

## **LEARNING OBJECTIVES**

*After completing this lesson, you will be able to:*

1. Draw an Inscribed or Circumscribed Polygon
2. Create an Ellipse using two different methods
3. Define an Elliptical Arc
4. Create Donuts
5. Define a Location with a Point
6. Select various Point Styles
7. Use 3 new Object Snap modes

# **LESSON 5**

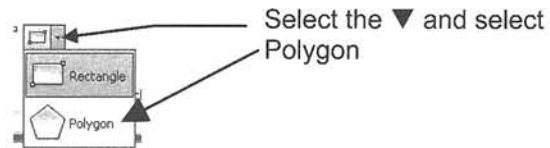
# POLYGON

A polygon is an object with multiple edges (flat sides) of equal length. You may specify from 3 to 1024 sides. A polygon appears to be multiple lines but in fact it is one object. You can specify the center and a radius or the edge length. The radius size can be specified Inscribed or Circumscribed.

## CENTER, RADIUS METHOD

1. Select the **Polygon** command using one of the following:

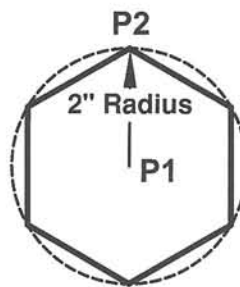
**Ribbon = Home tab / Draw panel /**  
**or**  
**Keyboard = POL <enter>**



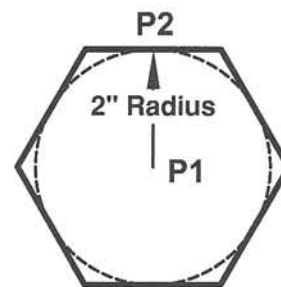
2. The following prompts will appear on the command line:

\_polygon Enter number of sides <4>: **type number of sides <enter>**  
Specify center of polygon or [Edge]: **specify the center location (P1)**  
Enter an option [Inscribed in circle/Circumscribed about circle]<I>: **type I or C<enter>**  
Specify radius of circle: **type radius or locate with cursor. (P2)**

Note:  
The dashed circle is shown only as a reference to help you visualize the difference between Inscribed and Circumscribed. Notice that the radius is the same (2") but the Polygons are different sizes. Selecting Inscribed or Circumscribed is important.



INSCRIBED



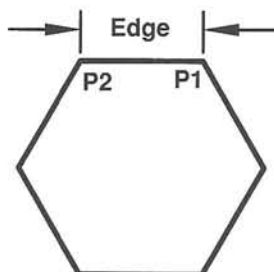
CIRCUMSCRIBED

## EDGE METHOD

1. Select the **Polygon** command using one of the options shown above.

2. The following prompts will appear on the command line:

\_polygon Enter number of sides <4>: **type number of sides <enter>**  
Specify center of polygon or [Edge]: **type E <enter>**  
Specify first endpoint of edge: **place first endpoint of edge (P1)**  
Specify second endpoint of edge: **place second endpoint of edge (P2)**


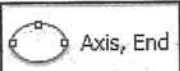


# ELLIPSE

There are 3 methods to draw an Ellipse. You may (1) specify 3 points of the axes, (2) define the center point and the axis points or (3) define an elliptical Arc. The following 3 pages illustrates each of the methods.

## AXIS END METHOD

1. Select the **ELLIPSE** command using one of the following:

Ribbon = Home tab / Draw panel  /  Axis, End  
or  
Keyboard = EL <enter>

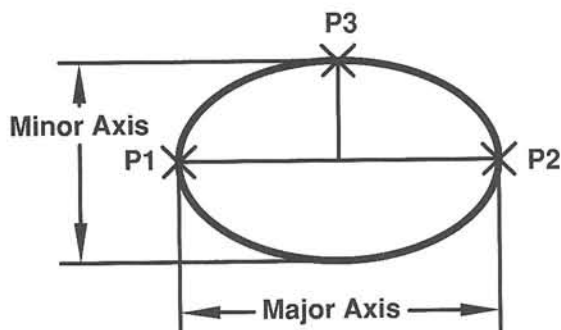
2. The following prompts will appear on the command line:

Command: `_ellipse`

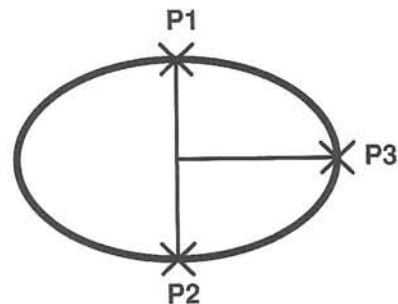
Specify axis endpoint of ellipse or [Arc/Center]: **place the first point of either the major or minor axis (P1).**

Specify other endpoint of axis: **place the other point of the first axis (P2)**

Specify distance to other axis or [Rotation]: **place the point perpendicular to the first axis (P3).**



Specifying Major Axis first (P1/P2),  
then Minor Axis (P3)




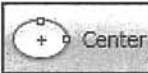
Specifying Minor Axis first (P1/P2),  
then Major Axis (P3)

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# ELLIPSE....continued

## CENTER METHOD

1. Select the **ELLIPSE** command using one of the following:

Ribbon = Home tab / Draw panel  /  Center  
or  
Keyboard = EL <enter> C <enter>

2. The following prompts will appear on the command line:

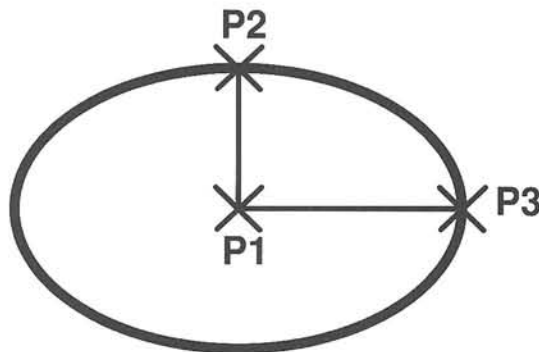
Command: `_ellipse`

Specify axis endpoint of ellipse or [Arc/Center]: `_c`

Specify center of ellipse: ***place center of ellipse (P1)***

Specify endpoint of axis: ***place first axis endpoint (either axis) (P2)***

Specify distance to other axis or [Rotation]: ***place the point perpendicular to the first axis (P3)***


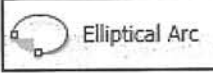


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# ELLIPSE....continued

## ELLIPTICAL ARC METHOD

1. Select the **ELLIPSE** command using one of the following:

Ribbon = Home tab / Draw panel  /  Elliptical Arc  
or  
Keyboard = EL <enter> A <enter>

2. The following prompts will appear on the command line:

Command: \_ellipse

Specify axis endpoint of ellipse or [Arc/Center]: \_a

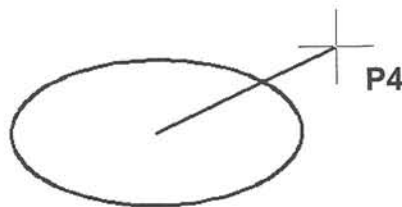
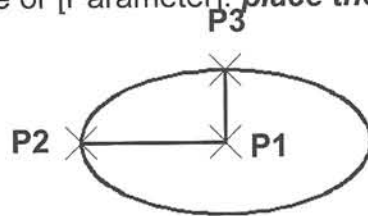
Specify axis endpoint of elliptical arc or [center]: **type C <enter>**

Specify center of axis: **place the center of the elliptical arc (P1)**

Specify endpoint of axis: **place first axis point (P2)**

Specify distance to other axis or [Rotation]: **place the endpoint perpendicular to the first axis (P3)**

Specify start angle or [Parameter]: **place the start angle (P4)**



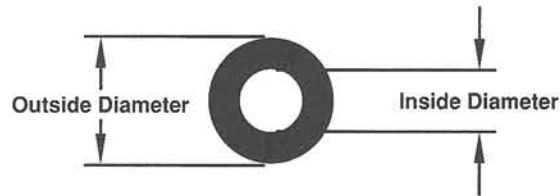
Specify end angle or  
**place end angle (P5)**

[Parameter/Included angle]:




# DONUT

A Donut is a circle with **width**. You will define the **Inside** and **Outside** diameters.



1. Select the **DONUT** command using one of the following:

**Ribbon = Home tab / Draw panel ▼ / **  
or  
**Keyboard = DO <enter>**

2. The following prompts will appear on the command line:

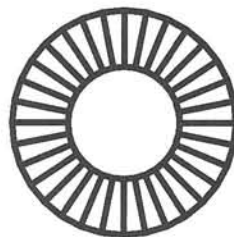
Command: `_donut`  
Specify inside diameter of donut: ***type the inside diameter <enter>***  
Specify outside diameter of donut: ***type the outside diameter <enter>***  
Specify center of donut or <exit>: ***place the center of the first donut***  
Specify center of donut or <exit>: ***place the center of the second donut or <enter> to stop***

## Controlling the “FILL MODE”

1. Command: ***type FILL <enter>***
2. Enter mode [ON / OFF] <OFF>: ***type ON or OFF <enter>***
3. Type ***REGEN <enter>*** to regenerate the drawing to show the latest setting of the ***FILL*** mode.



**FILL = ON**



**FILL = OFF**

# POINT

**Points** are used to locate a point of reference or location. A **Point** may be represented by one of many **Point Styles** shown below in the Point Style box.

The only object snap option that can be used with Point is **Node**.  
(Refer to the next page for more information on Node object snap)

## HOW TO USE THE POINT COMMAND

1. Select the **POINT** command using one of the following:

**Ribbon = Home tab / Draw panel ▼ / **

**or**

**Keyboard = PO <enter>**

2. The following prompts will appear on the command line:

Command: `_point`

Current point modes: `PDMODE=3 PDSIZE=0.000`

Specify a point: *place the point location*

Specify a point: *place another point or press the “ESC” key to stop*

## HOW TO SELECT A “POINT STYLE”

1. Open the Point Style dialog box:

**Ribbon = Home tab / Utilities panel ▼ / Point Style**

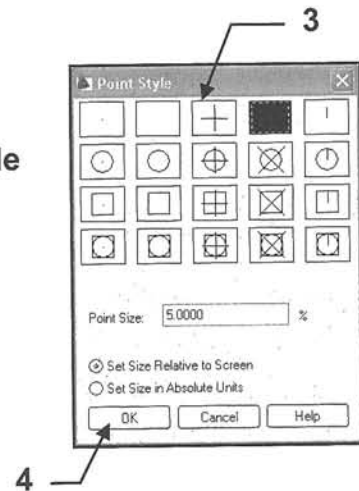
**or**

**Keyboard = ddptype <enter>**

2. The Point Style dialog box will appear.

3. Select a point style tile.

4. Select the **OK** button.



### Point Size:

#### Set Size Relative to Screen

Sets the point display size as a percentage of the screen size. The point display does not change when you zoom in or out

#### Set Size in Absolute Units

Sets the point display size as the actual units you specify under Point Size. Points are displayed larger or smaller when you zoom in or out.

# MORE OBJECT SNAPS

## 3 MORE OBJECT SNAP OPTIONS:



**NODe** This option snaps to the object "**POINT**" describe on the previous page

Select **Node** object snap and place the cursor on the **POINT**. The cursor will snap to the **POINT**.

Note: This is the **ONLY** object snap that you can use with the object **POINT**.



**NEArest** Snaps to the nearest location on an object.

*For example, if you want to attach a Line somewhere on a Circle between quadrants.*

Select the Line command then select **Nearest** object snap.

Place the cursor anywhere on the circumference of the Circle and press the left mouse button. The Line will now be accurately attached to the Circle at the location you selected.



**M2P** **Mid Between 2 Points**

Locates a midpoint between two points

*You may select this option from the object snap menu (shift+Rt Click) or you may type **M2P <enter>** when prompted for an endpoint. No tool or running object snap option is available.*

### HOW TO USE "MTP":

1. Select the Line command and draw 2 parallel lines.



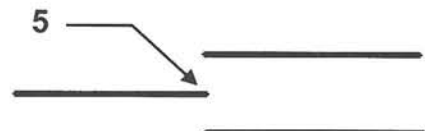
2. Select the **Line** command again.

3. Type **M2P <enter>**

4. Using **Endpoint object snap** select each of the 2 endpoints (P1) and (P2)



5. The new line's first endpoint should start exactly midpoint between those 2 endpoints.

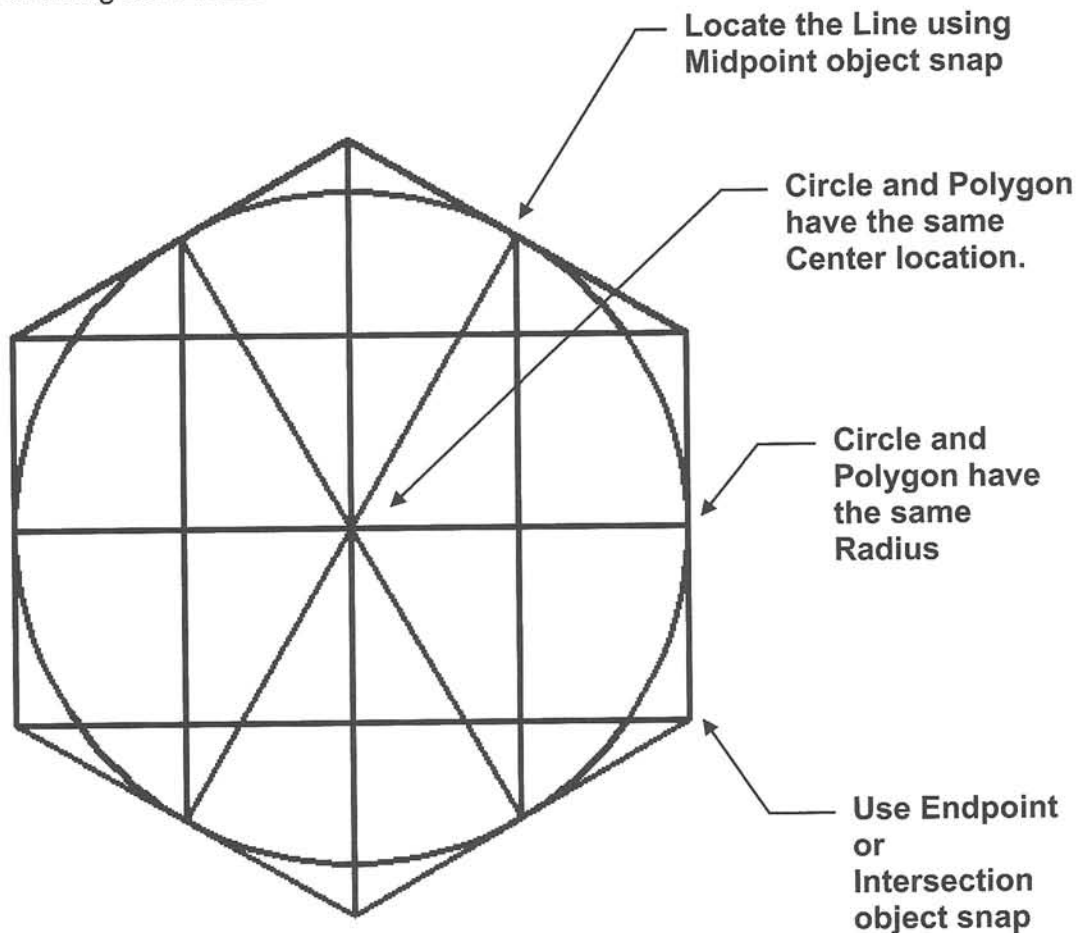




# EXERCISE 5A

## INSTRUCTIONS:

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. **Draw** the Circle first using the Center / Radius option.
3. Draw the Circumscribed Polygon next using object snap Center to locate the center of the Polygon at the center of the Circle and Quadrant object snap to locate the radius of the Polygon on the Circle.
4. Draw the Lines last using Object snaps Midpoint and Endpoint.
5. **Ortho (F8) ON**
6. **Increment Snap (F9) OFF** (It will get in your way)
7. Use layer: Object Line
8. **Save** the drawing as: **EX5A**



# EXERCISE 5B

## INSTRUCTIONS:

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Select the **Point Style** shown below
3. Draw the **Point** first.

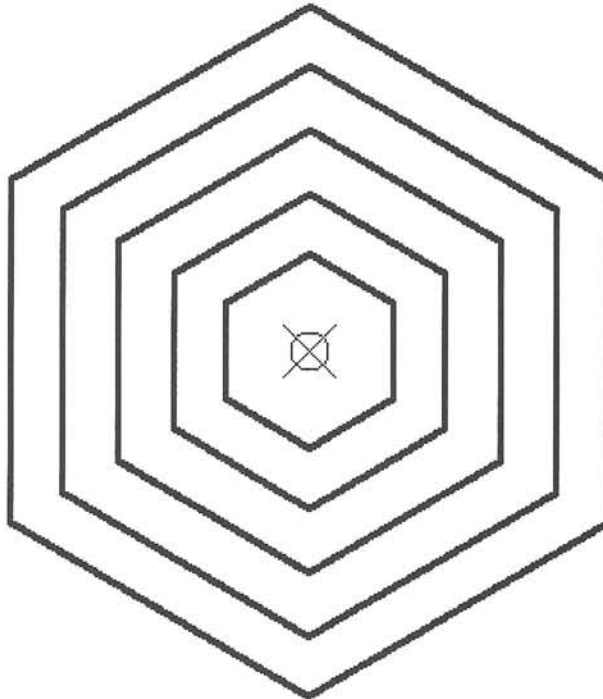
**Note:** Your Point may not appear as large as the one shown below.

4. Draw the Inscribed Polygons
  - a. Locate the center of each Polygon using Object Snap **NODE**.
5. **Ortho** (F8) **ON**
6. **Increment Snap** (F9) **OFF**
7. Use layer Object Line

### **Note:**

**Place the Polygon points with the cursor. If you type a radius the Polygon will automatically rotate and locate the flat at the bottom.**

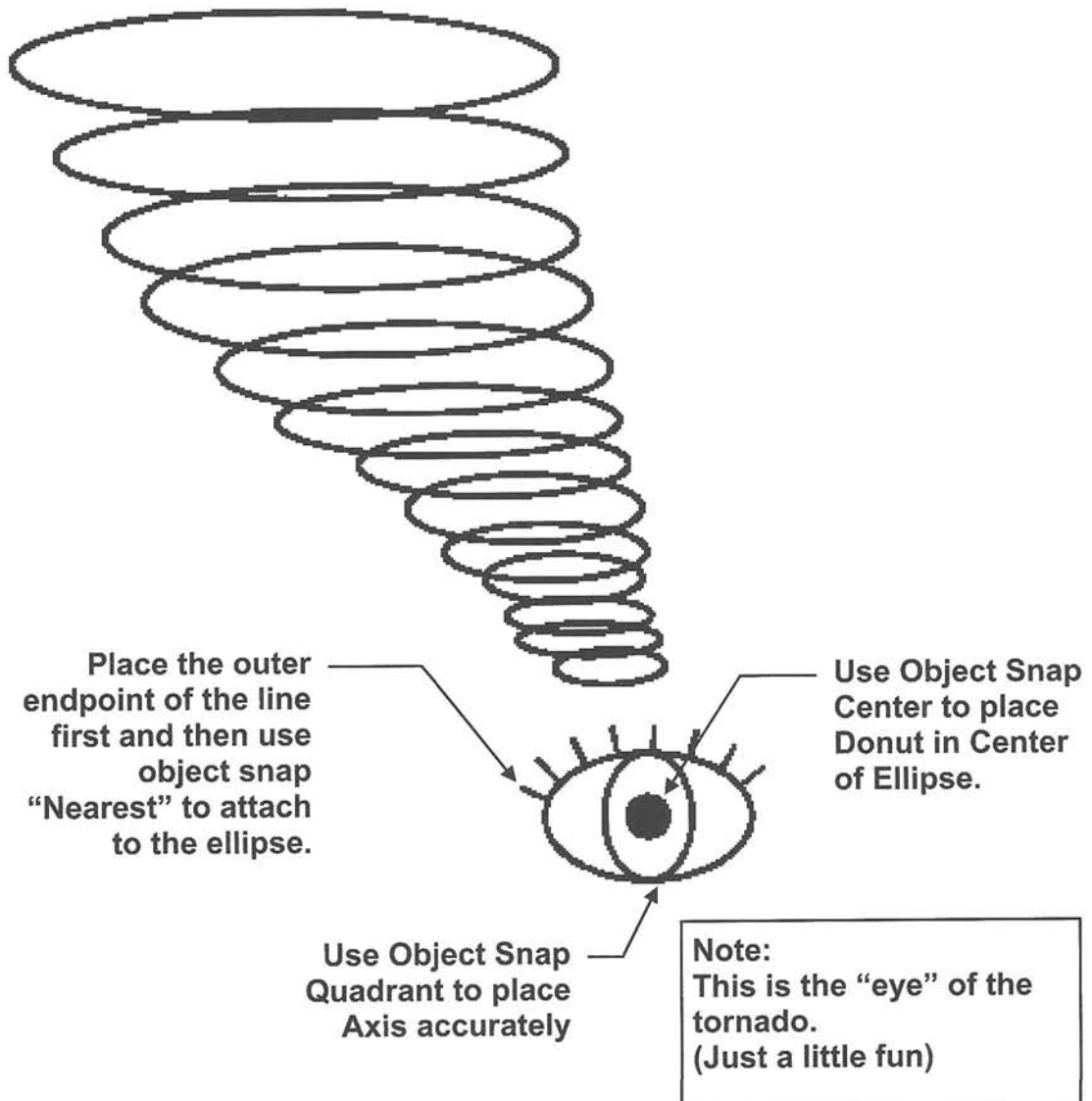
8. **Save** the drawing as: **EX5B**



# EXERCISE 5C

## INSTRUCTIONS:

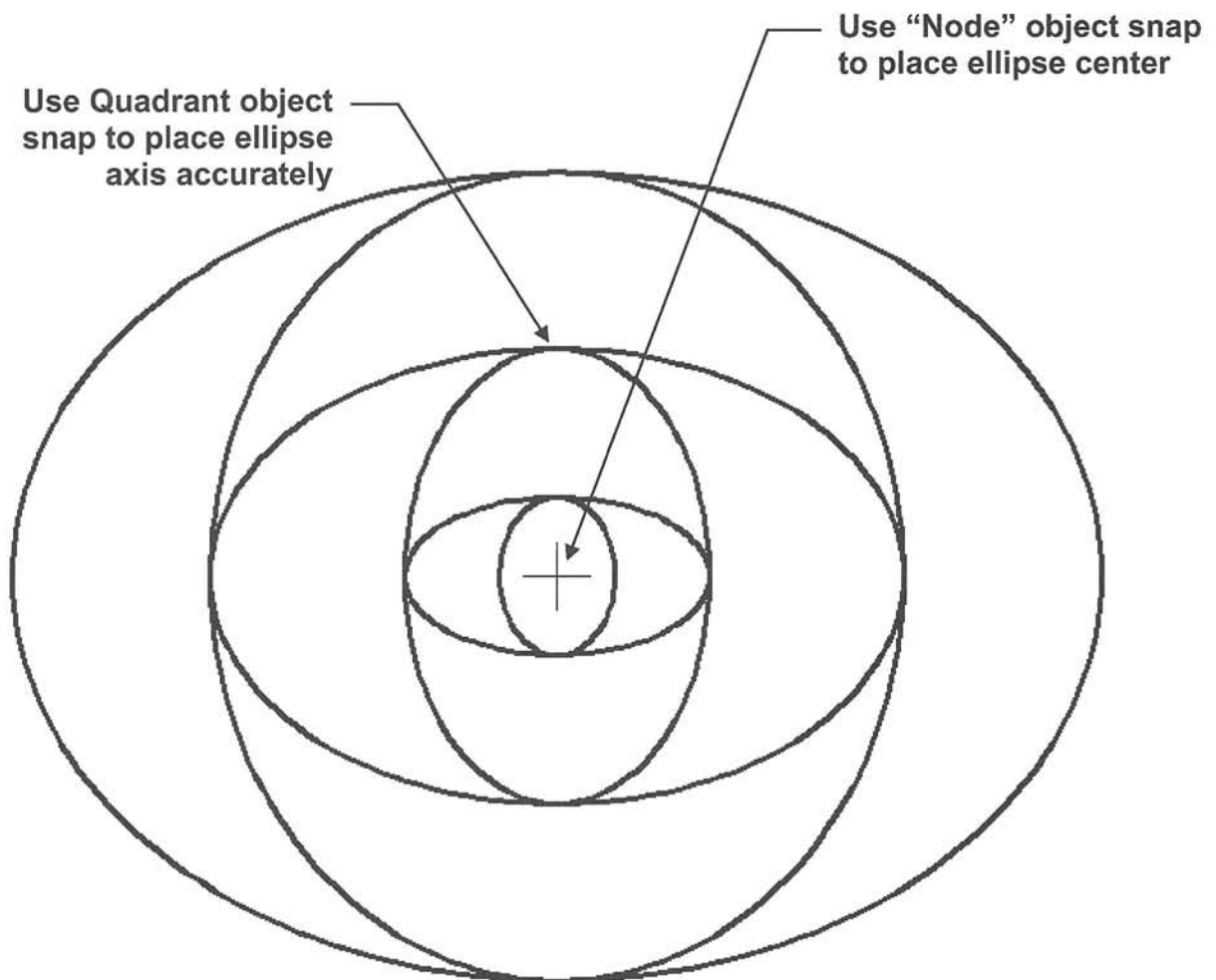
1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Draw the Objects below using **Ellipse**, **Line** and **Donut**.
3. Use Object Snap: **Quadrant**, **Center** and **Nearest**.
4. **Ortho (F8) ON**
5. **Increment Snap (F9) OFF**
6. Use any layer you like.
7. **Save** the drawing as: **EX5C**



# EXERCISE 5D

## INSTRUCTIONS:

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Select the **Point Style** shown below
3. Draw the **Point** first.
4. Draw the **Ellipses**:
  - a. Locate the **center** of each Ellipse using Object Snap: **NODE**.
  - B. Locate the **Axis** using Object snap: **Quadrant**
5. **Ortho** (F8) **ON**
6. **Increment Snap** (F9) **OFF**
7. Use layer: Object Line
8. **Save** the drawing as: **EX5D**

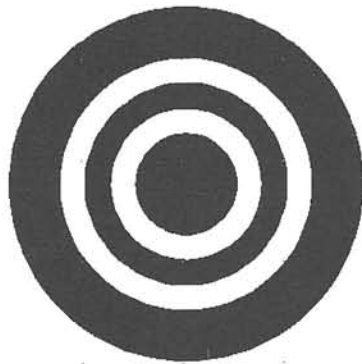


# EXERCISE 5E

## INSTRUCTIONS:

### STEP 1

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Draw the 3 **DONUTS** shown below.
3. Use Object Snap **Center** to place the centers accurately.
4. **Increment Snap (F9) OFF**
5. Use layer: Object Line

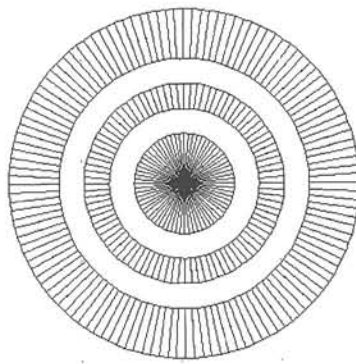


### Donut sizes

1. ID = 0    OD = 1
2. ID = 1.5    OD = 2
3. ID = 2.5    OD = 3.5

### STEP 2

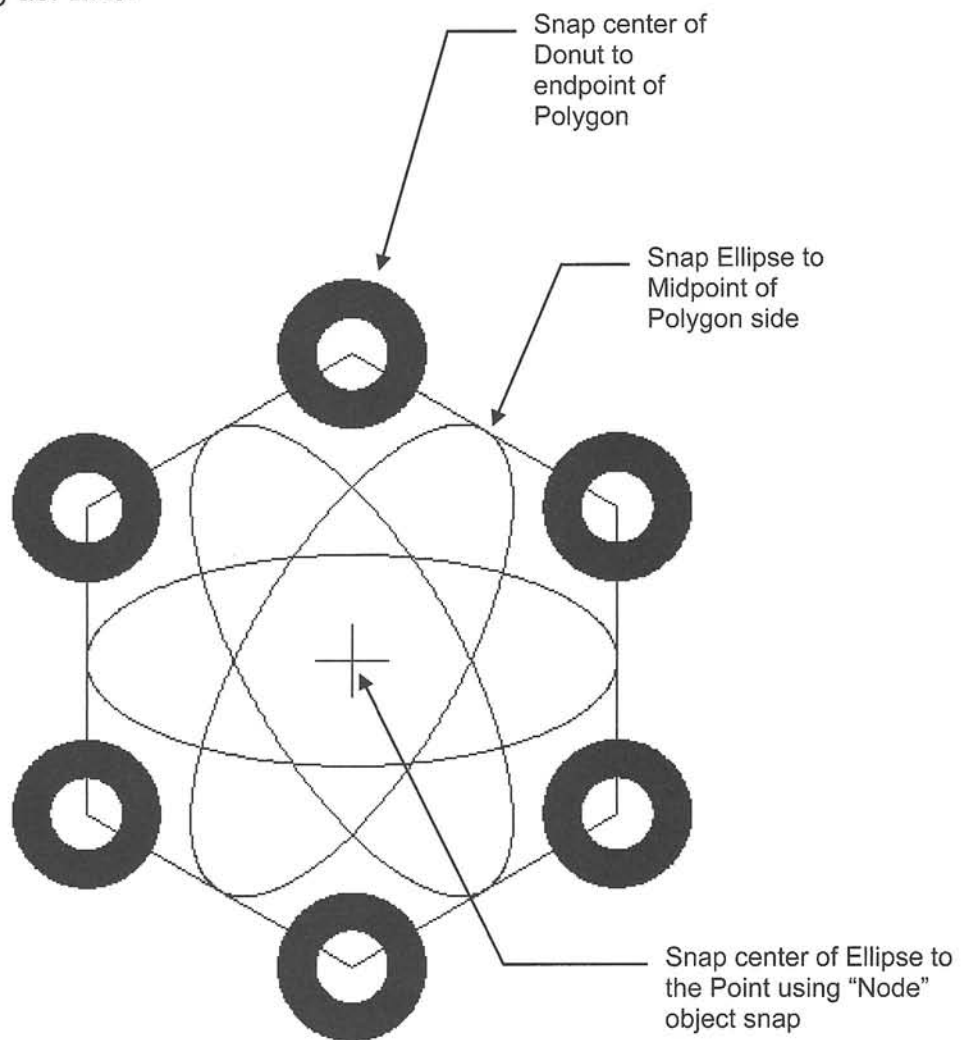
6. Turn the FILL mode **OFF**
7. Type **Regen <enter>**
8. **Save** the drawing as: **EX5E**



# EXERCISE 5F

## INSTRUCTIONS:

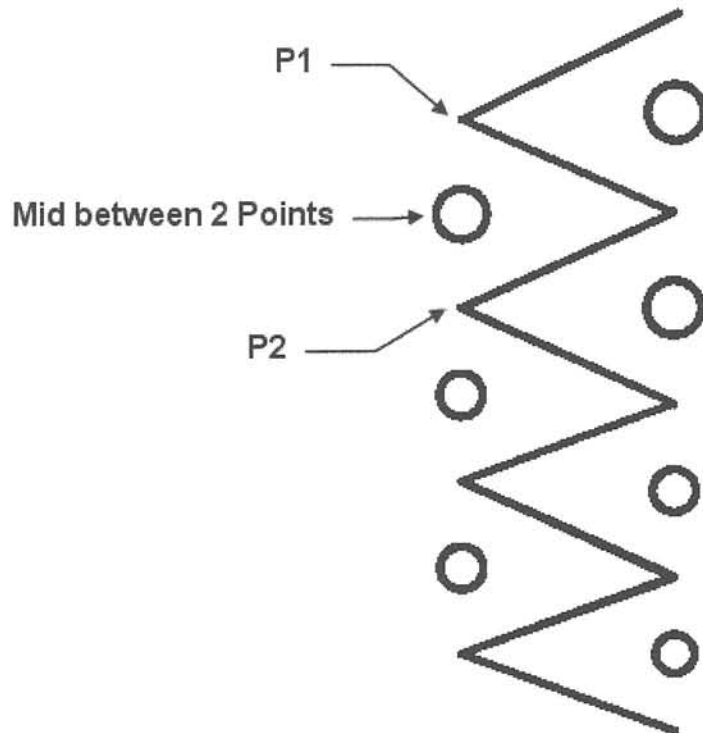
1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Draw the objects below using: **Point, Polygon, Ellipse** and **Donut**.
3. **Ortho (F8) ON**
4. **Increment Snap (F9) OFF**
5. Use whatever layers you like
6. **Save** the drawing as: **EX5F**



# EXERCISE 5G

## INSTRUCTIONS:

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Draw the Zig Zag Lines approximately as shown below.
3. Set Running Object Snap to "**Endpoint**".
4. **Increment Snap** (F9) **OFF**
5. **Ortho** (F8) = **ON**
6. Draw the circles at the "**Midpoint between 2 points**". (P1 and P2)
7. Use layer: Object Line.
8. **Save** the drawing as: **EX5G**



# EXERCISE 5H

## INSTRUCTIONS:

1. Start a **NEW** file using **2013-Workbook Helper.dwt**.
2. Draw the **Rectangle** on the left first. (any size)
3. Draw the **Polygon** next using the “**EDGE**” option.
  - A. Use Object Snap: “**Endpoint**” to place **Edge** points accurately.
4. **Increment Snap (F9) OFF**
5. **Ortho (F8) = ON**
6. Use Layer: Object Line
7. **Save** the drawing as: **EX5H**

