10

CITY SCHOOLS DIVISION OF DASMARIÑAS

TLE

TECHNICAL DRAFTING

TLE

Technical Drafting

Development Team of the Module

Authors: MA. JUDA B. BELTRAN/ MARGIE F. ROSANTO

Editor: Celedonio B. Balderas Jr.

Reviewer: Celedonio B. Balderas Jr.

Management Team: Gemma G. Cortez, Ed.D., CID – Chief

Leylanie V. Adao, EPS - LR

Joel D. Salazar, EPS In-charge

SDO Dasmarinas City

Guide in Using Learner's Module

For the Parents/Guardian

This module is designed to assist you as the learning facilitator at home. It provides you with activities and lesson information that the learners need to accomplish in a distance learning modality.

For the Learner

This module is designed to guide you in your independent learning activities at your own pace and time. This also aims to help you acquire the competencies required by the Department of Education at the comfort of your home.

You are expected to answer all activities on separate sheets of paper and submit the outputs to your respective teachers on the time and date agreed upon.

M O D U L E 1
Operate CAD Software and Hardware

I What I need to know?

LO 1: Operate CAD software and computer hardware (TLE_ICTTD9-12CA-Ia-b1), (TLE_ICTTD9-12CA-Ic-j-2)

- Identify CAD software features according to the software provider
- Explore CAD working Environment
- Manipulate CAD features as per job requirement

This module was designed and written with you in mind. It is here to help you understand the basics of Computer-Aided Design, a drawing method widely used in Technical Drawing today. Included in this module are learning activities designed to deepen your knowledge and hone your skills to create accurate technical drawing following standards set by the industry.

The module is divided into five (5) lessons, namely:

- Lesson 1 – CAD Software and Hardware
- Lesson 2 – AutoCAD Interface
- Lesson 3 – Drawing Aids
- Lesson 4 – Draw Commands
- Lesson 5 – Modify Commands

After going through this module, you are expected to:

1. Know the software and hardware used in CAD design.
2. Identify the name and function of AutoCAD interface.
3. Utilize drawing aids to achieve productivity and accuracy.
4. Illustrate how to create objects using draw commands; and
5. Construct geometric figures using draw and modify commands.

I What is new?

Refer to the images for the questions below.

Image 1.

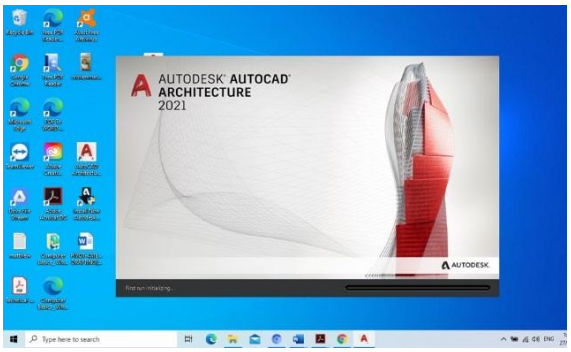
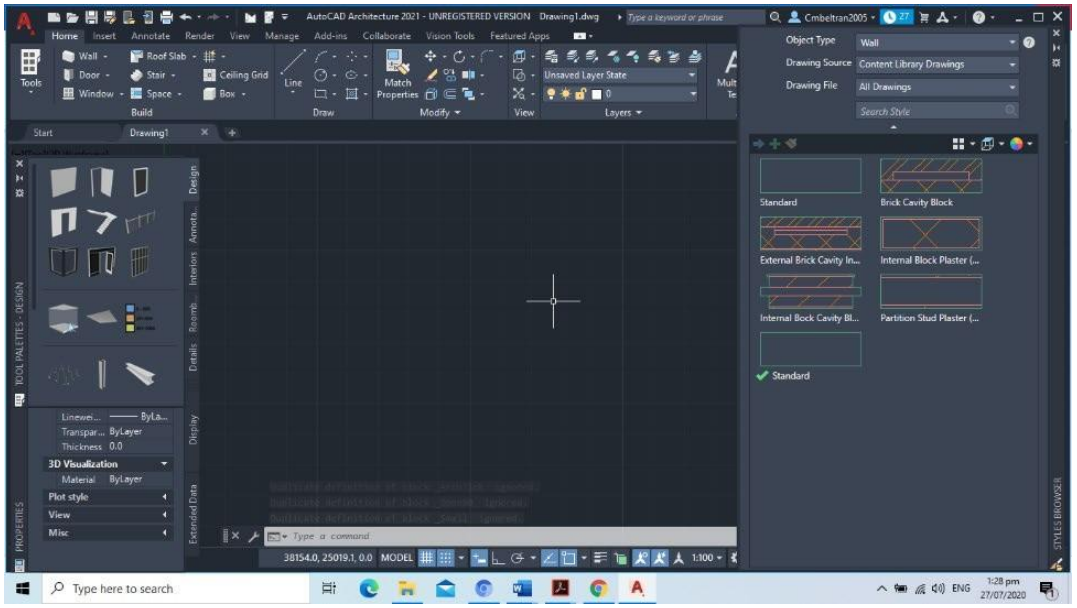


Image 3.

Image 2.



Questions:

1. What is the application being opened in image 1?

Answer: _____

2. What is the function of the application
Answer: _____

3. As an incoming Grade 10 Technical Drafting student who experienced tedious manual drawing, give at least 4 benefits of using the software. Refer to image 2.
Answer:
a) ____ _____

b) _____ _____

c) ____ _____

d) _____ _____

4. What do you think are the accessories needed in doing your task as a Technical Drafting CAD student? You can refer to image 3. Give at least 4 Answers:
a) _____

b) _____

c) _____

d) _____

D What I know?

Choose the letter of the best answer. Write the letter of your answer on a separate sheet of paper.

1. What is the software application that enables computer aided design (CAD)? and drawing?
   A. AutoCAD C. Micro cad
   B. Autodesk D. None of the Above
2. What is the device that is used to navigate and select various options on the computer screen?
   A. Keyboard B. Mouse C. Monitor D. Stylus

3. _____is usually used as a substitute for computer mouse.
   A. Touch pad B. Keyboard C. Stylus D. Mousepad

4. _____ is the main part of a desktop computer and is also known as a "tower" or "chassis".

A. VGA C. CPU

B. Power Supply D. System Unit

5. What is a set of programs, procedures, and related documentation associated with a computer system?

A. Input B. Hardware C. Software D. Output

6. Which hardware device will allow user to modify, access and delete files?

A. CPU B. Computer Disk Drive C. VGA D. Mousepad

7. Which device enables the user to input commands or text into a computer?

A. Keyboard B. Monitor C. Mouse D. Digitizer

8. Which hardware from the choices below has the capability to print designs with higher accuracy on a piece of paper?

A. Ink jet printer B. Dot matrix C. LED printer D. Plotter

9. The following statements explain the benefits of using CAD under productivity except

A. Drawing created can be continuously retrieved.

B. Pattern fills can be placed with a single pick.

C. Digital information is accurate.

D. Modifying drawing can be done quickly.

10. What computer hardware converts AC electrical power into a low DC voltage?

A. Processor B. Hard disk C. VGA D. Power Supply

11. It is also called the brain of the computer where most of the computing takes place.

A. CPU B. VGA C. Power Supply D. Hard Drive

12. What is being referred to by the "term chassis or tower"?

A. Processor B. System unit C. Microsoft D. Hard Drive

10. When your drawing using CAD your work can be shared across a network which only means that CAD

A. has improved accuracy B. Better Interaction

C. has 3D visualization and analysis D. Better productivity

11. Which input device is controlled with finger or a digital pen called stylus?

A. Keyboard B. Mouse C. Digitizer tablet D. Computer

12. The following is an example of hardware except

A. Keyboard B. VGA C. AutoCAD D. Power Supply

13. _____ is a piece of equipment that provides data to a computer processor/memory.

A. Output device B. Input device C. Storage device D. Computer

14. ____ is being referred to as a collection of physical parts of the computer?

A. Software B. Hardware C. Input D. Output

15. What type of hardware device that displays information or results.

A. Input Device B. Output device C. Storage device D. Power supply

D What is it?

Lesson 1 CAD Software and Hardware

This module is intended for Technical Drafting students who are starting to use CAD in creating accurate drawing following standards set by the industry. The succeeding lessons will lead you to gradually achieve the knowledge and skills needed to create and plot a CAD drawing using AutoCAD software.

TERMINOLOGIES

Software is a set of programs, procedures, and related documentation associated with a computer system.

Hardware- It is the collection of the physical parts of the computer system, the parts that you can touch and see.

Input Device - An input device is a piece of hardware that provides data to a computer processor/memory.

Output device – An output device is any hardware that displays information or results.

What is CAD
CAD or Computer Aided Design is creating a drawing or design using Computer or technology. The use of Cad started since 1964 but was widely used when AutoCAD was launched to the market by Autodesk in 1982.

Although AutoCAD was created for Mechanical Engineering, It is widely used in Construction industry. Using Cad offers better productivity, accuracy, better interaction and collaboration across network, 3D imaging and technical run before assembly or fabrication.

CAD SOFTWARE AND HARDWARE

The software
Software can be categorized into two main groups: operating system software and application software.

APPLICATION SOFTWARE	Definition or Function
   	The application software, also called programs, has a specific use or task to perform such as AutoCAD for architectural drawings and layouts, Canva for business and marketing, Adobe Photoshop for image processing etc.
OPERATING SYSTEM SOFTWARE	
	The operating system software provides various levels of interaction (called interface) between the computer and the user, as well as between the computer and the application software. Ex. Windows xp, Windows Vista, Ubuntu, MacOS, Solaris, Linux etc.

AutoCAD Is the first CAD software for PC that was developed by Autodesk which enables computer-aided design. This application has been available in the market since 1982. This Software is used to produce 2D and 3D drawings.

The Hardware

Examples of input Device	Function
1. Keyboard 	The keyboard is a device that enables a user to input commands or text into computer.

2. Mouse 	This hand held device is used to select an object by pointing and clicking the button. This is used to navigate and select various options on the computer screen.
3. Touchpad 	First introduced for laptops in the 1990s, a touchpad is usually a substitute for computer mouse. It has specialized surface that can detect the movement of a user's finger and use that information to direct a pointer and control a computer.
4. touch screen 	As the name suggests, a touch screen is a touch-sensitive screen that reacts to stylus or fingers moving across it. Note: AutoCAD software can be installed in celphones and iPads.

OUTPUT DEVICE	**Description/Function**
1. Monitor 	A monitor displays data from a computer onto a screen so the user can interact with the data via digital interface.
2. Printers 	Printers take electronic data sent from a computer and generate a hard copy.
3. Plotte 	Plotters are commonly used to print designs on a piece of paper using pen. This is commonly used in engineering drawing because this is more precise than the ordinary printer.

SAMPLE PROCESSORS	Definition/Function
1. CPU- the central Processor Unit **Intel processor** **AMD processor** 	Processor is also called the brain of the computer where the processing of all instruction takes place.

SYSTEM UNIT	DEFINITION/FUNCTION
	System unit is also known as a "tower" or chassis," is the main part of a desktop computer. It includes the motherboard, CPU, RAM and other components. The system unit also includes the case that houses the internal components of the computer.
COMPUTER DISK DRIVE 	Computer Disk Drive is a hardware device that reads and writes data from optical disks via laser beam technology. This allows user to modify, access and delete files. Optical Drives such as CD or DVD-ROMs are becoming rarely used in modern computers especially in portable PCs such as laptops and netbooks.
POWER SUPPLY 	Power supply is hardware component of a computer that supplies all other component with power.

Note for the student:

Please access the link below to enhance learning about CAD software and hardware.

https://www.scan2cad.com/tips/autocad-brief-history/

E What I can do?

Activity Sheet 2

Classify the words below into input, output, hardware, application, and operating system software. Copy on a separate sheet of paper the guide given below for your answers. 20 pts.

Windows 10	Words	Excel	Mouse
Video card	Windows Vista	Solaris	Linux
Printer	Ubuntu	Microphone	Processor
Plotter	Lazada	Touch Screen	Google Mail
Monitor	Google Search	Computer Speaker	Keyboard

Input Hardware	Output Hardware	Application Software	Operating System Software

T

Score: _____

E What else can I do?

Activity Sheet 3

Answer briefly what is being asked in the statement below. Unlock your thinking prowess and gather 3 golden stars if you answer all correctly. 5 points each. Use a separate sheet of paper

Score: _____

Questions	Corresponding Star
1. What is the difference between hardware and software? Answer:	
2. What is the difference between output and input device? Answer:	
3. What is the difference between application software and operating system software? Answer:	

For the teacher: *Give a corresponding star to every answered question.*			
	Both functions were discussed.	*Only one function has been discussed.*	*Both answers are incorrect.*

A What I have learned?

Activity sheet4

Give your answer in 5 sentences for the question below. Use a separate sheet of paper.

1. As a technical drafting student, give reasons why studying AutoCAD software and hardware is necessary.
Answer:

A What can I achieve?

Write your answer on the space provided before the number. Choose the letters only.

_____1. What is the computer hardware that takes electronic data sent from a computer and generate a hard copy?

A. Plotter B. Printer C. Projector D. Processor

_____2. It is called the brain of the computer where the processing of all instruction takes place.

A. VGA B. Power Supply C. Projector D. CPU

_____3. What device will project and turn an image onto a large surface, such as a white screen or wall?

A. Power Supply B. Printer C. Projector D. Monito

_____4. What is a type of software that provides various levels of interaction (called interface) between the computer and the user, as well as between the computer and the application software?

A. Application Software C. Operating Software
B. Processor D. Microsoft Word

_____5. It displays data from a computer onto a screen so the user can interact with the data via digital interface.

A. Projector B. Monitor C. PCU D. Touch screen

_____6. It has specialized surface that can detect the movement of a user's finger and use that information to direct a pointer and control a computer.

A. Mouse B. Monitor C. Touchpad D. Touch screen

_____7. What is a touch sensitive screen that reacts to stylus or fingers moving across it?

A. Keyboard B. Monitor C. Keypad D. Touch screen

_____ 8. What device enables a user to input commands or text into a computer screen?

A. Mouse B. Keyboard C. Keypad D. Touch

_____9. Which term from the choices below is also referred to as the "brain of the computer"?

A. System Unit B. Processor C. Power Supply D. VGA

_____10. Which hardware from the choices below mainly reads and writes data from optical disks via laser beam technology?

A. VGA C. System Unit
B. PCU D. Computer Disk Drive

_____11. These are examples of application software except_____.

A. Windows Xp B. AutoCAD C. Adobe Acrobat D. Photoshop

_____12. These are examples of hardware except_____.

A. Mouse B. Printer C. Projector D. Ubuntu

_____13. The following are examples of input device except_____.

A. Mouse B. Keyboard C. Monitor D. Graphic tablet

_____14._____means Computer Aided Design.

A. AutoCAD B. Micro CAD C. CAD D. Autodesk

_____15._____includes the motherboard, CPU, RAM, and other components.

A. Processor B. System unit C. Monitor D. Computer

D What I know?

Choose the letter of the best answer. Write the letter of your answer on a separate sheet of paper.

1. What will serve as a mouse pointer/cursor in the drawing area?
   A. Pointer C. Cross Hair
   B. The UCS icon D. Mouse
2. Which tab is displayed by default at startup, providing easy access to a variety of initial actions including access to drawing template files?
   B. Open B. Save C. New D. Start
3. Which area in the Auto Cad interface can help you create and draw objects?
   A. The Status bar C. The Drawing Area
   B. B. The Title Bar D. Ribbon
4. Which of the choices below is the extension file of AutoCAD?
   A. .com B. .doc C. .dwg D. .jpeg
5. _____is where you input your commands?
   A. The Drawing Area C. The command line window
   B. The Title Bar D. The quick access tool bar
6. Which part of the AutoCAD interface automatically displays the name of your file and the version of the AutoCAD you are using?
   A. The Drawing Area C. The Title Bar
   B. The Command line Window D. Menu Bar
7. Which part of the AutoCAD interface provides navigational access to all AutoCAD commands and features?
   A. Application Menu Bar C. Ribbon
   B. Quick Access Tool Bar D. Status Bar
8. Which is not included in the AutoCAD interface?
   A. File tab B. UCS icon C. Function Keys D. Command line
9. Where are the AutoCAD tools contained?
   A. Ribbon B. Title Bar C. Command line D. Menu Bar
10. Which of the following will you use to find related sources?
   A. Info Center C. Help Center
   B. Menu bar D. Quick Access tool bar
11. Which of the following will give you access to model and layout space?
   A. Menu Bar B. Info Center C. File tab D. Layout tab
12 What is the correct meaning of UCS?
   A. User Coordinate System C. Universal Coordinates System
   B. User Cartesian System D. Universal Cartesian System
13. Which of the following keyboard combination can open command line window?

A. Ctrl + 3 B. Ctrl + 9 C. Ctrl + 10 D. Ribbon

14. Which of the following provides an easy way to access all the open drawings in AutoCAD?

A. File Tab B. Model Tab C. Application Tool Bar D. Ribbon

15. ____ is a 3D navigation tool that appears when the 3D graphics system is enabled and allows you to switch between standard and isometric views.

A. File Tab B. View Cube C. Application Tool Bar D. Ribbon

D What is in?

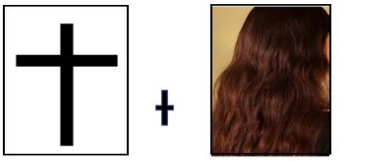
Give the correct words taken from the 2 pictures. Let us play 2 pics 2 words.

Score_____

What is this? 

What is this? 

1.



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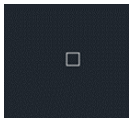
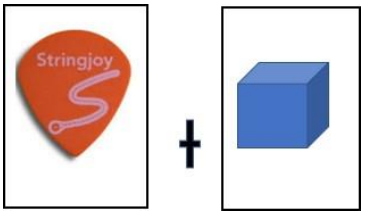
What is this? 

What is this? 

3.



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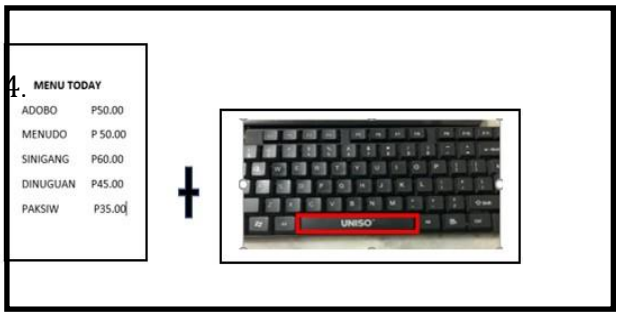

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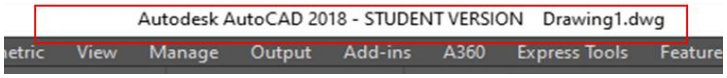
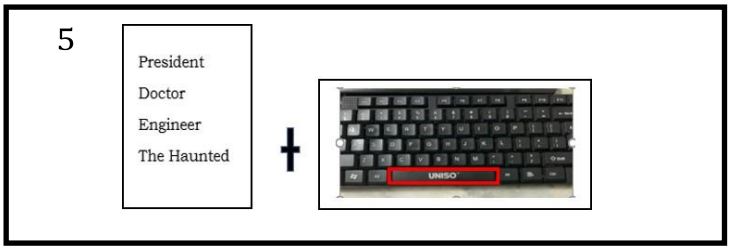
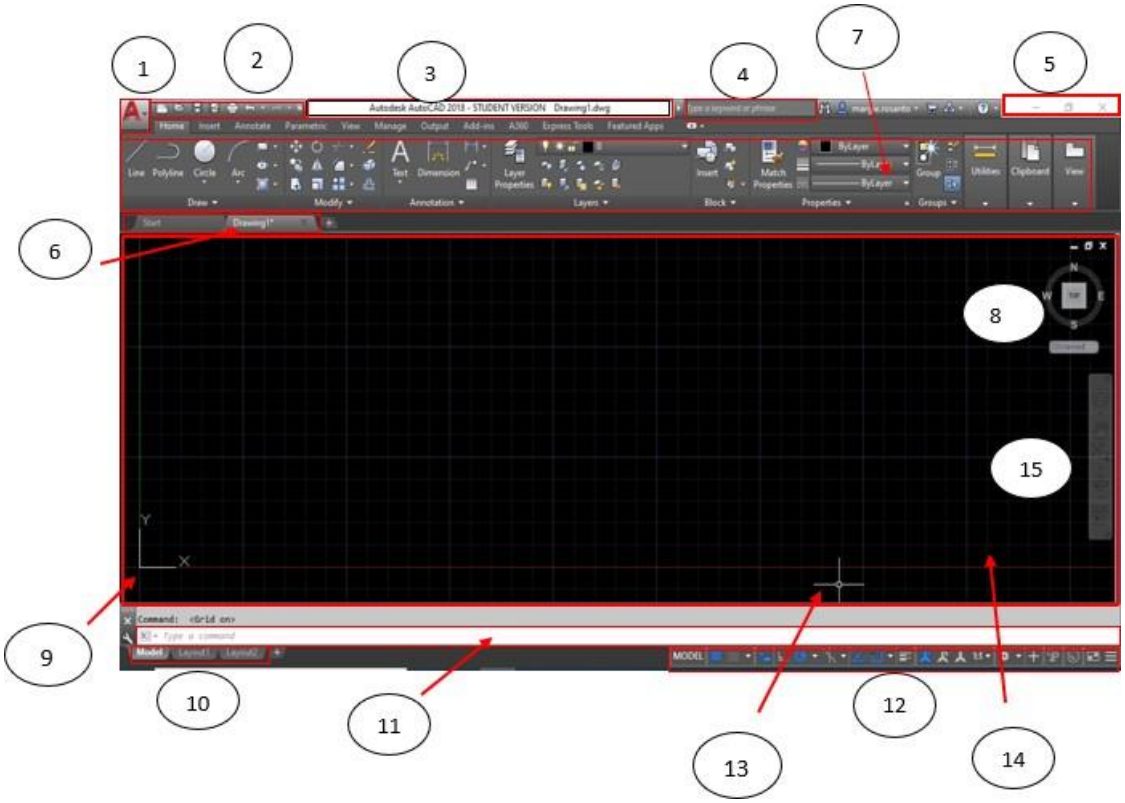
What is this?





t							r

Name the parts of the AutoCAD User Interface.



Notes to the teacher:

If the learner gets a perfect score in the drill and review, the learner can immediately proceed to the next activities in this module; otherwise, he/she can repeat answering and continue. All activities should be answered honestly and accurately. Enjoy learning and have fun!

D What is it?

This module will prepare the learners in using CAD-based drawing guided by standards set by the industry. The lessons will help the learners to understand the concepts and underlying principles in the preparation of CAD.

Lesson 2 The AutoCAD Interface

The AutoCAD interface contains tools, drawing aids and features to help the user enhance his/her design and perform the task quickly and accurately. Let us now learn The AutoCAD interface by knowing first how to start AutoCAD.

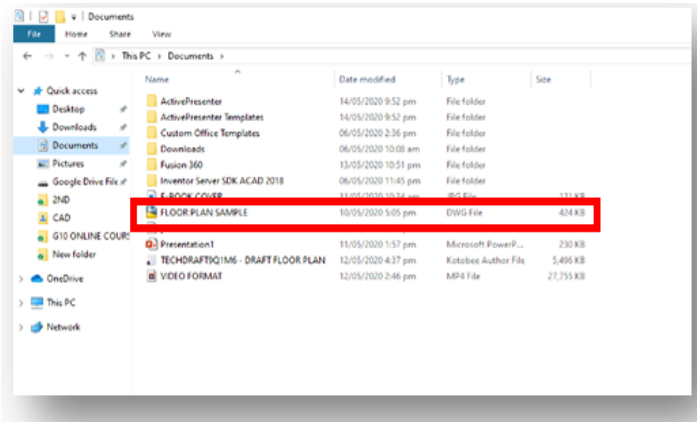
Starting AutoCAD

Use one of the following Method to start AutoCAD

1. On the Start Menu, click the Windows icon found at the lower left-side of the taskbar, then look for the AutoCAD installed in your computer.

2. Using the AutoCAD Program icon/ or at the Quick Launch Toolbar, double-click the icon to open.
When program is installed in your computer, it will create a program icon on your desktop as well as add it to the Start menu.

3. From the existing drawing file, double-click the drawing file icon inside a folder or in any location from your computer.



Note: Drawing files done and saved in AutoCAD will have .dwg as file extension and will also create a backup file (.bak).

The AutoCAD Interface

Let us start knowing The AutoCAD interface by answering the parts of the AutoCAD user interface on page 19.

Interface Name
1. Application Menu/Menu Bar Access common tools to start or publish a file in the Application menu. Click the Application button to do the following: Create, open, audit, recover, purge, print and access options dialog box.   
2. Quick Access Toolbar (QAT) It provides direct and easy access to common or defined sets of commands, such as New, Open, Save, Save As, Undo, Plot, and Redo.   

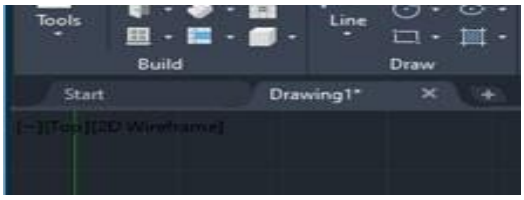
4. Info center

It consists of a set of tools on the right side of the title bar that enables you to access product-related information sources.

5. Help, Minimize/Restore and Close

6. File Tabs

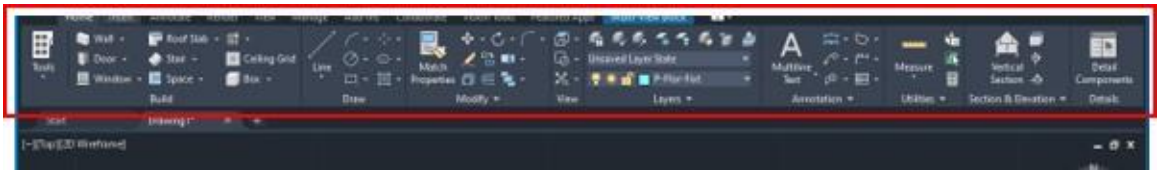
The file tabs give access to all open drawing file in the application. The Start tab is displayed by default at startup, providing easy access to a variety of initial actions, including access to drawing template files, recently opened drawings and sheet sets, and online and learning options.

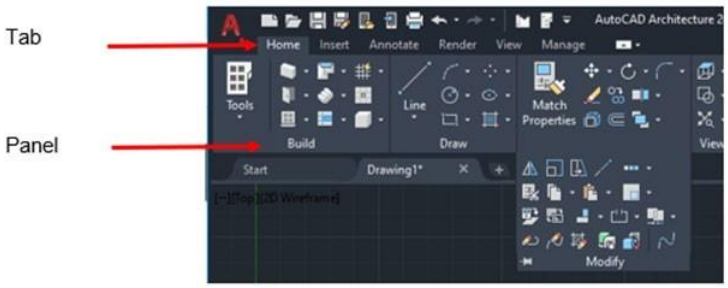


7. Ribbon

The Ribbon contains various AutoCAD commands arranged in panels and tabs.

Tip: You can select your command from the icons here to start drawing, otherwise use the command line.





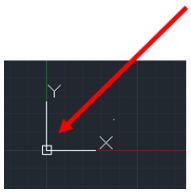
8. View Cube

The ViewCube is a 3D navigation tool that appears when the 3D graphics system is enabled and allows you to switch between standard and isometric views. It is visible by default.

9. UCS Icon

User Coordinate System (UCS) indicates the x and y axes. Its origin is (0, 0, 0).It establishes the location and orientation of a movable Cartesian coordinate system. The UCS is an essential tool for many precision operations.

Tip: If you want to move the UCS icon, first click or select the UCS icon then click and drag the square origin grip to its new location.



10. Model and Layout tabs

The Model Tab is the entire drawing area and the Layout tab is a 2D working environment for creating drawing sheets.

11. Command line

This is where you input your commands in drawing.

Tip: Always look at the command line. It will prompt you to your next action. You can use Ctrl + 9 to open your command line.

12. Status Bar

The status bar displays the cursor location, drawing tools, and tools that affect your drawing environment. It provides quick access to some of the most used drawing tools, where you can toggle settings such as grid, snap, polar tracking,

and object snap. You can also access additional settings for some of these tools by clicking their drop-down arrows.

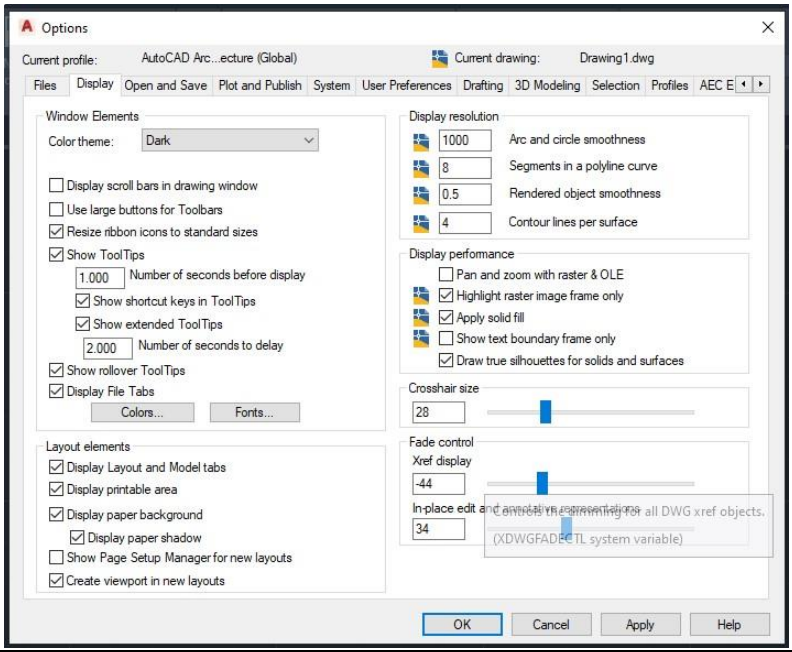
13. Crosshair

The crosshair is used for locating points and selecting objects while you are drawing.

Tip: You can change the size of your crosshair in the options dialog box.

How to access options and specify preferences for general drawing settings:

1. Type options in the command line. In the Options dialog box, click a tab and set options as desired. To change the size of cross hair, select display and look for cross hair settings.



14. Drawing Area

This is where you create your drawing.

Tip: You can change the color of your drawing area by accessing options (OP).

15. Navigation Bar

The following tools are available from the navigation bar.

- Pan
- Zoom tools
- Orbit tools

E What is more?

Activity sheet 1

Score: _____

Supply the correct term described in the statements below. Use a separate sheet of paper. Erasures are not allowed.

1. This is where you create your drawing.
2. This tool is for locating points and selecting objects when you are drawing.
3. It is a 2D working environment for creating drawing sheets.
4. It establishes the location and orientation of a movable Cartesian coordinate system.
5. It provides direct and easy access to common or defined sets of commands, such as New, Open, Save, Save As, Undo, Plot, and Redo.
6. It gives access to all open drawing files.
7. This is where you type your commands in drawing.
8. Pan, Zoom and orbit tool are available from this bar.
9. It contains various AutoCAD commands arranged in panels and tabs.
10. It consists of a set of tools on the right side of the title bar that enables you to access product-related information sources.

A What can I achieve?

Read the questions carefully. Choose and write only the letters of your answers on a separate sheet of paper.

1. Which task will you perform in the command line?
   A. Input Commands
   B. Draw
   C. Open drawing files
   D. Access command

2. Which tab needs to be clicked to access drawing template files, recently opened drawings and sheet sets?
   A. Open B. Save C. New D. Start

3. What will you type when you want to change the color of your drawing area?
   A. CTR+9 B. OP C. P D. None of the Above

4. _____ indicates the x and y axes.
   A. UCS
   B. Drawing Aid Button
   B. Annotation scale
   D. Line weight

5. Pan, Zoom and orbit tool are available in this bar.
   A. The Drawing Area
   B. The Title Bar
   C. Navigation Bar
   D. The quick access tool bar

6. What is displayed in the title bar?
   A. File name and the date
   B. AutoCAD version and Date
   C. File name and AutoCAD version
   D. AutoCAD version only

7. What will you access in the file tabs?
   A. saved drawings
   B. open drawings
   C. B only
   D. Both A and B

8. Which is not included in the AutoCAD interface?
   A. File tab B. UCS icon C. Options D. Command line

9. What will you choose to access draw and modify commands?
   A. Ribbon B. Title Bar C. File tab D. Menu Bar

10. When finding AutoCAD related sources, use_____.
   A. Info Center
   B. Menu bar
   C. Help Center
   D. Quick Access tool bar

11. What is a 2D working environment for creating drawing sheets?
   A. Application Menu Bar
   B. Layout tab
   C. Menu bar
   D. File Tab

12. Which of the following choices does not belong to the group?
    A. Using the Start Menu
    B. Using the AutoCAD Program Icon
    C. Using the Layout tab
    D. Using the existing Drawing File

13. Which keyboard combination can open command line window?
    A. Ctrl + 3 B. Ctrl + 9 C. Ctrl + 10 D. Ribbon

14. The saved file in AutoCAD can have this drawing extension.
    A. .dwg B. .do C. .jpeg D. .com

15. What part of the AutoCAD interface provides direct and easy access to common or defined sets of commands, such as New, Open, Save, Save As, Undo, Plot, and Redo?
    A. Quick Access Tool Bar
    B. Model Tab
    C. Application Tool Bar
    D. Ribbon

I What is new?

Answer the questions for you. Use a separate sheet of paper. Erasures are not allowed.

1. In your opinion, can you draw your floor plan accurately using manual drawing without using tools? Explain your answer in 3-4 sentences.
2. List at least two tools that will help you draw with accuracy in manual drawing. Explain in two sentences how these tools help you.

3. Name drawing aids or tool you wish AutoCAD application have in its drawing features.

_____

_____

_____

_____

_____

_____

Note to students:
Teacher will check your work, please write legibly, Erasures are not allowed

D What I know?

Choose the right function key from column A as defined in column B. Same answer can occur more than once. Write you answer on a separate sheet of paper.

Column A.	Column B.
a. F2	1. An AutoCAD online Help System.
b. F11	2. This will allow you to pick points that lie on a regular grid.
c. F9	3. It provides a command interface near the cursor in the drawing area.
d. F5	4. It provides a track along alignment paths that are based on object snap points.
e. F10	5. This will allow you to snap onto a specific object location when you are picking a point.
f. F8	6. A function key for orthogonal, which means either vertical or horizontal.
g. F7	7. It will allow you to snap into whatever angles you choose to configure.
h, F3	8. It is a rectangular pattern of dots displayed on the screen which acts as a visual aid that gives you

a general idea about the size of drawn objects.

i. F12

9. Displays an expanded command history in the command window.

j. F1

10. Using this shortcut key, we can create a drawing in isoplane.

D What is in?

Given below are jumbled letters of AutoCAD drawing Aids, Find out the correct word by looking at the clue. Have Fun learning.

JUMBLED LETTERS	CLUE	ANSWER
1. THORO DEOM	_ R_____ E	
2. JECTOB PANS	O _ _ _ _ T s _ _ _	
3. SUTSAT ARB	_ _ _ _ _ s _ _ R	
4.WRGINDA DRIG	_ _ A _____ D	
5. PANS DEOM	_ N _____E	
6. ORLAP RACTNIG	P_ _ _ _ T _ _ _ _ _ _	
7. CIMANDY PUTIN	_ Y _ _ _ _ C_____ T	
8. JECTOB PANS	_ _ J _ _ _ s _ _ _	
9.JECTOB PANS KINGTRAC	O _ _ _ _ T _ _ _ P T _ _ _ _ _ G	
10. WRGINDA SAID	_ _ _ _ _ N _ A _ D	

D

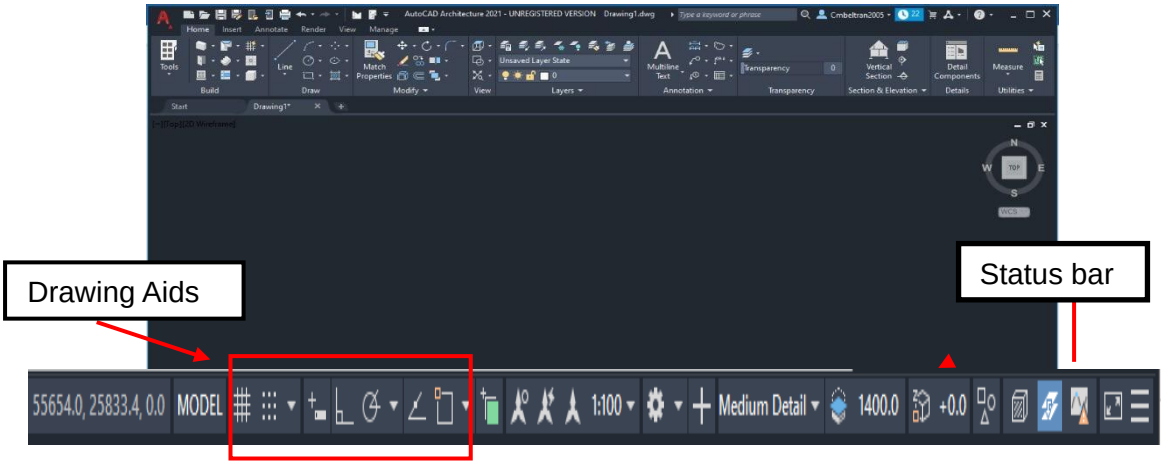
What is it?

Lesson 3 Drawing Aids

Drawing in AutoCAD is like drawing in a drawing board, you will need drafting tools To achieve precision. In fact, many of the drawing aids that AutoCAD provides are the same to traditional drafting tools. In manual drawing to draw vertical and horizontal lines you will need T-square and triangles. AutoCAD has similar drawing aids to help you achieve the same output. This means the concept are very similarso go ahead and explore the drawing aids.

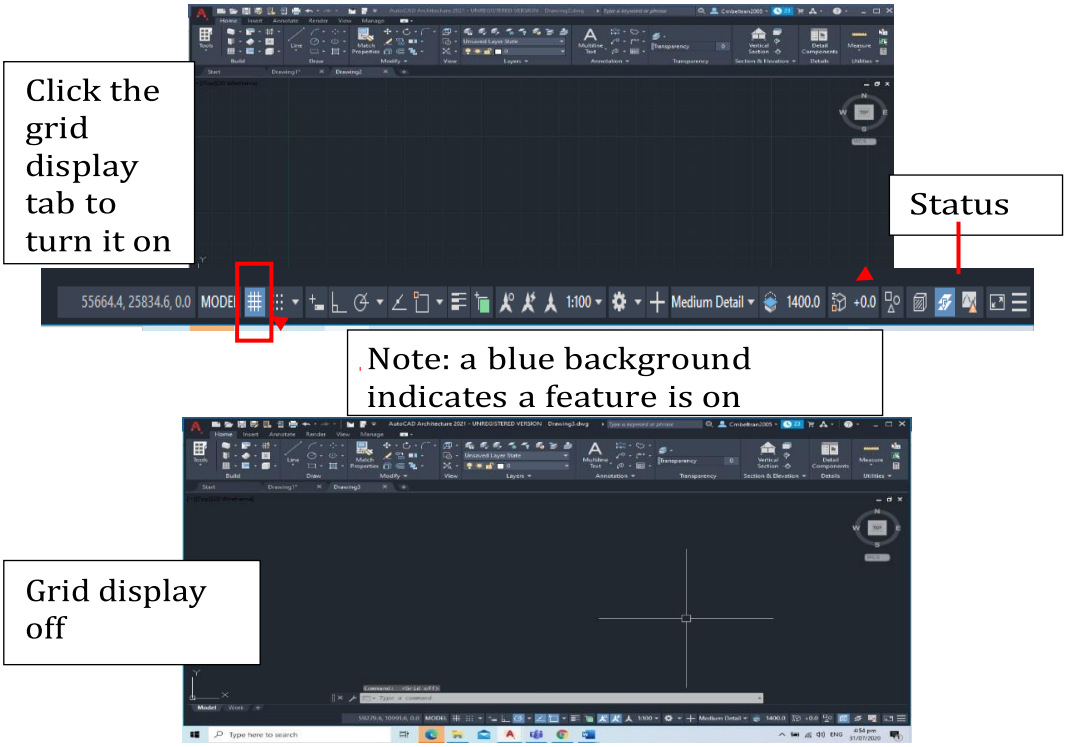
How to access drawing aids

1. Look for the status bar located at the lower corner of your AutoCAD interface
2. Look for the drawing grid, Snap mode, dynamic input, ortho mode, polar tracking



The Drawing Grid
Function key: F7
Command Line: Limits

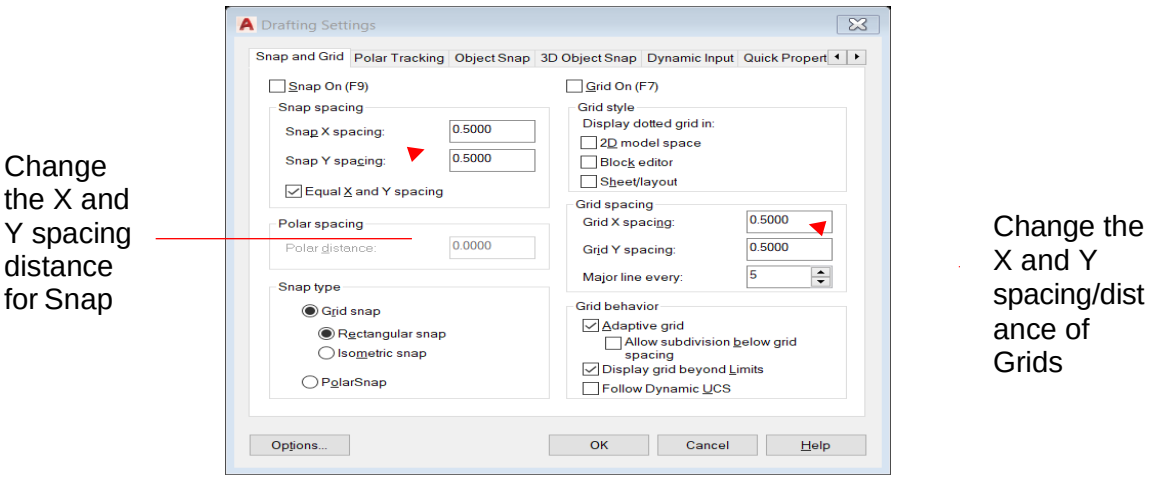
The grid is a rectangular pattern of lines or dots displayed on the screen. Using grid is like using graphing paper under a drawing. You can set the grid spacing and can be used to define the extent of your drawing. The grid cannot be printed.



Grid Settings can be specified in the Drawing Settings dialogue box, to access the drawing settings, right click on the grid display tab and select Grid settings. Both Snap and Grid settings will be access in this tab.

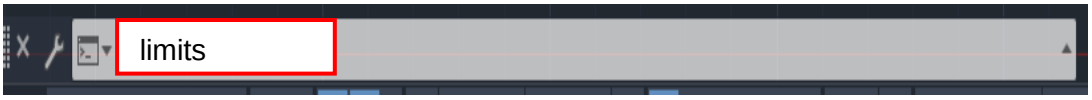
The Drawing/ Drafting Settings

Keyboard: DDRMODES/DSETTINGS



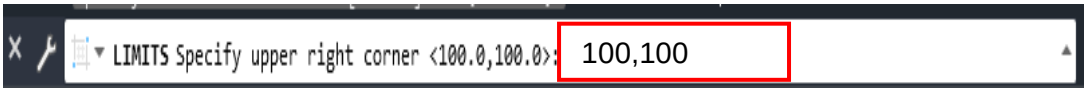
Setting Grid limits

1.Command line: *type* LIMITS ↵



2.*type* 0,0 ↵

3.*type 100,100* ↵

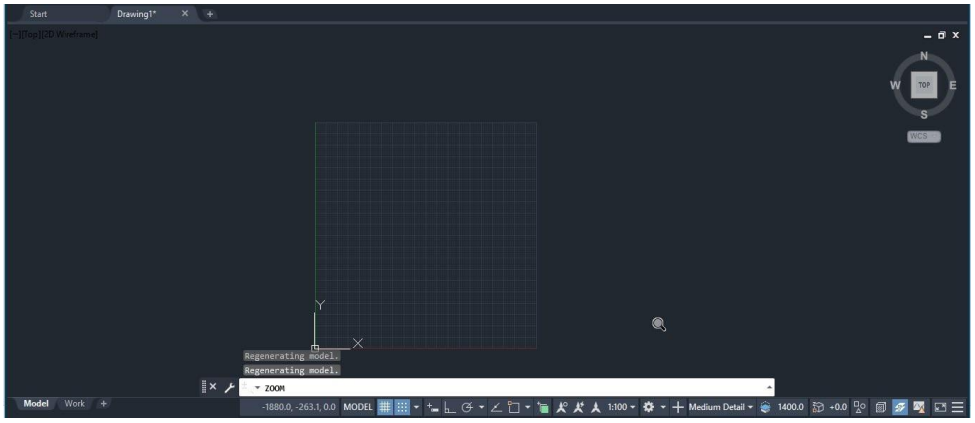


4. type gridisplay ↵

5. enter the value of 0 ↵

6. *type* Zoom _All ↵

AutoCAD will show the limits you set in your drawing area.



Note: To restore the grid display to the entire XY plane of the UCS, set grid display to 3.

Limits is useful if you know the print size of your objects and is used to specify the extent of the grid.

Tip: Always remember to press ENTER ↵ or space bar to execute the command you entered in the command line and press Esc to exit the command

Snap Mode
Function Key: F9
Command line: **Snap**

When the snap mode is on the cursor movement will allow you to pick points that lie on a regular Grid. Although the snap grid is different from the display grid, they are set to the same value to avoid confusion. Or to align the display grid with the snap grid, set the display grid to zero. See the drafting setting on page 34.

Setting the Snap mode in the command line ↵

1. Command line: type Snap

2.

Note: changing the snap settings can be done in the Drawing settings dialogue box.

Tip: The quick way to set the snap mode on and off is by using the F9 function key or just click the snap button on the status bar.

Ortho Mode
Function key: F8
Command Line: Ortho

Ortho or short for orthogonal, which means either vertical or horizontal.

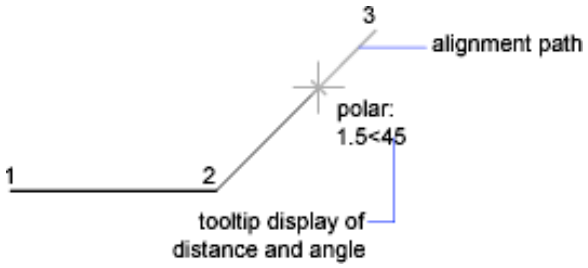
Setting the Ortho Mode On

1. Command line: type Ortho ↵

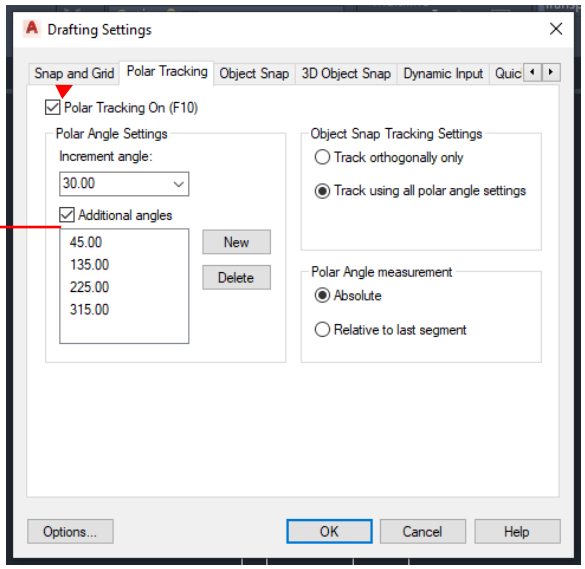
2. Command line: Type On ↵

Polar Tracking

Function Key: F10
It guides cursor movement to specified angles. It is like Ortho except it simply indicates when your crosshair is close to a vertical or horizontal angle.

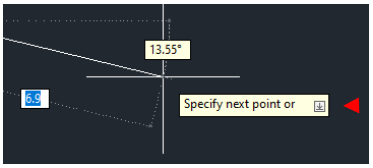


Modify the Polar tracking setting at the Drawing Settings Dialogue box, just right click on the polar tracking tab and select settings.



Dynamic Input
Function Key: F12

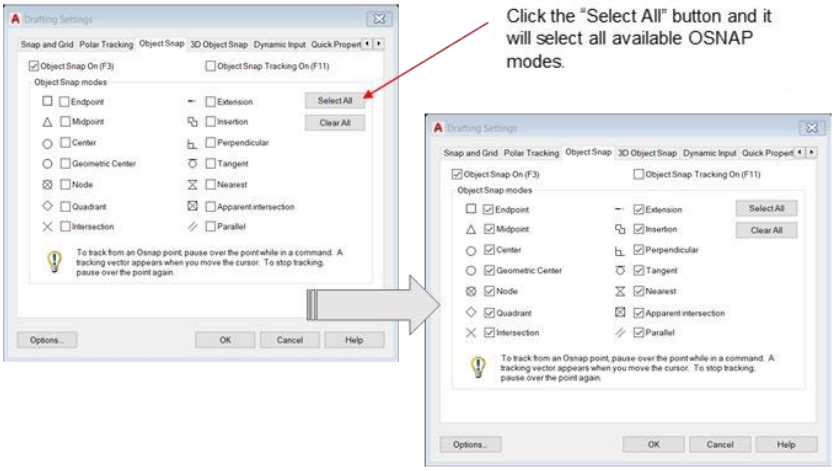
It provides a command interface near the cursor in the drawing area.



- Dynamic input

Object Snap Tracking 

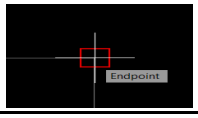
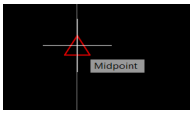
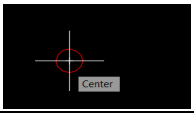
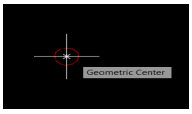
Function Key: F11
provides a track along alignment paths that are based on object snap points. To have ease in using the different object snaps mode, we can activate the Running object snaps. It can be configured using the Object Snap tab of the Drafting Settings dialogue box as illustrated below.

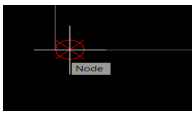
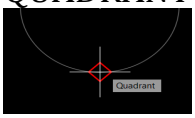
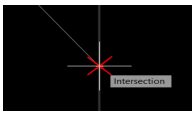
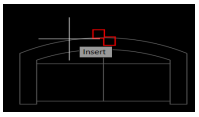
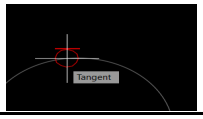
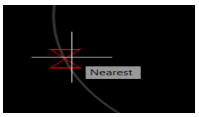
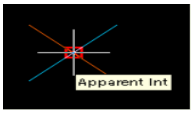
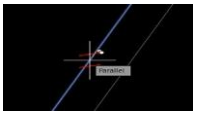
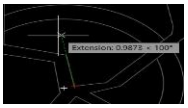


Object snap 

Function Key: F3
This drafting feature will allow you to snap onto a specific object snap location when you are picking a point. It can look for key points on objects and select those points automatically. These points are called object snap, see the complete list of object snap modes on pp 38-39.

List of Object snap modes

ENDPOINT 	This snap mode snaps at exact endpoint of a line, arc or other object that has a definite ending to it. This is used for joining lines, and dimensioning.
MIDPOINT 	Midpoint snap mode finds the exact middle of any object that has a beginning and an end. All lines and arcs have a midpoint.
CENTER 	Center snap mode allows you to snap to the exact center of circles, arc, and ellipses.
GEOMTRIC CENTER 	This snap mode snaps to the 'geometric' center of a rectangle rather than trying to find the two midpoints. Works on closed polylines, rectangles, splines.

NODE 	Node snap mode snaps to the center of a point object.
QUADRANT 	Quadrant snap mode snaps to one of the four circle quadrant points located at north, south, east and west or 90, 270, 0 and 180 degrees respectively.
INTERSECTION 	This snap mode snaps to the physical intersection of any two drawing objects.
INSERTION 	This snaps to the insertion points of objects such as blocks, text and attributes.
PERPENDICULAR 	Perpendicular snap mode snaps to a point which forms a perpendicular with the selected object.
TANGENT 	This snap mode snaps to a tangent point on a circle.
NEAREST 	This snap mode finds the closest point on an object relative to where you started.
APPARENT INTERSECTION 	This snap mode snaps to the point where objects appear to intersect in the current view.
PARALLEL 	This is used to draw a line parallel to any other line in your drawing.
EXTENSION 	This enables you to snap to some point along the imaginary extension of a line, arc or polyline segment.

Function Keys

Keyboard Shortcut Key	Name	Description
F1	Help	This function key displays Help for the active tooltip, command, palette or dialog box.
F2	Expanded History	It shows expanded command history in the Command window.
F3	Object Snap	This function key will turn object snap on and off.
F5	Isoplane	It is the plane with an angle of 30 degrees from horizontal. By using this shortcut key, we create any drawing in isoplane.
F7	Grid display	This will turn the grid display on and off.
F8	Ortho Mode	This function key will lock cursor movement to horizontal or vertical.
F9	Grid snap	This will restrict the cursor movement to specified grid intervals.
F10	Polar tracking	It guides cursor movement to specified angles.
F11	Object snap tracking	Tracks the cursor horizontally and vertically from object snap locations.
F12	Dynamic input	It provides a command interface near the cursor in the drawing area.

Please watch the video link below for more information about the status bar:
https://tinyurl.com/y6rtrmwp

E What is more?

Activity sheet 1

Provide a short description or function for the following terms below. Use separate sheet of paper.

Terminology	Short Description/Function
1. Object snap	
2. Ortho Mode	
3. Polar Tracking	
4. Snap	
5. Drawing Grid	
6. Dynamic Input	
7. Object Snap Tracking	
8. Tangent	
9. Parallel	
10. Enter	
11. Esc	
12. Quadrant	
13. Midpoint	
14. Drafting Settings	
15. Object Snap Tracking	

Total score: _____

A What I have learned?

Activity sheet 4

Differentiate the scenarios below. Write your Answer on a separate sheet of paper. Write Legibly and Erasures are not allowed.

1. Setting the grid display to 0 against setting it to 3 Answer:
2. Setting limits before drawing against drawing without limits

Note to student: If computer and AutoCAD application is available try to perform these drafting settings at home.

A What can I achieve?

Read and understand the questions carefully. Write your answer on a separate sheet of paper. Choose the letters only.

1. Which Function Key from the choices below set your drafting setting to ortho mode?
   A. F6 B. F7 C. F8 D. F9

2. Drafting Settings can be accessed in what part of the AutoCAD interface
   A. Ribbon B. Menu Bar C. Status Bar D. Title Bar

3. Drafting Settings can be accessed using this Command Alias.
   A. DRRMODES B. DDRMODES C. DDRMMODES D. DDRRMODE

4. What is the function key for the object snap?
   A. F1 B. F2 C. F3 D. F

5. _____Executes the command in AutoCAD.
   A. Enter B. Space Bar C. both A and B D. A only

6. What is the Function Key for Object Snap Tracking
   A. F8 B. F9 C. F10 D. F11

7. _____Provides a command interface near the cursor in the drawing area.
   A. Ortho B. Osnap C. Dynamic Input D. Grid display

8. Which of the following does not belong to the group?
   A. Mid-point B. Parallel C. Midsection D. Tangent

9. _____guides the cursor movement to specified angles?
   A. Polar Tracking B. Object snap C. Ortho mode D. Grid Snap

10. If F10 is for Polar tracking_____is for Grid display
    A. F4 B. F6 C. F5 D. F7

11. What Function key Displays Help for the active tooltip, command, palette or Dialog box.
    A. F1 B. F2 C. F3 D. F4

12. What Function key to select If you want to know the commands you entered?
    A. F1 B. F2 C. F3 D. F4

13. If you want to set the Grid Limits, you will first input_____.
    A. Limits B. Grid C. O D. Enter

14. If you want to activate or check all the running object snap you must access_____.

A. Grid display B. Polar Tracking C. Drafting Settings D. Snap Settings

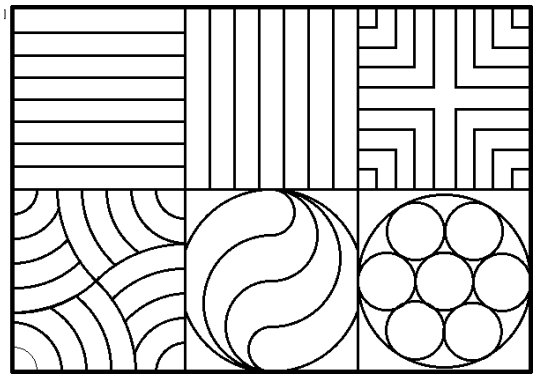
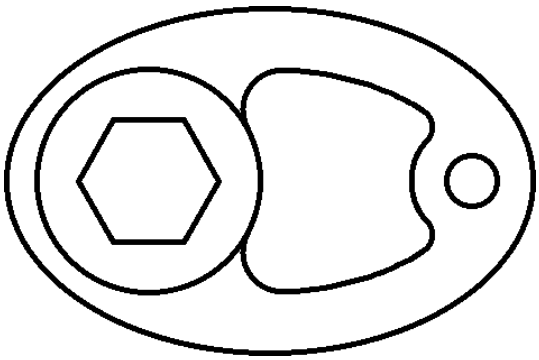
15. What type of snap point is used to draw a line parallel to any other line in your drawing.

A. Quadrant B. Parallel C. Intersection D. Extension

I What is new?

Answer these questions for you. Write your answers on a separate sheet of paper. Erasures are not allowed.

1. Name at least 4 geometric figures in each object below.
2. What draw tools were utilized in creating each object?

Object 1. 	Answer for Q1 a. b. c. d	Answer for Q2 a. b. c. d
Object 2. 	Answer for Q1 a. b. c. d	Answer for Q2 a. b. c. d.

D *What is it?*

Lesson 4 The Draw Commands

DRAW COMMANDS

Constructing and drawing of an object in AutoCAD is usually done using commands. Commands are instructions set by the user to tell the AutoCAD software what to do. Frequently accessed commands are in the toolbar arranged in panels and tabs. You can activate it by typing its corresponding shortcut or command alias. More skilled and experienced draftsmen recommend the use of shortcut commands as it facilitates easier communication with the application. In addition, shortcut commands are the same in almost all versions of AutoCAD, so whether you are using the latest or an older version of the program, you can just enter or type these shortcuts withoutlooking or finding for it in the toolbar.

In this lesson, we will be discussing the most utilized group of commands in AutoCAD the Draw Commands. A good understanding of the Draw commands is fundamental to the efficient use of AutoCAD.

LINE COMMAND

With the Line command you can draw a simple line from one point to another. Line objects have two ends (the first point and the last point). Each line segment drawn is a separate object and can be moved or erased as required. To execute this command just hit enter key on the keyboard or Escape if you want to exit the command.

COMMAND	ICON	SHORTCUT
LINE		L

Two Ways to activate the line command

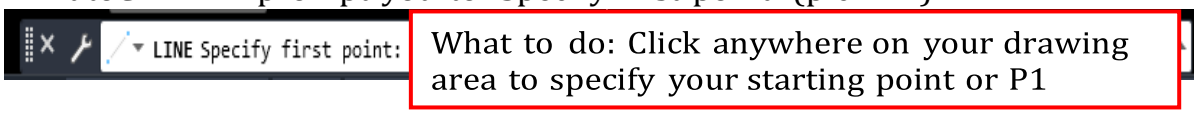
A. Using the Command line

When entering a command using mouse and keyboard it will appear in the Command Line. Always pay close attention to the command line to see what to do next and to know the options available. As a beginner to make your drawing experience using AutoCAD as easy as possible always look at the command line to see what AutoCAD will prompt you to do.

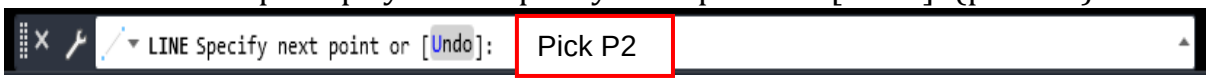
To start drawing, go to the bottom part of the AutoCAD interface and locate the Command line.

1. Type "L" then press Enter (↵)

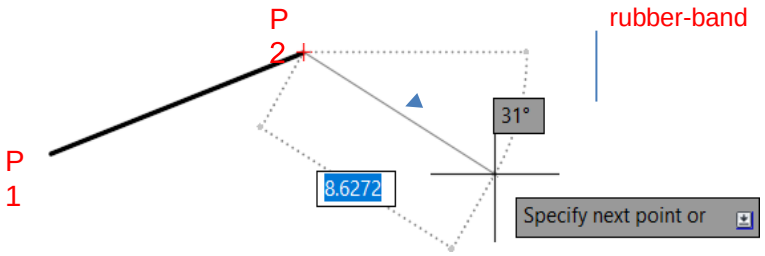
2. AutoCAD will prompt you to: Specify first point: (pick P1)



3. AutoCAD will prompt you to: Specify next point or [Undo]: (pick P2)



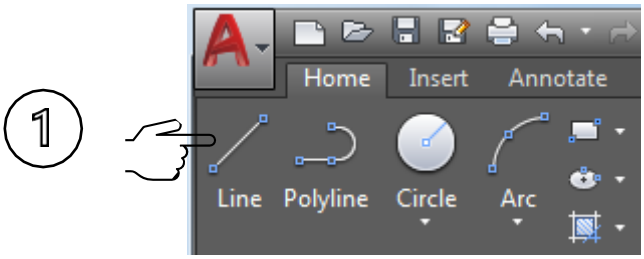
4. Specify next point or [Undo]: ↵ or Esc (to end)



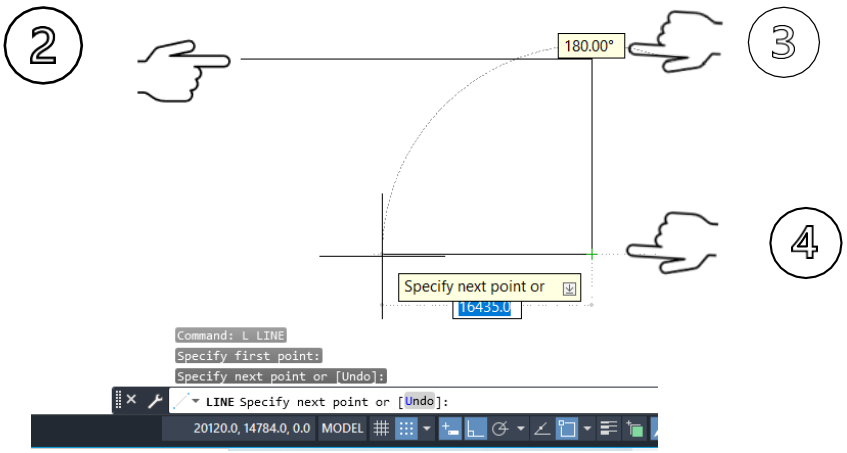
Remember: after picking your point 1 drag your mouse to your desired direction then click again to mark you P2 to complete your line segment

B. Using the line icon

To activate the line command click the displayed line icon in the draw panel bar then specify the starting point by clicking anywhere in the drawing area. Click again to create a second point, or continue to create object. To end the line command press Esc on the keyboard.



Follow the process illustrated by the hands

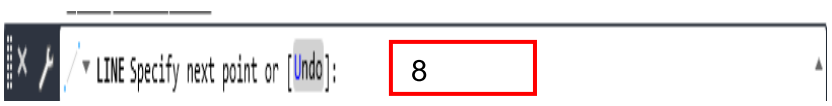


How to create a line with precise distance?

Let us create object 1 using Command Entry.

1. 

press Enter

2. 

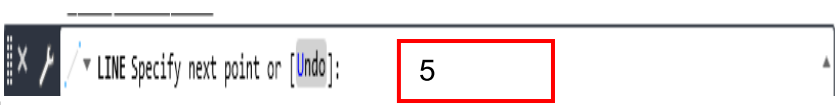
press Enter

3. 

Press Enter

4. 

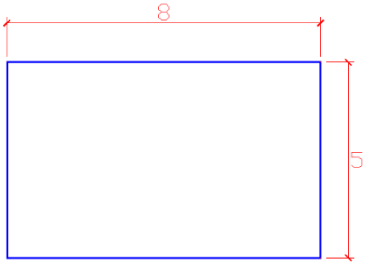
Press Enter

5. 

press Enter

Or instead of typing 5 you can type C to close the object

Object 1



How to create a line at a specific angle using the line icon?

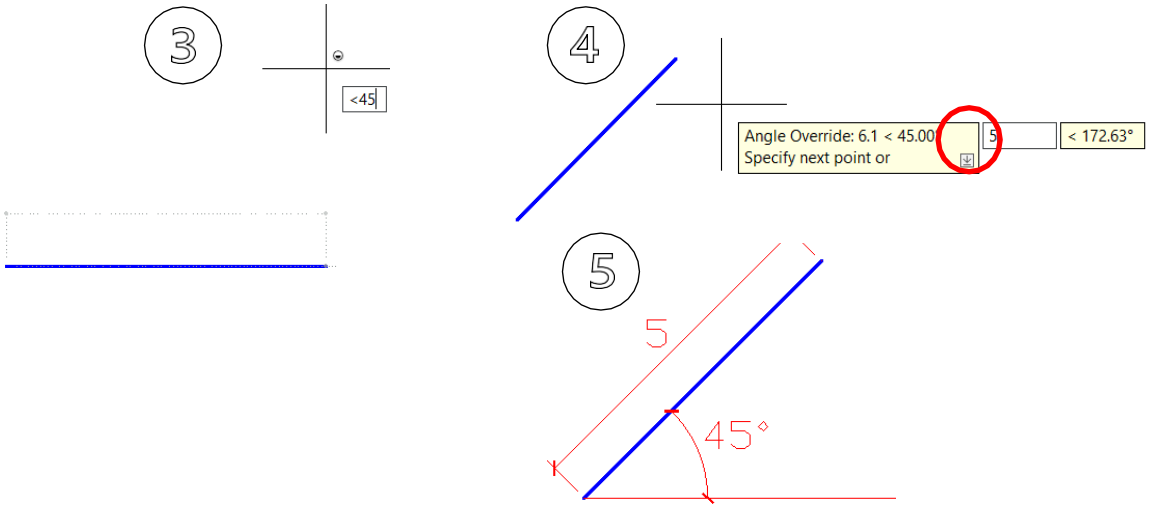
1. Click Home tab > Draw panel > Line.

2. Specify the start point.

3. Enter the left angle bracket (<) and Input the angle, for example <45,

4. Move the cursor to indicate the direction or specify the length of the line, for Example 5.

5. Press space bar or Enter.



Drawing Lines using Specific Coordinates

1. Click Home tab > Draw panel > Line.

2. Type the coordinate value for the first point by typing the X value, a comma, then the Y value, for example 2,5.

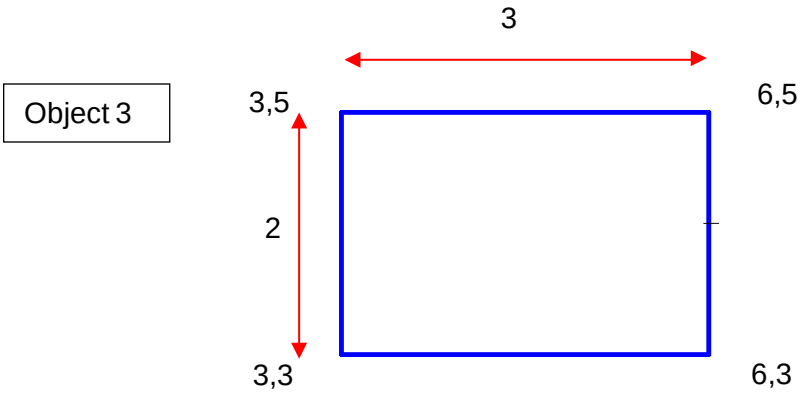
3. Press the Spacebar or Enter

4. Do one of the following:
- If dynamic input is on: Type the pound sign (#) followed by the X-value, a comma, then the Y-value, for example #5,7.
- If dynamic input is off: Type the X value, a comma, then the Y value, for example 5,7.

5. Press the Spacebar or Enter.

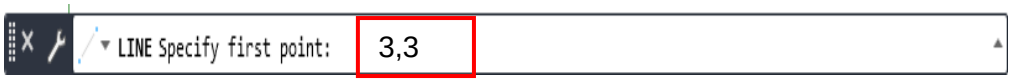
Note: When dynamic input is on, relative coordinates are the default. When dynamic input is off, absolute coordinates are the default. Press F12 to turn dynamic input on or off.

Example 1. Let us draw this rectangle below using Cartesian coordinates



1. turn the Dynamic input off

2. Type L Enter. AutoCAD will prompt you to:

3. 

Input 3,3 <Enter>. AutoCAD marks the first point and prompts you to:

4. 

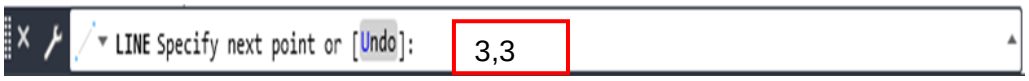
Input 6,3 <Enter>. AutoCAD marks the second point and prompts you to:

5. 

Input 6,5 <Enter>. AutoCAD marks the third point and prompts you to:

6. 

Input 3,5 <Enter>. AutoCAD marks the fourth point and prompts you to:

7. 

Input 3,3 <Enter> to close the rectangle or you can type C<Enter>. Your drawing should be the same as object 3. Save your work as Drawing 1.dwg.

Relative Coordinate

AutoCAD can measure coordinates from the last specified point by placing the @ character in front of the coordinate for example @ 2,1. By using the @symbol, AutoCAD will measures 2 units in the positive x directions and 1 unit in the positive y direction from your current position.

Command Sequence

1. Click Home tab > Draw panel > Line.
2. Specify the first point.
3. To specify the second point relative to the first point, do one of the following:
- If dynamic input is on: Type the X-value, a comma, then the Y-value, for example 4,7.
- If dynamic input is off: Type the at sign (@) followed by the X-value, a comma, then the Y-value, for example @4,7.

4. Press the Spacebar or Enter.

Ex 2. Let us try to draw similar rectangle beside object 3 using relative coordinates.

1. Continue from exercise 1.

2. Type L Enter

Input 8,3

3. 

Input @ 3,0

4. 

Input @ 0,2

5. 

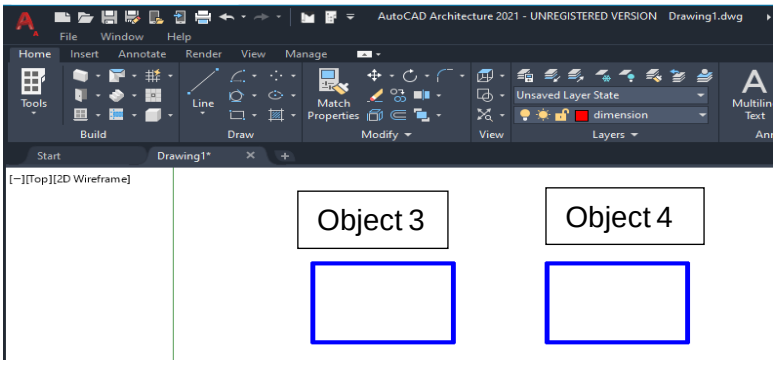
Input @ -3,0

6. 

Input @0,-2

7. 

or Type C to close the rectangle. Your drawing is similar to Ex.1
8. Enter- to end the command

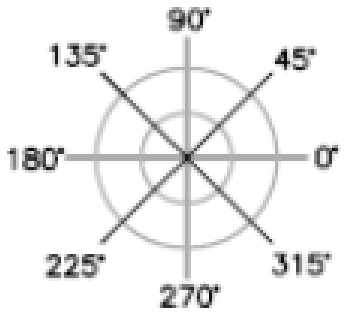


Polar Coordinates

Polar coordinates are used when you need to draw the next points at a specific angle. To use polar coordinates, specify a point, enter a distance and an angle separated by bracket (<).

Ex. @ 3<135 ,3 is a distance, < 135 is the angle.

By default, angles increase in the counterclockwise direction and decrease in the clockwise direction. To specify a clockwise direction, enter a negative value for the angle. For example, entering 1<315, locates the same point as entering 1<-45. You can change the angle conventions for the current drawing with the UNITS command.



Let us draw object 3 using polar coordinates

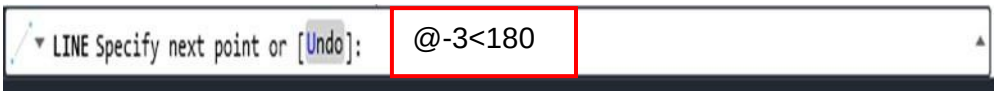
1. Type L Enter

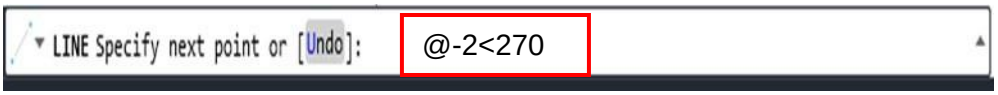
Let us start from point 3,3

2. 

3. 

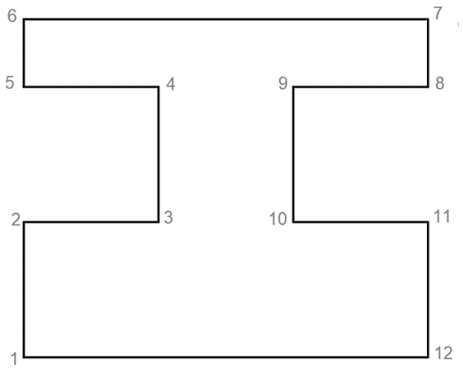
4. 

5. 

6. 

7. Enter- to end the command

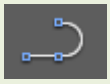
Example: Draw the object below using Absolute polar and Relative Coordinates



Absolute (X, Y)	Relative (@X, Y)	Polar(@Distance<Angle)
Type L for line command, and then press Enter.	Type L for line command, and then press Enter.	Type L for line command, and then press Enter.
1. First point: type **3,3.**	1. First point: type **3,3.**	1.First point: type **3,3.**
2. Specify next point: type **0,2.**	2. @0,2	2. @2<90
3. Specify next point: type **2,0**	3. @2,0	3. @2<0
4. Specify next point: type **0,2**	4. @0,2	4. @2<90
5. Specify next point: type **-2,0**	5. @-2,0	5. @-2<0
6. Specify next point: type **0,1**	6. @0,1	6. @1<90
7. Specify next point: type **0,6**	7. @6,0	7. @6<0
8. Specify next point: type **0, -1**	8. @0, -1	8. @-1<-270
9. Specify next point: type **-2,0**	9. @-2,0	9. @-2<0
10. Specify next point: type **0, -2**	10. @ 0, -2	10. @_2<90
11. Specify next point: type **2, 0**	11. @ 2,0	11. @-2<0
12. Specify next point: type **0, -2**	12. @0, -2	12. @-2<270
13. Specify next point: type: **-6,0** press Enter or Esc.	1. @-6,0	1. @-6<0

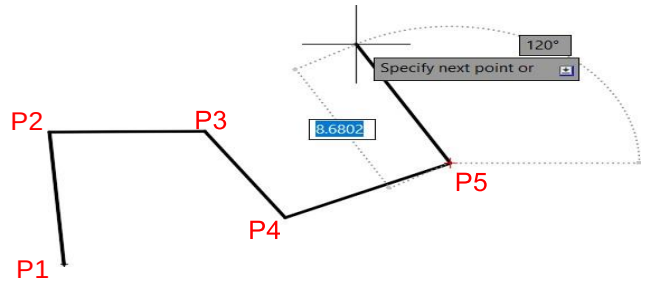
POLYLINE COMMAND

The Polyline or Pline command is like the line command except that the resulting object may be composed of several segments which form a single object.

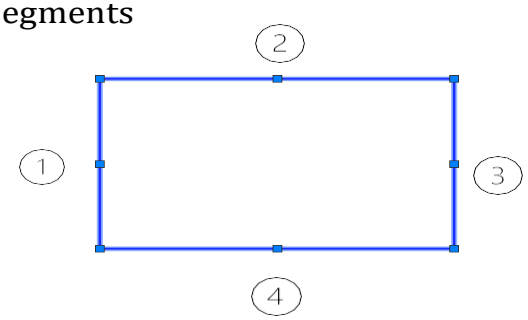
COMMAND	ICON	SHORTCUT
POLYLINE / PLINE		PL

Command Sequence:

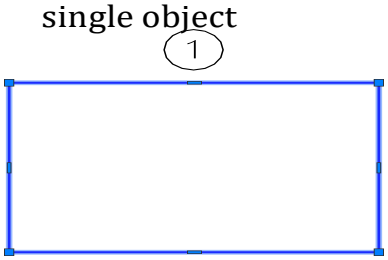
Command: Type "**PL**" the press Enter (↵) or Click  icon in the ribbon
Specify start point: (pick P1) Current linewidth is 0.0000
Specify next point or [Arc/Half width/Length/Undo/Width]: (pick P2)
Specify next point or [Arc/Close/Half width/Length/Undo/Width]: (pick P3)
Specify next point or [Arc/Close/Half width/Length/Undo/Width]: (pick P4)
Specify next point or [Arc/Close/Half width/Length/Undo/Width]: (pick P5)
Specify next point or [Arc/Close/Half width/Length/Undo/Width]: (or C to close)



rectangle drawn using line has 4 line segments



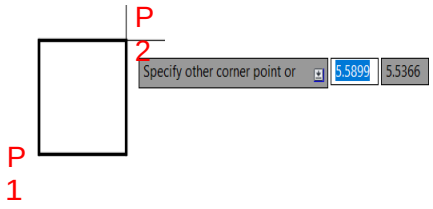
rectangle drawn using Polyline is a single object



RECTANGLE COMMAND

The Rectangle command is used to draw a rectangle whose sides are vertical and horizontal. The position and size of the rectangle are defined by picking two diagonal corners. The rectangle is not really an AutoCAD object at all. It is, in fact, just a closed polyline which is automatically drawn for you.

COMMAND	ICON	SHORTCUT
RECTANGLE		REC



Command Sequence:

Command: Type "**REC**" then press Enter (↵)or

Click  icon in the ribbon

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: (pick P1)

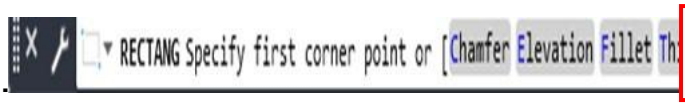
Specify other corner point or [Dimensions]: (pick P2)

instead of picking a second point to draw the rectangle, you have the option of entering dimensions. Say you wanted to draw a rectangle 20 drawing units long and 10 drawing units wide. The command sequence would look like this:

Command Sequence:

1. 

Enter

2. 

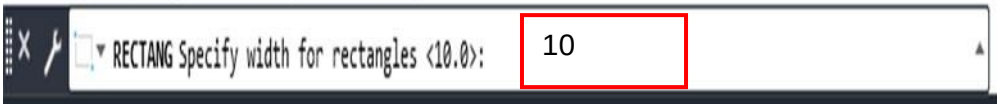
Pick a point anywhere in your drawing area

3. 

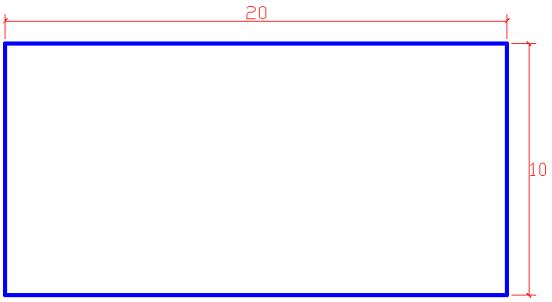
Enter

4. 

Enter

5. 

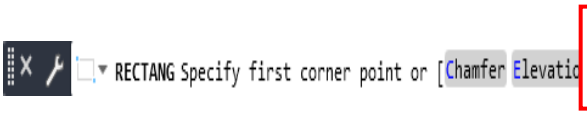
Enter



Let us try draw another rectangle15 units long and 10 units wide.

1. 

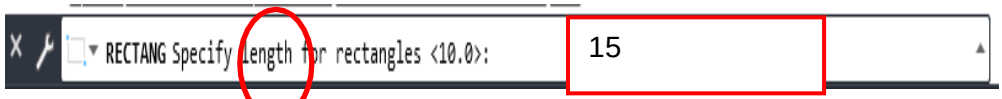
Enter

2. 

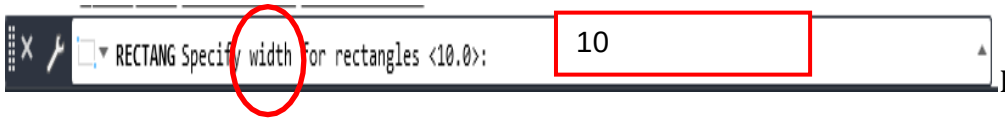
Pick a point anywhere in your drawing area

3 . 

Enter

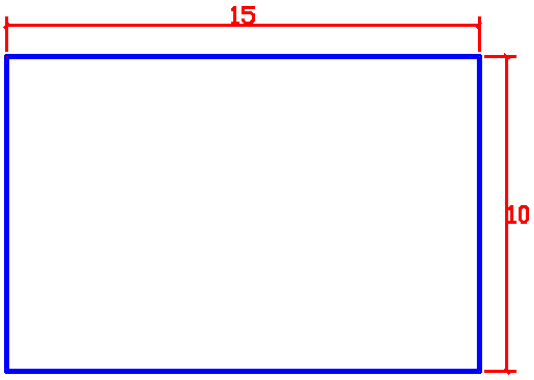
4. 

Enter

5. 

Enter

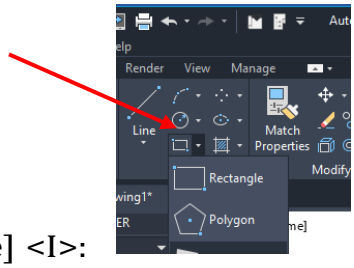
Object 3



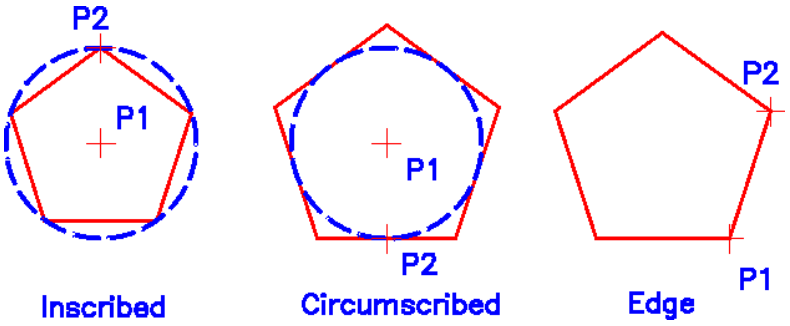
The Polygon Command

The Polygon command creates an equilateral closed polyline. This command can be used to create any regular polygon from 3 up to 1024 sides. Circumscribed polygon is created around the circle while the Inscribed polygon is created within the circle. In drawing both the inscribed and circumscribed polygon you must specify the number of sides, the center of the polygon and the radius. The radius is used to calculate the size of the polygon.

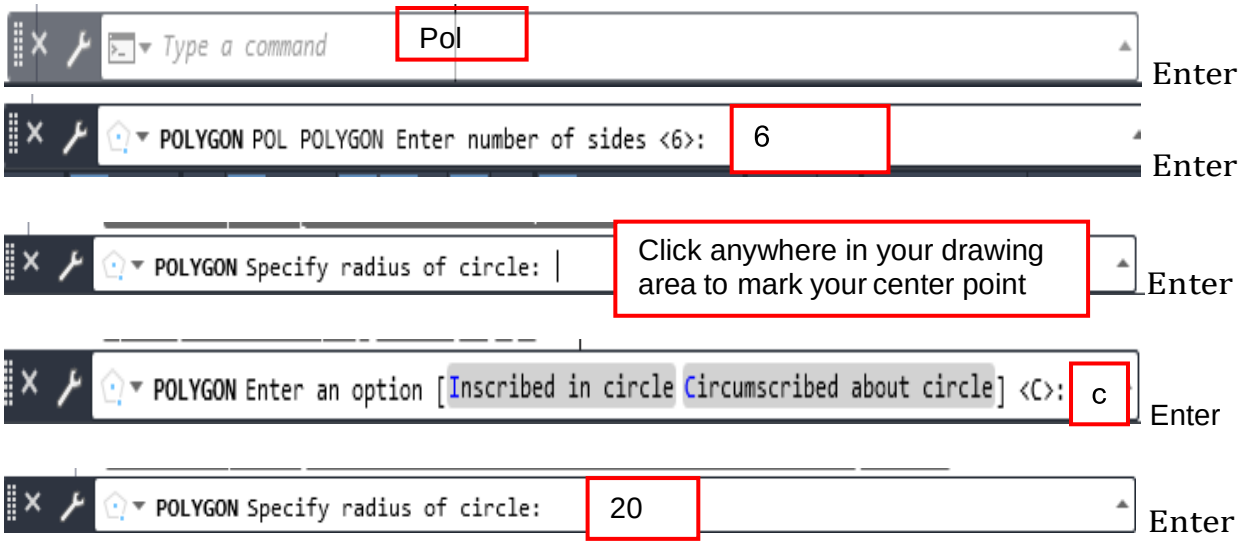
Command Sequence

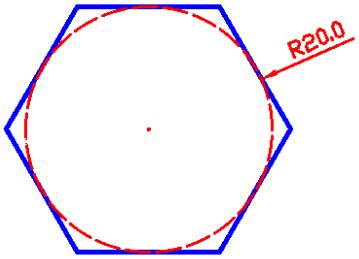


Command: Type "**POL**" then press Enter (↵)or
Click Rectangle drop-down>Polygon icon in the ribbon>
Enter number of sides<4>: 5
Specify center of polygon or [Edge]: (pic P1 or type E to define by edge length)
Enter an option [Inscribed in circle/Circumscribed about circle] <I>:
(To accept the inscribed default or type C for circumscribed)
Specify radius of a circle: (pick P2 or enter exact radius



Example of drawing circumscribed polygon with six sides and 20 as radius. Using command Entry.





Follow same process in drawing the inscribed polygon

Note: AutoCAD will not draw circle using polygon. Circle in the polygon above is for illustration

CIRCLE COMMAND

The Circle command is used to draw circles. There are several ways you can define the circle. The default method is to pick the center point and then to either picka second point on the circumference of the circle or enter the circle radius at the keyboard.

COMMAND	ICON	SHORTCUT
CIRCLE		C

- **Center Radius**

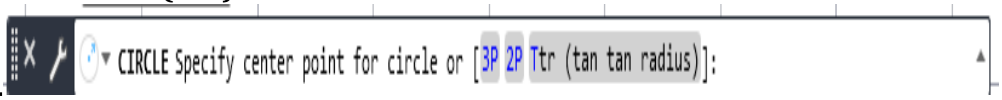
This is the default method of creating a circle. You can specify the center point by picking a point anywhere in your drawing area and you can enter a value for the radius or pick a point on the screen.

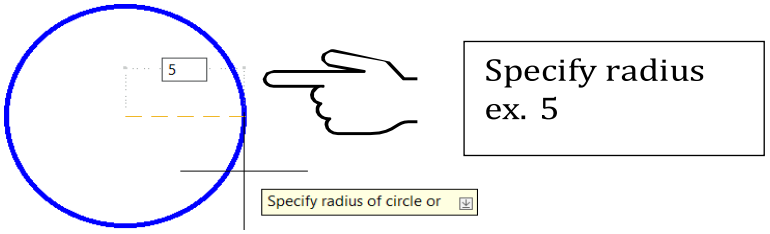
Let us draw a circle with a radius of 5 using command entry.

Type "**C**" then press **Enter (↵)**

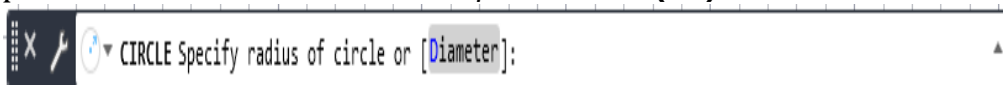
1. 

Click anywhere in the drawing area to mark the center of your circle press **Enter (↵)**

2. 



Type the radius of the circle then *press* **Enter (↵)**

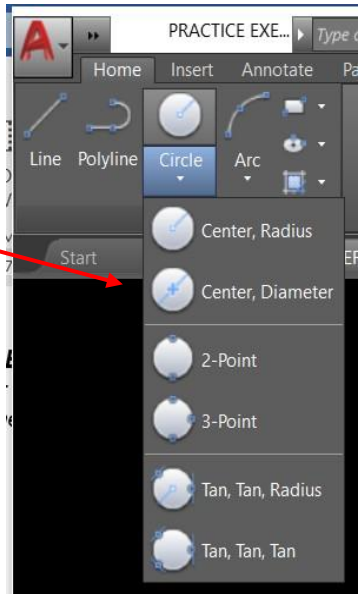
3. 

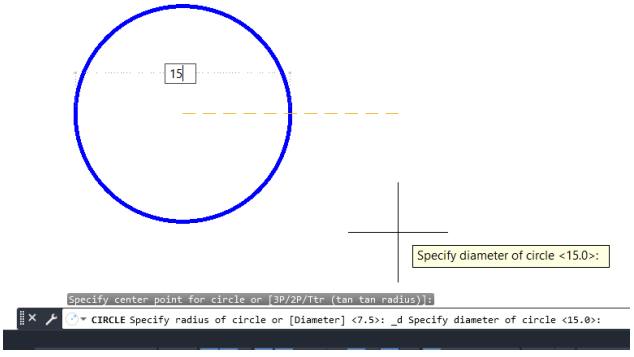
Aside from the default method, there are other options that you can use to create a circle depending on the conditions given.

- **Center, Diameter**

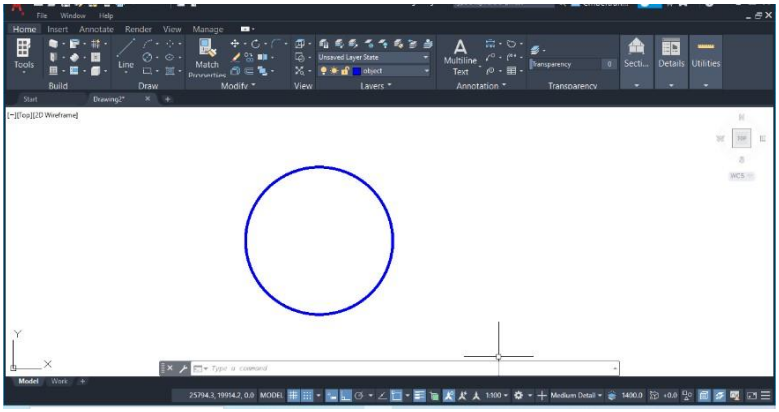
Let us try to draw a circle with 15 as the diameter.

1. Click icon in the ribbon
2. click anywhere in your drawing area to mark the center of the Circle and input 15 for the diameter of the circle.





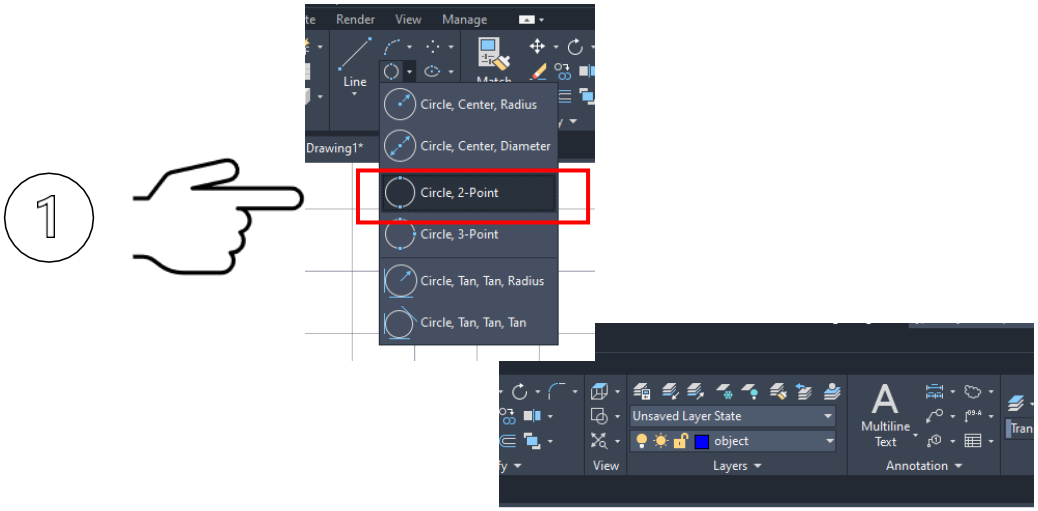
3. press enter to complete the command



- **2-Point**

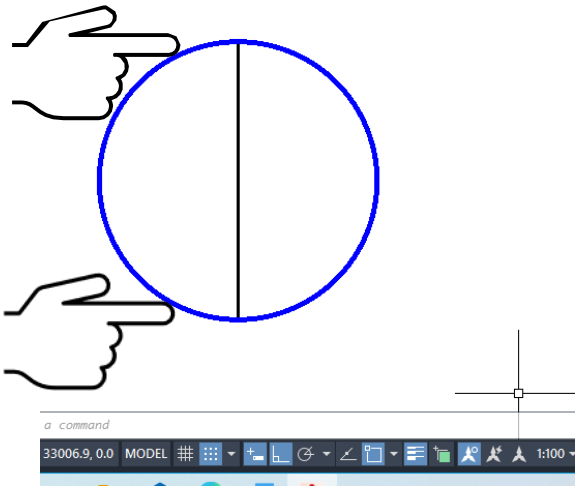
Creates circle using two point of a diameter

Let us create circle using 2 point in 3 steps by following the illustrations below.



2 Click the first endpoint of circle's diameter

3 Click the second endpoint of circle's diameter



- **3-Point**

Creates a circle using 3 points on a circumference

Type "**C**" the press **Enter (↵)** or Click  icon in the ribbon
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 3P
Specify first point on circle: pick P1
Specify second point on circle: pick P2
Specify third point on circle: pick P3

- **Tan, Tan Radius**

Creates a circle with a specified radius and tangent to two objects. Sometimes more than one circle matches the specified criteria. The program draws the circle of the specified radius whose tangent points are closest to the selected points.

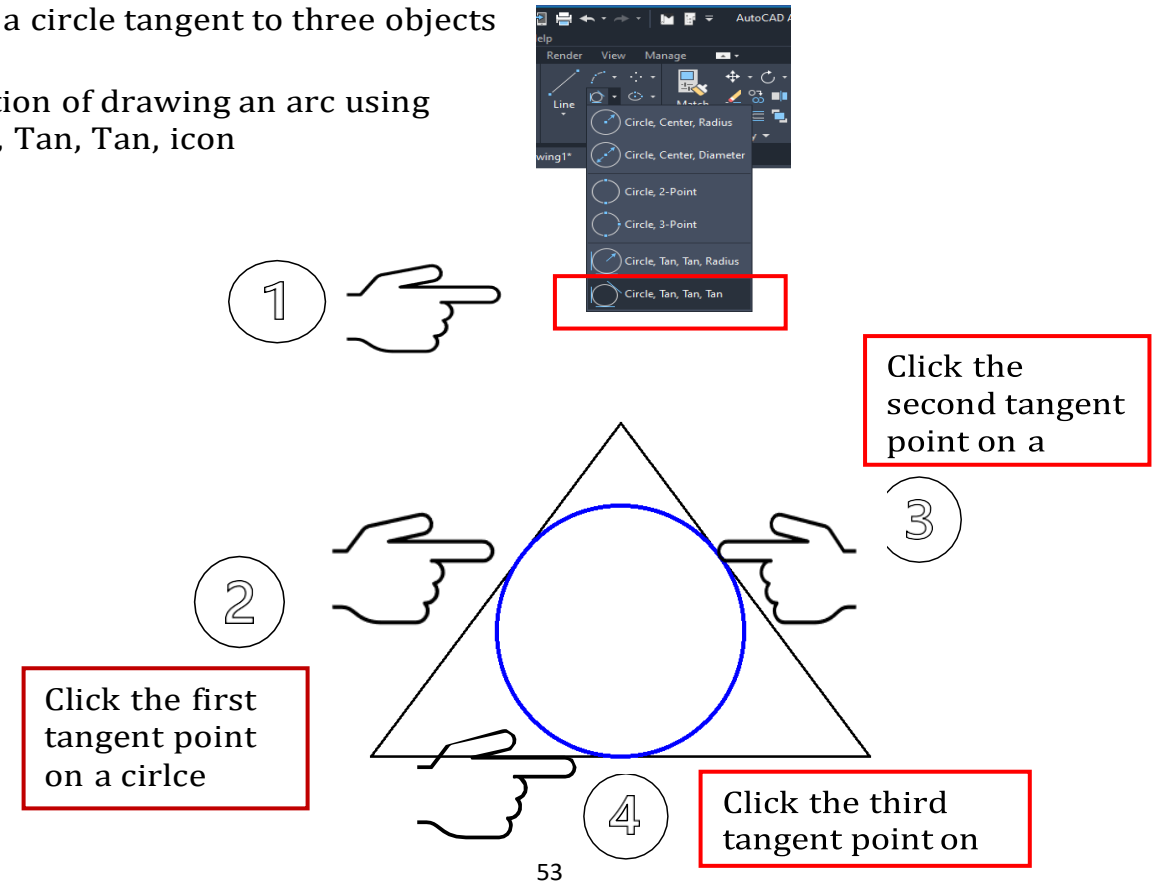
Command Sequence

Type "**C**" the press **Enter (↵)** or Click icon  in the ribbon
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: ttr
Specify point on object for first tangent of circle: pick p1
Specify point on object for second tangent of circle: pick p2
Specify radius of circle <2.1642>: type the exact radius

- **Tan, Tan, Tan**

Creates a circle tangent to three objects

Illustration of drawing an arc using the Tan, Tan, Tan, icon



Note: For Tan, Tan, Radius and Tan, Tan, Tan option, an existing object must be present as this will serve as the reference for specify of points.

Click  icon in the ribbon
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: _3p Specify first point on circle: _tan to pick P1
Specify second point on circle: _tan to pick P2
Specify third point on circle: _tan to pick P3

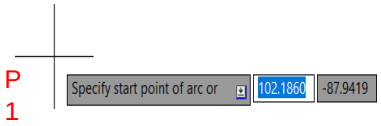
ARC COMMAND

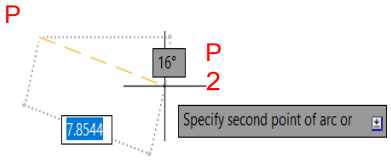
The Arc command allows you to draw an arc of a circle. There are numerous ways to define an arc, the default method uses three pick points - a start point, a second point and an end point. Using this method, the drawn arc will start at the first pick point, pass through the second point and end at the third point.

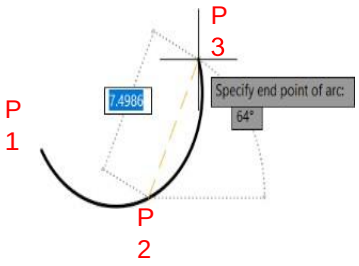
COMMAND	ICON	SHORTCUT
ARC		A

Command Sequence:

Command: Type "**A**" the press Enter (↵) or Click  icon in the ribbon
Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (pick P2)
Specify end point of arc: (pick P3)



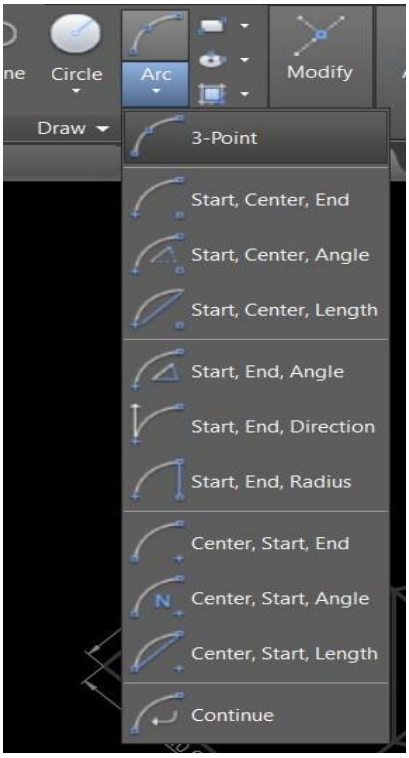




Note: It is also possible to create an arc by trimming a circle object.

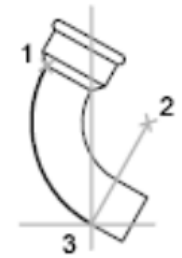
Other options to define an arc:

Start, Center, End



Creates an arc using a start point, center and end

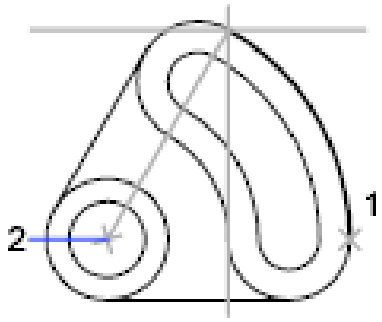
Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (pick P2)
Specify end point of arc: (pick P3)



start(1), center(2), end(3)

- **Start, Center, Angle**

Creates an arc using a start point, center and an included angle



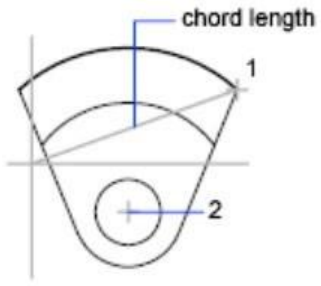
start, center, angle

Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (type C)
Specify center point of arc: (pick center)
Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: (pick end point*)*

- **Start, Center, Length**

Creates an arc using a start point, center and the length of a chord

Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (type C)
Specify center point of arc: (pick center)
Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: (type L)
Specify length of chord (hold Ctrl to switch direction): type length



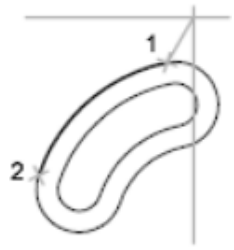
start, center, length

- **Start, End, Angle**

Creates an arc using a Start point, End point and an Included angle.

Command Sequence

Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (type E)
Specify end point of arc: (pick P2)
Specify center point of arc (hold Ctrl to switch direction) or [Angle Direction Radius]: (type A)
Specify included angle (hold Ctrl to switch direction): (type angle)



start, end, angle

- **Start, End, Direction**

Creates an arc using a start point, and end point and a tangent direction at a start Point.

Command Sequence

Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (type E)
Specify end point of arc: (pick P2)
Specify center point of arc (hold Ctrl to switch direction) or [Angle Direction Radius]: (type D)
Specify tangent direction for the start point of arc (hold Ctrl to switch direction):
(pick point on the desired direction)

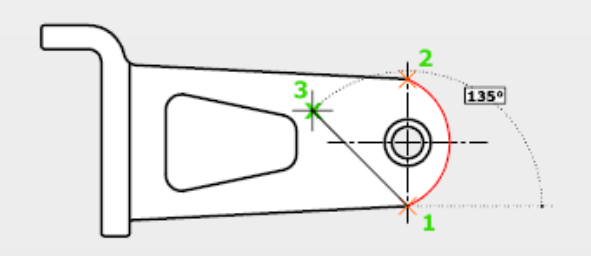
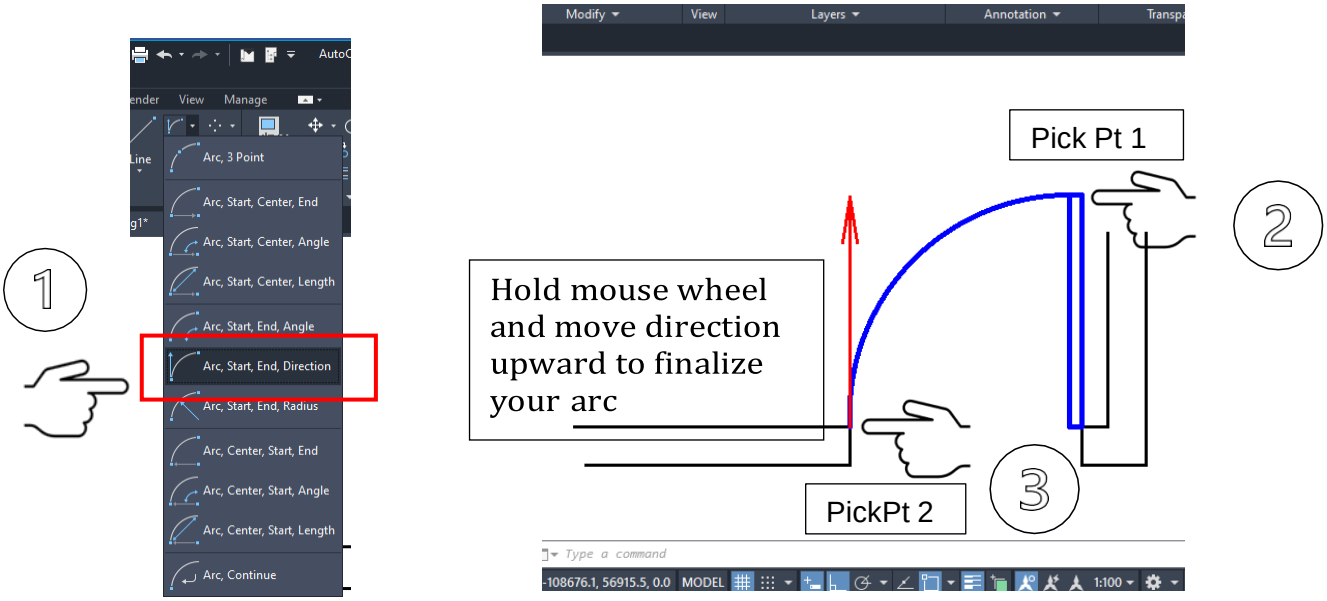


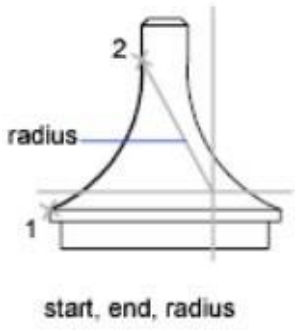
Illustration of drawing an arc using the start, End, Direction icon



- **Start, End, Radius**

Creates an arc using a start point, endpoint and radius.

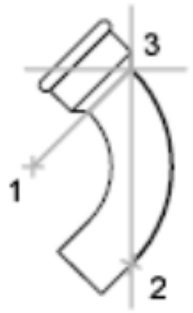
Specify start point of arc or [Center]: (pick P1)
Specify second point of arc or [Center/End]: (type E)
Specify end point of arc: (pick P2)
Specify center point of arc (hold Ctrl to switch direction) or [Angle Direction Radius]: (type R) Specify radius of arc (hold Ctrl to switch direction): (type desired radius of arc)



start, end, radius

- **Center, Start, End**

Creates an arc using center point, start point and the third point that determines the endpoint



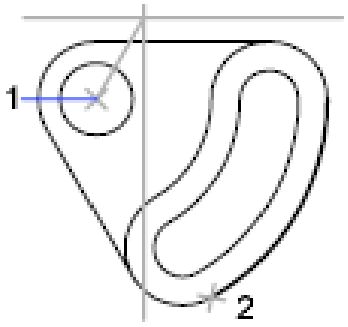
center(1), start(2), end(3)

Specify start point of arc or [Center]: (type C)
Specify center point of arc: (pick center point)
Specify start point: (pick point)
Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: (pick end point)

- **Center, Start, Angle**

Creates an arc using a center point, start point and included angle

Specify start point of arc or [Center]: (type C)
Specify center point of arc: (pick center point)
Specify start point: (pick point)
Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: (type A)
Specify included angle (hold Ctrl to switch direction): (type angle)



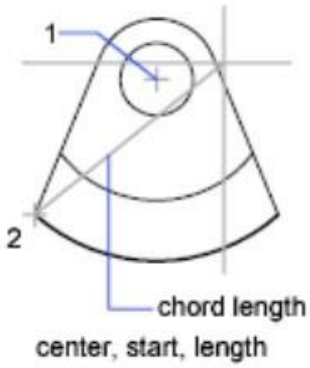
center, start, angle

- **Center, Start, Length**

Creates an arc using center point, start point and the length of a chord

Specify start point of arc or [Center]: (type C)
Specify center point of arc: (pick center point)
Specify start point: (pick point)

Specify end point of arc (hold Ctrl to switch direction) or [Angle chord Length]: (type L)
Specify length of chord (hold Ctrl to switch direction): (type length)
Continue – enables you to easily draw an arc that is tangent to the last line, arc, or polyline that was drawn. To use this arc option, there must be a line or an arc to be use as a reference.
Specify end point of arc (hold Ctrl to switch direction): (pick end point



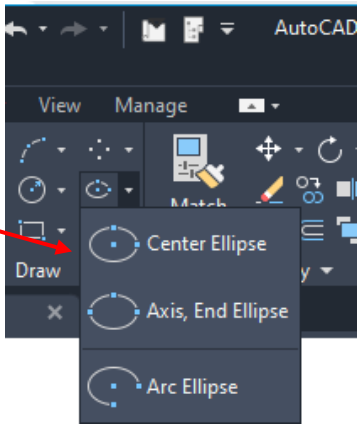
The Ellipse Command

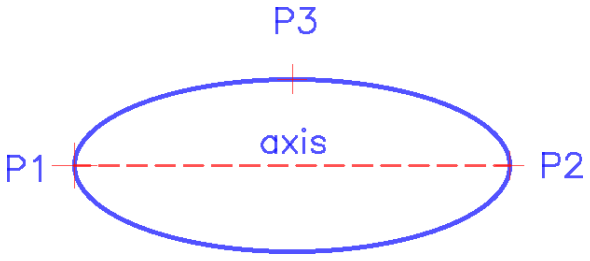
Ellipse command creates an ellipse or an elliptical arc. The first two points of the ellipse determines the distance between the center of the ellipse and the endpoint of the second axis

COMMAND	ICON	SHORTCUT
ELLIPSE		EL

Command Sequence

Type EL then press **Enter (↵)**
Specify axis endpoint of ellipse or [Arc/Center]: (pick P1)
Specify other endpoint of axis: (pick P2)
Specify distance to other axis or
[Rotation]: (pic P3)





Note to students:
To learn more about Draw commands please access Techdraft Warriors in the Youtube.

E What is more?

Activity Sheet 1

Read the statement carefully and write TRUE if the statement is correct, and FALSE if the statement is incorrect. Write your answer on a separate sheet of paper.

.

1. The first two points of the ellipse determines the distance between the center of the ellipse and the endpoint of the second axis. True or False?

2. The Default method of the command Arc command uses three pick points the start point, the second point and the center point. True or False?

3. The default method of creating a circle is to enter the diameter after picking a point in your drawing area. True or False?

4. In drawing a rectangle using the REC command, instead of picking a second point to draw a rectangle, you have the option to enter the dimension. True or False?

5. The correct order of entering the dimension using REC command is width first followed by length. True or False?

6. When you select the 2 point in creating a circle AutoCAD will prompt you to click the center point of the circle. True or False?

7. For Tan, Tan, Radius and Tan, Tan, Tan option in creating a circle an existing object must be present to serve as reference specifying points. True or False?

8. In Polygon command a circle outside the polygon is called Circumscribed. True or False?

9. @3,2 is an example of polar coordinates entry. True or False?

10. @3<45 is an example of relative coordinate entry. True or False?

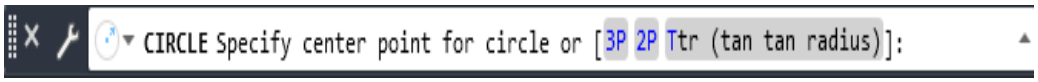
E What I can do?

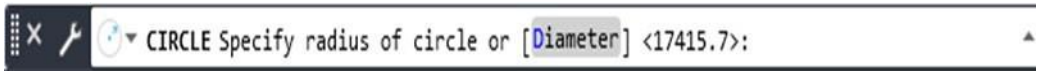
Activity Sheet2

Draw what is being asked in each number below by providing the command entry.

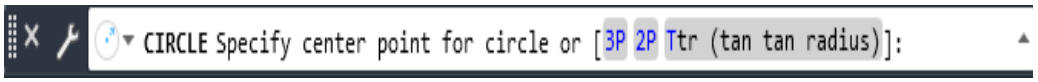
1. Draw a line with 10 units as length

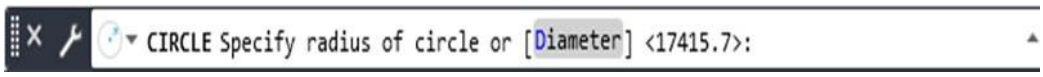
2. *Draw a circle with a radius of 8*





3. A circle with 8 as diameter





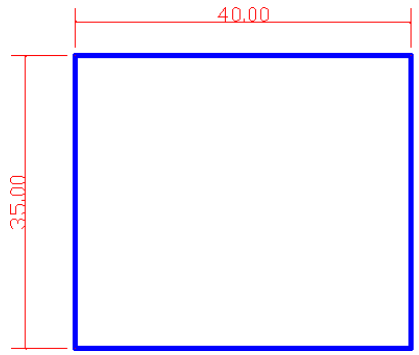
Note to students:
Teacher will check your work, please write legibly, Erasures are not allowed

E What else can I do?

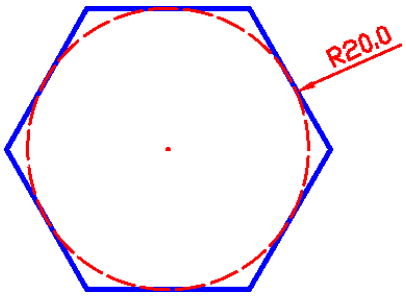
Activity Sheet3

Use Separate sheet of paper in performing your activity. Write legibly.

1. Illustrate how to draw the object in AutoCAD by providing the command entry in drawing the rectangle below.



2. Illustrate how to draw the object using AutoCAD by providing the command entry in drawing the circumscribed polygon.



Note to student: If you have access to computer with AutoCAD application, you can draw the object using AutoCAD save your activity and submit to your designated classroom portal.

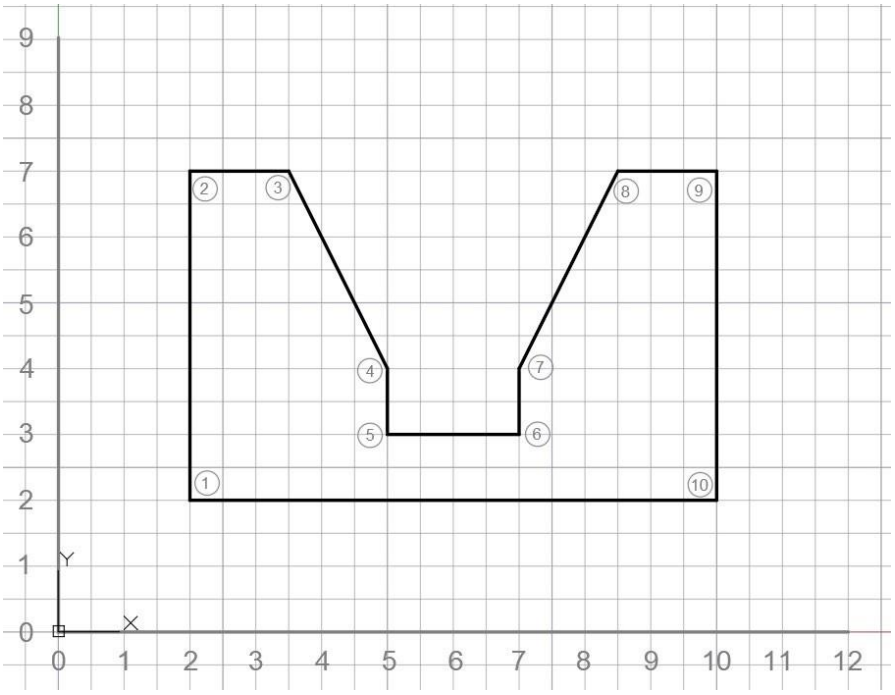
Total Score: _____

For the teacher: *Give a corresponding star to the total points gathered*	5	3	1
	If the 2 questions had been answered correctly	*Only one question has been answered correctly*	*No correct Answer*

A What I have learned?

Activity Sheet4

Draw the object by providing the absolute, relative, and polar coordinate entry of the figure below. Use Separate sheet of paper.



Absolute	Relative	Polar
Start point	Start point	Start point
To Point 2	To Point 2	To Point 2
To Point 3	To Point 3	To Point 3
To Point 4	To Point 4	To Point 4
To Point 5	To Point 5	To Point 5
To Point 6	To Point 6	To Point 6
To Point 7	To Point 7	To Point 7
To Point 8	To Point 8	To Point 8
To Point 9	To Point 9	To Point 9
To Point 10	To Point 10	To Point 10
To Point 11	To Point 11	To Point 11

A What can I achieve?

Write your answer on the space provided before the number. Choose the letters only

1. What do you need to specify after typing REC command
   A. First point B. Dimension C. Area D. Second Point

2. Rectangle drawn using line has how many segments?
   A.1 B. 2 C. 3 D.4

3. When you type the circle command, AutoCAD will prompt you to do this action
   A. Specify first C. Specify third point
   B. Specify second point D. Specify center point

4. What circle option to choose if the radius and two tangent points are given?
   A. Tan, Tan, Radius C. Center Radius
   B. Tan, Tan, Tan D. 3Points

5. Which arc option can create an arc using a start point, center and included angle
   A. Start, Center, End C. Start, Center, Length
   B. Start, Center, Angle D. Start, End, Angle

6. What is the Function Key for Object Snap Tracking
   A. F8 B. F9 C. F10 D. F11

7. Which arc option can create an Arc using start point, and End Point, and a tangent direction at a start point?
   A. Start, Center, End C. Start, Center Angle
   B. Start, Center, Length D. Start, End, Direction

8. Which of the following does not belong to the group?
   A. Mid-point B. Parallel C. Midsection D. Tangent

9. What action will come first after typing an arc command?
   A. Specify end point of arc: (pick P3)
   B. Specify start point of arc or [Center]: (pick P1)
   C. Specify second point of arc or [Center/End]: (pick P2)
   D. None of the Above

10. Which command can be used to create any regular polygon from 3 up to 1024 sides

A. POL B. PL C.PO D. P

11. What should be the Arrangement of the command sequence of Ellipse command?

I. Type EL then press **Enter (↵)**
II. Specify other endpoint of axis: (pick P2)
Specify distance to other axis or
[Rotation]: (pic P3)
III. Specify axis endpoint of ellipse or [Arc/Center]: (pick P1)
IV. Specify distance to other axis or
[Rotation]: (pic P3)

A. I, II, III, IV B. I, III, II, IV C. I, II, III, IV D. II, III, IV, I

12. Which of the following is the correct command sequence in creating 3point circle

I. Type "**C"** the press **Enter (↵)** or Click icon in the ribbon
II. Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 3P
III. Specify first point on circle: pick P1
IV. Specify second point on circle: pick P2
V. Specify third point on circle: pick P3

+

A. I, II, III, IV, V C. I, II, III, V, IV
B. I, III, II, IV, V D. I, III, II, IV, V

13. What type of coordinate entry is @-6,0?

A. Absolute B. Relative C. Polar D. None of the Above

14. What type of coordinate entry is @1<90?

A. Absolute B. Relative C. Polar D. None of the Above

15. What type of coordinate entry is 6,0?

A. Absolute B. Relative C. Polar D. None of the Above

D What is in?

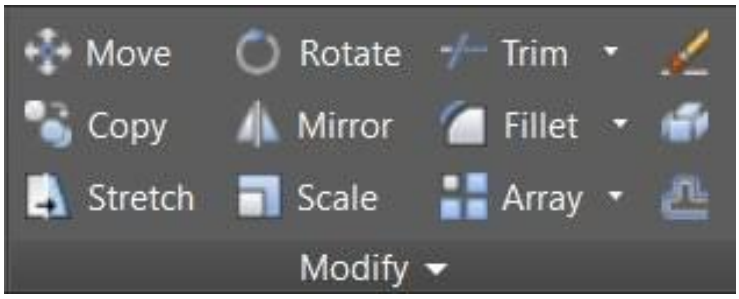
Score: _____

Name the Modify tools given below.		
1.  Ans_____	5.  Ans_____	8.  Ans_____
2.  Ans_____	6.  Ans_____	9.  Ans_____
3.  Ans_____	7.  Ans_____	10.  Ans_____
4.  Ans_____		

D What is it?

Lesson 5 The Modify Commands

Just like draw commands, modify commands are also set of special commands which comes handy whenever you are performing drawing tasks in AutoCAD. As the name suggest, a modify command allows the user to make some changes or modifications to existing lines and objects. AutoCAD provides a whole range of tools such as Trim, Offset, Move, Mirror, Copy and many others. As you will notice, the command names function the same way as its name. Just like with draw commands, modify commands can be accessed through the icon/symbol in the toolbar, typing-in the shortcut in the keyboard, or from the pull-down menu.



ERASE COMMAND

The Erase command is one of the simplest AutoCAD commands and is one of the most utilized Command. The command erases (deletes) any selected object(s) from the drawing. Remember you can always get deleted objects back by typing U to undo, from the Standard toolbar or by using the OOPS command.

COMMAND	ICON	SHORTCUT
ERASE		E

Command Sequence:

Command: ERASE or E **(↵)** or Click icon  in the ribbon
Select objects: (pick an object to erase)
Select objects: (to end the selection and erase the object)

Another option to delete or erase an object in AutoCAD is by just selecting the object to be deleted and press the Delete button in the keyboard.

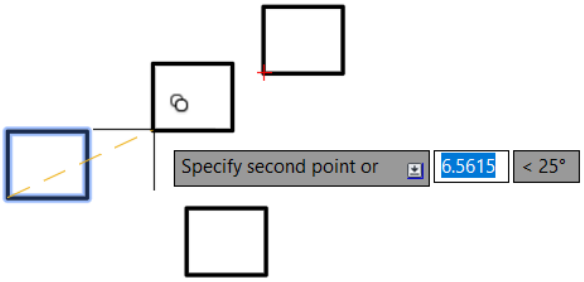
COPY COMMAND

The Copy command can be used to create one or more duplicates of any drawing object or objects which you have previously created. Copy is a very useful and timesaving command because you can create very complex drawing elements and then simply copy them as many times as you like.

COMMAND	ICON	SHORTCUT
COPY		CO

Command Sequence:

Command: COPY or CO **(↵)** or Click  icon in the ribbon
Select objects: (pick object to copy, P1)
Select objects: (to end selection)
Specify base point or displacement, or [Multiple]: (pick P2 or M for multiple copies)
Specify second point of displacement or <use first point as displacement>: (pick P3)



The multiple option allows you to create additional copies of the selected object(s) by picking as many new points as you like. To end a multiple copy, just hit the key.

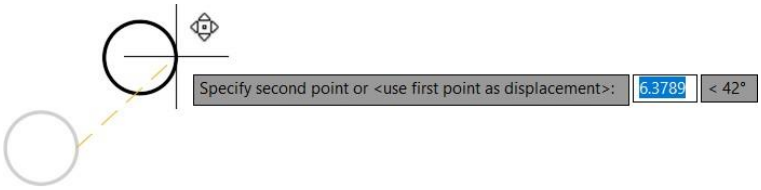
MOVE COMMAND

The Move command works in a similar way to the Copy command except that no copy is made, the selected object(s) is simply moved from one location to another.

COMMAND	ICON	SHORTCUT
MOVE		M

Command Sequence:

Command: MOVE or **(↵)** or Click icon  in the ribbon
Select objects: (pick object to move, P1)
Select objects: (to end selection)
Specify base point or displacement: (pick P2)
Specify second point of displacement or <use first point as displacement>: (pick P3)

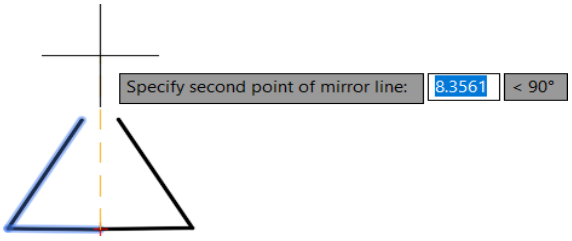


MIRROR COMMAND

The Mirror command allows you to mirror selected objects in your drawing by picking them and then defining the position of an imaginary mirror line using two points.

COMMAND	ICON	SHORTCUT
MIRROR		MI

Command Sequence:
Command: MIRROR or MI **(↵)** or Click  icon in the ribbon
Select objects: (pick object to mirror, P1)
Select objects: (to end selection)
Specify first point of mirror line: (pick P2)
Specify second point of mirror line: (pick P3)
Delete source objects? [Yes/No] <N>: (for No to keep the original object)

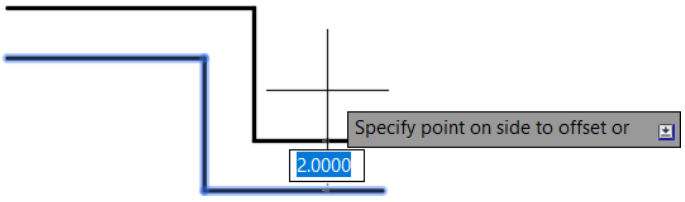


OFFSET COMMAND

Offset is probably one of the most useful commands for constructing drawings. The Offset command creates a new object parallel to or concentric with a selected object. The new object is drawn at a user defined distance (the offset) from the original and in a direction chosen by the user with a pick point. You can offset lines, arcs, circles, ellipses, 2D polylines, xlines, rays and planar splines.

COMMAND	ICON	SHORTCUT
OFFSET		O

Command Sequence:
Command: OFFSET or O **(↵)** or Click  icon in the ribbon
Specify offset distance or [Through] <1.0000>: 10 (specify distance)
Select object to offset or <exit>: (select object, P1)
Specify point on side to offset: (pick direction, P2)
Select object to offset or <exit>: (to end or select another object to offset)



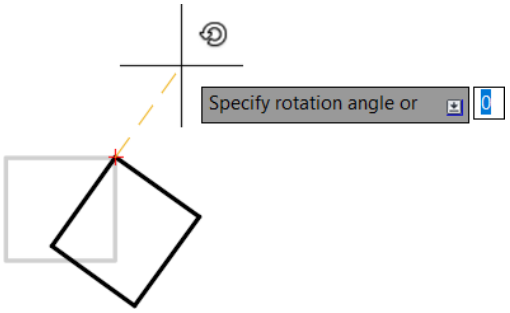
ROTATE COMMAND

The Rotate command allows an object or objects to be rotated about a point selected by the user.

COMMAND	*ICON*	*SHORTCUT*
ROTATE		R

Command Sequence:
Command: ROTATE or RO **(↵)** or Click  icon in the ribbon
Current positive angle in UCS: ANGDIR=counterclockwise ANGBASE=0
Select objects: (pick object to rotate, P1)
Select objects: (to end selection)
Specify base point: (pick base point, P2)
Specify rotation angle or [Reference]: (pick second point, P3 or enter angle)

Remember, by default, AutoCAD angles start at 3 o'clock and increase in an anti-clockwise direction. The "ANGDIR" and "ANGBASE" variables remind you of this. If you want to rotate in a clockwise direction you can enter a negative angle by using a minus sign.



Note: You can change the angle direction and the base angle using the Units command, Format Units... from the pull-down menu. Click the "Clockwise" check box to change the direction and click the "Direction..." button to set the base angle.

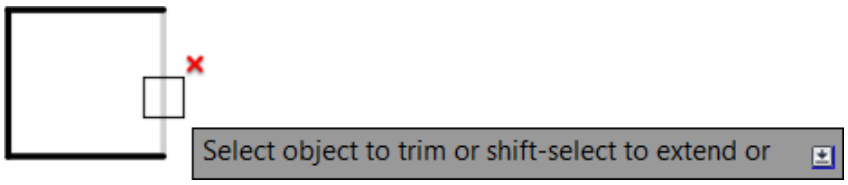
TRIM COMMAND

The Trim command can be used to trim a part of an object. In order to trim an object you must draw a second object which forms the "cutting edge". Cutting edges can be lines, xlines, rays, polylines, circles, arcs or ellipses. Blocks and text cannot be trimmed or used as cutting edges.

COMMAND	ICON	SHORTCUT
TRIM		TR

Command Sequence:

Command: TRIM or TR **(↵)** or Click  icon in the ribbon
Current settings: Projection=UCS Edge=None
Select cutting edges ...
Select objects: (select the cutting edge, P1)
Select objects: (to end cutting edge selection)
Select object to trim or shift-select to extend or [Project/Edge/Undo]: (pick the part of the square which you want to trim, P2)
Select object to trim or shift-select to extend or [Project/Edge/Undo]: (pick the circle, P3) Select object to trim or shift-select to extend or [Project/Edge/Undo]: (to end)



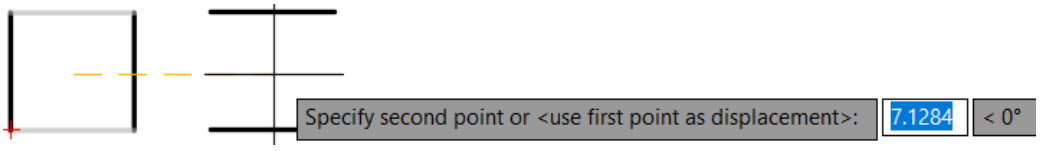
STRETCH COMMAND

The Stretch command can be used to move one or more vertices of an object while leaving the rest of the object unchanged. In the example below, a rectangle has been stretched by moving one vertex to create an irregular shape.

COMMAND	ICON	SHORTCUT
STRETCH		S

Command Sequence:

Command: STRETCH or S **(↵)** or Click  icon in the ribbon
Select objects to stretch by crossing-window or crossing-polygon...
Select objects: (pick first point of crossing window)
Specify opposite corner: (pick second point of window) S
elect objects: (to end selection)
Specify base point or displacement: (pick base point)
Specify second point of displacement: (pick second point)



SCALE COMMAND

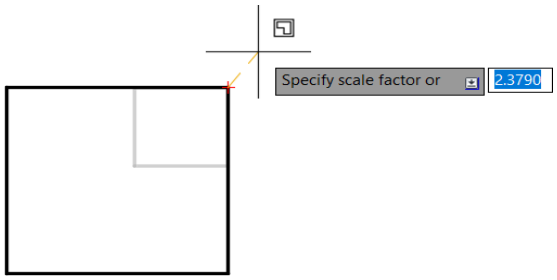
The Scale command can be used to change the size of an object or group of objects. You are prompted for a pick point about which the selection set will be scaled. Scaling can then be completed by picking a second point (not always easy because it can sometimes be difficult to precisely control the scaling) or by entering a scale factor at the keyboard. For example a scale factor of 2 will double the size of the objects in the selection set and a factor of 0.5 will reduce them into half.

COMMAND	ICON	SHORTCUT
SCALE		SC

Command Sequence:

Command: SCALE or SC **(↵)** or Click  icon in the ribbon
Select objects: (pick objects to be scaled, P1)
Select objects: (to end selection)
Specify base point: (pick base point, P2)

Specify scale factor or [Reference]: (pick second point, P3 or enter scale factor)



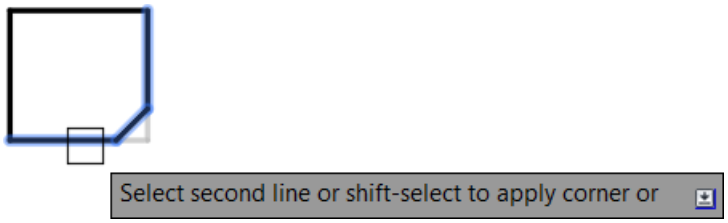
CHAMFER COMMAND

The Chamfer command enables you to create a chamfer between any two non-parallel lines as in the illustration below or any two adjacent polyline segments. Usually, the Chamfer command is used to set the chamfer distances before drawing the chamfer. Follow the command sequence below where the chamfer distances are changed to 20 before the chamfer is made.

COMMAND	ICON	SHORTCUT
CHAMFER		CH

Command Sequence:

Command: CHAMFER or CHA **(↵)** or Click  icon in the ribbon
(TRIM mode) Current chamfer Dist1 = 10.0000, Dist2 = 10.0000
Select first line or [Polyline/Distance/Angle/Trim/Method]: D (to set distances)
Specify first chamfer distance <10.0000>: 20 (enter required distance)
Specify second chamfer distance <20.0000>: (first distance value or enter a different value)
Select first line or [Polyline/Distance/Angle/Trim/Method]: (pick P1)
Select second line: (pick P2) The chamfer is made and the command end.



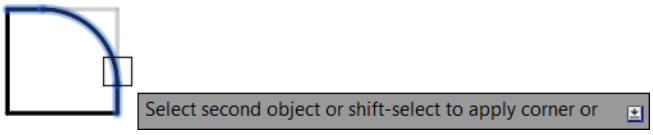
FILLET COMMAND

The Fillet command is a very useful tool which allows you to draw an arc between two intersecting lines or adjacent polyline segments. You need first to use the command to set the required radius and then a second time to select the two lines.

COMMAND	ICON	SHORTCUT
FILLET		F

Command Sequence:

Command: FILLET or F **(↵)** or Click  icon in the ribbon
Current settings: Mode = TRIM, Radius = 10.0000
Select first object or [Polyline/Radius/Trim]: R
Specify fillet radius <10.000>: 25
Select first object or [Polyline/Radius/Trim]: (pick P1)
Select second object: (pick P2)



The Fillet command can also be used to fillet arcs and circles. The "Polyline" option also allows you to fillet all vertices of a polyline with a single command.

Tips: Make sure that the radius you specify will fit the objects you select, otherwise the fillet command will not work.

EXPLODE COMMAND

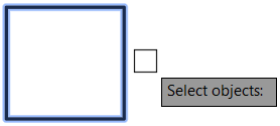
The Explode command allows breaking an object into its component objects. This can be useful when you want to modify or edit individual points or segments of an object made using the polyline command.

COMMAND	ICON	SHORTCUT
EXPLODE		EXPL

Command Sequence:

Command: EXPLODE or EXPL **(↵)** or Click  icon in the ribbon

Select objects: pick object to explode and then press **(↵)**



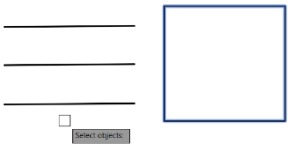
EXTEND COMMAND

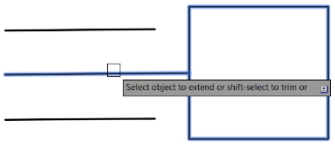
Use the extend command when you want to extend objects to meet the edges of other objects.

COMMAND	ICON	SHORTCUT
EXTEND		EX

Command Sequence: 

Command: EXTEND or EX **(↵)** or Click icon in the ribbon
Current settings: Projection=UCS, Edge=None
Select boundary edges…
Select objects or <select all>: pick boundary edge **(↵)**
Path does not intersect with the bounding edge.
Select object to extend or shift-select to trim or [Fence Crossing Project Edge Undo]: pick object to extend and then **(↵)**





ARRAY COMMAND

Using the Array command, you can duplicate existing objects in a rectangle or circular (polar) pattern. You can select which type of array to use in the Array dialog box. Click the Rectangular or Polar options to see point, distance, and method requirements for each type.

COMMAND	ICON	SHORTCUT
ARRAY		AR

Type of Array

- **Rectangular array**

Rectangular array creates an array of rows and columns of copies of the selected objects.

- **Polar array**

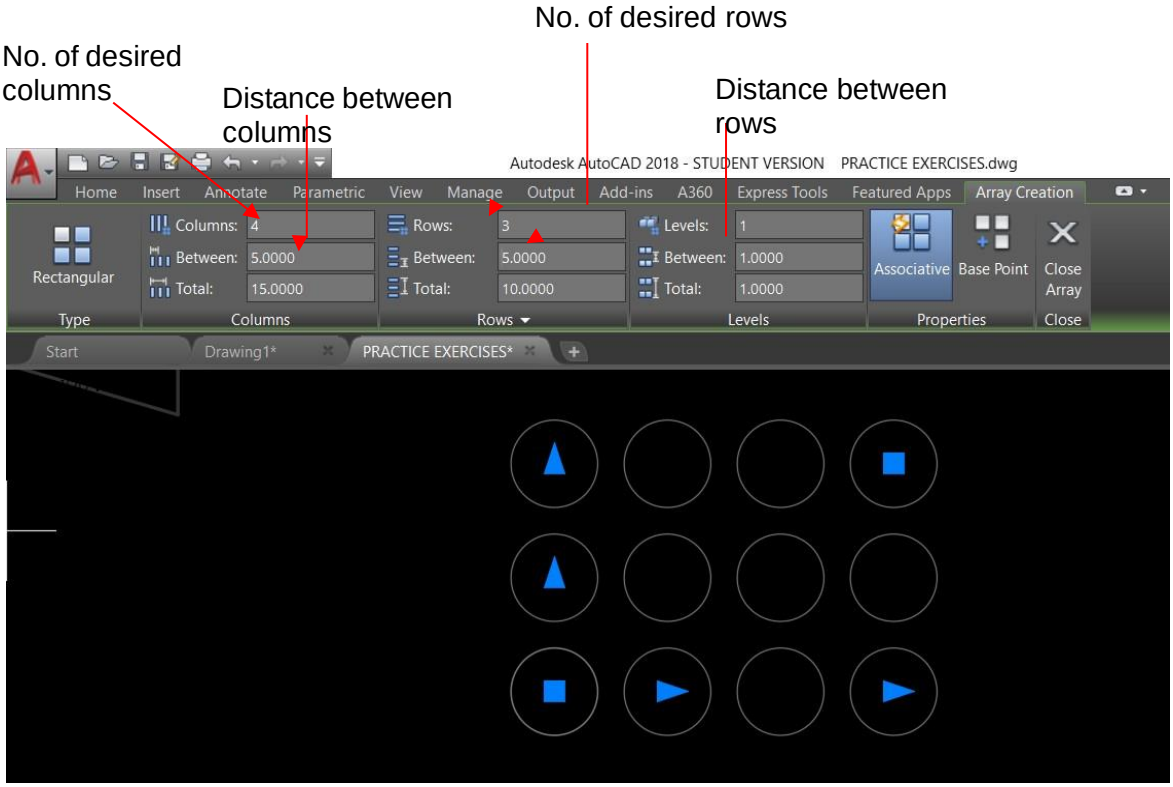
Polar array creates an array by copying the selected objects around a specified center point.

The following illustration shows a rectangular and polar array command sequence

- **Rectangular Array Command Sequence:**

Command: ARRAY or AR **(↵)** or Click  icon in the ribbon
Select objects: pick object to array **(↵)**
Enter array type [Rectangular PAth Polar]: type R **(↵)**
Type=Rectangular Associative=Yes
Select grip to edit array or [Associative Base point COUnt Spacing COLumns Rows Levels eXit]: type COL **(↵)**
Enter the number of columns or [Expression] <4>: type number of columns **(↵)**
Specify the distance between columns or [Total Expression] <5.611>: type distance **(↵)**
Select grip to edit array or [Associative Base point COUnt Spacing COLumns Rows Levels eXit]: type R **(↵)**
Enter the number of rows or [Expresion] <3>: type number of rows **(↵)**
Specify the distance between rows or [Total Expression] <5.6611>: type distance of rows **(↵)**
Press (↵) or Esc to end command

Another option to set up the rectangular array is by directly entering the desired number of columns and rows in the ribbon after initiating the command as shown below:
Command: ARRAY or AR **(↵)** or Click icon in the ribbon
Select objects: pick object to array **(↵)**
Enter array type [Rectangular PAth Polar]: type R **(↵)**
Type=Rectangular Associative=Yes
Click Close Array once done.

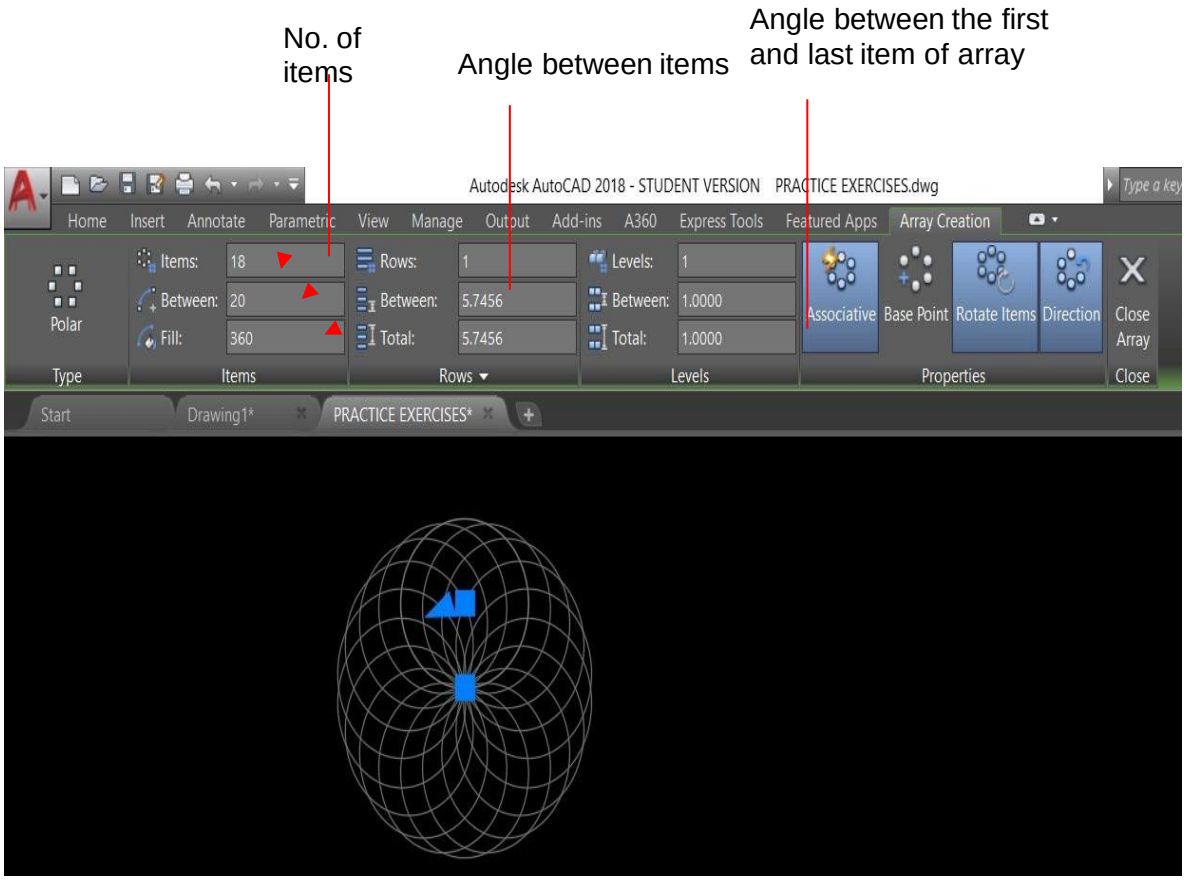


- **Polar Array Command Sequence:**

Command: ARRAY or AR **(↵)** or Click  icon in the ribbon
Select objects: pick object to array **(↵)**
Enter array type [Rectangular PAth Polar]: type PO **(↵)**
Type=Polar Associative=Yes
Specify center point of array or [Base point Axis of rotation]: Pick center point or base point
Select grip to edit array or [Associative Base point Items Angle between Fill angle ROWs Levels ROTate items eXit] <exit>: type A if you want to specify angle between each object **(↵)**
Specify angle between items or [Expression] <60>: type desired angle between **(↵)**
Select grip to edit array or [Associative Base point Items Angle between Fill angle ROWs Levels ROTate items eXit] <exit>: type I if you want to specify number of items
Enter number of items in array or [Expression] <6>: type number of items **(↵)**
Select grip to edit array or [Associative Base point Items Angle between Fill angle ROWs Levels ROTate items eXit] <exit>: type F to specify the angle between the first and last item of array
Specify the angle to fill (+=ccw, -=cw) or [Expression] <360>: type desired angle to be filled **(↵)**
Type X to stop the command or press **(↵)**

Another option to set up the polar array is by directly entering the desired settings in the ribbon after initiating the command as shown below:

Command: ARRAY or AR **(↵)** or Click icon in the ribbon
Select objects: pick object to array **(↵)**
Enter array type [Rectangular PAth Polar]: type PO **(↵)**
Type=Polar Associative=Yes
Click Close Array once done.

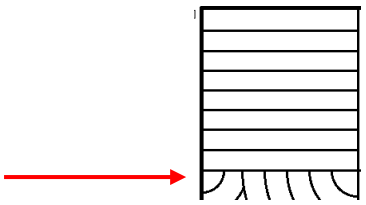
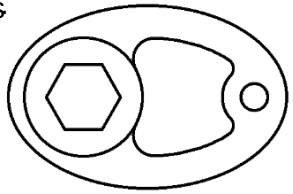
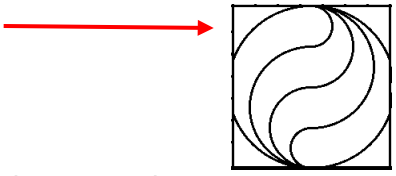
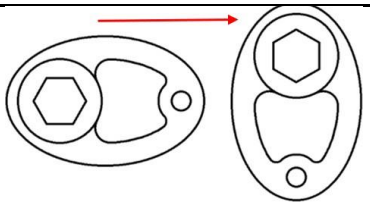
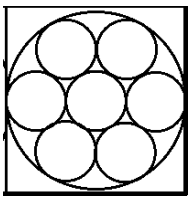
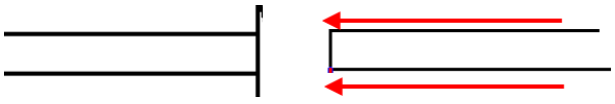


Note to students :
To learn more about Draw commands please access Techdraft Warriors in the YouTube.

E What is more?

Illustrate the command sequence on how to modify the given objects. Use the icon in the modify tool bar in starting your command. Use separate sheet of paper for Activity1 and Activity 1.1. See Scoring Rubric for the sets of criteria in gaining the perfect score for Speed, Accuracy and Cleanlines.

Speed	5
Accuracy	5
Cleanliness	5
Total=	15

Activity Sheet 1	**Activity Shee1.1**
1.15pts.  trim the unnecessary lines at the bottom of the object	1. 15pts  Delete the object
2.15pts.  delete the rectangle	2. 15pts.  Rotate the object
3. 15pts.  Make 2 copies of this object	3. 15pts.  Extend the horizontal lines on the right side guided by the arrow, to the vertical line on the left side.

Note to student: If you have access to computer with AutoCAD application you can draw the object using AutoCAD save your activity and submit to your teacher assigned portal.

A What can I achieve?

Write your answer on the space provided before the number. Choose the letters only

1. What command to use if you want to modify or edit individual points or segments of an object?
   A. Explode B. Erase C. Delete D. Move

2. What modify command will extend object to meet the edges of another object?
   A. Fillet B. Extend C. Offset D. Rotate

3. What command works in a similar way to the copy command except that no copy is made. The selected object(s) is simply moved from location to another.
   A. Move B. Copy C. Extend D. Rotate

4. When you input mirror command, AutoCAD will prompt you to what action?
   A. Pick object to mirror C. Pick point 2
   B. Specify first point of mirror D. Pick a point

5. What is the short command for offset?
   A. Off B. Of C. O D. Os

6. What is the short command for Rotate?
   A. Rot B. Ro C. R D. Rt

7. What is the short command for Trim?
   A. Trim B. Tri C. Tr D. T

8. What modify command will draw an arc between two intersecting lines or adjacent polyline segments
   A. Chamfer B. Rotate C. Mirror D. Fillet

9. Sheila wants to duplicate existing objects in a circular (polar) pattern. What modify command from the choices below should she likely use?
   A. Mirror B. Copy C. Array D. Rotate

10. When you type the scale command, what will AutoCAD prompt you to do next?
   A. Select object: (pick objects to be scaled, P1)
   B. Select objects: (to end selection)
   C. Specify base point: (pick base point, P2)
   D. Specify scale factor or [Reference]: (pick second point, P3 or enter scale

11. _____ command allows you to mirror selected objects in your drawing by picking them and then defining the position of an imaginary mirror line using two

points.

A. Mirror B. Copy C. Array D. Rotate

12. Which type of array command creates an array of columns of copies of the selected object

A. Path B. Rectangular C. Polar D. None the Above

13. What is the short command for Explode

A. Expl B. Ex C. X D. E

14. What command can be used to change the size of an object or group of objects.

A. Move B. Rotate C. Copy D. Scale

15. What modify command from the choices below erases any selected object from the drawing.

A. Trim B. Erase C. Offset D. Move

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