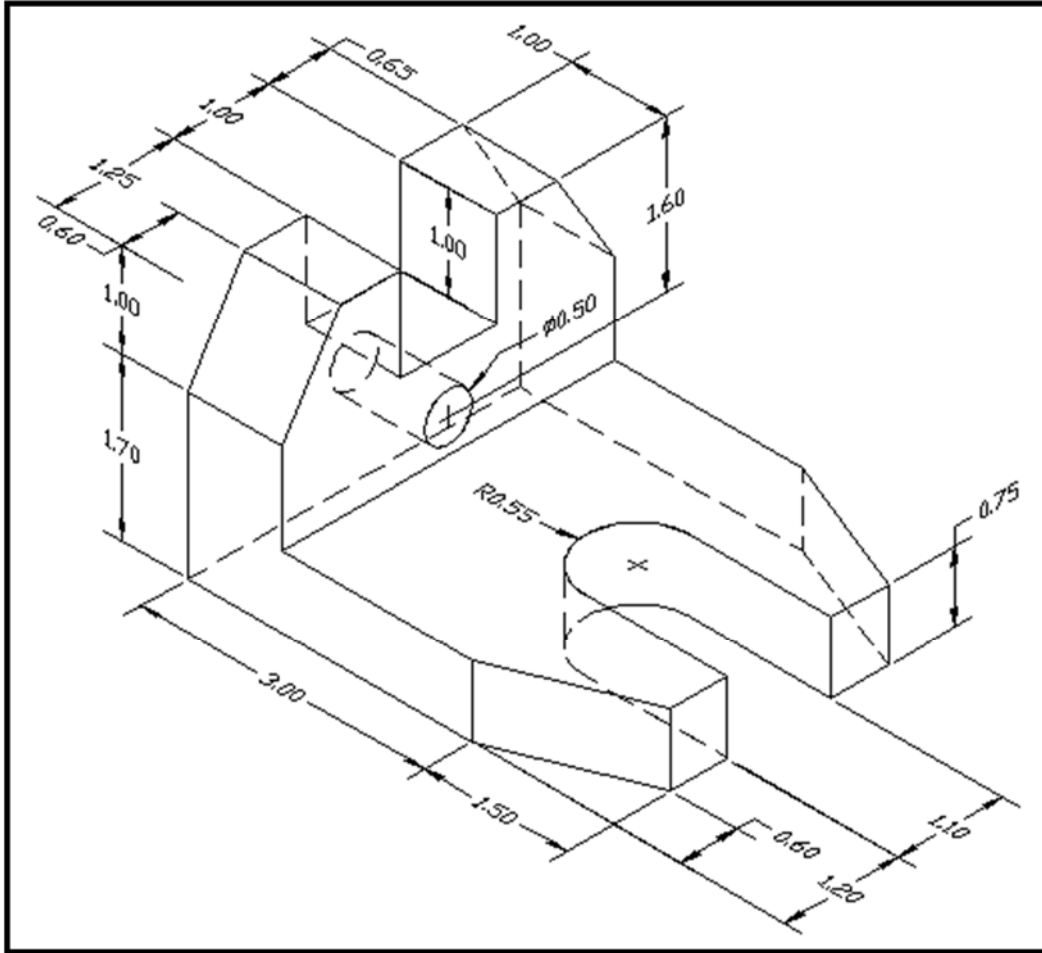


Engr 210 – Engineering Graphics
Lab #13 – Wireframe Modeling

This exercise will develop facility in visualizing three-dimensional objects, and creating three-dimensional models using wireframes.



1. Start by opening a new file.
2. In the *Select Template* manager, **left-mouse-click** on the *triangular* button to the right of the *Open* button, and select *Open with no Template – Imperial*.
3. In the *Status Bar* area, reset the options and turn **ON** the *GRID*, *POLAR*, *OSNAP*, *LWT* and *MODEL* options.
4. Create the rectangular base of the solid by selecting the *Line* icon in the *Draw* toolbar. In the command prompt area, the message “*Specify first point:*” is displayed.

Command: `_line Specify first point: 0,0 [ENTER]`
(Type 0,0 in the command prompt area and press the [ENTER] key.)

5. We will create a 4.5" × 3.5" rectangular by entering the absolute coordinates of the other corners.

Specify next point or [Undo]: 4.5,0 [ENTER]

Specify next point or [Undo]: 4.5,3.5 [ENTER]

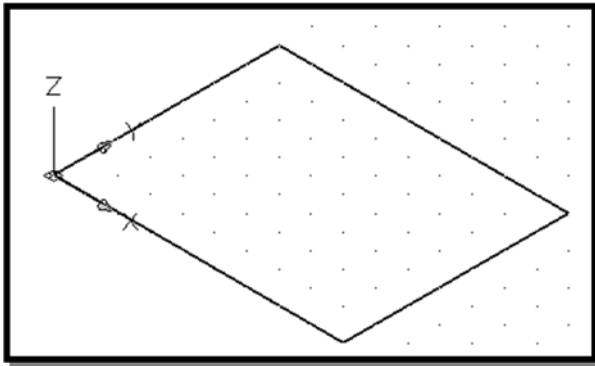
Specify next point or [Undo]: 0,3.5 [ENTER]

6. Close the rectangle by clicking on the starting point.

7. In the pull-down menus, select:

[View] => [3D Views] => [SE Isometric]

- Notice the orientation of the sketched 2D rectangle in relation to the displayed AutoCAD user coordinate system. By default, the 2D sketch-plane is aligned to the XY plane of the world coordinate system.



The next several steps will create a three-dimensional box that will serve as the boundary of the wireframe model.

8. Click on the *Copy* icon in the *Modify* toolbar. Pick the edges of the rectangle as the object to copy.

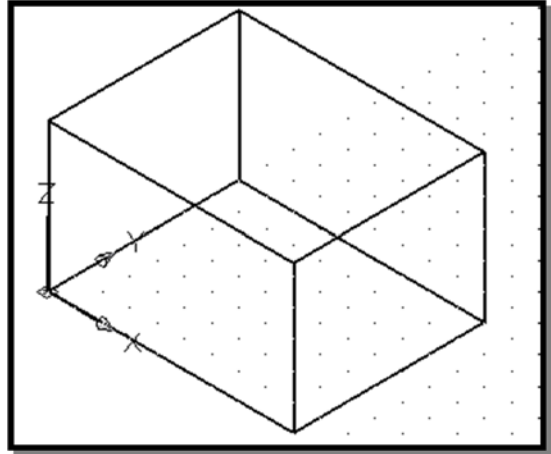
9. Inside the graphics window, right-mouse-click once to end the selection.

10. In the command prompt area, the message “*Specify base point or displacement, or [Multiple]:*” is displayed. Pick any corner of the sketched rectangle as a base point to create the copy.

11. In the command prompt area, the message “*Specify second point of displacement or <use first point as displacement>.*” is displayed.

Enter: @0,0,2.7 [ENTER]

12. Use the **Line** command to create the 3D box as shown.



13. Select the **Line** icon in the *Draw* toolbar.

14. In the command prompt area, the message “*line Specify first point:*” is displayed. Select **Snap From** in the *Object Snap* toolbar.

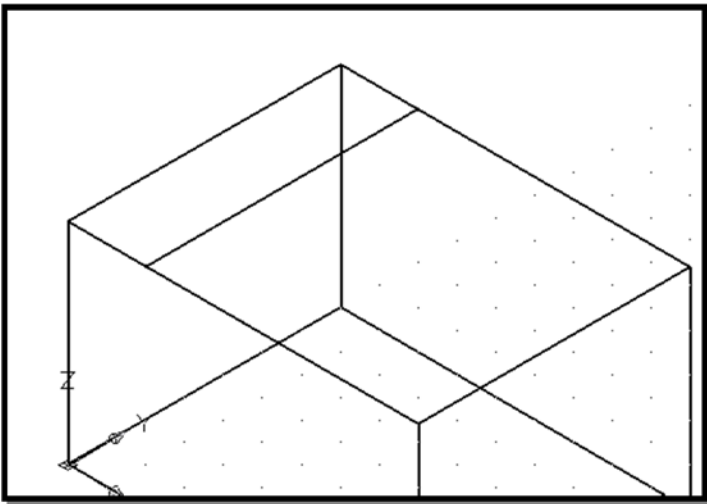
15. Select the **top-back corner** of the box as the reference point.

16. In the command prompt area, the message “*line Specify first point: _from Base point <Offset>:*” is displayed.

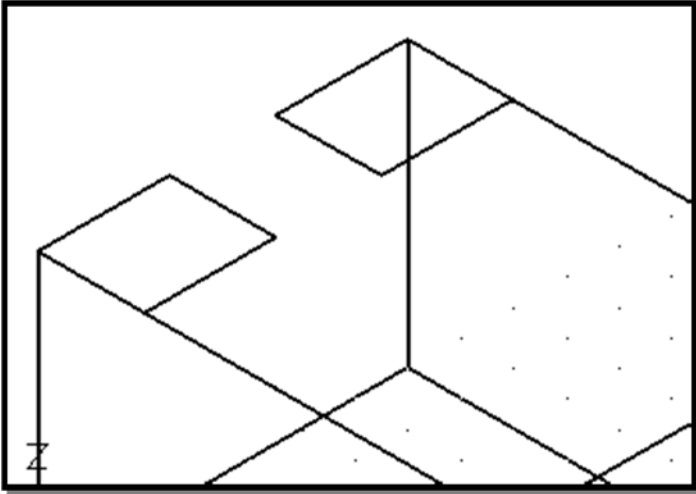
Command: @1,0,0 [ENTER]

17. In the command prompt area, the message “*Specify next point or [Undo] .*” is displayed.

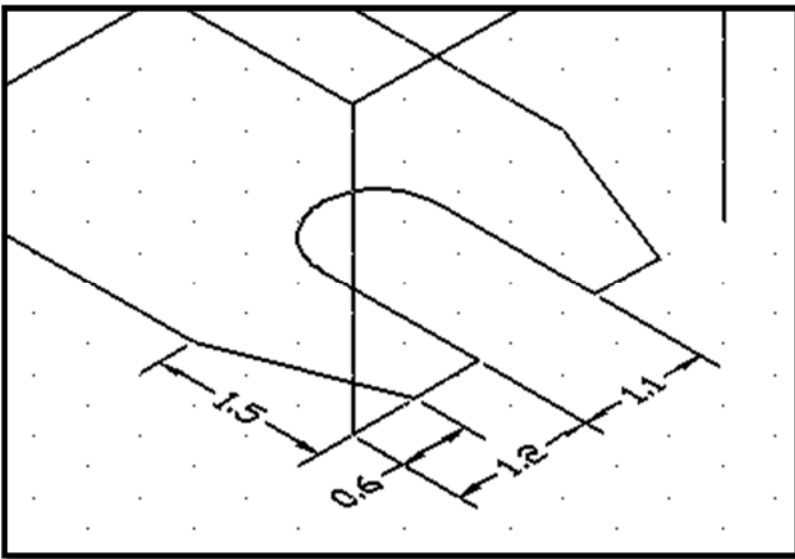
Command. Specify next point or [Undo]. @0,-3.5,0 [ENTER]



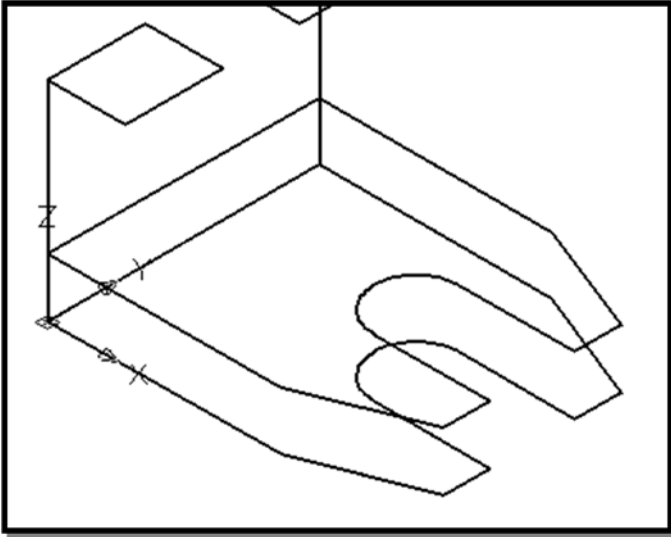
18. Using the **Line** command and the **Snap From** option in the *Object Snap* toolbar, create the remaining lines in the top plane. Use the **Trim** command to trim away unwanted lines. (Use the dimensions given on the first page of this handout.) Note that the trim command only works when the trimming entity and the entity to trim are both parallel to the x-y plane.



19. Using the **Line** command, the **Snap From** option in the **Object Snap** toolbar, and the **Circle** command, create the geometry shown in bottom plane. Use the **Trim** command to trim away unwanted lines.



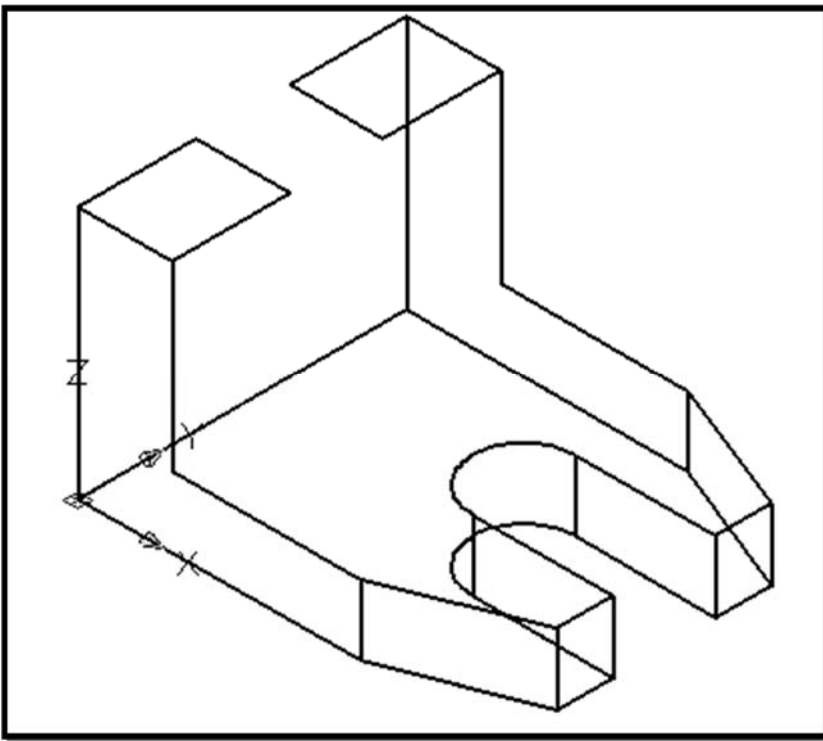
20. Click on the **Copy** icon in the **Modify** toolbar.
21. In the command prompt area, the message “*Select objects*” .“ is displayed. Pick the edges of the bottom plane.
22. Inside the graphics window, **right-mouse-click** once to end the selection.
23. In the command prompt area, the message “*Specify base point or displacement, or [Multiple]:*” is displayed. Pick any corner of the rectangle to be used as a base point to create the copy.



24. In the command prompt area, the message “*Specify second point of displacement or <use first point as displacement>:*” is displayed.

Enter: **@0,0,0.75 [ENTER]**

25. Create the vertical lines connecting the corners of the bottom planes with those of the copy made in the previous step. Add remaining lines needed, and trim or erase unwanted ones.



26. To facilitate the creation of entities in the left plane, we will change the position of the User Coordinate System (UCS).

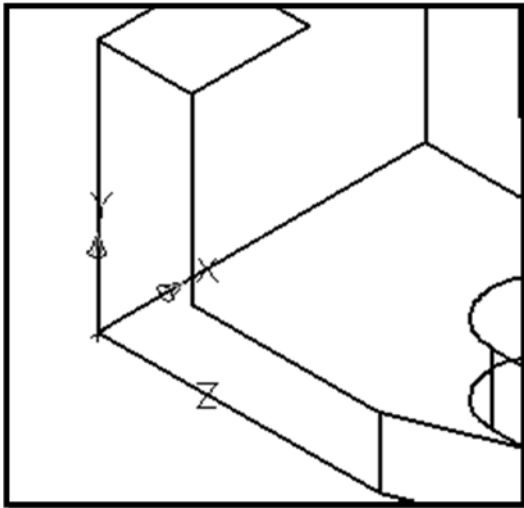
In the pull-down menus, select:

[Tools] => [New Ucs] => [3 Point]

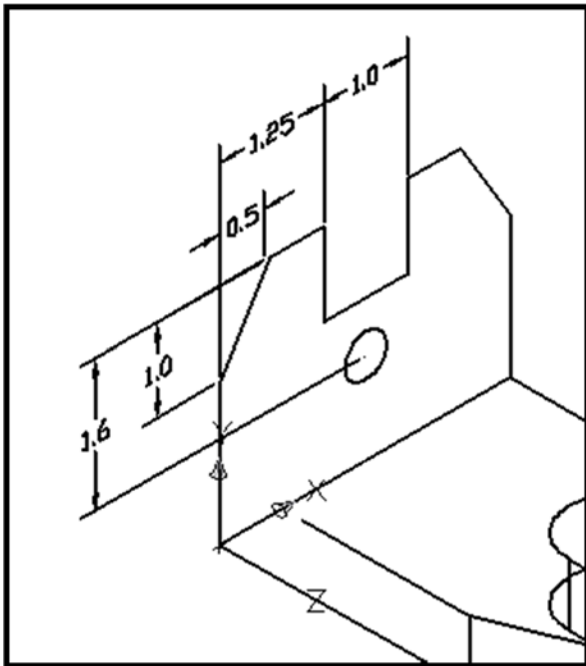
27. In the command prompt area, the message “*Specify new origin point <0,0,0>:*”, click on the

lower, left corner of the **frontal** plane.

28. In the command prompt area, the message “Specify point on positive portion of X-axis <1.0000,0.0000,0.0000>:”, click on the **lower, left corner** of the **back** plane (coordinates <0,3.5,0>).
29. In the command prompt area, the message “Specify point on positive-Y portion of the UCS XY plane <0.0000,1.0000,0.0000>:”, click on the **upper, left corner** of the **frontal** plane (coordinates <0,0,2.7>).

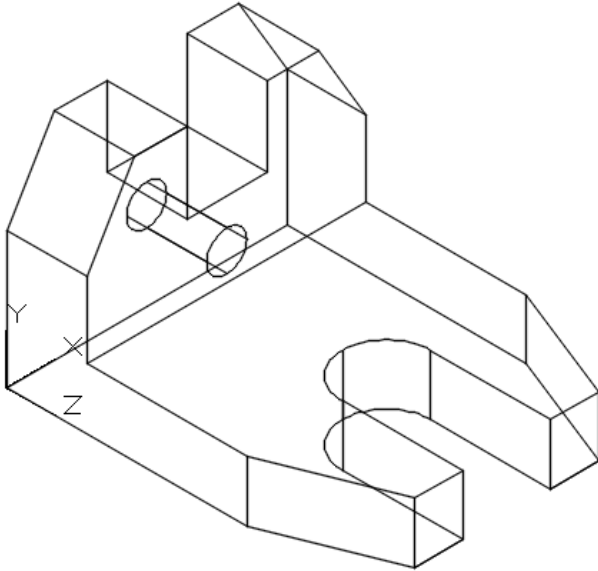


30. Notice the new position and orientation of the UCS icon.



30. Create the geometry on the left plane as shown. Be careful to take into account the new position of the User Coordinate System in specifying coordinates of points

31. Copy the geometric entities previously created in the left plane using the **Copy** icon in the **Modify** toolbar. Use relative coordinates of **@0,0,1** to indicate the position of the second point of displacement.



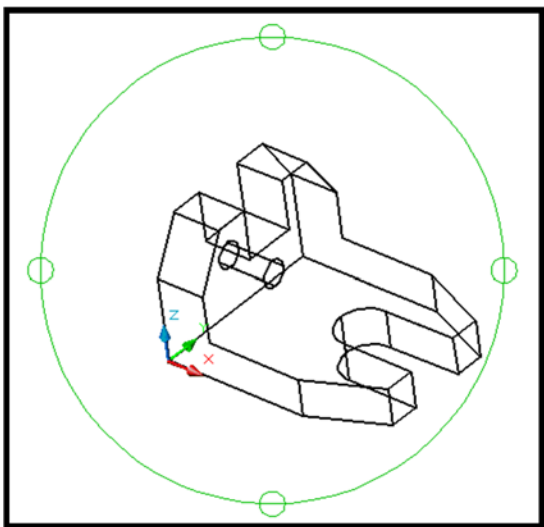
32. Complete the wireframe model by creating connecting lines of corresponding edges of the entities in the left plane and the copy made in the previous step. Make sure to create connecting lines between corresponding *Quadrants* of the two circles.
33. Save this drawing files as **Lab13-a.dwg**.

Using the View Toolbar

1. Move the cursor on top of any icon and **right-click** on any icon of the *Standard* toolbar to display a list of toolbar menu groups.
2. Select **View**, with the left-mouse-button, to display the *View* toolbar on the screen.
 - The *View* toolbar contains two sections of icons that allow us to quickly switch to standard 2D and 3D views.
3. On your own, examine the wireframe model by using the different icons in the *View* toolbar.

Dynamic Rotation — 3D orbit

1. In the pull-down menus, select: **[View] => [Orbit] => [Free Orbit]**.



- The *3D-Orbit* view displays an **arcball**, which is a circle, divided into four quadrants by smaller circles. *3D-Orbit* enables us to manipulate the view of 3D objects by clicking and dragging with the left-mouse-button.

2. Inside the *arcball*, press down the left-mouse-button and drag it up and down to rotate about the screen X-axis. Dragging the mouse left and right will rotate about the screen Y-axis. Inspect the accuracy of your wireframe as you slowly rotate the model.
3. Move the cursor to different locations on the screen, outside the *arcball* or on one of the four small circles, and experiment with the real-time dynamic rotation feature of the *3D-ORBIT* command.

Assignment:

Create a wireframe model of the solid whose front and top views are given below. The dimensions are in mm. Save this drawing as **Lab13-b.dwg**.

