Square Pyramid of base side **25** mm & **40** mm height is resting on its base with its Axis Perpendicular to HP and its base edges are equally Inclined to VP. A section plane is cutting the axis at point of **21** mm from its base at an angle of **30°** with respect to HP & perpendicular VP. Extract the sectional front view, sectional top view & its true shape of the section.

- Change the work space environment to **3D Modeling** (**WORKSPACE SWITCHING**)
- Complete the preliminary steps (setting **UNITS** & **LIMITS**)
- Select **Top plane** (since the True shape of the solid is visible in **TOP** view)

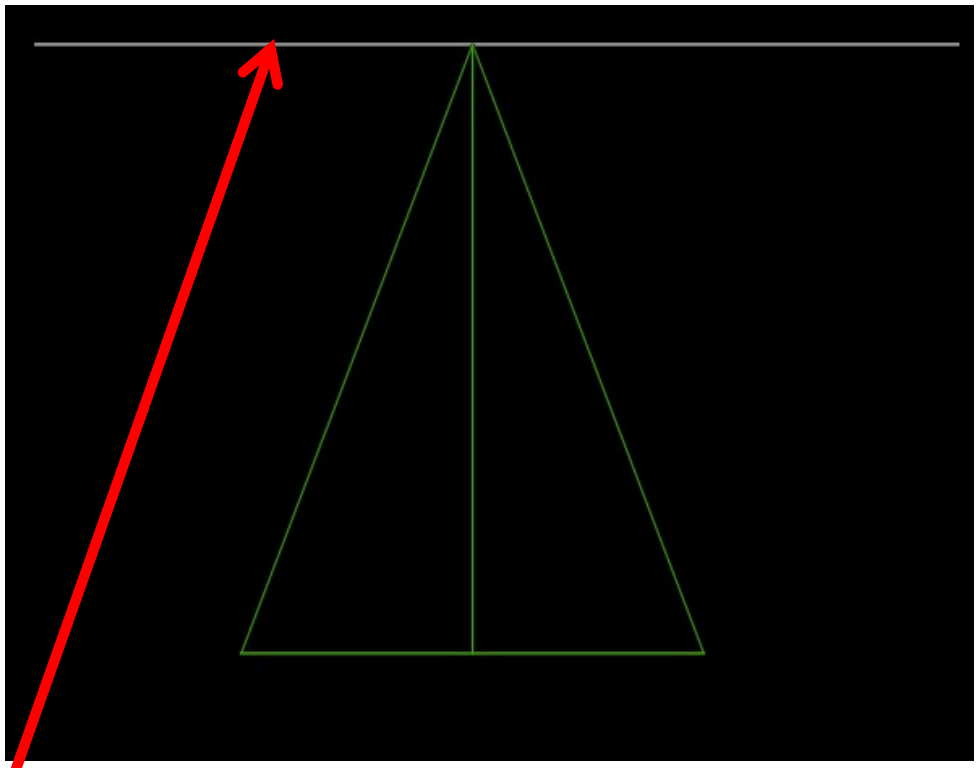


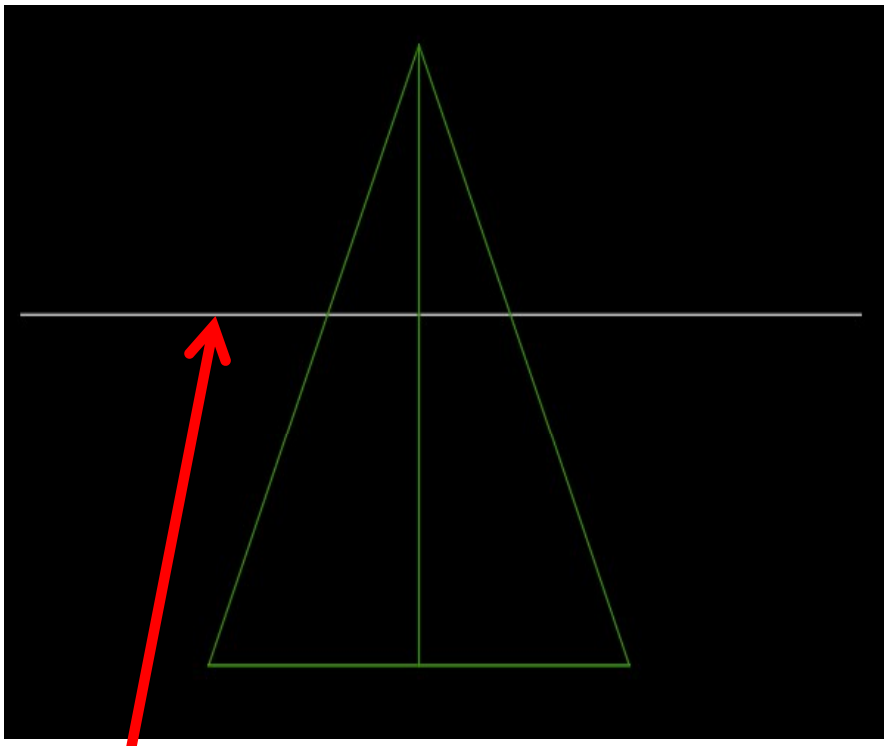
Top View of the Square Pyramid



Front View of the Square Pyramid

- Use Pyramid command from **MODELLING** tool bar to create the Square Pyramid with given base & height
- Rotate the Pyramid (45^0) such that the base edges are equally inclined to **VP** using the **ROTATE** command from **MODIFY** tool bar

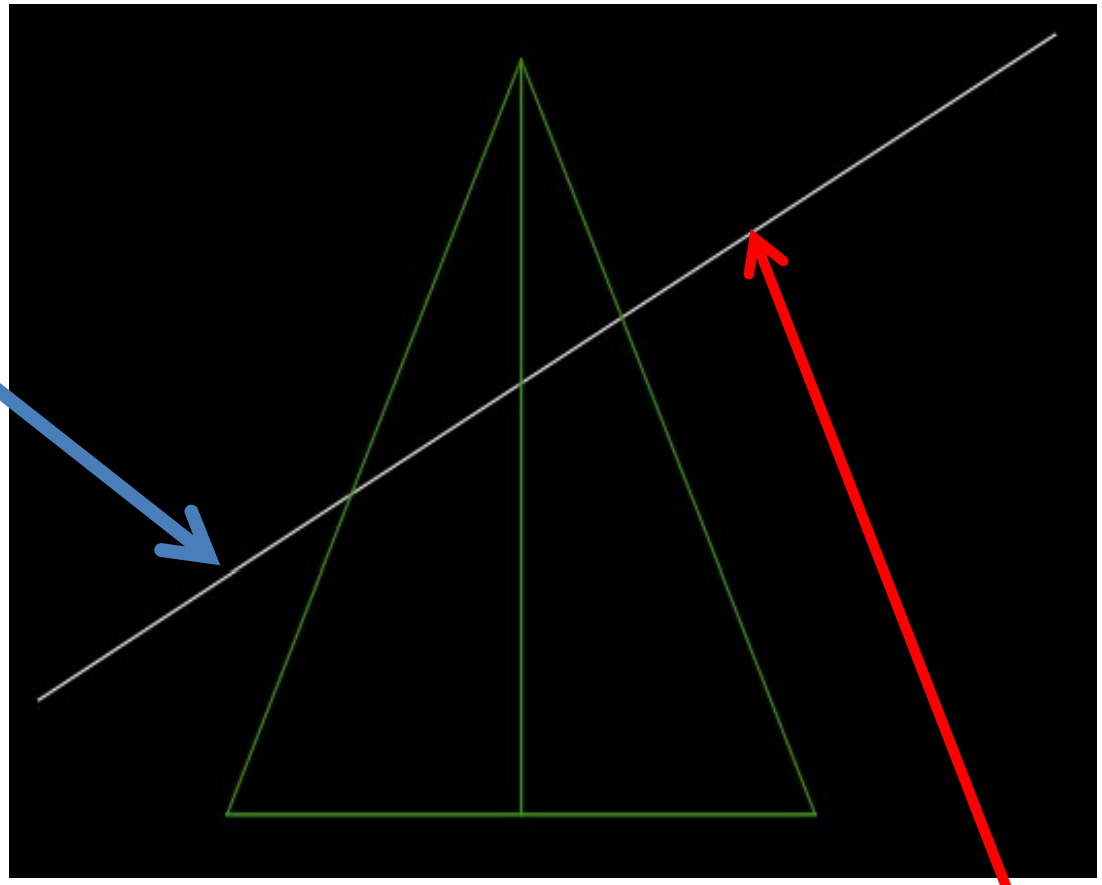




Draw a **Horizontal Line Touching** the **Apex** of the SQ Pyramid

Use **Move** command to move the Horizontal line **Down** ward for **19** mm

- The Inclined Line is Drawn for the Given Angle **30º** in **Front Plane** at the Given Height **21** mm from the Base (**19** mm from Apex)
- The inclined line is used as the Reference to Locate the **Section Plane** using **Section Tool**

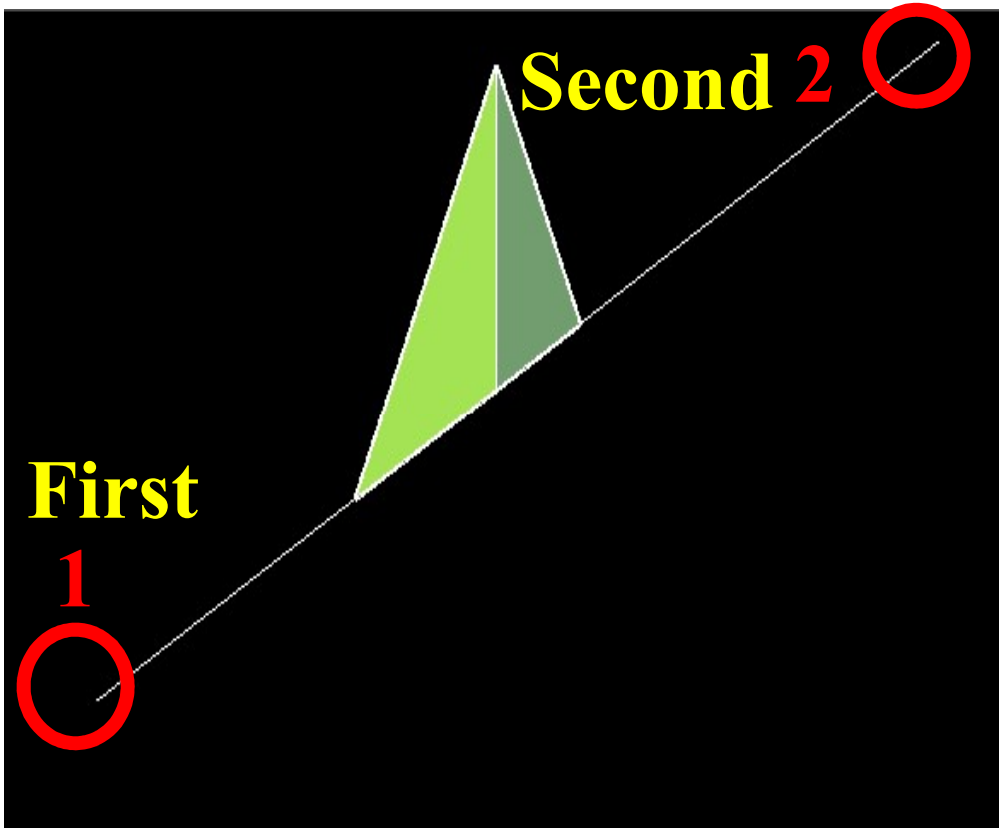


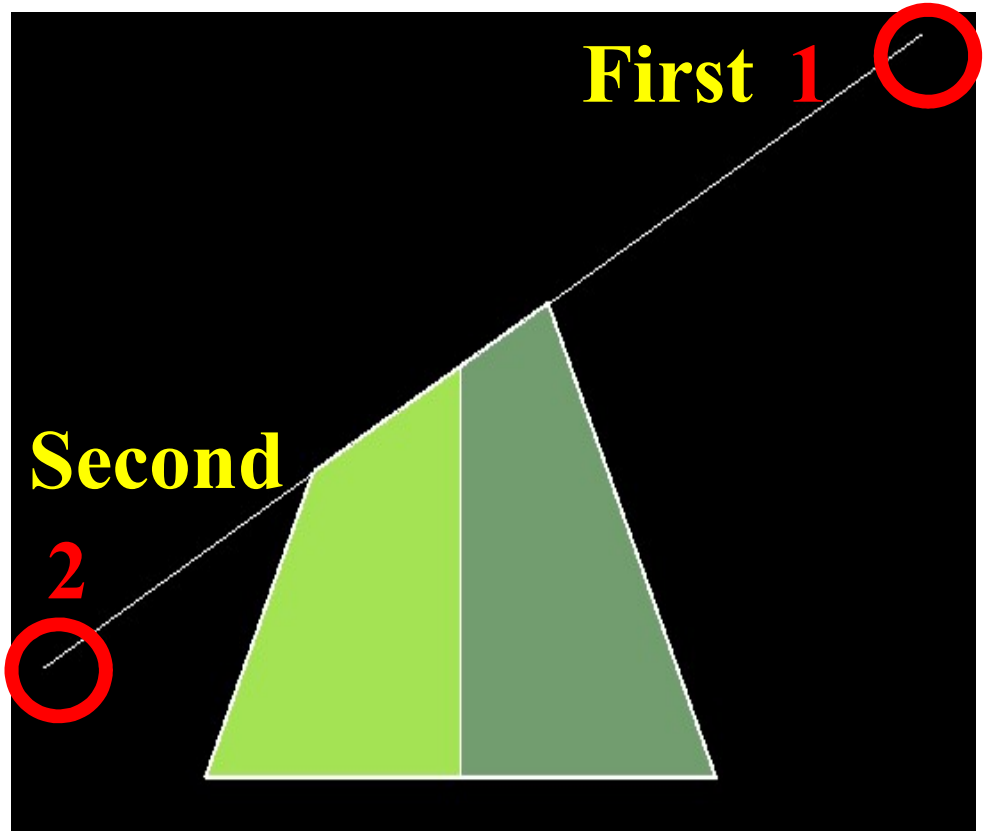
- Use Rotate command & Rotate the **Horizontal Line** for **30º**

- Click on **Section Plane** in **Section** Tool Bar

- After the click the **Command prompt** ask for **any point to locate section line**

➢ While defining a point to **locate section line**

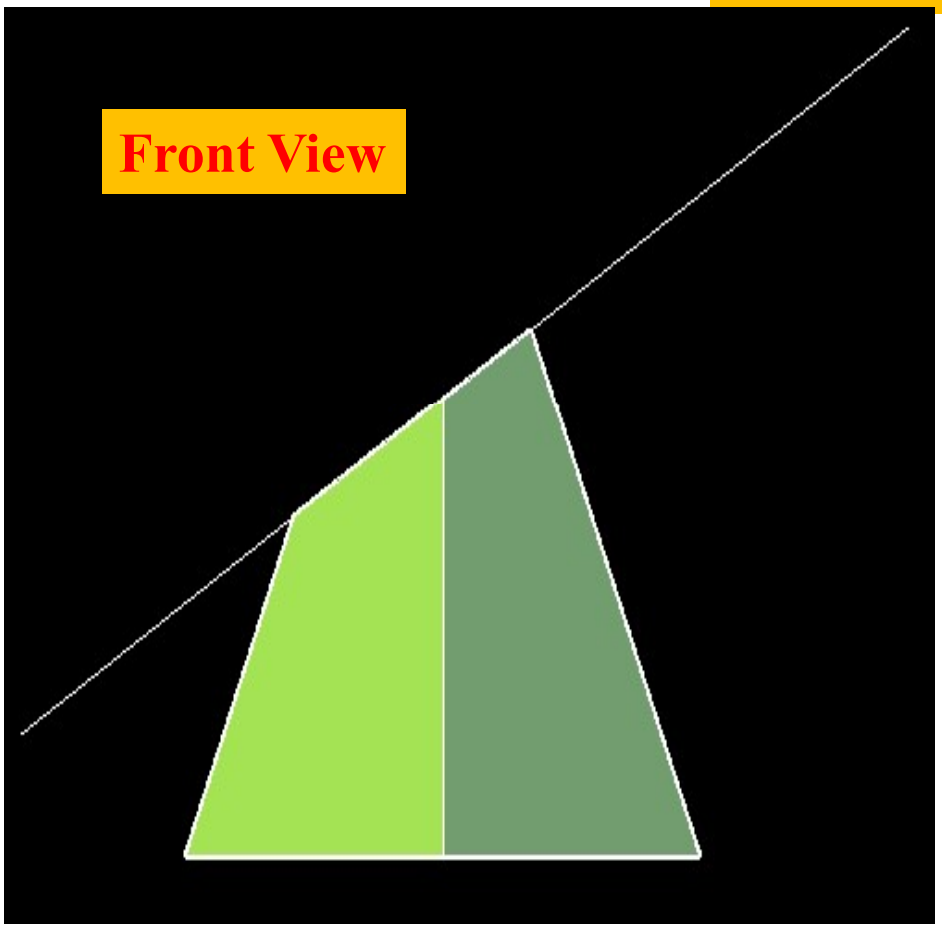


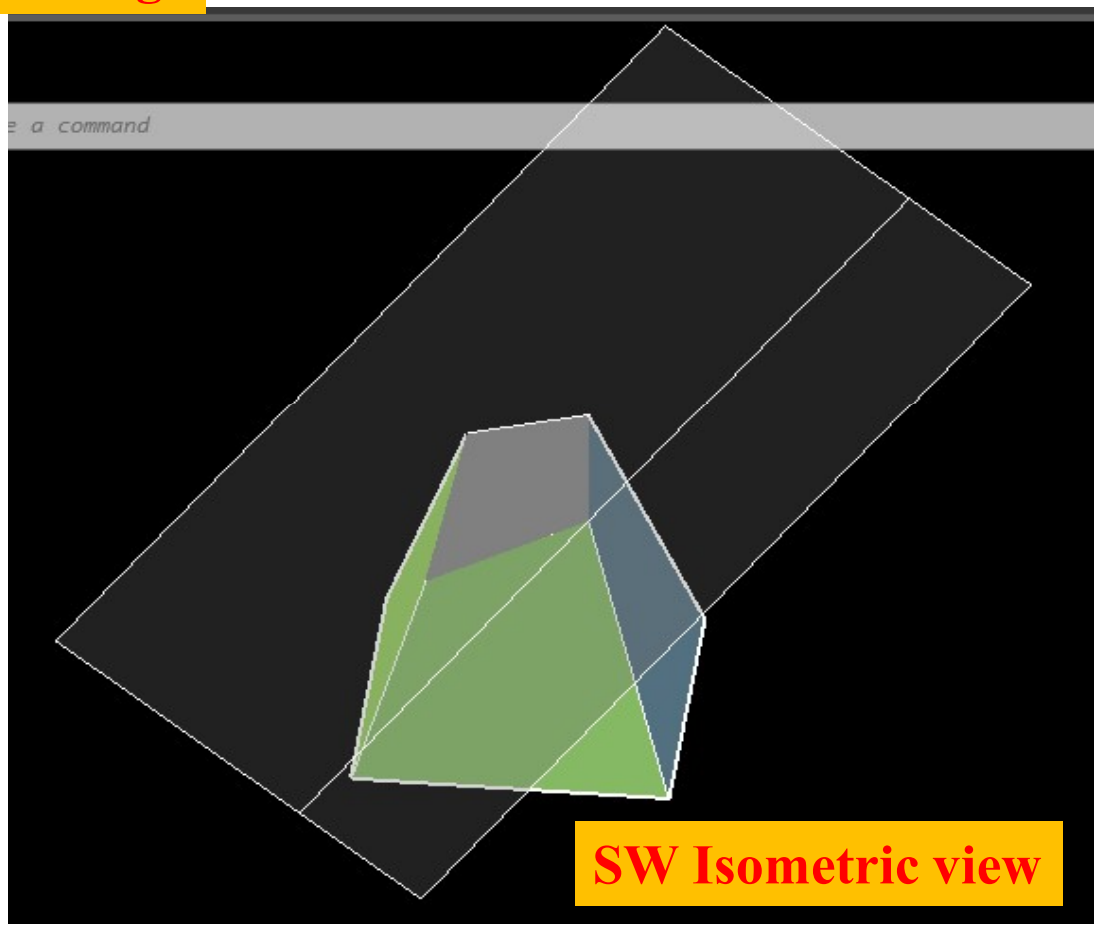


➢ The **Bottom portion** of the Solid is Sectioned

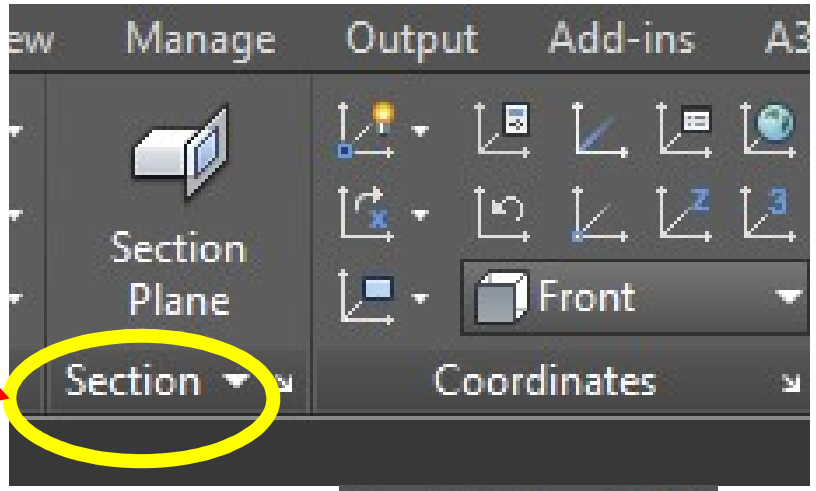
➢ The **Top portion** of the Solid is Sectioned

After Sectioning

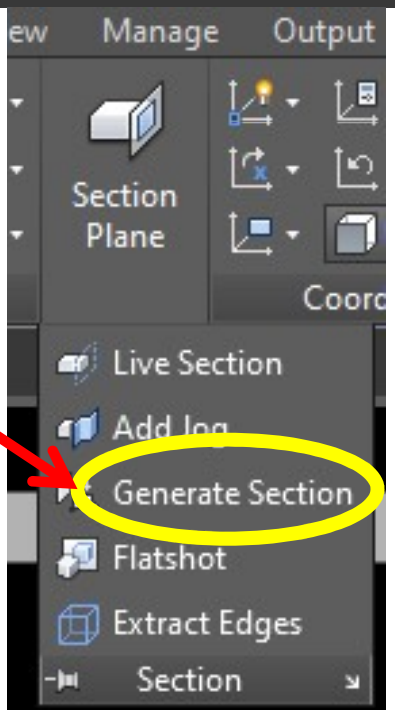


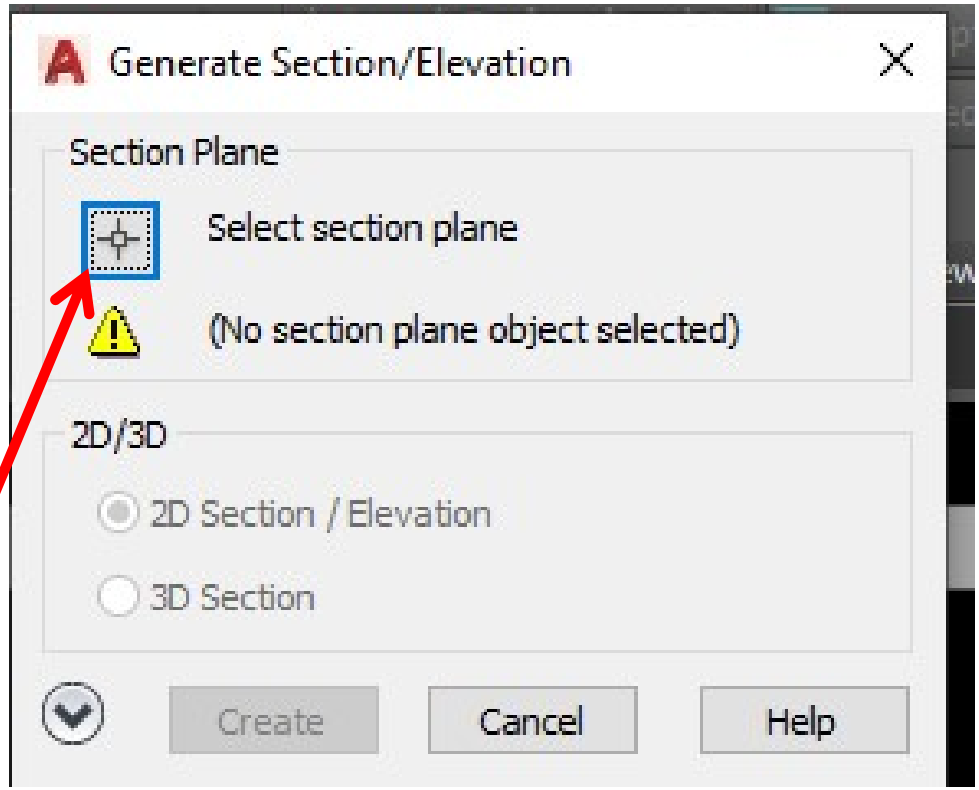


- To Pick the Sectioned Solid for Extracting the Orthographic Views
- Click on the **Section Tool**

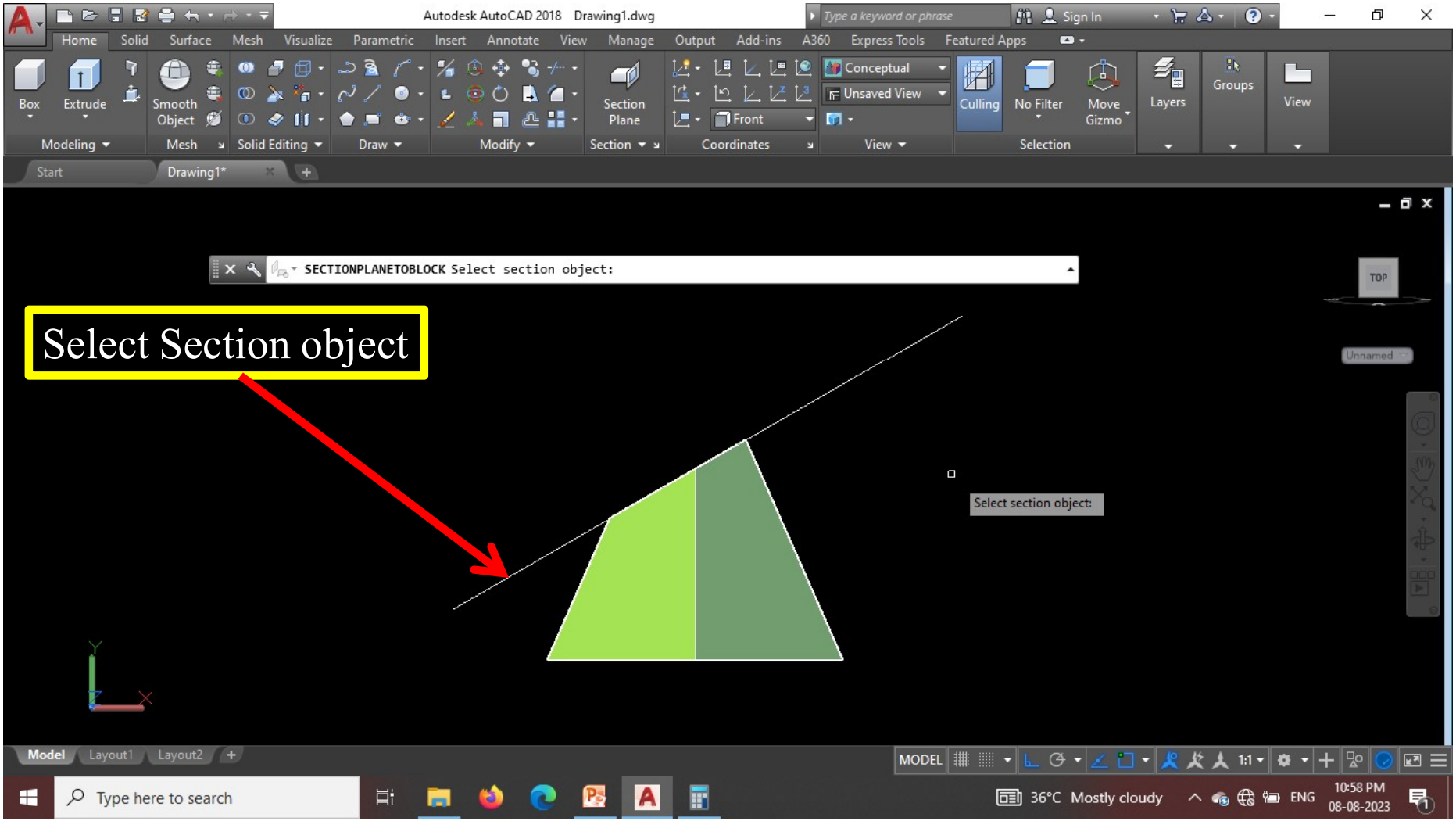


- Select **Generate** Section





➢ Click on **Section Plane**


Autodesk AutoCAD 2018 Drawing1.dwg
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins A360 Express Tools Featured Apps
Box Extrude Smooth Object Section Plane Conceptual Unsaved View Front Culling No Filter Move Gizmo Layers Groups View
Modeling Mesh Solid Editing Draw Modify Section Coordinates View Selection
Start Drawing1*
SECTIONPLANETOBLOCK Select section object:
Select Section object
Select section object:
TOP
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MODEL
Type here to search
36°C Mostly cloudy
ENG
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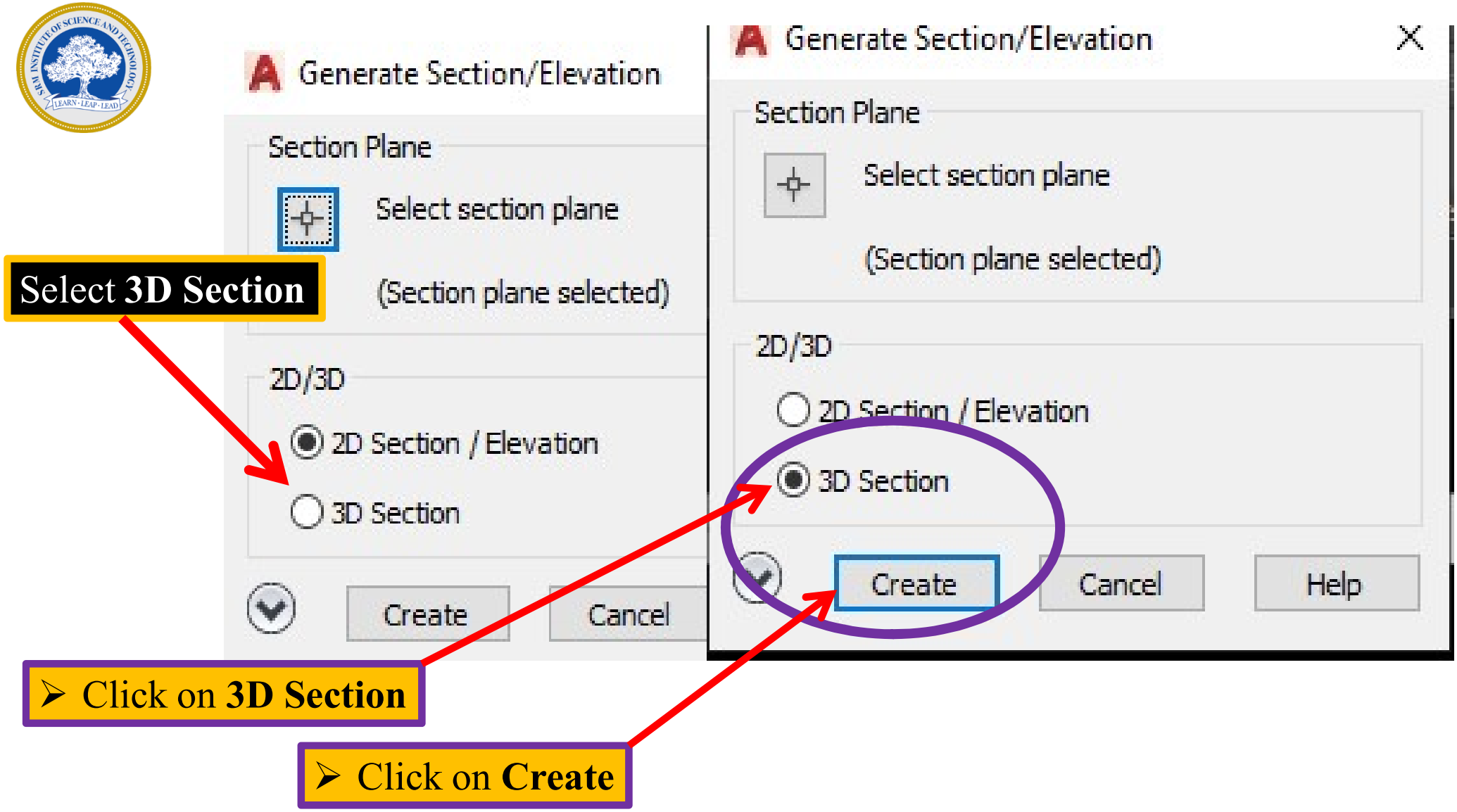
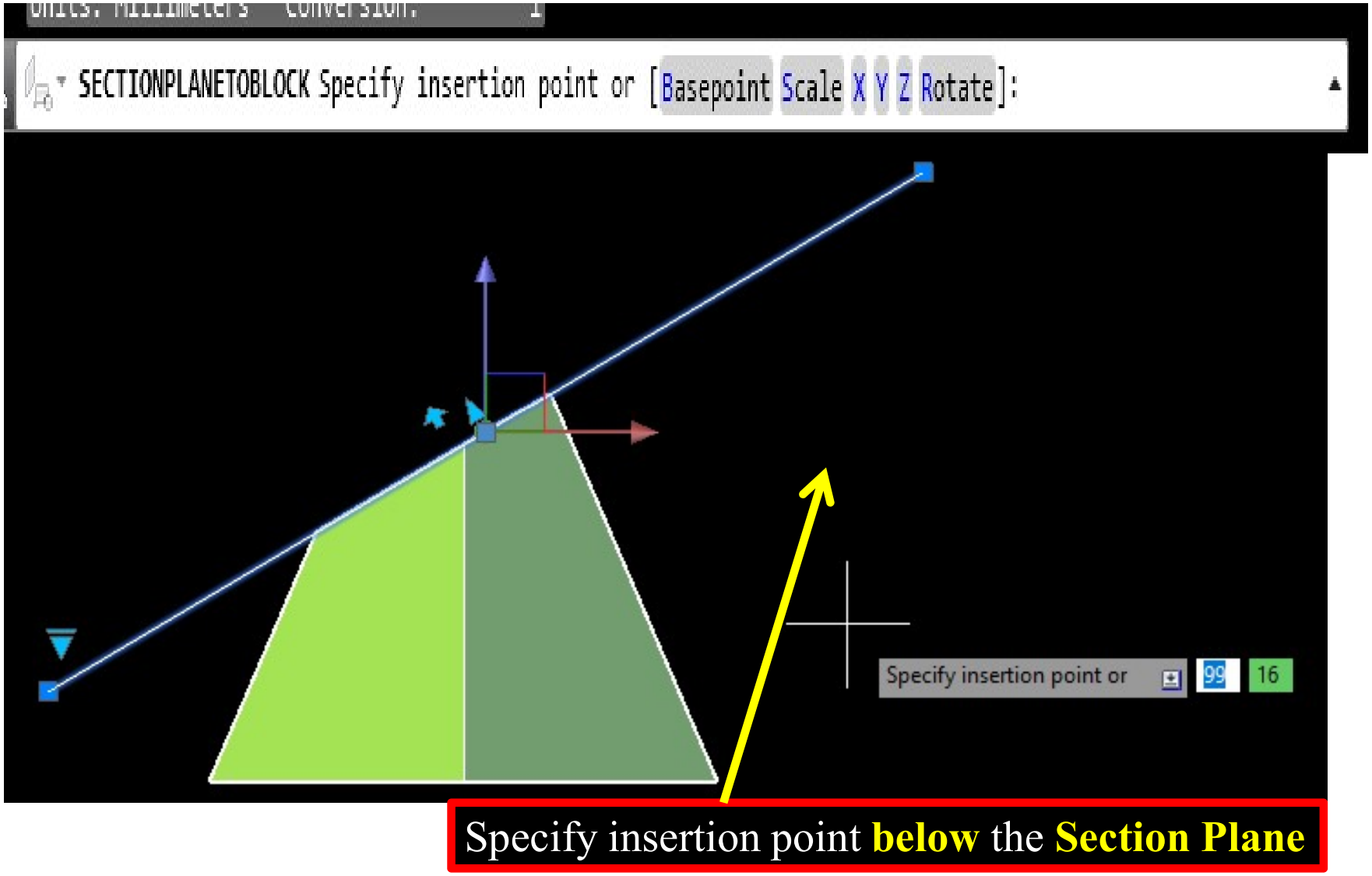
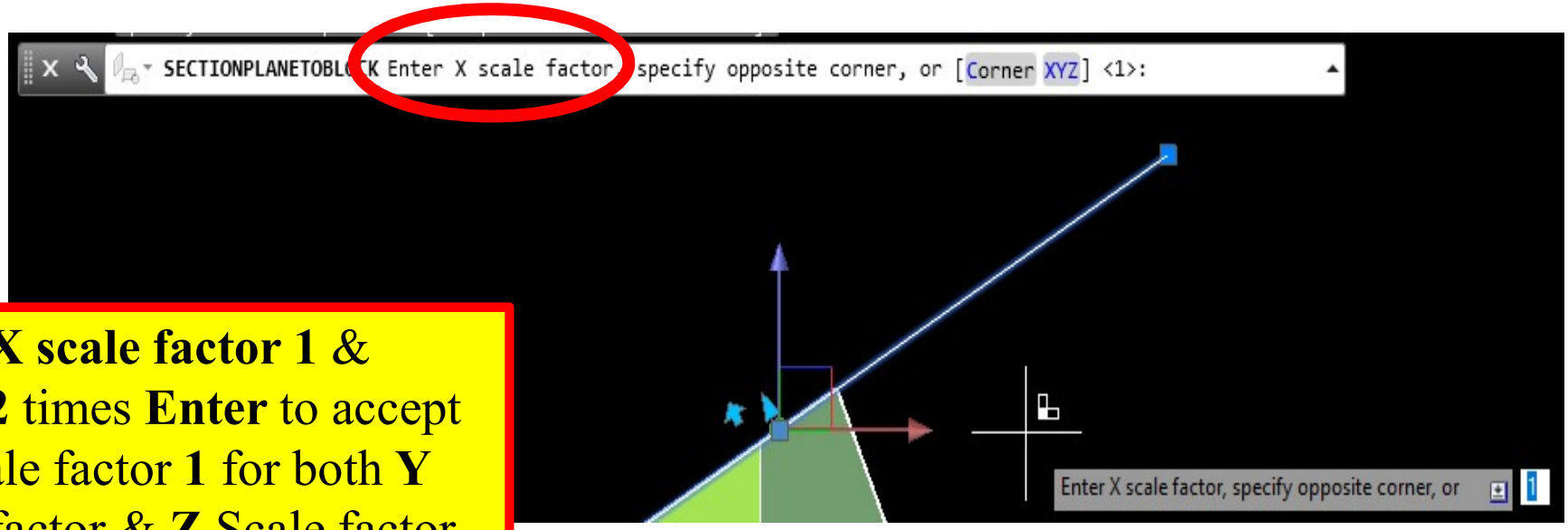
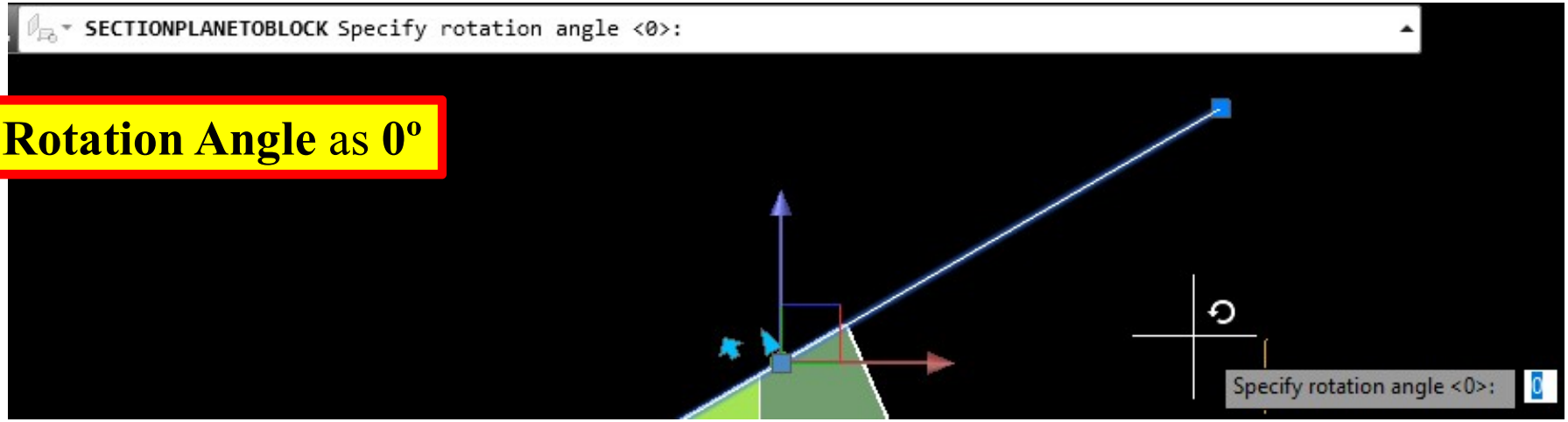

Generate Section/Elevation
Section Plane
Select section plane
(Section plane selected)
2D/3D
2D Section / Elevation
3D Section
Create
Cancel
Help
Select 3D Section
➢ Click on 3D Section
➢ Click on Create

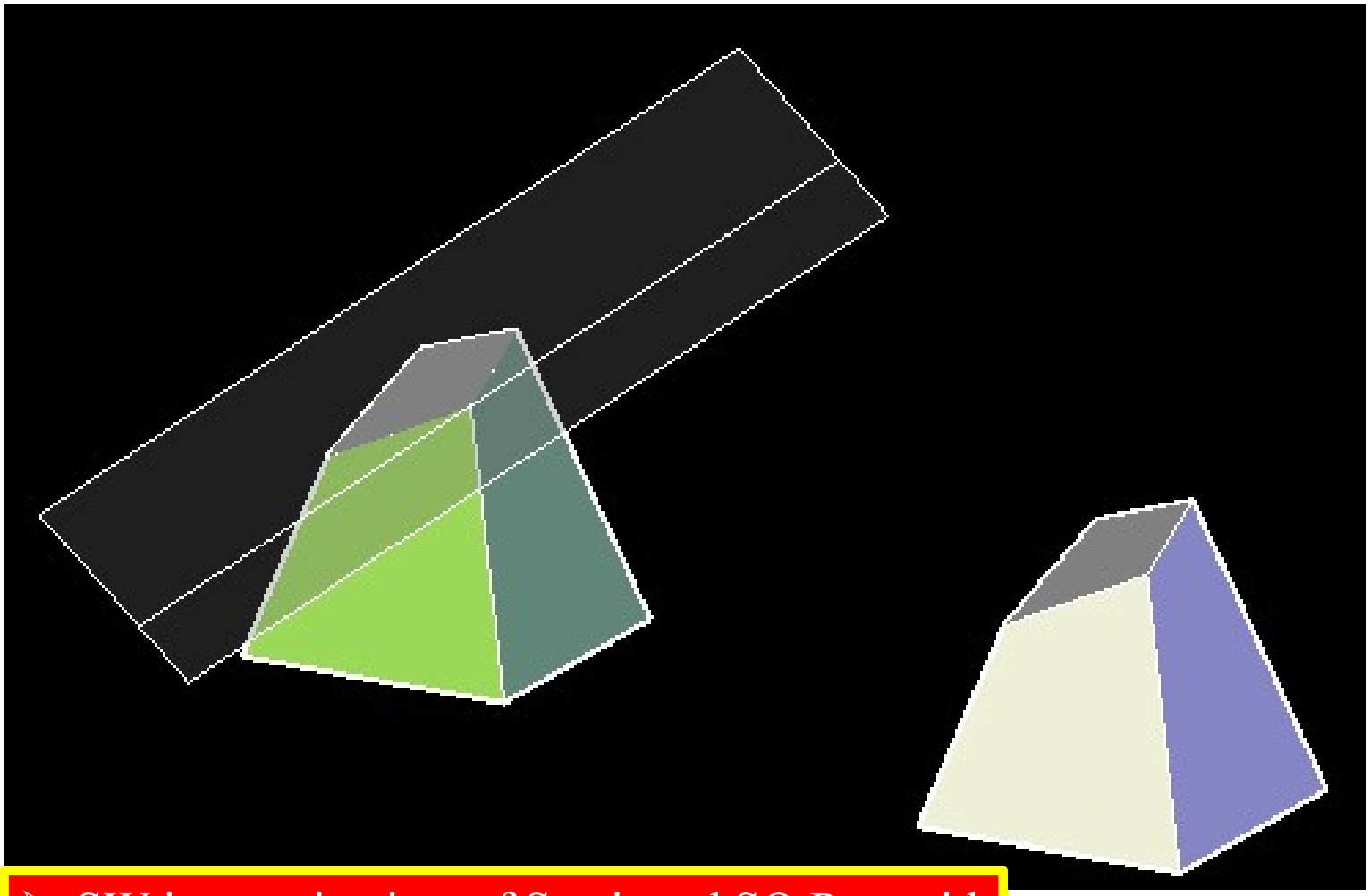

SECTIONPLANETOBLOCK Specify insertion point or [Basepoint Scale X Y Z Rotate]:
Specify insertion point or
99
16
Specify insertion point **below** the **Section Plane**



- Enter **X scale factor 1** &
- Press **2** times **Enter** to accept the scale factor **1** for both **Y** Scale factor & **Z** Scale factor

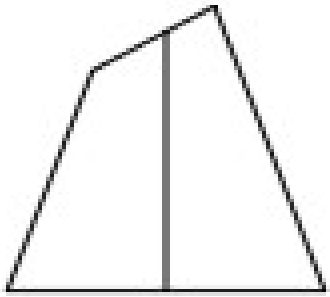


- Specify **Rotation Angle** as **0º**

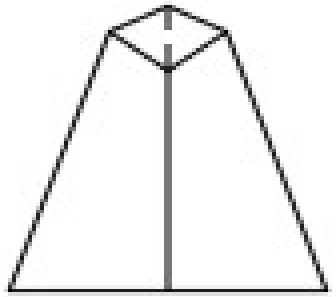


➢ SW isometric view of Sectioned SQ Pyramid

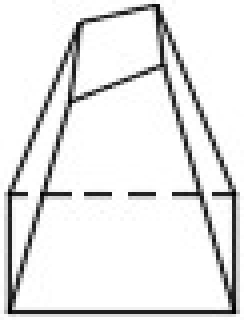
- Use **DRAFTING STANDARD** from **VIEW BASE** tool bar for setting the **FIRST ANGLE** of projection.
- Use **BASE** command from **VIEW BASE** tool bar & select the command **FROM MODEL SPACE** to select the Sectioned Solid & press **ENTER** & assign the **LAYOUT NAME** & press enter.
- Select the **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**.



Sectional Front View



Sectional Side View



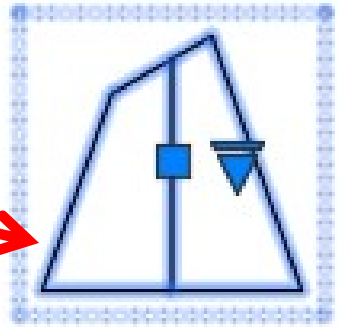
Sectional Top View

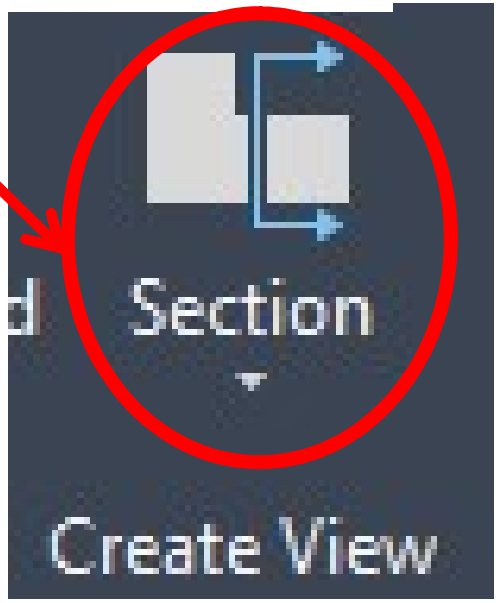
- In the **LAYOUT** sheet press **ENTER** to paste the Selected Sectioned Solid to the top to get **FRONT VIEW** & drag orthogonally down to get Top view & Drag Right side to get Side view & press Enter.

- Click on the **Front view** of the model, **CREATE VIEW** tool bar will be displayed at the top and select the **FULL** from the **Section view** Tool Bar
- Select two ends of cutting plane and drag (downwards) perpendicular to the cutting plane to get the **TRUE** shape of the section

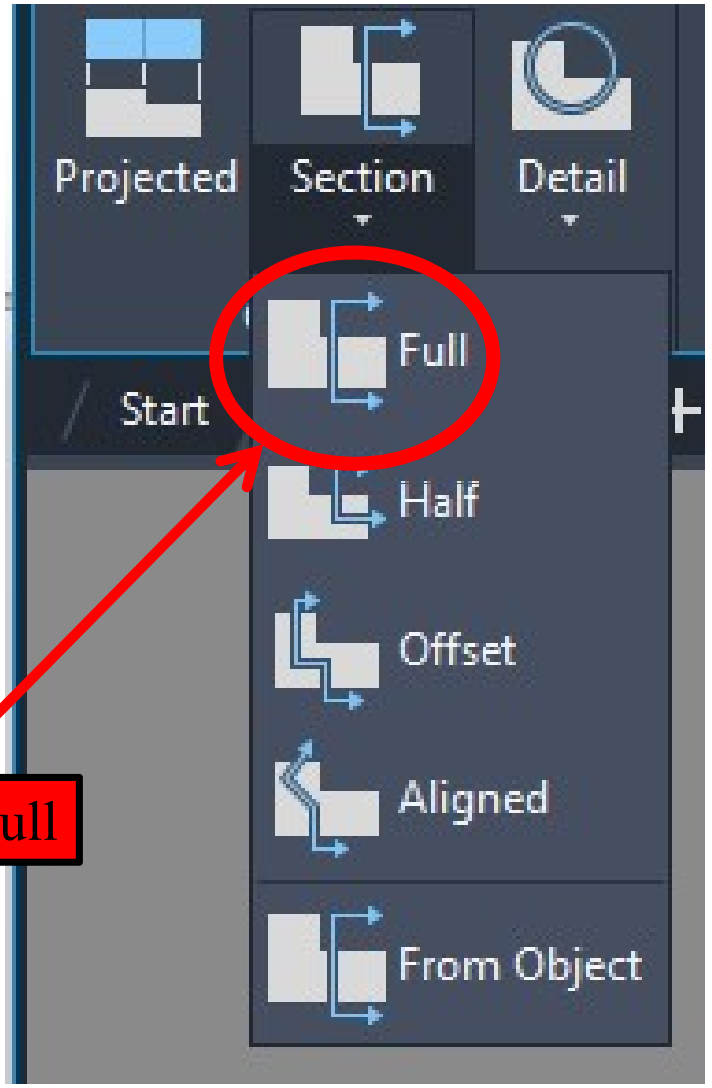
To Extract the True Shape of the Section

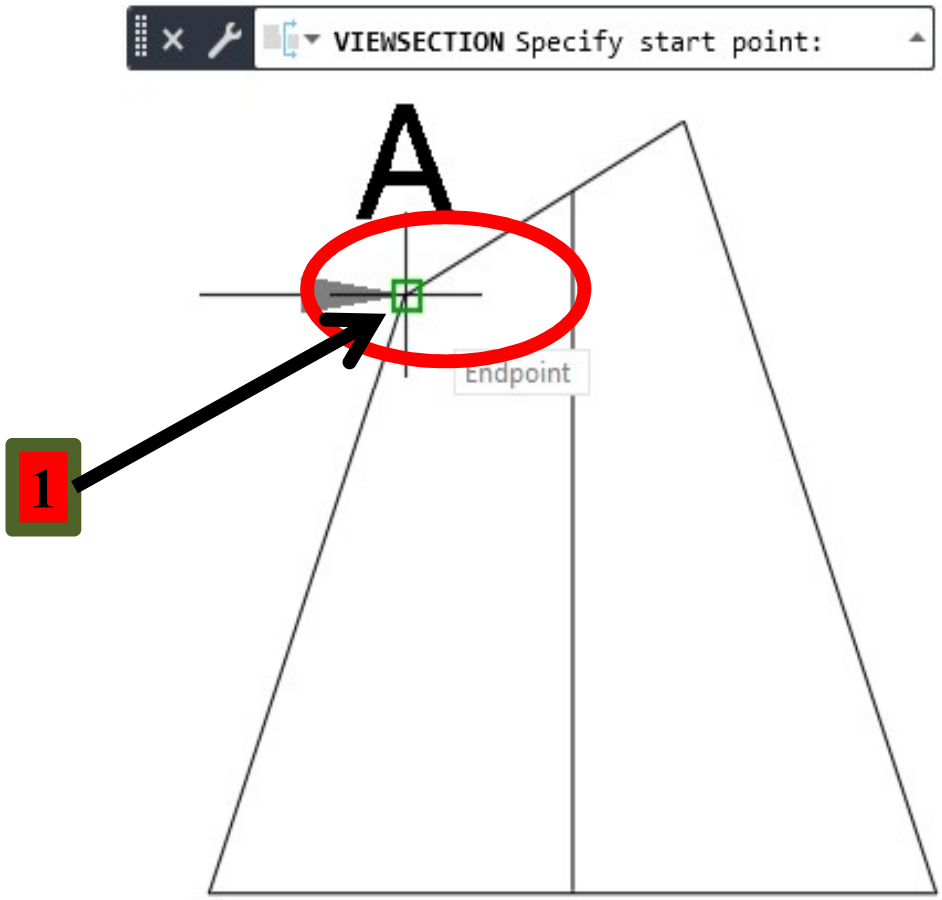
- Click on the **Front View**
- Select the **Section** Tool in **Create view** Tool Bar

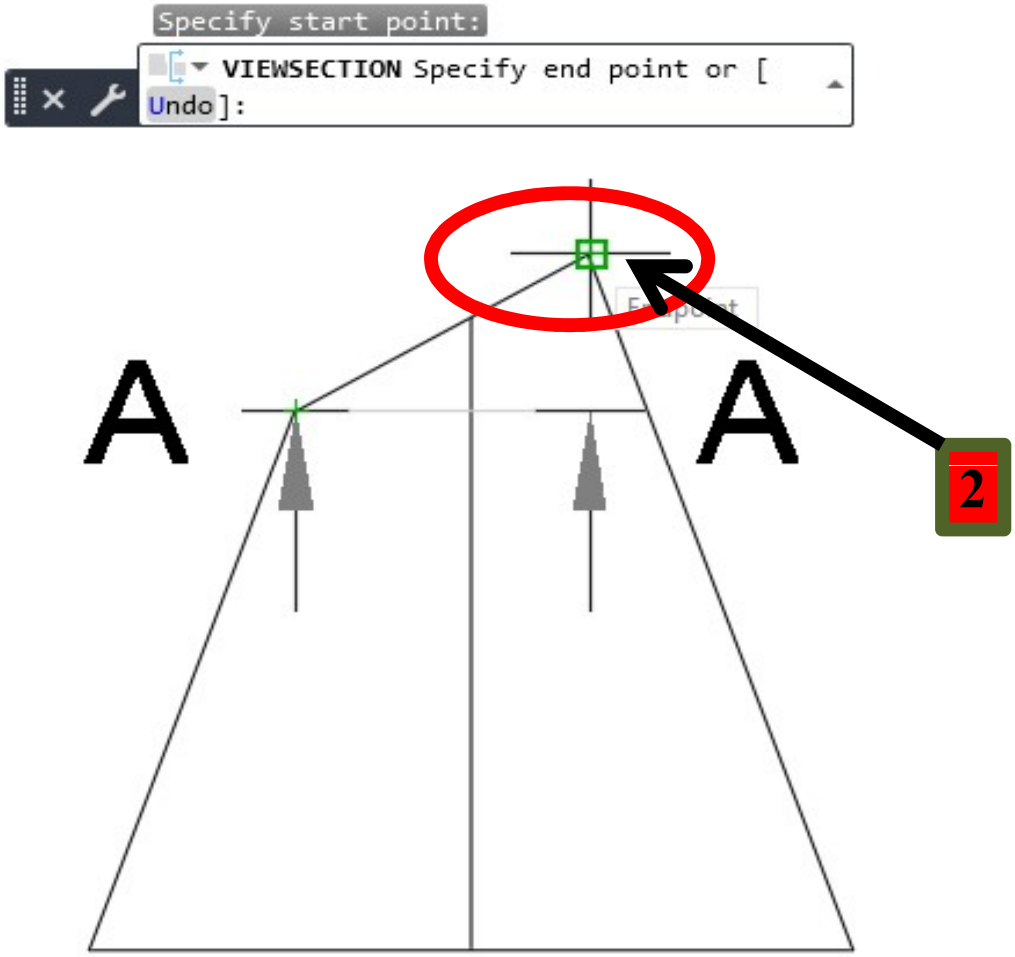




Select Full




VIEWSECTION Specify start point:
A
Endpoint
1


Specify start point:
VIEWSECTION Specify end point or [
Undo]:
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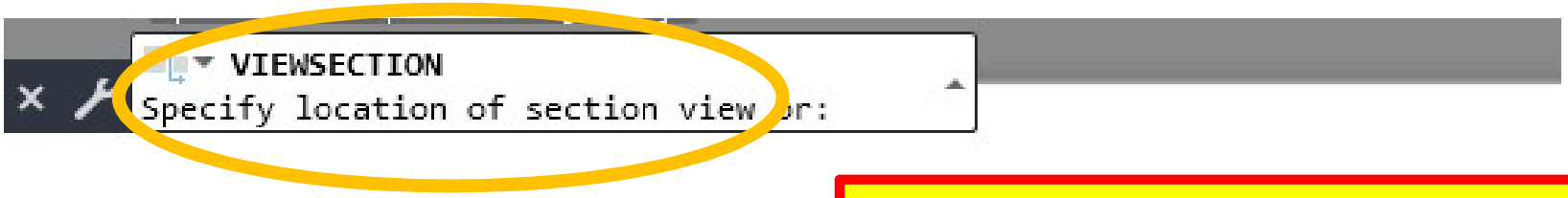
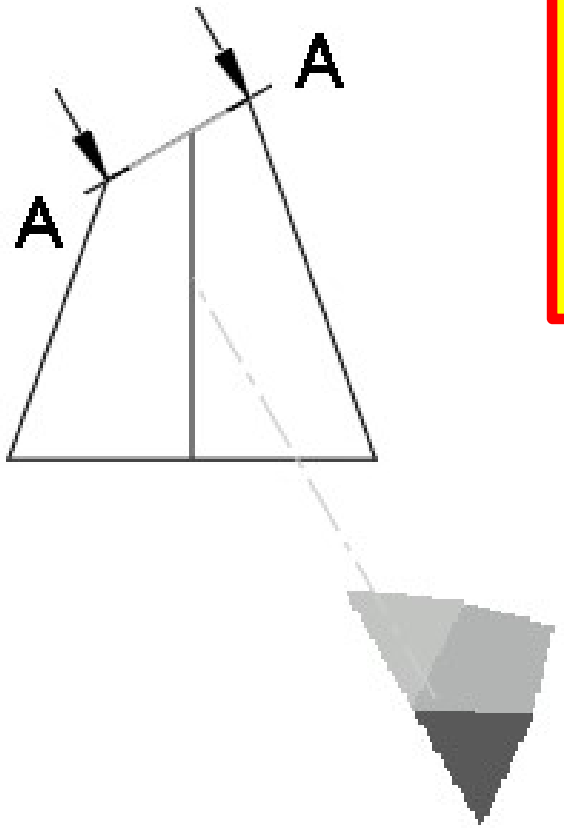
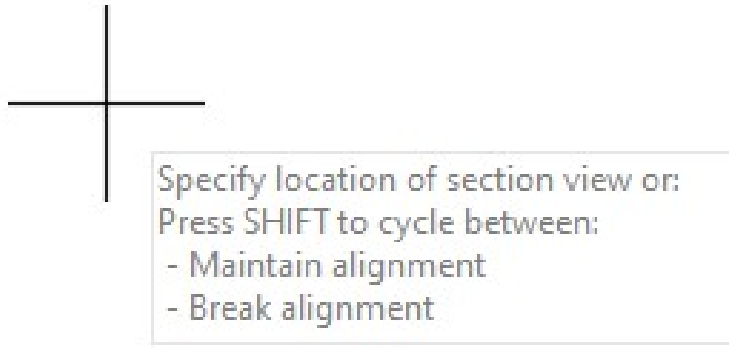
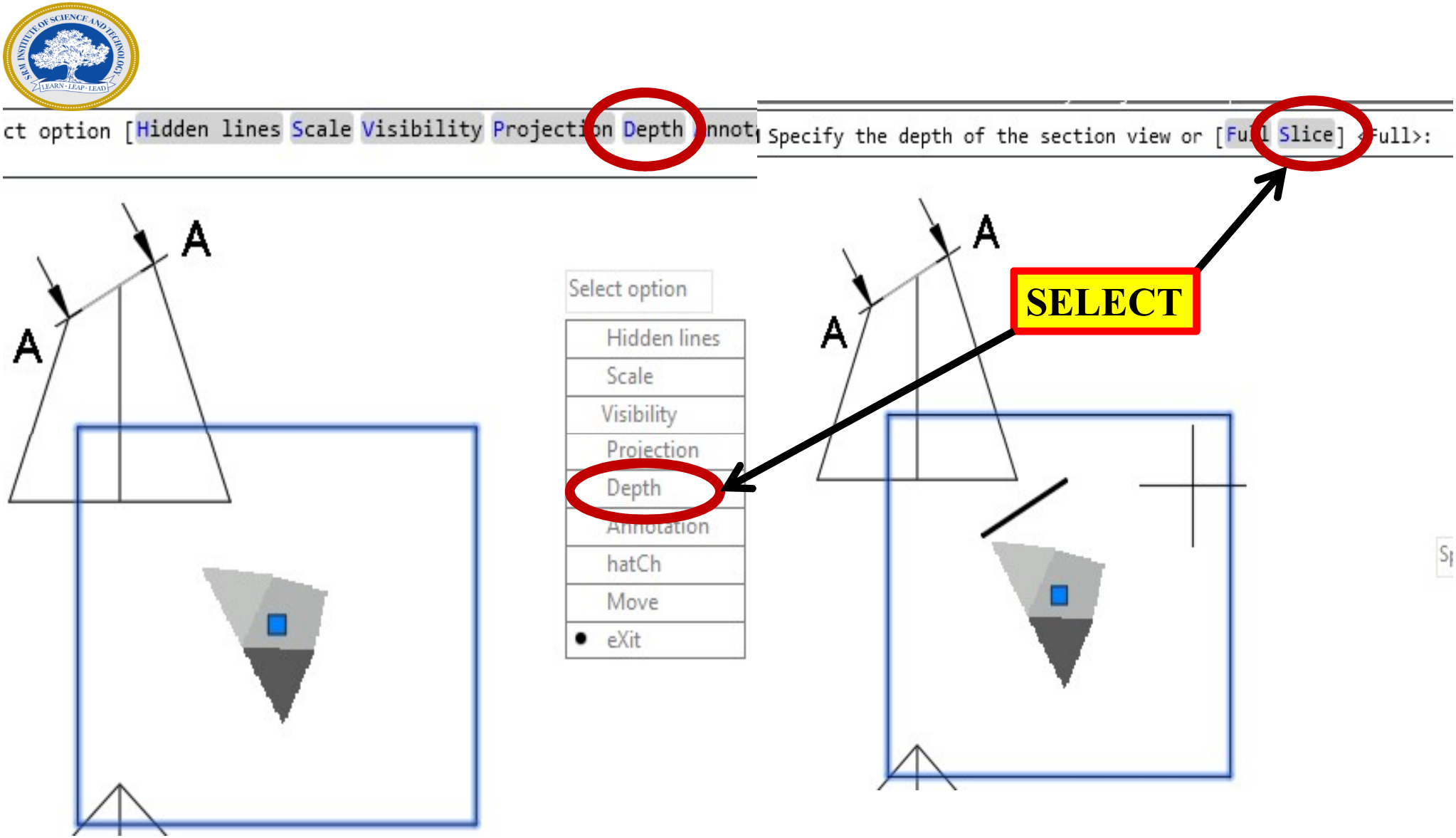


- Drag the Cursor **Perpendicular** to the Arrow direction
- **Left Click** to place the **location of Section view.**






ct option [Hidden lines Scale Visibility Projection Depth
Specify the depth of the section view or [Full Slice] <Full>:
A
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Select option
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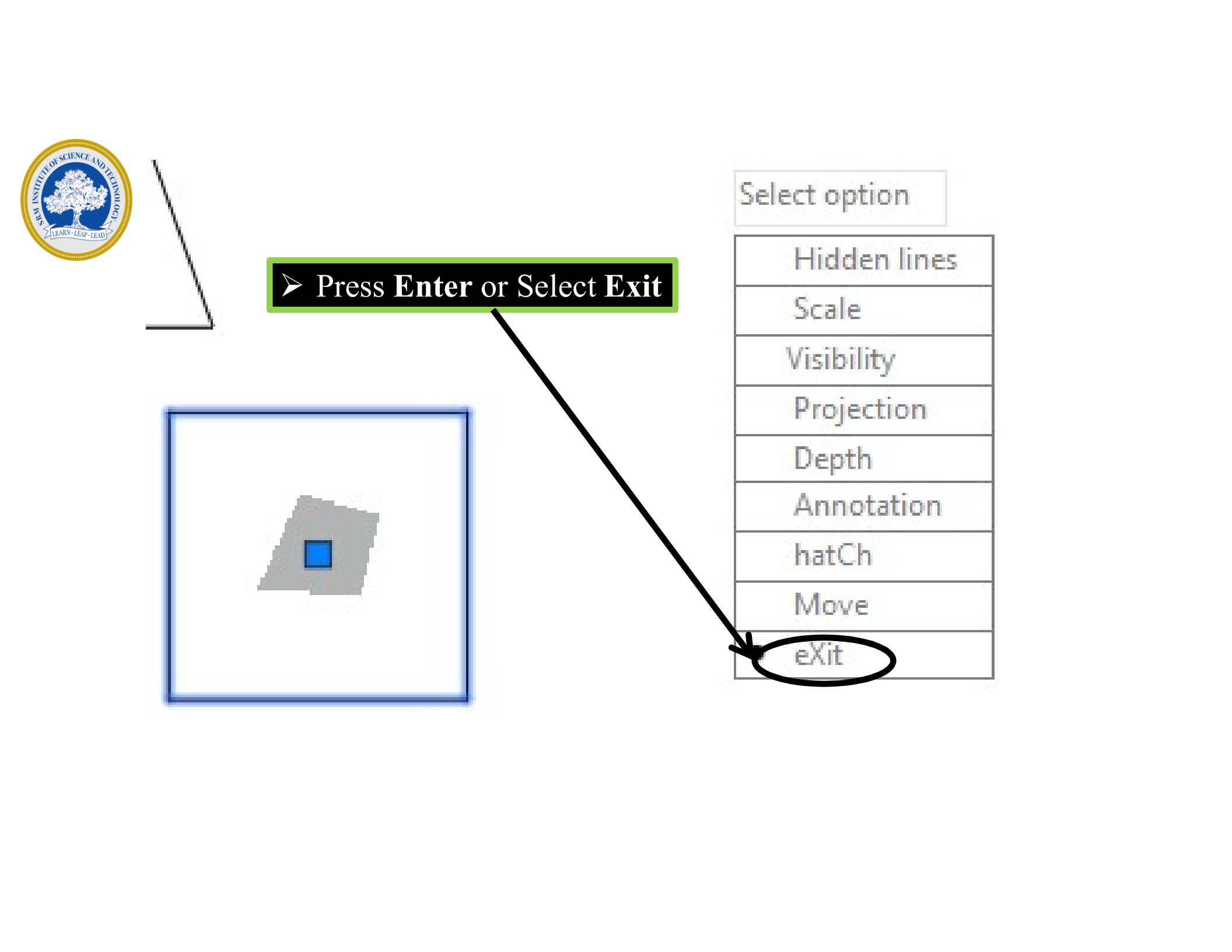
Press Enter or Select Exit
Select option
Hidden lines
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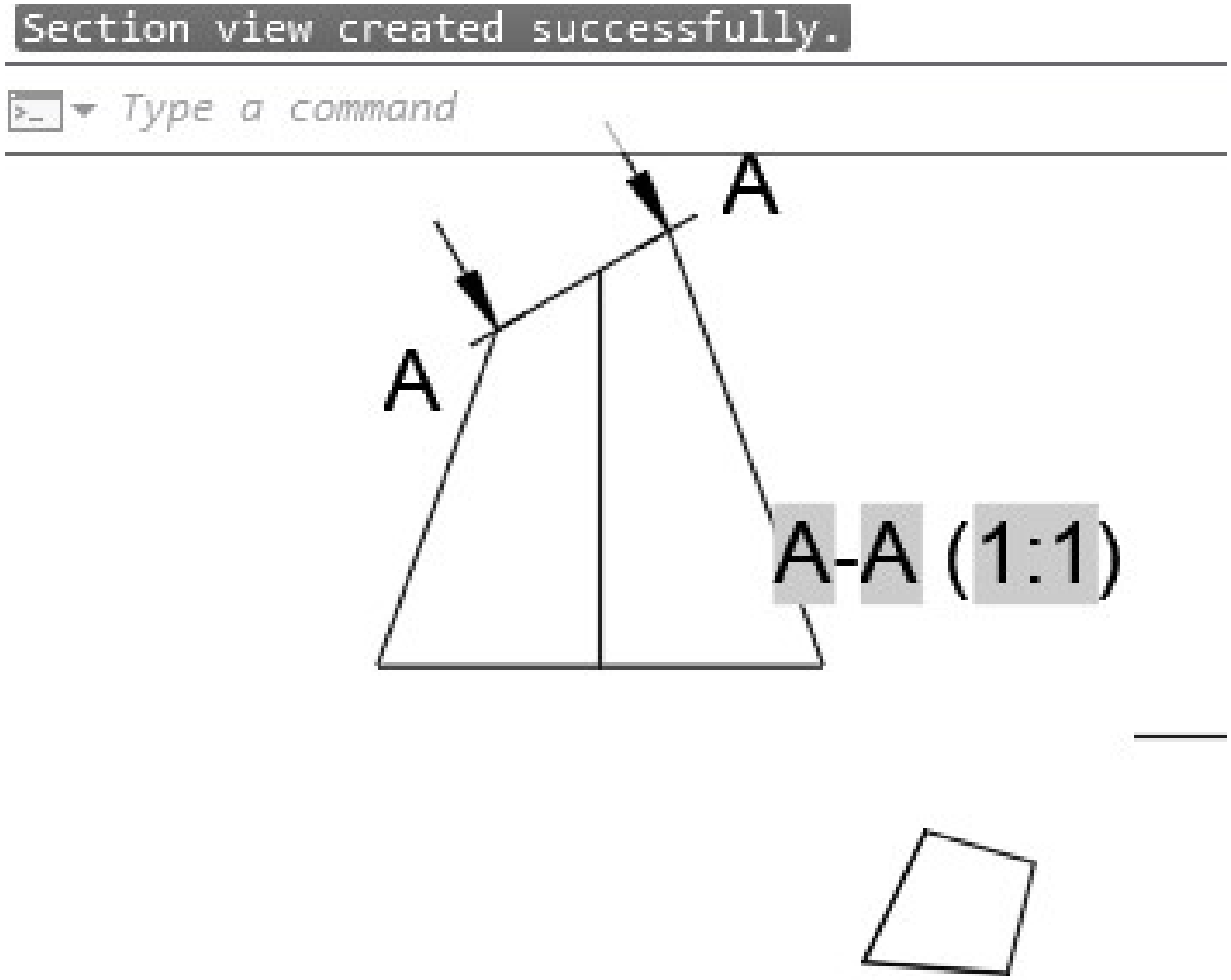
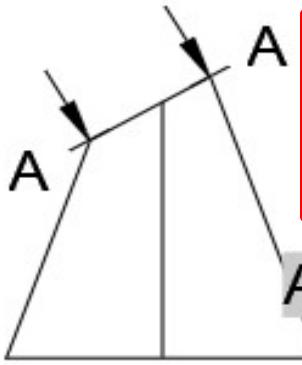
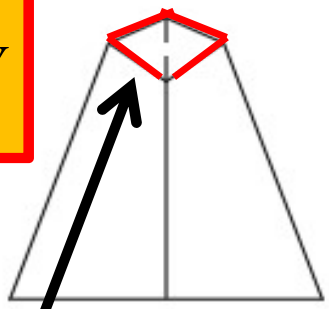
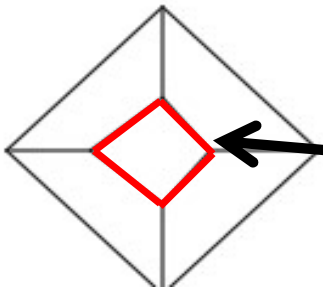

Section view created successfully.
Type a command
A
A
A-A (1:1)

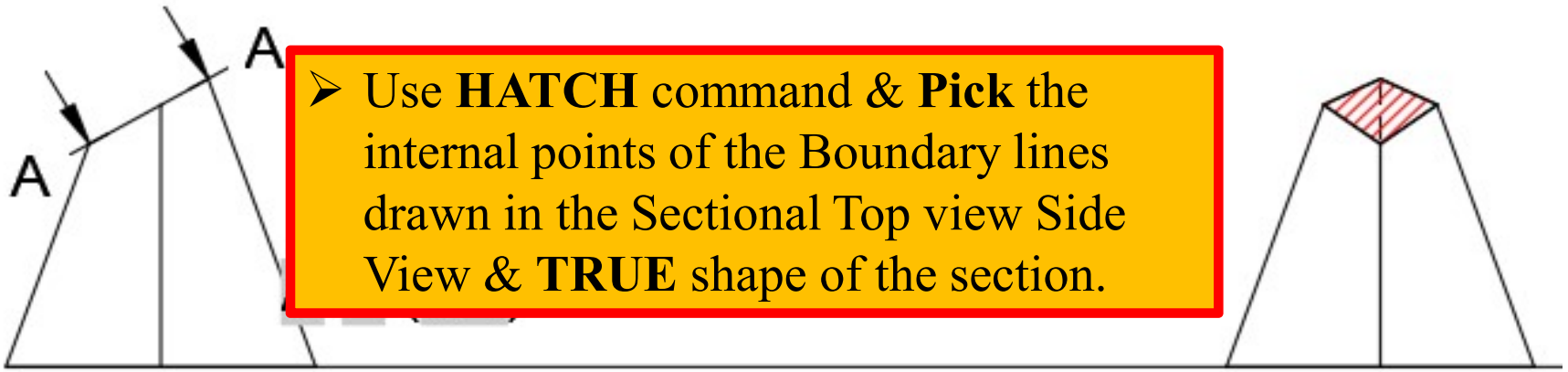


- Use **LINE** command from **DRAW** tool bar & draw the reference line **XY**



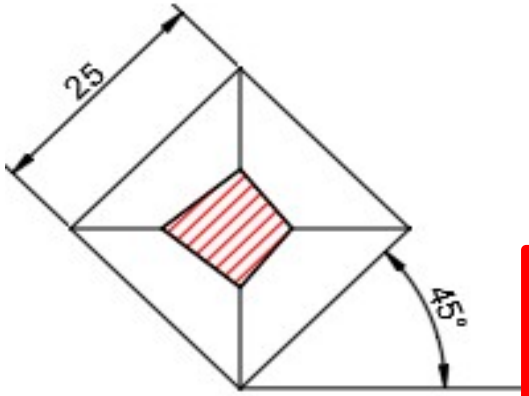


- Use **LINE** command to draw the boundary line in the Sectional Top view & **TRUE** shape



- Use **HATCH** command & **Pick** the internal points of the Boundary lines drawn in the Sectional Top view Side View & **TRUE** shape of the section.

TRUE SHAPE of the Section

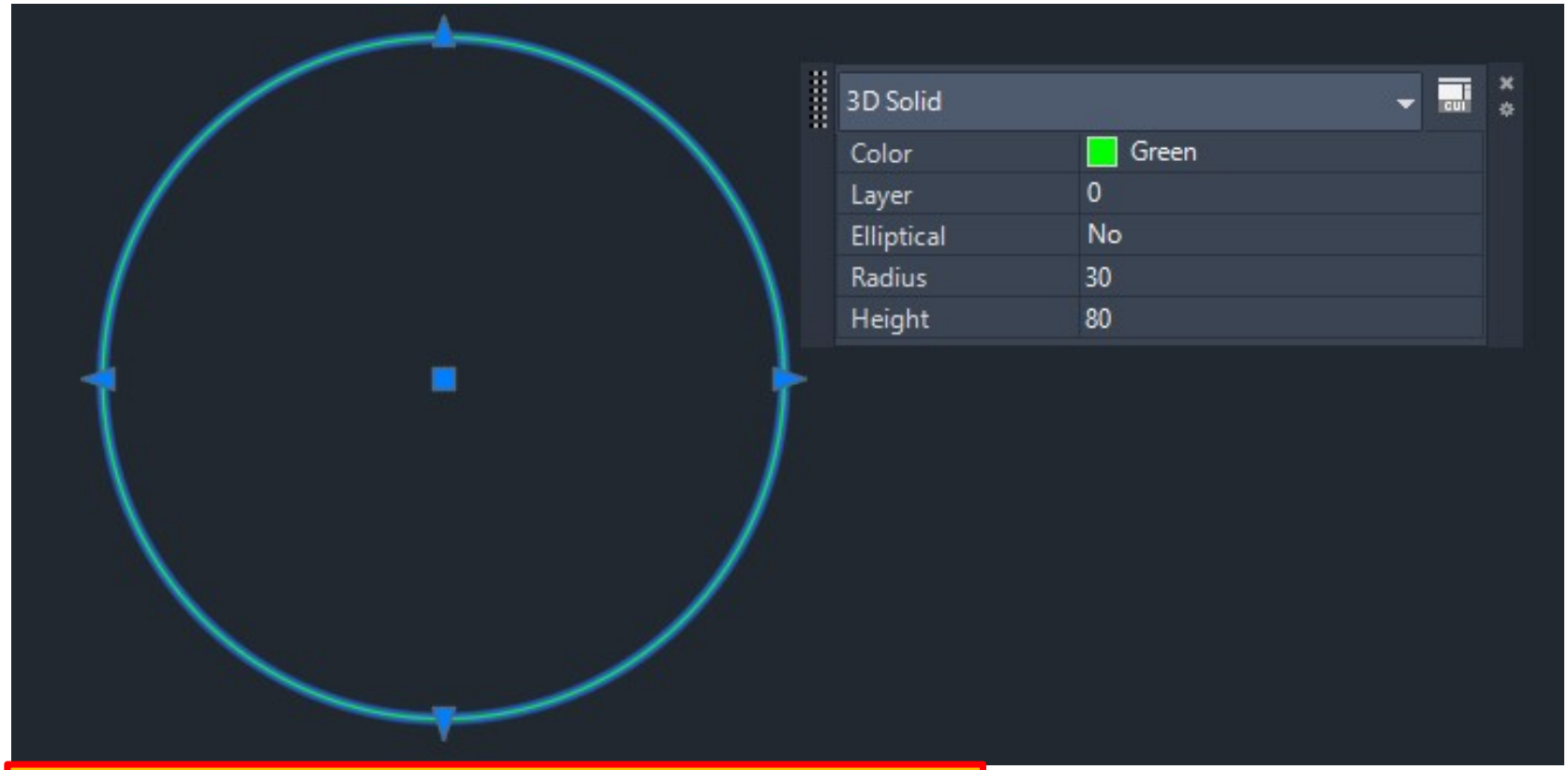


- Use **DIMENSION** tool from **ANNOTATION** tool bar & mark the relevant dimensions

A cylinder of **60** mm diameter, **80** mm height and having its axis vertical is cut by a section plane, perpendicular to the VP, inclined at **40°** to the HP and intersecting the axis **35** mm above the base. Draw its front view, sectional top view, sectional side view and the true shape of the section.

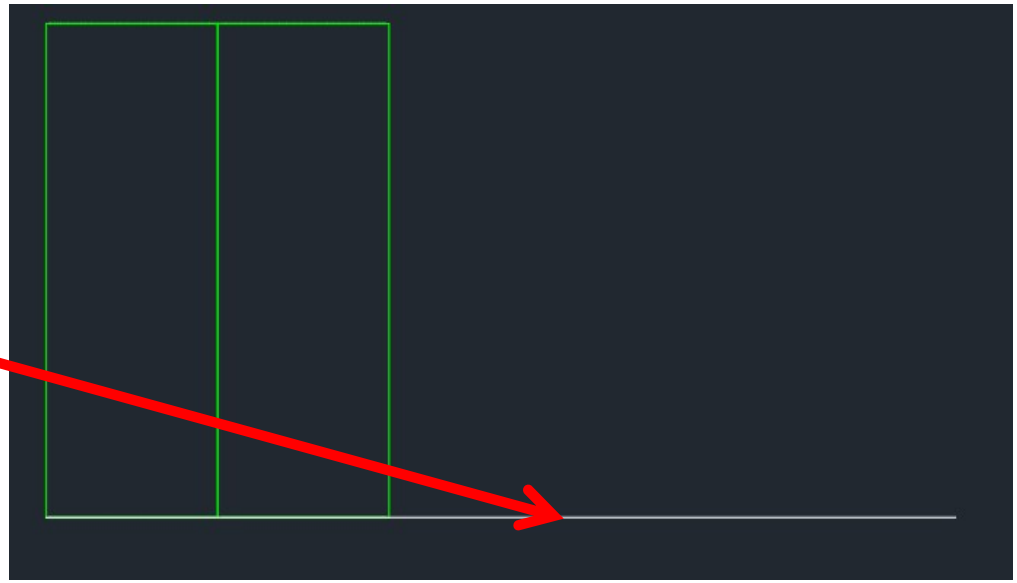
- Change the work space environment to **3D Modeling** (**WORKSPACE SWITCHING**)
- Complete the preliminary steps (setting **UNITS** & **LIMITS**)
- Start with **TOP** view (since **True shape** of the solid is visible in **TOP** view)
- Use **Cylinde**r command from **MODELLING** tool bar to create the Cylinder with given axis length.

Cylinder axis perpendicular to HP

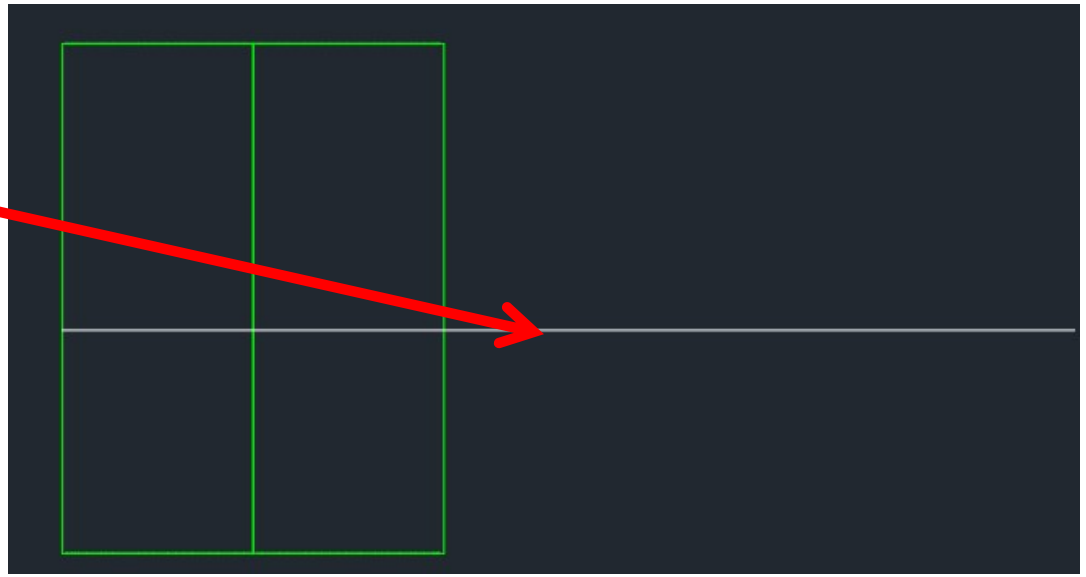


- Select **Top Plane** & Create the **Cylinder** for the given **Radius** & **Height**

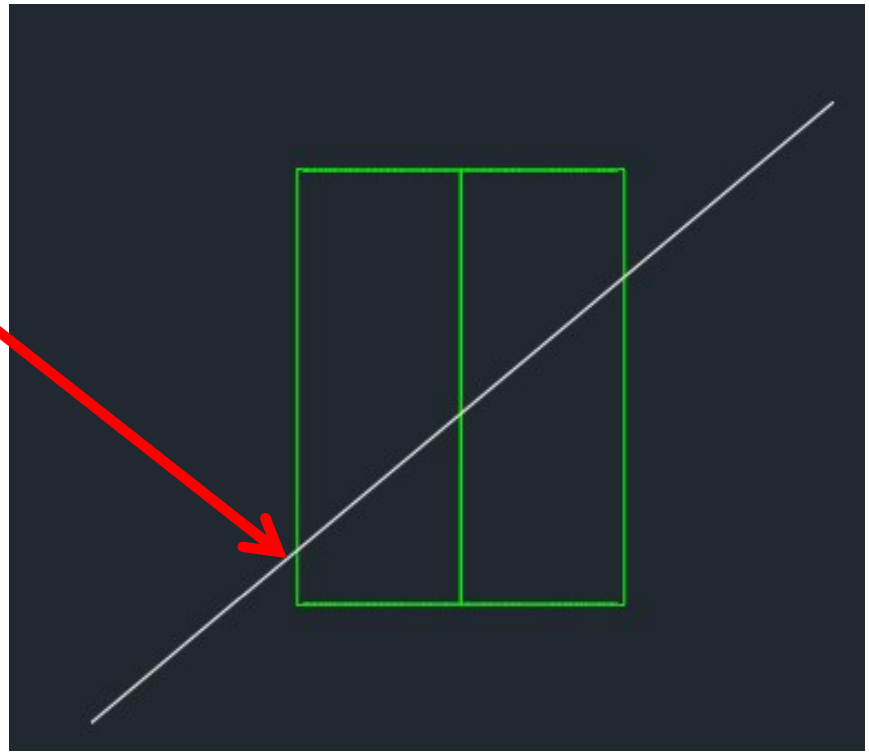
- Select **Front Plane** & Draw a **Horizontal Line** Touching the Base of the Cylinder.

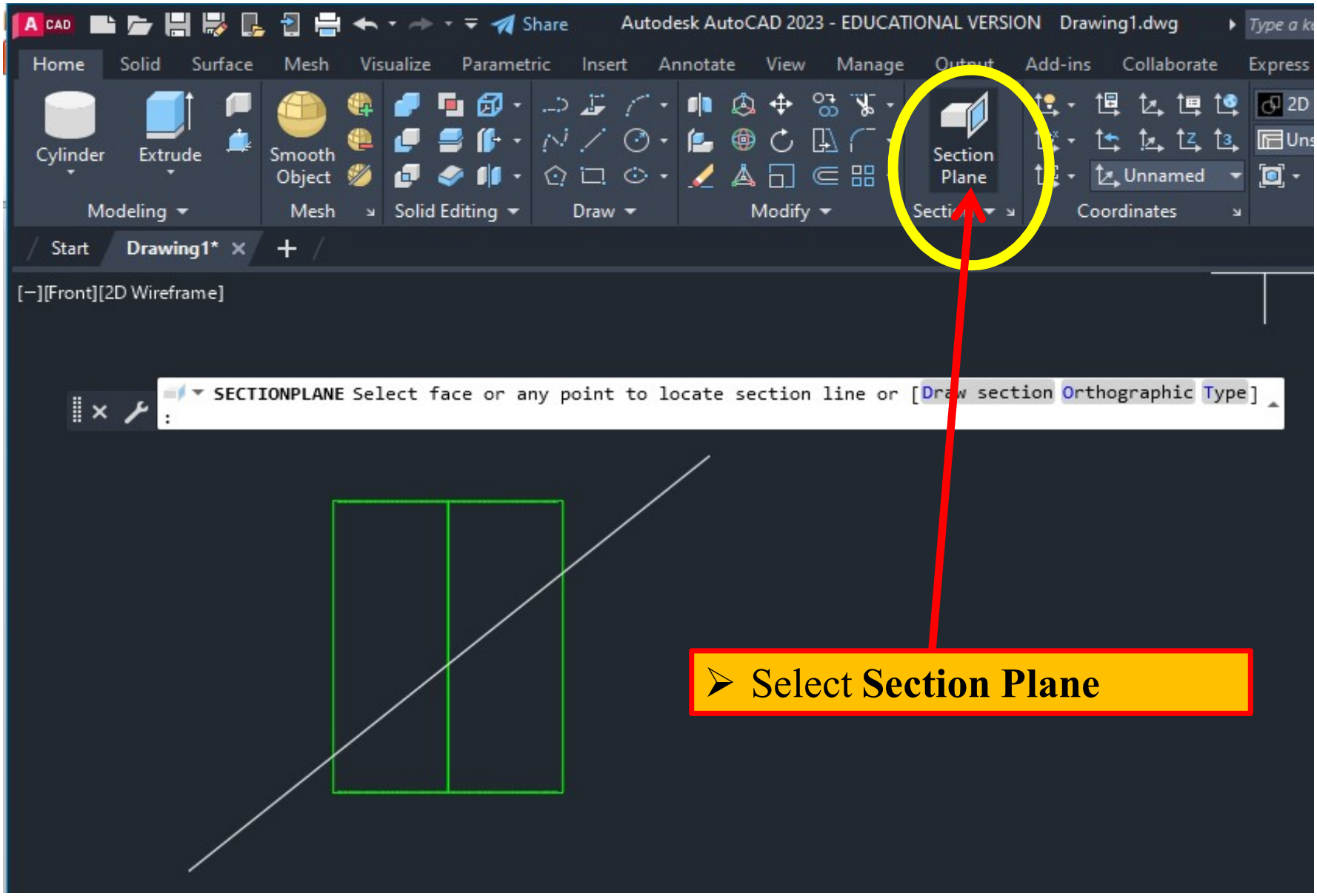


- **Move** the Horizontal Line for **35** mm Above the Base

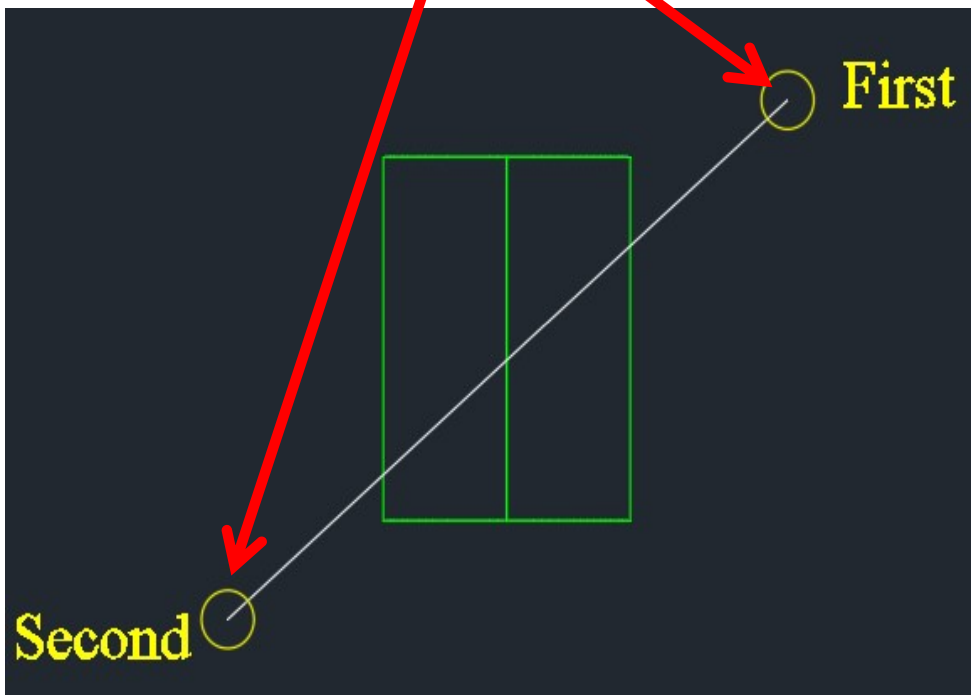


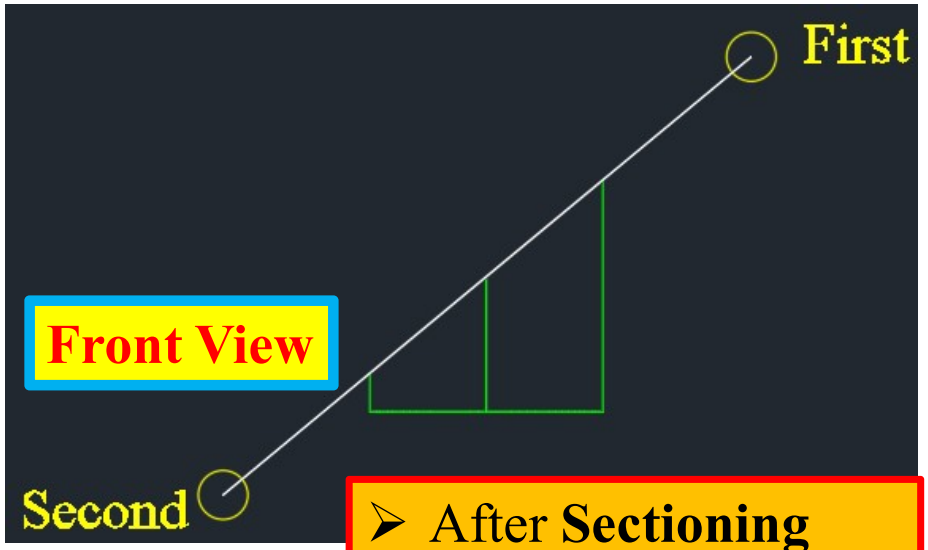
- **Rotate** the Horizontal Line for **40º**



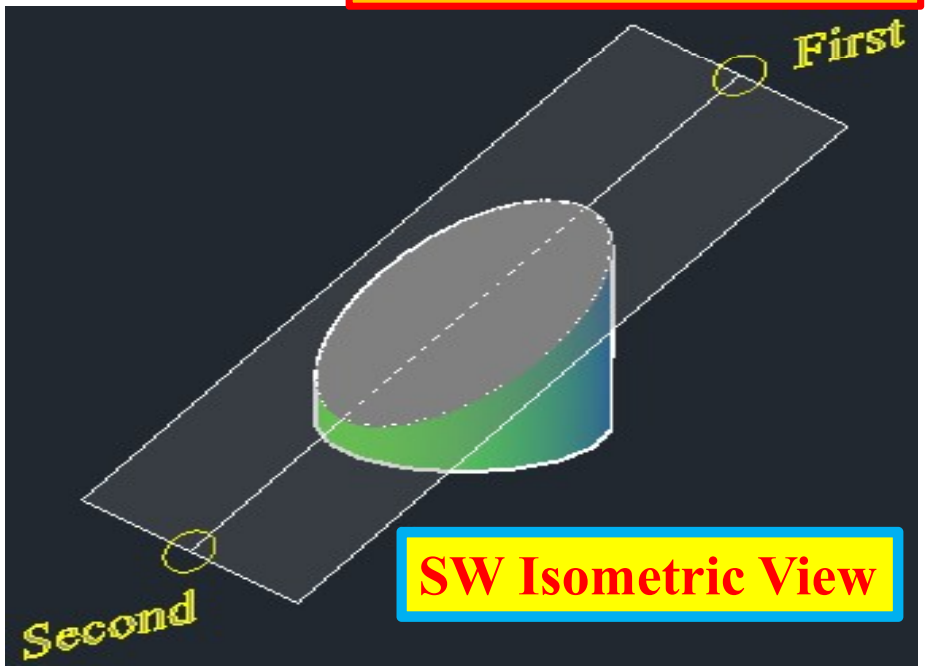

Autodesk AutoCAD 2023 - EDUCATIONAL VERSION Drawing1.dwg
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins Collaborate Express
Cylinder
Extrude
Smooth Object
Section Plane
Modeling
Mesh
Solid Editing
Draw
Modify
Coordinates
Unnamed
Start
Drawing1*
[−][Front][2D Wireframe]
SECTIONPLANE Select face or any point to locate section line or [Draw section Orthographic Type]
:
➢ Select Section Plane

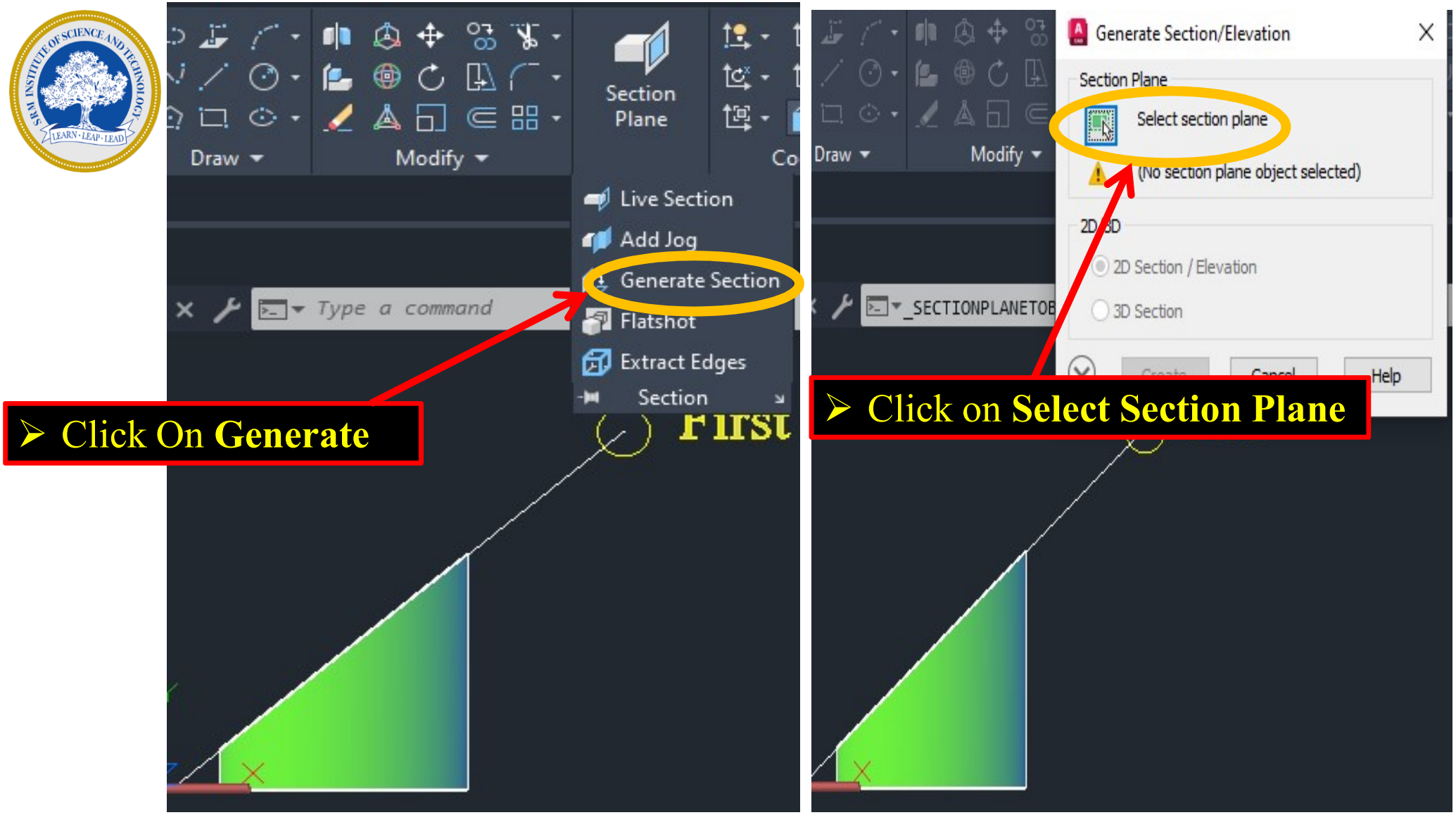
➢ To Locate the **Section Plane**

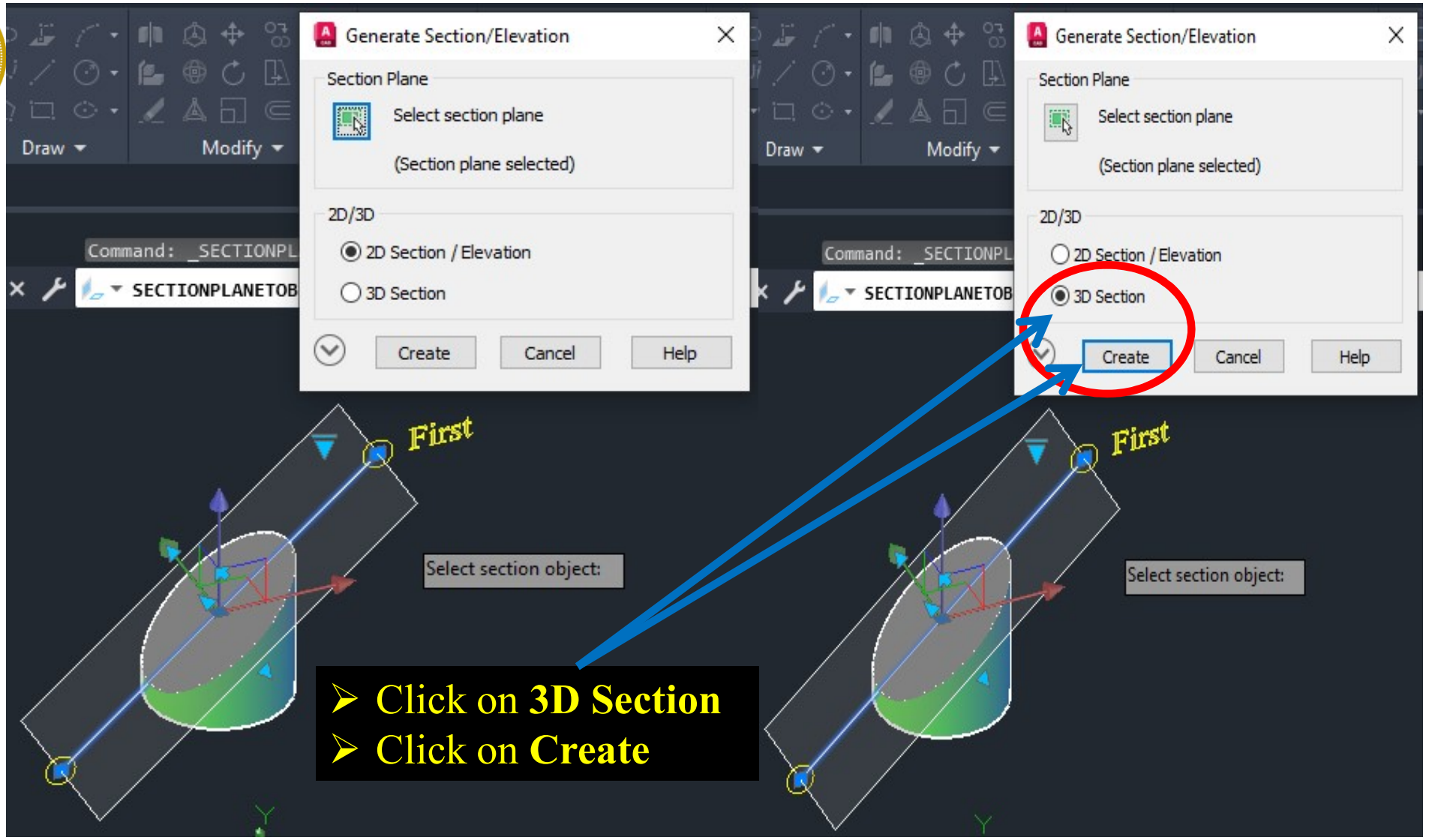


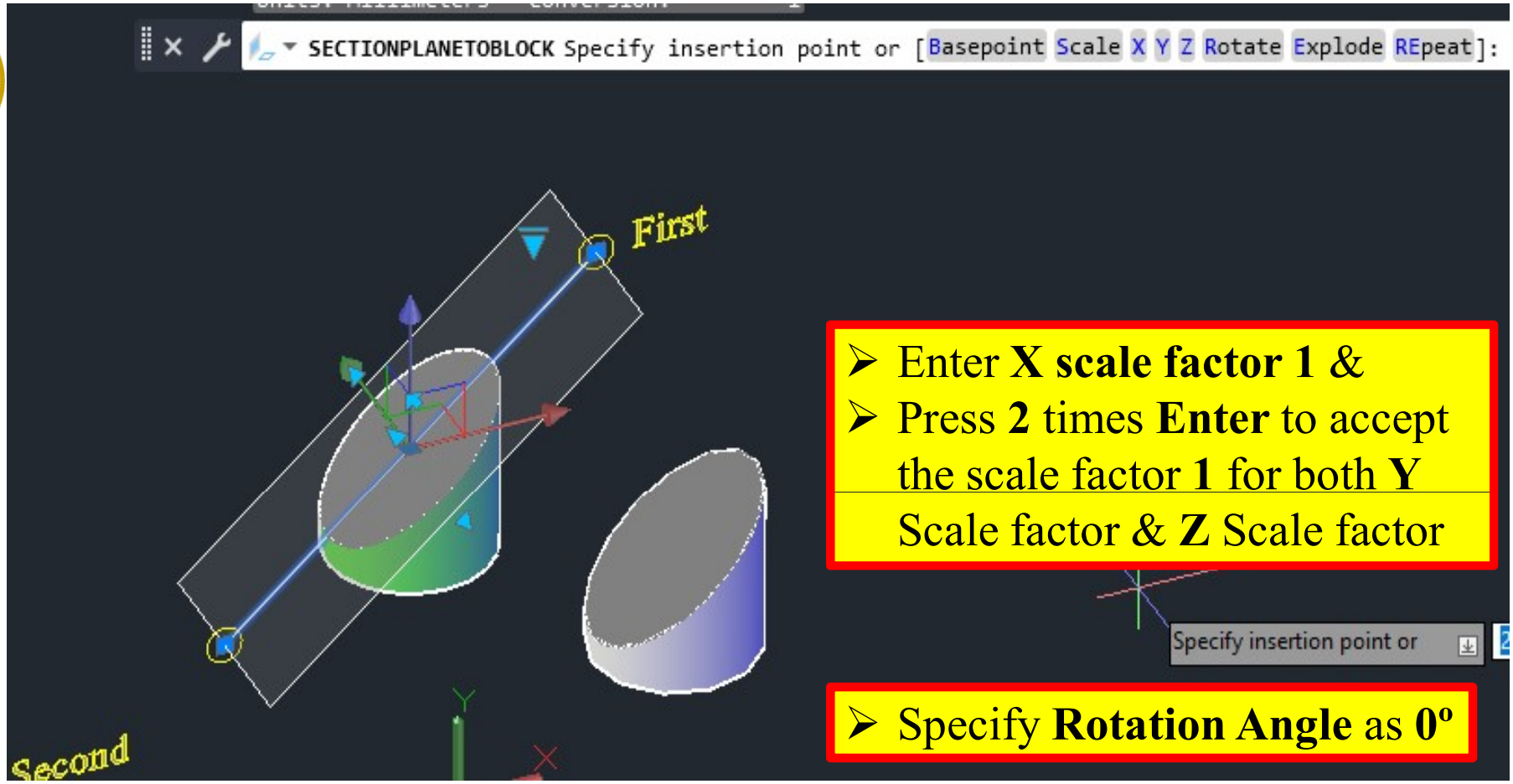


➢ After **Sectioning**




Draw
Modify
Section Plane
Live Section
Add Jog
Generate Section
Flatshot
Extract Edges
Section
Type a command
➢ Click On Generate
Generate Section/Elevation
Section Plane
Select section plane
(No section plane object selected)
2D Section / Elevation
3D Section
Help
➢ Click on Select Section Plane


Draw
Modify
Command: _SECTIONPL
SECTIONPLANETOB
Generate Section/Elevation
Section Plane
Select section plane
(Section plane selected)
2D/3D
2D Section / Elevation
3D Section
Create
Cancel
Help
First
Select section object:
Generate Section/Elevation
Section Plane
Select section plane
(Section plane selected)
2D/3D
2D Section / Elevation
3D Section
Create
Cancel
Help
First
Select section object:
➢ Click on 3D Section
➢ Click on Create

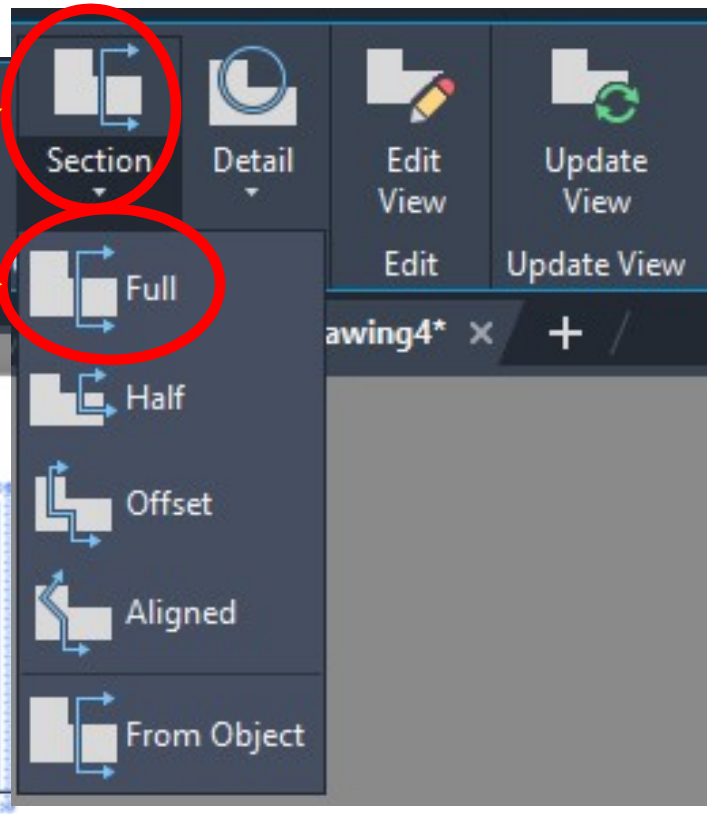

SECTIONPLANETOBLOCK Specify insertion point or [Basepoint Scale X Y Z Rotate Explode REpeat]:
First
Second
➢ Enter X scale factor 1 &
➢ Press 2 times Enter to accept the scale factor 1 for both Y Scale factor & Z Scale factor
Specify insertion point or
➢ Specify Rotation Angle as 0º

- 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 select the Sectioned Solid & press **ENTER** & assign the **LAYOUT NAME** & press enter.
- 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**.

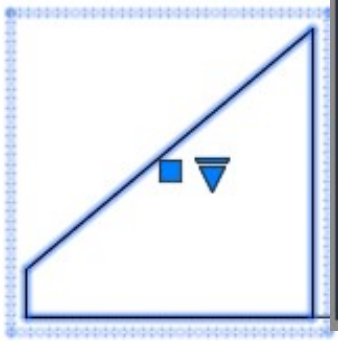
- Click on the **Front view** of the model, **CREATE VIEW** tool bar will be displayed at the top and select the **FULL** from the **Section view** Tool Bar
- Select two ends of cutting plane and drag (downwards) perpendicular to the cutting plane to get the **TRUE** shape of the section

To Extract the True Shape of the Section

- After Click Select the **Section** Tool in **Create view** Tool Bar
- Select **Full**

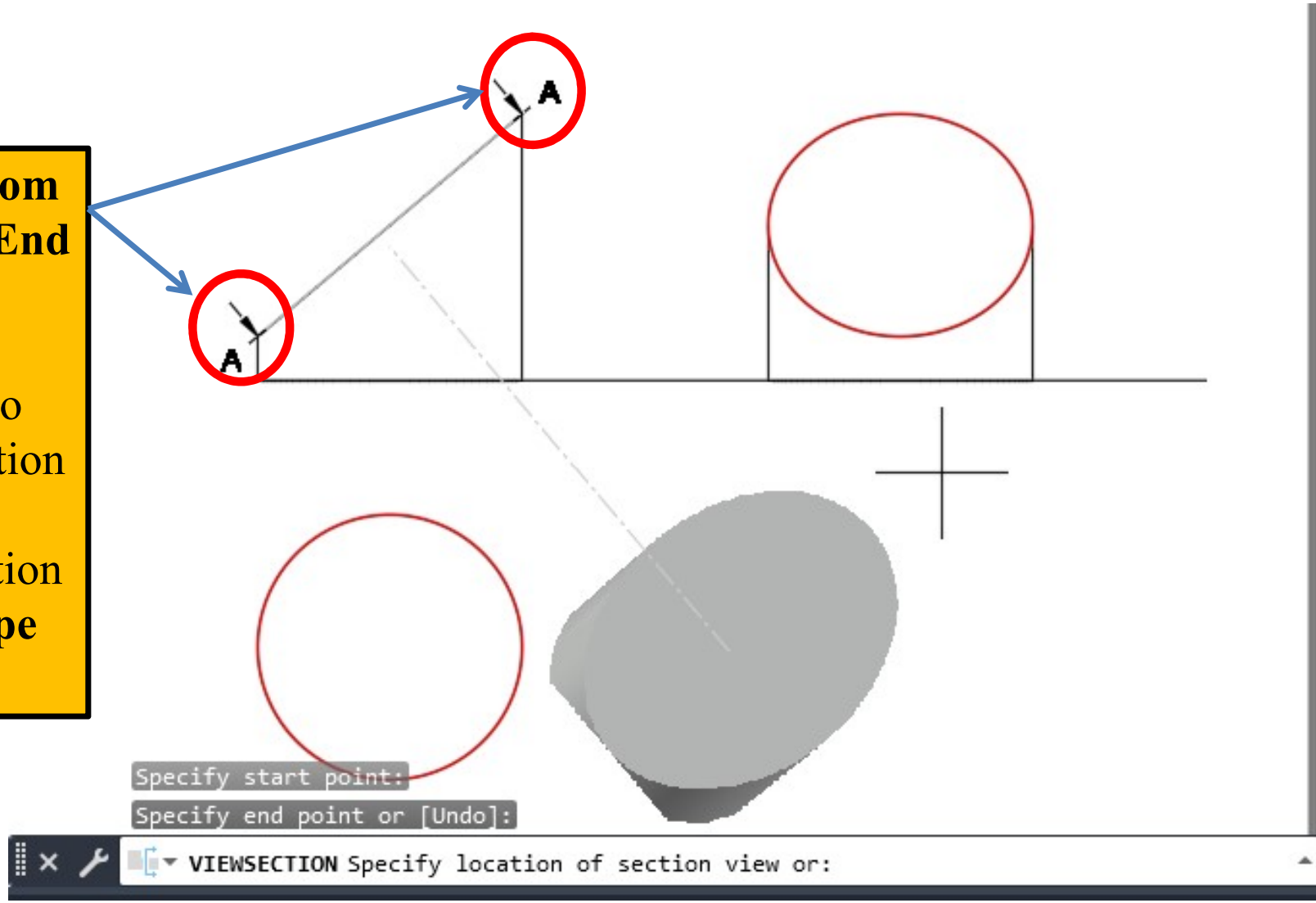


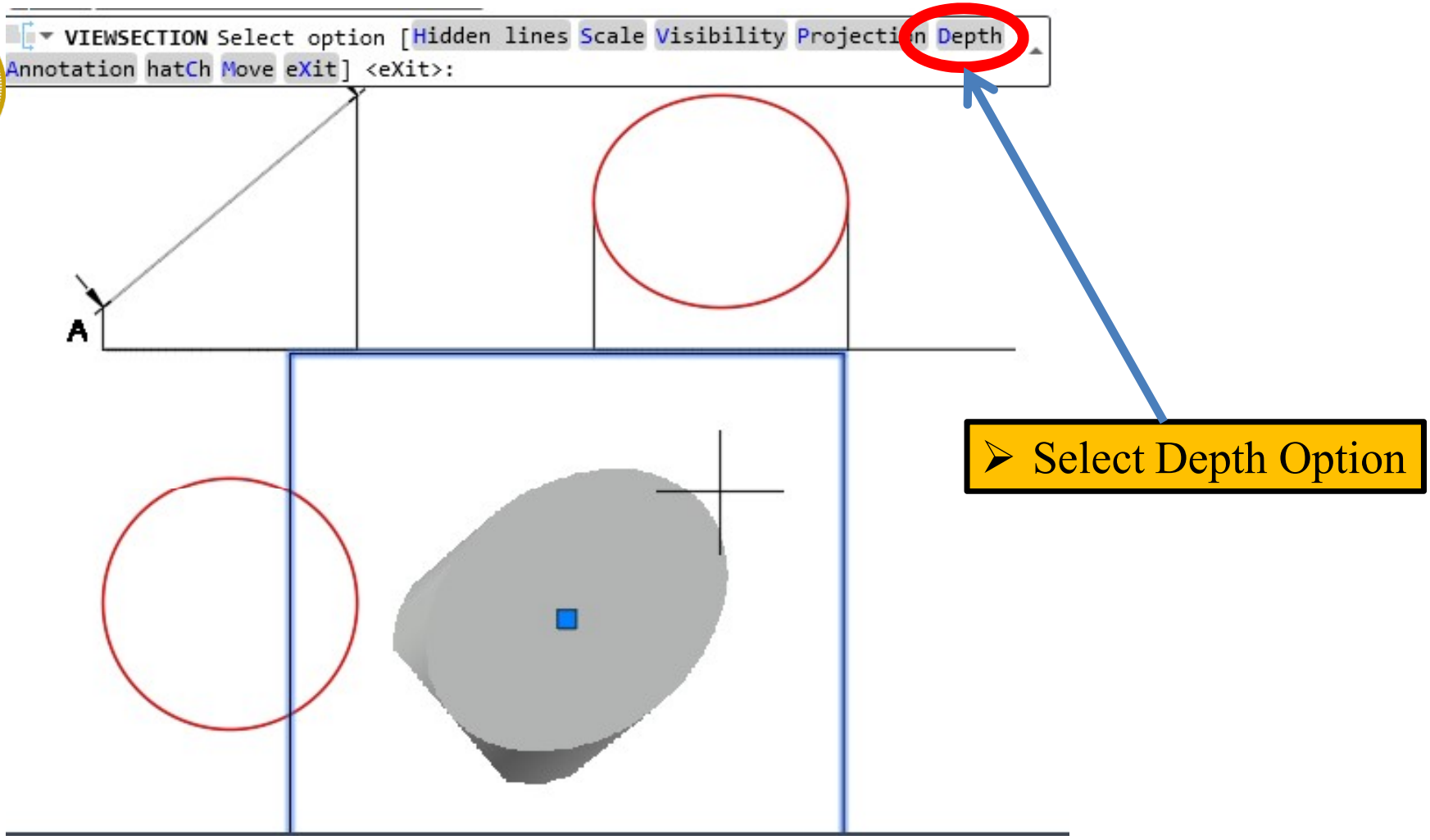
- Click on the **Sectional Front View**



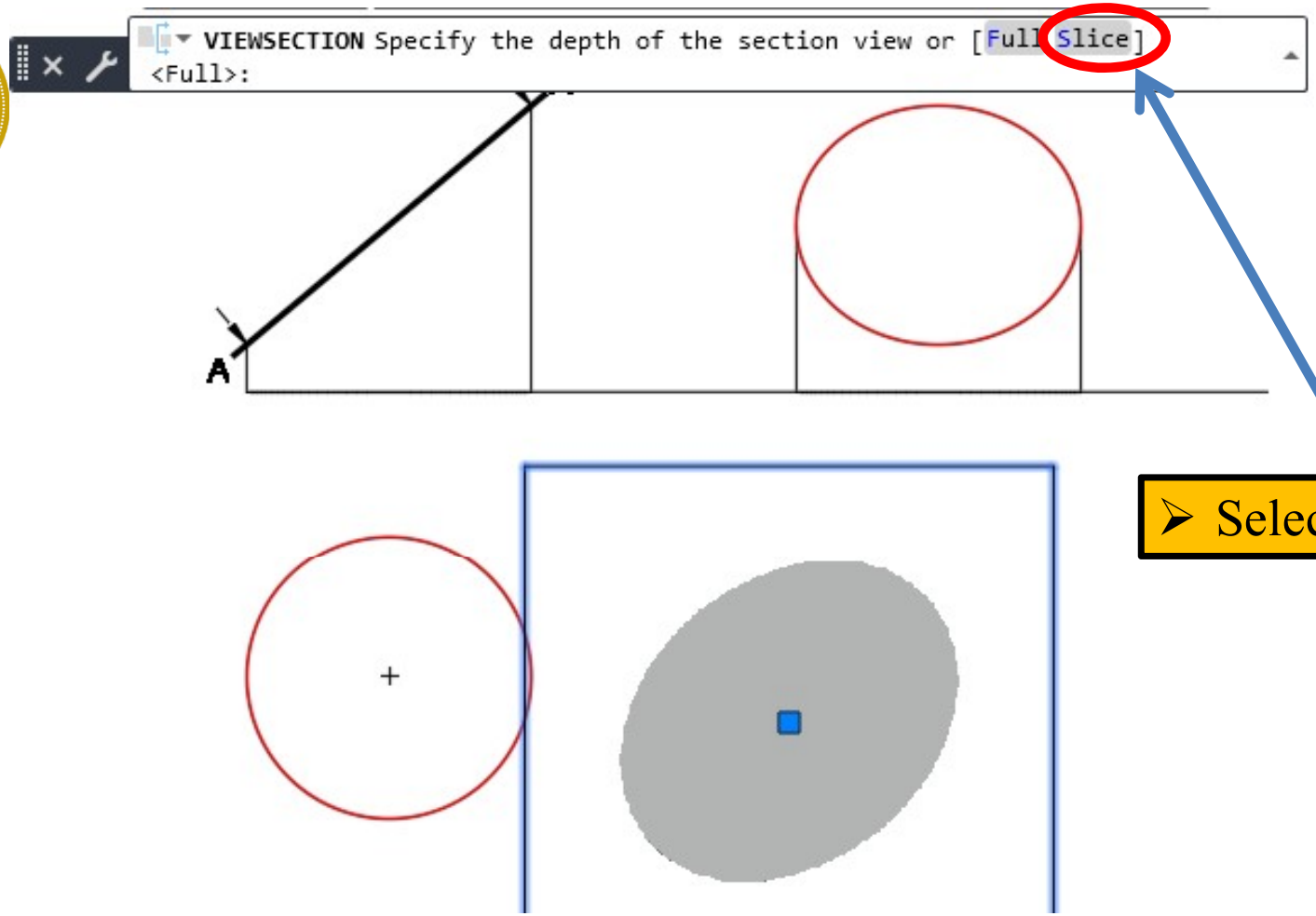
Sectional Front View

- Specify the **Bottom End** & the **Top End** of the Section
- Drag the Curser **Perpendicular** to the Arrow Direction & Press Enter to Specify the location of the **True Shape** of the Section.

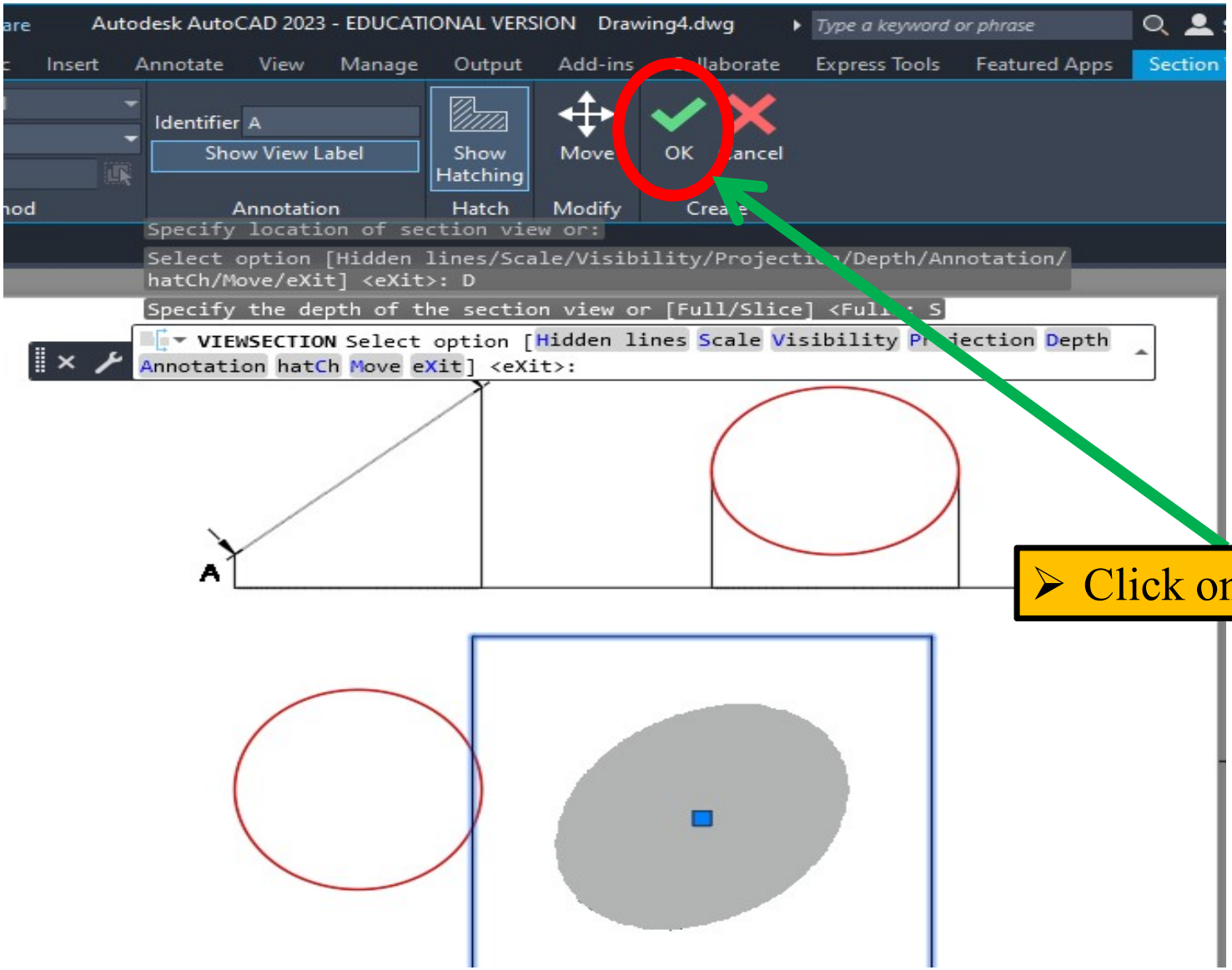




➢ Select Depth Option

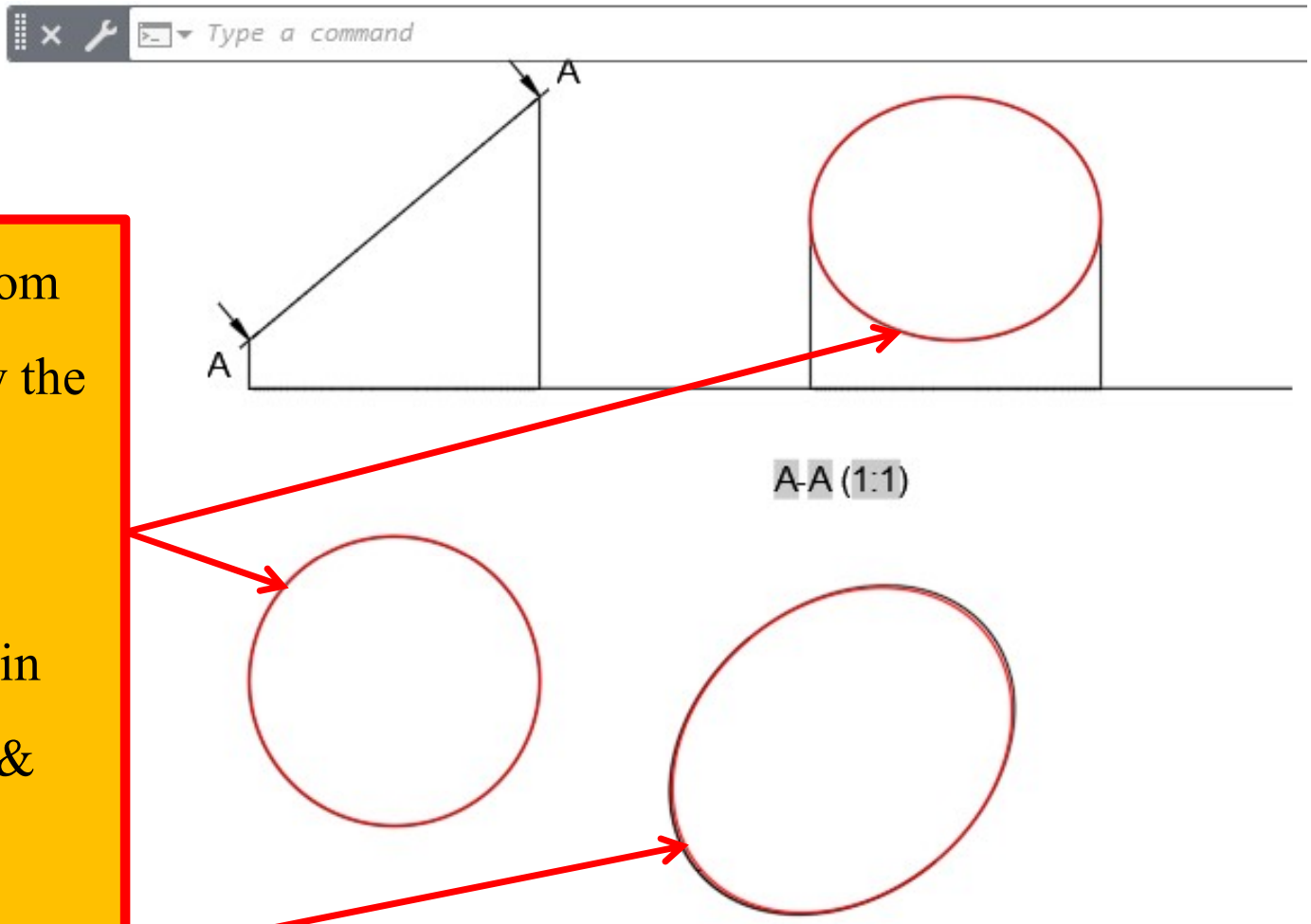


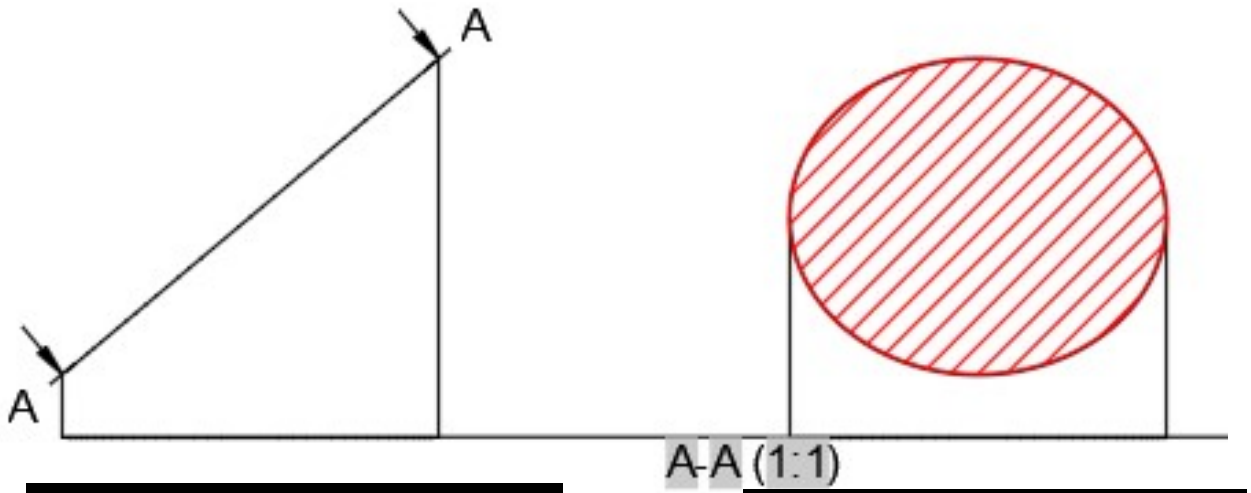
➢ Select Slice Option



➢ Click on Green Tick

- Use **LINE** command from **DRAW** tool bar & draw the reference line **XY**
- Use **LINE** command to draw the boundary line in the Sectional Top view & **TRUE** shape

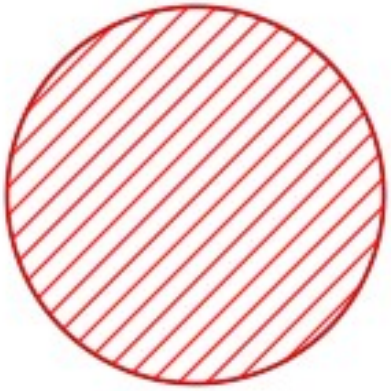




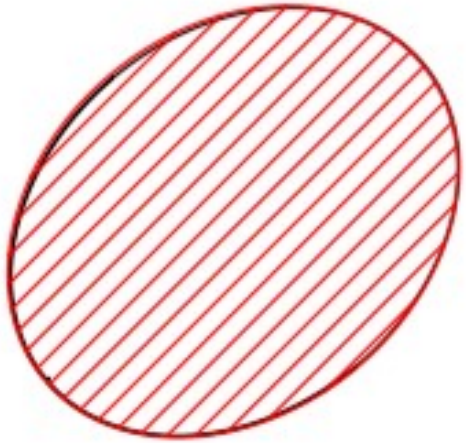
Sectional Front View

Sectional Side View

- Use **HATCH** command & **Pick** the internal points of the Boundary lines drawn in the Sectional Top view & **TRUE** shape



Sectional Top View



True Shape of the Section