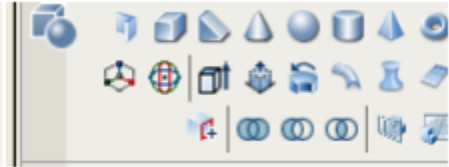



ZTM112 BİLGİSAYAR DESTEKLİ ÇİZİM TEKNİĞİ

- Yrd.Doç.Dr.Caner KOÇ
- Ankara Üniversitesi Ziraat Fakültesi Tarım Makinaları ve Teknolojileri Mühendisliği Bölümü
- ckoc@ankara.edu.tr

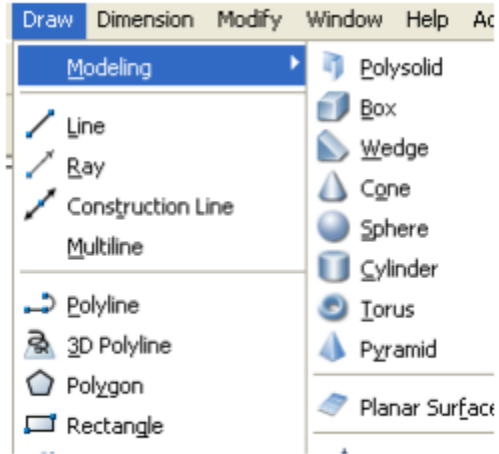
Primitives



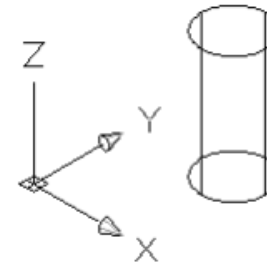
- Modeling toolbar: 
- Draw menu: Modeling » Box
- Command entry: **box**
- Dashboard: 3D Make panel, Box

- Modeling toolbar: 
- Draw menu: Modeling » Cylinder
- Command entry: **cylinder**
- Dashboard: 3D Make panel, Cylinder

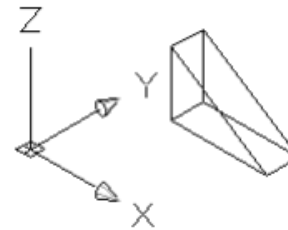
- Modeling toolbar: 
- Draw menu: Modeling » Wedge
- Command entry: **wedge**
- Dashboard: 3D Make panel, Wedge



Command: **cylinder** <Enter>
Specify center point of base or [3P/2P/Ttr/Elliptical]:
{Pick a point anywhere on screen}
Specify base radius or [Diameter]: **1** <Enter>
Specify height or [2Point/Axis endpoint] <2.0000>: **4** <Enter>



Command: **wedge** <Enter>
Specify first corner or [Center]: <Enter>
Specify other corner or [Cube/Length]: **L** <Enter>
Specify length <3.0000>: **3** <Enter>
Specify width <4.0000>: **1** <Enter>
Specify height or [2Point] <2.0000>: **2** <Enter>





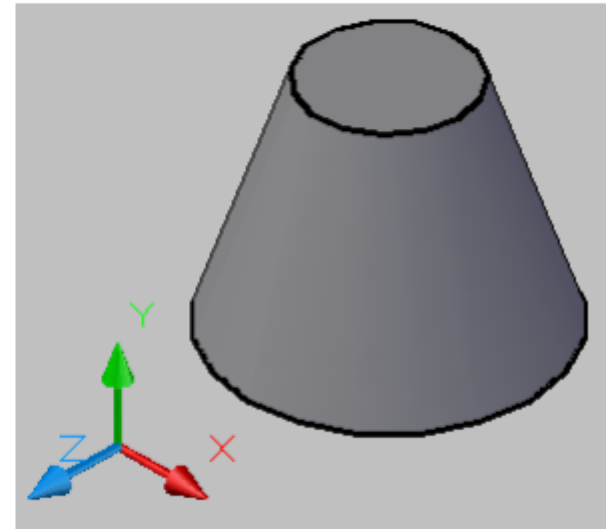
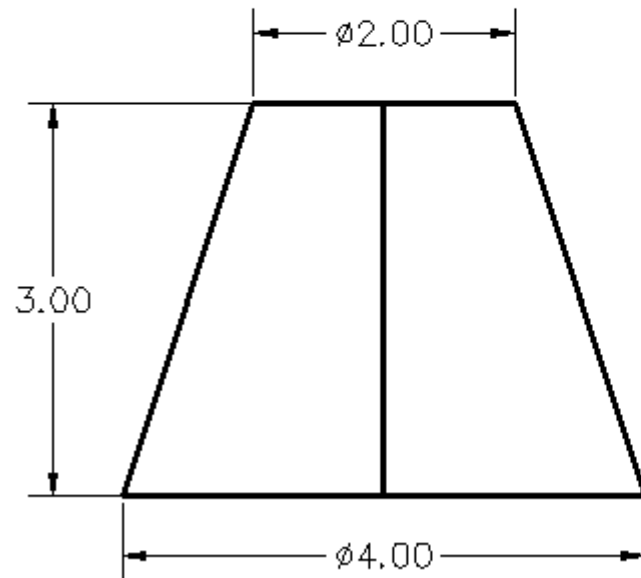
Toolbar: Modeling

Menu: Draw > Modeling > Cone

Command entry: **cone**

Dashboard: 3D Make panel, Cone

Command: `_cone` <Enter>
Specify center point of base or [3P/2P/Ttr/Elliptical]: `5,5` <Enter>
Specify base radius or [Diameter] `2` <Enter>
Specify height or [2Point/Axis endpoint/Top radius] <0000>: `_top`
Specify top radius `1` <Enter>
Specify height or [2Point/Axis endpoint] `3` <Enter>





Modeling toolbar:

Draw menu: Modeling » Pyramid

Command entry: **pyramid**

Dashboard: 3D Make panel, Pyramid

Command: **pyramid** <Enter>

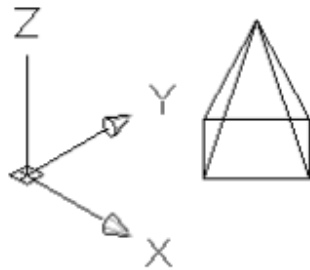
4 sides Circumscribed

Specify center point of base or [Edge/Sides]:

{Pick a point anywhere on screen}

Specify base radius or [Inscribed] <1.0000>: **1** <Enter>

Specify height or [2Point/Axis endpoint/Top radius] <2.0000>: **3**
<Enter>



Command: **pyramid** <Enter>

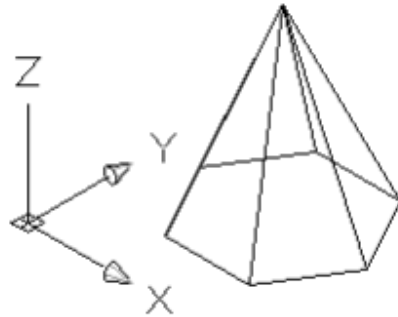
4 sides Circumscribed

Specify center point of base or [Edge/Sides]: **S** <Enter>

{Pick a point anywhere on screen}

Specify base radius or [Inscribed] <1.0000>: **2** <Enter>

Specify height or [2Point/Axis endpoint/Top radius] <2.0000>: **5**
<Enter>



Command: **pyramid** <Enter>

4 sides Circumscribed

Specify center point of base or [Edge/Sides]: **s** <Enter>

Enter number of sides <4>: **5** <Enter>

Specify center point of base or [Edge/Sides]:

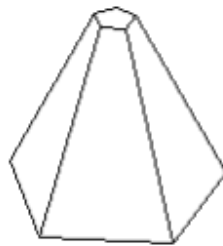
Pick a point anywhere on screen}

Specify base radius or [Inscribed]: <Enter>

Specify height or [2Point/Axis endpoint/Top radius] <-9.2512>: **t**
<Enter>

Specify top radius <0.0000>: **.5** <Enter>

Specify height or [2Point/Axis endpoint] <-9.2512>: **6** <Enter>





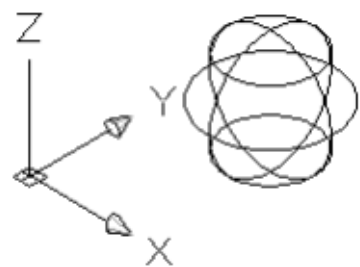
Modeling toolbar:

Draw menu: Modeling » Sphere

Command entry: **sphere**

Dashboard: 3D Make panel, Sphere

Command: **sphere** <Enter>
Specify center point or [3P/2P/Ttr]:
{Pick a point anywhere on screen}
Specify radius or [Diameter] <2.3094>: 2
<Enter>



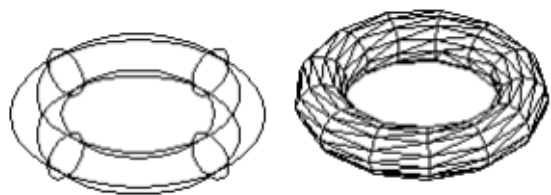
Modeling toolbar:

Draw menu: Modeling » Torus

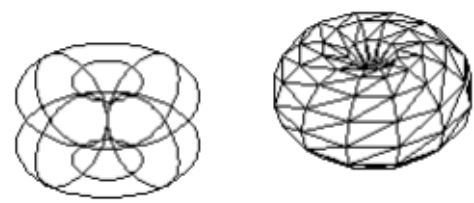
Command entry: **torus**

Dashboard: 3D Make panel, Torus

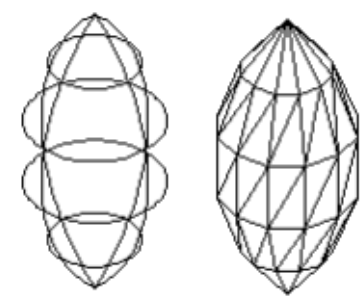
Command: **torus**
Specify center point or [3P/2P/Ttr]:
{Pick a point anywhere on screen}
Specify radius or [Diameter] <3.3282>: 4
Specify tube radius or [2Point/Diameter]: 1



Command: **torus**
Specify center point or [3P/2P/Ttr]:
{Pick a point anywhere on screen}
Specify radius or [Diameter] <3.0000>: 4
Specify tube radius or [2Point/Diameter] <6.0000>: 4



Command: **TORUS**
Specify center point or [3P/2P/Ttr]:
{Pick a point anywhere on screen}
Specify radius or [Diameter] <4.0000>: -1
Specify tube radius or [2Point/Diameter] <2.0000>:
1.5



Modeling toolbar: 

Draw menu: Modeling » Polysolid

Command entry: **polysolid**

Dashboard: 3D Make panel, Polysolid

Command: **polysolid** <Enter>
Specify start point or [Object/Height/Width/Justify] <Object>: **w**
<Enter>
Specify width <0.2500>: **.4** <Enter>
Specify start point or [Object/Height/Width/Justify] <Object>: **h**
<Enter>
Specify height <4.0000>: **3** <Enter>
Specify start point or [Object/Height/Width/Justify] <Object>:
{Pick a point anywhere on screen}
Specify next point or [Arc/Undo]: <Ortho on> **3** <Enter>
Specify next point or [Arc/Undo]: **2** <Enter>
Specify next point or [Arc/Close/Undo]: **3** <Enter>
Specify next point or [Arc/Close/Undo]: **c** (Figure A)

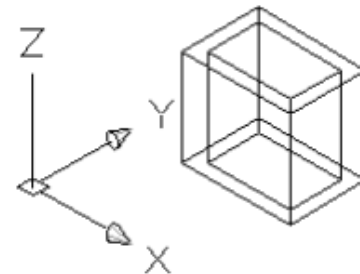
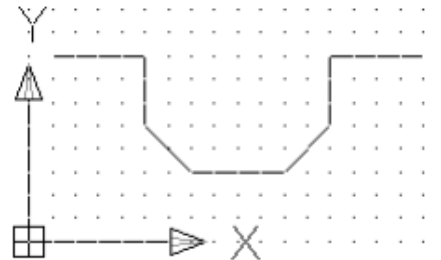


Figure A

Using the **POLYLINE** command (**PL**), to create the figure "A".

Use **POLYSOLID** command; select "Object" option to construct Figure "C".



Grid space = 0.25

Figure B

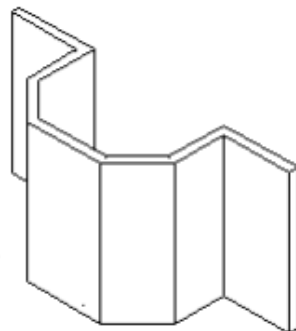
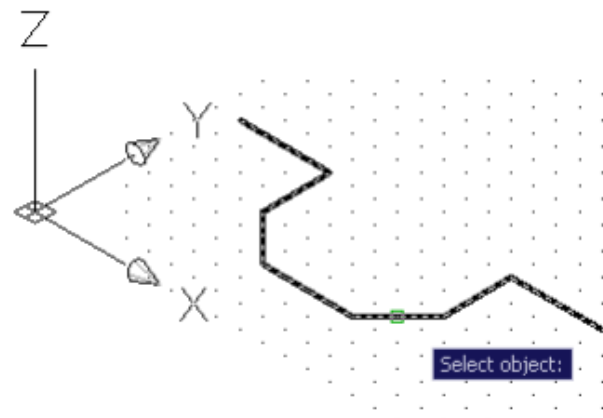


Figure C

Constructing a Planar Surface



Modeling toolbar:

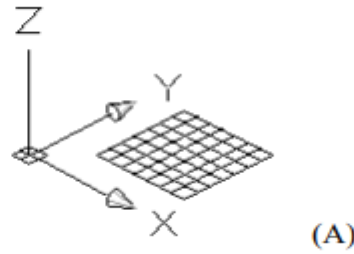
Draw menu: Modeling > Planar Surface

Command entry: **planesurf**

Dashboard: 3D Make panel, Planar Surface

Command: **_Planesurf** <Enter>
Specify first corner or [Object] <Object>: **4,4**
<Enter>
Specify other corner: **10,10** <Enter> (Fig. A)

Command: **l** <Enter>
LINE Specify first point: 11,11 <Enter>
Specify next point or [Undo]: **@10<90** <Enter>
Specify next point or [Undo]: <Enter>



(A)

Command: **o** <Enter>
OFFSET
Current settings: Erase source=No Layer=Source
OFFSETGAPTTYPE=0
Specify offset distance or [Through/Erase/Layer] <1.0000>: **5**
<Enter>

Select object to offset or [Exit/Undo] <Exit>: *{Select the line}*
Specify point on side to offset or [Exit/Multiple/Undo] <Exit>:
{select the side}

Use the ARC 3-point option to draw two arc as shown.
(Figure B)



Figure A



Figure B

Command: **_Planesurf** <Enter>
Specify first corner or [Object] <Object>: **o** <Enter>
Select objects: *{select line}* 1 found
Select objects: *{select the line}* 1 found, 2 total
Select objects: *{select the arc}* 1 found, 3 total
Select objects: *{select the arc}* 1 found, 4 total
Select objects: <Enter>

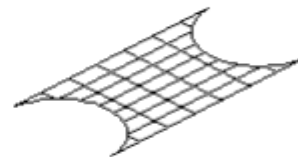


Figure C

 **Modify menu:** 3D Operations > Thicken

 **Command entry:** **thicken**

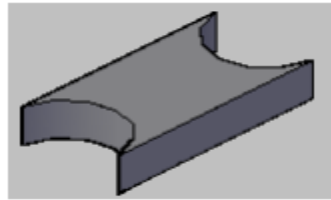
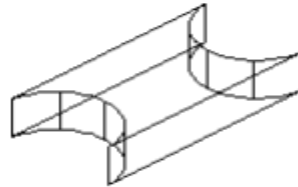
 **Dashboard:** 3D Make panel (click icon to expand), Thicken Surface

Command: **thicken** <Enter>

Select surfaces to thicken: {select the figure C/1 found


Select surfaces to thicken: <Enter>

Specify thickness <0.0000>: **2** <Enter>



(Figure D)

Figure D

 **Modify menu:** 3D Operations > Convert to Surface

 **Command entry:** **convtosurface**

 **Dashboard:** 3D Make panel (click icon to expand), Convert to Surface

With the CONVTSOLID command, you can convert the following objects into extruded 3D solids:

- *Uniform-width wide polylines with thickness*
- *Closed, zero-width polylines with thickness*
- *Circles with thickness*

Note You cannot use CONVTSOLID with polylines that contain vertices with 0 width or that contain segments of variable width.

Using the POLYLINE command, construct the figure E, and then cover it to a solid model.

Command: **PLINE** <Enter>

Specify start point: **25,25** <Enter>

Current line-width is 0.0000

Specify next point or

[Arc/Halfwidth/Length/Undo/Width]:

@5<90 <Enter>

Specify next point or

[Arc/Close/Halfwidth/Length/Undo/Width]:

a <Enter>

Specify endpoint of arc or

[Angle/Center/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width]: **1**

<Enter>

Specify endpoint of arc or

[Angle/Center/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width]: **2**

<Enter>

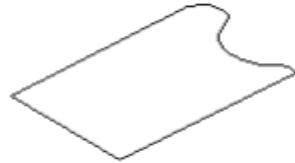


Figure E

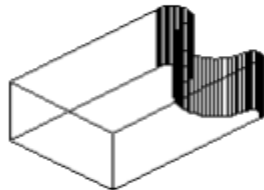
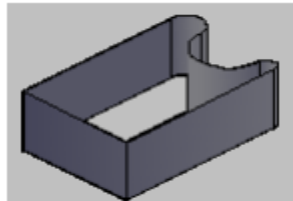


Figure F





Modeling toolbar

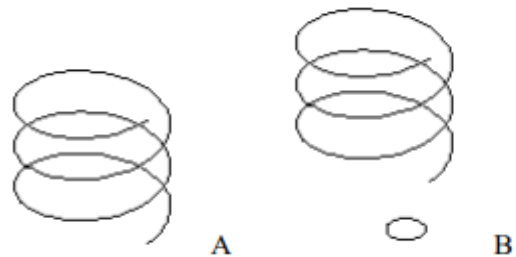
Command entry: **HELIX**

Dashboard: 3D Make panel (click icon to expand), Helix

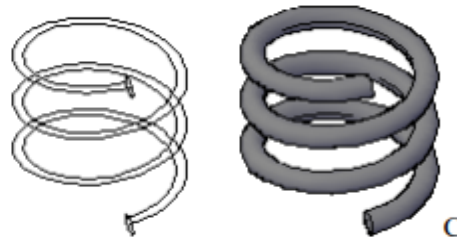
Construct a solid model of a spring. Create a centerline as shown on the following figures. Use this centerline as a path to extrude a circle through.

Command: **helix** <Enter>
Number of turns = 3.0000 Twist=CCW
Specify center point of base: *{pick a point on screen}*
Specify base radius or [Diameter] <1.0000>: **.5** <Enter>
Specify top radius or [Diameter] <1.0000>: **.5** <Enter>
Specify helix height or [Axis endpoint/Turns/turn Height/tWist] <1.0000>:<Enter>
(Figure A)

Draw a circle with 0.125 diameter. (Figure B)



Command: **_sweep** <Enter>
Current wire frame density: ISOLINES=4
Select objects to sweep: *{pick the circle}* 1 found
Select objects to sweep: <Enter>
Select sweep path or [Alignment/Base point/Scale/Twist]: *{pick the helix}*





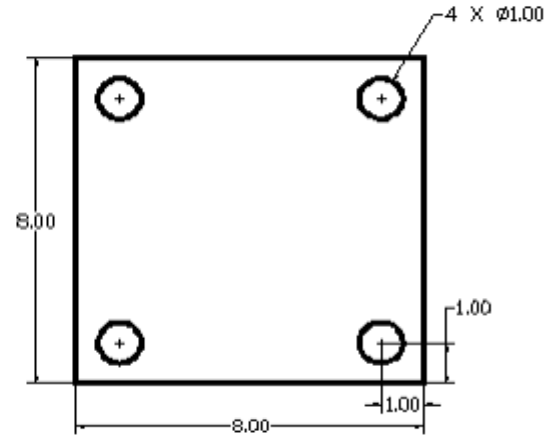
Draw toolbar:

Draw menu: Region

Command entry: **region**

Construct the following 2D shape and convert it to 2D Region Model:

Command: **_region** <Enter>
Select objects: 1 found {select the square and four circles}
Select objects: 1 found, 2 total
Select objects: 1 found, 3 total
Select objects: 1 found, 4 total
Select objects: 1 found, 5 total
Select objects: <Enter>
5 loops extracted.
5 Regions created

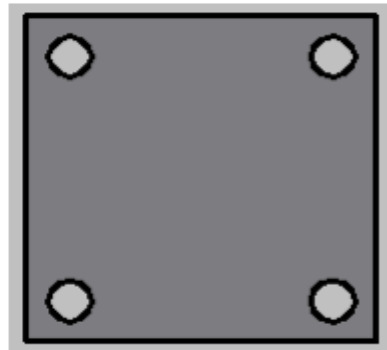


View Conceptual:

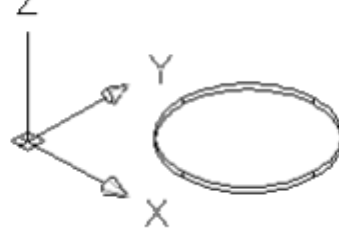
Command: **_vscurrent**
Enter an option
[2dwireframe/3dwireframe/3dHidden/Realistic/Conceptual/Other]
<2dwireframe>: **_C**

Command: **subtract** <Enter>
Select solids and regions to subtract from ..
Select objects: 1 found {select the square}
Select objects: <Enter>

Select solids and regions to subtract ..
Select objects: {select the four circles} 1 found
Select objects: 1 found, 2 total
Select objects: 1 found, 3 total
Select objects: 1 found, 4 total
Select objects: <Enter>

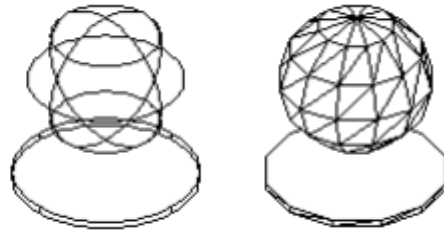


Command: **cylinder** <Enter>
 Specify center point of base or [3P/2P/Ttr/Elliptical]: **10,10**
 <Enter>
 Specify base radius or [Diameter] <6.0000>: **6** <Enter>
 Specify height or [2Point/Axis endpoint] <-3.0000>: **.5** <Enter>



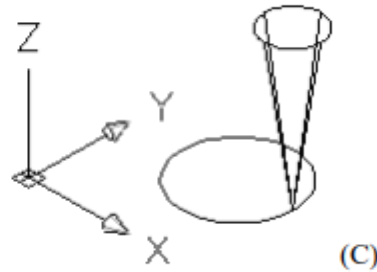
(A)

Command: **sphere** <Enter>
 Specify center point or [3P/2P/Ttr]: **10,10,8** <Enter>
 Specify radius or [Diameter] <6.0000>: **5** <Enter>



(B)

Command: **c** <Enter>
 CIRCLE Specify center point for circle or [3P/2P/Ttr (tan
 tan radius)]: **10,10,0.5** <Enter>
 Specify radius of circle or [Diameter] <6.0000>: **2**
 <Enter>

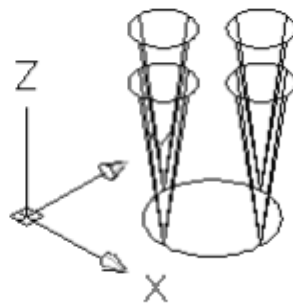


(C)

Command: **cone** <Enter>
 Specify center point of base or [3P/2P/Ttr/Elliptical]:
10,12,3.5 <Enter>
 Specify base radius or [Diameter] <0.5000>: **.5** <Enter>
 Specify height or [2Point/Axis endpoint/Top radius]
 <-3.0000>: **-3** <Enter>

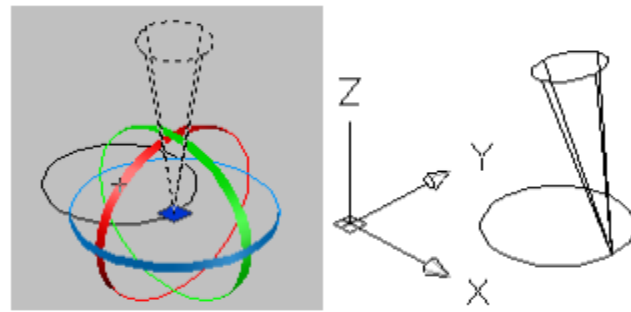
*Copy the cone to each quadrant of 4" diameter
 circle. (Figure D)*

*Rotate each cone 15° from the vertical axis.
 (figure E)*

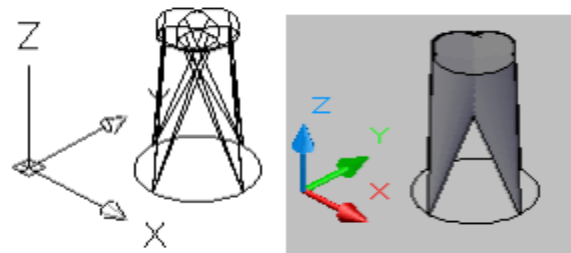


(D)

Command: **_3drotate** <Enter>
 Current positive angle in UCS:
 ANGDIR=counterclockwise
 ANGBASE=0
 Select objects: {select the cone}1 found
 Select objects: <Enter>
 Specify base point: {snap to the
 endpoint }; Figure E
 Pick a rotation axis: {left click on the
 green circle to rotate along Y axis}
 Specify angle start point: 15 <Enter>
 Regenerating model.

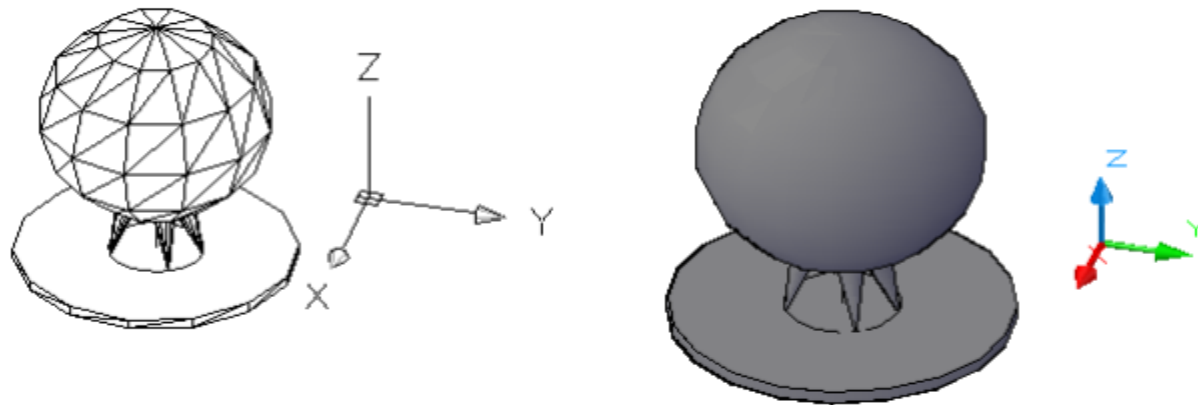


(E)



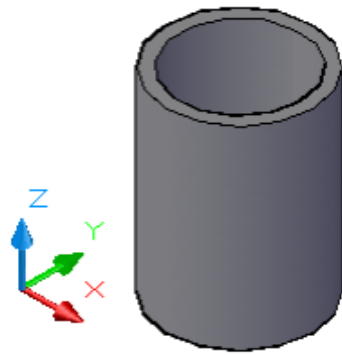
Command: **vpoint** <Enter>

Current view direction: VIEWDIR=1.0000,-
 1.0000,1.0000
 Specify a view point or [Rotate] <display
 compass and tripod>: **R** <enter>
 Enter angle in XY plane from X axis <315>:
15 <Enter>
 Enter angle from XY plane <35>: <Enter>
 (Figure F)



(F)

Command: **cylinder** <Enter>
 Specify center point of base or [3P/2P/Ttr/Elliptical]:
{select any point on screen}
 Specify base radius or [Diameter] <0.5000>: **2.5** <Enter>
 Specify height or [2Point/Axis endpoint] <0.0000>: **-7.5** <Enter>

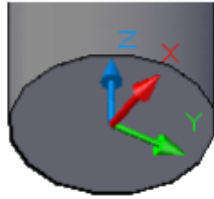


(A)

Command: <Enter>
CYLINDER
 Specify center point of base or [3P/2P/Ttr/Elliptical]: *{snap to center of the upper cylinder}*
 Specify base radius or [Diameter] <2.5000>: **3** <Enter>
 Specify height or [2Point/Axis endpoint] <-7.5000>: **-8** <Enter>

(Figure A)

Command: **ucs** <Enter>
 Current ucs name: *WORLD*
 Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAxis]
 <World>: **o** <Enter>
 Specify new origin point <0,0,0>:
{snap to center of the base}



(B)

Change the UCS (User Coordinate System) position from "C" to "D":

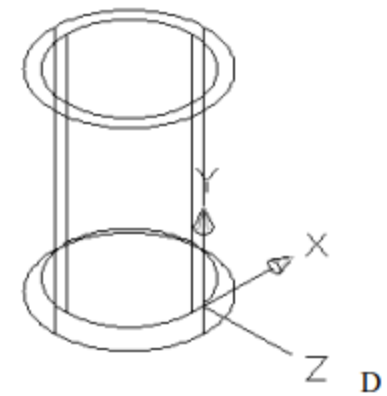
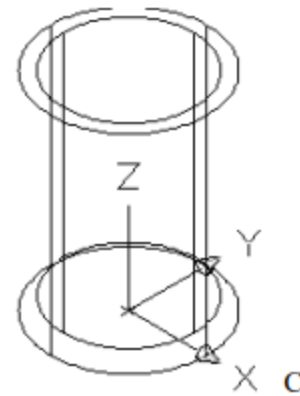
Command: **ucs** <Enter>
 Current ucs name: *NO NAME*
 Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAxis]
 <World>: **n** <Enter>

Specify origin of new UCS or [ZAxis/3point/OBject/Face/View/X/Y/Z] <0,0,0>: **3** <Enter>

Specify new **origin** point <0,0,0>: **3,0,1** <Enter>

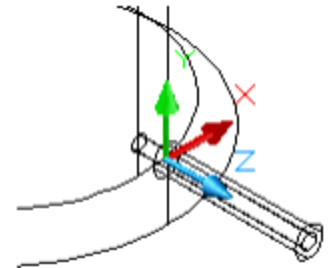
Specify point on positive portion of **X**-axis <4.0000,0.0000,1.0000>: **@ 3<90** <Enter>

Specify point on positive-**Y** portion of the UCS XY plane <2.0000,0.0000,1.0000>:
@0,0,3 <Enter>



Command: **cylinder** <Enter>
 Specify center point of base or [3P/2P/Ttr/Elliptical]: **0,0** <Enter>
 Specify base radius or [Diameter] <0.00>: **.25** <Enter>
 Specify height or [2Point/Axis endpoint] <5.0000>: **2.5** <Enter>

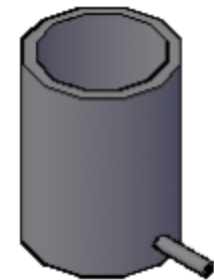
Command: **cylinder** <Enter>
 Specify center point of base or [3P/2P/Ttr/Elliptical]: *{snap to the center of the .25" diameter cylinder}*
 Specify base radius or [Diameter] <0.2500>: **.125** <Enter>
 Specify height or [2Point/Axis endpoint] <2.5000>: **-3** <Enter>



E

(Figure E)

Subtract these two cylinders to create .125 diameter tube. {Figure F}



F

Text and Dimensions in 3D

- Creating Text with Thickness
- Dimensioning in 3D

3. Exercise 14-1

Construct the following 3D solid model, add a single TEXT with default height and thickness of .125. Complete the dimensions as shown. (Figure 1)

You need to switch the work plane as necessary, using UCS "3point" or "Face" option.

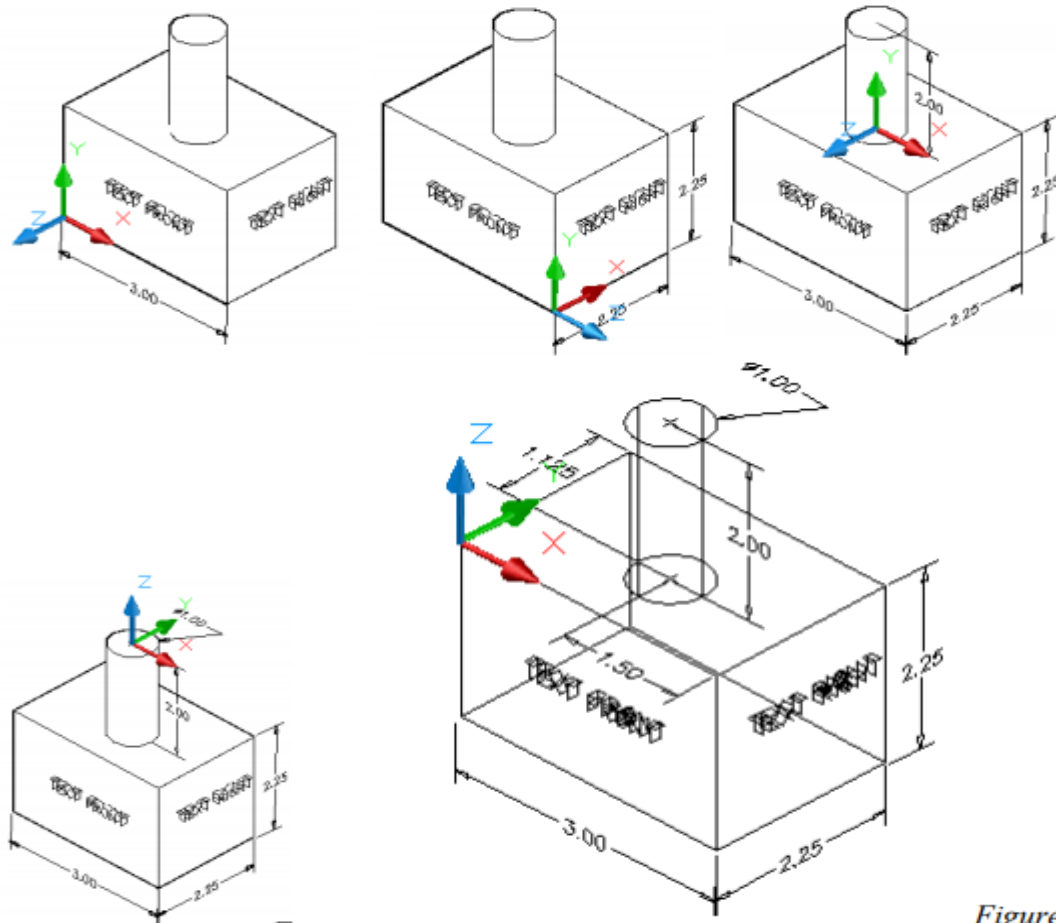


Figure -1