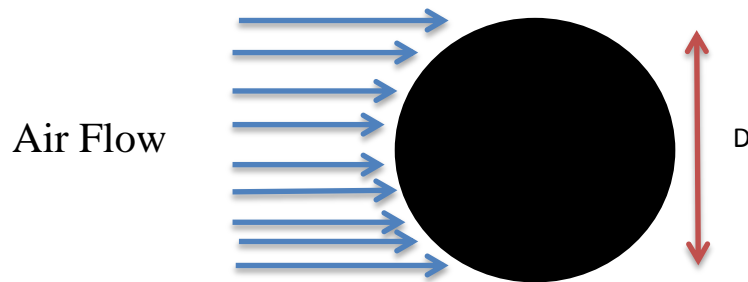




Example 2/

An air flow through solid sphere (bluff body effect). The solid sphere diameter ($d= 0.1\text{m}$). The outside domain size length, ($L= 2\text{m}$) and width ($W= 1\text{m}$). The velocity for air flow, ($V= 5\text{m/s}$). consider the velocity is uniform. The pressure of environment is ambient atmosphere which is at a pressure of 101325 pa (1 atm).



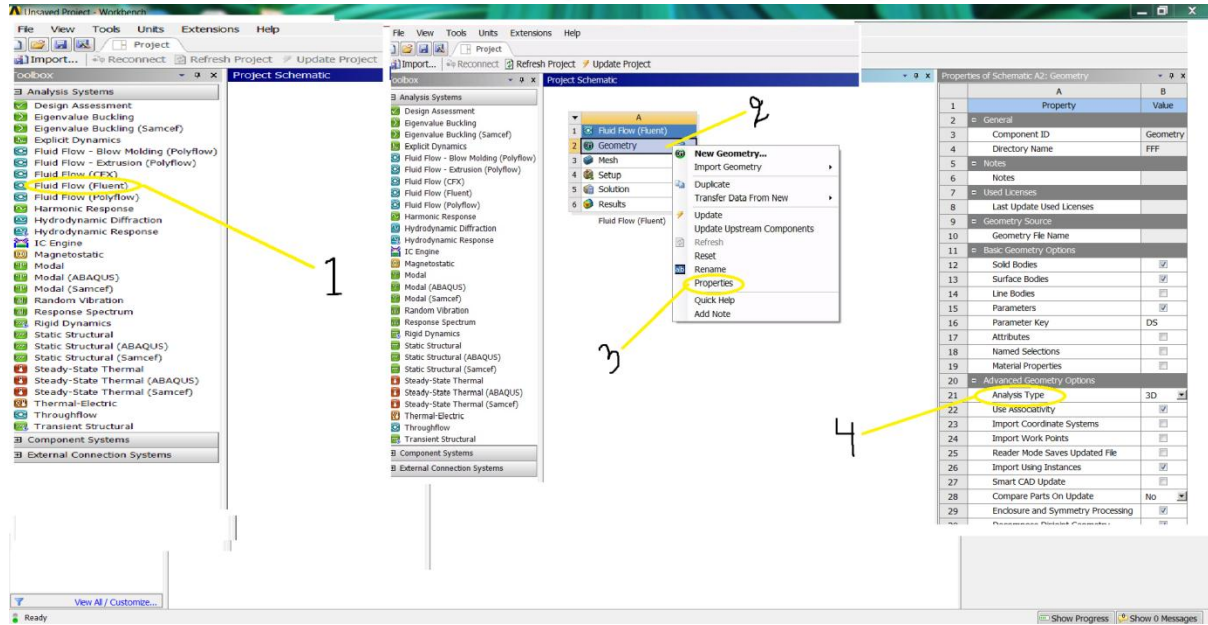
Objective:

- 1- To create a workbench project.
- 2- To start design modeler.
- 3- To learn how to create a sketch.
- 4- To create 2D geometry.
- 5- Save the project.
- 6- To make mesh for project.

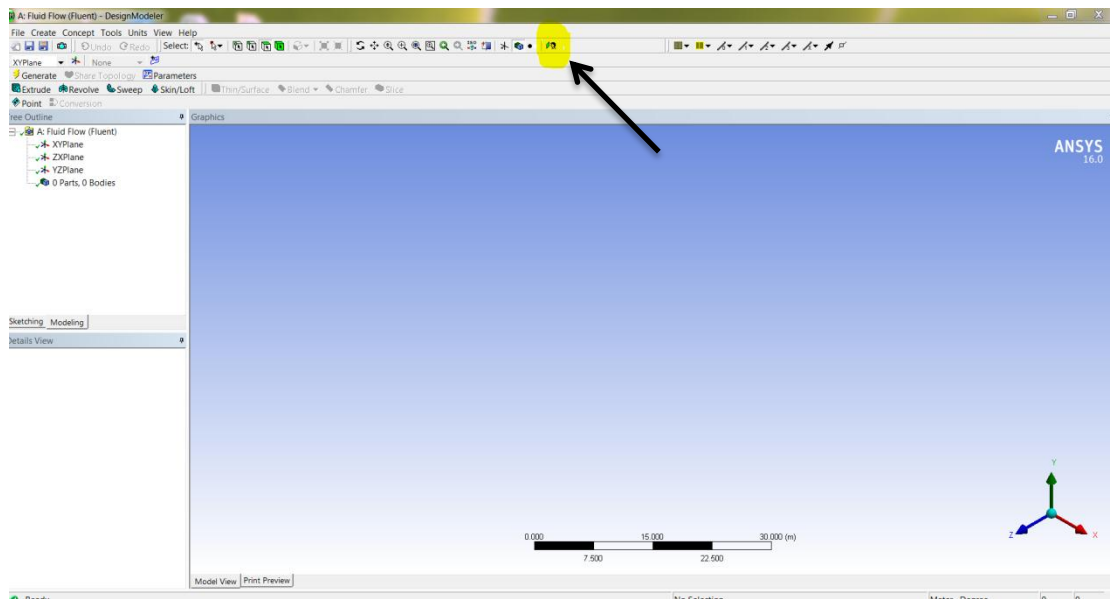


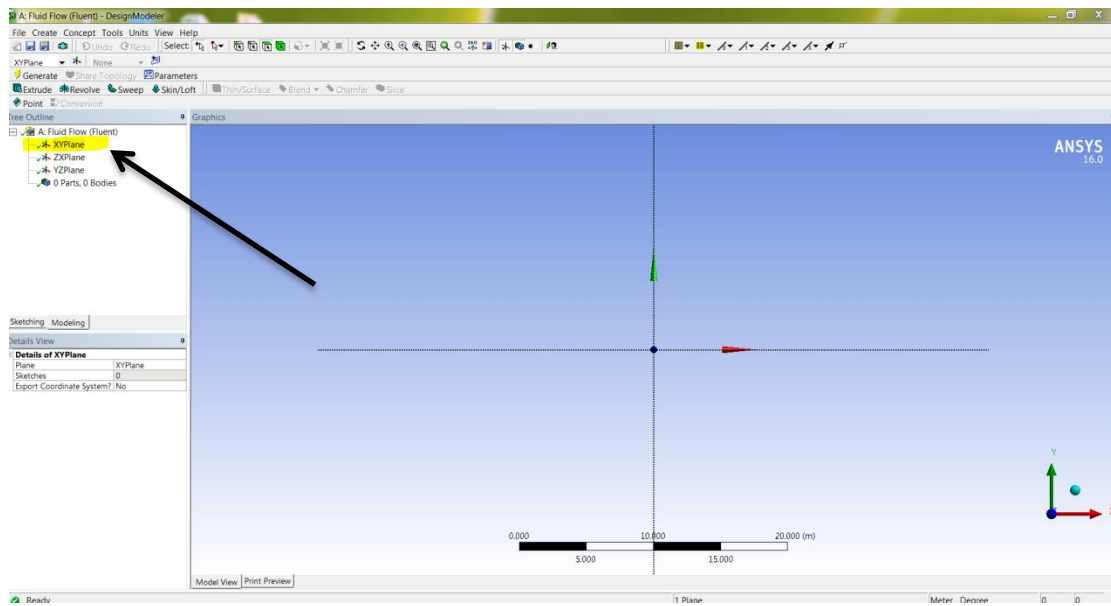
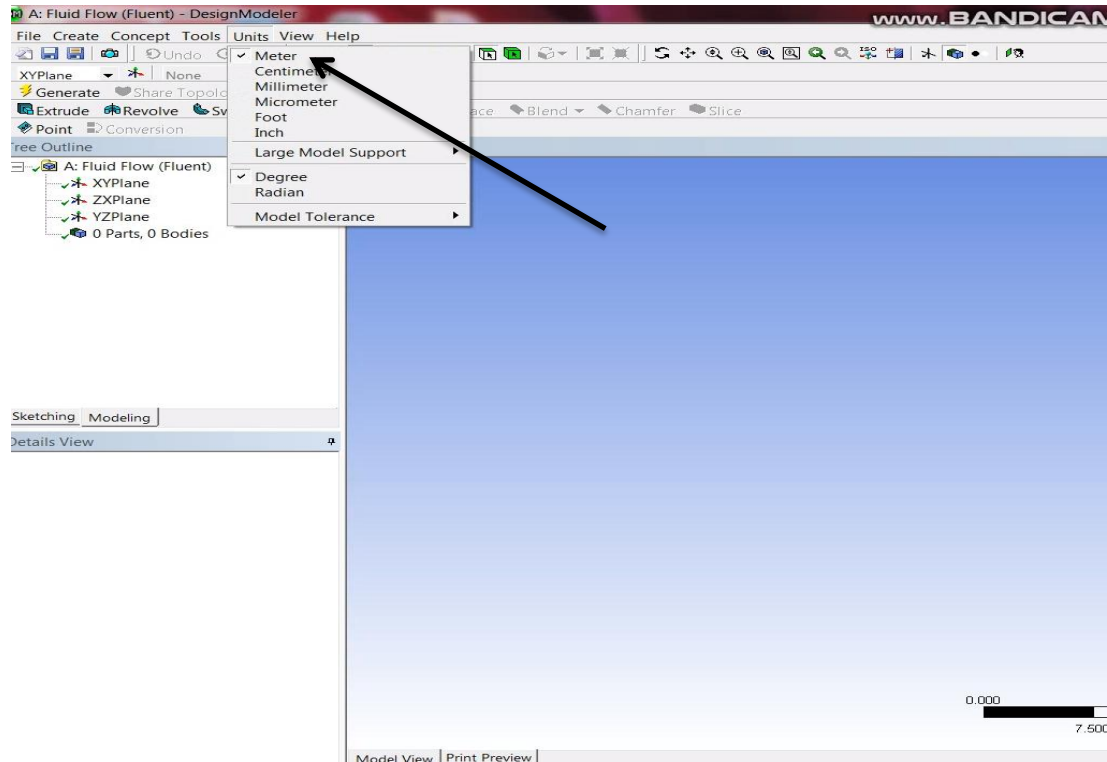
Design the geometry

- 1- Ansys program → Analysis system → Fluid Flow (Fluent)
 Geometry → Right click → Properties → Analysis type (2D)



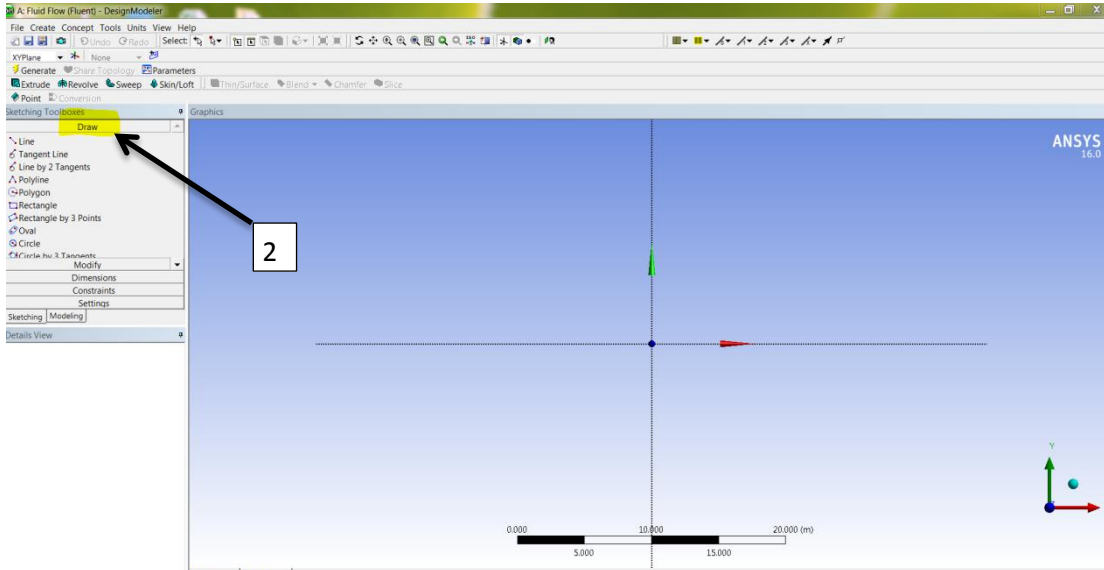
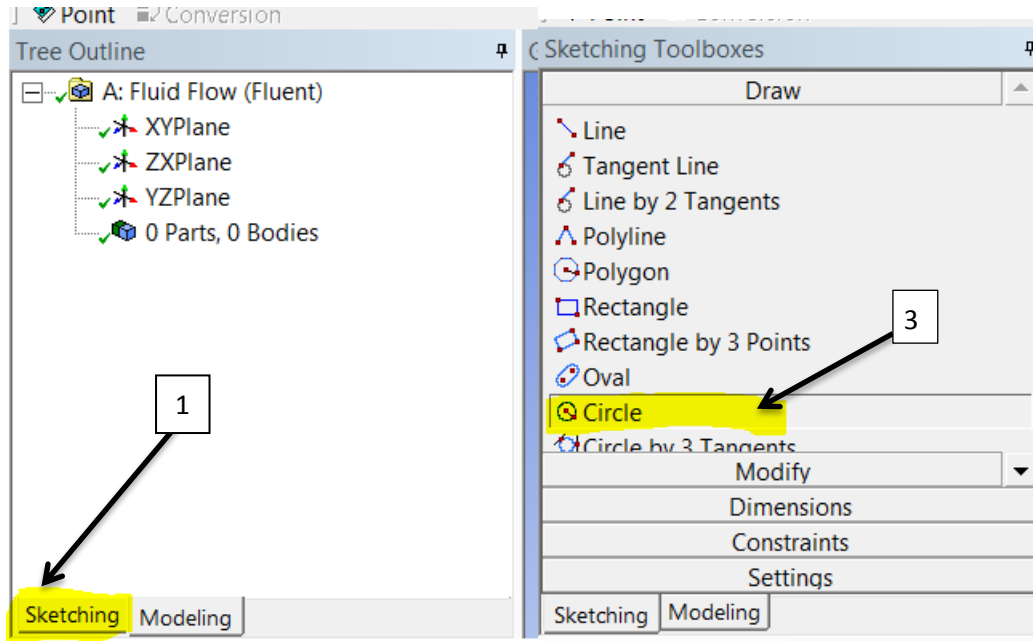
- 2- Geometry → To convert coordinates to XY plane → Unit → Meter → XYPlane

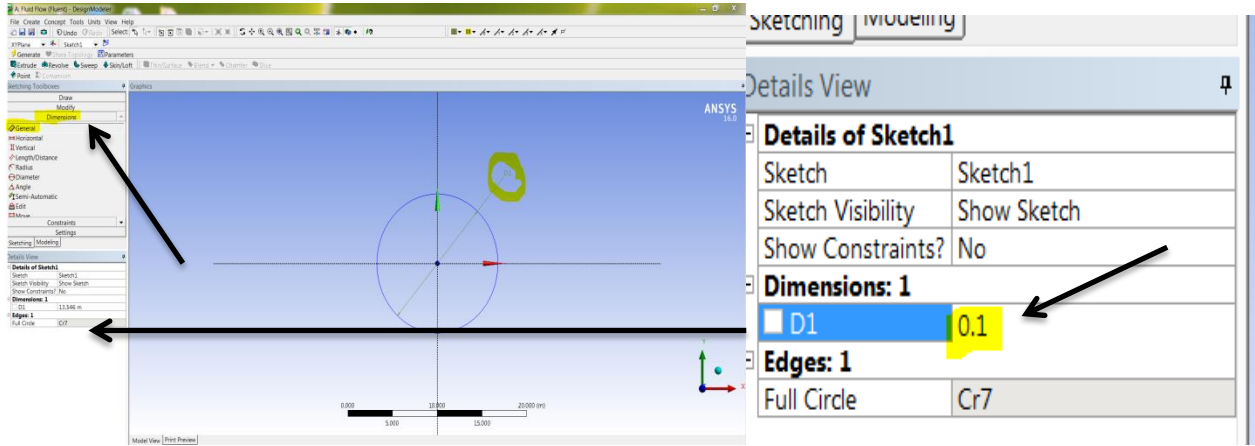






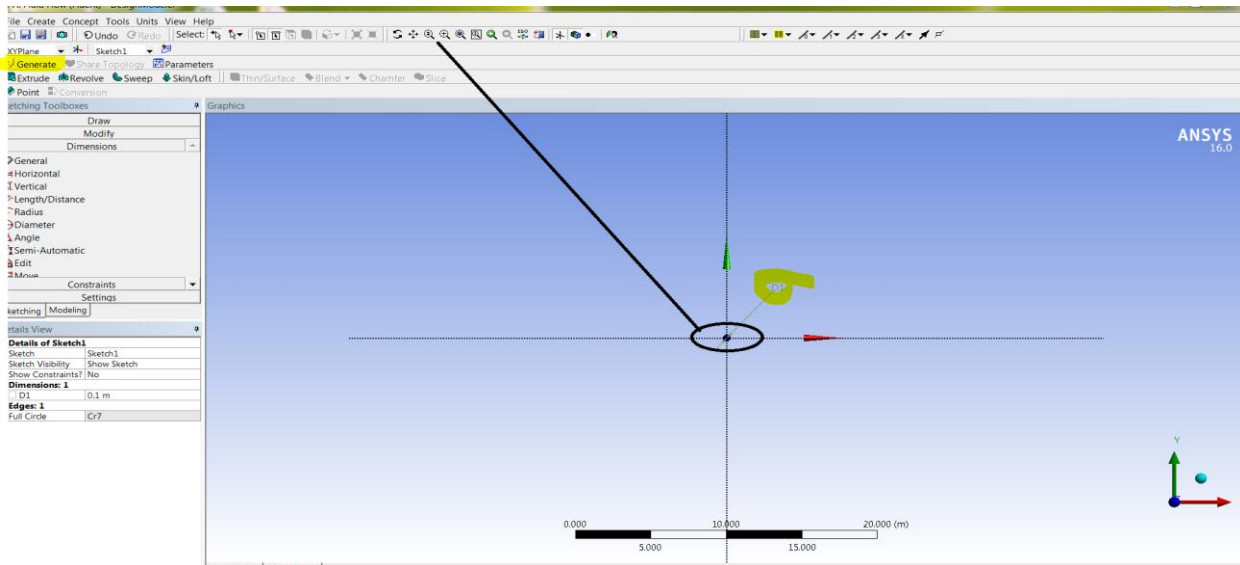
3-Sketching → Draw → Circle → Dimension →
Determine the circumference of the circle

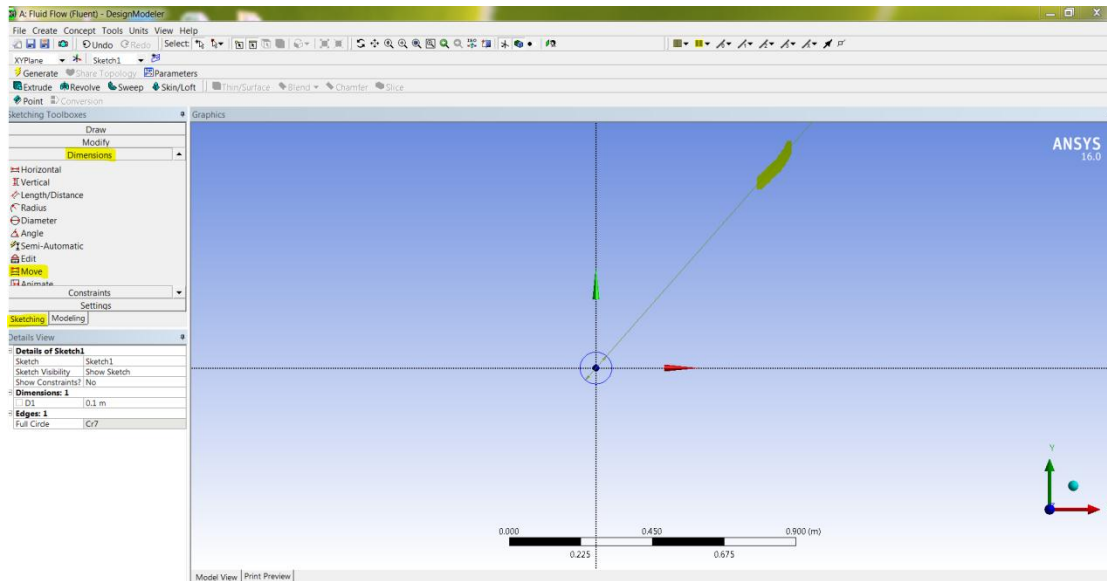




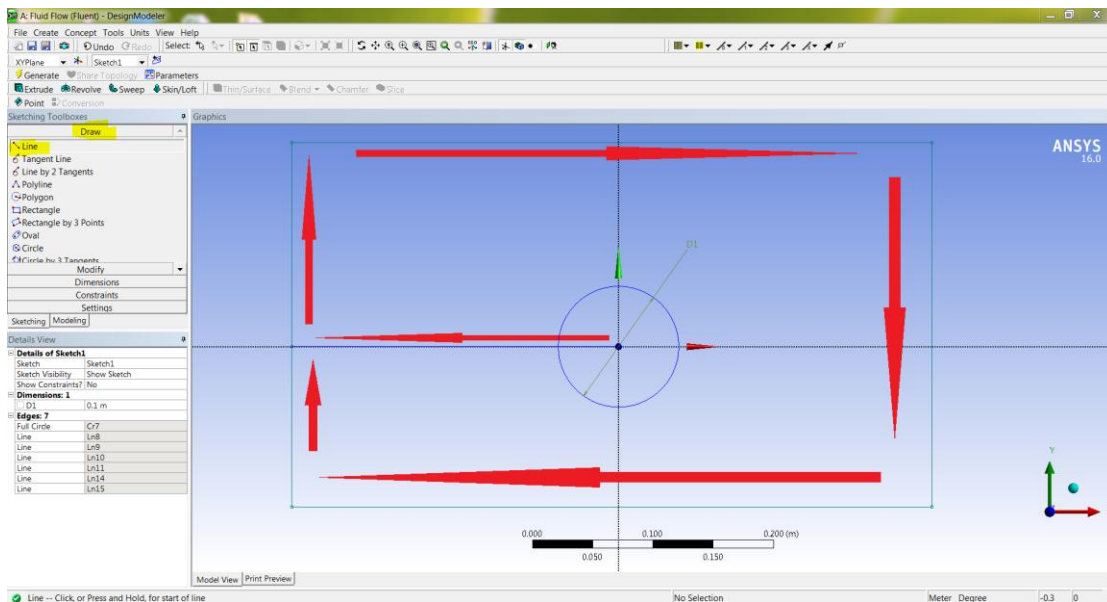
4-Enlarge the circle → → Dimension → Move

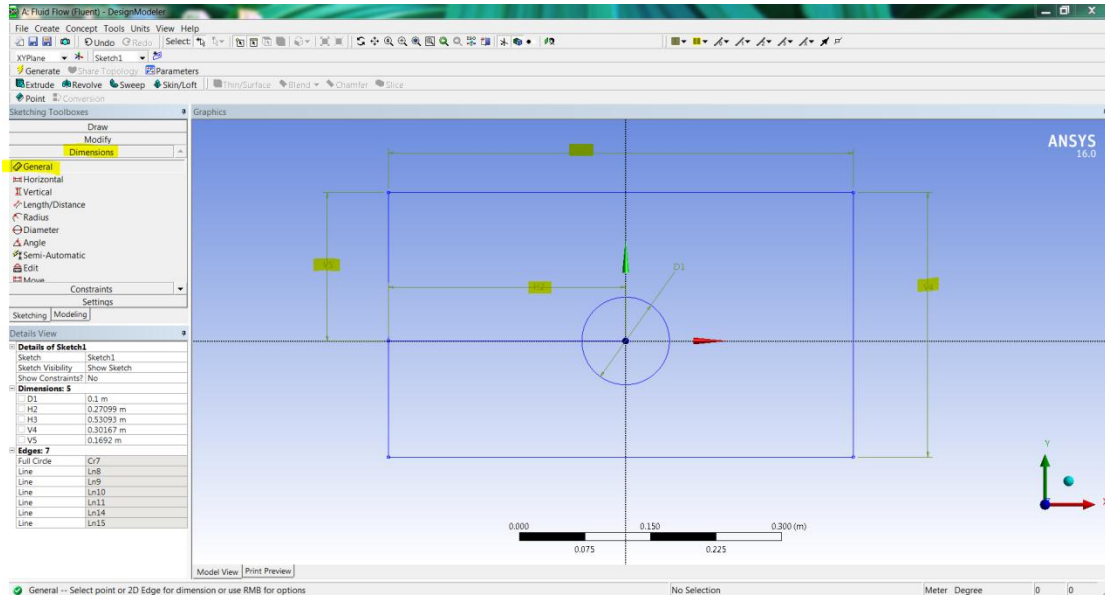
Move the dimension line close to the circle





5- Draw \longrightarrow Line \longrightarrow From the center of the circle \longrightarrow Draw a line around the circle \longrightarrow Dimension

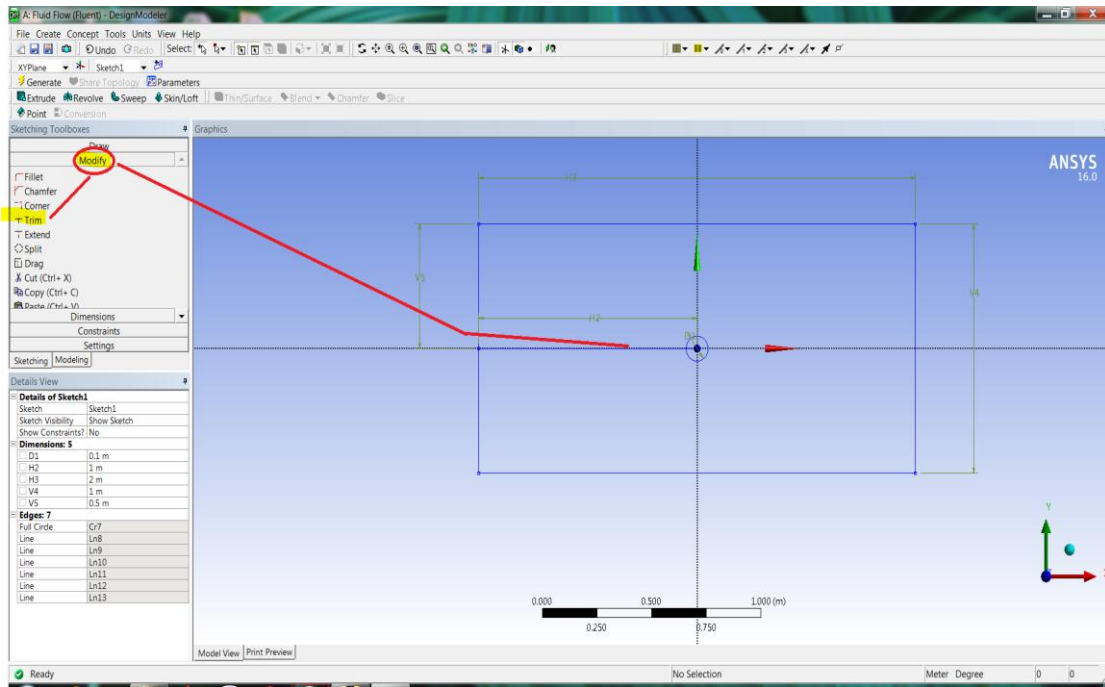




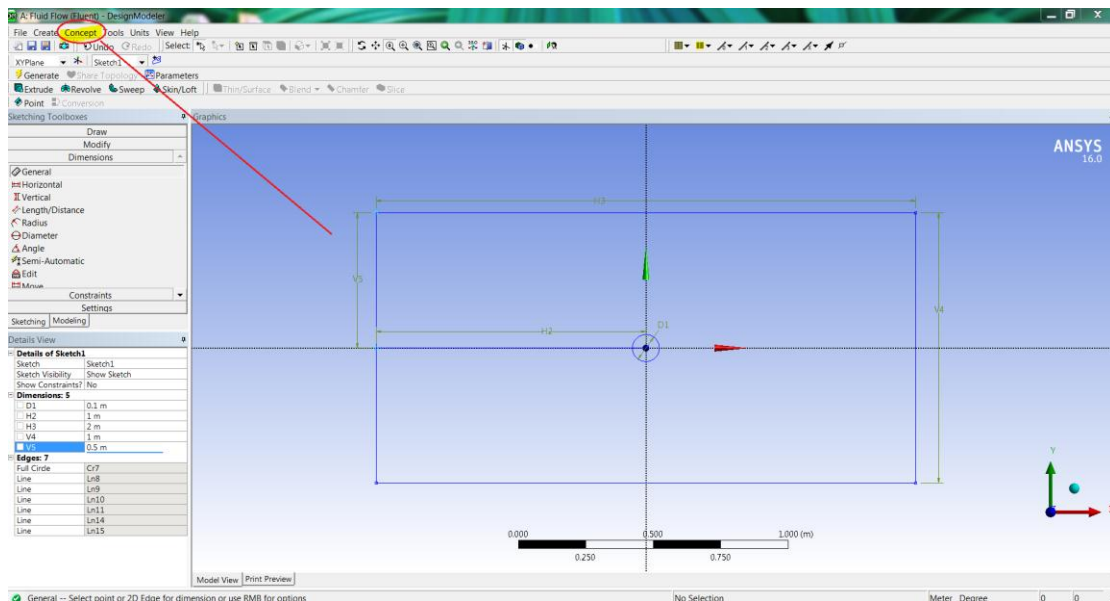
Details View	
Details of Sketch1	
Sketch	Sketch1
Sketch Visibility	Show Sketch
Show Constraints?	No
Dimensions: 5	
<input type="checkbox"/> D1	0.1 m
<input type="checkbox"/> H2	1 m
<input type="checkbox"/> H3	2 m
<input type="checkbox"/> V4	1 m
<input checked="" type="checkbox"/> V5	0.5 m
Edges: 7	
Full Circle	Cr7
Line	Ln8
Line	Ln9
Line	Ln10
Line	Ln11
Line	Ln14
Line	Ln15

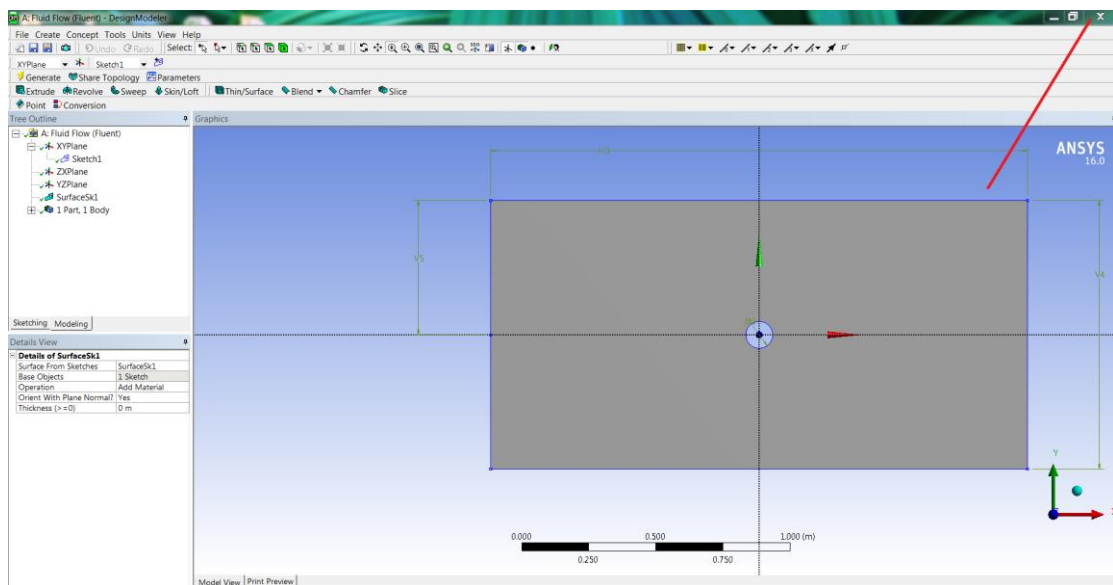
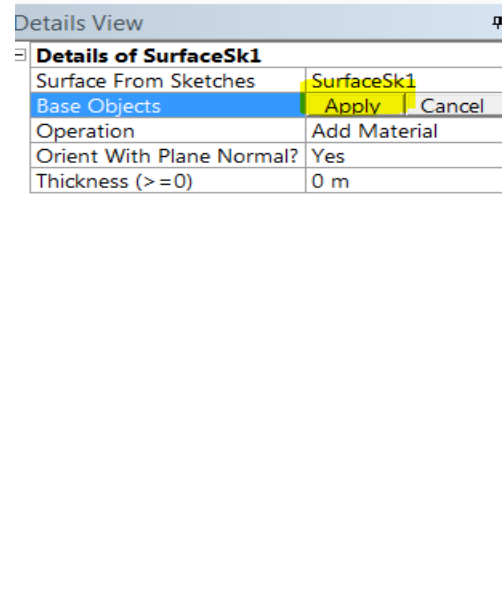
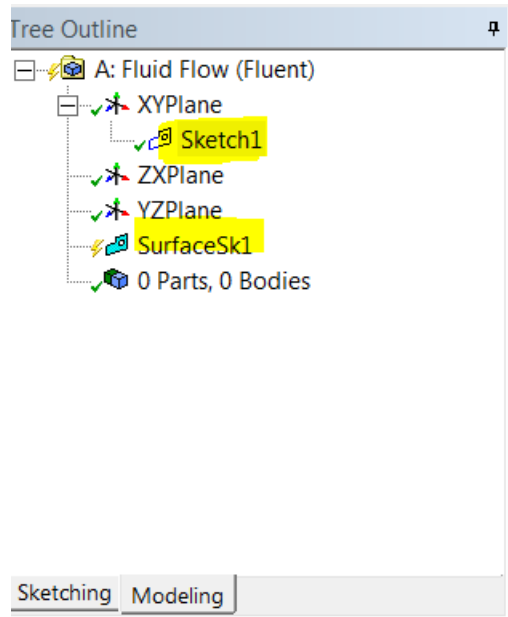


6- Modify → Trim → delete the line drawn from the center of the circle.



7- Concept → Surfaces from sketches → Select sketch1
Apply → Generate

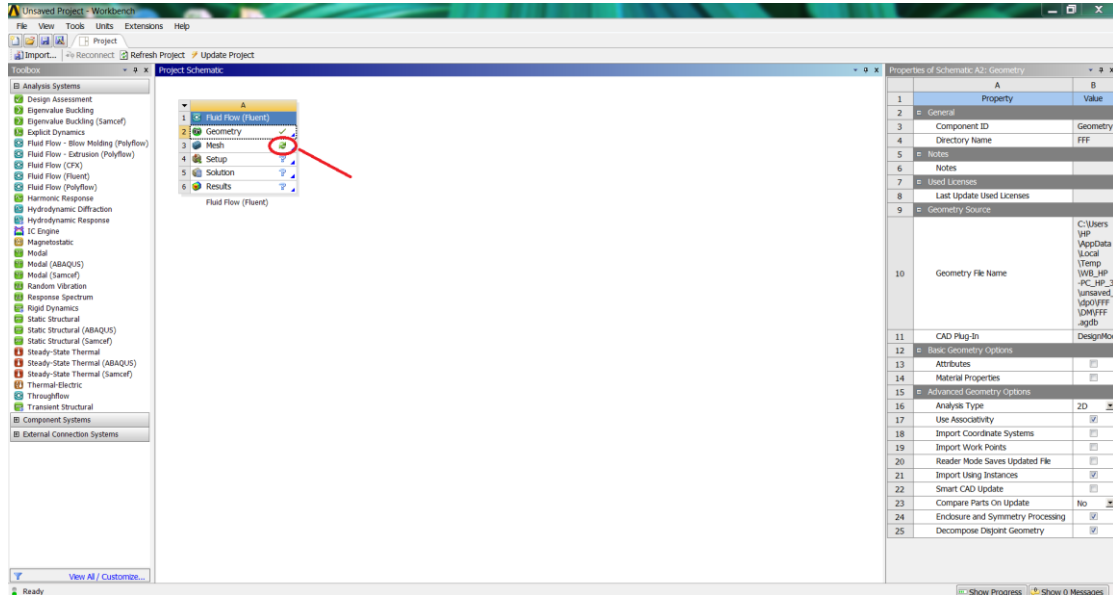




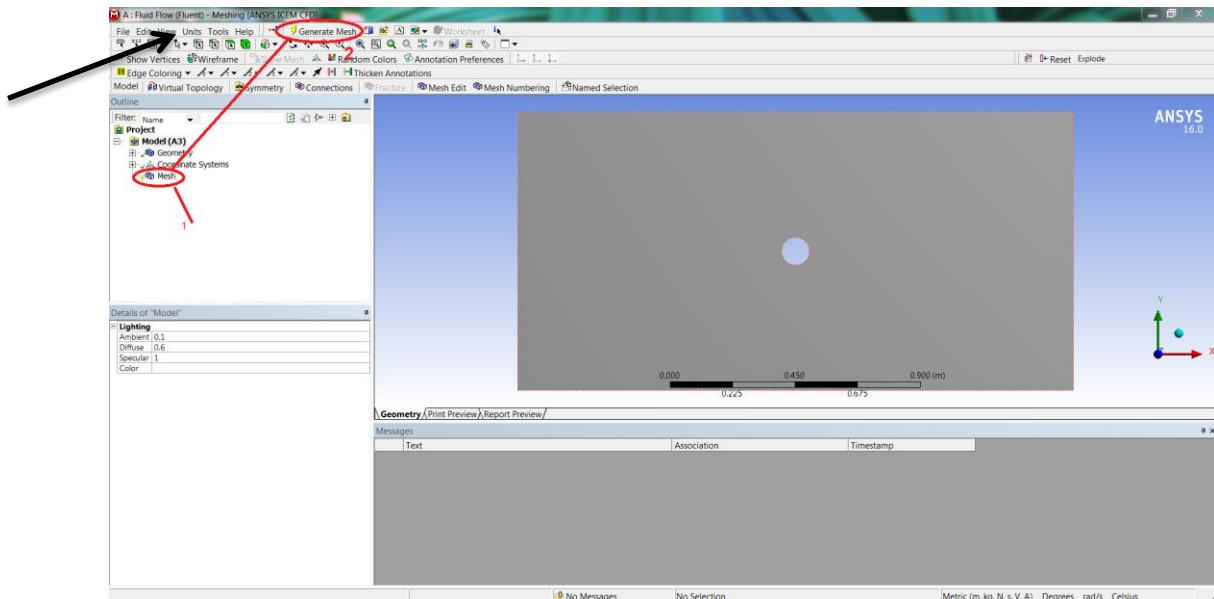


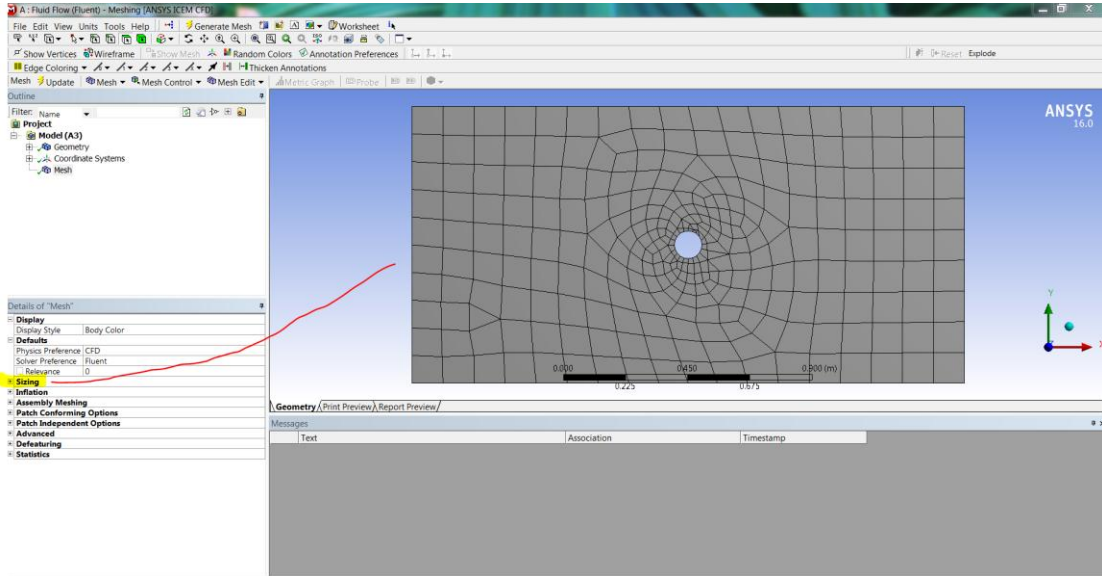
The mesh steps

1- Open the mesh → Check the unit

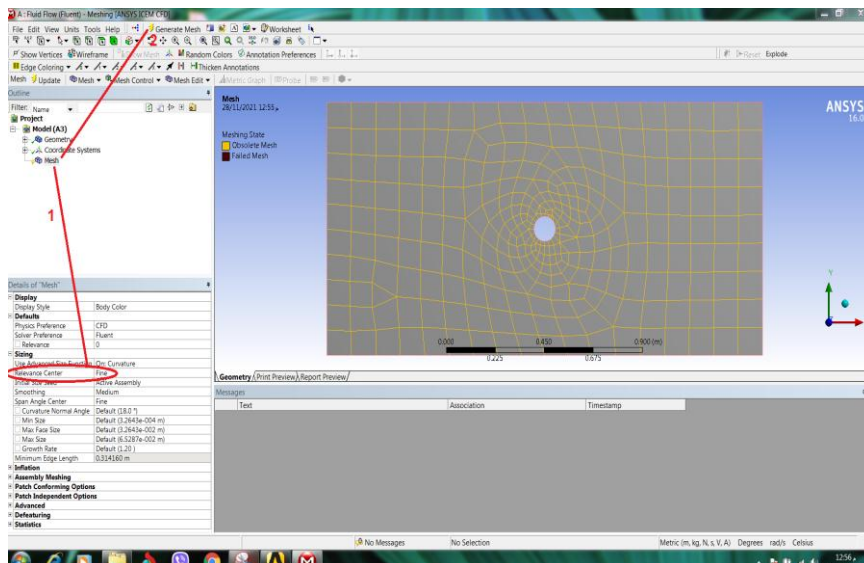
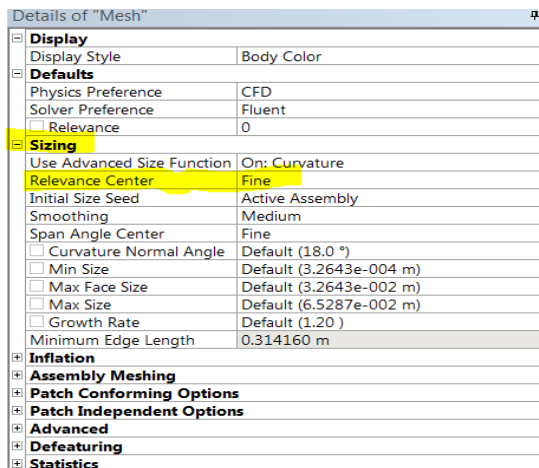


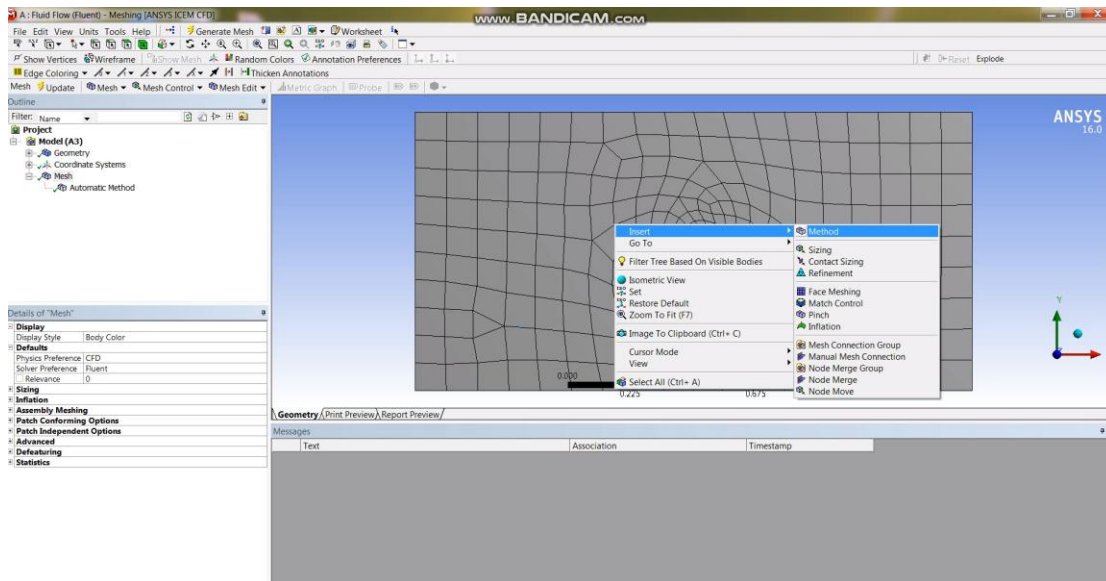
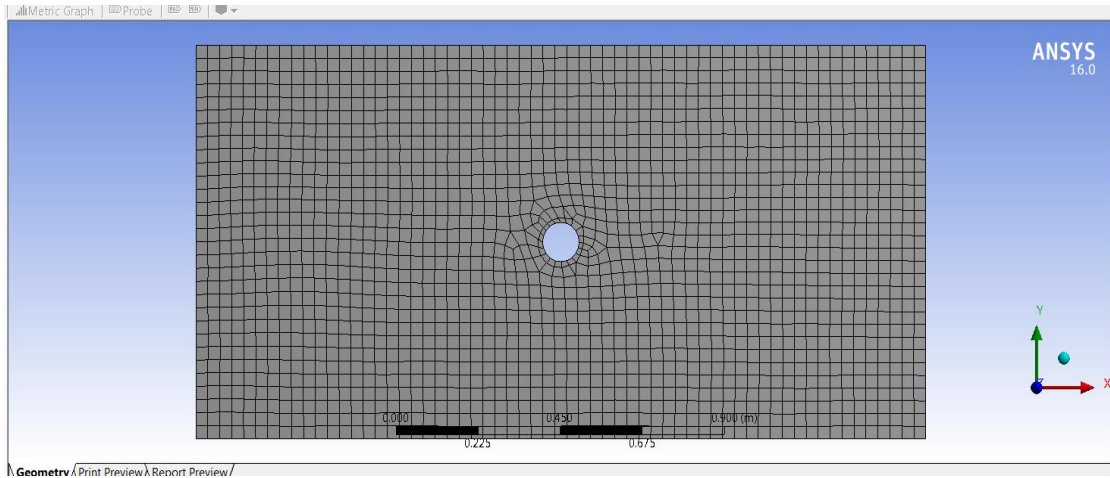
2- Mesh → Generate mesh → Sizing





3- Sizing → Relevance Center → Fine → Mesh
→ Generate mesh

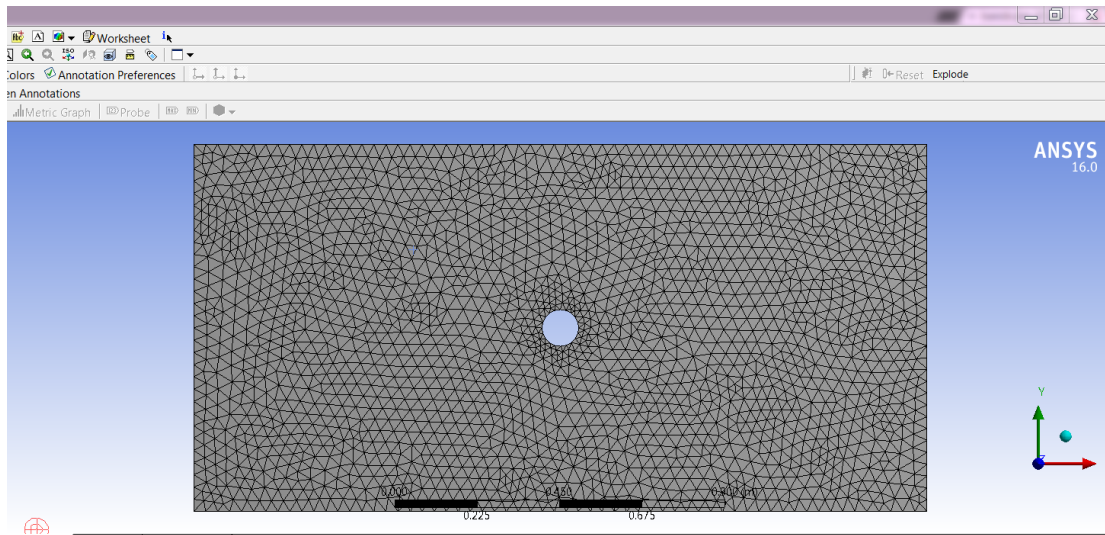




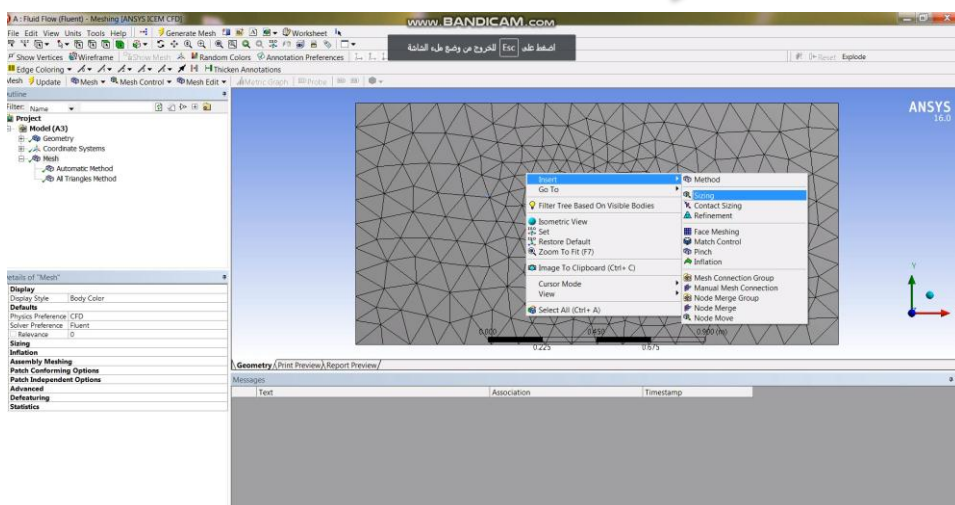


Details of "Automatic Method" - Method	
Scope	
Scoping Method	Geometry Selection
Geometry	Apply Cancel
Definition	
Suppressed	No
Method	Automatic
Element Midside Nodes	Use Global Setting

Details of "Automatic Method" - Method	
Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Suppressed	No
Method	Quadrilateral Dominant
Element Midside Nodes	Use Global Setting
Free Face Mesh Type	Quad/Tri



5- Insert → Sizing → Select the line of the circle → Apply
 → Element size= 0.01 → Enter → Mesh → Generate mesh

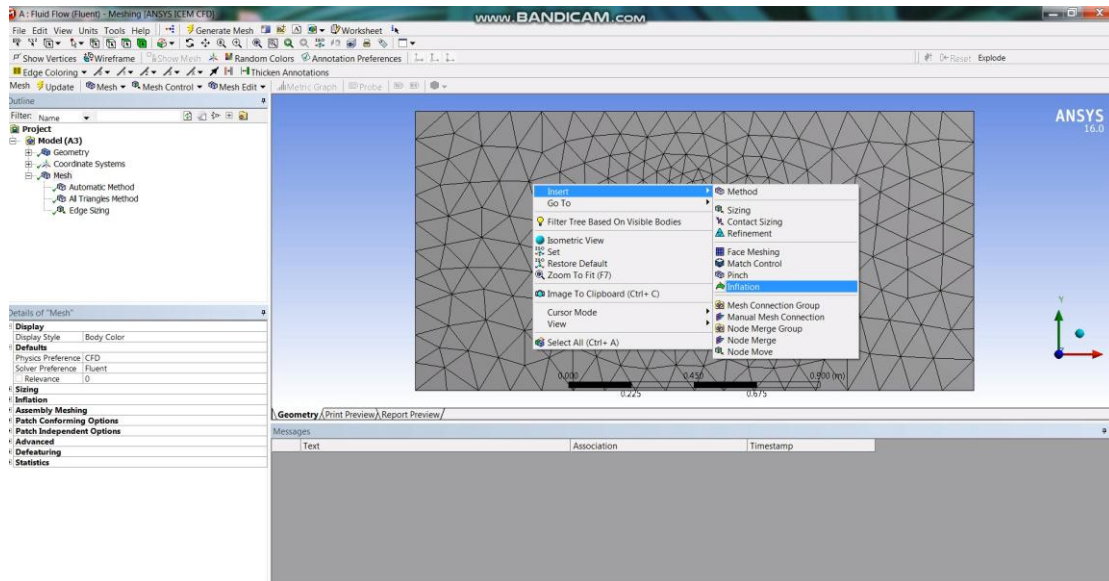




Details of "Sizing" - Sizing	
Scope	
Scoping Method	Geometry Selection
Geometry	Apply Cancel
Definition	
Suppressed	No
Type	Element Size
<input type="checkbox"/> Element Size	Default
Behavior	Soft
<input type="checkbox"/> Curvature Normal Angle	Default
<input type="checkbox"/> Growth Rate	Default
<input type="checkbox"/> Local Min Size	Default (0. m)

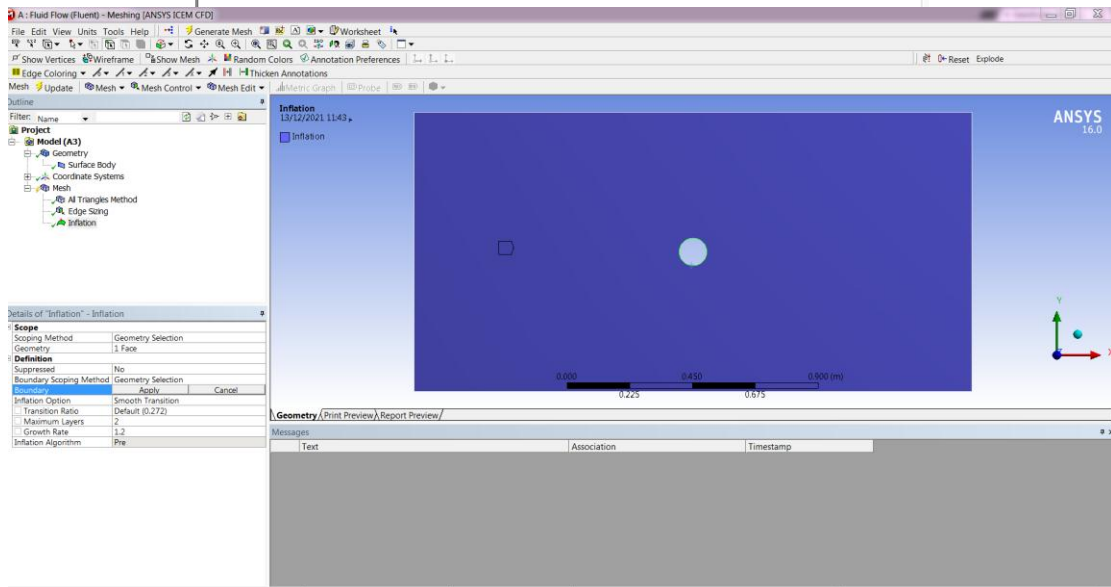
Details of "Body Sizing" - Sizing	
Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Suppressed	No
Type	Element Size
<input checked="" type="checkbox"/> Element Size	0.01
Behavior	Soft
<input type="checkbox"/> Curvature Normal Angle	Default
<input type="checkbox"/> Growth Rate	Default
<input type="checkbox"/> Local Min Size	Default (3.2643e-004 m)

6- Insert → Inflation → Select the geometry → Apply
→ Select the boundary → Apply → Maximus
layer=10

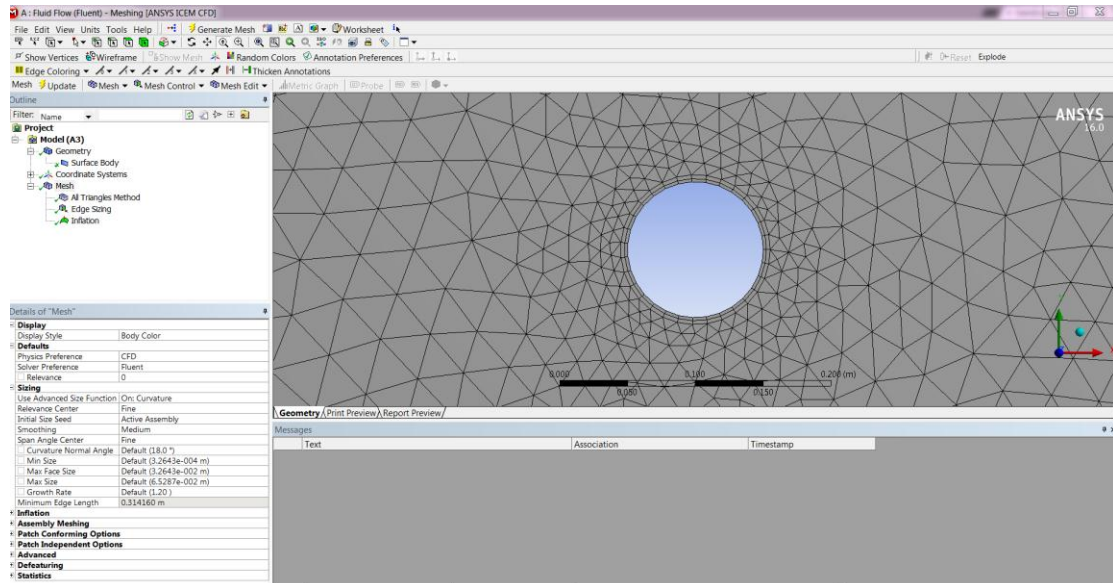




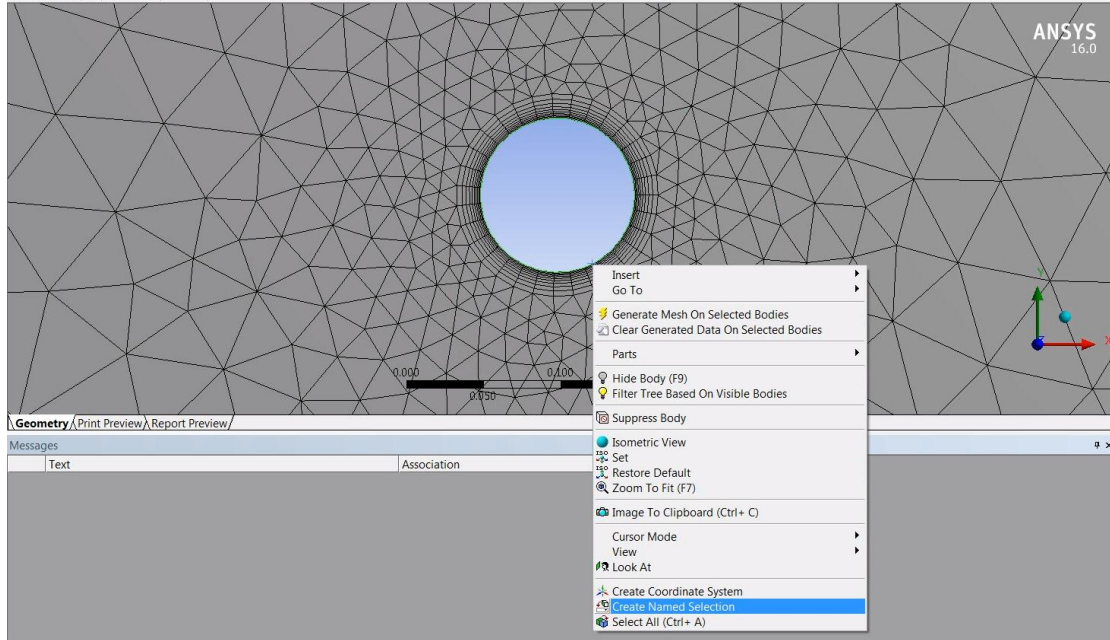
Details of "Inflation" - Inflation	
Scope	
Scoping Method	Geometry Selection
Geometry	Apply Cancel
Definition	
Suppressed	No
Boundary Scoping Method	Geometry Selection
Boundary	No Selection
Inflation Option	Smooth Transition
<input type="checkbox"/> Transition Ratio	Default (0.272)
<input type="checkbox"/> Maximum Layers	2
<input type="checkbox"/> Growth Rate	1.2
Inflation Algorithm	Pre



Details of "Inflation" - Inflation	
Scope	
Scoping Method	Geometry Selection
Geometry	1 Face
Definition	
Suppressed	No
Boundary Scoping Method	Geometry Selection
Boundary	1 Edge
Inflation Option	Smooth Transition
<input type="checkbox"/> Transition Ratio	Default (0.272)
<input checked="" type="checkbox"/> Maximum Layers	10
<input type="checkbox"/> Growth Rate	1.2
Inflation Algorithm	Pre



7- Select Boundary (right click) → create named selection
ok and repeat this step for all boundary → Update





The image displays two screenshots of the ANSYS 16.0 software interface. The top screenshot shows a 3D model of a sphere with a mesh. A dialog box titled "Selection Name" is open, with "spher" entered in the text field. The dialog box has two main options: "Apply selected geometry" (which is selected) and "Apply geometry items of same:" (which is unselected). Under the second option, there are checkboxes for "Size", "Type", "Location X", "Location Y", and "Location Z", all of which are currently unchecked. At the bottom of the dialog box, there is an "Apply To Corresponding Mesh Nodes" checkbox, also unchecked. "OK" and "Cancel" buttons are at the bottom of the dialog. The background shows the sphere mesh with a coordinate system (X, Y, Z) and a scale bar from 0.000 to 1.000 (m). The ANSYS 16.0 logo is in the top right corner.

The bottom screenshot shows the same 3D model of the sphere mesh, but now the mesh is more refined, especially around the sphere. The "Selection Name" dialog box is no longer present. The software interface includes a menu bar at the top with options like "File", "Edit", "View", "Units", "Tools", "Help", "Generate Mesh", "Worksheet", "Show Vertices", "Wireframe", "Show Mesh", "Random Colors", "Annotation Preferences", "Edge Coloring", "Thicken Annotations", "Update", "Mesh", "Mesh Control", "Mesh Edit", "Metric Graph", "Probe", "Reset", and "Explode". On the left side, there is a "Project" tree showing the hierarchy: "Model (A3)" > "Geometry" > "Coordinate Systems" > "Mesh" > "All Triangles Method" > "Edge Sizing" > "Inflation". Below the tree is a "Properties" panel for the "Mesh" object, showing various settings like "Display Style", "Body Color", "Physics Preference", "CFD", "Inflation", "Relevance", "Zing", "Flation", "Assembly Meshing", "Mesh Conforming Options", "Mesh Independent Options", "Advanced", "Featuring", and "Statistics". The ANSYS 16.0 logo is in the top right corner.