AutoCAD®

In 7 Days

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Acknowledgments

I am thankful to my students who asked me such questions whose answers were very helpful to make this book more useful.

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Introduction

Do you want to make floor plans or other drawings in fast and easy way using Autodesk® AutoCAD® ? But you don't have any practical experience of using AutoCAD, then this book is for you. You will start from scratch and the book will guide you in step by step exercises to learn the commands and procedures. I have tried to include all the information needed to complete different exercises in the book. I hope you will not be stuck at any point and waste your time in searching Help, Internet or other books to work on the topics.

The book doesn't teach you lessons to remember or doesn't ask you questions to answer. From Day 1, you start with a simple exercise with some basic commands and each day you will work on more complex drawings. By the end of Day 7, you may feel that you have enough knowledge of AutoCAD to work on large 2D projects.

Download Folder:

You download the required files from CadBook folder at

https://drive.google.com/open?id=0B0ostAbVyHuYOXV2WFJlbEtUdG8

and save them on your hard disk.

How to use this book:

1. Install AutoCAD 2010 or later. Download files from Download Folder.
2. Work on **EACH** step. If you miss even a small step or work on a step in wrong way, you may get error on a later step.
3. Enter all numbers (distances, angles, number of repetitions etc.) **accurately**. One wrong entry can disturb the whole exercise.
4. If you do a step wrong, click on **Undo** or press **Ctrl Z**. If several steps are wrong, delete the wrong object (select it and press Delete) and draw it again.
5. When you finish an exercise following all the steps, see the figure only and try to make it again without reading the steps. Read only that step which you cannot remember.
6. Once you are able to make the exercise without reading the steps, practice to make it in as little time as possible to increase your speed and accuracy.
7. Complete the steps 6 & 7 on the same day.

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What you accomplish on each day:

Day 1

You explore the AutoCAD user interface. You open a new file and make initial settings before starting a new drawing. You learn how to draw with absolute and relative coordinates.

Day 2

You learn how to make rectangular array by distributing objects in rows and columns and polar array by distributing objects on a circle. You draw a pattern using both rectangular and polar arrays.

Day 3

You make a grid and draw objects by snapping to grid points.

Day 4

You learn different editing methods to increase the speed and accuracy of your drawing.

Day 5

You learn how to manage your drawing using layers. You add information to your drawing in the form of text and dimensions. You learn using blocks as reusable objects. You add hatch patterns to represents materials.

Day 6

You draw a house plan with walls, doors, windows, furniture and fixtures. You also print a simple plot of your plan.

Day 7

You draw typical floor plan of a multistory hotel. You use external references to manage a complex drawing efficiently. You plot the floor plan on a sheet with title block. You also learn how to plot different parts of a drawing with different scales on the same sheet.

Contents at a Glance

Contents

Day 1 Coordinates, Lines, Arcs

AutoCAD drawings consist of drawing elements such as Lines, Arcs etc. You specify points for drawing elements e.g. Start and End points for a line, Start – Center – End points for an arc, Center point and Radius for a circle etc. The points are located on a coordinate system. You can specify points as Absolute Coordinates or Relative Coordinates.

But before starting a new drawing, you need to make some initial settings.

1.1 AutoCAD User Interface

When you start the AutoCAD program, what you see on the desktop is the user interface. Different tools are arranged in the form of a Ribbon. The default user interface shows the Ribbon and a large drawing area where you draw different elements of your AutoCAD drawing. (Fig. 1.1)

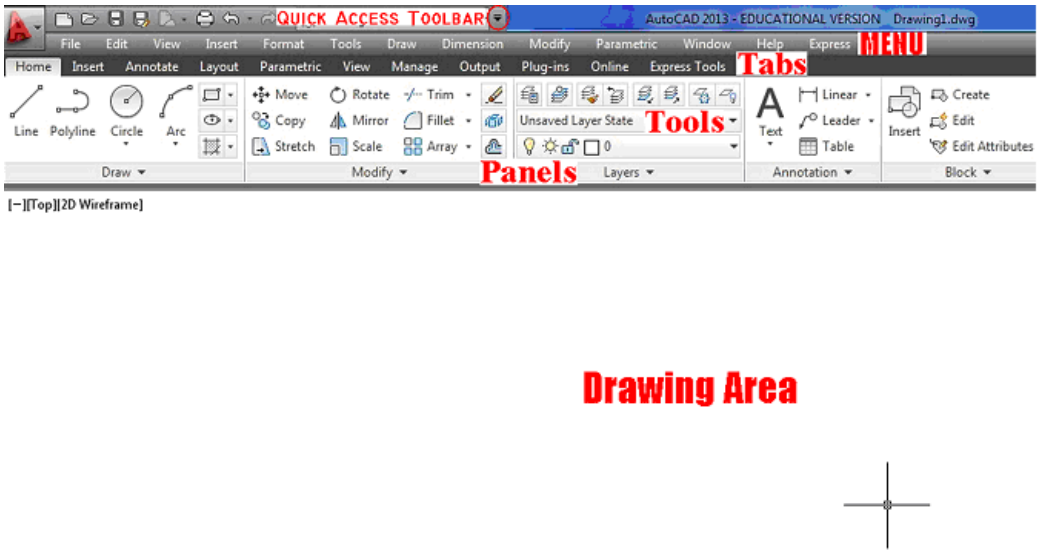

Fig. 1.1 – AutoCAD User Interface

1. The Ribbon consists of Tabs, Panels, Tools etc.
2. Each **TAB** (Home, Insert, Annotate, Layout ...) represents a particular topic.
3. When you press a tab, all panels change according to the topic of the tab.
4. Each panel contains tools to do a particular job.
5. On the top, you see Quick Access Toolbar (QAT). You keep frequently used tools on it. You can customize it by clicking on the dropdown arrow at the end of QAT.
6. A **contextual tab** appears to show tools to edit/modify a particular object. When job is done, the contextual tab disappears.
7. In the drawing area, you sketch/modify different AutoCAD elements.
8. The MENU is not shown by default. To show the menu, bring the cursor in the drawing area and type MENUBAR ↵ 1 ↵ (Fig. 1.2).
9. **Note: ↵ means press Enter key**.

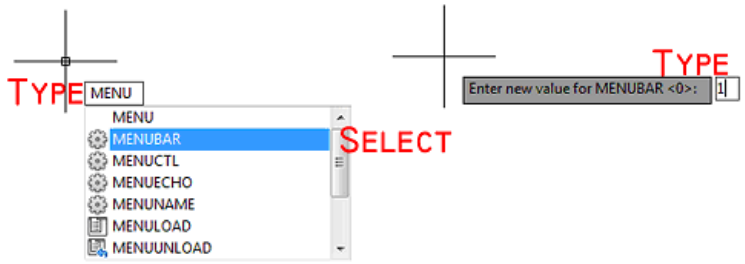

Fig. 1.2 – Show Menu

1.2 Status Bar

Status bar is located at the bottom of the AutoCAD window. It contains various tools to control different drawing aids.

1. These tools can be toggled ON or OFF by clicking on them or by pressing a function key.
2. If a tool is ON, it is displayed in blue color.
3. If a tool is OFF, it is displayed in grey color.
4. Some tools on the status bar are shown in Fig. 1.3. Their location or icon may be different in different versions of AutoCAD, but their function and related function key is same.

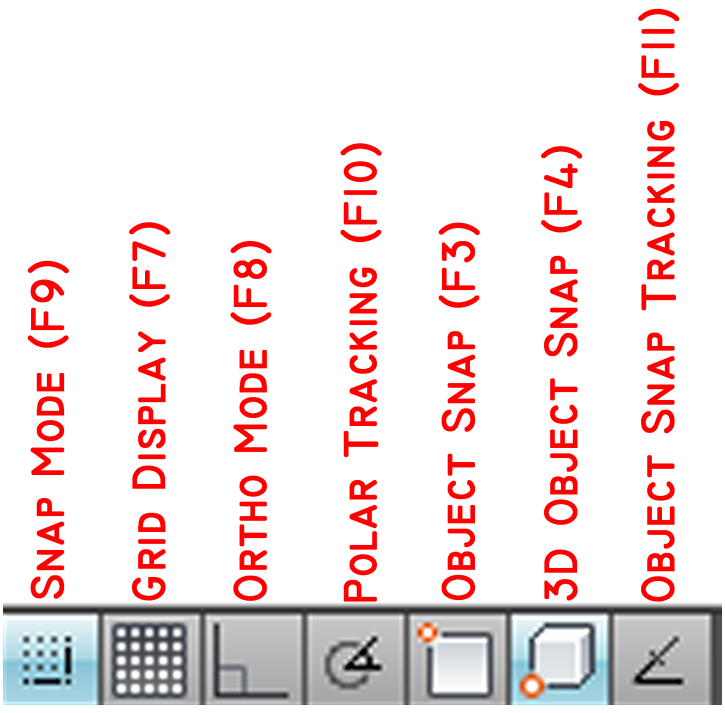

Fig. 1.3 – Tools on Status Bar

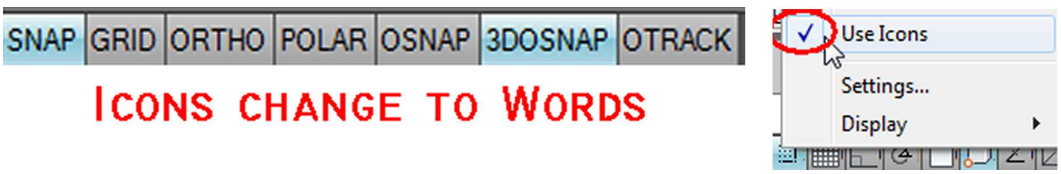

Fig. 1.4 – Change Icons on the Status Bar

5. If the icons seem confusing to you, you can convert them into word. Just right-click on any icon and unselect Use Icons. (Fig. 1.4). This feature is available in AutoCAD 2014 and before.

6. You also see Settings… in Fig. 1.4. If you click on Settings…, a dialog box will open to make different drafting settings (Fig. 1.5).
7. You can get Drafting Settings dialog box by clicking on Tools (on Menu) → Drafting Settings... (Fig. 1.6).

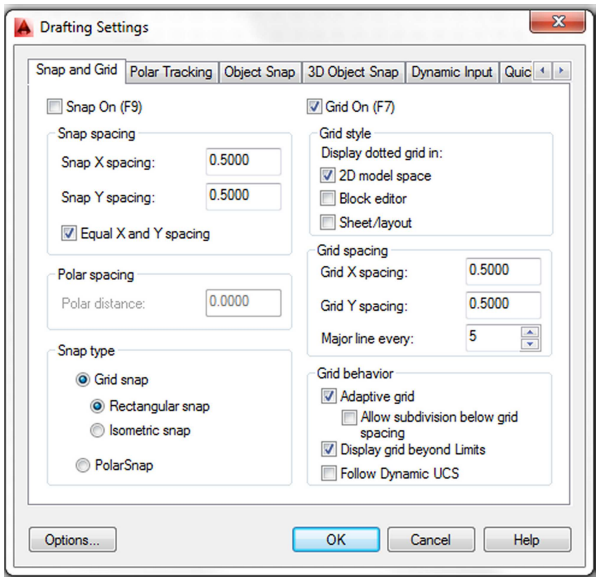

Fig. 1.5 – Drafting Settings Dialog

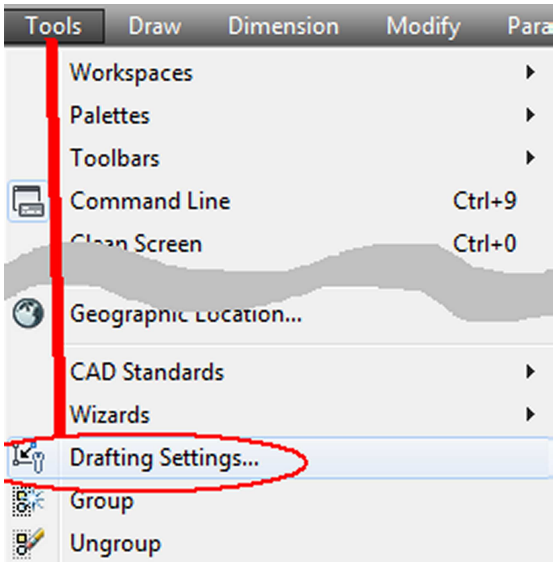

Fig. 1.6 – Drafting Settings Menu

1.3 Command Window

1. Below the drawing area, you see the command window (Fig. 1.7).
2. You can set its location.
3. You can adjust the width of previous commands.
4. You can see all previous commands in the text windows by pressing F2.
5. You can hide/unhide the command window by pressing Ctrl 9.

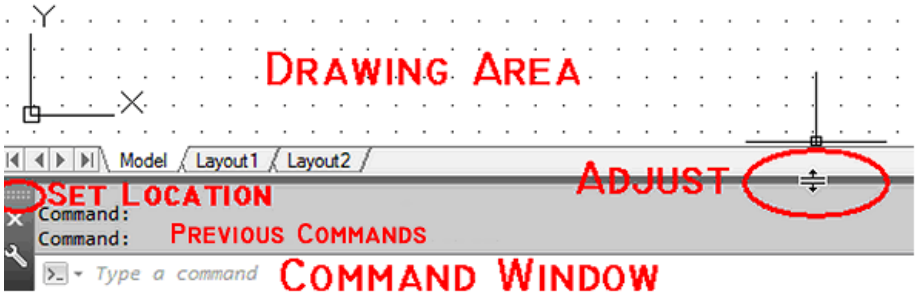

Fig. 1.7 – Command Window

1.4 Initial Settings

Before starting your first drawing, you may make some initial settings.

1. Click on AutoCAD button  on the top left corner → Click Options (Fig. 1.8).
2. Alternatively, on the menu bar, click Tools → Options.

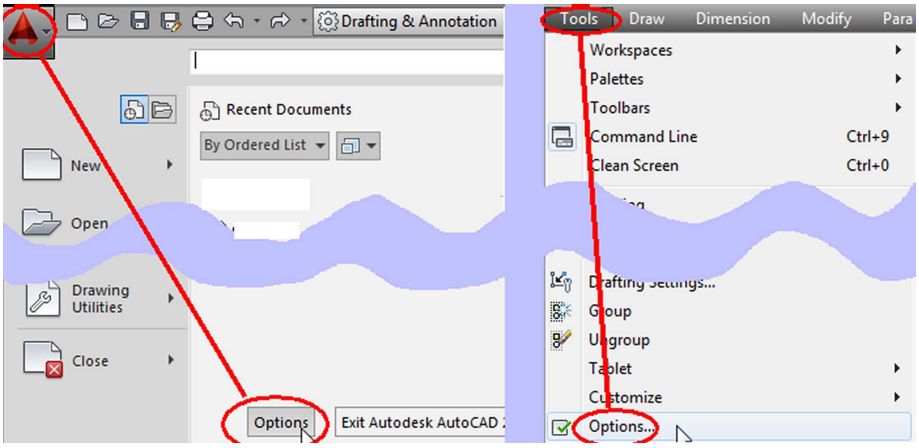

Fig. 1.8 – AutoCAD Options

1.4.1 Display Tab

1. On the Display tab, select a Color Scheme (Fig. 1.9).
2. Click on Colors. You will see a sub dialog box where you can select color of different Interface elements. For example, for Context = 2D model space → Interface element = Uniform background, you can select Color = White.

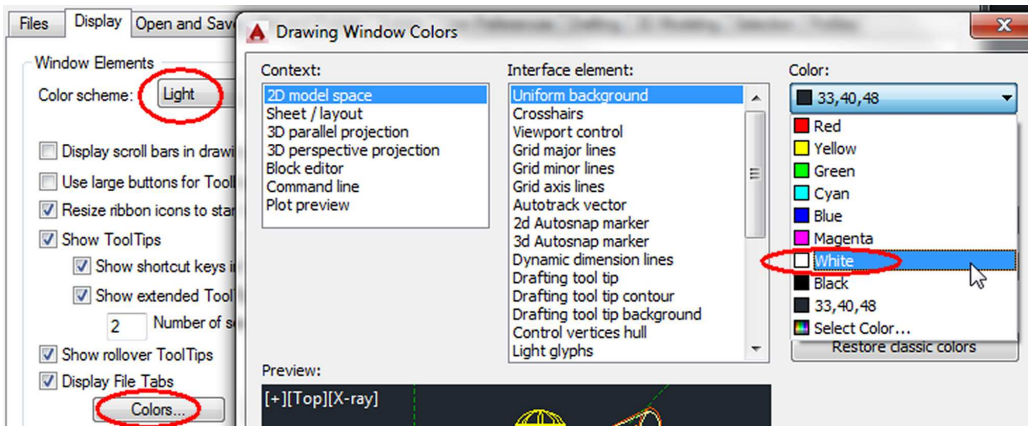

Fig. 1.9 – Display Tab Options

1.4.2 User Preferences Tab

1. On the User Preferences tab, click on Right-Click Customization (Fig. 1.10).
2. In the Right-Click Customization dialog box, select the radio-buttons shown in Fig. 1.10.
3. Click Apply & Close → OK.
4. After these settings, ↵ means right-click (or press Enter key). ↵ is used
    - to finish or end a command in progress
    - to finish the selection of objects
    - to repeat the last command

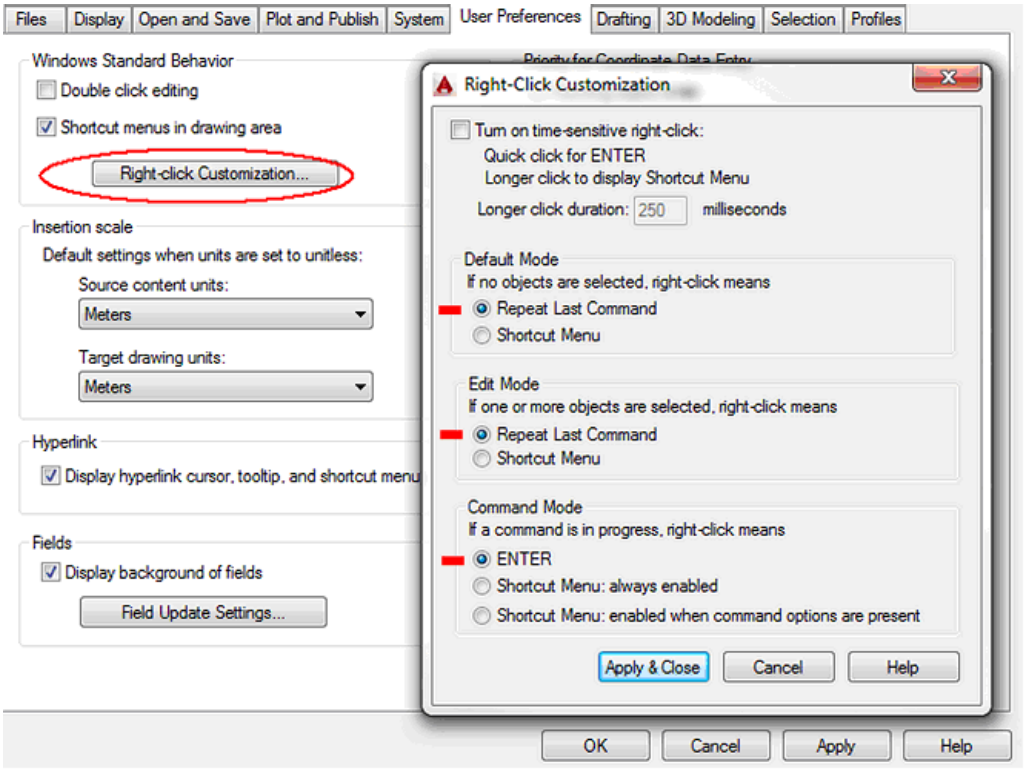

Fig. 1.10 – Display Tab Options

1.5 Absolute Cartesian Coordinates

Absolute Cartesian coordinates are distances from the origin (0,0,0) which is intersection of X,Y,Z axes. Look at the drawing shown in Fig. 1.11. Coordinates of all points are shown as absolute coordinates. The drawing consists of lines and arcs. First you will draw lines and then arcs.

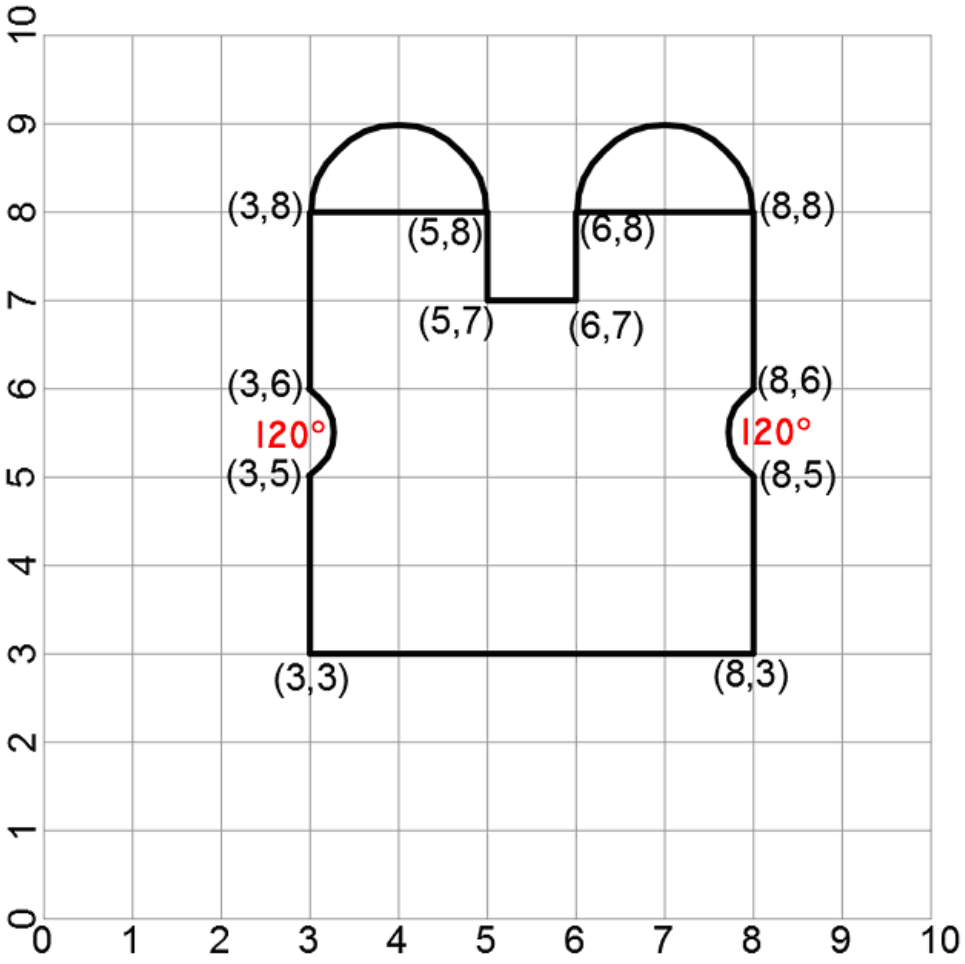

Fig. 1.11 – Drawing with Absolute Coordinates

1. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)
2. Click on AutoCAD button on the upper-left corner → Click on Save As → File name: **Ex01**.
3. As you can see from the drawing in Fig 1.11, the lower-left corner is at point (0,0) and the upper-right corner is at point (10,10). You will set these drawing limits for your AutoCAD drawing.
4. On Menu → Format → Drawing Limits
5. Prompt appears near the cursor. (**The prompt should appear near the cursor. If not then press F12 to turn Dynamic Input ON**).
6. To Specify lower left corner, type 0, 0↵
7. To Specify upper right corner, type 10, 10↵ (Fig. 1.12).
8. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A↵ .

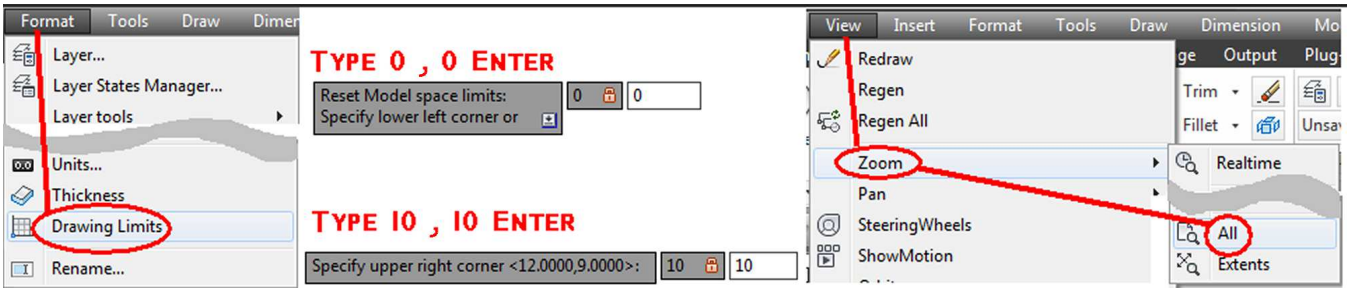

Fig. 1.12 – Set Drawing Limits

9. Now set the input for absolute coordinates. Tools → Drafting Settings → Dynamic Input tab → Pointer Input Settings → Select Absolute Coordinates (Fig. 1.13).

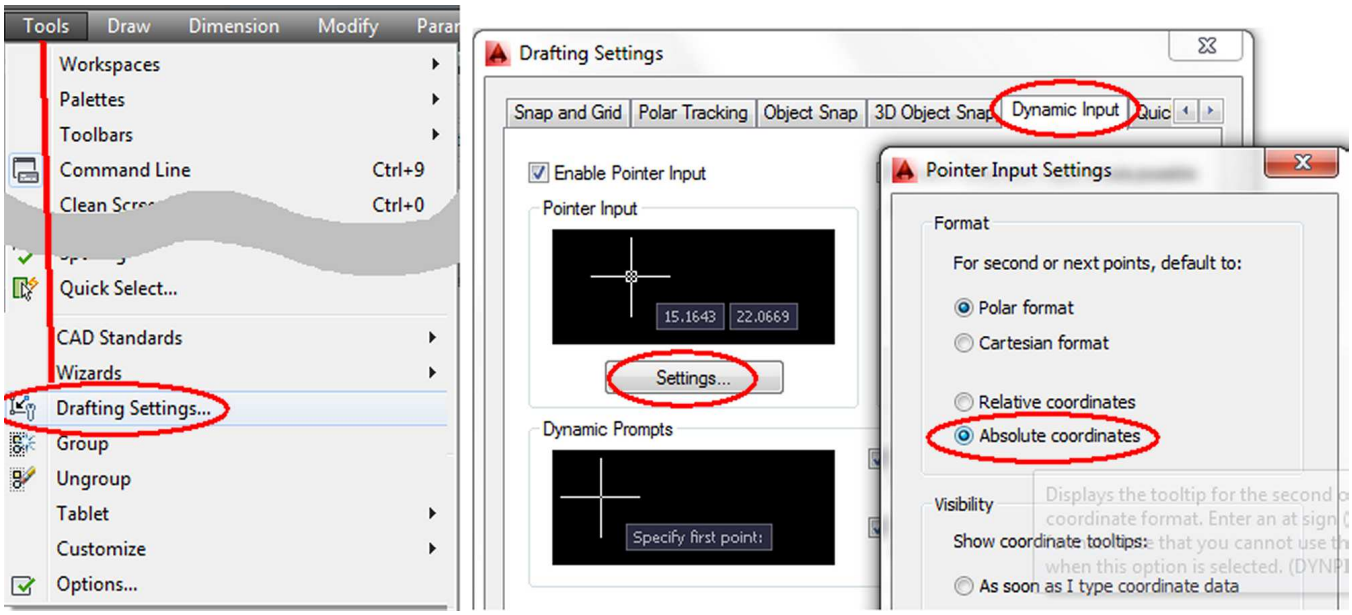

Fig. 1.13 – Input Absolute Coordinates

10. Now start drawing the line in the lower part of Fig. 1.10.
11. On Home tab → Draw panel → click on Line tool OR Type L↵ (Fig. 1.14).
12. Line command starts and prompts you to specify the first point. You type **3, 5**↵ . First point is placed on the screen.
13. Now you are prompted to specify the next point. You type **3, 3**↵ . First segment of the line is drawn.
14. In the same way you type **8, 3**↵ and then **8, 5**↵ .
15. To finish the line command, you press↵ (Enter) again or right-click. Line command ends and you see the lower part of Fig. 1.10 drawn on the screen.
16. **Note: It is not necessary to select Absolute Coordinates in Fig. 1.13. If Relative Coordinates is selected in Drafting Settings, you can enter absolute coordinates by using #. For example, above line can be drawn by typing L↵ , #3, 5 ↵ , #3, 3↵ , #8, 3↵ , #8, 5↵ ↵**

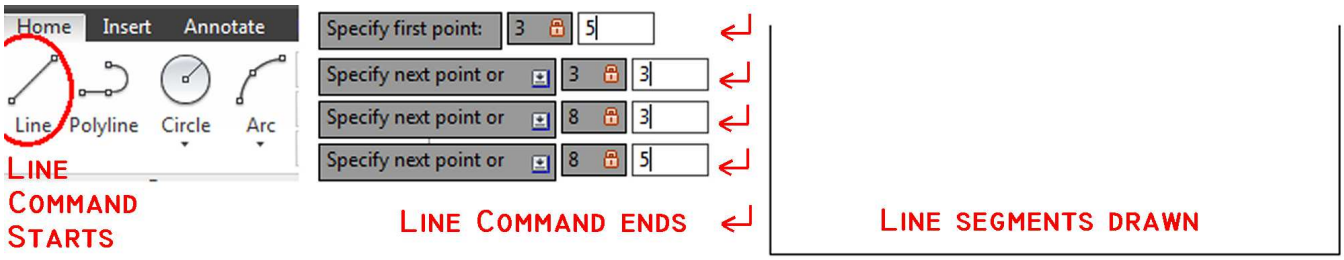

Fig. 1.14 – Drawing line segments

17. In the same way you will draw lines in the upper part of the drawing by starting the line command and typing **8 , 6**↵ and then **8 , 8**↵ and then **6 , 8**↵ and then **6 , 7**↵ and then **5 , 7**↵ and then **5 , 8**↵ and then **3 , 8**↵ and then **3 , 6**↵ . In the end right-click or ↵ (press Enter) to finish the line command.
18. If you feel that you have entered a wrong point, just type **U**↵ and enter the correct point.

19. Next you will draw arcs. The points are already there in the drawing so you don't need to enter any point. You will just snap to the points on the objects. You need to snap to Endpoints and Midpoints. Now you turn ON the snap to Endpoints and Midpoints.
20. Tools → Drafting Settings → Object Snap tab (or OSNAP → right-click → Settings) → Select Endpoint, Midpoint, Center (Fig. 1.15). Also turn on OSNAP by clicking on it or by pressing F3.

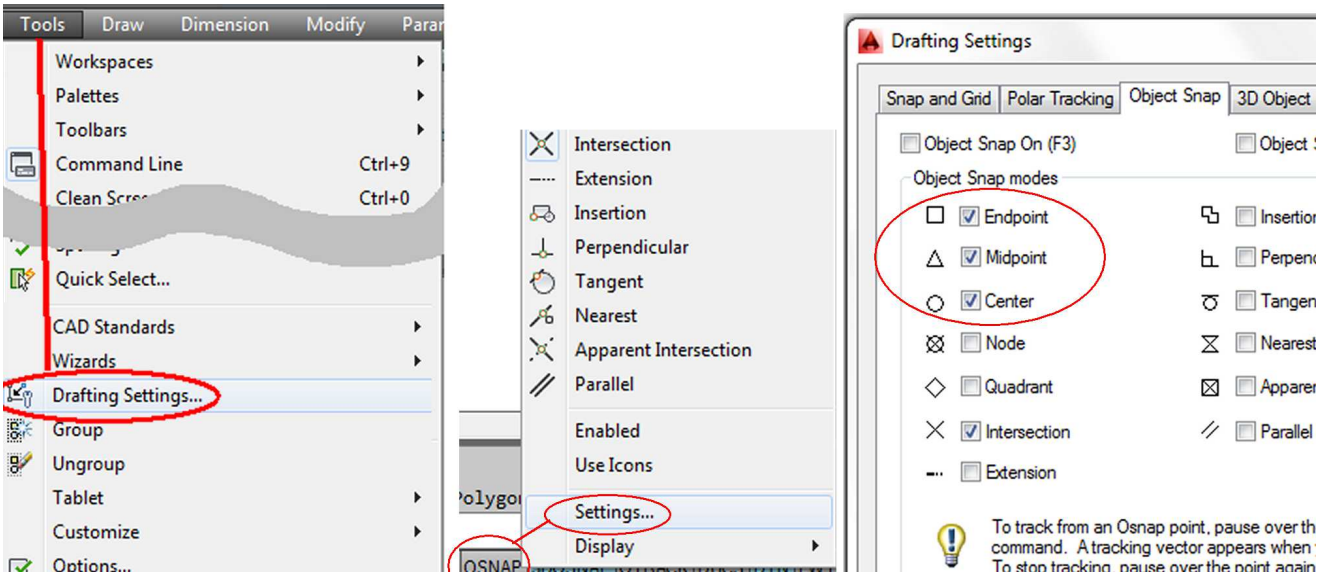

Fig. 1.15 – Object Snap settings

21. Arcs are drawn in ANTI-CLOCKWISE way. For the upper- right arc, start – center – end points are as shown in Fig. 1.16.

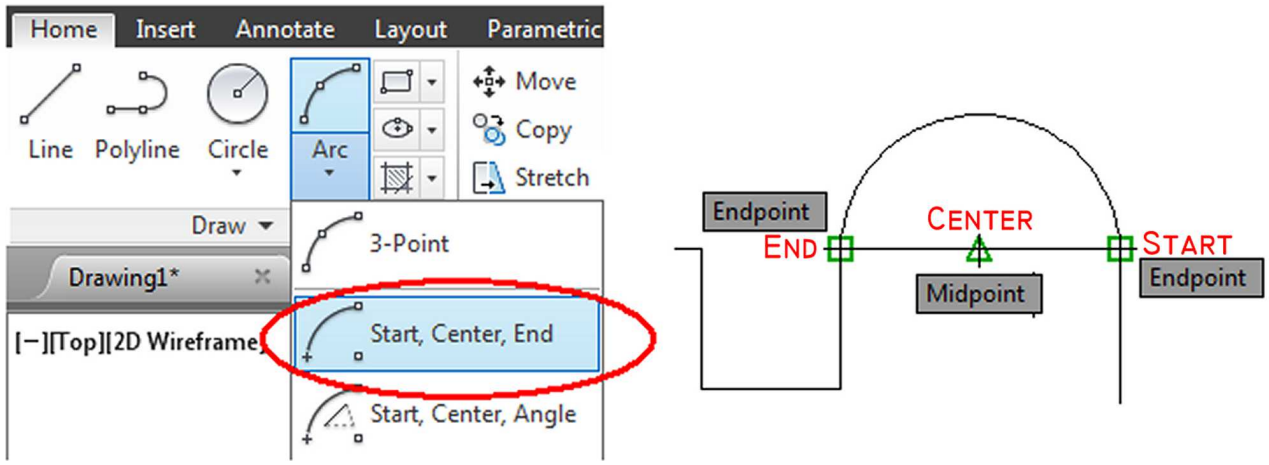

Fig. 1.16 – Draw Arc

22. On Home tab → Draw panel → click on dropdown arrow under Arc tool.
23. Select the option Start, Center, End (Fig 1.16).
24. Click near the points shown in Fig 1.16. Make sure you see the green Snap symbols as shown in Fig. 1.16.
25. In the same way, draw the upper- left arc.
26. For the middle arcs, Start – End – Angle are given.
27. On Home tab → Draw panel → click on dropdown arrow under Arc tool.
28. Select the option Start, End, Angle (Fig 1.17).

29. Click near the start point, then end point shown in Fig 1.17 and then type 120↵ (for the angle). Make sure you see the green Snap symbols.
30. For the other arc, repeat steps 23 – 25 above.
31. On Menu → Tools → Drafting Settings → Dynamic Input tab → Pointer Input Settings → Select Relative Coordinates (Fig. 1.13).

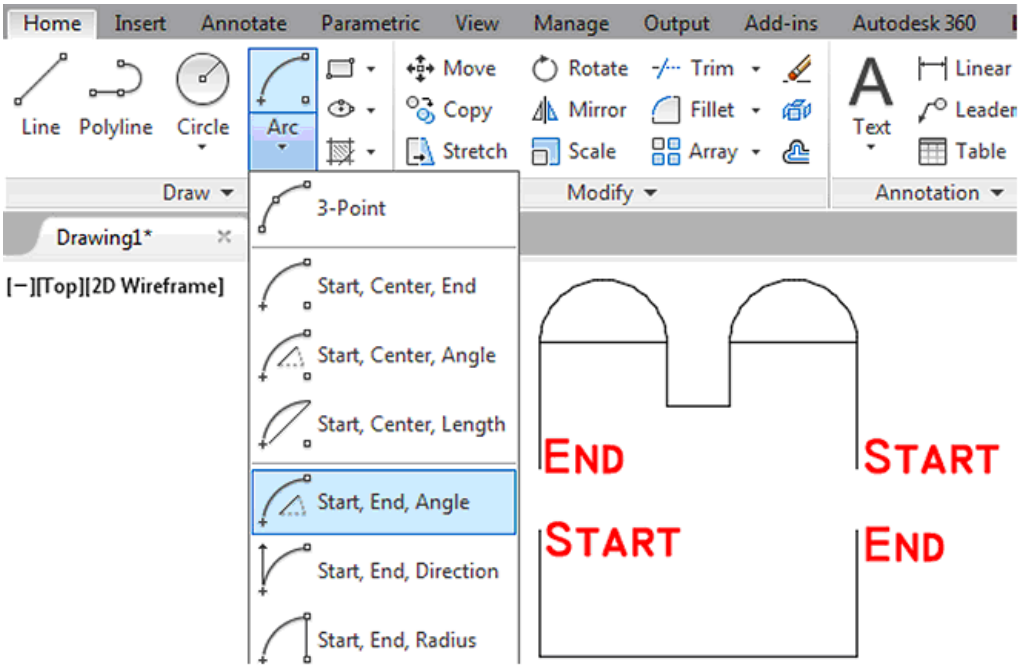

Fig. 1.17 – Draw Arc

32. Click  on QAT (Quick Access Toolbar in Fig. 1.1) Or press Ctrl S to Save your work.

1.6 Relative Cartesian and Polar Coordinates

Relative Cartesian coordinates are distances from the last point you specified. Cartesian points are expressed in the form of (x, y) i.e., horizontal and vertical distance. Polar points are expressed in the form of (D, θ) i.e., distance and angle from positive x-axis.

Look at the drawing shown in Fig. 1.18. Coordinates of all points are shown as relative coordinates (Cartesian and Polar). The drawing consists of lines.

1. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)
2. Click on AutoCAD button  on the upper-left corner → Click on Save As → File name: **Ex02**.
3. As you can see from the drawing in Fig 1.18, the width of the drawing is 14 and height of the drawing is about 10. You will set the drawing limits somewhat more than the width and height say 20, 15.
4. On Menu → Format → Drawing Limits → Type 0 , 0↵ 20 , 15↵ (Fig. 1.12).
5. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A↵ .
6. On Menu → Tools → Drafting Settings → Dynamic Input tab → Pointer Input Settings → Select Relative Coordinates (Fig. 1.13).

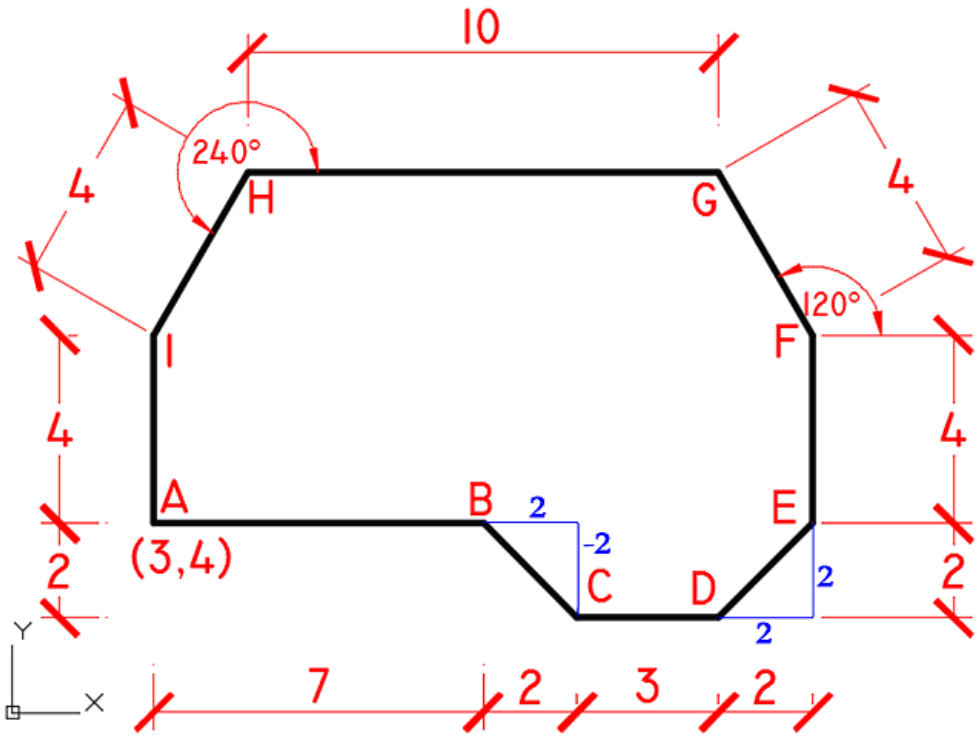

Fig. 1.18 – Relative Coordinates

7. On Home tab → Draw panel → click on Line tool OR Type L↵ (Fig. 1.14).
8. Line command starts and prompts you to specify the first point. You type **3 , 4**↵ . First point is specified on the screen.
9. In going from A to B, horizontal distance is x = 7 (right) and vertical distance is y = 0. You type **7 , 0**↵ . Line from A to B is drawn.
10. In going from B to C, horizontal distance is x = 2 (right) and vertical distance is y = –2 (down). You type **2 , –2**↵ . Line from B to C is drawn.
11. In going from C to D, horizontal distance is x = 3 (right) and vertical distance is y = 0. You type **3 , 0**↵ . Line from C to D is drawn.
12. In going from D to E, horizontal distance is x = 2 (right) and vertical distance is y = 2 (up). You type **2 , 2**↵ . Line from D to E is drawn.
13. In going from E to F, horizontal distance is x = 0 and vertical distance is y = 4 (up). You type **0 , 4**↵. Line from E to F is drawn.
14. In going from F to G, distance is d = 4 and angle is θ = 120° (relative polar coordinates). You type **4 < 120**↵ . Line from F to G is drawn.
15. In going from G to H, horizontal distance is x = –10 (left) and vertical distance is y = 0. You type -1**0 , 0**↵ . Line from G to H is drawn.
16. In going from H to I, distance is d = 4 and angle is θ = 240° (relative polar coordinates). You type **4 < 240**↵ . Line from H to I is drawn.
17. Bring cursor on A. When you see green square (snap to endpoint), click. Line from I to A is drawn.
18. Press Enter↵ (or right-click) to end the line command.
19. Click  on QAT (Or press Ctrl S) to Save your work.

1.7 Ortho Mode and Tracking

When Ortho mode is ON (press F8), the cursor is restricted orthogonally i.e. the cursor will move horizontally (at 0°) or vertically (at 90°).

When Object Snap Tracking is ON (press F11), you can select a point along a path based on an object endpoint or midpoint or an intersection between objects.

Look at the drawing shown in Fig. 1.19. The drawing consists of lines and arcs.

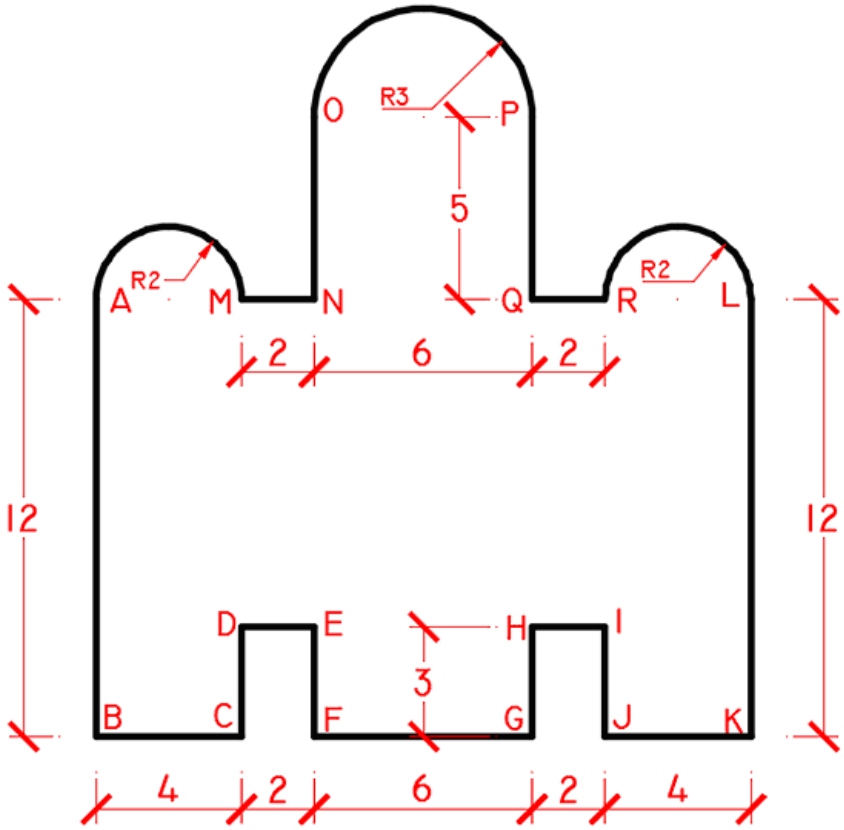

Fig. 1.19 – Ortho Mode - Tracking

1. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)
2. Click on AutoCAD button on the upper-left corner → Click on Save As → File name: **Ex03**.
3. As you can see from the drawing in Fig 1.19, the width of the drawing is 18 and height of the drawing is about 20. You will set the drawing limits somewhat more than the width and height say 25, 25.
4. On Menu → Format → Drawing Limits → Type 0 , 0↵ 25 , 25↵ (Fig. 1.12).
5. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A↵ .
6. Turn Object Snap (OSNAP) ON. Turn Ortho Mode (ORTHO) ON. Turn Object Snap Tracking (OTRACK) ON (Fig. 1.3 – 1.4).
7. On Home tab → Draw panel → click on Line tool OR Type L↵ (Fig. 1.14).
8. Line command starts and prompts you to specify the first point. Bring cursor to left side of the screen where y ≈ 15 (Fig. 1.20 step 1) and click. Point A is specified.
9. Bring cursor down and Type **12**↵ (Fig. 1.20 step 2). Point B is specified.
10. Bring cursor to left and Type **4**↵ (Fig. 1.20 step 3). Point C is specified.
11. Bring cursor up and Type **3**↵ (Fig. 1.20 step 4). Point D is specified.

12. Bring cursor to left and Type **2**↵ (Fig. 1.20 step 5). Point E is specified.
13. Bring cursor down and Type **3**↵ (Fig. 1.20 step 6). Point F is specified.
14. Bring cursor to left and Type **6**↵ (Fig. 1.20 step 7). Point G is specified.

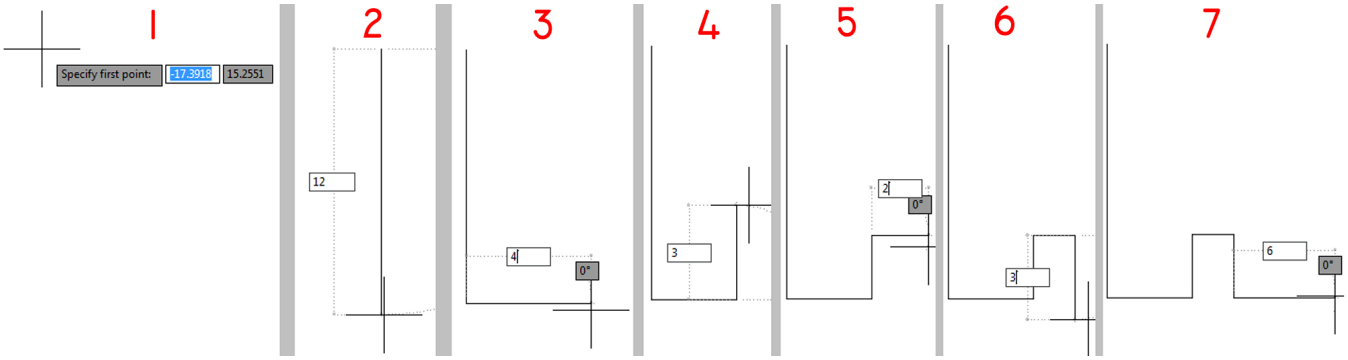

Fig. 1.20 – Steps using Ortho Mode

15. Bring cursor up and Type **3**↵ (Fig. 1.21 step 8). Point H is specified.
16. Bring cursor to left and Type **2**↵ (Fig. 1.21 step 9). Point I is specified.
17. Bring cursor down and Type **3**↵ (Fig. 1.21 step 10). Point J is specified.
18. Bring cursor to left and Type **4**↵ (Fig. 1.21 step 11). Point K is specified.
19. Bring cursor up and Type **12**↵ (Fig. 1.21 step 12). Point L is specified.
20. Type **(Enter)**↵ to finish the line command.

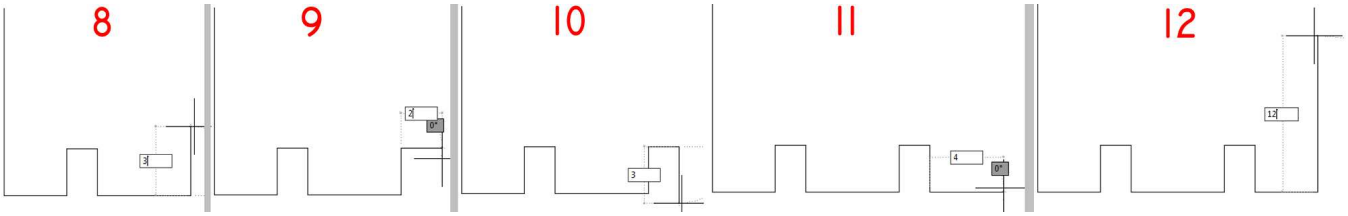

Fig. 1.21 – Steps using Ortho Mode

21. Click on Line tool OR Type L↵. Line command starts and prompts you to specify the first point. Bring cursor on point A. A green square appears indicating that the endpoint is snapped. DO NOT CLICK. Move cursor horizontally to left. A dotted green tracking line appears. Type **4**↵ (Fig. 1.22 step 13). Point M is specified.
22. Bring cursor to left and Type **2**↵ (Fig. 1.22 step 14). Point N is specified.
23. Bring cursor up and Type **5**↵ (Fig. 1.22 step 15). Point O is specified.
24. Type **(Enter)**↵ to finish the line command.
25. Click on Line tool OR Type L↵. Line command starts and prompts you to specify the first point. Bring cursor on point O. A green square appears indicating that the endpoint is snapped. DO NOT CLICK. Move cursor horizontally to left. A dotted green tracking line appears. Type **6**↵ (Fig. 1.22 step 16). Point P is specified.
26. Bring cursor down and Type **5**↵ (Fig. 1.22 step 17). Point Q is specified.
27. Bring cursor to left and Type **2**↵ (Fig. 1.22 step 18). Point R is specified.
28. Type **(Enter)**↵ to finish the line command.

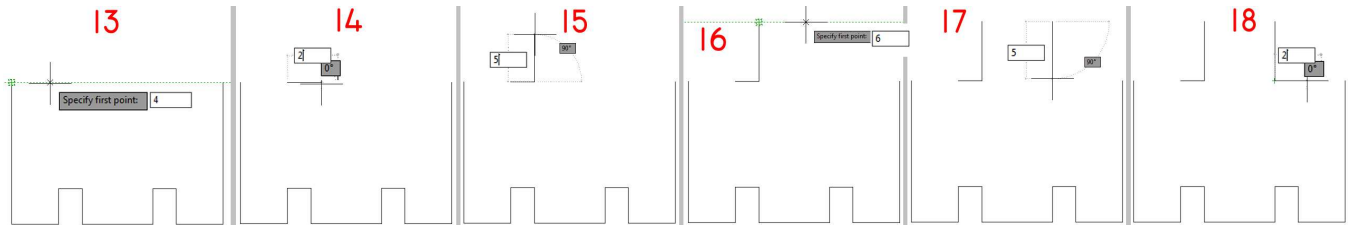

Fig. 1.22 – Steps using Ortho Mode with Object Tracking

29. Now you will draw arcs. On Home tab → Draw panel → click on dropdown arrow under Arc tool.
30. Select the option Start, End, Radius. Click near M, then A shown in Fig 1.23 and then type **2**↵ (for the radius). Make sure you see the green Snap symbols.
31. Arc tool. Select the option Start, End, Radius. Click near P, then O shown in Fig 1.23 and then type **3**↵ (for the radius). Make sure you see the green Snap symbols.
32. Arc tool. Select the option Start, End, Radius. Click near L, then R shown in Fig 1.23 and then type **2**↵ (for the radius). Make sure you see the green Snap symbols.

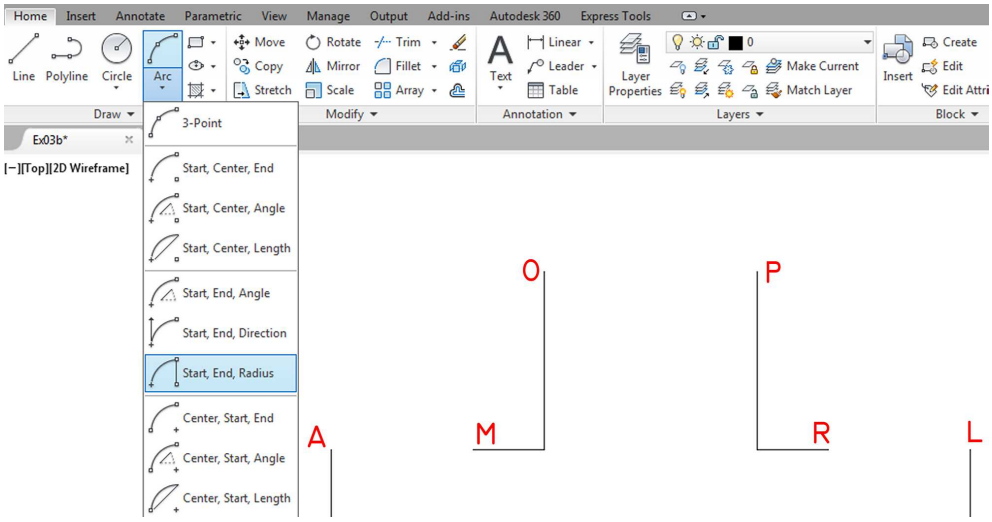

Fig. 1.23 – Draw Arcs

33. Click  (Or press Ctrl S) to Save your work.

Day 2 Rectangular and Polar Array

Array command allows you to create copies of an object in a rectangular or circular pattern.

2.1 Rectangular Array

In rectangular array, objects are distributed in rows and columns (also levels for 3D). Look at Fig. 2.1.

There is a big rectangle starting at point A(0,0) with dimensions (235, 125).

There is a medium rectangle starting at point B(10,10) with dimensions (75, 105).

There is a small rectangle starting at point C(15,15) with dimensions (10, 15).

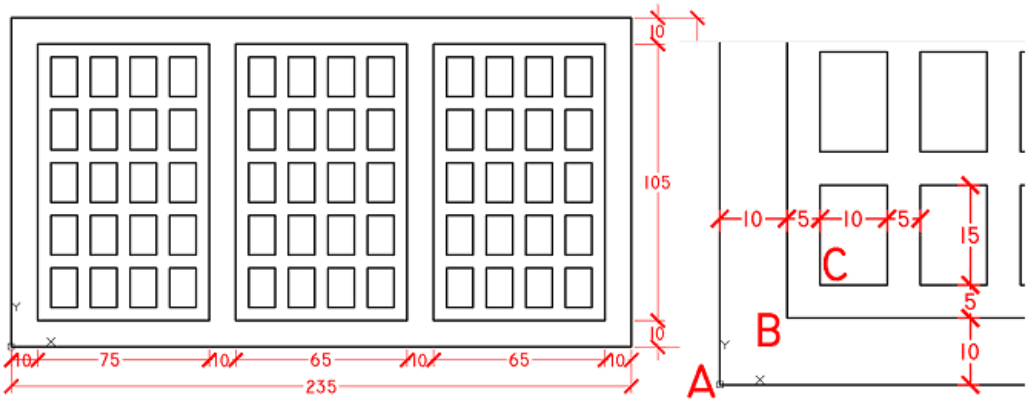

Fig. 2.1 – Rectangular Array

34. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)

1. Click on AutoCAD button  on the upper-left corner → Click on Save As → File name: **Ex04**.
2. As you can see from the drawing in Fig 2.1, the width of the drawing is 235 and height of the drawing is 105. You will set the drawing limits somewhat more than the width and height say 250, 150.
3. On Menu → Format → Drawing Limits → Type **0 , 0**↵ **250 , 150**↵ (Fig. 1.12).
4. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A↵ .
5. On Home tab → Draw panel → click on Rectangle tool OR Type REC↵ (Fig. 2.2).
6. To draw a small rectangle, type **15 , 15**↵ **10 , 15** ↵. A small rectangle is drawn.

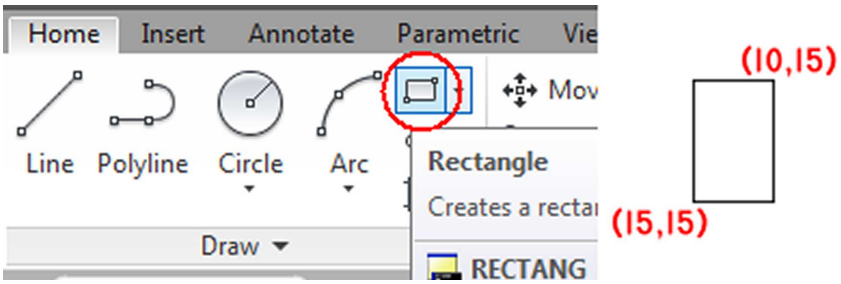

Fig. 2.2 – Draw rectangle

7. Next step is to repeat this rectangle in 4 (vertical) columns and 5 (horizontal) rows. The distance between the columns is 10 + 5 = 15 (distance from left to left OR right to right OR center to center). The distance between the rows is 15 + 5 = 20 (distance from bottom to bottom OR top to top OR center to center).

8. On Home tab → Modify panel → click on Array tool (Fig. 2.3). Prompt for Select objects appears. Click on the rectangle to select it. Press Enter↵ or right-click to finish the prompt.

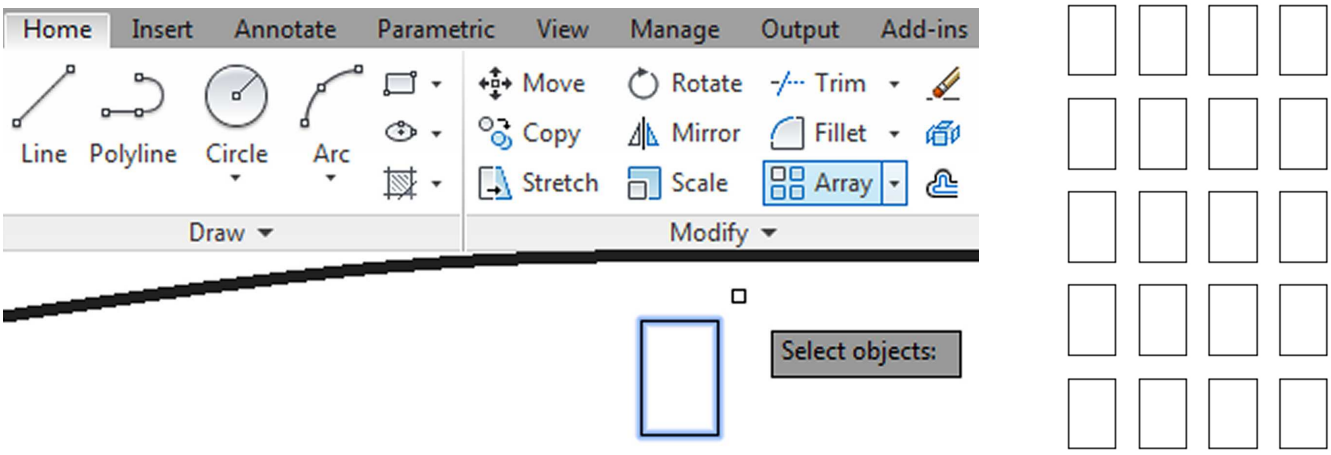

Fig. 2.3 – Array Command

9. Array Creation contextual tab appears. Make settings as shown in Fig. 2.4.

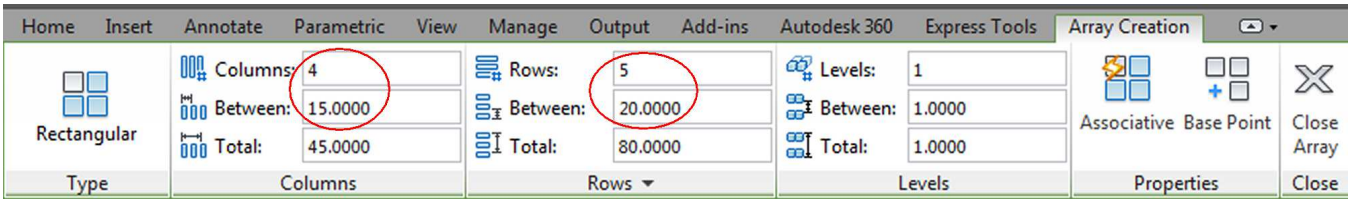

Fig. 2.4 – Array Creation contextual tab

10. Click on Close Array to finish the Array command. A 5 x 4 array of rectangles appear.
11. To draw medium rectangle, click on Rectangle tool OR Type REC↵ . Then type **10 , 10**↵ **65 , 105**↵ . A medium rectangle is drawn.
12. This medium rectangle + 20 small rectangles are repeated 3 times horizontally (3 columns at a distance of 65+10=75 in 1 row only).

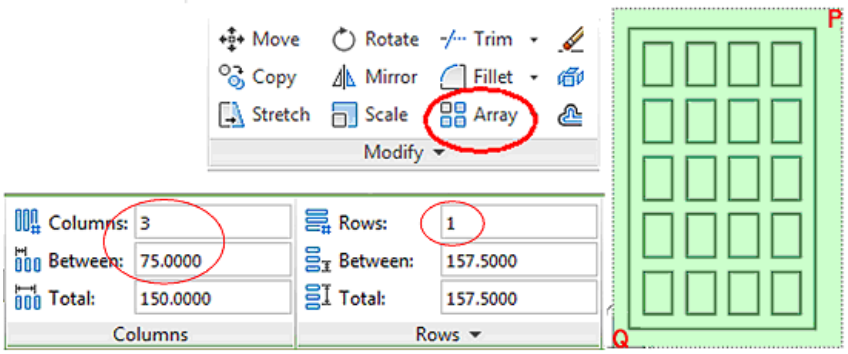

Fig. 2.5 – Rectangular Array

13. On Home tab → Modify panel → click on Array tool (Fig. 2.5). Prompt for Select objects appears. Make a selection window (Click somewhere outside on upper-right corner P then click somewhere outside on lower-left corner Q. All the objects inside the selection window (fully or partly) are selected. Press Enter↵ or right-click to finish the prompt.
14. Array Creation contextual tab appears. Make settings as shown in Fig. 2.5.
15. Click on Close Array to finish the Array command. A 1 x 3 array appear.

16. To draw the big rectangle, click on Rectangle tool OR Type REC↵ . Then type **0 , 0**↵ **235 , 125**↵ . The big rectangle is drawn.
17. The drawing shown in Fig. 2.1 is complete. Press Ctrl S to Save your work.

2.2 Polar Array

In polar array, objects are distributed on a circle.

Look at Fig. 2.6. In the lower-left part, a line is distributed on a circle. This is achieved by Polar Array command. This part is then repeated in 2 rows and 2 columns by Rectangular Array command. The upper-right part is scaled by a factor of 0.6 and the lower-right part is scaled by a factor of 1.4.

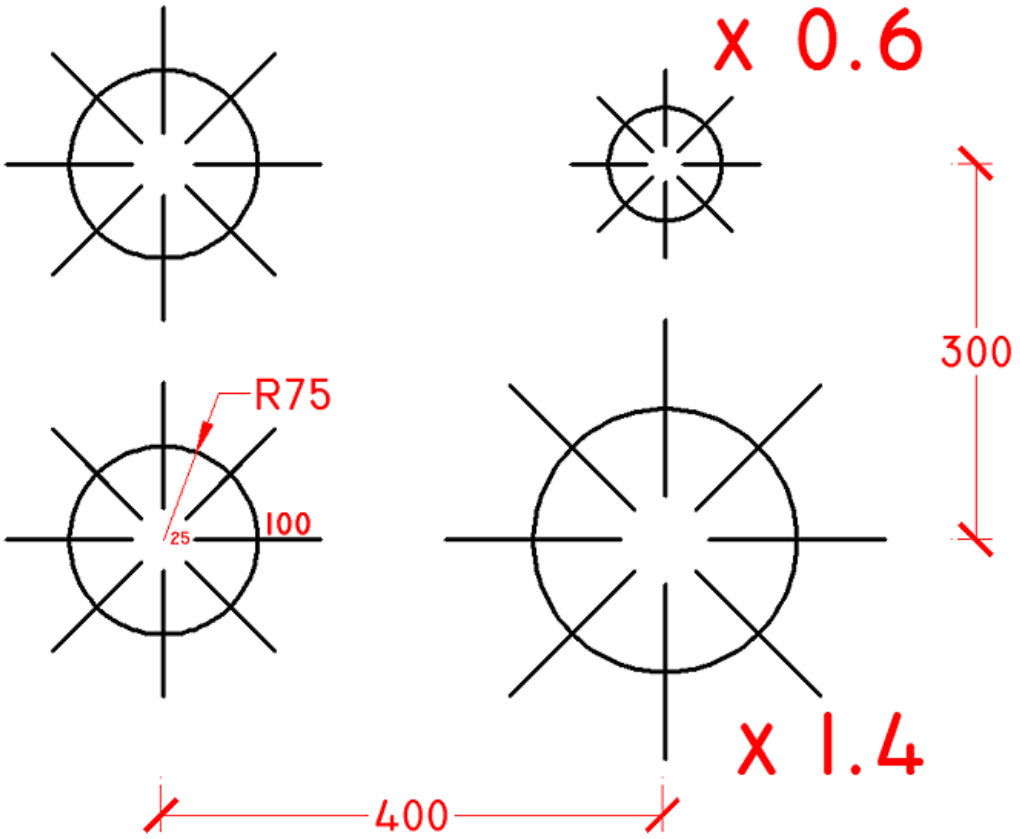

Fig. 2.6 – Polar Array

1. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)
2. Click on AutoCAD button  on the upper-left corner → Click on Save As → File name: **Ex05**.
3. As you can see from the drawing in Fig 2.6, the width of the drawing is about 500 and height of the drawing is about 400. You will set the drawing limits somewhat more than the width and height say 600, 500.
4. On Menu → Format → Drawing Limits → Type **0 , 0**↵ **600 , 500**↵ (Fig. 1.12).
5. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A↵ .
6. On Home tab → Draw panel → click on Circle tool OR Type C↵ (Fig. 2.7).

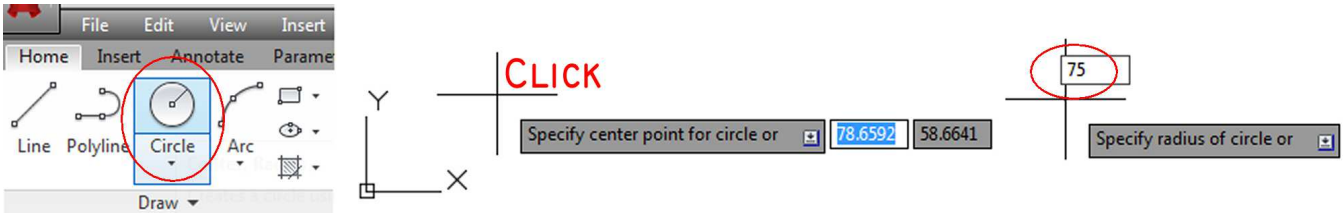

Fig. 2.7 – Draw Circle

7. You are prompted to Specify center point for circle. Click somewhere on lower-left side to specify center point for circle. Now you are prompted to Specify radius for circle. Type **75↵ .** A circle is drawn.
8. Turn Object Snap (OSNAP) ON. Turn Ortho Mode (ORTHO) ON. Turn Object Snap Tracking (OTRACK) ON (Fig. 1.3 – 1.4).
9. Make Snap settings as shown in Fig. 1.15.
10. On Home tab → Draw panel → click on Line tool OR Type L↵ (Fig. 1.14).
11. Line command starts and prompts you to specify the first point.
12. Bring cursor close to the circle and then to center of the circle. A green circular snap symbol appears. DO NOT CLICK. Move the cursor to right and type **25↵** .
13. Move the cursor to right and type **100↵** . Press Enter or right-click to finish the line command.
14. A line starting at 25 units to the right of the center and length = 100 units is drawn.

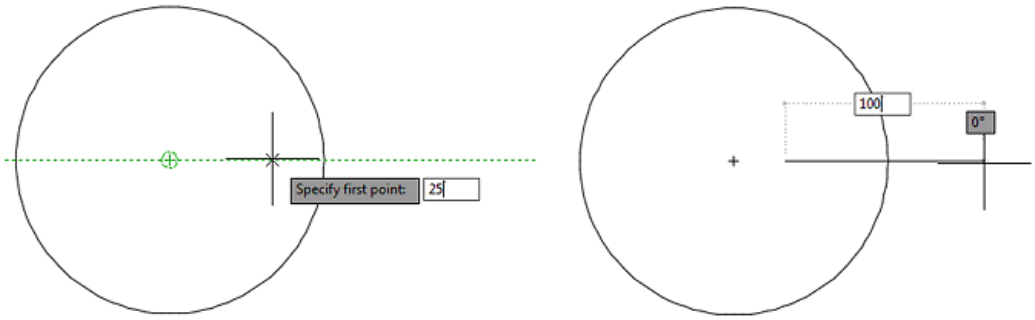

Fig. 2.8 – Draw Line

15. On Home tab → Modify panel → click on dropdown arrow to the right of Array tool and select Polar Array (Fig. 2.9). Prompt for Select objects appears. Click on the line to select it. Press Enter↵ to finish the prompt.
16. You are prompted to Specify center point of array. Bring cursor near the center of circle. When you see a small green circle, click to snap to the center point of the circle.

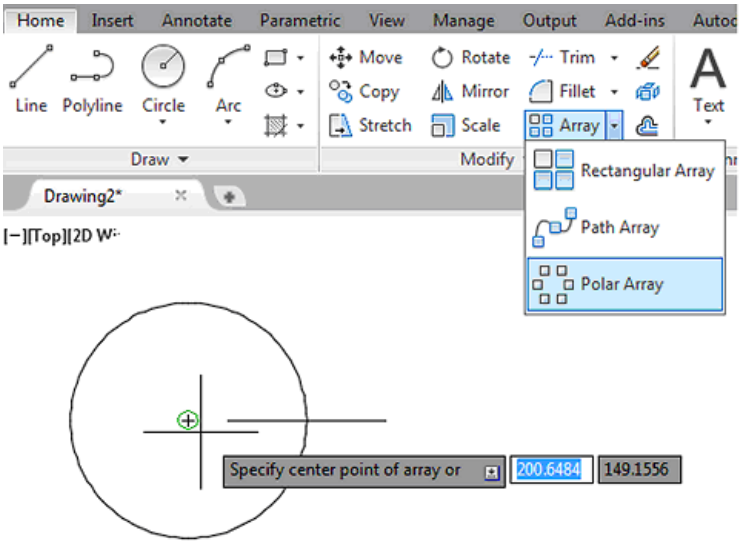

Fig. 2.9 – Polar Array

17. Array Creation contextual tab appears. Make settings as shown in Fig. 2.10.
18. Click on Close Array to finish the Array command. A polar array of lines appears.

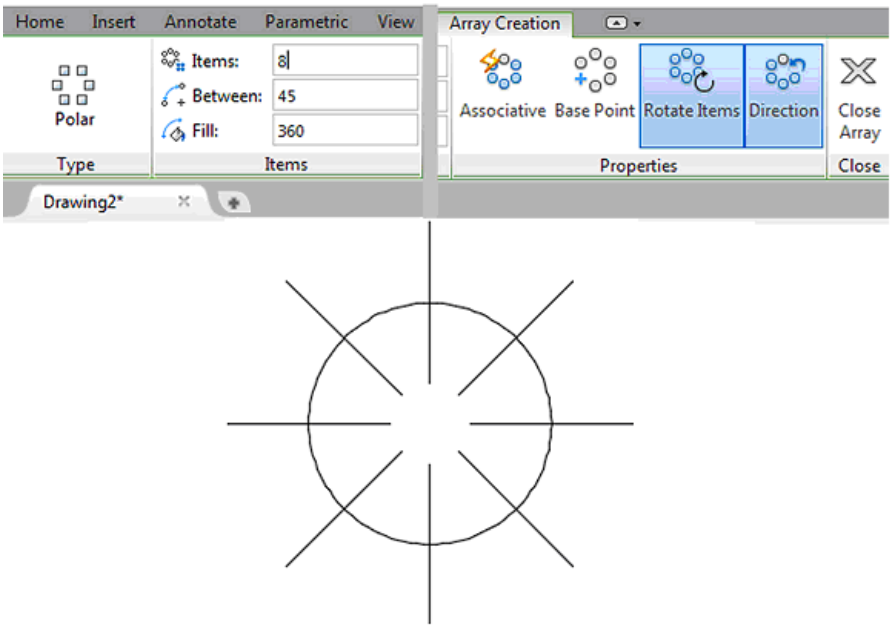

Fig. 2.10 – Polar Array Creation

19. On Home tab → Modify panel → click on dropdown arrow to the right of Array tool and select Rectangular Array (Fig. 2.11). Prompt for Select objects appears. Make a selection window (Click somewhere on upper-right corner A then click somewhere on lower-left corner B. All the objects inside the selection window (fully or partly) are selected. Press Enter↵ to finish the prompt.

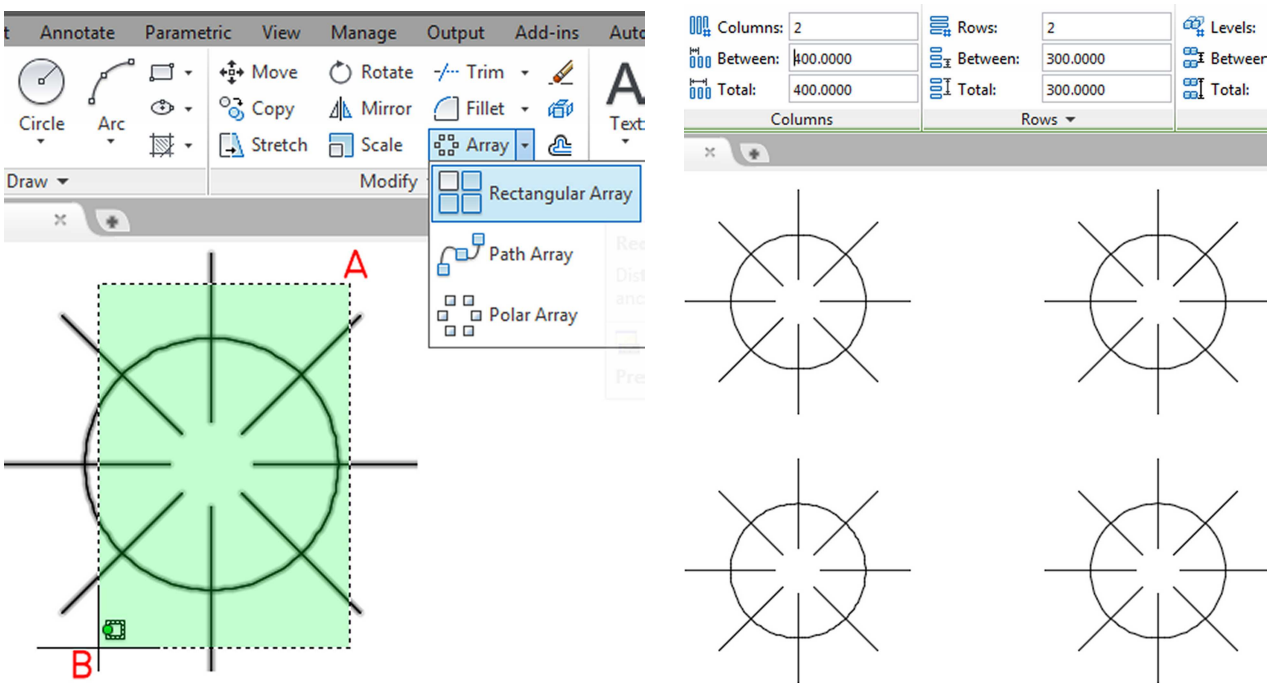

Fig. 2.11 – Rectangular Array Creation

20. Array Creation contextual tab appears. Make settings as shown in Fig. 2.11 (Columns = 2; Between Columns = 400; Rows = 2; Between Rows = 300).
21. Click on Close Array to finish the Array command. A 2 x 3 array appear.

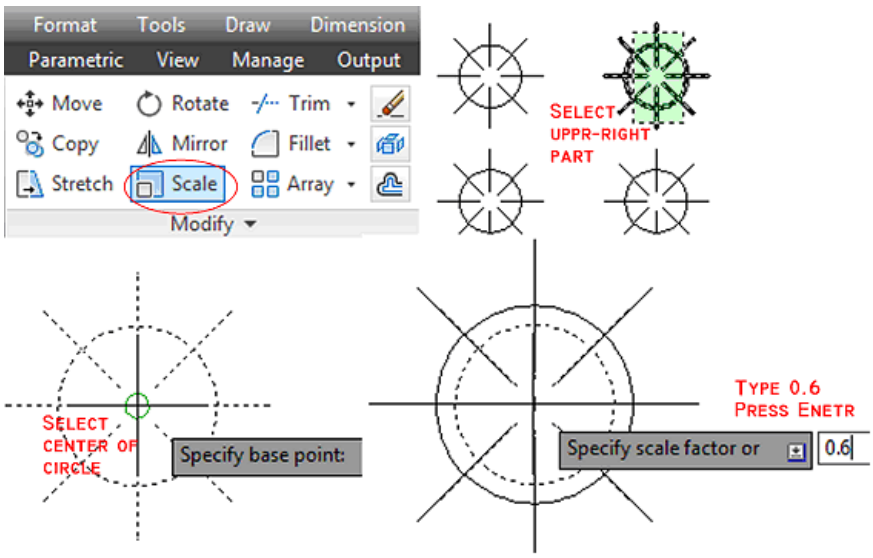

Fig. 2.12 – Rectangular Array Creation

22. On Home tab → Modify panel → click on Scale tool OR Type SC↵ (Fig. 2.12).
23. You are prompted to select objects. Select the upper-right part.
24. You are prompted to Specify base point. Snap to center of circle (click when small green circle appears).
25. You are prompted to Specify scale factor. Type 0.6↵ .
26. In the same way, scale lower-right part by a factor of 1.4.
27. The drawing shown in Fig. 2.6 is complete. Press Ctrl S to Save your work.

2.3 Pattern with Arrays

You can make interesting patterns using polar and rectangular arrays. One such example is shown in Fig. 2.13.

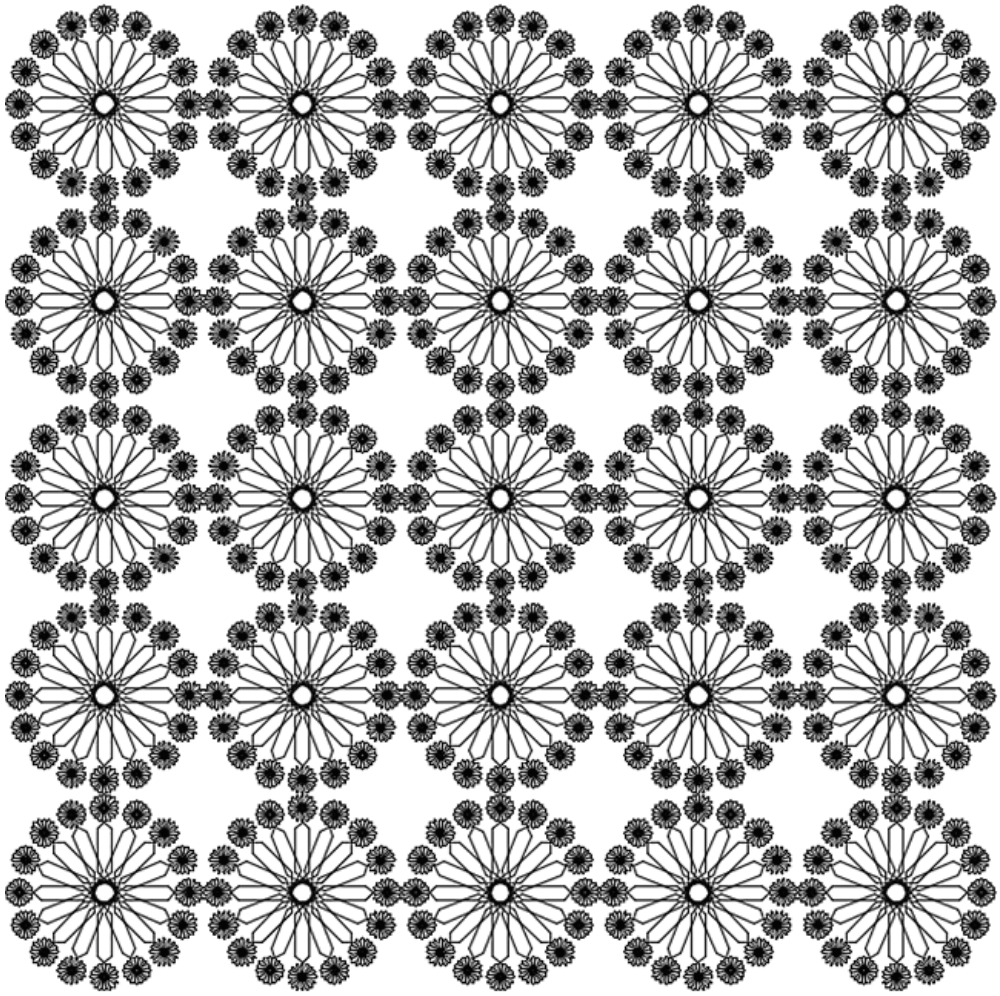

Fig. 2.13 – Pattern Creation using Arrays

1. Open (double-click on) Start.dwg found in CADFiles folder in Download Folder (page v)
2. Click on AutoCAD button on the upper-left corner → Click on Save As → File name: **Ex06**.
3. On Menu → Format → Drawing Limits → Type **0 , 0** ↵ **10 , 10** ↵ (Fig. 1.12).
4. To adjust the screen for these drawing limits, you will select View → Zoom → All (Fig. 1.12) OR Type Z ↵ A ↵ .
5. Turn Object Snap (OSNAP) ON. Turn Object Snap Tracking (OTRACK) ON (Fig. 1.3 – 1.4).

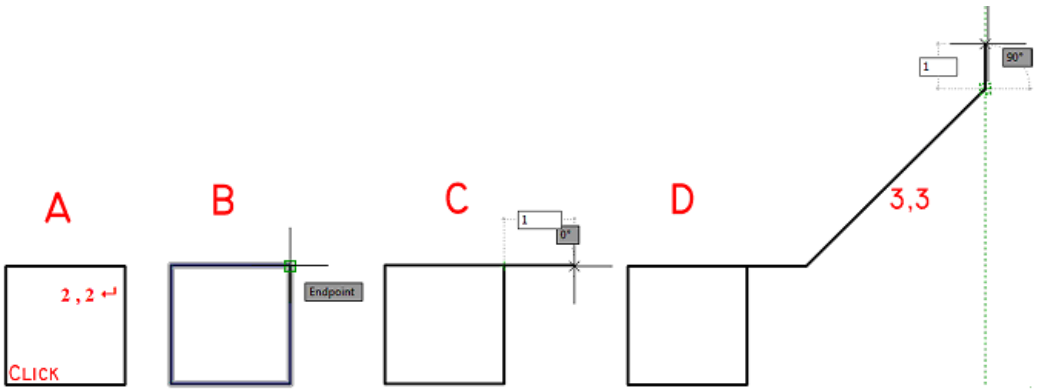

Fig. 2.14 – Rectangle and Line

6. On Home tab → Draw panel → click on Rectangle tool OR Type REC↵ . Click somewhere on lower-left part of the drawing area, move cursor little away and type **2 , 2**↵ (Fig. 2.14 A).
7. On Home tab → Draw panel → click on Line tool OR Type L↵ . Snap to upper-right corner of the rectangle (Fig. 2.14 B).
8. Move cursor to right. When you see green dotted tracking line, type **1**↵ (Fig. 2.14 C).
9. Type **3, 3**↵ (Fig. 2.14 D).
10. Move cursor to up. When you see green dotted tracking line, type **1**↵ (Fig. 2.14 D).
11. Move cursor to left. When you see green dotted tracking line, type **1**↵ **.**
12. Type **-3, -3**↵
13. Click snapping to upper-right corner of the rectangle. You will get the drawing as shown in Fig. 2.15 A.

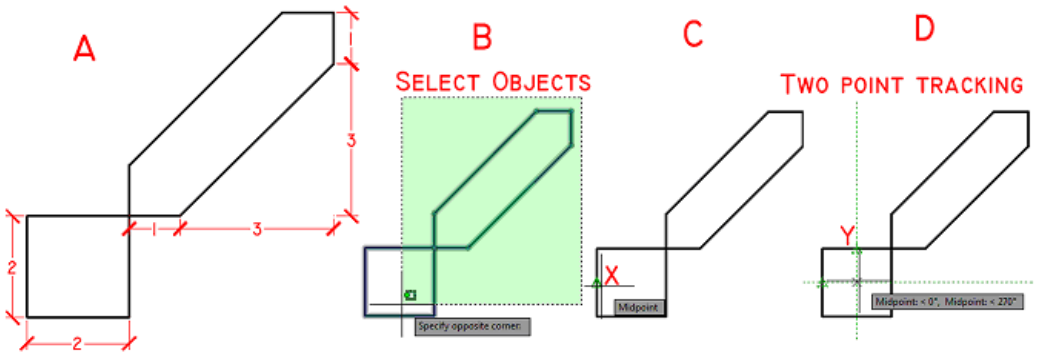

Fig. 2.15 – Two point tracking

14. Now you will make polar array of this drawing.
15. On Home tab → Modify panel → click on dropdown arrow to the right of Array tool and select Polar Array (Fig. 2.9). Prompt for Select objects appears. Select the drawing (Fig. 2.15 B). Press Enter↵ to finish the prompt.
16. You are prompted to Specify center point of array which is center of the rectangle. You need tracking from mid-point of vertical side and mid-point of horizontal side.
17. Bring cursor on X (mid-point of vertical side. Fig. 2.15 C). You will see a small triangle (mid-point snap symbol). DO NOT CLICK. Move cursor to right. You will see green dotted horizontal tracking line.
18. Bring cursor on Y (mid-point of horizontal side. Fig. 2.15 D). You will see a small triangle (mid-point snap symbol). DO NOT CLICK. Move cursor down until you will see green dotted tracking lines from both mid-points. Now CLICK to track the middle point of the rectangle.

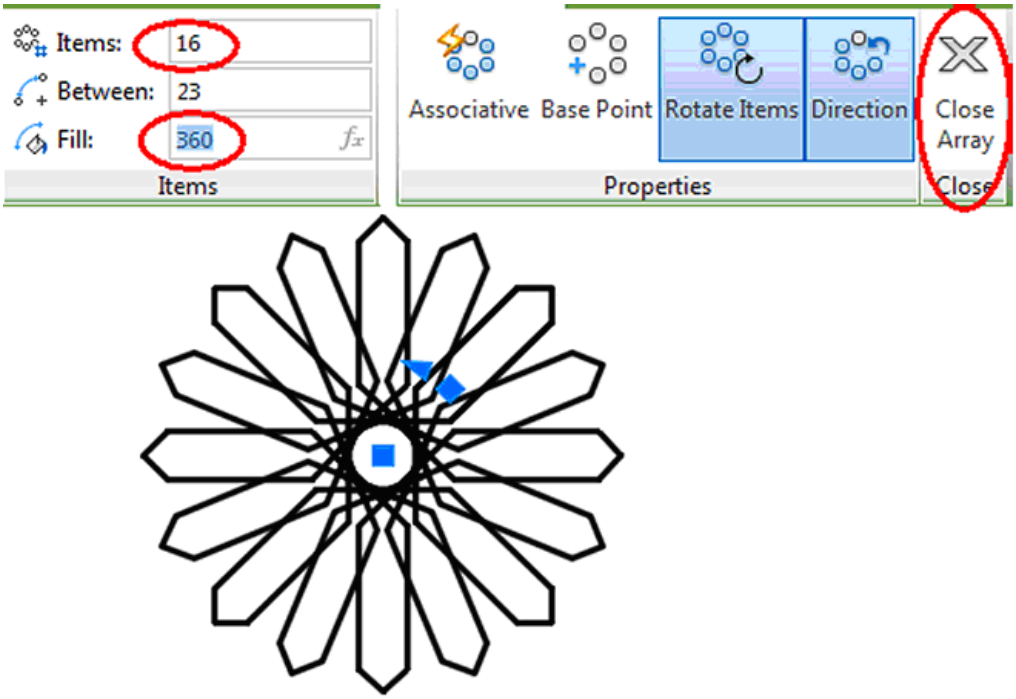

Fig. 2.16 – Two point tracking

19. Array Creation contextual tab appears. Make settings as shown in Fig. 2.16 (Items = 16, Fill = 360). Click Close Array.
20. **Rotate wheel of mouse to zoom in or out. Press wheel and drag to pan**.

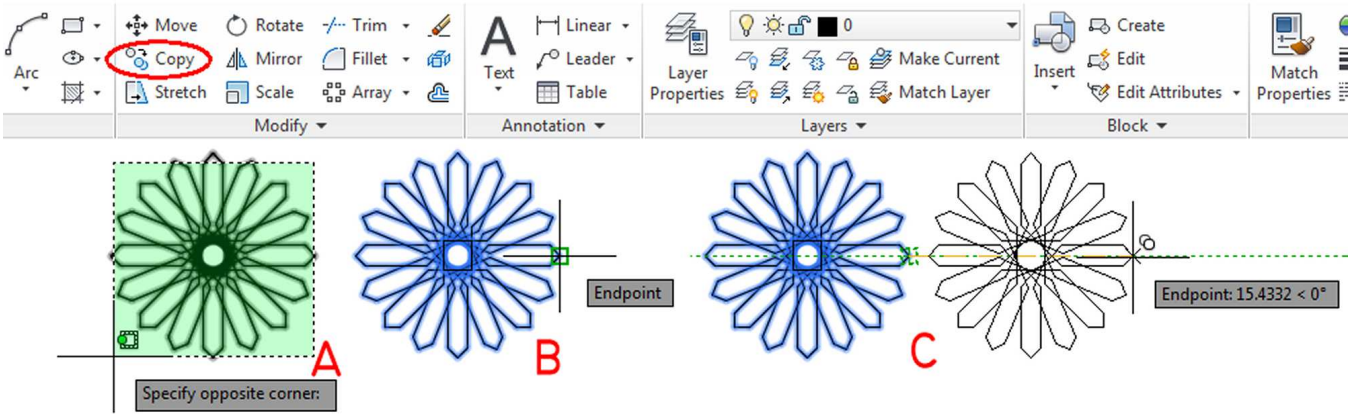

Fig. 2.17 – Copy Command

21. On Home tab → Modify panel → click on Copy tool (Fig. 2.17). Prompt for Select objects appears. Select the drawing (Fig. 2.17 A). Press Enter↵ to finish the prompt.
22. You are prompted to Specify base point. Snap to middle-right point (Fig. 2.17 B). Move cursor away to right and click to make copy of the drawing (Fig. 2.17 C). Press **Enter or ESC** to finish the Copy command.

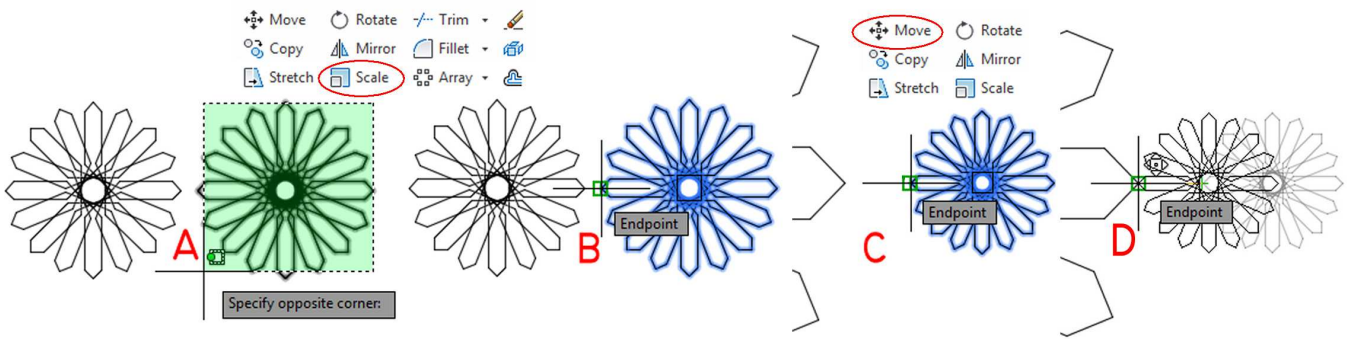

Fig. 2.18 – Scale and Move Commands

23. On Home tab → Modify panel → click on Scale tool OR Type SC↵ .
24. You are prompted to select objects. Select the right copied part (Fig. 2.18 A).
25. You are prompted to Specify base point. Snap to middle-left point (click when small green square appears Fig. 2.18 B).
26. You are prompted to Specify scale factor. Type 0.2↵ . The right part is scaled down by a factor of 0.2.
27. On Home tab → Modify panel → click on Move tool OR Type M↵ .
28. You are prompted to select objects. Select the right scaled part (Fig. 2.18 C).
29. You are prompted to Specify base point. Snap to middle-left point (click when small green square appears Fig. 2.17 C).
30. You are prompted to Specify second point. Snap to middle-right point of left part (Fig. 2.18 D). You will get a drawing as shown in Fig. 2.19 A.

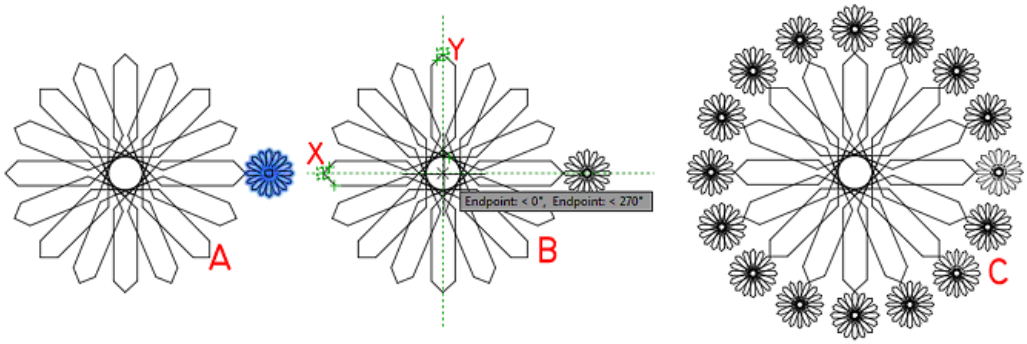

Fig. 2.19 – Polar Array with Two point Tracking

31. Now you will make polar array of the scaled part.
32. On Home tab → Modify panel → click on dropdown arrow to the right of Array tool and select Polar Array (Fig. 2.9). Prompt for Select objects appears. Select the right scaled part (Fig. 2.19 A). Press Enter↵ to finish the prompt.
33. You are prompted to Specify center point of array which is center of the rectangle. You need 2 point tracking for middle point of the big drawing.
34. Bring cursor on X (middle-left point Fig. 2.19 B). You will see a small square (end-point snap symbol). DO NOT CLICK. Move cursor to right. You will see green dotted horizontal tracking line.
35. Bring cursor on Y (middle-top point Fig. 2.19 B). You will see a small square (end-point snap symbol). DO NOT CLICK. Move cursor down until you will see green dotted tracking lines from both end-points. Now CLICK to track the middle point of the drawing.
36. Array Creation contextual tab appears. Make settings as shown in Fig. 2.16. Click Close Array. You will get the drawing as shown in Fig. 2.19 C.

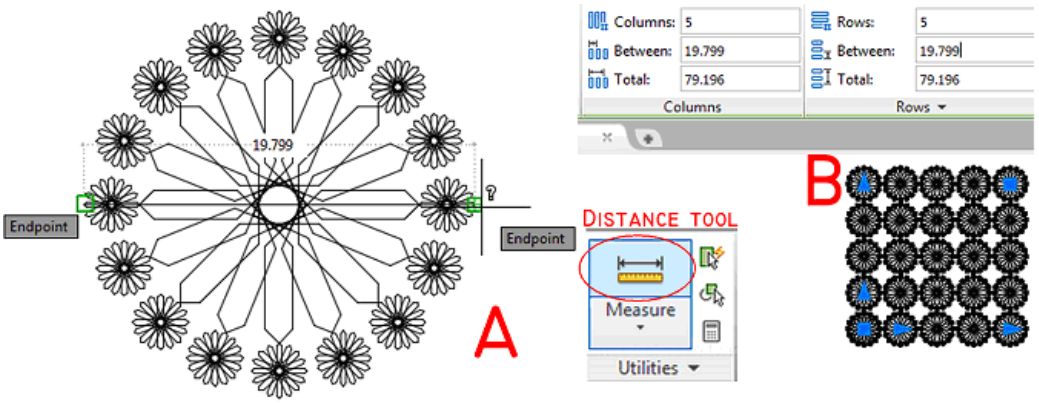

Fig. 2.20 – Rectangular Array

37. Now you will make a 5 x 5 rectangular array of the drawing. But you need to know the distance between columns and rows which is equal to the width of the drawing.
38. On Home tab → Utilities panel → click on Distance tool. Click on middle-left end-point and then middle-right end-point (Fig. 2.20 A). You will that the distance is 19.799.
39. On Home tab → Modify panel → click on dropdown arrow to the right of Array tool and select Rectangular Array (Fig. 2.11). Prompt for Select objects appears. Select the whole drawing. Press Enter↵ to finish the prompt.
40. Array Creation contextual tab appears. Make settings as shown in Fig. 2.20 B (Columns = 5; Between Columns = 19.799; Rows = 5; Between Rows = 19.799).
41. Click on Close Array to finish the Array command. A 5 x 5 array appear.
42. The drawing shown in Fig. 2.13 is complete. Press Ctrl S to Save your work.